

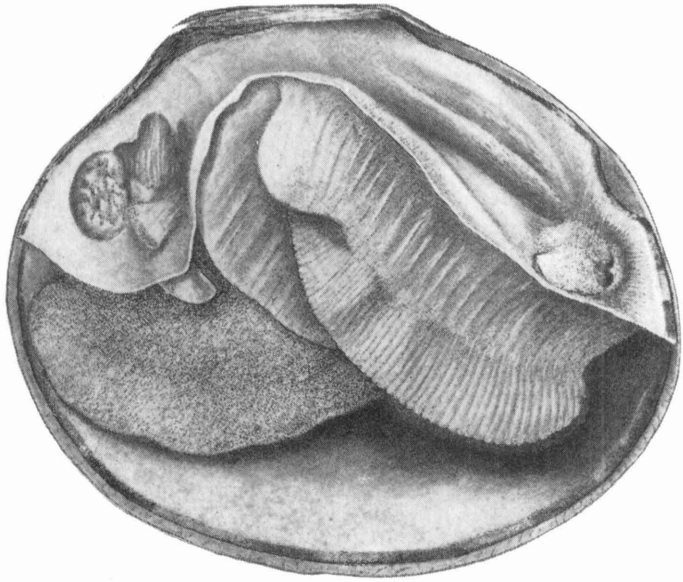
UNIVERSITY OF MICHIGAN
MUSEUM OF ZOOLOGY

Miscellaneous Publications No. 6

A Synopsis of the Classification of the Fresh-
Water Mollusca of North America,
North of Mexico,
AND
A Catalogue of the More Recently
Described Species, With Notes

BY
BRYANT WALKER

ANN ARBOR, MICHIGAN
PUBLISHED BY THE UNIVERSITY
DECEMBER 30, 1918



DROMUS DROMAS (LEA).

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PART I—SYNOPSIS

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The Occasional Papers, publication of which was begun in 1913, serve as a medium for the publication of brief original papers based principally upon the collections in the Museum. The papers are issued separately to libraries and specialists, and, when a sufficient number of pages have been printed to make a volume, a title page, table of contents and index are supplied to libraries and individuals on the mailing list for the entire series.

The Miscellaneous Publications include papers on field and museum technique, monographic studies and other papers not within the scope of the Occasional Papers. The papers are published separately, and, as it is not intended that they shall be grouped into volumes, each number has a title page and when necessary a table of contents and index.

ALEXANDER G. RUTHVEN,
Director of the Museum of Zoology,
University of Michigan.

PREFACE

It has been many years since the students of the North American fresh-water mollusca have had at their service a concise and complete synopsis of the classification in general use.

The several monographs published by the Smithsonian Institution of W. G. Binney and Prime in 1865 and Tryon in 1873, together with Lea's last Synopsis in 1870, gave a very complete representation of the systematic arrangement in use at that time.

Tryon's "Monograph of the Fresh-water Mollusca of the United States," a continuation of Haldeman's Monograph of 1842, did not include the Pleuroceridæ and did not add substantially to systematic classification.

Since that time, although our knowledge on the subject has greatly increased, there have been no general monographs published covering the entire field and the recorded advances in classification are only to be found in many scattered publications not always accessible to the ordinary collector.

Certain groups have, indeed, been studied monographically. Simpson's monumental "Synopsis of the Naiades" (1900) followed by his "Descriptive Catalogue" of 1914, revolutionized the classification of that great group and pointed the way to a natural classification that has since been greatly elaborated by Ortmann in many scattered papers.

Baker's elaborate "Lymnæidæ of North and Middle America" (1911) marked another great advance in systematic classification.

Sterki's recent "Preliminary Catalog of North American Sphæriidæ" (1916) embodies the results of many years of careful study of that family and is, it is to be hoped, but the fore-runner of a complete, illustrated monograph of that most interesting, but difficult, group.

With these exceptions, the many changes in systematic nomenclature resulting from the investigations of many different workers have been published piece-meal, as it were, and in many different publications.

The need of a concise synopsis, showing the state of the science at the present time as adopted by those who are most familiar with the subject, has been met by the Museum of Zoology of the University of Michigan in its endeavors to further the study of Natural History in the schools of the state and Part I of this paper is an attempt to place before the amateur student a summary of the classification of the fresh-water mollusca which is in current use. It is to be understood, of course, that with our constantly increasing knowledge, many changes will, undoubtedly, be necessary in the future and are to be expected and hoped for. The arrangement here presented is what the compiler understands to be the state of the science at the present time.

Part II is an out-growth of a card catalogue that the writer has maintained for his own convenience for many years. In the last half century the knowledge of our fauna has enormously increased, but the many new species

have been described in many scattered publications not always accessible to the student and not to be found except by laborious and time-taking search. The convenience of a catalogue giving references to all of the new species described since the Smithsonian monographs were published is obvious.

In addition to such references, it has been deemed of service to add under many of the species, old and new, the published opinions of many writers as to their specific validity and relationships. It will be understood, of course, that such quoted opinions are not necessarily those of the compiler and are not endorsed by him unless expressly so stated. They are given solely for what they are worth as representing the views of the author at the time of their publication.

The whole subject is brought down to May 1, 1918.

BRYANT WALKER.

Dated July 1, 1918.

A SYNOPSIS OF THE CLASSIFICATION OF THE FRESH-WATER
MOLLUSCA OF NORTH AMERICA, NORTH OF MEXICO.

Class GASTROPODA.
Subclass EUTHYNEURA.
Order PULMONATA.
Suborder BASOMMATOPHORA.

Superfamily LIMNOPHILA.

The North American *Limnophila* are in the main inhabitants of fresh water, but are occasionally found in slightly brackish water along the sea coast. The epidermis is smooth; the contractile tentacles are flattened or cylindrical; the eyes are placed on the inner bases of the tentacles. The genital orifices are separated, the male orifice is near the tentacle, the female at the base of the neck, near the respiratory orifice. The jaw is simple or composed of three pieces. The radula has numerous rows of small teeth.

Key to the families of *Limnophila*.

- I. Shell spiral, dextral, spire more or less elongated.....*Lymnæidæ*.
- II. Shell discoidal, with the columellar margin simple,
not dilated*Planorbidæ*.
- III. Shell spiral, sinistral*Physidæ*.
- IV. Shell patelliform or spiral, dextral, neritoid or planorboid
with the columellar margin broadly dilated.....*Ancylidæ*.

Family LYMNÆIDÆ.

Shell spiral, dextral, spire usually elongated and acute, but in some groups small and depressed.

Animal dextral. Head with a broad, short muzzle dilated at the end. Foot rounded behind. Tentacles flattened.

Jaw composed of three plates, a large one in the center, with two small, narrow laterals. Radula broad; central tooth small, simple or bicuspid, the laterals bi- or tricuspid. The marginals bi-, tri-, or multicuspid or serriform.

Genus LYMNÆA Lamarck, 1799.

Shell spiral, dextral, thin, unicolor or occasionally with longitudinal stripes; spire usually acute; aperture large, oval, rounded below, extremities united by a thin parietal callus; columella more or less twisted or plicate; lip thin, sometimes with an internal thickening or varix. Animal dextral; head large; tentacles flattened, triangular; eyes sessile on the inner bases of the tentacles.

Key to the subgenera of *Lymnæa*.

1. { Spire elevated 2.
 { Spire short 6.
2. { Body-whorl greatly inflated *Lymnæa s. s.*
 { Body-whorl slightly inflated 3.
3. { Shell very slender; spire longer than the aperture; lip continuous *Acella*.
 { Shell more or less inflated; spire shorter than the aperture; lip not continuous 4.
4. { Columella smooth, reflected over the umbilicus *Galba*.
 { Columella twisted or plicate 5.
5. { Surface with impressed, spiral lines *Stagnicola*.
 { Surface longitudinally costate *Polyrhytis*.
6. { Body-whorl large, not inflated, elongate *Pseudosuccinea*.
 { Body-whorl large, inflated 7.
7. { Shell large, solid, bulimiform; lip not expanded *Bulimnæa*.
 { Shell moderate, spire very short, usually thin, lip more or less expanded 8.
8. { Shell thin, lip widely expanded, surface polished; spire acute, whorls rounded *Radix*.
 { Shell thicker; lip occasionally expanded; lines of growth distinct; spire broad, whorls shouldered *Stagnicola (pars)*.

Subgenus LYMNÆA s. s.

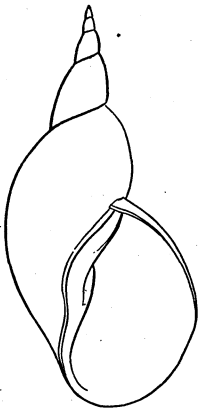


Fig. 1

Shell large, thin, with an acute, slender spire and expanded body-whorl; axis gyrate, forming a (usually) pervious spiral coil without a true umbilicus; the callus on the body-whorl closely appressed; the outer lip flaring more or less, simple, sharp, normally without any thickening. Penis-sac very large; penis very short (about one-quarter the length of the penis-sac); penis retractors normally two, very large; anterior termination of the prostate bulb-shaped. Radula with unicuspid central and bicuspid lateral teeth, marginals serrate.

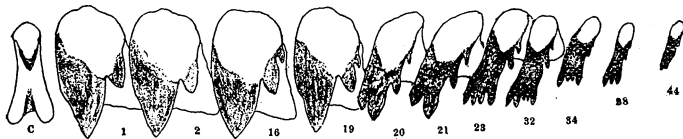


Fig. 2

Type: *L. stagnalis* L.

Example: *L. stagnalis appressa* Say, fig. 1. Radula, fig. 2.

Subgenus PSEUDOSUCCINEA Baker, 1908.



Fig. 3

Shell thin, succineiform; spire short; body-whorl large, elongated, not inflated; surface sculptured with spiral, incised lines; axis gyrate.

“Prostate long, narrowly cylindrical with a slight bulbous termination; penis thick, about half as long as penis-sac; lateral teeth bicuspid.”



Fig. 5



Fig. 4

Type: *L. columella* Say, fig. 3. Radula, fig. 4. Jaw, fig. 5.

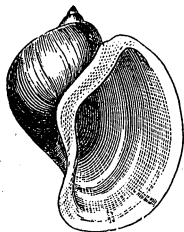


Fig. 6

Subgenus RADIX Montfort, 1810.

Shell thin, globose-oval; spire short, acute; body-whorl large, inflated; aperture very large; lip expanded.

“Prostate short, pear-shaped when viewed laterally; penis very slender, longer than penis-sac; first lateral tooth tricuspid, balance bicuspid.”



Fig. 7

Type: *L. auricularia* L., fig. 6. Radula, fig. 7.

Subgenus BULIMNEA Haldeman, 1841.

Shell large and solid, bulimiform, with an impervious axis, a twisted or subplicate pillar, the callus on the body-whorl and pillar closely appressed and the outer lip not thickened or expanded.

"Prostate very large, irregularly elongate-ovate; penis very large, one-fourth longer than penis-sac, gradually enlarging in diameter toward the distal end; lateral teeth tricuspid."

Type: *L. megasoma* Say, fig. 8. Radula, fig. 9.

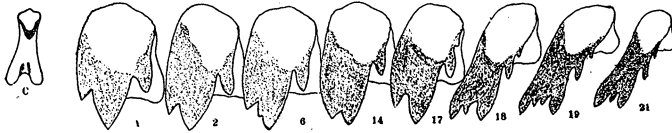


Fig. 9

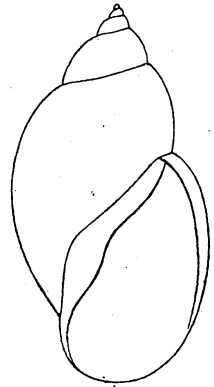


Fig. 8

Subgenus ACELLA Haldeman, 1841.

Shell thin, smooth, acute, extremely slender; aperture expanded at the margin; the inner lip not appressed, a moderate chink behind it; axis gyrate, pervious, not plicate; outer lip simple, sharp.

"Prostate large, flatly cylindrical; penis thick, about four-sevenths the length of penis-sac; lateral teeth bicuspid; the mesocone with a distinct entoconic swelling."

Type: *L. haldemani* "Desh." W. G. Binn., fig. 10. Radula, fig. 11.

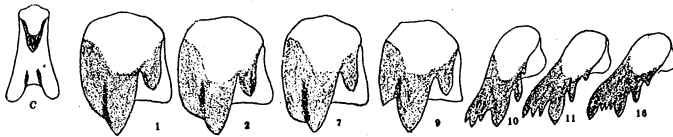


Fig. 11



Fig. 10

Subgenus GALBA Schrank, 1803.

Shell small, turreted; spiral sculpture wanting or subobsolete; columella smooth; inner lip flatly reflected over the umbilicus.

"Prostate long-ovate; penis a trifle shorter than penis-sac, of narrow diameter; lateral teeth bicuspid."

Type: *L. truncatula* Müll.

Example: *L. caperata* Say, fig. 12. Radula, fig. 13.

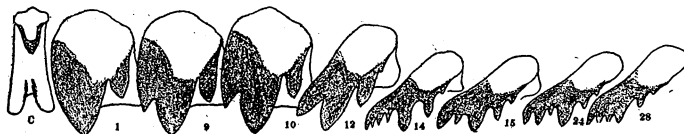


Fig. 13



Fig. 12

Section PSEUDOGALBA Baker, 1913.

Shell as in *Galba*, but with the inner lip less expanded. Genitalia in *Galba*. Lateral teeth tricuspid.



Fig. 14

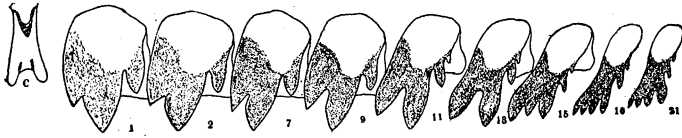


Fig. 15

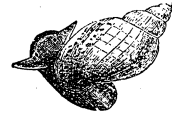


Fig. 16

Type: *L. humilis* Say, fig. 14. Radula (*L. obrussa* Say), fig. 15. Animal (ibid.), fig. 16.

Subgenus STAGNICOLA Leach, 1830.

Shell varying from elongate to short-ovate; outer lip (usually) somewhat thickened within; columella distinctly plicate; inner lip appressed; axis slightly or not all perforate; surface with strong, spirally impressed lines.

“Prostate elongate-pyriform; penis from three-fourths to four-fifths the length of penis-sac, very thick; lateral teeth bicuspid.”

Type: *L. palustris* Müller, fig. 16. Radula, fig. 18.



Fig. 17

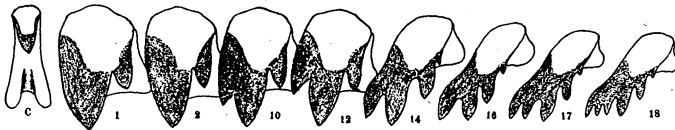


Fig. 18

Section POLYRHYTIS Meek, 1876.

Shell longitudinally costate. Soft anatomy unknown.

Type: *L. kingii* Meek.

Example: *L. utahensis* Call, fig. 19.



Fig. 19

Family PLANORBIDÆ.

Key to the subfamilies of *Planorbida*.

- Shell discoidal *Planorbina*.
- Shell spiral *Pompholigina*.

Subfamily PLANORBINÆ H. and A. Adams, 1858.

Shell discoidal, ultra-dextral or sinistral. Animal sinistral, having the pulmonary, genital and excretory orifices on the left side. Tentacles long, slender and cylindrical. Jaw in three segments. Radula with the numerous teeth arranged in nearly horizontal rows, central small and bicuspid, marginals tricuspid, laterals multicuspid.

In the formation of the keys and descriptions of the various subdivisions of the family, the shells are treated with reference to their apparent mode of spiral growth.

Key to the genera of *Planorbinae*.

1. Aperture dentate within *Segmentina*.
2. Aperture without internal teeth *Planorbis*.

Genus PLANORBIS Müller, 1774.

Shell discoidal, dextral or sinistral, spire very much depressed, not usually rising above the margin of the body whorl; no real columella; aperture oblique; outer lip simple and sharp or thickened. Animal smooth; head short; tentacles long, slender and cylindrical; eyes sessile on the inner bases of the tentacles; foot short, narrow, obtuse at both ends; jaw and radula as in the subfamily.

Key to the subgenera of *Planorbis*.

1. { Aperture simple, lip thickened *Helisoma*.
- { Aperture simple, lip sharp 2.
- { Aperture campanulate, lip thickened *Planorbella*.
2. { Shell sinistral *Planorbis s. s.*
- { Shell dextral 3.
3. { Base of body-whorl flattened *Tropidiscus*.
- { Base of body-whorl convex 4.
4. { Body-whorl rounded or angulated *Gyraulus*.
- { Body-whorl acutely carinated or lenticular *Hippeutis*.

Subgenus PLANORBIS s. s.

Shell sinistral, large, with a moderate number of gradually increasing whorls, rounded above and below; aperture slightly and gradually expanded, with its margin simple and sharp.

Represented in our fauna by a single section.

Section PLANORBINA Haldeman, 1842.

Shell like *Planorbis*, s. s., but vertically compressed, with smaller and more numerous whorls and a very oblique aperture.

Type: *P. olivaceus* Spix.

Example: *P. glabratus* Say, fig. 20.

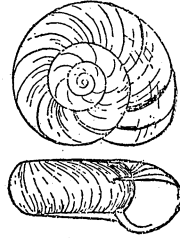


Fig. 20

Subgenus HELISOMA Swainson, 1840.

Shell dextral or sinistral, few whorled, the whorls carinate above and rapidly enlarging; base funicular; aperture suddenly expanding and thickened.

Key to the sections of *Helisoma*.

1. Shell dextral, carinated above and below, spire and base funicular *Helisoma* s. s.
2. Shell sinistral, early whorls flattened and carinate above, base funicular *Pierosoma*.



Fig. 21

Section of HELISOMA s. s.

Shell dextral, moderate size, few whorled, the whorls carinated above and below and rapidly enlarging; spire and base funicular, aperture suddenly expanded, with a thickened peritreme.

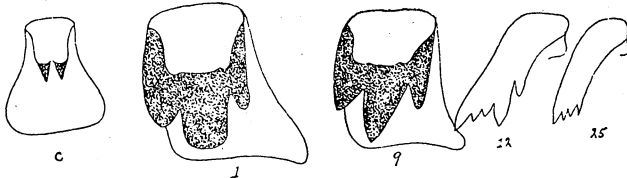


Fig. 22



Fig. 23

Type: *P. bicarinatus* Say, fig. 21. Radula, fig. 22. Animal, fig. 23.

Section PIEROSOMA Dall, 1905.

Shell sinistral, large, high, with few transversely sculptured whorls; the early whorls carinate and flattened above, funicular below; in the adult the flattened apex is usually depressed below the upper level of the body whorl; the aperture is suddenly expanded and somewhat thickened.

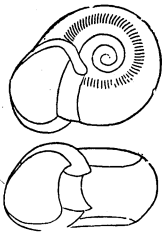


Fig. 24



Fig. 25

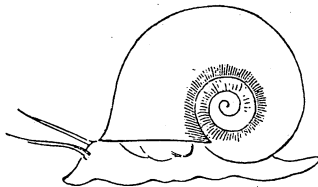


Fig. 26

Type: *P. trivolvis* Say, fig. 24. Radula, fig. 25. Animal, fig. 26.

Subgenus PLANORBELLA Haldeman, 1842.

Shell sinistral, depressed, whorls more numerous than in *Helisoma*; apex scarcely, if any, depressed below the level of the body-whorl; base funicular; body-whorl constricted behind the widely expanded, campanulate aperture.

Type: *P. campanulatus* Say, fig. 27. Radula, fig. 28.



Fig. 27

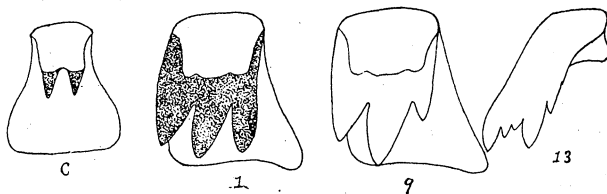


Fig. 28

Subgenus TROPIDISCUS Stein, 1850.



Fig. 29

Shell dextral, moderately large, depressed, upper surface convex, base flattened, adult periphery angular or carinate, the aperture oblique, slightly expanded, simple.

Type: *P. umbilicatus* Müller.

Example: *P. cultratus* d'Orb., fig. 29.

Subgenus HIPPEUTIS Agassiz, 1837.

Shell dextral, small, lenticular, with a small number of rapidly increasing whorls, the last enveloping a large part of the preceding whorl; apex slightly depressed, base with a narrow umbilicus, aperture oblique with a thin sharp margin.

Type: *Helix fontanus* Lightfoot.

Section MENETUS H. and A. Adams, 1855.

Like *Hippeutis*, but the last whorl not enveloping the preceding whorls to so large an extent.

Type: *P. opercularis* Gld., fig. 30.

Subgenus GYRAULUS Agassiz, 1837.

Shell dextral, small, with few, rapidly increasing whorls, fully exposed above and below, with a nearly median periphery, rounded or obtusely angulated, but not accurately carinated.



Fig. 30

Key to the sections of *Gyraulus*.

1. Surface spirally striate and hispid.....*Gyraulus s. s.*
2. Surface smooth or finely striate.....*Torquis*.
3. Surface costate*Armiger*.

Section GYRAULUS, s. s.

Periphery rounded, or angulated, surface spirally striate and hispid; aperture simple, sharp-edged, oblique.

Type: *P. albus* Müller.

Example: *P. hirsutus* Gld., fig. 31.

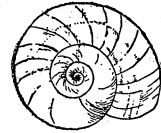


Fig. 31

Section TORQUIS Dall, 1905.

Like *Gyraulus s. s.*, but with more rounded, less rapidly increasing whorls, not hispid nor spirally striate; aperture expanded and slightly thickened in the adult.



Fig. 32



Fig. 33

Type: *P. parvus* Say, fig. 32. Radula, fig. 33.

Section ARMIGER Hartmann, 1840.

Shell dextral, very small, with few rapidly increasing, costate whorls, the costæ projecting at the periphery; the form in a general way like *Gyraulus*.

Type: *P. crista* L., fig. 34.



Fig. 34

Genus SEGMENTINA Fleming, 1817.

Shell discoidal, dextral, whorls few, rounded or carinated above and below, with one or more sets of laminæ or teeth in the interior of the shell.

Animal as in *Planorbis*, tentacles filiform; foot narrow anteriorly, wider behind, obtusely rounded at both ends. Radula, central tooth bicuspid; laterals tricuspid; marginals 4-5 cuspid.

Type: *Nautilus lacustris* Lightfoot.

Subgenus PLANORBULA Haldeman, 1842.

Shell rather small, whorls few, slowly and regularly increasing, rounded or carinated above and below; aperture somewhat expanded, lip more or less thickened within; a single persistent set of 6 dentiform lamellæ at short distance within the aperture.



Fig. 35



Fig. 36

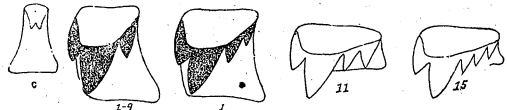


Fig. 37

Type: *Planorbis armigerus* Say, fig. 35. Aperture, fig. 36. Radula, fig. 37.

Subfamily POMPHOLIGINÆ Dall, 1866.

Shell spiral, dextral, flattened above; the body whorl very large.

Animal sinistral. Tentacles moderate, stout, cylindrical, slightly globose at the tips; eyes sessile, near the inner base of the tentacles; foot short, bluntly rounded behind; jaw single, subcordiform; radula with the teeth in nearly horizontal rows, central tooth small, bicuspid, laterals wide.

Key to the genera of *Pompholiginae*.

1. Shell imperforate *Pompholyx*.
2. Shell deeply umbilicate *Carinifex*.

Genus POMPHOLYX Lea, 1856.



Fig. 38

Shell spiral, dextral, globosely depressed, imperforate; whorls few, spire short, obtuse; last whorl very wide, ventricose; aperture very large, wide, subcircular, expanded; lip thin; columella thickened.

Animal as in the subfamily.

Type: *P. effusa* Lea, fig. 38. Radula, fig. 39.

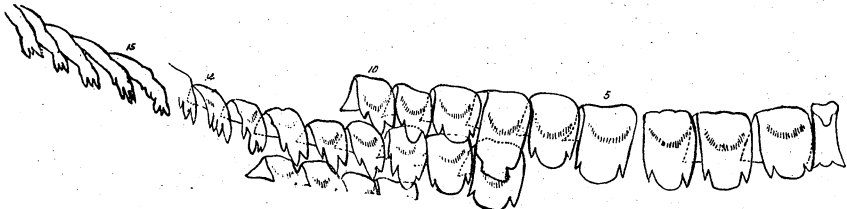


Fig. 39

Genus CARINIFEX W. G. Binney, 1863.

Shell spiral, dextral, inflated, angular; spire terraced; whorls numerous, visible above, last whorl very large, broad above, rapidly attenuated below, visible above, last whorl very large, broad above, rapidly attenuated below, umbilicus funnel shaped; aperture triangular, broad above, narrow below; inner lip slightly thickened; outer lip thin, acute, angular above, flexuose.



Fig. 40

Animal sinistral, resembling *Planorbis*, but with much shorter tentacles; jaw single; radula similar to that of *Pompholyx*.

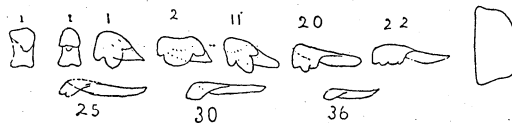


Fig. 41

Type: *Planorbis newberryi* Lea, fig. 40. Radula and jaw, fig. 41.

Family PHYSIDÆ.

Shell spiral, sinistral, thin, smooth or with microscopic transverse striae, shining, spire more or less produced.

Animal sinistral, having the pulmonary, genital and excretory orifices on the left side; tentacles slender, cylindrical; foot narrow, pointed behind; jaw single, arcuate, with a vertical fibrous accessory process on the superior margin; radula with the teeth arranged in oblique rows. Central tooth wide, base with projecting processes before and behind, multicuspid; laterals obliquely bent, comb-like, multicuspid, with a peculiar process at their external angle.

1. Shell elongate, slender, smooth, polished, inner edge of the mantle simple, not digitate, not extending beyond the shell *Aplexa*.
2. Shell less elongated, body whorl usually inflated, smooth or with microscopic revolving striae; inner edge of the mantle digitate or lobed, extending partly over the shell. . *Physa*.

Genus PHYSA Draparnaud, 1801.

Shell sinistral, oblong, thin, translucent, shining; spire acute, usually short; whorls convex; aperture ovate, rounded below; columella twisted, lip thin, acute, sometimes thickened within.

Animal as in the family, but with the inner margin of the mantle digitate or lobed, and extending over the shell.

Section PHYSA s. s.

Shell smooth.



Fig. 42

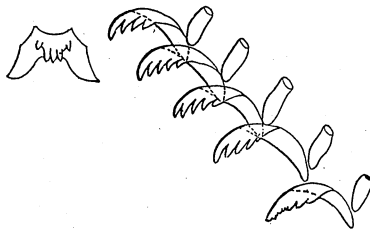


Fig. 43



Fig. 44

Type: *Bulla fontinalis* L.Example: *P. gyrina* Say, fig. 42.Radula: *P. humerosa* Gld., fig. 43.Animal: *P. heterostropha* Say, fig. 44.

Section COSTATELLA Dall, 1870.

Shell longitudinally costate.

Type: *P. costata* Newc., fig. 45.

Fig. 45

Genus APLEXA Fleming, 1822.

Shell sinistral, elongated, slender, smooth, shining; spire acute; lip simple, sharp, columella but slightly twisted.

Animal similar to that of *Physa*, but with the inner edge of the mantle simple, not digitate nor reflected over on the body whorl.

Fig. 46

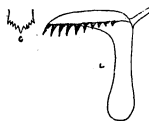


Fig. 47



Fig. 48

Type: *Bulla hypnorum* L., fig. 46. Radula, fig. 47. Animal, fig. 48.

Family ANCYLIDÆ.

Shell patelliform or dextrally spiral, neritiform or planorbiform.

Animal (fig. 49) sinistral or dextral, with a large oval foot; tentacles short, blunt, cylindrical; eyes sessile on their inner bases; jaw in three parts or the whole segmented in plates; radula with the teeth arranged in rows nearly horizontal or slightly curved, central tooth small, unicuspid or bicuspid, laterals bicuspid or comb-like, marginals comb-like or subobsolete.



Fig. 49

Key to the subfamilies of *Ancylidæ*.

- 1. { Shell patelliform 2.
- { Shell planorbiform or neritiform.....*Neoplanorbina*.
- 2. { Shell and apex unicolored..... 3.
- { Shell small, with pink apex.....*Rhodacmeina*.
- 3. { Shell large, apex submedial.....*Lancina*.
- { Shell small, apex more or less posterior and excentric...*Ferrissina*.

Subfamily LANCINÆ Hannibal, 1914.

Shell large for the family, ovate-elliptical, depressed or roundly arched; apex submedial, not prominent, smooth or concentrically striate. Animal with the jaw as in *Lymnæa* with two accessory plates. Radula also lymnæid in character. Central tooth unicuspid or tricuspid; laterals bicuspid with large quadrate bases; marginals comb-like, the cusps extending beyond the base.

Key to the genera of *Lancina*.

- Shell larger, apex subcentral*Lanx*.
- Shell smaller, apex subterminal*Fisherola*.

Genus LANX Clessin, 1880.

Shell large, broadly ovate, roundly arched, rather solid, apex not prominent, smooth or concentrically striate, subcentral. Radula as in the subfamily.

Type: *Ancylus newberryi* Lea, fig. 50.

Radula: *Lanx pattelloides* (Lea), fig. 51.



Fig. 50

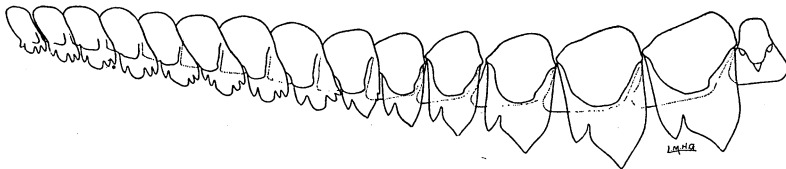


Fig. 51

Subgenus WALKEROLA Hannibal.

Shell as in *Lanx*, but thinner and more depressed.

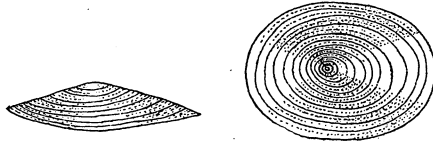


Fig. 52

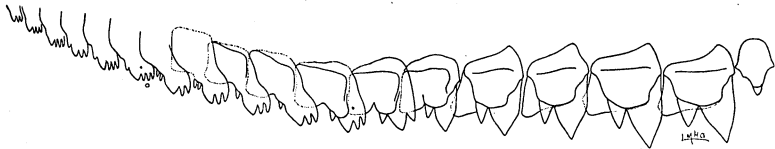


Fig. 53

Type: *Lanx klamathensis* Hann., fig. 52. Radula, fig. 53.

Genus FISHEROLA Hannibal, 1912.

Shell rounded-ovate, somewhat broader anteriorly, depressed-conic, finely concentrically striate, apex small, indistinct, subterminal, but not inclined. Anatomy unknown.

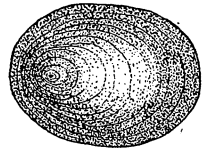


Fig. 54

Type: *Fisherola lancides* Hann., fig. 54.

Subfamily FERRISSIINÆ Walker, 1917.

Shell small, thin, broadly ovate to oblong; apex more or less posterior and eccentric, apex (in North American species) smooth or radially striate, Animal having the jaw segmented in plates. Radula with a bicuspid central, laterals obliquely reflected with from two to five small cusps, arranged like the teeth of a comb, marginals also comb-like, cusps not (usually) extending to the basal line.

Key to the genera of *Ferrissinae*.

- Shell never septate *Ferrissia*.
- Shell in maturity septate *Gundlachia*.

Genus FERRISSIA Walker, 1903.

Shell ovate to oblong, conic, more or less elevated, apex excentric and posterior, radially striate or smooth.

Animal as in the subfamily.

Key to the subgenera of *Ferrissia*.

- Shell elevated, apex radially striate*Ferrissia s. s.*
- Shell depressed, apex smooth*Lævapex*.

Subgenus FERRISSIA s. s.

Shell conic, elevated, apex radially striate.

Type: *Ancylus rivularis* Say, fig. 55. Radula, fig. 56.



Fig. 55



Fig. 56

Subgenus LÆVAPEX Walker, 1903.

Shell more or less depressed, apex smooth.

Type: *Ancylus fuscus* C. B. Ads., fig. 57.

Radula: *Ferrissia diaphana* (Hald.), fig. 58.

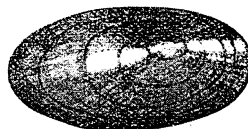


Fig. 57

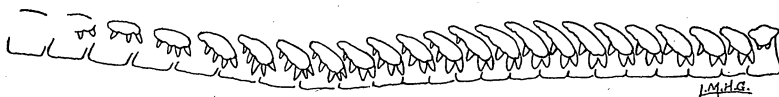


Fig. 58

Genus GUNDLACHIA Pfeiffer, 1849.

Shell small, thin, ancyliform, obliquely conical; apex posterior, excentric, smooth or radially striate, inclined to the right; basal side more or less closed by a flat, horizontal septum; aperture broad-oval; margin continuous, simple, entire. Animal as in *Ferrissia*. Radula with a bicuspid central and tricuspid laterals and marginals, the cusps short and broad.

Key to the subgenera of *Gundlachia*.

- Apex smooth or concentrically wrinkled.....*Gundlachia s. s.*
- Apex radially striate*Kincaidella*.

Subgenus GUNDLACHIA s. s.

Apex smooth.

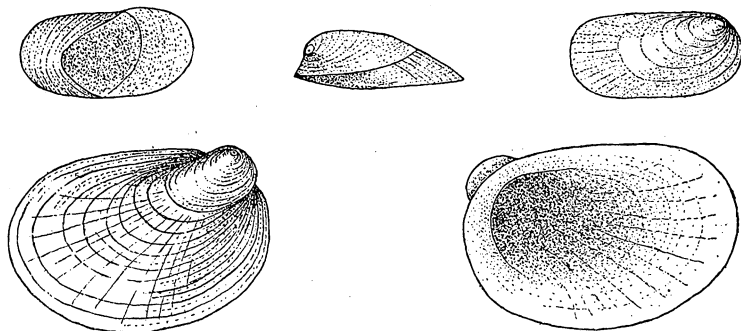


Fig. 59

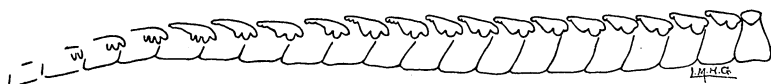


Fig. 60

Type: *Gundlachia ancyliformis* Pfr.Example: *Gundlachia hinkleyi* Walk., fig. 59. Radula, fig. 60.

Subgenus KINCAIDELLA Hannibal, 1912.

Apex radially striate.

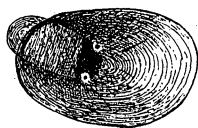


Fig. 61

Type: *Ancylus fragilis* Try. = *G. californica* Row.Example: *G. meekiana* Stimp., fig. 61. Radula, fig. 62.

Fig. 62

Subfamily RHODACMEINÆ Walker, 1917.

Shell patelliform, conical, elevated or depressed, apex tinged with pink. Animal having the jaw composed of numerous segmented plates. Radula with a long, slender central, unicuspid or faintly bicuspid, and with the base widely expanded in some species; the first lateral very large, with an enormous mesocone, the blade-like cusp extending beyond the base, the ectocone is back of the mesocone, entirely separated from it and has several small cusps; there is no endocone; the next four laterals are similar in shape, but diminish rapidly in size towards the margin; these are succeeded by two or three transition teeth, smaller and with more or less imperfect cusps. The marginals are very small, rapidly decreasing in size towards the outer edge, with large quadrate bases wider than high, vestigial, the cusps being nearly, if not quite obsolete.

Genus RHODACMEA Walker, 1917.

Shell and animal as in the subfamily.

Key to the sections of *Rhodacmea*.

- Shell elevated. Radula having the base of the central tooth expanded and not overlapped by the mesocone of the first lateral *Rhodacmea s. s.*
- Shell depressed. Base of central tooth of radula not expanded, overlapped by the mesocone of the first lateral....*Rhodocephala*.

Section RHODACMEA s. s.

Shell elevated. Radula with a unicuspid central, which has the base triangularly expanded; laterals with the cusp of the mesocone extending but little beyond the base and not overlapping the base of the central tooth.
 Type: *Ancylus filusus* Con., fig. 63. Radula, fig. 64.



Fig. 63

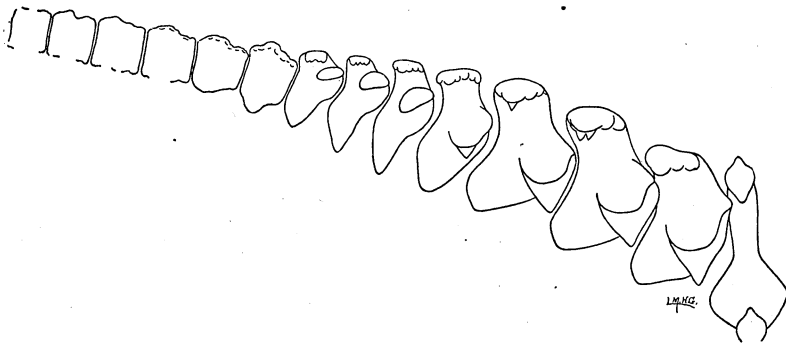


Fig. 64

Section RHODOCEPHALA Walker, 1917.

Shell depressed. Radula with a faintly bicuspid central, which has the sides of the base straight and not expanded; laterals with the cusp of the mesocone extending far beyond the base and overlapping the base of the central tooth.



Fig. 65

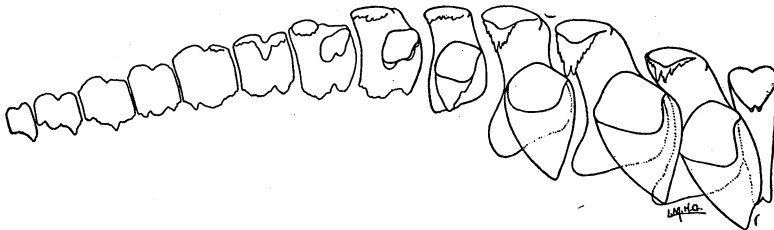


Fig. 66

Type: *Rhodacmea rhodacme* Walk., fig. 65. Radula, fig. 66.

Subfamily NEOPLANORBINÆ Hannibal, 1912.

Shell small, planorbiform or neritiform.

Key to the genera of *Neoplanorbinae*.

Shell planorbiform *Neoplanorbis*.
 Shell neritiform *Amphigyra*.

Genus NEOPLANORBIS Pilsbry, 1906.

Shell very minute, planorboid, dextral, subdiscoidal, nearly flat above, convex below, usually carinate at the periphery; whorls two, rapidly enlarging; aperture very oblique, wider than high, a little dilated at the base; lip thin, not continuous; columellar margin straight and broadly dilated, somewhat thickened within. Dentition and anatomy so far as known similar to *Amphigyra*.



Fig. 67

Type: *N. tantillus* Pils., fig. 67.

Genus AMPHIGYRA Pilsbry, 1906.

Shell minute, dextral, neritoid or crepiduliform, imperforate, with a small, depressed, lateral spire; whorls about $1\frac{1}{2}$, very rapidly enlarging, the last very convex dorsally; apex smooth; body-whorl spirally striate; aperture very large, transversely oval; lip continuous and full, thin; cavity of the spire very small, a thin, broad, concave, columellar plate projecting across the end next the spire.

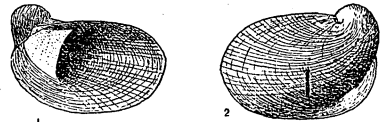


Fig. 68



Fig. 69

Animal sinistral, externally lymnaeid; tentacles short, blunt, cylindric; eyes near their inner bases; a short, false gill in the pallial cavity. Radula arranged as in *Lymnaea*, central tooth unicuspid, laterals bicuspid, marginals low, wide, with four or five cusps.

Type: *A. alabamensis* Pils., fig. 68. Radula, fig. 69.

Subclass STREPTONEURA.
 Order PECTINIBRANCHIA.
 Suborder TÆNIOGLOSSA.
 Superfamily PLATYPODA.

Key to the families of *Platypoda*.

- 1. { Operculum concentric 2.
- { Operculum spiral 3.
- 2. { Shell very large; animal with both gill and lung..... *Ampullariidæ*.
- { Shell smaller; animal with gill only..... *Viviparidæ*.
- 3. { Operculum circular, multispiral *Valvatidæ*.
- { Operculum paucispiral 4.
- 4. { Animal with external verge, central tooth with basal denticles *Ammicolidæ*.
- { Animal without verge; no basal denticles on central tooth *Pleuroceridæ*.

Family AMPULLARIIDÆ.

Shell large, spiral, globosely turbinate; aperture entire; operculum (in the North American species) corneus, concentric, with a sub-central nucleus.
 Animal with snout divided into two long, tentacular lobes; tentacles long and filiform; eyes on peduncles on the outer bases of the tentacles; mantle with two cervical lobes, that on the left forming a more or less elongated siphon; genital orifices on the right side in the pallial cavity; the respiratory chamber divided into two parts, the one being a lung and the other containing a large gill; foot large, simple; jaws two; radula with seven rows of teeth, central large, subtrapezoidal, multicuspid, no basal denticles; the laterals and marginal narrow, uni- or bicuspid. Oviparous.

Genus AMPULLARIA Lamarck, 1799.

Shell dextral, globose, with a green or brown epidermis; spire short, last whorl rounded, inflated; umbilicate; aperture entire, angular above, rounded below, lip simple.

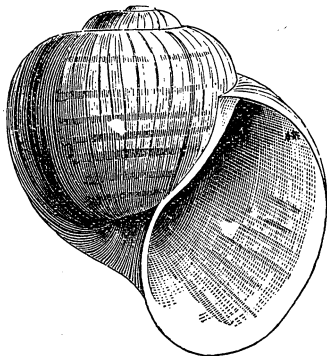


Fig. 70



Fig. 71

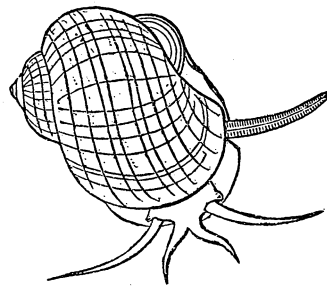


Fig. 72

Type: *Nerita urceus* Müll.

Example: *A. paludosa* Say, fig. 70. Radula, fig. 71. Animal, fig. 72.

Family VIVIPARIDÆ.

Shell moderately large, turbinate, imperforate, or subperforate; whorls convex; aperture entire, subcircular or somewhat angled above; lip simple; operculum convex, concentric, nucleus subcentral, sometimes subspiral.

Animal with a long snout, not divided into tentacular lobes; tentacles long and slender, in the male the right one is shorter, truncated and forms a sheath for the verge; eyes on peduncles on the exterior base of the tentacles; mantle with two cervical lobes, of which the right is the larger, forming with the mantle distinct tubular conduits for the ingress and egress of water for respiration; jaws two; radula with the teeth simple or denticulate, central tooth large, broad, without basal denticles, laterals large, subtrigonal, marginals narrow, elongated. Ovoviviparous.

Key to the Genera of *Viviparidæ*.

- | | | |
|----|---|--|
| 1. | { | Operculum wholly concentric 2. |
| | | Operculum with subspiral nucleus <i>Lioplax</i> . |
| 2. | { | Reflected apices of the lateral teeth simple <i>Campeloma</i> . |
| | | Reflected apices of the lateral teeth denticulate 3. |
| 3. | { | Inner margin of the operculum simple <i>Viviparus</i> . |
| | | Inner margin of the operculum reflected, forming an elevated marginal fold <i>Tulotoma</i> . |

Genus VIVIPARUS Montfort, 1810.

Shell dextral, spiral, subconoidal; rather thin, smooth, imperforate or slightly umbilicate; light green or olivaceous, unicolored or banded with brown or tinged with purple; whorls convex, aperture entire, subcircular; lip simple, acute; columellar and parietal margin not usually thickened; operculum concentric, inner margin simple, not reflected.

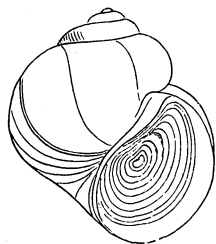


Fig. 73

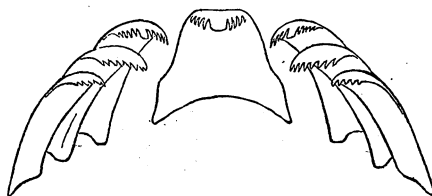


Fig. 74

Animal with foot of moderate size, not produced beyond the snout. Teeth of the radula multicuspid.

Type: *Helix vivipara* L.

Example: *V. intertextus* (Say), fig. 73. Radula, fig. 74.

Genus *CAMPELOMA* Rafinesque, 1819.

Shell dextral, spiral, imperforate, thick and solid; olivaceous green, unicolorous, spire produced; whorls smooth, rounded or shouldered; aperture oval; lip simple, columella and parietal wall usually callously thickened. Operculum concentric, inner margin simple.

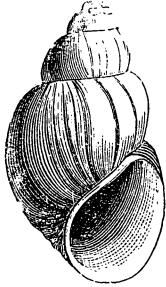


Fig. 75

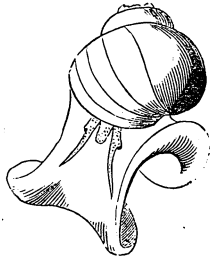


Fig. 76

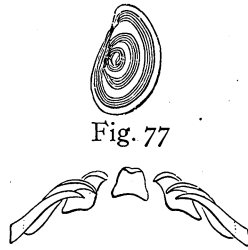


Fig. 77

Fig 78

Animal with the foot large, rather thin, much produced beyond the snout; snout small; teeth of the radula simple or only very minutely crenulated.

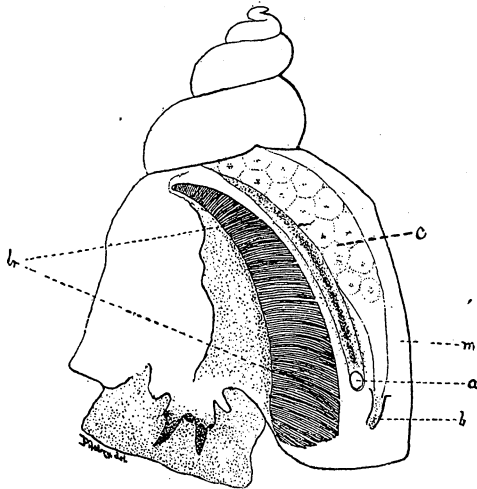


Fig 78A

a.—Anus.
br.—Gill.

b-c.—Uterus.
m.—Mantle.

Type: *C. crassula* Raf.

Example: *C. decisum* (Say), fig. 75. Animal, fig. 76. Operculum, fig. 77.

Radula: *C. integrum* (Say), fig. 78.

Animal: *C. subsolidum* (Anth.), fig. 78A.

Genus LIOPLAX Troschel, 1856.

Shell dextral, spiral, thin, ovate, turreted, imperforate, spire produced; whorls rounded, or carinated; olivaceous green or dark brown; aperture oval subcircular; lip thin, continuous; operculum concentric, with a subspiral nucleus.



Fig. 79

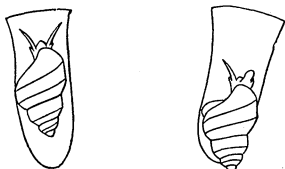


Fig. 80

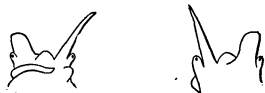


Fig. 81



Fig. 82

Animal with the foot very large, greatly produced beyond the snout; snout very short. Lingual teeth smooth at their apices.

Type: *Limnaea subcarinata* Say, fig. 79. Animal, fig. 80. Operculum, fig. 81. Radula, fig. 82.

Genus TULOTOMA Haldeman, 1840.

Shell (typically) large, solid, thick, imperforate, obtusely conic, spire elevated; whorls flattened, nodulous, carinated; peristome thin, continuous; operculum concentric, subtriangular, with the inner margin reflected forming an elevated marginal fold.

Animal with a moderate foot, not produced beyond the snout; snout small; lingual teeth multicuspid.

Type: *Paludina magnifica* Con., fig. 83. Radula, fig. 84. Operculum, fig. 85.

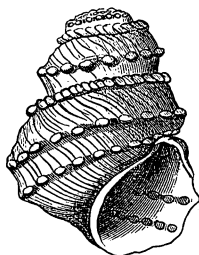


Fig. 83

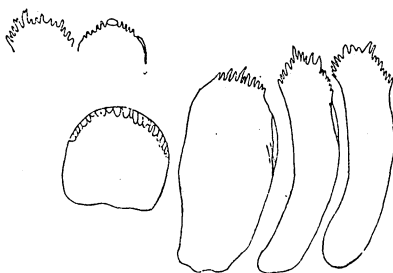


Fig. 84



Fig. 85

Family VALVATIDÆ.

Shell small, spiral, dextral, turbanate, or subdiscoidal; whorls rounded or carinated; aperture entire, circular; lip simple, sharp; operculum orbicular, multispiral, whorls with a thin elevated edge.

Animal diœcious; tentacles long, slender, cylindrical; eyes sessile on the internal bases of the tentacles; snout long; foot large, bilobed in front; gill external, plumose, protected by a long, slender pallial appendage; verge exterior, placed on the right side, at the base of and below the tentacle; jaws two; lingual teeth multicuspid, no basal denticles on the central tooth.

Genus VALVATA Müller, 1774.

The characters of the genus are those of family.

Type: *V. cristata* Müll.

Example: *V. tricarinata* (Say), fig. 86. Animal, fig. 87. Radula, fig. 88.

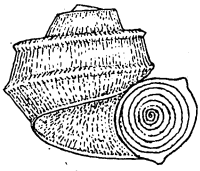


Fig. 86



Fig. 87



Fig. 88

Family AMNICOLIDÆ.

Shell small, spiral, dextral, conical, imperforate or umbilicated; unicolor; aperture entire, lip simple, acute; operculum concentric, spiral or subspiral.

Animal with a long snout; tentacles long, cylindrical, with the eyes at their outer bases; foot oblong, truncate before, rounded behind; gills internal; verge exerted, placed on the back, some distance behind the right tentacles; jaws two; central tooth of the radula multicuspid and with one or more basal denticles; laterals hatchet-shaped, multicuspid; marginals slender, multicuspid.

Key to subfamilies of *Amnicolidæ*.

- 1. { Operculum multispiral *Lyogyrinae*.
- { Operculum concentric *Bythininae*.
- { Operculum paucispiral 2.

- 2. { Foot divided *Pomatiopsinae*.
- { Foot simple 3.

- 3. { Shell thin, subglobose to elongate; columella not thickened
 *Amnicolinae*.
- { Shell thick, short, body-whorl very large; columella thickened
 *Lithoglyphinae*.

Subfamily BYTHININÆ Stimson, 1865.

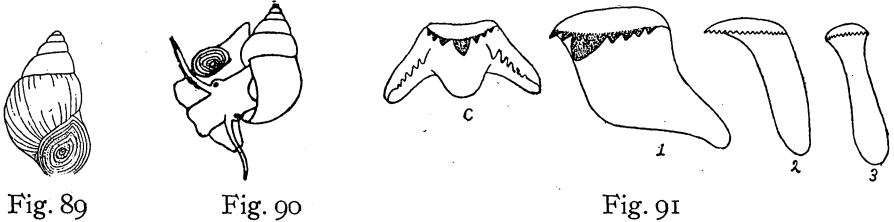
Shell small, spiral, dextral, turbinate, spire produced; operculum calcareous, concentric.

Foot simple; central tooth of the radula with several basal denticles.

Genus BYTHINIA Leach, 1818.

Shell large for the family, spiral, elevated, subperforate; aperture oval; peristome thin, continuous; lip simple, sharp; operculum calcereous, concentric.

Type: *Helix tentaculata* L., fig. 89. Animal, fig. 90. Radula, fig. 91.



Subfamily AMNICOLINÆ Gill, 1871.

Shell small, spiral, dextral, subglobose to elongate, thin; imperforate or umbilicate; columella and parietal wall not callously thickened; operculum corneous, paucispiral.

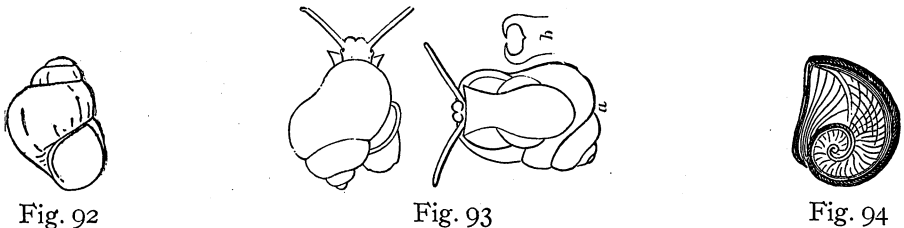
Foot simple; central tooth of the radula with several denticles.

Key to genera of *Amnicolinae*.

- | | | | |
|----|---|---|-----------------------|
| 1. | { | Shell smooth, periphery rounded | 2. |
| | | Shell smooth, periphery angulate | <i>Littoridina</i> . |
| | | Shell strongly carinated | <i>Pyrgulopsis</i> . |
| | | Shell spinose | <i>Potamopyrgus</i> . |
| | | Shell longitudinally ribbed | <i>Tryonia</i> . |
| 2. | { | Shell slender, spire long | <i>Paludestrina</i> . |
| | | Shell ventricose, spire usually short | <i>Amnicola</i> . |

Genus AMNICOLA Gould and Haldeman, 1841.

Shell small, oval-conic, rather short, spire subacute; whorls 4-6, convex; aperture oval; peritreme continuous; lip simple, sharp; columella not thickened. Operculum thin, corneous, paucispiral.



Animal oviparous; central tooth of the radula multicuspid, with a tooth-shaped process from the middle of the anterior surface, reaching beyond the

base, and with several basal denticles; laterals and marginals multicuspid. Verge short, bifid, with a globular base.

Type: *Paludina limosa* Say, fig. 92. Animal, fig. 93. Operculum, fig. 94. Radula, fig. 95.



Fig. 95

Subgenus CINCINNATIA Pilsbry, 1891.

Radula more minute and the denticulations of the cusps finer and sharper.

Type: *Paludina cincinnatiensis* Anth., fig. 96.

Radula, fig. 97.



Fig. 96

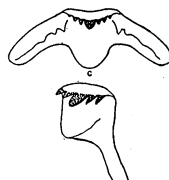


Fig. 97

Genus PALUDESTRINA d'Orbigny, 1840.

Shell similar to *Amnicola*, but more slender and elongated. Central tooth with but one basal denticle on each side, and without the tongue shaped process of *Amnicola*. Verge bifid.



Fig. 98

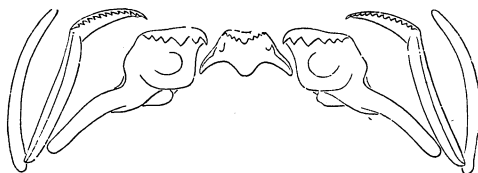


Fig. 99

Type: *Cyclostoma acutum* Drap.

Example: *P. nickliniana* (Lea), fig. 98. Radula, fig. 99.

Genus TRYONIA Stimpson, 1865.

Shell perforate, elongated, turreted, subulate; apex acute; surface longitudinally ribbed or plicated; whorls numerous, shouldered; aperture small, oblique, rhombo-ovate, lip sharp, thin and effuse at the base; peritreme continuous.

Type: *T. clathrata* Stimp., fig. 100.

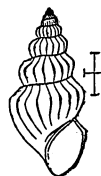


Fig. 100

Genus PYRGULOPSIS Call and Pilsbry, 1886.

Shell ovate-conical or turreted, imperforate, whorls having a single, strong carina at the periphery, which may or may not be concealed on the spire; apex acute; whorls $4\frac{1}{2}$ to 6; aperture ovate, peristome continuous;

central tooth of the radula with but one basal denticle on each side; denticles of the lateral teeth large and angular, those of the laterals small and slender.

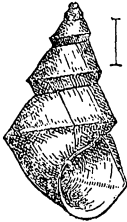


Fig. 101

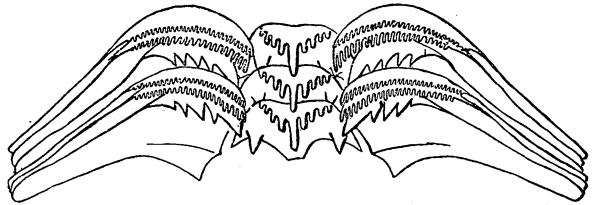


Fig. 102

Type: *Pyrgula nevadensis* Stearns, fig. 101. Radula, fig. 102.

Genus POTAMOPYRGUS Stimpson, 1865.



Fig. 103

Shell ovate-conic, imperforate; apex acute; whorls angulated and usually coronated with spines; body-whorl two-thirds the length of the shell; aperture ovate, lip acute.

Animal with rostrum of moderate length; tentacles very long, slender, tapering and pointed; eyes on prominent tubercles; foot rather short, strongly auriculated in front; central tooth of radula trapezoidal, inferior margin nearly straight; faintly enlobate; basal teeth minute and close to the lateral margin; denticles of the intermediate tooth numerous and of equal size.

Type: *Melania corolla* Gld.

Example: *P. coronatus* (Pfr.), fig. 103.

Genus LITTORIDINA Souleyet, 1852.

Shell narrowly perforate, subpyramidal, solid, opaque, body-whorl subangulate at the periphery; aperture pyriform, acutely angulated above; columella thickened, white; peritreme not continuous, lip sharp.

Verge very large, with five or six small, digitate appendices. Radula as in *Ammicola*.



Fig. 104

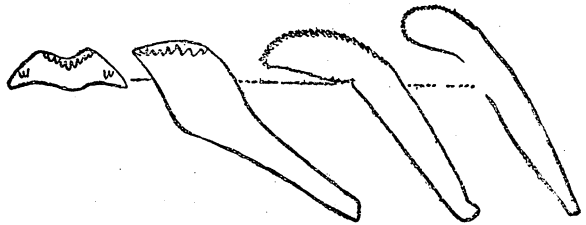


Fig. 105

Type: *L. gaudichaudii* Soul.

Example: *L. monroensis* (Frfd.), fig. 104. Radula, (*L. hatcheri* Pils.), fig. 105.

Subfamily LITHOGLYPHINÆ Fischer, 1885.

Shell small, spiral, dextral, spire short, body-whorl large, forming most of the shell; columella usually callously thickened; operculum corneous, subspiral.

Foot simple; central tooth of the radula with several basal denticles.

Key to the genera of *Lithoglyphinae*.

- I. { Shell imperforate or narrowly perforate..... 2.
- { Shell widely umbilicate 3.
- 2. { Peritreme sinuous, lip effuse below, verge winged..... *Fluminicola*.
- { Peritreme continuous in same plane, verge simple..... *Gillia*.
- { Peritreme very oblique, lip effuse above, verge bifid.... *Somatogyrus*.
- 3. { Shell spirally striate, depressed, turbinate, widely umbilicate
- { *Cochliopa*.
- { Shell smooth, globose-turbinate, umbilicus narrower, but deep. *Clappia*.

Genus COCHLIOPA Stimpson, 1865.

Shell depressed-conic; base concave, umbilicus large and deep; aperture oblique; operculum corneous, subspiral.

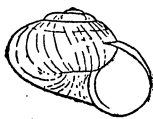


Fig. 106

Rostrum of moderate size; tentacles rather long and tapering. Teeth of the radula multicuspid, basal denticles on central tooth 2 or 3 on each side. Verge rather elongated, compressed, geniculated and bifid.

Type: *Annicola rowellii* Tryon.

Example: *C. riograndensis* P. and F., fig. 106.

Genus CLAPPIA Walker, 1909.

Shell minute, spiral, dextral, globose-turbinate, narrowly but deeply umbilicate. Spire short; body whorl large; whorls round; aperture large; lip simple; columellar lip thin, appressed to the body-whorl only at the upper end; operculum paucispiral, nuclear whorls large, slowly and regularly increasing.

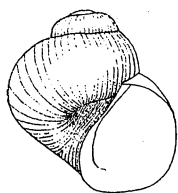


Fig. 107



Fig. 108

Rachidian tooth as in *Somatogyrus*, intermediate tooth with a long peduncle and a strong tooth projecting from the infero-anterior angle, laterals multicuspid.

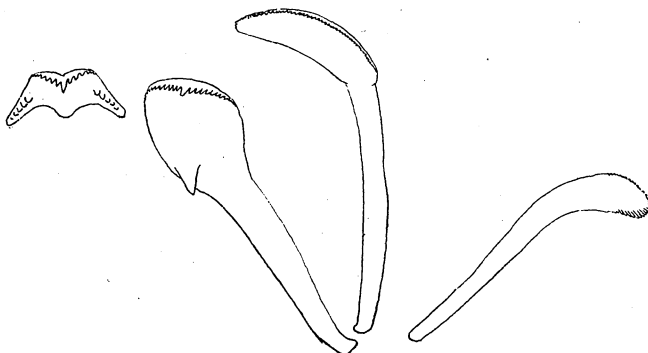


Fig. 109

Type: *C. clappii* Walker, fig. 107. Operculum, fig. 108. Radula, fig. 109.

Genus FLUMINICOLA Stimpson, 1865.



Fig. 110

Shell spiral, dextral, obliquely ovate, thick, solid, smooth, imperforate; spire moderate, obtuse; aperture ovate; columella flattened, calloused; lip effuse and

projecting anteriorly so that the peritreme is not continuously in the same plane; operculum corneous, subspiral.

Rostrum rather large; tentacles tapering, foot broad; central tooth of the radula with several basal denticles on each side; outer lateral teeth with a smaller number of denticles than the inner. Verges large, compressed, with a broad semicircular wing on the left side.

Type: *Paludina nuttalliana* Lea, fig. 110. Radula, fig. 111.



Fig. 111

Genus SOMATOGYRUS Gill, 1863.

Shell dextral, spiral, usually rather thick and solid, smooth, imperforate or narrowly perforate; spire usually short; apical whorl spirally punctate or lirate; body-whorl large, more or less inflated; aperture very oblique; lip sharp, projecting above; columella callously thickened. Operculum corneous, subspiral, nuclear whorls small, rapidly increasing.



Fig. 112

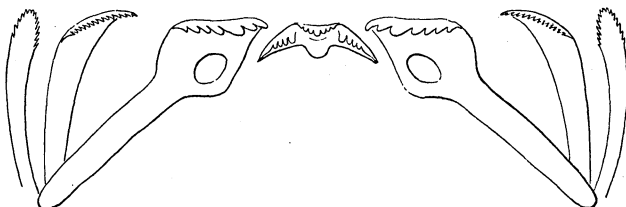


Fig. 113

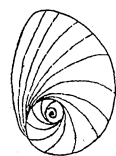


Fig. 114

Rostrum rather broad, flat and square-cut; tentacles rather short and flattened; teeth of the radula multicuspid, basal denticles on the central tooth 3-4 on each side. Verges broad, compressed and bifid.

Type: *Amnicola depressa* Tryon, fig. 112. Radula, fig. 113. Operculum, fig. 114.

Genus GILLIA Stimpson, 1865.



Fig. 115

Shell spiral, dextral, not very thick, smooth, imperforate; spire short, obtuse, body whorl large, inflated; aperture large, oblique; peritreme continuous on the same plane, lip thin, sharp; columella very

slightly thickened; operculum corneous, subspiral.

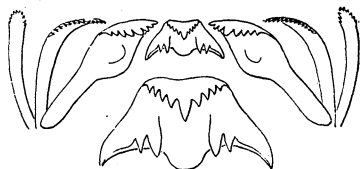


Fig. 116

Rostrum broad, subtruncate, foot oblong, rounded behind and auriculate

in front; tentacles long, slender and pointed; teeth of the radula multicusp-
pid; central tooth with two basal denticles on each side. Verge small,
simple, lunate.

Type: *Melania atilis* Lea, fig. 115. Radula, fig. 116.

Subfamily LYOGYRINÆ Pilsbry, 1916.

Shell minute, conical or subdepressed. Operculum circular, multispiral.

Key to the genera of *Lyogyrinae*.

- Shell amnicoliform *Lyogyrus*.
- Shell valvatæform (s. g.) *Hauffenia*.

Genus LYOGYRUS Gill, 1863.



Fig. 117

Shell very small, spiral, dextral, smooth, umbilicate; globose-
turbinate or elongate-ovate; aperture nearly circular; peritreme
continuous, frequently quite separated from the body-whorl.
Operculum corneous, circular, multispiral.

Rostrum bilobed in front, half as long as the tentacles, which are rather
stout; foot auriculated in front; gill external. Dentition as in *Paludestrina*,
basal denticles on rachidian tooth two on each side.

Type: *Valvata pupoidea* Gld., fig. 117.

Genus HORATIA Bourguignat, 1887.

Shell very small, amnicoliform, thick-shelled, umbilicate, almost smooth;
whorls only 3-4, convex, rapidly increasing, the last large, rounded; suture
impressed; aperture very oblique, rounded; lip adherent, straight, sharp;
columella thickened, incurved. Operculum corneous,
transparent, purple-red, with 3-4 slowly increasing spi-
rals and an almost central nucleus.

Type: (first species) *Horatia klecakiana* Bgt.

Subgenus HAUFFENIA Pollonera, 1898.

Shell minute, rather thin, valvatæform, widely
umbilicate.

Type: (first species) *Horatia tellini* Poll.

Example: *Horatia micra* (P. and F.), fig. 118.

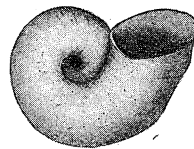
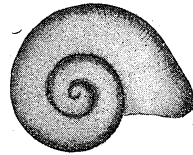
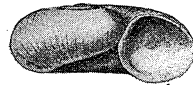


Fig. 118

Subfamily POMATIOPSINÆ Stimpson, 1865.

Foot divided by a transverse sulcus at about its anterior third. Verge simple. Rachidian tooth with one basal denticle on each side, denticles of the lateral and marginal teeth fewer and proportionately larger than in the other subfamilies. Only one genus.

Genus POMATIOPSIS Tryon, 1862.

Shell dextral, spiral, thin, smooth, long, turreted, umbilicated; aperture somewhat expanded; lip simple or slightly reflected; operculum corneous, subspiral.



Fig. 119



Fig. 120



Fig. 121

Animal not as long as the shell, rostrum large, longer than the tentacles, which are short and subulate. Verge very large, simple, convoluted, outer margin rounded and smooth, inner margin sharp and wrinkled.

Type: *Cyclostoma lapidaria* Say, fig. 119. Animal, fig. 120. Radula, fig. 121.

Family PLEUROCERIDÆ.

Animal oviparous, edge of mantle smooth; eyes on the external bases of the tentacles; no verge. Rachidian tooth large, broader than long, rounded below, multicuspid; laterals subrhomboidal, multicuspid; marginals narrow, multicuspid.

Shell dextral, spiral, thick and solid, globose or elongated; aperture entire or more or less canaliculated below, operculum corneous, subspiral.

Key to the genera of *Pleuroceridæ*.

- | | | |
|----|---|--|
| 1. | { | Aperture canaliculate below 2. |
| | | Aperture angulated below, not canaliculate 4. |
| | | Aperture entire, rounded below <i>Anculosa</i> . |
| 2. | { | Shell fusiform, canal long <i>Io</i> . |
| | | Shell conical, canal short 3. |
| 3. | { | Spire elongated; no callus thickening on parietal wall. <i>Pleurocera</i> . |
| | | Spire short; parietal wall callously thickened above and below <i>Lithasia</i> . |
| | | Spire short; parietal wall callously thickened above. <i>Eurycalon</i> . |
| 4. | { | Aperture entire above <i>Goniobasis</i> . |
| | | Aperture with a sutural slit <i>Gyrotoma</i> . |

Genus IO Lea, 1831.

Shell large, spiral, dextral, imperforate, fusiform, smooth, tuberculate or spinose; spire elevated, base of aperture prolonged in a long canal; columella round, smooth and concave; lip thin; operculum corneous, sub-spiral. Animal as in the family.

Type: *Fusus fluviatilis* Say.

Example: *I. spinosa* Lea, fig. 122. Radula, fig. 123.



Fig. 122



Fig. 123



Fig. 124



Fig. 125

Genus LITHASIA Haldeman, 1840.

Shell of medium size, spire dextral, imperforate, globose conic, smooth or tuberculate; thick and solid, spire elevated, obtusely conic; aperture large, rhomboidal; columella smooth, callously thickened above and below; base of the aperture shortly channelled below. Animal as in the family.

Type: *L. geniculata* Hald., fig. 124.

Operculum, *L. obovata* (Say), fig. 125.

Section ANGITREMA Haldeman, 1841.

Shell similar to *Lithasia* but with the basal canal more produced.

Type: *Melania armigera* Say, fig. 126.

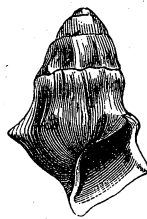


Fig. 126

Genus EURYCÆLON Lea, 1864.

Shell large, obovate, thick, solid; spire short; body-whorl large; columella callously thickened above, incurved below and subtruncate.

Type: *Anculosa anthonyi* Budd, fig. 127.

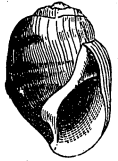


Fig. 127

Genus PLEUROCERA Rafinesque, 1818.



Fig. 128

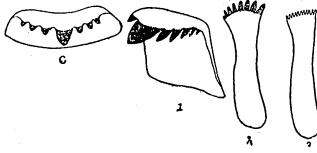


Fig. 129

Shell usually lengthened, conic or cerithiform, spiral, dextral, imperforate; smooth, tuberculate, spirally striate or carinate; aperture moderate, subrhomboidal, prolonged into a short canal below; columella smooth, twisted, not callously thickened; lip simple, sharp, sinuous, somewhat expanded.

Type: *P. acuta* Raf., fig. 128. Radula, fig. 129.

Section STREPHOBASIS Lea, 1861.



Fig. 130

Shell smooth, spire rather short, obtusely conical, body-whorl subcylindrical; aperture subquadrate; columella thickened below, twisted and drawn back, base subcanaliculate; lip acute, very sinuous.

Type: *Melania plena* Anth., fig. 130.

Genus GONIOBASIS Lea, 1862.

Shell medium size, dextral, spiral, imperforate; smooth, longitudinally plicate, transversely striate or tuberculate; thick, solid, ovate-conic to elongate turreted; aperture subrhomboidal, subangular at the base but not canaliculate; columella smooth, not twisted; lip simple, acute.



Fig. 131

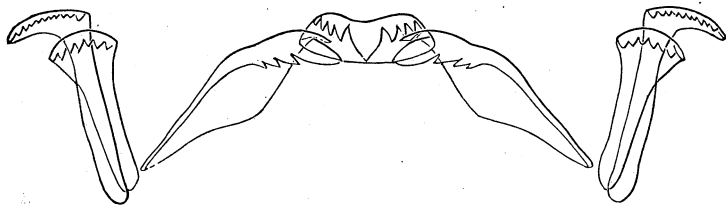


Fig. 132

Type: *G. osculata* Lea, fig. 131. Radula, *G. depygis* (Say), fig. 132.

Genus *GYROTOMA* Shuttleworth, 1845.

Shell of moderate size, spiral, dextral, imperforate, smooth or spirally striate, rather thick and solid, conical or globosely ovate; aperture oval or elliptical, with a sutural slit or fissure above, entire below; lip thin and sharp.

Fig. 133 Type: *G. ovoidea* Shutt., fig. 133. Radula, fig. 134.

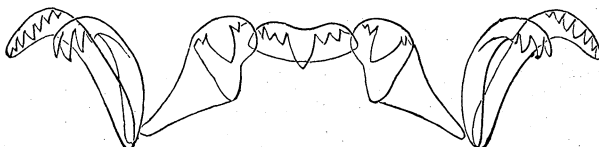


Fig. 134

Genus *ANCULOSA* Say, 1821.

Shell of moderate size, dextral, imperforate (except in one species), smooth, tuberculate, spirally striate, sulcate or carinate, thick, solid, subglobose with a very short spire or thinner and conical; aperture oval or sub-circular, entire, rounded below; columella callously thickened; lip simple, acute.

Type: *Melania prarosa* Say, fig. 135. Radula, fig. 136.

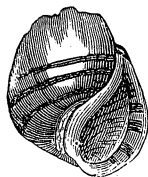


Fig. 135

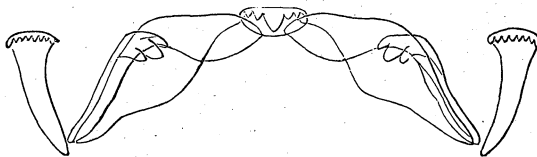


Fig. 136

Order *ASPIDOBANCHIA*.Suborder *RHIPIDOGLOSSA*.

The Rhipidoglossæ differ radically from the Tænioglossæ in the character of the lingual dentition. The radula has many rows of teeth, consisting of a central, 2-5 laterals and numerous marginals arranged like the sticks of a fan.

Family *NERITIDÆ*.

Head large, rostrum divided and lobed in front; tentacles long and slender; eyes carried on peduncles placed at the external base of the tentacles; foot large, truncate before and obtuse behind, sides simple; gill large, triangular, pointed, free at its extremity; branchial and excretory orifices

on the right side. Radula with a very small central tooth, 2 to 5 lateral teeth of varying size and shape and numerous spatulate marginals.

Shell imperforate, globose, spire short; internal divisions of the shell absorbed; aperture semi-ovate, entire, columellar region expanded and flattened, usually thickened; lip acute; operculum subspiral.

Key to the genera of *Neritidae*.

1. Operculum calcareous, edge with projecting processes (apophyses) articulating with the columella.....*Neritina*.
2. Operculum corneous, without apophyses.....*Lepyrium*.

Genus *NERITINA* Lamarck, 1809.

Shell dextral, spiral, thick and solid, subglobose; spire short; surface smooth (in American species); aperture semi-circular, columella flattened, straight, smooth or finely denticulate; lip acute, inner surface smooth; operculum calcareous, semi-circular, paucispiral, nucleus excentric; with two apophyses, the upper shorter, sometimes dilated and crested; the lateral in the form of an arched rib.



Fig. 137



Fig. 138

Animal as in the family. Radula with the central tooth small, subquad-rangular, cusp smooth; first lateral large, second and third small, fourth very large, prolonged below and with the cusp semicircular and denticulate, laterals numerous, spatulate.

Type: *N. perversa* Gmel.

Example: *N. reclinata* Say, fig. 137. Radula, fig. 138.



Fig. 139

Genus *LEPYRIUM* Dall, 1896.

Shell small, dextral, spiral, corneous, thin, semi-transparent; spire very small and depressed, body-whorl large; aperture large, semi-circular; columella concavely flattened, calloused, straight, smooth; lip thin, acute operculum thin, corneous, paucispiral without apophyses.

Radula with a wide rachidian tooth with a finely denticulated cusp; laterals two, the inner small and oblique, the other large with the cusp finely denticulate; laterals spatulate, numerous. Animal otherwise unknown.

Type: *Neritina showalteri* Lea, fig. 139.

Class LAMELLIBRANCHIA.

Order EULAMELLIBRANCHIA.

Suborder SUBMYTILACEA.

Key to the families of *Submytilacea*.

1. { Ligament external 2.
 { Ligament internal 5.
2. { Hinge with cardinal, anterior and posterior lateral teeth 4.
 { Hinge with cardinal teeth only *Cyrenellidæ*.
 { Hinge with lateral teeth only (no true cardinals) or edentate 3.
3. { Gills with distinct, interlamellar septa, parallel with the gill
 filaments *Unionidæ*.
 { Gills either without distinct, interlamellar septa or, when
 present, oblique to the gill-filaments *Margaritanidæ*.
4. { Pallial line simple *Sphæriidæ*.
 { Pallial line sinuate *Cyrenidæ*.
5. { Hinge with cardinal and lateral teeth *Rangiidæ*.
 { Hinge without distinct teeth *Dreissensiidæ*.

Family MARGARITANIDÆ.

“Diaphragm incomplete, formed by the gills; posteriorly the outer lamina of the outer gills not connected with the mantle for a considerable distance; anterior end of the inner gills separated from the palpi by a gap; branchial and anal openings ill-defined, and the latter not closed above; no super-anal developed; gills without water-tubes and with scattered interlamellar connections, which in certain places form irregular rows or with continuous septa which run obliquely forwards; marsupium formed by all four gills; larva a small semicircular glochidium, without distinct hooks; shell elongated; sculpture of the beak concentric; hinge-teeth imperfect; epidermis blackish.” (Ortmann.)

Genus MARGARITANA Schumacher, 1817.

Shell elongated, usually arcuate, rounded in front, almost lacking a posterior ridge; beaks rather low, sculpture consisting of a few coarse, parallel ridges which follow the growth lines; epidermis concentrically striate, brownish or blackish; hinge-teeth generally imperfect or not fully developed, two more or less perfect pseudocardinals in the left valve and one in the right, often reduced to mere tubercles; laterals short, usually imperfect or wholly wanting; cavity of the beaks rather shallow.

Key to the subgenera of *Margaritana*.

- Gills with scattered interlamellar connections forming irregular rows running obliquely forwards.....*Margaritana s. s.*
 Gills with continuous septa running obliquely forwards..*Cumberlandia*.

Subgenus MARGARITANA s. s.

Shell as in the genus.

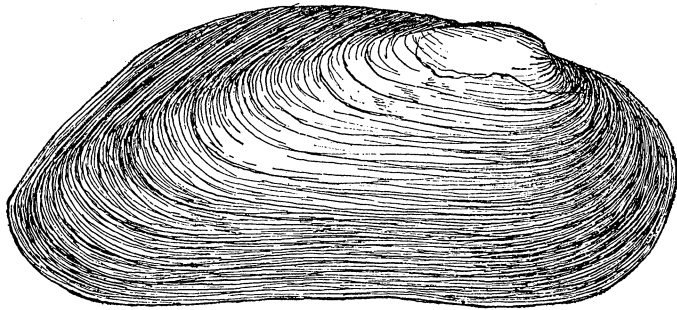


Fig. 140

Animal as in the family, but having the gills without water-tubes and with scattered interlamellar connections which in certain places form irregular rows, running obliquely forwards.

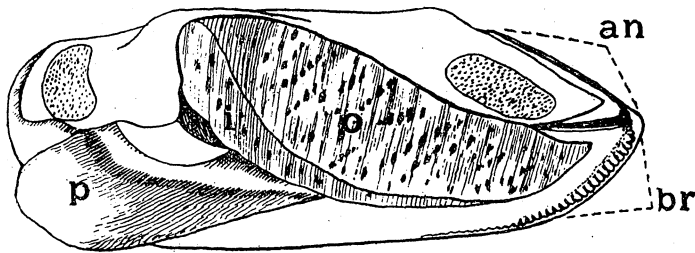


Fig. 141*

Type: *Mya margaritifera* L., fig. 140. Animal, fig. 141.

*The following lettering applies to all the figures of the animals of the Margaritanidæ and Unionidæ except as otherwise stated:

- | | |
|-------------------------------|----------------------------------|
| an.—anal opening. | p.—foot. |
| br.—branchial opening. | pp.—papillæ on margin of mantle. |
| f.—flaps of margin of mantle. | sa.—supra-anal opening. |
| i.—inner gill. | mp.—marsupium. |
| o.—outer gill. | |

Subgenus CUMBERLANDIA Ortmann, 1912.

Shell as in the genus.

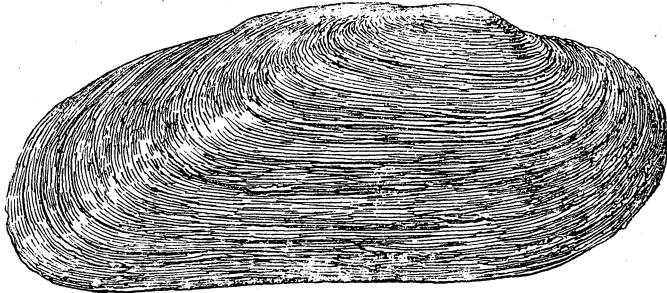


Fig. 142

Animal as in the family, but having the gills with incomplete water-tubes and with continuous septa, which run obliquely forwards.

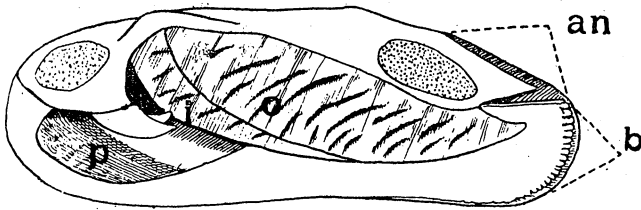


Fig. 143

Type: *Unio monodonta* Say, fig. 142. Animal, fig. 143.

Family UNIONIDÆ.

"Diaphragm complete, formed by the gills; posteriorly the outer lamina of the outer gill connected with the mantle to its posterior end; anterior end of the inner gills separated from the palpi by a gap; branchial and anal openings sharply separated from one another by the diaphragm; anal openings very rarely not closed above and without supra-anal, generally closed and with a supra-anal opening (which very rarely may be obliterated); gills with water-tubes and distinct, interlamellar septa, running parallel to the filaments. Marsupium in all four gills or only in the outer gills; larva a glochidium. Shell of very variable shape; sculpture of the beak more or less reduced, of various types, but originally of the concentric or zig-zag pattern; hinge teeth perfect or imperfect; epidermis plain or with color-markings." (Ortmann.)

Key to the subfamilies of *Unionidae*.

1. { Water-tubes simple in the gravid female..... 2
 { Water-tubes in the gravid female divided into three tubes,
 of which only the centre one is used as an ovisac..... *Anodontinae*.
2. { Male and female shells usually alike; edge of the gravid
 marsupium always sharp and not distending..... *Unioninae*.
 { Male and female shells usually different; edge of the gravid
 marsupium distending and bulging out beyond the original
 edge of the gill *Lampsilinae*.

Subfamily UNIONINÆ (Swainson, 1840) Ortmann, 1910.

"Inner lamina of the inner gills generally free from the abdominal sac (sometimes, in extralimital forms, connected); supra-anal opening sometimes not separated from the anal, normally present, the closed part rather short; branchial opening well-defined; no papillae nor flaps on the edge of mantle in front; marsupium formed by all four gills or by the outer gills only; edge of marsupium always sharp and not distending; water-tubes not divided in the gravid female; glochidium semielliptic or semicircular, without spines; shell generally heavy and solid, rounded to elongated, mostly with dull-colored epidermis; sculpture of the beak generally rather indistinct, concentric or pustulous or with indications of double loops or zig-zag bars; hinge always complete, with rather strong teeth; generally no difference of sex shown in the shell." (Ortmann.)

Key to the genera of *Unioninae*.

1. { All four gills serving as marsupia..... 2.
 { Outer gills only serving as marsupia..... 6.
2. { Male and female shells alike..... 3.
 { Male and female shells different..... *Tritogonia*.
3. { Hinge with perfect pseudocardinals and laterals..... 4.
 { Hinge teeth rudimentary or wanting..... *Gonidea*.
4. { Surface plicate 5.
 { Surface pustulose *Quadrula*.
 { Surface smooth *Fusconaia*.
5. { Beaks sculptured with coarse, concentric or somewhat double-looped ridges, which do not extend over the surface. *Amblema*.
 { Beaks sculptured with strong, zig-zag ridges extending over the upper surface *Megalonaias*.

- 6. { Surface tuberculous 7
- { Surface smooth or spiny 8.
- 7. { Nacre deep purple *Rotundaria*.
- { Nacre white or tinged with pink..... *Plethobasus*.
- 8. { Hinge with perfect pseudocardinals and laterals..... 9.
- { Hinge teeth imperfect, vestigial..... *Lastena*.
- 9. { Shell short, rounded, quadrate or oblique..... 10.
- { Shell (usually) elongate and straight..... 11.
- 10. { Beak sculpture distinct, subconcentric, rounded upon the
 posterior slope *Lexingtonia*.
- { Beak sculpture coarser, inclined to be more or less double-
 looped *Pleurobema*.
- 11. { Beak sculpture running parallel with the growth-lines and
 angled on the posterior slope..... *Elliptio*.
- { Beak sculpture concentric, rounded behind..... *Uniomorus*.

Genus QUADRULA (Rafinesque, 1820) Agassiz.

Shell triangular, quadrate or rhomboid; solid, inflated with rather coarse prominent beaks, which are generally sculptured with a few coarse, irregular, subparallel ridges that are inflated where they cross the posterior ridge; posterior ridge ordinarily well developed; disk sculptured or smooth; epidermis usually dull-colored, dark and rayless or feebly rayed; hinge plate heavy, wide, flattened; pseudocardinals solid, direct, ragged; laterals double in the left and single in the right valve; cavity of the beaks deep and compressed. Marsupium occupying all four of the gills throughout, the whole smooth and pad-like.

Key to the sections of *Quadrula*.

- Posterior slope with a radial furrow above the posterior ridge
..... *Quadrula s. s.*
- No radial furrow above posterior ridge..... *Theliderma*.

Section QUADRULA s. s.

Shell quadrate or rhomboid; surface pustulose, with a high, rounded or sharp posterior ridge, above which on the posterior slope is a decided

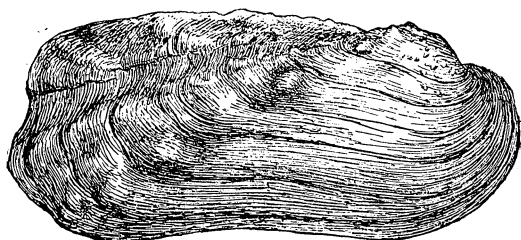


Fig. 144

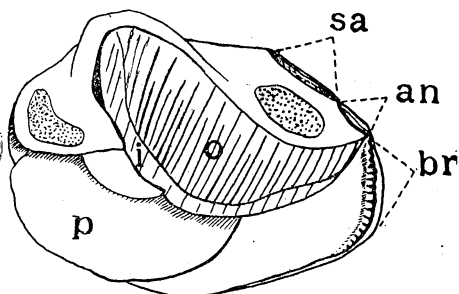


Fig. 145

radial furrow; umbonal region high; epidermis shining, usually painted with a beautiful pattern of triangular spots or chevron-shaped lines.

Type: *Unio cylindricus* Say, fig. 144. Animal, *Q. metanevra* Raf., fig. 145.

Section THELIDERMA (Swainson, 1840) Simpson.

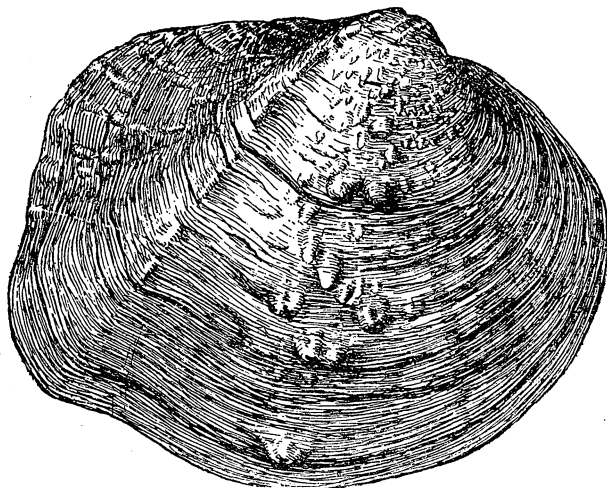


Fig. 146

Shell rounded, quadrate to rhomboid, solid, pustulose; beaks rather prominent, sculpture consisting of a few, rather coarse, subparallel ridges; anterior end rounded, base often arcuate, posterior end truncate, high and angled behind the ligament, epidermis rarely rayed, never as in *Quadrula* s. s.

Type: *Unio lachrymosus* Lea, fig. 146.

Genus TRITOGONIA Agassiz, 1852.

Shell solid, elongate, rhomboid, having a strong, irregular posterior ridge, obliquely truncated behind in the male, in the female this region is somewhat compressed and expanded into a broad wing; base curved; whole surface, except the rounded wing of the females, covered with pustules;

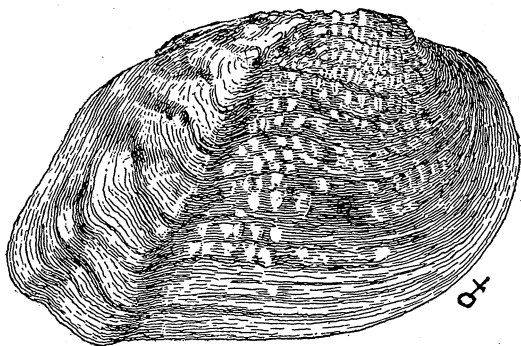


Fig. 147

beaks rather low, incurved and turned forward over the well developed lunule; beak sculpture strong, consisting of irregular, subparallel ridges which are curved upwards behind and fine radiating ridges in front of and behind them; epidermis dark olive; hinge plate rather narrow; pseudo-

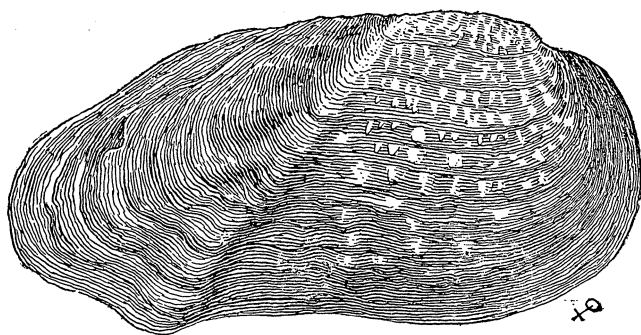


Fig. 147

cardinals strong, ragged; laterals long and straight, near to the pseudo-cardinals; cavity of beaks rather deep and compressed; female shell more compressed than that of the male. Marsupium occupying all four gills.

Type: *Unio tuberculatus* Bar., fig. 147.

Genus MEGALONAIAS Utterback, 1915.

Shell large, heavy, obovate or rhomboid, alate post-dorsally, disk obliquely folded; beaks sculptured with coarse, double-looped corrugations, which extend over the upper surface of the disk as nodulous plications; epidermis

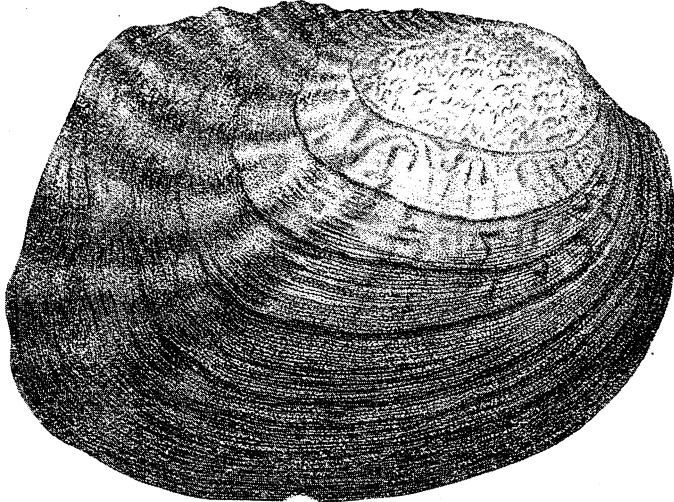


Fig. 148

dark-brown or blackish; beak cavities narrow and deep; anterior muscle scars deep and filled with a nacreous deposit, posterior scars large and indistinct.

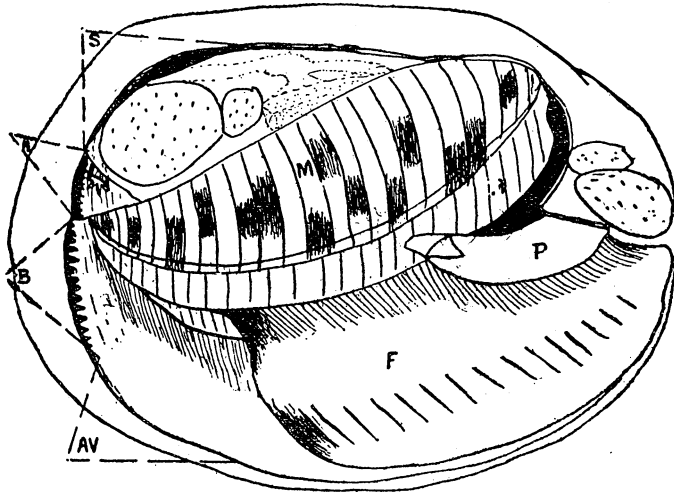


Fig. 149*

Type: *Unio heros* Say, fig. 148. Animal, fig. 149.

* The following lettering applies to figs. 149, 165 and 201:

- | | | |
|----------------------------|----------------|------------------------|
| A.—Anal opening. | F.—Foot. | P.—Palp. |
| Av.—Antero-ventral margin. | I.—Inner gill. | S.—Supra-anal opening. |
| B.—Branchial opening. | M.—Marsupium. | |

Genus AMBLEMA Rafinesque, 1819.

Shell more or less alate; beaks prominent, sculptured with coarse, concentric or somewhat double-looped ridges which do not extend over the surface of the shell; surface of the valves usually sculptured with oblique folds; posterior slope generally having small radial plications, which curve

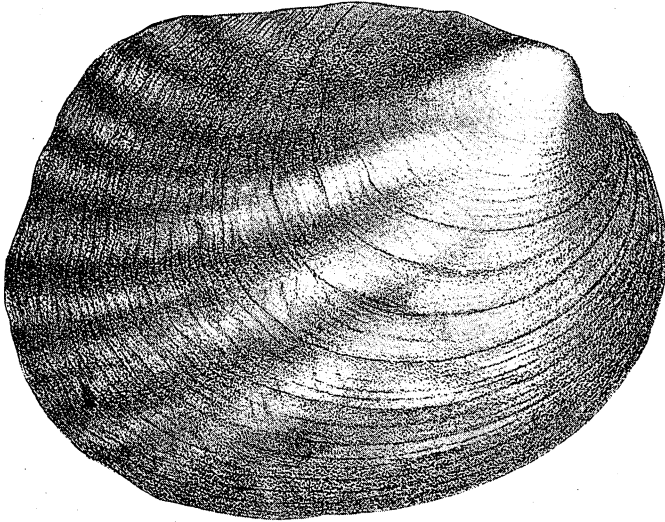


Fig. 150

upwards behind; epidermis brownish or blackish; anterior muscle scars large, distinct, very shallow, the anterior edge smooth, the rest apparently filled with roughened shelly matter; posterior scars large, shallow, indistinct; escutcheon large and dark.

Marsupium occupying all four gills.

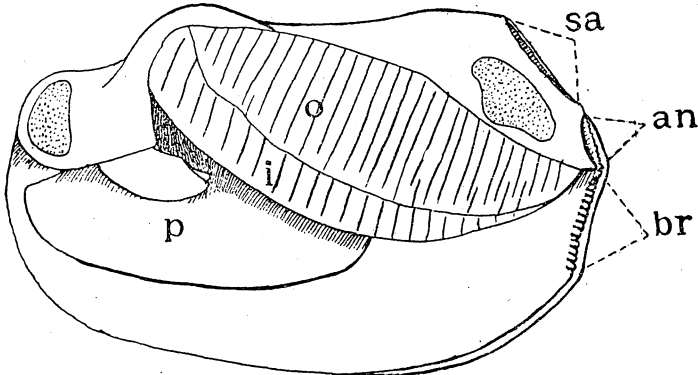


Fig. 151

Type: *A. costata* Raf.

Example: *A. undulata* (Bar.), fig. 150. Animal, *A. trapezoides* (Lea), fig. 151.

Genus FUSCONAIA Simpson, 1900.

Shell round, rhomboid, triangular or short elliptical, with a moderate posterior ridge; beaks high and full, curved inward and forward, sculptured with a few coarse, parallel ridges, which curve upward behind; epi-

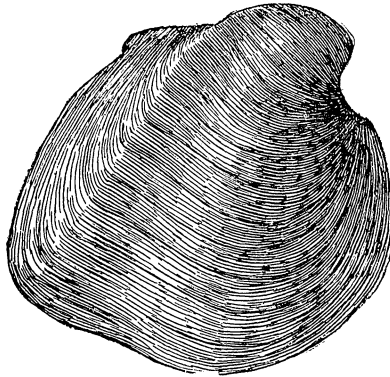


Fig. 152

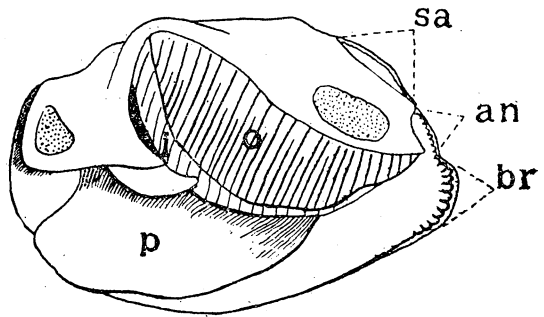


Fig. 153

dermis dark; surface not sculptured; hinge plate of moderate width; pseudocardinals strong; nacre white, salmon or purple.

All four gills marsupial.

Type: *Unio trigonus* Lea, fig. 152. Animal, (*F. rubiginosa* (Lea)), fig. 153.

Genus ROTUNDARIA (Rafinesque, 1820) Simpson.

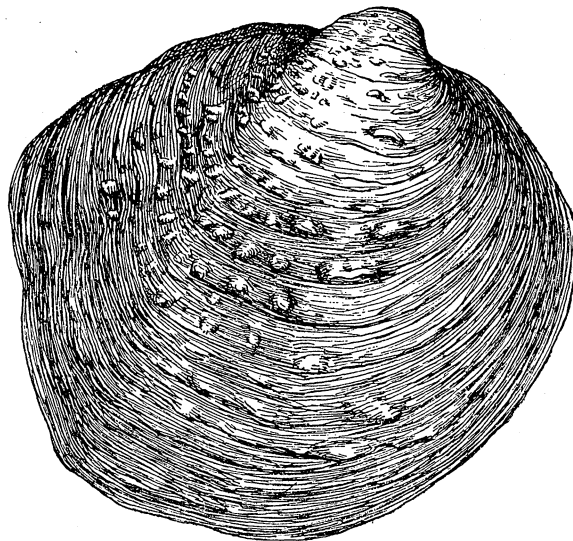


Fig. 154

Shell rounded; slightly truncated above in front; posterior ridge low; beaks prominent, curved inward and forward over a strongly marked line.

tle; beak sculpture consisting of numerous, fine, irregular, broken, somewhat concentric corrugations; posterior three-fifths of the shell tuberculate; epidermis brown; nacre purple.

Only the outer gills serving as marsupium.

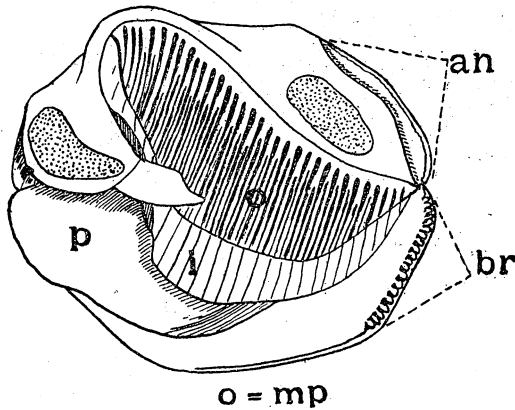


Fig. 155

Type: *Obliquaria (Rotundaria) tuberculata* Raf., fig. 154. Animal, fig. 155.

Genus PLETHOBASUS Simpson, 1900.

Shell large, irregularly oval, inflated, solid, somewhat suddenly swollen at the posterior base; posterior ridge low and rounded; beaks rather high, near the anterior end, having a few strong ridges, which are curved up-

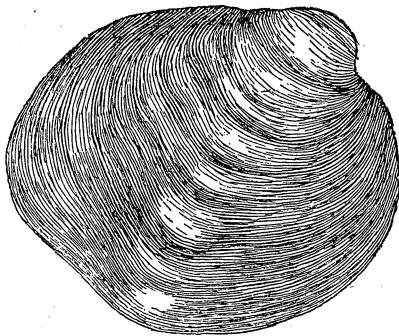


Fig. 156

wards behind; a row of low, irregular tubercles extends from near the beaks to post-basal part of the valves; epidermis tawny yellow to dark brown; hinge plate solid, not flattened; pseudo-cardinals triangular, rough;

cavity of the beaks not deep; front part of the shell very heavy, thinner behind.

Outer gills only serving as marsupium.

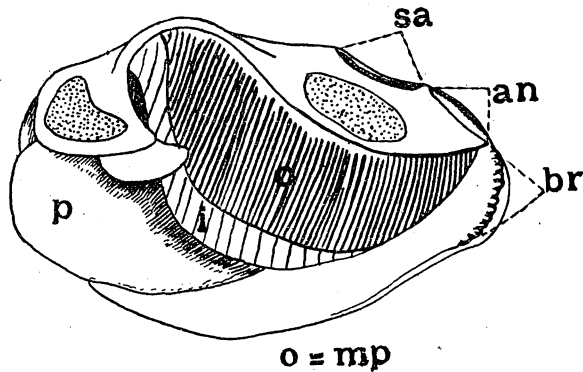


Fig. 157

Type: *Unio asopus* Green, fig. 156. Animal, fig. 157.

Genus **PLEUROBEMA** (Rafinesque, 1820) Agassiz.

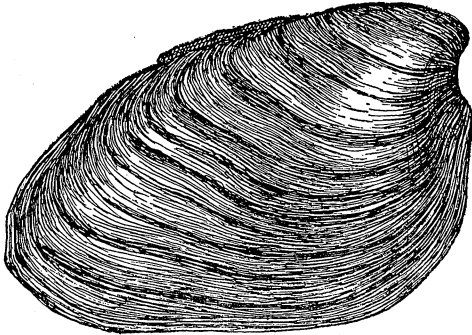


Fig. 158

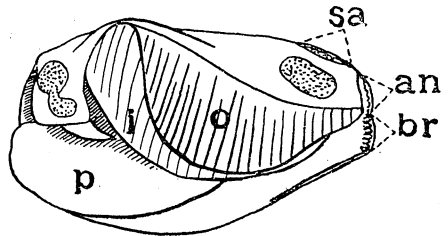


Fig. 159

Shell solid, triangular to rhomboid, usually with a prominent umbonal region; beaks at or near the anterior end of the shell, incurved and pointed forward over a small, but well developed lunule; beak sculpture coarse, consisting of a few, often broken, ridges, which curve upward posteriorly; posterior ridge present, but low and rounded; epidermis showing the rest periods plainly, tawny to olive, often ornamented with rays which show a tendency to break into square spots; hinge rather strong, plate generally narrow; pseudocardinals double in both valves. Cavity of the beaks shallow.

Outer gills only serving as marsupium.

Type: *Unio clava* Lam., fig. 158. Animal, fig. 159.

Genus LEXINGTONIA Ortmann, 1914.

“Shell subquadrate or subtrapezoidal, with slightly elevated beaks and well developed hinge teeth. Beaks not much anterior. Outer surface without sculpture. Epidermis lighter or darker brownish, with rather indistinct rays, which are narrower or wider and do not break up into blotches. Beak sculpture distinct, consisting of rather numerous (six to eight), rather crowded, subconcentric ridges, which form an indistinct, rounded angle upon the posterior ridge and are in front

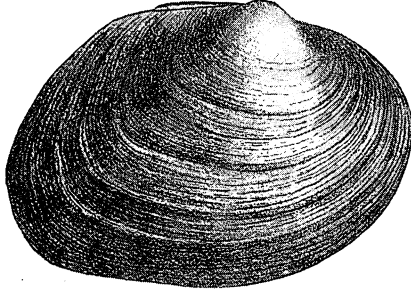


Fig. 160

of this somewhat wavy and corrugated, but without showing any distinct zigzag pattern. Towards the disk, they disappear. Nacre whitish or pinkish.”

Animal having only the outer gills marsupial and subcylindrical, red placentæ.

Type: *Unio subplanus* Con., fig. 160.

Genus ELLIPTIO Rafinesque, 1819.

Shell inequilateral, ovate to elongated, rounded in front and pointed or biangulate behind, with a more or less developed posterior ridge, often becoming slightly arcuate when old; beaks only moderately full, generally sculptured with coarse ridges, which run parallel with the growth lines or are somewhat doubly looped, sometimes broken and showing fine radiating lines behind; surface smooth, slightly concentrically ridged or pustulous; epidermis generally rather dull colored, rayless or fully rayed; hinge-plate narrow, two pseudocardinals and two laterals in the left valve and one pseudocardinal and one lateral in the right, with rarely a vestige of a second lateral; cavity of the beaks not deep or compressed. Marsupium occupying the whole length of the outer gills only, forming a thick, smooth pad when filled with young.

Key to the sections of *Elliptio*.

- Shell spinose *Canthyria*.
- Shell smooth or feebly corrugated..... *Elliptio s. s.*

Section ELLIPTIO s. s.

Shell elongated, rhomboid or oval, usually more or less biangulate behind; beak sculpture consisting of a few rather strong ridges, which are nearly parallel to the growth lines or slightly doubly looped; the surface smooth or feebly corrugated.

Type: *Unio crassidens* Lam., fig. 161. Animal, fig. 162.

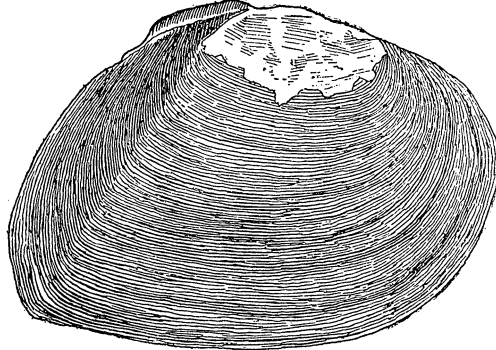


Fig. 161

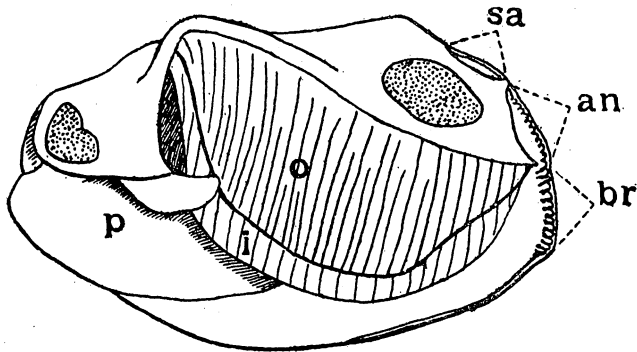


Fig. 162

Section CANTHYRIA Swainson, 1840.

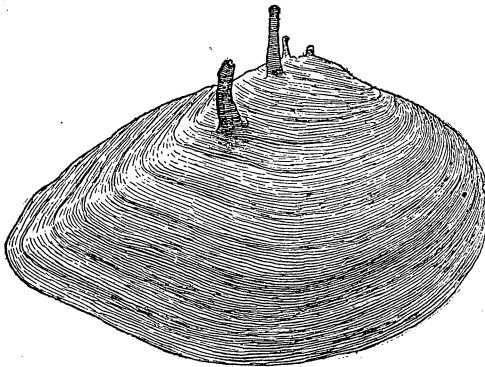


Fig. 163

Shell inflated, suboval, spinose, with a high, rather sharp posterior ridge, above which it is somewhat truncated; beaks rather compressed; epidermis smooth and shining, variegated with angular blotches; hinge sharply curved at the centre; pseudocardinals rather compressed; laterals short, remote; beak cavities rather deep.

Type: *Unio spinosus* Lea, fig. 163.

Genus UNIOMERUS Conrad, 1853.

Shell trapezoidal, with a rounded posterior ridge and pointed or feebly biangulate behind; beaks not prominent, sculptured with curved, rather

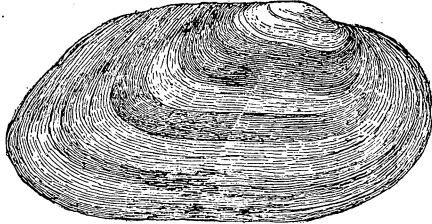


Fig. 164

strong, concentric ridges; epidermis generally rayless; pseudocardinals usually compressed, laterals delicate, slightly curved.

Outer gills only marsupial.

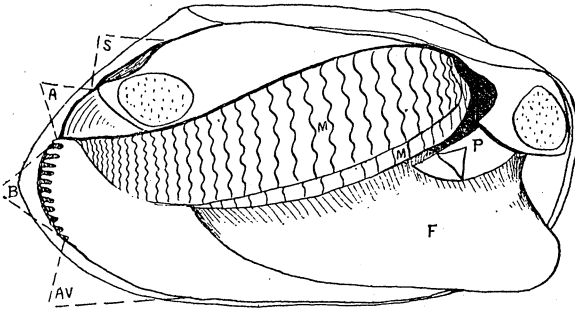


Fig. 165

Type: *Unio tetralasmus* Say, fig. 164. Animal, fig. 165.

Genus LASTENA Rafinesque, 1820.

Shell elongated, subsolid, inequilateral, generally wider in front, rounded and truncate at the anterior base, pointed at the post-basal region, and hav-

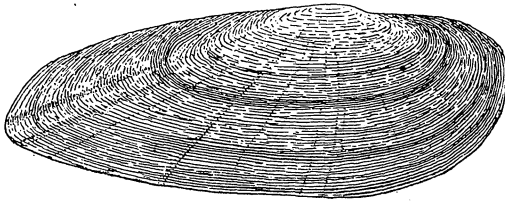


Fig. 166

ing a low posterior ridge, with one or more secondary ridges above it; beaks low, sculptured with a few coarse, irregular, longitudinal folds; epi-

dermis shining, often rayed; a single imperfect tooth in each valve and sometimes vestiges of laterals; nacre purplish shading to blue at the edge; pallial line radially ridged.

Animal having the foot very large, as long as the shell when extended, of a subcylindrical, compressed shape, with a distal swelling. The middle portion of the outer gills only marsupial. Glochidia semicircular, slightly oblique, inequivalve, without points or hooks.

Type: *Anodonta (Lastena) lata* Raf., fig. 166.

Genus GONIDEA Conrad, 1857.

Shell elongated, subtriangular, much narrowed in front, wide behind, inflated, subsolid, usually with a high, sharp posterior ridge; beaks rather sharp but not high, the sculpture consisting of a few, strong, concentric bars; epidermis rayless; hinge with a rudimentary pseudocardinal and lateral in each valve, though these are sometimes wanting; pallial line with a trace of a sinus behind; nacre lurid to purplish.

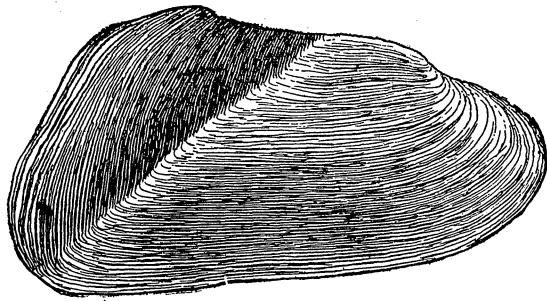


Fig. 167

Female having all four gills marsupial; with well developed septa, running parallel to the gill filaments and forming water tubes; septa not all continuous, but are often interrupted, chiefly so toward the proximal (basal) part of the gill and, towards the edge, frequently shorter septa are intercalated. Glochidia subovate or nearly subcircular, without hooks.

Type: *Anodonta angulata* Lea, fig. 167.

Subfamily ANODONTINÆ Ortmann, 1912.

"Inner lamina of inner gill free from the abdominal sac, or more or less connected with it, rarely entirely connected; supra-anal opening well separated from the anal, sometimes the connection of the mantle separating it from the anal is very long and the supra-anal is quite short; branchial opening well defined, no papillæ or flaps in front of it on the edge of the mantle; marsupium formed by the outer gills in their length, distending, when

charged, and the thickened tissue at the edge capable of stretching out in a direction transverse to the gill, but not beyond the edge (or only slightly so); water-tubes in the gravid female divided longitudinally into three tubes, with only the one in the middle used as an ovisac, and closed at the base of the gill; glochidium semicircular or triangular, with a spine (hook), in the middle of the ventral margin of each valve; shell generally very heavy, often thin, never round, but more or less elongated; color of epidermis generally bright and with color markings; sculpture of the beak double-looped or concentric, in the latter case often extremely heavy; hinge rarely complete and, if so, of peculiar structure; generally there is a distinct tendency toward the reduction of the hinge-teeth, and often they are completely absent; sexual differences in the shell very rarely present." (Ortmann.)

Key to the genera of *Anodontinae*.

- | | | | |
|----|---|---|-------------------------|
| 1. | { | Beak sculpture concentric | 2. |
| | { | Beak sculpture double-looped | 4. |
| 2. | { | Beak sculpture fine | <i>Anodontoides</i> . |
| | { | Beak sculpture coarse | 3. |
| 3. | { | Pseudocardinals well developed | <i>Alasmidonta</i> . |
| | { | Pseudocardinals rudimentary | <i>Strophitus</i> . |
| 4. | { | Hinge wholly edentulous | <i>Anodonta</i> . |
| | { | Hinge teeth more or less developed | 5. |
| 5. | { | Beak sculpture tubercular; surface tubercular or folded | 6. |
| | { | Beak sculpture not tubercular; surface smooth except on posterior slope | 7. |
| 6. | { | Beak sculpture strong and continuous with tubercular surface sculpture | <i>Arcidens</i> . |
| | { | Beak sculpture poorly developed and not continuous with surface sculpture | <i>Arkansia</i> . |
| 7. | { | Beak sculpture double-looped; pseudo-cardinals fully developed | <i>Iasmigona</i> . |
| | { | Beak sculpture open behind; a single pseudo-cardinal in each valve | <i>Simpsoniconcha</i> . |

Genus STROPHITUS Rafinesque, 1820.

Shell elliptical to rhomboid, inflated, subsolid, pointed or biangulate behind, with a low posterior ridge, which is sometimes double; beaks full, sculpture consisting of a few, strong, concentric ridges, which curve sharply

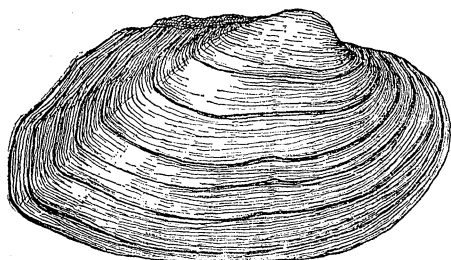


Fig. 168

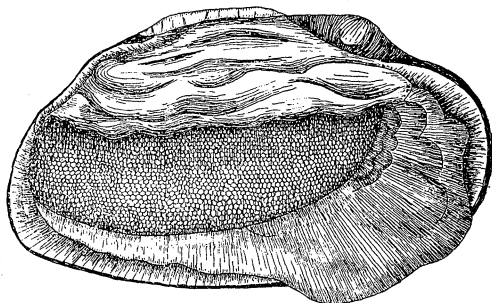


Fig. 169

upwards behind; epidermis rayed or rayless, shining; hinge line incurved in front of the beaks; teeth rudimentary, a vestigial, compressed tooth in each valve, and sometimes a secondary tooth; laterals rarely present. Marsupium occupying the whole of the outer gills, consisting of short, horizontal ovisacs, which run directly across the gills.

Type: *Anodonta undulata* Say.

Example: *S. edentulus* (Say), fig. 168. Animal, fig. 169.

Genus ANODONTA Lamarck, 1799.

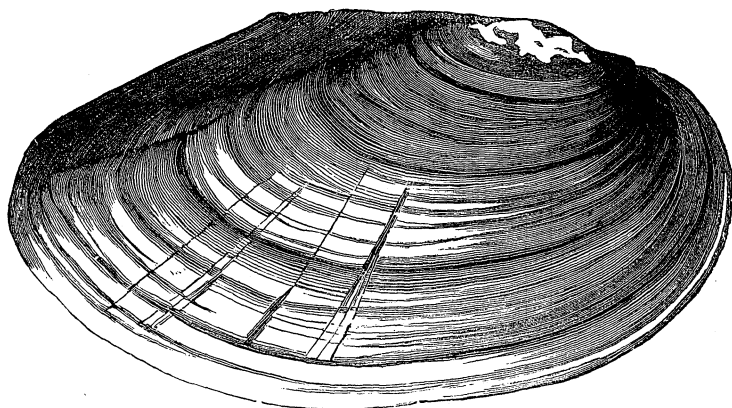


Fig. 170

Shell elliptical, thin, inflated, often slightly winged posteriorly; beak sculpture consisting of rather numerous, more or less parallel ridges, usually somewhat doubly looped and becoming slightly nodulous on the loops; surface generally smooth, shining; hinge edentulous, reduced to a mere line, regularly curved; nacre dull.

Marsupium occupying the whole outer gills, when filled forming a smooth, very thick, liver-colored pad.

Type: *Mytilus cygneus* L.

Example: *A. cataracta* Say, fig. 170. Animal, fig. 171.

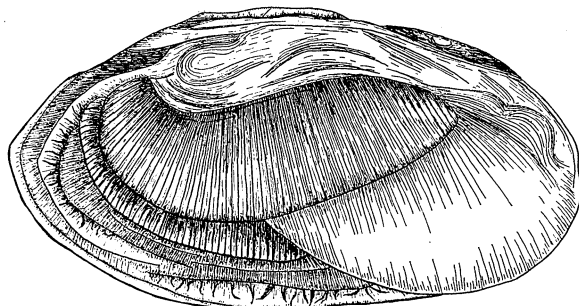


Fig. 171

Genus ANODONTOIDES Simpson, 1898.

Shell elliptical, inflated, thin, with a faint posterior ridge, sometimes constricted at the centre of the base; beaks rather full, with a few, not very coarse, subparallel, concentric ridges, which are curved up rather suddenly, behind and back of these are fine radiating ridges; epidermis smooth and

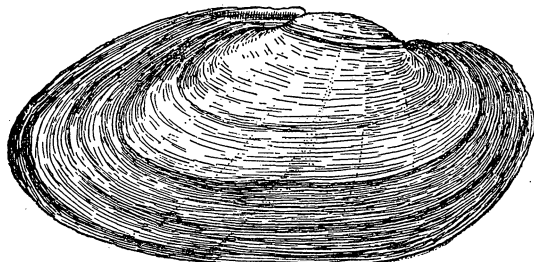


Fig. 172

shining, often rayed; hinge line slightly incurved in front of the beaks, edentulous or bearing the merest rudiments of teeth; nacre bluish-white. Marsupium occupying the outer gills only.

Type: *Anodonta ferussaciana* Lea, fig. 172.

Genus ARCIDENS Simpson, 1900.

Shell subsolid, inflated, subrhomboidal, with full high beaks; beak sculpture very strong, consisting of irregular corrugations, which fall into two loops, at the base of which the ridges are swollen into knobs that continue out in two radiating rows on to the disk of the shell; in front of and behind the beaks are many fine, radial wrinkles, the posterior ones being zig-

zagged; surface of the shell covered with oblique folds and wrinkles; epidermis dark olive, shining; left valve with two elongated, compressed pseudo-cardinals, the posterior under the beak and curved upwards, cutting off

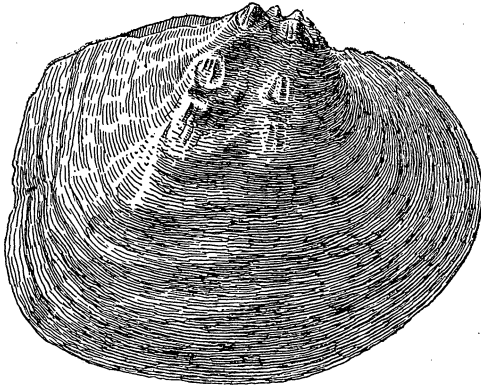


Fig. 173

the hinge plate in the right valve, which has a single, compressed pseudo-cardinal in front; laterals numerous, short, blurred; nacre white. Marsupium occupying the outer gills.

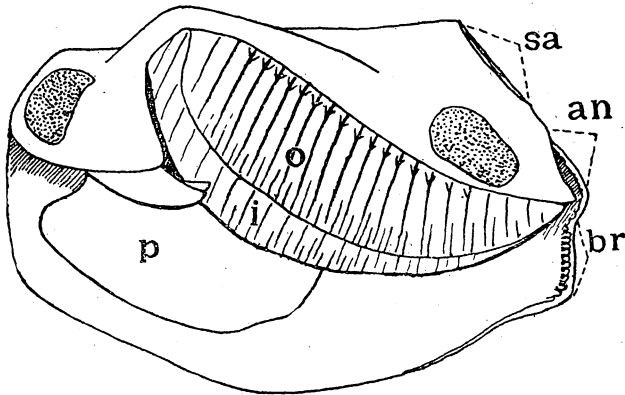


Fig. 174

Type: *Alasmodonta confragosa* Say, fig. 173. Animal, fig. 174.

Genus ARKANSIA Ortmann and Walker, 1912.

Shell moderately thick, subrotund to subovate or subrhomboidal, inflated, with full beaks. Disk sculptured with irregular, oblique folds, which are sometimes indistinct. Beak sculpture poorly developed, consisting of two to three double-looped bars, the loops slightly swollen or tubercular, dis-

appearing toward the disk and not continuous with the sculpture of the latter. Hinge well developed, with strong pseudocardinals, a very strong

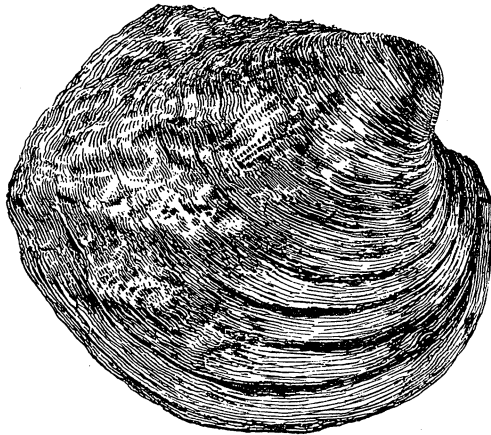


Fig. 175

interdental projection in the left valve and well developed, strong, but rather short laterals.

Outer gills only marsupial.

Type: *Arkansia wheeleri* O. and W., fig. 175.

Genus *LASMIGONA* Rafinesque, 1831.

Shell elliptic-rhomboid, compressed; beaks low, their sculpture consisting of strong bars; one pseudocardinal in the right valve and two in the left, the hinder somewhat \wedge -shaped, cutting off the hinge-plate in the right valve; laterals generally imperfect. Marsupium thick, padlike, filling the outer gills.

Key to the subgenera of *Lasmigona*.

- | | | | |
|----|---|---|------------------------|
| 1. | { | Shell corrugated on posterior slope..... | <i>Lasmigona s. s.</i> |
| | { | Shell smooth | 2. |
| 2. | { | Hinge teeth delicate | 3. |
| | { | Hinge teeth very heavy..... | <i>Pterosyna</i> . |
| 3. | { | Lateral teeth compressed, moderately developed..... | <i>Platynaias</i> . |
| | { | Lateral teeth nearly or quite wanting..... | <i>Alasminota</i> . |

Subgenus PLATYNAIAS Walker, 1917.

Shell smooth, subsolid, shining, rayed; beak sculpture sharply double-looped; teeth delicate; laterals compressed, moderately developed.

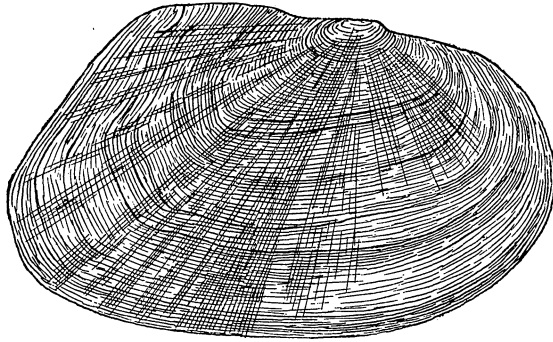


Fig. 176

Type: *Symphynota compressa* Lea, fig. 176.

Subgenus LASMIGONA s. s.

Shell subrhomboid, compressed, corrugated behind; beaks low, their sculpture consisting of several coarse ridges, which generally fall into two slight loops, and often with radiating ridges in front and behind; epidermis

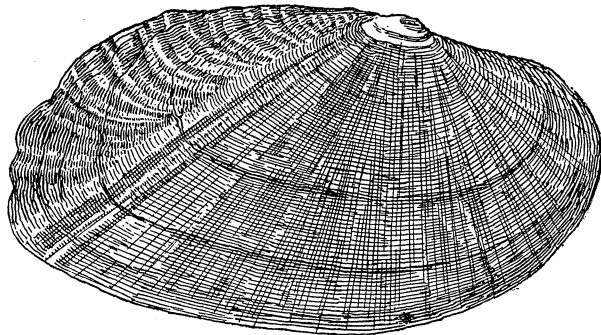


Fig. 177

shining; laterals partly developed, consisting of blurred ridges, which slope diagonally downward and backward on the hinge-plate; cavities of the beaks shallow.

Type: *Alasmidonta costata* Raf., fig. 177.

Subgenus ALASMINOTA Ortmann, 1914.

Shell elongated elliptical, rather small. Surface without sculpture. Pseudocardinals delicate; laterals nearly or quite wanting. Beak sculpture: not heavy, consisting of four to six rather fine, sharp bars, the first one or

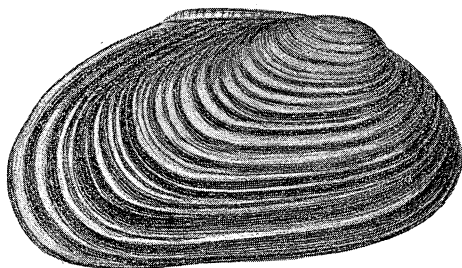


Fig. 178

two subconcentric, the following ones sharply double-looped, the posterior loop smaller, separated from the anterior by a deep, sharp, re-entering angle.

Type: *Margaritana holstonia* Lea, fig. 178.

Subgenus PTEROSYNA Rafinesque, 1831.

Shell large, ovate-rhomboid, inflated in the post-basal region; beaks much compressed; their sculpture sharply and strongly doubly looped; epidermis dark, scarcely rayed; teeth very heavy.

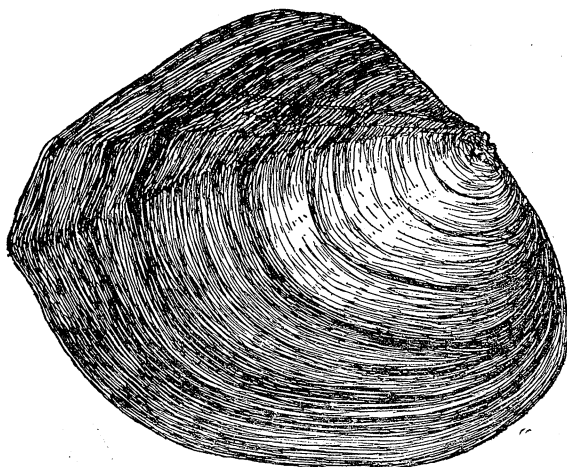


Fig. 179

Type: *Alasmodonta complanata* Bar., fig. 179.

Genus ALASMIDONTA Say, 1818.

Shell generally rhomboid, inflated, with a well developed posterior ridge, which ends in a point when it is single or a biangulation when double; beaks full and high, with coarse, concentric or slightly doubly looped bars; epidermis rayed, shining; hinge with two pseudocardinals in the left valve and one in the right; laterals usually wanting or imperfect, present in *Pro-lasmidonta*, cavity of the beaks deep; nacre bluish. Marsupium occupying the entire outer gills.

Key to the subgenera of *Alasmidonta*.

1. { Lateral teeth present *Prolasmidonta*.
 { Lateral teeth absent or obsolete..... 2.
2. { Shell solid, pseudocardinals solid, stumpy..... 3.
 { Shell thinner, pseudocardinals compressed or imperfect..... 4.
3. { Shell ovate-rhomboid, inflated *Alasmidonta s. s.*
 { Shell smaller, compressed, very solid..... *Pegias*.
4. { Posterior slope slightly corrugated..... *Rugifera*.
 { Posterior slope smooth 5.
5. { Shell rhomboid, posterior ridge low, rounded..... *Pressodonta*.
 { Shell subtriangular, posterior ridge high, sharp..... *Bullella*.

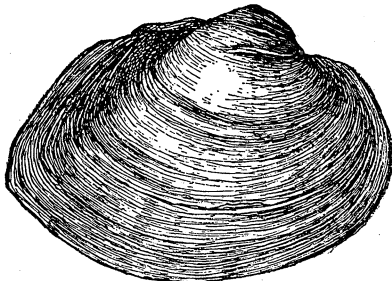


Fig. 180

Subgenus ALASMIDONTA s. s.

Shell ovate-rhomboid, solid, inflated, shining, with very strong, generally concentric, beak sculpture; pseudocardinals solid, stumpy, somewhat radiately ridged; laterals short, very imperfect or wanting; beak cavities deep, compressed.

Type: *Monodonta undulata* Say, fig. 180.

Subgenus PRESSODONTA Simpson, 1900.

Shell small, decidedly rhomboid, surface generally painted with unbroken rays; beak sculpture slightly corrugated; teeth compressed.

Type: *Unio calceolus* Lea, fig. 181.



Fig. 181

Subgenus PROLASMIDONTA Ortmann, 1914.



Fig. 182

Lateral hinge teeth present, but their number reversed, two in the right, one in the left valve. Beak sculpture moderately heavy, bars with an angle upon the posterior ridge and a slight sinus in front of it. Inner lamina of inner gills free. Female shell recognizable by a slight swelling in the region of the posterior ridge.

Type: *Unio heterodon* Lea, fig. 182.



Fig. 183

Shell small, thickened in front, with a sharp posterior ridge, in front of which is a wide, radial impression, ending in a basal sinus; above this ridge is another, making the shell decidedly biangulate and truncate behind; beak sculpture consisting of sub-conic corrugations, generally swollen on the posterior ridge; epidermis dextricated, but showing a few, dark radial rays on the base of the shell; pseudocardinals rather solid; laterals wanting.

Type: *Margaritana fabula* Lea, fig. 183.

Subgenus RUGIFERA Simpson, 1900.

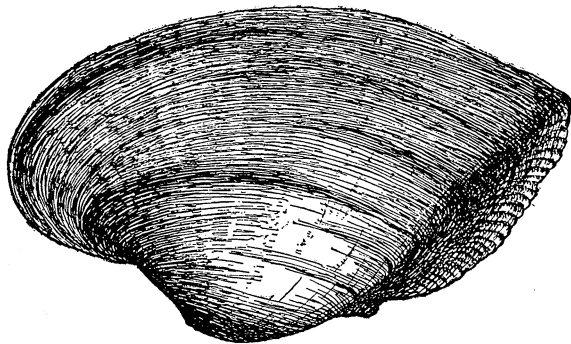


Fig. 184

Shell elongated, rhomboid, inflated, surface brilliantly painted with radiations which often break into dappled or splashed pattern of color; posterior slope slightly corrugated; teeth very imperfect; laterals wanting.

Type: *Alasmodontia marginata* Say, fig. 184.

Subgenus BULLELLA Simpson, 1900.

Shell thin, greatly inflated, somewhat triangular, with a high, sharp posterior ridge; beaks very full, having exceedingly strong, concentric sculpture; extending well on to the disk; pseudocardinals reflexed, compressed.

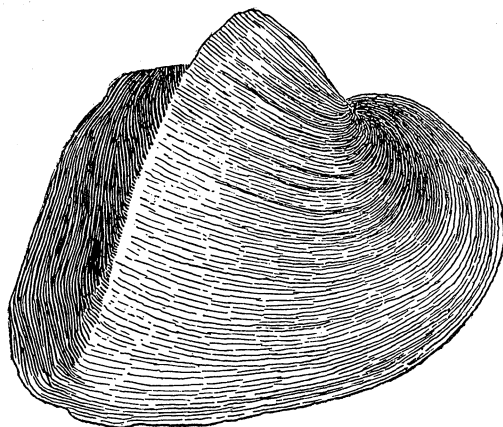


Fig. 185

Type: *Margaritana arcula* Lea, fig. 185.

Genus SIMPSONICONCHA Frierson, 1914.

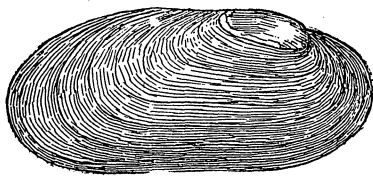


Fig. 186

Shell small, elongate elliptical, rounded in front and behind, often slightly incurved at the central base; beak rather sharp, but not full; sculpture consisting of fine parallel ridges which are looped up in the middle and open behind; epidermis brownish, rayless; teeth imperfect, a single, irregular, compressed tooth in each valve; laterals nearly or quite wanting; anterior end of the shell much thickened; nacre dull whitish. Marsupium occupying the whole of the outer gills.

Type: *Alasmodonta ambigua* Say, fig. 186.

Subfamily LAMPSILINÆ Ortmann, 1912.

"Inner lamina of inner gills rarely more or less free from the abdominal sac, generally connected with it throughout; supra-anal opening separated from the anal, rarely entirely closed; branchial openings well defined; edge of the mantle in front of the branchial opening smooth to crenulated or with peculiar papillæ or a flap; marsupium rarely formed by the whole outer gill, generally only by or within the posterior part of the outer gill; edge of marsupium, when charged, distending and bulging out beyond the original edge of the gill, generally assuming a beaded appearance; water-tubes simple in the gravid female; glochidium semicircular or semi-elliptic,

without spine, rarely celt-shaped and with two spines; shell heavy or lighter, rounded, or oval to elongate; color of the epidermis rarely dull, mostly bright, with color markings; sculpture of the beak generally double-looped, but often obsolete, more rarely concentric; hinge generally complete, with well developed teeth, which only in rare cases show a tendency to become reduced; sexual differences more or less noticeable in the shell, often very strongly expressed." (Ortmann.)

Key to the genera of *Lampsilinæ*.

- | | | | |
|-----|---|---|-------------------------|
| 1. | { | Male and female shells alike..... | 2. |
| | { | Male and female shells different..... | 5. |
| 2. | { | Shell elongate-triangular..... | <i>Ptychobranchus</i> . |
| | { | Shell rounded-triangular or oval..... | 3. |
| 3. | { | Shell oval, with a medial row of large tubercles..... | <i>Obliquaria</i> . |
| | { | Shell rounded-triangular, nodulously wrinkled or lachrymose.... | 4. |
| 4. | { | Epidermis painted with delicate mottlings on a light ground,
beak cavities shallow..... | <i>Cyprogenia</i> . |
| | { | Epidermis painted with radiating hair-lines, beak cavities
deep and compressed..... | <i>Dromus</i> . |
| 5. | { | Female shell more or less expanded in the post-basal region..... | 6. |
| | { | Female shell slightly swollen just behind the middle of the
base..... | <i>Medionidus</i> . |
| 6. | { | Dorsal margin winged..... | 7. |
| | { | Dorsal margin not winged..... | 8. |
| 7. | { | Pseudocardinals perfect; glochidium celt-shaped, with two
spines..... | <i>Proptera</i> . |
| | { | Pseudocardinals rudimentary; glochidium semicircular, with-
out spines..... | <i>Paraptera</i> . |
| 8. | { | Pseudocardinals well developed, complete..... | 9. |
| | { | Pseudocardinals divided into irregular laminae..... | <i>Glebula</i> . |
| 9. | { | Shell with a distinct posterior ridge, dorsal-slope smooth..... | 10. |
| | { | Shell usually without a distinct posterior ridge, or when dis-
tinct, dorsal-slope radiately sculptured..... | 11. |
| 10. | { | Hinge heavy and strong; hinge-plate wide and flat..... | <i>Plagiola</i> . |
| | { | Hinge delicate; hinge-plate narrow..... | <i>Amygdaloniais</i> . |

- | | | |
|-----|---|---|
| 11. | { | Marsupial expansion of the female shell of the same texture as the rest of the shell 12. |
| | | Marsupial expansion of the female shell of different texture from the rest of the shell and usually radiately sculptured <i>Truncilla</i> . |
| 12. | { | Inner edge of the mantle in front of the branchial opening differentiated with papillæ or flaps 13. |
| | | Inner edge of mantle in front of branchial opening without papillæ or flaps 16. |
| 13. | { | Shell smooth 14. |
| | | Shell strongly sculptured posteriorly <i>Lemiox</i> . |
| 14. | { | Beak sculpture double-looped 15. |
| | | Beak sculpture concentric <i>Carunculina</i> . |
| 15. | { | Inner edge of mantle in front of branchial opening in female distinctly papillate <i>Eurynia</i> . |
| | | Inner edge of mantle in front of branchial opening in female with a ribbon-like flap <i>Lampsilis</i> . |
| 16. | { | Shell inflated, usually higher than long <i>Obovaria</i> . |
| | | Shell subcompressed, longer than high <i>Actinonaias</i> . |

Genus PTYCHOBANCHUS Simpson, 1900.

Shell triangular, solid, sometimes becoming arcuate in old specimens; umbonal region rather elevated; beak sculpture consisting of faint, somewhat broken ridges, which have a tendency to be doubly looped; posterior

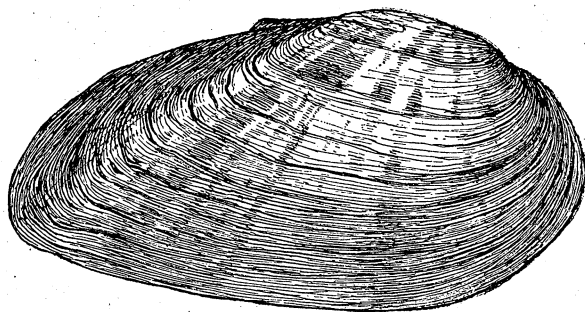


Fig. 187

ridge rounded, but well developed; epidermis usually painted with wavy hair-like rays or broken, radiating bars, which show a tendency to form square spots; hinge-plate rather wide and flat; pseudocardinals small, low, triangular and roughened; laterals club-shaped, remote.

Marsupium occupying the basal half of the entire length of the outer gills and having in front six to twenty beautiful folds; ovisacs distinct, each ending below in an enlarged, rounded bulb, which has a colored spot in the centre.

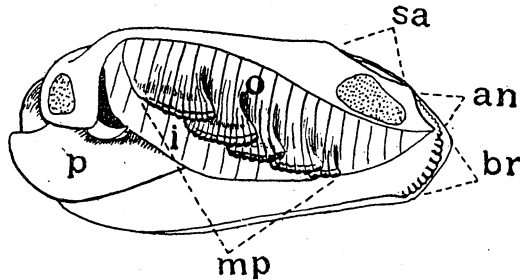


Fig. 188

Type: *Unio phaseolus* Hild., fig. 187. Animal, *P. subtentus*. (Say), fig. 188.

Genus OBLIQUARIA Rafinesque, 1820.

Shell inflated, solid, oval, ending in a tolerably sharp point behind, having a row of large, compressed, longitudinal knobs running from the beaks to the centre of the base, those of one valve alternating with the knobs of the other, and a well developed posterior ridge, the space between the ridge and the knobs somewhat excavated; posterior slope and sometimes the entire shell more or less corrugately sculptured; beaks prominent, incurved and pointed slightly forward toward a tolerably well developed lunule; beak sculpture strong, consisting of four or five heavy, parallel ridges, which fall

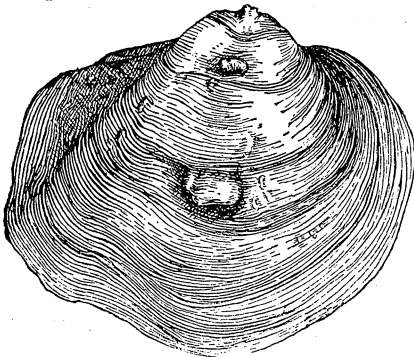


Fig. 189

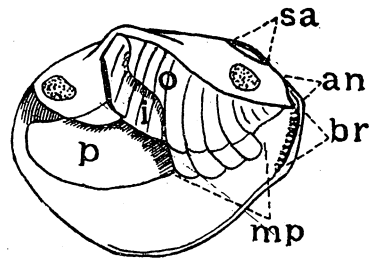


Fig. 190

low in front, but are curved upwards behind; epidermis smooth, generally shining, painted with numerous, delicate, wavy, darker, broken rays; pseudo-cardinals strong, distinct and ragged; laterals short, nearly straight; front part of the shell very solid, suddenly becoming rather thin, just behind the knobs. Marsupium consisting of a few, distinctly marked ovisacs (4 to 7) occupying a position just behind the centre of the outer gills, projecting far below the rest of the branchia, their bases rounded.

Type: *O. reflexa* Raf., fig. 189. Animal, fig. 190.

Genus DROMUS Simpson, 1900.

Shell solid, rounded triangular; beaks well forward, rather high; beak sculpture consisting of fine ridges running parallel with the growth lines, the furrows between the ridges interrupted at the posterior ridge; posterior ridge distinct; a series of humps runs from the beaks down to the central part of the base of the shell, which is otherwise sculptured by irregular, concentric ridges; epidermis beautifully painted by undulated, radiating,

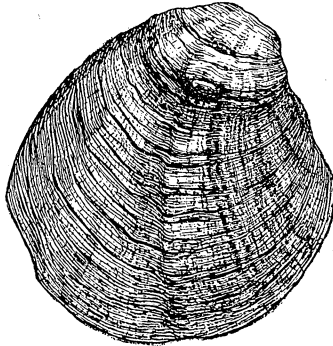


Fig. 191

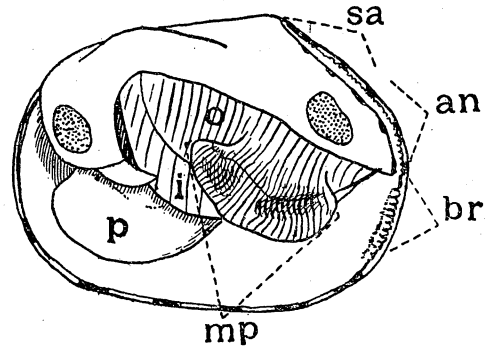


Fig. 192

broken hair-lines or fine maculations; hinge plate wide and flat; pseudo-cardinals triangular, small and low, ragged; laterals low, short, club-shaped; cavity of the beaks deep and compressed; front part of the shell very thick, suddenly becoming thinner at the row of humps. Marsupium occupying the base of nearly the whole outer gills in numerous narrow ovisacs, which extend beyond the original edge of the gill.

Type: *Unio dromas* Lea, fig. 191. Animal, frontispiece, fig. 192.

Genus CYPROGENIA Agassiz, 1852.

Shell solid, inflated, rounded, triangular, sometimes slightly retuse, generally a little biangular behind; posterior ridge usually well developed; umbonal region flattened parallel with the axis of the shell, sometimes com-

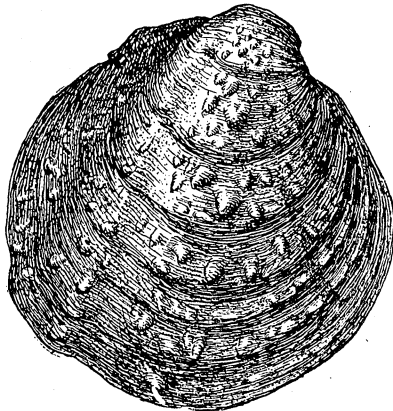


Fig. 193

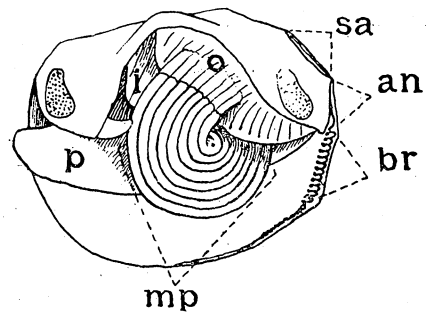


Fig. 194

pressed; beaks curved inward and forward, their sculpture very faint, consisting of slightly double looped ridges; sculpture of the shell nodular, radiately wrinkled or lachrymose; ligament black and conspicuous; lunule distinct, well developed; epidermis shining, painted with a delicate mottling on a light ground; hinge plate wide and flat; pseudo-cardinals heavy, triangular, blunt and ragged; laterals short, obliquely striated, cavity of the beaks not deep; nacre bright and silvery.

Marsupium consisting of from seven to twenty-three very long, purple ovisacs pendant from near the central base of the outer gills and formed into a close coil with the ends turned inward.

Type: *Unio irroratus* Lea, fig. 193. Animal, fig. 194.

Genus *PLAGIOLA* (Rafinesque, 1819), Agassiz.

Shell solid, surface irregularly, concentrically ridged; epidermis smoothish, but here and there wrinkled; painted with larger and smaller scattered rays, which are generally broken into irregular lunate or squarish blotches;

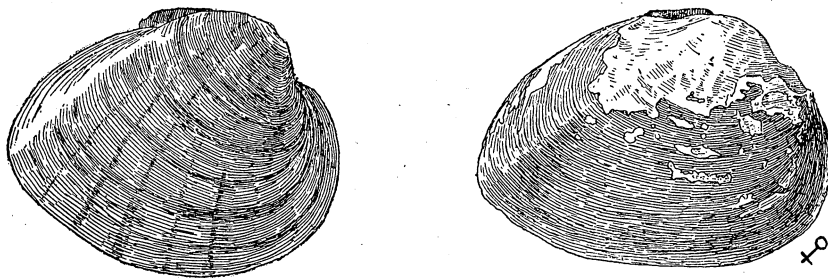


Fig. 195

hinge heavy and strong; hinge plate wide and flat; female shell smaller than the male, more inflated and swollen at the post basal region. Marsupium large, projecting far below the inner gills.

Type: *Unio securis* Lea, fig. 195.

Genus *AMYGDALONAIAS* Fischer and Crosse, 1893.

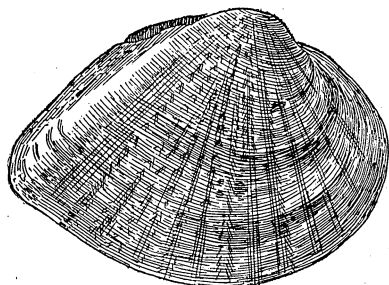


Fig. 196

Shell inflated, decidedly truncate at the posterior slope; surface slightly concentrically sculptured; posterior ridge sharp and well defined; epidermis shining, sometimes wrinkled, looped and painted with a beautiful pattern of broken or arrow-marked rays; area of the beaks flattened off in the direction of the axis of the shell, but not compressed; beak sculpture delicate, some-

what broken and doubly looped, the anterior loop rounded, the posterior sharp below, the ribs fading out where they cross the posterior ridge; hinge

delicate; pseudo-cardinals rather compressed, high and ragged; hinge plate narrow; female shell very slightly swollen at the post-base. Marsupium consisting of numerous, distinct ovisacs and having a well marked sulcus extending around it at some distance above its base.

Type: *Unio cognatus* Lea.

Example: *P. elegans* (Lea), fig. 196.

Genus MEDIONIDUS Simpson, 1900.

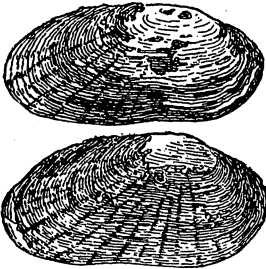


Fig. 197

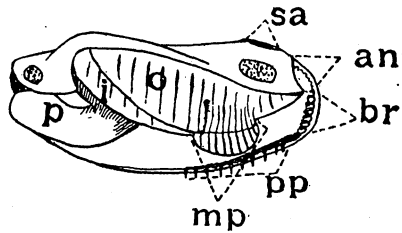


Fig. 198

Shell elongated, rather inflated, often arcuate when adult, sometimes having a posterior ridge; dorsal slope and occasionally the posterior portion of the shell plicately or nodulously wrinkled; epidermis smooth and bright, variegated with broken green rays and blotches; beak sculpture consisting of rather fine, subparallel, often broken ridges in two loops, the anterior rounded, the posterior somewhat angled, occasionally broken into zigzags; pseudo-cardinals small, stumpy and somewhat roughened; laterals rather short, slightly curved and club-shaped; female shell slightly swollen behind the middle of the base. Marsupium occupying the central posterior part of the outer gills, sometimes extending nearly their whole length.

Type: *Unio conradicus* Lea, fig. 197. Animal, fig. 198.

Genus GLEBULA Conrad, 1853.

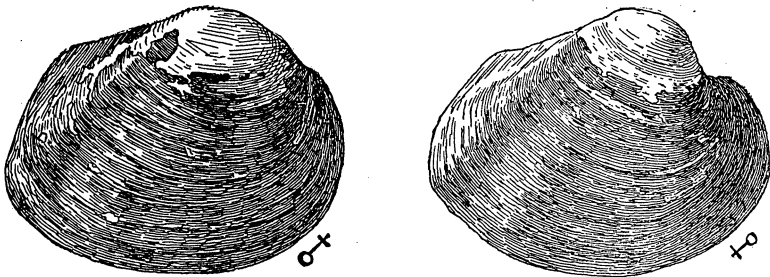


Fig. 199

Shell solid, much inflated, short, elliptical, bluntly pointed and slightly biangulate behind, with a low, posterior ridge; female shell swollen at the

post-base; beaks compressed, sculpture unknown; epidermis brownish, cloth-like; pseudo-cardinals divided into irregularly radiating, granular lamina, sometimes to the number of a dozen or more in each valve; hinge-plate reduced to a mere rounded line behind the pseudo-cardinals; laterals short, remote. Ovisacs apparently separated from each other by a sulcus.

Type: *Unio rotundata* Lam., fig. 199.

Genus PROPTERA Rafinesque, 1819.

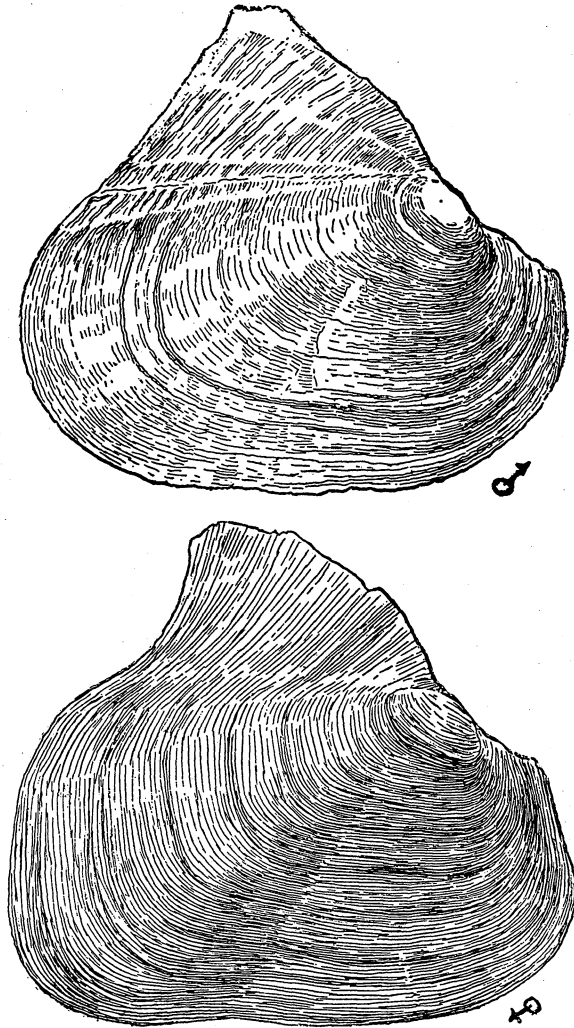


Fig. 200

Shell usually large, gaping at anterior edge and edge of dorsal slope, winged along the dorsal region when young and often when adult; beak

sculpture feeble, consisting, when developed, of an anterior and posterior loop, the former often wanting; epidermis generally brown, often cloth-like when fresh, rayless or feebly rayed; teeth rather compressed, pseudo-cardinals frequently imperfect or nearly wanting; laterals remote. Marsu-

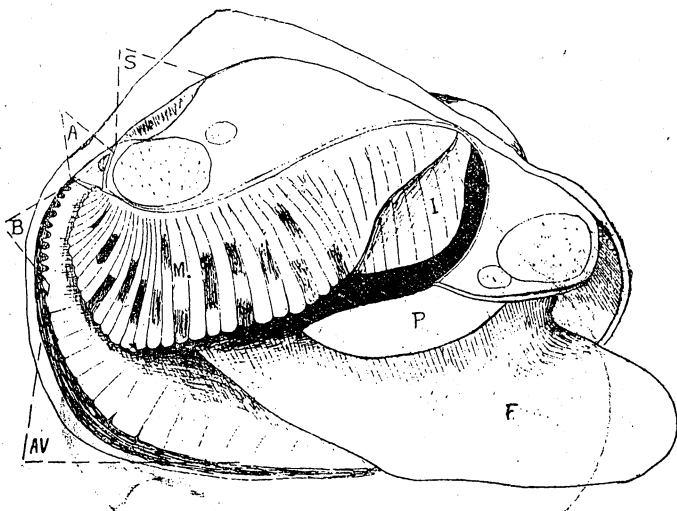


Fig. 201

pium kidney-shaped, consisting of numerous ovisacs occupying the posterior part of the outer gill; edge of mantle in female slightly lamellar in front of the branchial opening with granulations, but without papillæ. Glochidia celt-shaped, with two spines, one at each of the ventral corners.

Type: *Unio alatus* Say, fig. 200. Animal, fig. 201.

Genus PARAPTERA Ortmann, 1911.

Shell large, thin, elliptical or slightly obovate, more or less compressed, winged on the dorsal margin; beaks low; epidermis rather smooth, often feebly rayed, dull colored, but usually glossy; teeth compressed, pseudo-cardinals but feebly and often imperfectly developed; nacre purplish. Male and female shells nearly alike, the latter scarcely swollen at post-basal region.

Marsupium kidney-shaped, swollen, consisting of many ovisacs occupying the posterior part of the outer gill; mantle edge of the female slightly

lamellar in front of the branchial opening, with crenulations, but not with papillæ. Glochidia very small, of suboval shape.

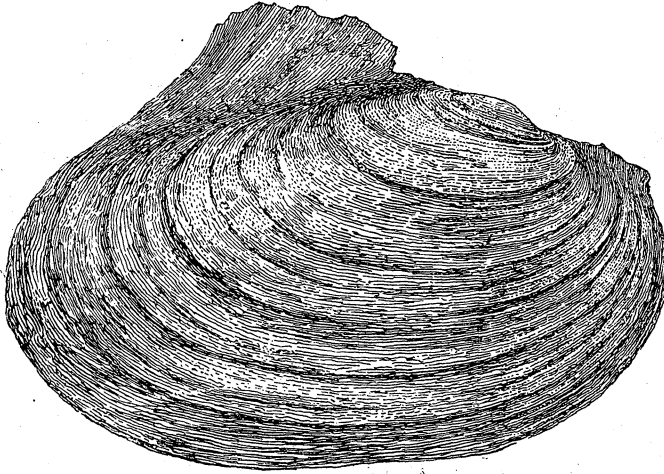


Fig. 202

Type: *Unio gracilis* Bar., fig. 202.

Genus OBOVARIA Rafinesque, 1819.

Shell short, oval, rounded or retuse, solid, inflated, thick in front, thinner behind, with high beaks, which are sculptured with very faint, irregular, often broken and slightly nodulous ridges, which show a tendency to fall into two loops, the posterior often open behind; epidermis dull, brownish, silky or cloth-like, rarely rayed, rays indistinct; female shell but slightly inflated in the post basal region, commonly having a shallow furrow or a flattened area at the posterior end; pseudo-cardinals solid; stumpy; laterals short, club-shaped. Marsupium kidney-shaped, projecting far below the edge of the gill and occupying the posterior portion of the outer gills.

Key to the subgenera of *Obovaria*.

- Shell retrorse to short oval, beaks high and central.....*Obovaria s. s.*
 Shell elliptical, beaks anterior.....*Pseudoön.*

Subgenus OBOVARIA s. s.

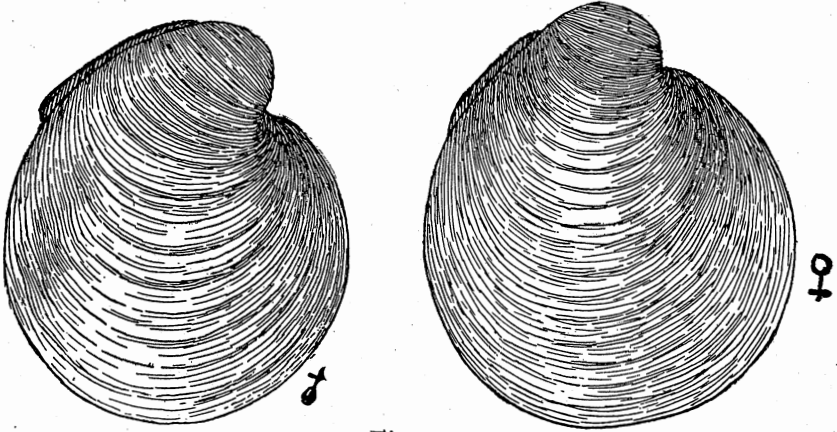


Fig. 203

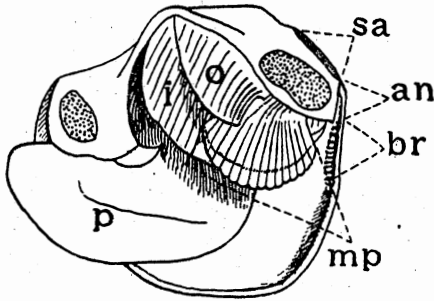


Fig. 204

Shell retrorse to short oval; beaks high, central; pseudo-cardinals rarely parallel with the laterals; cavity of the beaks deep, subcompressed; nacre bluish-white or purple. Marsupium as in the genus.

Type: *Unio retusa* Lam., fig. 203. Animal, fig. 204.

Subgenus PSEUDOÖN Simpson, 1900.

Shell elliptical, inflated, solid; that of the male slightly pointed at the upper posterior part; epidermis brownish or blackish, rayless or very feebly

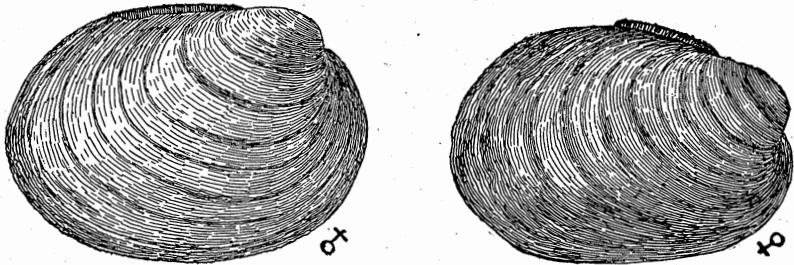


Fig. 205

rayed; beaks anterior; pseudo-cardinals solid, stumpy or slightly elongate in age, and showing a tendency toward being parallel with the laterals; nacre silvery, iridescent posteriorly. Marsupium kidney-shaped, not reaching to the posterior end of the outer gill, though extending quite well forward.

Type: *Unio ellipsis* Lea, fig. 205.

Genus ACTINONAIAS Fischer and Crosse, 1893.

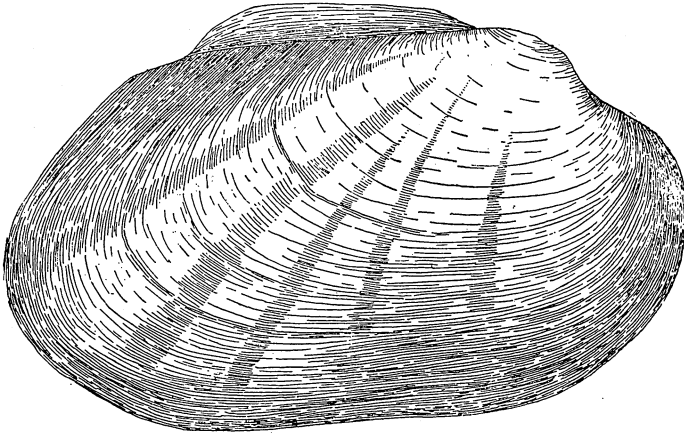


Fig. 206

“Shell ovate or subelliptical, distinctly longer than high, compressed or slightly inflated, without, or with, indistinct posterior ridge. Disk not sculptured. Beaks moderately anterior, never in the middle of the shell and never very near the anterior end. Beak-sculpture poorly developed, consisting of a few faint bars, which have a tendency to become double-looped, with the central part between the loops obliterated. Epidermis yellowish to greenish, generally with distinct rays. Male and female shells differing in shape, but the difference often hardly noticeable.

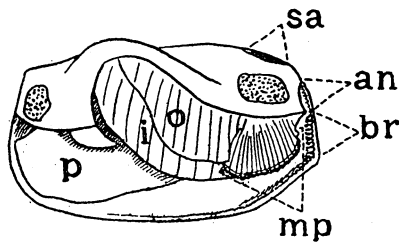


Fig. 207

Soft parts agreeing with those of Obovaria in every respect: the glochidia also of the same type.” (Ortmann.)

Type: *Unio sapotalensis* Lea, (animal), fig. 207.

Example: *A. ligamentinus* (Lam.), fig. 206.

Genus CARUNCULINA Simpson, 1898.

Shell small, inflated, obovate, rather solid, with a thick dark epidermis, which is rayless or only feebly rayed; beak sculpture consisting of rather strong, concentric ridges, which form, as a general thing, only a single rounded loop in front and are strongly curved upward behind. Pseudo-

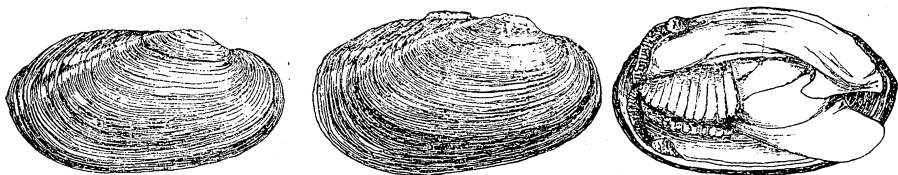


Fig. 208

Fig. 209

cardinals compressed, smooth on the inside, generally reflected upward, somewhat torn on the edges. Shell quite commonly pointed posteriorly, that of the female truncated obliquely on the post-base. Marsupium kidney-shaped, formed by a few large ovisacs, projecting beyond the gill; female having a well developed caruncle on the inner edge of the mantle in front of the branchial opening.

Type: *Unio parvus* Bar., fig. 208. Animal, fig. 209.

Genus EURYNIA Rafinesque, 1820.

Shell oval to oblong; surface smooth; beak sculpture delicate, double-looped; female shell more or less expanded or swollen in the post-basal region.

Inner edge of the mantle in the female distinctly papillate. Marsupium kidney-shaped, occupying the posterior part of the outer gill.

Key to the subgenera of *Eurynia*.

Shell elongate, more or less pointed behind.

Papillæ on inner edge of mantle regular, uniform, reaching to middle of lower margin.....*Eurynia s. s.*

Shell subovate or subelliptical, not much pointed behind.

Papillæ on inner edge of mantle irregular, not reaching to middle of lower margin.....*Micromya*.

Subgenus EURYNIA s. s.

Shell usually of good size, subelliptical, elongated, more or less pointed behind; beak sculpture double-looped, the posterior loop often open behind.

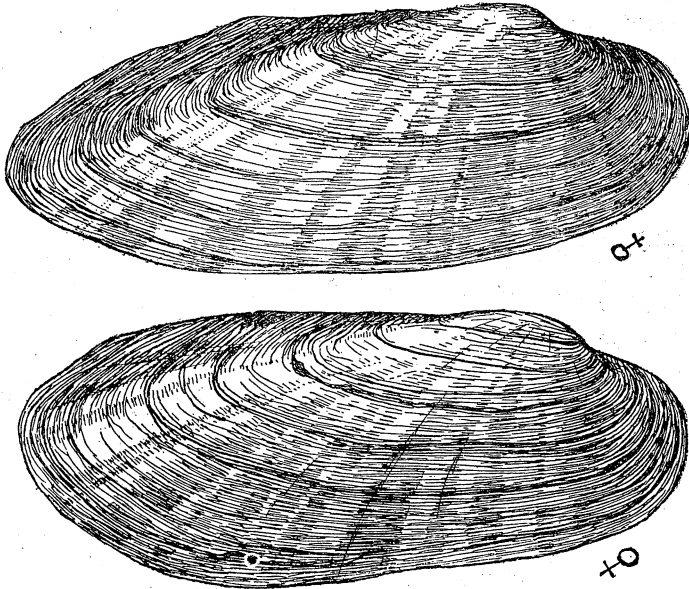


Fig. 210

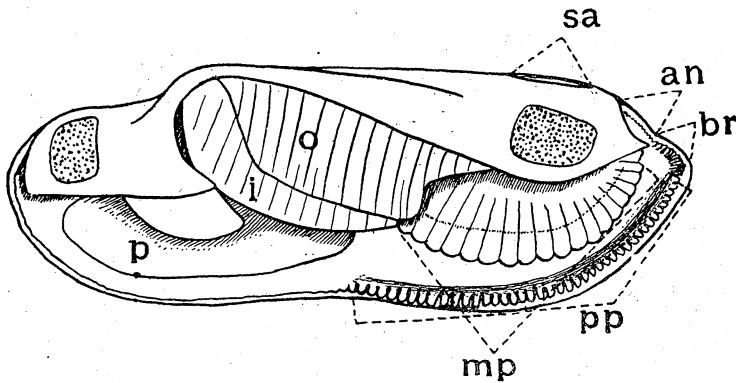


Fig. 211

Inner edge of the mantle in the female in front of the branchial opening with a long row of quite regular, uniform, subequal papillæ, reaching to about the middle of the lower margin.

Type: *Unio recta* Lam., fig. 210. Animal, fig. 211.

Subgenus MICROMYA Agassiz, 1852.

Shell small or of medium size, suboval or subelliptical, not very long and not much pointed behind; beak sculpture distinctly double-looped, but often obsolete, the posterior loop often showing a tendency to be open.

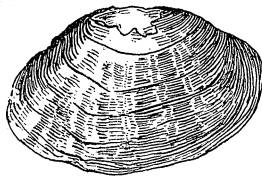
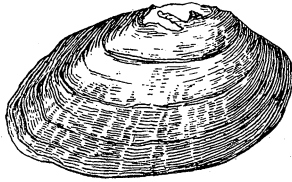


Fig. 212

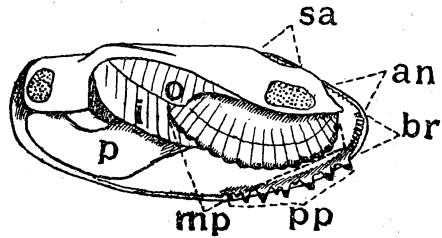


Fig. 213

Inner edge of the mantle of the female in front of the branchial opening with a shorter or longer row of rather irregular, larger and smaller papillae, reaching not quite to the middle of the lower margin.

Type: *Unio fabalis* Lea, fig. 212. Animal, *E. iris* (Lea), fig. 213.

Genus LAMPSILIS Rafinesque, 1820.

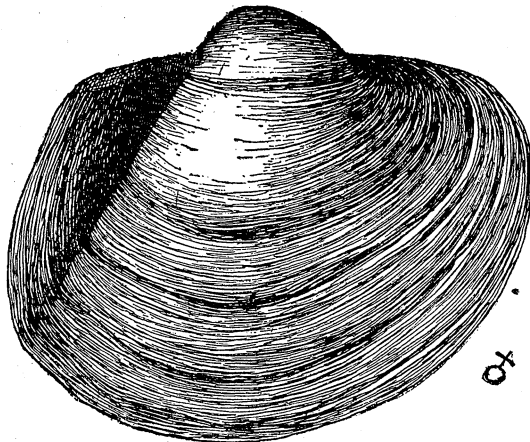


Fig. 214

Shell oval to elliptical, smooth or slightly, concentrically sculptured, usually without a posterior ridge; epidermis generally smooth and shining, often rayed; beak sculpture, consisting of double-looped, parallel ridges, sometimes the posterior loop open behind or the sculpture is obsolete; hinge

with one or two pseudocardinals and one lateral in the right valve, and two pseudo-cardinals and two laterals in the left; female shell having a strong inflation of the shell and dilatation in the post-basal region, producing a distinct posterior truncation of the shell. Marsupium kidney-shaped,

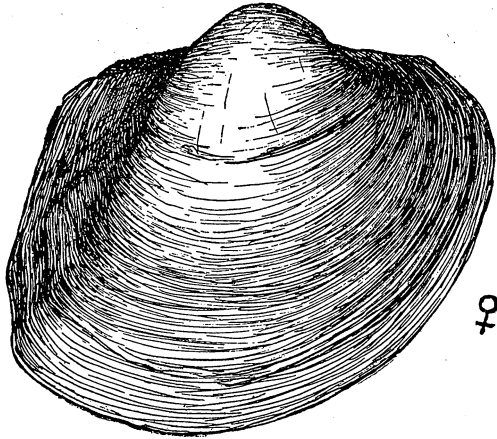


Fig. 214

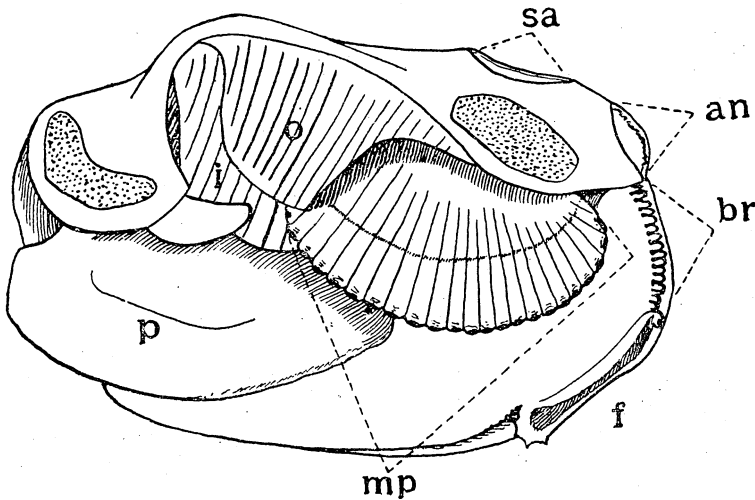


Fig. 215

occupying the posterior part of the outer gills; edge of the mantle of the female in front of the branchial opening developed into a ribbon-like flap, generally produced anteriorly into a full, projecting lobe, which has a lacerated appearance.

Type: *Unio ovatus* Say, fig. 214. Animal, fig. 215.

Genus LEMIOX (Rafinesque ??) Ortmann, 1916.

Shell triangularly ovate, solid, more or less inflated, with a low, rounded posterior ridge; beaks high, turned forward over a small lunule, sculpture distinctly double-looped; surface with strong, corrugated, subradial sculpture on the posterior half, which is divaricate on the posterior ridge and which sometimes covers the entire shell; epidermis clouded, dull-green or yellowish green, usually feebly rayed; pseudocardinals low, subradial, ragged, two in the left valve, one to three in the right valve; laterals heavy, double in the left valve, partly double in the right; muscle scars small, impressed; nacre silvery white, iridescent behind, thicker in front. Male shell subovate or subtriangular, with a broad, shallow, radial depression in front of the posterior ridge or having the whole disk, at least, flattened. Female shell usually ovate, sometimes inflated, smaller than the male, with a feebly developed marsupial swelling, distinctly, but irregularly, denticulate on the margin, at the base near the posterior end.

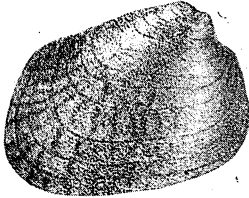


Fig. 216

Mantle margin of the female in front of the branchial opening denticulate on the outer margin. The inner margin has, just in front of the branchial, a few small papillæ and then is laminate and elevated and rather smooth and probably capable of some expansion.

Type: *Unio calatus* Con. (*Unio rimosus* Raf. ??), fig. 216.

Genus TRUNCILLA Rafinesque, 1819.

Shell rounded, oval or subtriangular, solid, inflated, generally smooth and rayed; beak sculpture delicate, often obsolete, double-looped; female shell very different from that of the male, having a very decided inflation in the post basal region, which is thinner than the rest of the shell, of different texture, often toothed and usually radiately sculptured.

Inner edge of the mantle in the female in front of the branchial opening is not parallel to the outer edge, but is more or less remote from it, often quite distant from it and has finer or coarser papillæ. The mantle between the two edges is peculiarly spongy. Marsupium swollen, kidney-shaped, formed by many ovisacs, occupying the posterior portion of the outer gill.

Key to the subgenera of *Truncilla*.

- 1. { Male shell smooth, no radiate, posterior furrow; female shell inflated along posterior ridge..... *Truncilla s. s.*
- | Male shell with a wide, radiate, posterior furrow..... 2.
- 2. { Female shell with a small, rounded, radial post-basal swelling..... *Scalenaria*.
- | Female shell with a greatly produced basal swelling, nearly in the centre of the base..... *Dysnomia*.
- | Female shell with a rounded, foliaceous swelling at the posterior base..... *Pilea*.

Subgenus TRUNCILLA s. s.

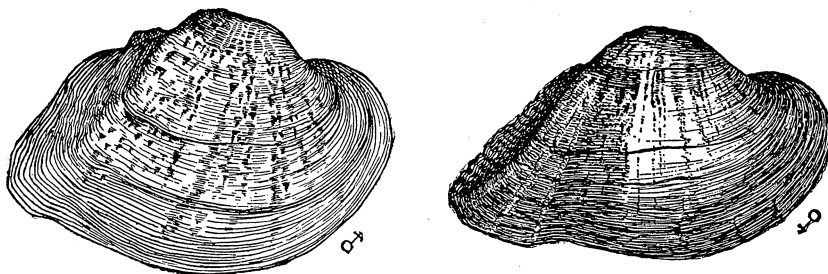


Fig. 217

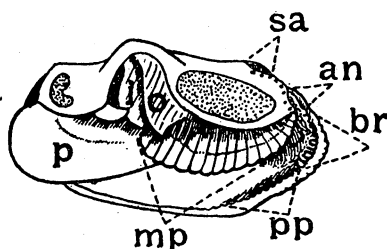


Fig. 218

Shell covered with broken rays, somewhat triangular and without a wide, radiate, posterior furrow.

Type: *T. triqueter* Raf., fig. 217. Animal, fig. 218.

Subgenus SCALENARIA (Rafinesque, 1820) Agassiz.

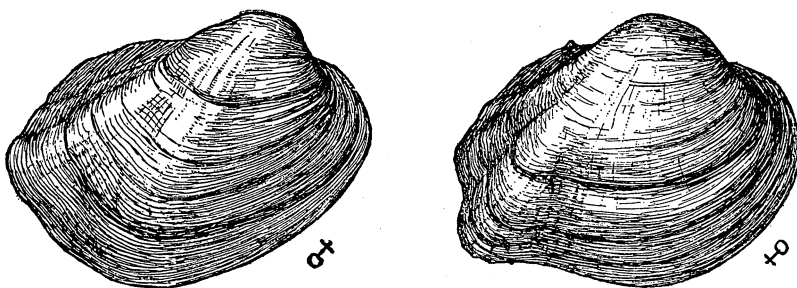


Fig. 219

Male shell having a wide, radiating, shallow depression in front of the posterior ridge; that of the female having a small, rounded, well-defined, radial post-basal swelling.

Type: *Unio sulcatus* Lea, fig. 219.

Subgenus DYSNOMIA Agassiz, 1852.

Shell of the male with a posterior and central radiating ridge, with a wide flattened space between, that of the female with a greatly produced

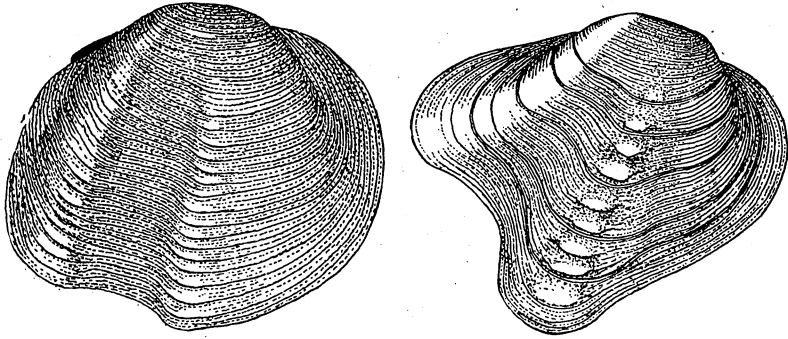


Fig. 220

inflation a little behind the centre of the base, being a continuation of the central ridge.

Type: *Unio foliatus* Hild., fig. 220.

Subgenus PILEA Simpson, 1900.

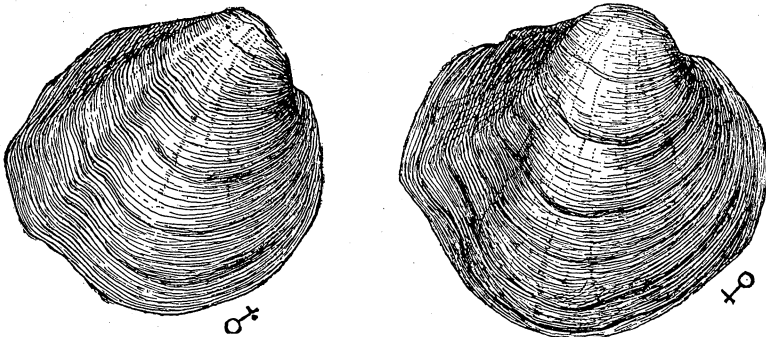


Fig. 221

Male shell with a wide, shallow, radiating depression in front of the posterior ridge, that of the female with a rounded foliaceous swelling at the posterior base.

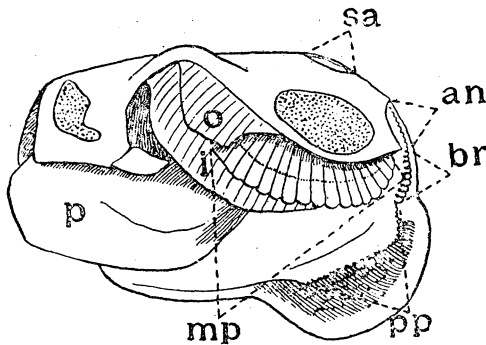


Fig. 222

Type: *Unio personatus* Say, fig. 221. Animal, *T. rangiana* (Lea), fig. 222.

Genus *incertæ sedis*.

Genus COKERIA Marshall, 1916.

"Shell gaping anteriorly, moderately thin, subquadrangular to subtriangular; abruptly rounded anteriorly, posterior margin nearly straight and perpendicular, dorsal margin straight, ventral margin gently curving throughout its entire length. Valves widest just in front of the posterior ventral angle. Umbones at about the anterior third of the dorsal margin,

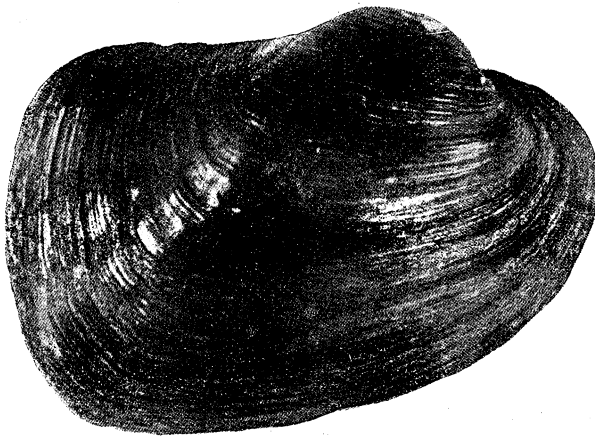


Fig. 223

high and incurved, the second growth line nearly horizontal. Posterior dorsal ridge very high, obtusely angular. Posterior area descending abruptly from the ridge and somewhat wing-like. Greatest inflation is along the umbonal ridge. A pronounced furrow extends from the umbo to the lower third of the posterior margin. Seven rest periods distinctly marked by con-

centric dark lines. Anteriorly from the middle portion a bold rounded rib occurs just below each rest-period. Dorsal area faintly radiately striate. Color, varying shades of chestnut, lighter (nearly straw color) anteriorly, darker posteriorly, rest stages sharply defined by blackish lines. Umbonal region faintly tinged with green. Periostracum thin, slightly glossy, closely adhering.

"Nacre anteriorly lustrous white and thickened; posteriorly thin violaceous and brilliantly iridescent. Pallial line not sharply defined and with several concentric striæ above it, its anterior portion radiately striated. Anterior adductor and retractor scars separated, deep and rough, posterior scars superficial. Dorsal scars concealed by the incurving of the upper portion of the valve.

"Lateral tooth of the right valve thin, very high, wing-like, striated longitudinally. Laterals of the left valve similar to that of the right valve, but smaller, the groove between them being very narrow. Pseudocardinals of the right valve two, thin, opposite, the upper one being the stronger. Pseudocardinals of the right (left?) valve coalescing, standing in the same straight line, the anterior one high, slightly curved, the posterior low, its summit irregularly crenulated. The sculpture of each umbo consists of four concentric ridges, highest (almost a nodule) at their posterior ends, and numerous concentric striæ." (Marshall).

Type: *Cokeria southalli* Marshall, fig. 223.

Family DREISSENSIIDÆ.

Shell mytiliform, equivalve, of prevailing prismatic substance, ligament subinternal; anterior adductor and pedal protectors inserted on a septum in the beak. Byssiferous.

Genus CONGERIA Partsch, 1835.

Type: *Congeria subglobosa* Partsch.

Typical *Congeria* is not represented in our fauna.

Subgenus MYTILOPSIS Conrad, 1857.

Shell mytiliform, attached by a byssus; hinge with a septum, beneath which on the cardinal side is a triangular cup-shaped, thin, white process, which projects obliquely towards the cavity of the valves; cartilage groove rather deep. Edge of the mantle united and extended posteriorly in two distinct siphons and open on the base for the extension of the foot.

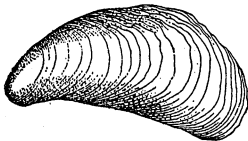


Fig. 224

Type: *Mytilus leucophaeatus* Con., fig. 224.

Family CYRENIDÆ.

Shell porcellanous, thick, solid, hinge-plate developed, teeth strong, prominent; equivalve; ligament external. Siphons distinctly developed; dioecious.

Genus CYRENA Lamarck, 1818.

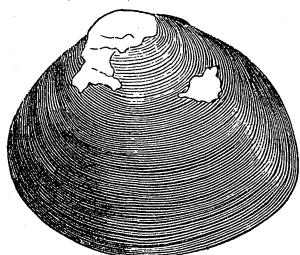


Fig. 225

Shell oval or subtrigonal, thick, solid, cardinal teeth, three in each valve; two anterior and two posterior laterals in the right valve and one anterior, and one posterior in the left; pallial line (in the American species, Section *Polymesoda* Rafinesque, 1820) with a deep, narrow sinus.

Type: *C. bengalensis* Lam.

Type: Section *Polymesoda*, *Cyclas caroliniana* Bosc., fig. 225.

Family SPHÆRIIDÆ.

Shell small and thin, ligament feeble, short; pallial line simple; no hinge plate; cardinal teeth usually two in each valve; laterals four in the right valve, two anterior and two posterior and two in the left, one anterior and one posterior; foot long, narrow, grooved, byssiferous when young; monœcious; the young incubated in a marsupium formed by the inner gill.

Key to the genera of *Sphæriidæ*.

- I. { Shell nearly equilateral; beaks subcentral..... 2.
- { Shell inequilateral; beaks terminal*Pisidium*.
- 2. { Nepeonic valves not distinctly separated from the subsequent growth of the shell 3.
- { Nepeonic valves inflated, separated from the adult growth by a distinct sulcus.....*Musculium*.
- 3. { Shell oval, cardinal teeth, two in each valve.....*Sphærium*.
- { Shell rhomboidal, one cardinal tooth in each valve.....*Eupera*.

Genus SPHÆRIUM Scopoli, 1777.

Shell thin, oval, more or less inflated; subequilateral, beaks subcentral; surface smooth or concentrically striate, teeth small, cardinals two in each valve, lateral teeth double in the right, single in the left valve. Siphons united at the base, but double at the extremity.

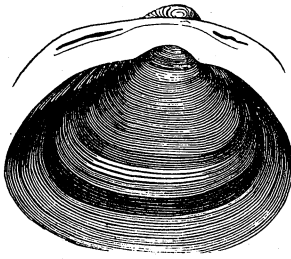


Fig. 226

Shell oval, relatively thick, nepeonic-shell passing into the adult without any distinct demarcation; anterior end shorter; surface usually concentrically striate or sulcate; cardinal teeth small but distinct.

Type: *Tellina cornea* L.

Example: *S. sulcatum* (Lam.), fig. 226. Animal, fig. 227.

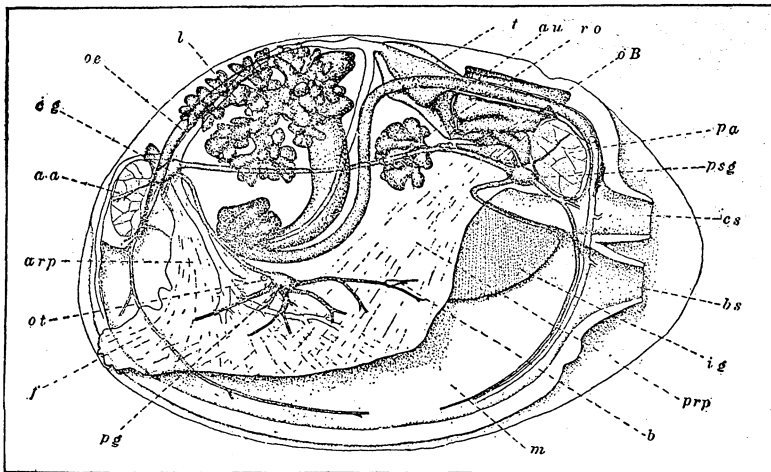


Fig. 227

- | | |
|-----------------------------------|------------------------------------|
| aa.—Anterior adductor muscle. | lp.—Labial palpus. |
| ao.—Anterior aorta. | m.—Mantle. |
| arp.—Ant. retractor pedis muscle. | oB.—Organ of Bojanus. |
| as.—Ant. adductor muscle scar. | oe.—Esophagus. |
| au.—Auricle. | og.—Outer gill. |
| b.—Byssal gland rudiment. | ot.—Otocyst. |
| bls.—Blood space. | ov.—Ovarian follicle. |
| bs.—Branchial siphon. | p.—Pericardial cavity. |
| c.—Cloacal chamber. | pa.—Posterior adductor muscle. |
| cg.—Cerebral ganglion. | pg.—Parieto-splanchnic ganglion. |
| cr.—Chitinous rods. | prp.—Post. retractor pedis muscle. |
| cs.—Cloacal siphon. | ps.—Post. adductor muscle scar. |
| f.—Foot. | psg.—Parieto-splanchnic ganglion. |
| fil.—Gill filament. | r.—Mantle ridge. |
| ifj.—Inter-filamentar junctions. | ro.—Reproductive organs. |
| ig.—Inner gill. | t.—Male follicle. |
| io.—Inhalent ostea. | vt.—Ventricle. |
| l.—Liver. | wt.—Water-tube. |

Genus MUSCULIUM Link 1807.



Fig. 228

Shell thin, suborbicular or oblong, smooth, shining, striae very fine and delicate; beaks calyculate; cardinal teeth minute, often obsolete.

Type: *Tellina lacustris* Müll.

Example: *M. jayanum* (Pme.), fig. 228. Animal, *M. truncatum* (Lins.), fig. 229.

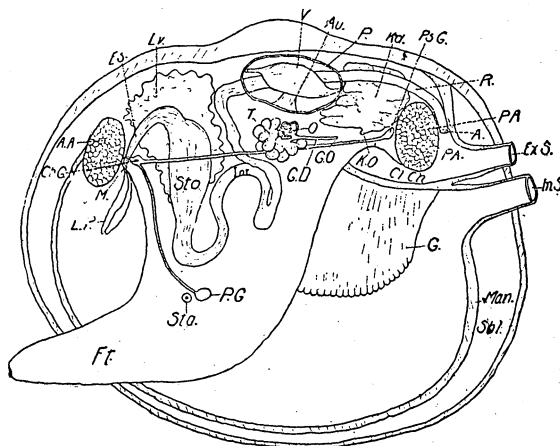


Fig. 229

- | | |
|-----------------------------------|----------------------------|
| M.—Mouth. | KO.—Kidney opening. |
| Lp.—Labial palps. | T.—Sperm follicles. |
| Es.—Oesophagus. | O.—Egg follicles. |
| Lv.—Liver. | GD.—Genital opening. |
| Sto.—Stomach. | AA.—Ant. adductor muscle. |
| Int.—Intestine. | PA.—Post. adductor muscle. |
| R.—Rectum. | Ft.—Foot. |
| A.—Anus. | ClCh.—Cloacal chamber. |
| CbG.—Cerebral ganglion. | ExS.—Excurrent siphon. |
| PsG.—Parieto-splanchnic ganglion. | InS.—Incurrent siphon. |
| PG.—Pedal ganglion. | G.—Gill. |
| Sta.—Statocyst. | Man.—Mantle. |
| V.—Ventricle. | Shl.—Shell. |
| Au.—Auricle. | Kd.—Kidney. |
| Pl.—Pericardium. | |

Genus EUPERA Bourguignat, 1854.



Fig. 230

Shell subrhomboidal. Moderately inflated, thin, with the posterior side longer; cardinal teeth feeble, one only, in each valve. Animal as in *Sphaerium*.

Type: *Pisidium moquinianum* Bgt.

Example: *E. singleyi* (Pils.), fig. 230.

Genus PISIDIUM C. Pfeiffer, 1821.



Fig. 231

Shell small, rounded, oval or obliquely cuneiform; inequilateral, anterior side longer; beaks terminal; cardinal teeth double in each valve, at times united, situated immediately under the beaks; laterals elongated, lamelliform, double in the right, single in the left valve; ligament on the shorter side, internal.

Animal with a single siphon, the excurrent orifice being merged with that of the foot.

Type: *Tellina amnica* Müll.

Example: *P. virginicum* (Gmel.), fig. 231.

Family CYRENELLIDÆ.

Shell rounded, inflated, thin, with a conspicuous epidermis; beaks forward; cardinal teeth two on the right and one on the left valve; no lateral teeth; pallial line not sinuate. Animal with two contractile siphons, elongated and united to their tips.

Genus CYRENELLA Deshayes, 1835.



Fig. 232

Shell as in the family, surface smooth or slightly concentrically sculptured.

Type: *Cyrenoidea dupontia* Joannis.

Example: *C. floridana* (Dall), fig. 232.

Family RANGIIDÆ.

Shell equivalve, covered with an epidermis, no internal nacre; beaks prominent, separated; hinge with two cardinal and anterior and posterior lateral teeth in each valve and an internal, central cavity for the ligament; pallial line sinuous. Mantle with two short siphons united at their bases and with papillose orifices; foot large, linguiform, compressed.

Genus RANGIA Desmoulins, 1832.

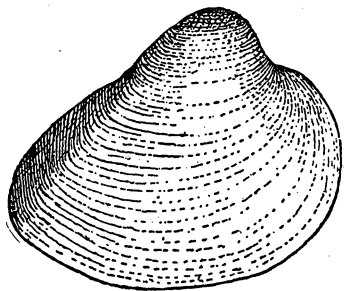
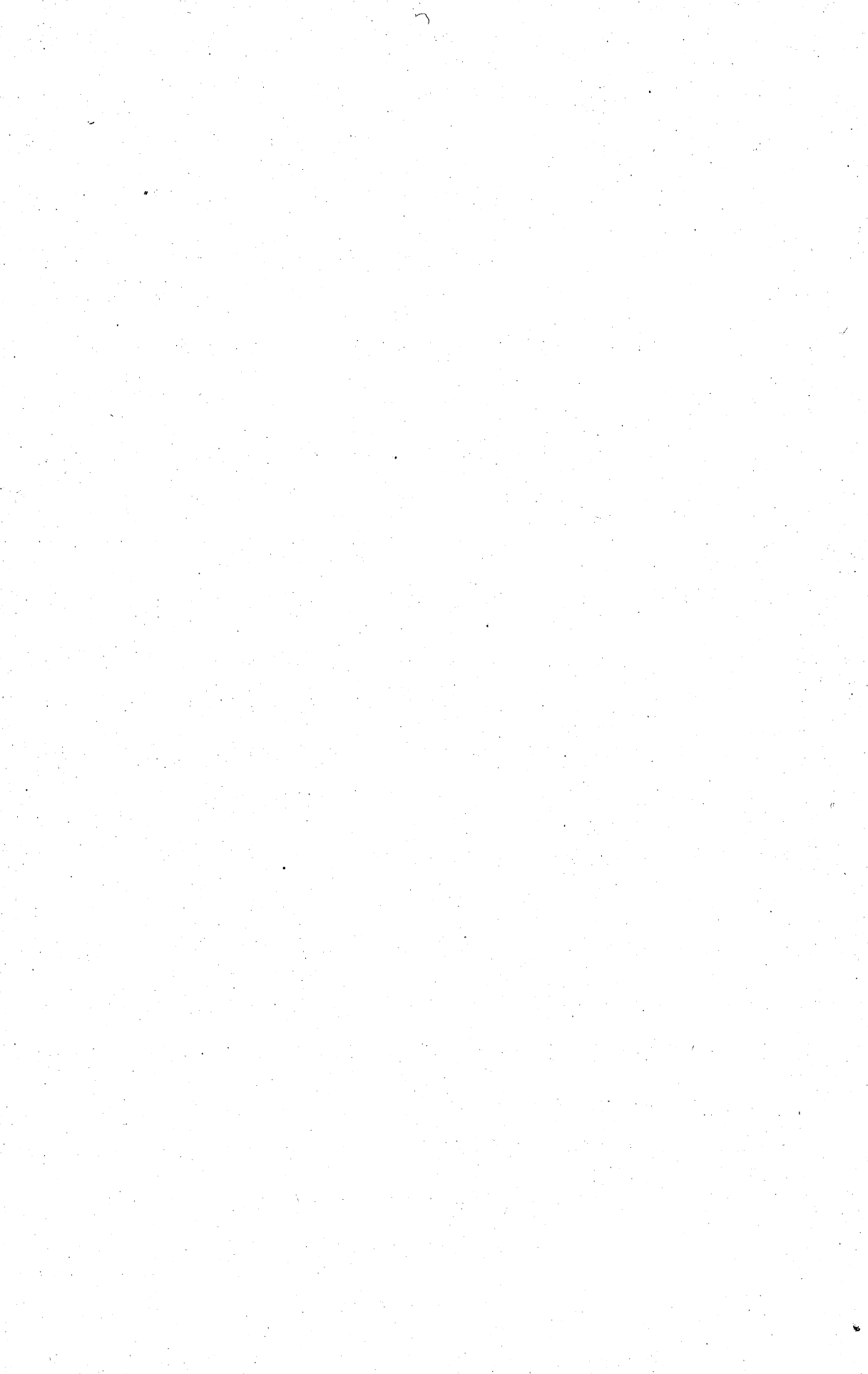


Fig. 233

Shell thick, oval, subtrigonal, ventricose, smooth, epidermis olive, beaks prominent, separated; ligament and resilium both enclosed in a single pit and invisible externally; laterals curved, cross-striated, more or less unequal, the posterior longer, anterior with the proximal end vertically hooked; pallial sinus small.

Type: *Gnathodon cuneatus* Gray, fig. 233.





UNIVERSITY OF MICHIGAN
MUSEUM OF ZOOLOGY

Miscellaneous Publications No. 6

A Synopsis of the Classification of the Fresh-
Water Mollusca of North America,
North of Mexico,

AND

A Catalogue of the More Recently
Described Species, With Notes

BY

BRYANT WALKER

PART II—CATALOGUE

ANN ARBOR, MICHIGAN
PUBLISHED BY THE UNIVERSITY
DECEMBER 30, 1918



A CATALOGUE OF THE MORE RECENTLY DESCRIBED
FRESH-WATER MOLLUSCA OF
NORTH AMERICA,
WITH NOTES

Subclass EUTHYNEURA.

Order PULMONATA.

Suborder BASOMMATOPHORA.

Superfamily LIMNOPHILA.

Family LYMNÆIDÆ.

Genus LYMNÆA Lamarck, 1788.

Baker's elaborate monograph of the *Lymnæidæ* of North America (No. 6) brings the subject down to 1911.

Simpsonia having been used by Rochebrune in 1904 for a group of Naiades, Baker (7, p. 120) has substituted *Pseudogalba* for his Lymnæid group. The synonymy will be as follows:

Simpsonia Baker, Chi. Acad. Sci., Sp. Pub. 3, 1911, p. 236. *Non* Rochebrune, 1904.

Pseudogalba Baker, Naut. XXVI, 1913, p. 120.

For a proposed revision of Baker's arrangement and key. see Colton (22, p. 116 and 23, p. 119) and reply by Baker (8, p. 20).

For the author's arrangement, see ante p. 6.

LYMNÆA APICINA Lea.

Although Lea's name *solida* for this species has page precedence as stated by Hannibal (53, p. 146), and has been preferred by Haldeman, Tryon and Binney, according to Kuster (Con. Cab., Lymnæus, p. 48) *solida* Phil. has priority and Lea's species must be known by the later name.

LYMNÆA AURICULARIA (L.).

This species seems to have become thoroughly acclimated and is extending its range in this country very rapidly. In addition to the localities cited by Baker (6, p. 182), it has been listed from Toledo, O., by Goodrich (47, p. 11); Lake Erie, Kingsville, Ont., by Allen (1, p. 60); Philadelphia, Pa., by Long (72, p. 27); Colorado Springs, Colo., by Henderson (55, p. 84); Charles River, Cambridge, Mass., by Clapp (19, p. 116) and Johnson (59, p. 83) and has more recently been found in the Detroit River at Belle Isle by Dr. H. B. Baker and at Gibraltar, Wayne Co., and La Plaisance Bay, Monroe Co., by Goodrich and at Harbor Beach, Huron Co., Mich., by Walter Koelz.

LYMNÆA COOPERI Hannibal.

Lymnæa Cooperi Hannibal, Proc. Mal. Soc. Lond., X, 1912, p. 143, pl. VI,
fig. 13a — c.

Type locality: Spring at Wright's, Santa Cruz Mountains, Cal.

LYMNÆA MONTANENSIS Baker.

Lymnæa montanensis Baker, Naut., XXVI, 1913, p. 115.

Type locality: Hayes' Creek, Ward, Montana.

Family PLANORBIDÆ.

Subfamily PLANORBINÆ H. and A. Adams, 1858.

Genus PLANORBIS Müller, 1774.

Dr. Dall (32, p. 80) has proposed the following arrangement of this genus:

Subgenus *Planorbis* s. s.

Type *Planorbis corneus* Müller.

Section *Planorbina* Haldeman.

Type *P. olivaceus* Spix.

Subgenus *Helisoma* Swainson.

Type *P. bicarinatus* (Say) Sowerby.

Section *Pierosoma* Dall.

Type *P. trivolvus* Say.

Section *Planorbella* Haldeman.

Type *P. campanulatus* Say.

Subgenus *Tropidiscus* Stein.

Type *P. umbilicatus* Müller.

Subgenus *Hippeutis* Agassiz.

Type *P. fontanus* Lightfoot.

Section *Menetus* H. and A. Adams.

Type *P. opercularis* Gould.

Subgenus *Gyraulus* Agassiz.

Type *P. albus* Müller.

Section *Torquis* Dall.

Type *P. parvus* Say.

Section *Armiger* Hartmann.

Type *P. crista* L.

For a criticism of Dall's arrangement, see Kennard (64, p. 47) and reply by Dall (33, p. 141).

Brown and Pilsbry have proposed (15, p. 212) a new section, *Tropicorbis*, type *P. liebmanni* Dkr., but without any definition.

PLANORBIS ALABAMENSIS Pilsbry.

Planorbis alabamensis Pilsbry, Naut., VIII, 1895, p. 114.

Type locality: Woodville, Ala.

Dall (32, p. 92) considers this a local race of *dilatatus* Gld., but it seems sufficiently distinct.

PLANORBIS ALABAMENSIS AVUS Pilsbry.

Planorbis alabamensis avus Pilsbry, Naut., XIX, 1905, p. 34.

Type locality: Caloosahatchee Pliocene, Fla. Also from the marl at Lake Panasoffkee, Fla.

PLANORBIS ANTROSUS Conrad.

Vanatta has shown (138, p. 138) that as the earliest available name this must take precedence over the familiar *P. bicarinatus* Say, non Lamarck, 1804.

Conrad's type has disappeared and until topotypes can be obtained, the uncertainty as to whether Conrad's species is typical *bicarinatus* Say or equivalent to var. *angistomus* Hald. prevents the proper re-arrangement of the forms.

According to Vanatta (l. c.) *P. bicarinatus major* and *bicarinatus minor* c. Beck (Index. Moll., 1837, p. 118) are synonyms of the typical form.

Planorbis biangulatus Say., Con. Icon., Planorbis, 1877, Sp. 25, pl. IV, fig. 25, said to be from Brazil is apparently this species.

PLANORBIS ANTROSUS ANGISTOMUS Haldeman.

Planorbis bicarinatus angistomus Haldeman, Mon., 1844, p. 7; Walker, Naut., 1909, XXIII, p. 4, pl. II, fig. 4-5.

Type locality not given.

PLANORBIS ANTROSUS AROOSTOOKENSIS Pilsbry.

Planorbis bicarinatus aroostookensis Pilsbry, Naut., VIII, 1895, p. 115; Walker, Naut., 1909, XXIII, p. 7, pl. I, fig. 1 & 3.

Type locality: Salmon Brook, Woodland, Aroostook Co., Me.

PLANORBIS ANTROSUS CORRUGATUS Currier.

Planorbis bicarinatus corrugatus Currier MSS, DeCamp, Kent Sci. Inst. Misc. Pub., 1868, p. 8; Walker, Naut., XXIII, 1909, p. 5, pl. I, fig. 10.

Type locality: Perch Lake, Kent Co., Mich.

PLANORBIS ANTROSUS PERCARINATUS Walker.

Planorbis bicarinatus major Walker, Naut., VI, 1893, p. 136.

Planorbis bicarinatus percarinatus Walker, Naut., XXIII, 1909, p. 6, pl. I, fig. 12.

Type locality: Crystal Lake, Benzie Co., Mich.

PLANORBIS ANTROSUS PORTAGENSIS Baker.

Planorbis bicarinatus portagensis Baker, Naut., XXII, 1908, p. 45; Walker, Naut., 1909, XXIII, p. 8, pl. I, fig. 9.

Type locality: Portage Lake, Aroostook Co., Me.

PLANORBIS ANTROSUS ROYALENSIS Walker.

Planorbis bicarinatus royalensis Walker, Naut., XXIII, 1909, p. 9, pl. I, fig. 11.

Type locality: Siskowit Lake, Isle Royale, Mich.

PLANORBIS ANTROSUS STRIATUS Baker.

Planorbis bicarinatus striatus Baker, Naut., XV, 1902, p. 120; Tr. Acad. Sci. St. Louis, 1906, XVI, p. 9, pl. I, fig. 11.

Type locality: Coldspring Park, Milwaukee, Wis. Also recent.

See Walker 151a, p. 7.

PLANORBIS ANTROSUS UNICARINATUS Haldeman.

Planorbis bicarinatus unicarinatus Haldeman, Mon., 1844, p. 7; Walker, Naut., XXIII, 1909, p. 3, pl. I, fig. 6-8.

Type locality: Schuylkill River, Pa.

PLANORBIS ARCTICUS Möller.

Planorbis arcticus Möller, Index Moll. Grönl., 1842, p. 5; Morch, Am. J. of Con., 1868, IV, p. 32, pl. 4, fig. 9.

Type locality: Kudsuk, Greenland. Also Fort Chimo, Ungava, Labrador.

PLANORBIS ARIZONENSIS Pilsbry and Ferriss.

Planorbis flocinctus Pilsbry and Ferriss, Pr. A. N. S. P., 1906, p. 165, pl. IX, figs. 1-3, not of Sandberger.

Planorbis arizonensis Pilsbry and Ferriss, Pr. A. N. S. P., 1915, p. 390.

Type locality: San Pedro River, Benson, Ariz.

PLANORBIS BILLINGSI Lea.

Planorbis billingsi Lea, Pr. A. N. S. P., 1864, p. 111; Jour. A. N. S. P., 1866, VI, p. 15, pl. 23, fig. 72; Obs., 1866, XI, p. 115, pl. 23, fig. 72.

Type locality: Ottawa River, Canada. See *parvus*.

PLANORBIS CALLIOGLYPTUS Vanatta.

Planorbis callioglyptus Vanatta, Naut., IX, 1895, p. 54.

Type locality: Freeport, Wash.

Is *opercularis planulatus* Cooper according to Dall (32, p. 92).

PLANORBIS CAMPANULATUS MINOR Dunker.

Planorbis campanulatus minor Dunker, Con. Cab., 1850, Limnæiden, p. 52,
pl. 9, fig. 10.

Type locality not given.

PLANORBIS CAMPANULATUS RUDENTIS Dall.

Planorbis campanulatus rudentis Dall, Rep. Harriman Exp., 1905, XIII,
p. 90.

Type locality: Knee Lake, Keewatin, Canada.

The citations of *P. multivolvis* from Newfoundland by Farrar (37, p. 36), and from Michigan by Walker, prior to 1907, refer to this form and not to Case's species.

PLANORBIS CAMPANULATUS SMITHII Baker.

Planorbis campanulatus smithii Baker, Naut., XXV, 1912, p. 118.

Type locality: Douglas Lake, Cheboygan Co., Mich.

PLANORBIS CARIBÆUS d'Orbigny.

This name has priority for the species commonly known as *tumidus* Pfr.

PLANORBIS CARUS Pilsbry and Ferriss.

Planorbis carus Pilsbry and Ferriss, Pr. A. N. S. P., 1906, p. 164, pl. IX,
figs. 4-5.

Type locality: Canyon of the Pecos River, above High Bridge, Val Verde
Co., Texas.

PLANORBIS CENTERVILLENSIS Tryon.

Planorbis centervilleensis Tryon, Mon., 1870, p. 210, pl. 7, fig. 7-9.

Type locality: Centerville, Cal.

Is a form of *opercularis* according to Dall (32, p. 92).

PLANORBIS CIRCUMSTRIATUS Tryon.

Planorbis circumstriatus Tryon, Am. J. of Con., II, 1866, p. 113, pl. 10,
figs. 6-8.

Type locality: Weatogue, Conn.

As identified by Sterki, this species is certainly distinct from *P. parvus* Say. It ranges from Connecticut to Colorado.

PLANORBIS COARCTATUS Sowerby.

Planorbis coarctatus Sowerby, Con. Icon., Planorbis, 1876, Sp. 21, pl. 3,
fig. 21 a-b.

Type locality: ?

This is apparently an immature *campanulatus*.

PLANORBIS COMMUTATUS "Dunker" Sowerby.

Planorbis commutatus Sowerby, Con. Icon., Planorbis, 1876, Sp. 63, pl. 8, fig. 63.

Type locality: North America.

PLANORBIS CORPULENTUS Say.

Is a valid species. See Walker 144, p. 133. The citation of this species from Florida or South Carolina by Melvill (74, p. 167) is no doubt erroneous. Sowerby's figures of this species in the Conchologia Iconica are *binneyi* Tryon.

PLANORBIS CRISTA L.

Planorbis nautilus, Walker, Naut., 1897, X, p. 117; Hanham, Naut., 1897, X, 130; Taylor, Naut., 1897, X, p. 139.

Planorbis costatus DeTarr and Beecher, Leaflet, Albany, 1878; Baker, Naut., 1906, XIX, p. 120.

Range: Maine, west to Alberta and Illinois.

PLANORBIS CULTRATUS Orbigny.

Planorbis cultratus Orbigny, Hist. Cuba Moll., 1853, (Fr. ed.) I, p. 196, pl. 14, figs. 5-8; Pilsbry, Naut., 1889, III, p. 63, pl. I, fig. 1-3.

Type locality: Cuba?

Listed from Miami, Fla., by Rhoads (113, p. 48) and by Pilsbry from Hidalgo, Tex. (88, p. 63) and by Pilsbry and Ferriss from Devil's River, Val Verde Co., Tex. (106, p. 165).

PLANORBIS DECLIVIS Sowerby.

Planorbis declivis Sowerby, Con. Icon., Planorbis, 1876, Sp. 28, pl. 4, fig. 29.

Type locality: ?

Von Martens (73, p. 397) thinks that this is probably a form of *trivolvus*. The name is pre-occupied by Tate (1870), for a species from Nicaragua.

PLANORBIS DEFLECTUS Say.

Planorbis deflexus Sowerby, Con. Icon., Planorbis, 1876, Sp. 88, pl. XI, fig. 88.

Dall (32, p. 94) considers this doubtfully distinct from *hirsutus* and apparently identical with the European form known as *draparnaudi* or *draparnaldi* Shepp.

PLANORBIS DILATATUS Gould.

Includes *buchanensis* Lea according to Tryon (132, p. 209); *virens* and *elevatus* according to Vanatta (136, p. 55); and *lens*, *alabamensis* and *buchanensis* according to Dall (32, p. 92).

PLANORBIS DILATATUS PENNSYLVANICUS Pilsbry.

Planorbis dilatatus pennsylvanicus Pilsbry, Naut., XXX, 1916, p. 96.
Type locality: Glenolden, Delaware Co., Pa.

PLANORBIS DURYI Wetherby.

Planorbis duryi Wetherby, Jour. Cin. Soc. Nat. Hist., 1879, p. 7, fig. 4.
Type locality: Everglades, Fla. Types No. 9712 Coll. Walker.

PLANORBIS DURYI INTERCALARIS Pilsbry.

Planorbis duryi intercalaris Pilsbry, Amer. Nat., 1887, XXI, p. 287.
Planorbis intercalaris Rhoads, Naut., 1899, XIII, p. 47.
Type locality: Florida.

PLANORBIS EUCOSMIUS Bartsch.

Planorbis eucosmius Bartsch, Pr. U. S. Nat. Mus., 1908, XXXIII, p. 699,
pl. 57, figs. 1-3.
Type locality: Greenfield Pond, Wilmington, N. C.

PLANORBIS EUCOSMIUS VAUGHANI Bartsch.

Planorbis eucosmius vaughani Bartsch, Pr. U. S. Nat. Mus., XXXIII, 1908,
p. 699, pl. 57, figs. 4-6.
Type locality; Burkes Place, La.

PLANORBIS EXACUOUS Say.

Commonly known as *exacutus* Say, but Dall (32, p. 91) restores the name as originally used by Say. Henderson and Daniels (56, p. 56), after careful consideration, have done likewise. It includes *buchanensis* Lea according to Vanatta (*vide* Simpson) (136, p. 54).

PLANORBIS EXACUOUS MEGAS Dall.

Planorbis exacuous megas Dall, Rep. Harriman Exp., XIII, 1905, p. 91.
Type locality: Birtle, Manitoba.

PLANORBIS GLABRATUS Say.

Haldeman's and Birney's figures do not represent this species, which is entirely distinct from *trivolvus*. It is not uncommon in Florida and in the United States does not range outside of that state, (Pilsbry, 91, p. 321). Dall (32, p. 86) includes *lentus*, which was described from New Orleans, but this does not accord with Fischer and Crosse's (38, p. 65) identification of Say's type. The true *glabratus* belongs to section *Planorbina* and not to *Pierosoma*.

PLANORBIS GRACILENTUS Gould.

Tryon (132, p. 192) and Fischer and Crosse (38, p. 72) consider this distinct from *liebmanni*, to which it is referred by Binney.

PLANORBIS HAVANENSIS Pfeiffer.

Listed from New Orleans, La., as a *Segmentina* by Pilsbry (85, p. 20) and Hinkley (58, p. 36).

PLANORBIS HIRSUTUS Gould.

Is considered distinct from *albus* Müll. by Vanatta (136, p. 55). Dall (32, p. 94) refers it to the so-called *albus* Müll., but in view of the uncertainty as to the proper name to be used for that species, retains Gould's name. Kennard (64, p. 49) considers the American and European species as distinct.

PLANORBIS HIRSUTUS BOREALIS Westerlund.

Planorbis borealis Westerlund, Mal. Bl., XXII, 1875, p. 77.

Type locality: Port Clarence, Alaska; Northern Sweden.

Stated by Dall (32, p. 94) to be "merely a somewhat delicately sculptured mutation."

PLANORBIS HORNI Tryon.

Planorbis horni Tryon, Am. J. of Con., I, 1865, p. 231, pl. 22, fig. 16.

Type locality: Fort Simpson, British America.

Listed as a var. of *trivolvis* by Pilsbry (95, p. 65). Dall (32, p. 89) states that there is a doubt as to whether the types came from Fort Simpson on the Mackenzie River, or Fort Simpson, British Columbia, but that the figure looks more like the Pacific variety (*subcrenatus*), which he refers to *trivolvis*.

PLANORBIS INTERTEXTUS Sowerby.

Planorbis intertextus Sowerby, Con. Icon., Planorbis, 1876, Sp. 123, pl. 14, fig. 123a-b.

Type locality: Florida.

Through the courtesy of Mr. E. A. Smith of the British Museum I have been able to examine one of the cotypes of this species. Both the description and the figure given by Sowerby are quite erroneous and very misleading. It has no resemblance whatever to *antrosus*, but is undoubtedly a young shell of one of the many southern mutations of *trivolvis*.

PLANORBIS JENKSII Carpenter.

Planorbis jenksii Carpenter, Central Falls (R. I.) Visitor, Mar. 2, 1871;

Con. Ex., II, 1887, p. 2.

Type locality: Pawtucket, R. I.

PLANORBIS LENTUS Say.

Fischer and Crosse (38, p. 65) restrict this species to the New Orleans form described by Say and do not consider that the figures given by Gould, Haldeman, Dunker and others represent the species. Dall (32, p. 86) refers it to *glabratus*.

PLANORBIS LIEBMANNI Dunker.

Is referred to *orbiculus* by Fischer and Crosse (38, p. 71), but is stated by Pilsbry (91, p. 322) to be distinct. It is the type of section *Tropicorbis* Brown and Pilsbry.

PLANORBIS MAGNIFICUS Pilsbry.

Planorbis magnificus Pilsbry, Naut., 1903, XVII, p. 75; Bartsch, Pr. U. S. Nat. Mus., XXXIII, 1908, p. 697, pl. 57, figs. 7-9.
Type locality: Cape Fear River, Wilmington, N. C.

PLANORBIS MULTIVOLVIS Case.

Is a valid species and has been rediscovered at Howe Lake, Marquette Co., Mich. See Walker, 149, p. 61. Earlier citations of this species from Michigan, except the original one, and Newfoundland refer to *P. campanulatus rudentis*.

PLANORBIS NATHORSTI Westerlund.

Planorbis nathorsti Westerlund, Vega Exp., IV, 1887, p. 168.
Type locality: Aulatsivik, West Greenland.

PLANORBIS OCCIDENTALIS Cooper.

Planorbis occidentalis Cooper, Pr. Cal. Acad. Sci., IV, 1870, p. 99.
Type locality: Not given. Range: Washington Terr. to San José, Cal.
See *trivolvus*. Is the mature form of *tumens* according to Cooper (26, p. 89).

PLANORBIS OPERCULARIS Gould.

Planorbis lenticularis Sowerby, Con. Icon., Planorbis, 1876, Sp. 110, pl. 13, fig. 110.
Includes *planulatus* Cooper, *centervillensis* Tryon and *multilineatus* Van. (*oregonensis* Van.) as varieties according to Dall (32, p. 92), with *callio-glyptus* Van. as a synonym of *planulatus*.

PLANORBIS OPERCULARIS MULTILINEATUS Vanatta.

Planorbis opercularis oregonensis Vanatta, Naut., IX, 1895, p. 54; non Tryon, 1865.
Planorbis opercularis multilineatus Vanatta, Naut., XIII, 1899, p. 48.
Type locality: Salem and Portland, Oregon.

PLANORBIS ORBICULUS Morelet.

Planorbis orbiculus Morelet, Test. Noviss., 1849, I, p. 17.

Includes *haldemani* Dunker (1850) *non haldemani* C. B. Adams (1849). Fischer and Crosse also include *liebmanni*, but Pilsbry (l. c.) considers it to be distinct.

PLANORBIS OREGONENSIS Tryon.

Planorbis oregonensis Tryon, Am. J. of Con., I, 1865, p. 231, pl. 22, fig. 17.
Type locality: Pueblo Valley, Oregon. See *trivoltis*.

PLANORBIS PARVUS Say.

Includes *billingsii* Lea according to Vanatta (136, p. 54) and Dall (32, p. 95) and *circumstriatus* Tryon according to Vanatta (l. c.).

PLANORBIS PARVUS WALKERI Vanatta.

Planorbis parvus walkeri Vanatta, Naut., XVI, 1902, p. 58.
Type locality: Hartland, Vt. Also Michigan.

PLANORBIS PERFORATUS "Gould?" Sowerby.

Planorbis perforatus Sowerby, Con. Icon., Planorbis, 1876, Sp. 105, pl. 13, fig. 105.

Type locality: United States.

Gould never described a *Planorbis* under this name. Clessin (20, p. 227) suggests that the species is perhaps from East Asia.

PLANORBIS PLANULATUS Cooper.

Is doubtfully referred to *P. opercularis* Gld. as a variety by Cooper (25, p. 100).

PLANORBIS PLEXATA Ingersoll.

Planorbis plexata Ingersoll, U. S. Geol. & Geog. Surv. Terr., 1874, p. 402, text-fig.

Type locality: St. Mary's Lake, Antelope Co., Col.

Is a var. of *trivoltis* according to Stearns (121, p. 105) and Cooper (26, p. 85).

PLANORBIS RUBELLUS Sterki.

Planorbis harni Pilsbry, Naut., IV, 1891, p. 137, *sine desc.*

Planorbis exacutus rubellus Sterki, L. and F. W. Moll., New Phila., 1894, p. 7.

Planorbis rubellus, Pilsbry, Naut., XIII, 1899, p. 51.

Type locality: Stone Creek Valley, Odbert's Station, O.

PLANORBIS SAMPSONI Ancey.

Planorbis sampsoni Ancey in Sampson, Bull. Sedalia N. H. Soc., No. 1, 1885, p. 10, text-fig.

Type locality: Flat Creek, Sedalia, Mo.

PLANORBIS SCALARIS (Jay).

Paludina scalaris Jay, Cat., 3rd ed., 1839, p. 112, pl. 1, figs. 8-9.

Physa scalaris Haldeman, Mon., 1842, p. 34, pl. IV, fig. 9; W. G. Binney, L. and F. W. Shells, Pt. II, 1865, p. 96, fig. 164.

Ameria scalaris Tryon, Mon., 1870, p. 168; Dall, Ann. N. Y. Lyc. N. H., IX, 1870, p. 356; Naut., III, 1889, p. 8.

Planorbis scalaris Pilsbry, Con. Ex., II, 1888, p. 113.

Physa (Thomsonia) carinifera Ancey, Le Nat., 1886, p. 358.

Type locality: Everglades of Florida.

Pilsbry (86, p. 287) states that this species is a *Planorbis*.

PLANORBIS SINUOSUS Bonnet.

Planorbis sinuosus Bonnet, Rev. & Mag. Zool., 1864, p. 280, pl. XXII, fig. 3.

Type locality: New Mexico.

Is referred to *glabratus* Say by Tryon (129, p. 183). Fischer and Crosse (38, p. 67) question this approximation, but as their opinion is based on Binney's figure (11, fig. 179), which does not represent Say's species, it is not of much value. However as *glabratus* is not known to occur outside of Florida, Tryon's suggestion is wrong anyway. Dr. Pilsbry informs me that it is *P. tumidus* Pfr.

PLANORBIS SUBCRENATUS DISJECTUS Cooper.

Planorbis subcrenatus disjectus Cooper, Pr. Cal. Acad. Sci., (2) III, 1890, p. 84, pl. 1, fig. 30.

Type locality: Tuolumne Meadows, Cal.

PLANORBIS TENUIS Phil.

Listed from the drift of the Santa Cruz River, Tucson, Ariz., by Pilsbry and Ferriss (109, p. 400).

PLANORBIS TRASKII Lea.

Planorbis traskii Lea, Jour. A. N. S. P., VI, 1866, p. 157, pl. XXIII, fig. 70; Obs., XI, 1866, p. 113, pl. XXIII, fig. 70.

Type locality: Kern Lake, Cal.

Dall (32, p. 88) considers this specifically distinct from *P. ammon*.

PLANORBIS TRIVOLVIS Say.

Includes *subcrenatus* Cpr., with *oregonensis* Tryon, *occidentalis* Cooper, and *tumens* Cooper, *non* Cpr., as synonyms and probably *hornii* Tryon according to Dall (32, p. 89). Pilsbry also (95, p. 65) lists *hornii* as a variety.

PLANORBIS TRIVOLVUS BINNEYI Tryon.

Planorbis corpulentus Gould, U. S. Expl. Exp., 1852, p. 114, fig. 130; Haldeman, Mon., 1844, p. 19, pl. III, figs. 7-9; W. G. Binney, L. & F. W. Shells, pt. II, 1865, p. 114, figs. 191-2; Sowerby, Con. Icon., 1877, Sp. 4, pl. I, fig. 4; pl. X, fig. 4b.

Planorbis binneyi Tryon, Am. J. of Con., III, 1867, p. 197.

Type locality: West Coast.

PLANORBIS UMBILICATELLUS Cockerell.

Planorbis umbilicatus Taylor, J. of Con., IV, 1885, p. 351, text-fig. *non* Müller (1774).

Planorbis umbilicatellus Cockerell, Con. Ex., 1885, II, p. 68.

Type locality: Brandon and Birtle, Manitoba. Ranges from New York to South Dakota. See also Vanatta (137, p. 117).

PLANORBIS VERMICULARIS Gould.

Is referred to *parvus* by Vanatta (136, p. 55), but is considered distinct by Dall (32, p. 95).

Genus SEGMENTINA Fleming, 1817.

Subgenus PLANORBULA Haldeman, 1842.

SEGMENTINA ARMIGERA (Say).

Dr. Pilsbry informs me that he has seen the type of *Planorbis lautus* H. Ads. and that it is a young specimen of this species.

SEGMENTINA ARMIGERA CAMPESTRIS Dawson.

Segmentina armigera campestris Dawson, Rep. Brit. N. A. Boundary Com., 1875, p. 349.

Type locality: Red River Valley, Canada.

SEGMENTINA CHRISTYI Dall.

Segmentina christyi Dall, Rep. Harriman Exp. XIII, 1905, p. 99, pl. 11, figs. 10-11.

Type locality: High Bluff, Manitoba; Fort Smith, Mackenzie River. Reported from South Dakota by Walker (151, p. 11).

SEGMENTINA CRASSILABRIS Walker.

Segmentina crassilabris Walker, Naut., XX, 1907, p. 122, pl. 7, figs. 4-6.

Type locality: Hamtramck, Wayne Co., Mich.

SEGMENTINA DECLIVIS (Tate).

Planorbis declivis Tate, Am. J. of Con., V, 1869, p. 159.

Type locality: San Augustin, Acoyapa, Nicaragua.

Cited by Dall (32, p. 98) from Umpqua River, Oregon.

Hannibal (53, p. 158) states that it has not been found by any of the local collectors in that region and questions the authenticity of the locality of Dall's specimens.

SEGMENTINA OBSTRUCTA (Morelet).

Planorbis obstructus Morelet, Test. Noviss. I, 1849, p. 17.

Planorbis berendti Tryon, Am. J. of Con., II, 1866, p. 10, pl. 2, figs. 14-16.

Type locality: Carmen Island, Yucatan.

"Occurs abundantly in Texas as far north as Austin." (Pilsbry 91, p. 322. See also Pilsbry and Ferris, 106, p. 166.) In the absence of a figure of this species in any American publication, I have quoted that of *berendti* Tryon from Mexico, which is considered a synonym by Fischer and Crosse (38, p. 78) and von Martens (73, p. 398).

SEGMENTINA WHEATLEYI (Lea).

Planorbis wheatleyi Lea, Jour. A. N. S. P. VI, 1866, p. 158, pl. 23, fig. 71;

Obs. XI, 1866, p. 113, pl. 23, fig. 71.

Segmentina wheatleyi Walker, Naut. XX, 1907, p. 123, pl. VII, figs. 7-9.

Dall (32, p. 97) has proposed a new section, *Haldemanina*, for this species, based on the "complex, dentiform and ridgelike" lamellæ, but these differ from those of the other species (*armigera* and *crassilabris*) only in degree. See Pilsbry and Ferriss (106, p. 166) and Walker (l. c.).

Subfamily POMPHOLIGINÆ Dall, 1866.

Genus POMPHOLYX Lea, 1856.

POMPHOLYX LEANA H. and A. Adams.

Pompholyx leana H. and A. Adams, Pr. Zool. Soc. London, 1863, p. 434.

Type locality: West Columbia.

POMPHOLYX SOLIDA Dall.

Pompholyx var. *solida* Dall, Ann. N. Y. Lyc. Nat. Hist., IX, 1870, p. 335, pl. II, fig. 7a.

Type locality: West Columbia.

Dall states that his species is clearly not *effusa* Lea, but that in the absence of typical specimens of *P. leana* H. and A. Adams described from West Columbia, it still remains doubtful whether it belongs to the latter species.

Genus CARINIFEX W. G. Binney, 1863.

Megastropha Lea, 1866

CARINIFEX NEWBERRYI MINOR Cooper.

Carinifex newberryi var. ? *minor* Cooper, Pr. Cal. Acad. Sci., IV, 1870, p. 98.
Type locality not stated.

CARINIFEX PONSONBYI E. A. Smith.

Carinifex ponsonbyi E. A. Smith, P. Z. S. Lond., 1875, p. 536, text-fig.
Planorbis ponsonbyi Sowerby, Con. Icon., Planorbis 1876, Sp. 80, pl. X,
figs. 80a-b.

Type locality: California.

Call (16, p. 149) states that the figure in the P. Z. S. is interchanged with that of *Diala leithii* described at the same time.

Family PHYSIDÆ.

Genus PHYSA Draparnaud.

Dall (32, p. 100) has proposed the following arrangement:

Section PHYSA s. s.

Type *P. fontinalis* L.

Section COSTATELLA Dall.

Type *P. costata* Newcomb.

For an excellent revision of the Eastern American species, see Crandall, No. 27.

Von Martens (73, p. 368) has proposed the subgenus *Alampetis* for the North American and Mexican species with a dull, not glossy, surface and (often) thickened lip. He gives no type, but mentions *P. ancillaria* as an example.

PHYSA ALBOFILATA Ancy.

Physa albofilata Ancy, in Sampson, Rep. Geol. Surv. Ark., II, 1891, p. 194.
Type locality: West Leatherwood Creek, Eureka Springs, Carroll Co., Ark.
See *gyrina*.

PHYSA ALTONENSIS Lea.

Physa altonensis Lea, Pr. A. N. S. P., 1864, p. 114; Jour. A. N. S. P., VI,
1866, p. 164, pl. 24, fig. 82; Obs., XI, 1866, p. 120, pl. 24, fig. 82.

Type locality: Alton, Ills.

Is *elliptica* according to Tryon (132, p. 163) and an abnormal *gyrina* according to Crandall (27, p. 71).

PHYSA AMPULLACEA Gould.

Includes *P. lordi* Bd., *propinqua* Try. and *coniformis* Try. as varieties according to Cooper (25, p. 98).

According to Henderson and Daniels (56, p. 52) it is possible that Lea's *P. nuttalli* may be this species. If so it would have priority.

PHYSA AMPULLACEA COLUMBIANA Hemphill.

Physa ampullacea columbiana Hemphill, Naut., IV, 1890, p. 27.

Type locality: Columbia River, Astoria, Oregon.

PHYSA AMYGDALUS Sowerby.

Physa amygdalus Sowerby, Con. Icon., Physa, 1873, Sp. 65, pl. 8, fig. 65.

Type locality: Texas.

PHYSA ANATINA Lea.

Physa anatina Lea, Pr. A. N. S. P., 1864, p. 115; Jour. A. N. S. P., VI, 1866, p. 171, pl. 24, fig. 94; Obs., XI, 1866, p. 127, pl. 24, fig. 94.

Type locality: Northern tributary of the Arkansas River, Kans.

PHYSA ANCILLARIA Say.

According to von Martens (73, p. 374) *Physa subarata* Mke. belongs to this species and not to *P. heterostropha* Say as supposed by Binney and is represented by fig. 1, pl. III of Haldeman's Monograph.

PHYSA ANCILLARIA CRASSA Walker.

Physa ancillaria crassa Walker, Naut., XIV, 1901, p. 98.

Type locality: Higgins Lake, Roscommon Co., Mich.

Types No. 1471 Coll. Walker.

PHYSA ANCILLARIA MAGNALACUSTRIS Walker.

Physa ancillaria magnalacustris Walker, Naut., XIV, 1901, p. 97.

Type locality: Frankfort, Benzie Co., Mich.

Types No. 9214 Coll. Walker.

PHYSA APLECTOIDES Sterki.

Physa aplectoides Sterki, Pr. O. St. Acad. Sci., IV, 1907, p. 381.

Type locality: Portage and Tuscarawas Co's., O. Also Isle Royale and Schoolcraft County, Michigan.

PHYSA AUREA Lea.

Is a synonym of *elliptica* and not of *heterostropha* according to Tryon (132, p. 163) and Crandall (27, p. 55).

PHYSA BILLINGSII Heron.

Physsa billingsii Heron, Tr. Ott. F. Nat. Club, I, 1880, p. 62, pl. 2, fig. 5.

Type locality: Billings' Bridge, Ottawa, Ont.

Is a var. of *integra* according to Crandall (27, p. 15).

PHYSA BINNEYANA Ancey.

Physsa diaphana Tryon, Am. J. of Con. I, 1865, p. 224, pl. 23, fig. 11, *non* Krauss (1848).

Physsa binneyana Ancey, Le Nat., 1886, p. 358.

Type locality: Oakland, Cal.

PHYSA BLANDI Lea.

Physsa blandi Lea, Pr. A. N. S. P., 1864, p. 116; Jour. A. N. S. P., VI, 1866, p. 168, pl. 24, fig. 88; Obs., XI, 1866, p. 124, pl. 24, fig. 88.

Type locality: California.

Includes *distinguenda* Try. and "?" is the same as *grosvernori* Lea and *nuttallii* Lea according to Cooper (25, p. 97). Both of the latter names have priority.

PHYSA BREVISPIRA Lea.

Physsa brevispira Lea, Pr. A. N. S. P., 1864, p. 116; Jour. A. N. S. P., VI, 1866, p. 173, pl. 24, fig. 98; Obs., XI, 1866, p. 129, pl. 24, fig. 98.

Type locality: Ottawa River, Ont.

PHYSA CARLTONII Lea.

Physsa carltonii Lea, Pr. A. N. S. P., 1869, p. 125; Jour. A. N. S. P., VIII, 1874, p. 63, pl. 21, fig. 19; Obs., XIII, 1874, p. 67, pl. 21, fig. 19.

Type locality: Mount Diablo, Cal.

PHYSA CONIFORMIS Tryon.

Physsa coniformis Tryon, Am. J. of Con., II, 1866, p. 6, pl. II, fig. 5.

Type locality: Humboldt River, Oregon.

PHYSA COOPERI Tryon.

Physsa cooperi Tryon, Am. J. of Con., I, 1865, p. 224, pl. 23, fig. 9.

Type locality: Crane Lake Valley, Cal.

Is a variety of *P. triticea* Lea according to Cooper (25, p. 97).

PHYSA CRANDALLI Baker.

Physa rhomboidea Crandall, Naut., XV, 1901, p. 44, pl. II, figs. 6-7; *non* Meek and Hayden (1856).

Physa crandalli Baker, Tr. Acad. St. Louis, XVI, 1906, p. 8.

Type locality: Cedar and Muddy Creeks, Sedalia, Mo. Also Dardenelles and Sulphur Springs, Ark., and Las Vegas, N. M.

Type No. 40775 Coll. Walker.

According to Springer (120, p. 513) is a synonym of *P. humerosa*.

PHYSA CROCATA Lea.

Physa crocata Lea, Pr. A. N. S. P., 1864, p. 114; Jour. A. N. S. P., VI, 1866, p. 169, pl. 24, fig. 90; Obs., XI, 1866, p. 125, pl. 24, fig. 90.

Type locality: Lafayette, Walker Co., Ga.

Is closely allied to *microstoma* Hald. according to Crandall (27, p. 70).

PHYSA CUPREONITENS Cockerell.

Physa cupreonitens Cockerell, J. of Con., VI, 1889, p. 63.

Type locality: Hot Spring, Wellsville, Colo.

Though described as a distinct species, in the text it is called a subspecies of *heterostropha*.

PHYSA CUBENSIS Pfeiffer.

Physa cubensis Pfeiffer, Wieg. Archiv., I, 1839, p. 354.

Physa heterostropha peninsulae Pilsbry, Naut., XIII, 1899, p. 48; *ibid*, XIII, 1899, p. 70.

Type locality: Cuba. Also Miami and elsewhere in Florida. See Rhoads (113, p. 48).

PHYSA DEFORMIS Currier.

Physa deformis Currier, Am. J. of Con., III, 1867, p. 112, pl. 6, fig. 1.

Type locality: Grand Rapids, Mich.

Is *elliptica* Lea according to Crandall (27, p. 54).

PHYSA DISTINGUENDA Tryon.

Physa distinguenda Tryon, Am. J. of Con., I, 1865, p. 225, pl. 23, fig. 6.

Type locality: Marysville and Stockton, Cal.

PHYSA DORBIGNYANA Lea.

Physa striata Lea, Pr. A. N. S. P. 1864, p. 115, *non* d'Orbigny (1853), *nec* Menke (1830).

Physa dorbignyana Lea, Jour. A. N. S. P., VI, 1866, p. 166, pl. 24, fig. 85; Obs., XI, 1866, p. 123, pl. 24, fig. 85.

Type locality: Monterey, Cal.

Is a synonym of *P. virgata* Gld. according to Pilsbry and Ferriss (108, p. 198).

PHYSA ELLIPTICA Lea.

Is a valid species according to Crandall (27, p. 54) and includes *troostiana* Lea and *minor* Crandall as varieties and *aurea*, *febigeri* and *nicklinii* Lea and *deformis* Currier as synonyms. Baker's figures (4, pl. 34, fig. 5), copied by Blatchley and Daniels (14, pl. I, fig. 118) do not represent the true *elliptica*.

PHYSA ELLIPTICA MINOR Crandall.

Physa elliptica minor Crandall, Naut., XV, 1901, p. 55.

Type locality: Grand Rapids, Mich.

Types No. 14469 Coll. Walker.

PHYSA FEBIGERI Lea.

Physa febigeri Lea, Pr. A. N. S. P., 1864, p. 114; Jour. A. N. S. P., VI, 1866, p. 174, pl. 24, fig. 99; Obs., XI, 1866, p. 130, pl. 24, fig. 99.

Type locality: Logan Co., O.

Is *elliptica* according to Tryon (132, p. 163) and Crandall (27, p. 55).

PHYSA FORSHEYI Lea.

Physa forsheyi Lea, Pr. A. N. S. P., 1864, p. 114; Jour. A. N. S. P., VI, 1866, p. 172, pl. 24, fig. 95; Obs., XI, 1866, p. 128, pl. 24, fig. 95.

Type locality: Rutersville, Texas.

Includes *whitei* Lea according to Crandall (27, p. 67).

PHYSA FRAGILIS Mighels.

Is a pathologic form of *ancillaria* according to Morse (75, p. 43).

PHYSA GROSVERNORI Lea.

Physa grosvernori Lea, Pr. A. N. S. P., 1864, p. 114; Jour. A. N. S. P., VI, 1866, p. 175, pl. 24, fig. 100; Obs., XI, 1866, p. 131, pl. 24, fig. 100.

According to Cooper (25, p. 97) includes *P. traskii* Lea, *occidentalis* Try., *dorbignyana* Lea and *sparsistriata* Try. as varieties.

Type locality: Santa Rita Valley.

Is a var. of *forshyei* according to Crandall (27, p. 69).

PHYSA GYRINA Say.

Includes *cylindrica* Newc., *altonensis*, *hawonii* and *smithsoniana* Lea as synonyms and *albofilata* Ancy, *hildrethiana* Lea and *oleacea* Tryon as varieties according to Crandall (27, p. 45).

PHYSA HALEI Lea.

Physa halei Lea, Pr. A. N. S. P., 1864, p. 114; Jour. A. N. S. P., VI, 1866, p. 165, pl. 24, fig. 83; Obs., XI, 1866, p. 121, pl. 24, fig. 83.

Type locality: Alexandria, La.

PHYSA HAWNII Lea.

Physa hawnii Lea, Pr. A. N. S. P., 1864, p. 115; Jour. A. N. S. P., VI, 1866, p. 165, pl. 24, fig. 84; Obs., XI, 1866, p. 121, pl. 24, fig. 84.

Type locality: Verdigris River, Kans.

Is *gyrina* according to Tryon (132, p. 162) and Crandall (27, p. 54).

PHYSA HETEROSTROPHA Say.

Includes *lata* and *primeana* Tryon according to Crandall (27, p. 29).

PHYSA HETEROSTROPHA ALBA Crandall.

Physa heterostropha alba Crandall, Naut., XV, 1901, p. 29.

Type locality: Cedar Lake, Capachet, N. Y.

Types No. 40747 Coll. Walker.

PHYSA HUMEROSA Gould.

Includes *rhomboidea* Crandall (*crandalli* Baker), according to Springer (120, p. 513).

PHYSA INTEGRAL Haldeman.

Includes *billingsii* as a var. according to Crandall (27, p. 56).

PHYSA LATA Tryon.

Physa lata Tryon, Am. J. of Con., I, 1865, p. 227, pl. 23, fig. 7.

Type locality: Juniata River, Hallidaysburg, Pa.

See *heterostropha*.

PHYSA LORDI Baird.

Physa parkeri Currier, Kent Sci. Inst., Misc. Pub., 1868, p. 7 (no desc.); DeCamp, Kent Sci. Inst., Misc. Pub., No. 5, 1881, p. 15, pl. 1, fig. 3.

Type locality (*parkeri*): Houghton Lake, Mich.

Types (*parkeri*) No. 11997 Coll. Walker.

Henderson and Daniels (56, p. 75) suggest that the Michigan and Canadian forms differ markedly from the typical western form.

PHYSA MALLEATA Tryon.

Physa malleata Tryon, Am. J. of Con., I, 1865, p. 225, pl. 23, fig. 14.

Type locality: Hell Gate River, Oregon.

PHYSA MARGARITA Lesson.

Physa margarita Lesson, Rev. Zool., 1840, p. 356.

Type locality: Newfoundland.

PHYSA MEXICANA CONOIDEA Fischer and Crosse.

Physa mexicana conoidea Fischer and Crosse, Moll. Mex., II, 1886, p. 101, pl. 39, figs. 8-8a.

Type locality: Mehedin, Mexico.

Also McLennan Co., Texas, see Strecker, 126, p. 64.

PHYSA NIAGARENSIS Lea.

Physa niagarensis Lea, Pr. A. N. S. P., 1864, p. 114; Jour. A. N. S. P., VI, 1866, p. 168, pl. 24, fig. 97; Obs., XI, 1866, p. 124, pl. 24, fig. 97.

Type locality: Niagara River, N. Y.

Is referred to *integra* by Tryon (132, p. 167), but Crandall (27, p. 55) considers it distinct.

PHYSA NICKLINII Lea.

Physa nicklinii Lea, Pr. A. N. S. P., 1864, p. 114; Jour. A. N. S. P., VI, 1866, p. 175, pl. 24, fig. 101; Obs., XI, 1866, p. 131, pl. 24, fig. 101.

Type locality: Callaghan's, Alleghany Co., Va.

Is *elliptica* according to Tryon (132, p. 163) and Crandall (27, p. 55).

PHYSA NUTTALLII Lea.

Physa nuttallii Lea, Pr. A. N. S. P., 1864, p. 116; Jour. A. N. S. P., VI, 1866, p. 171, pl. 24, fig. 93; Obs., XI, 1866, p. 127, pl. 24, fig. 93.

Type locality: Lewis River, Oregon.

See *ampullacea*.

PHYSA OCCIDENTALIS Tryon.

Physa occidentalis Tryon, Am. J. of Con., I, 1865, p. 226, pl. 2, fig. 8.

Type locality: San Francisco and numerous other localities in California and Oregon.

PHYSA OLEACEA Tryon.

Physa oleacea Tryon, Am. J. of Con., II, 1866, p. 6, pl. II, fig. 6.

Type locality: Bridgeport, Ala., and Lake Superior.

Is *elliptica* according to Tryon (132, p. 163). Crandall states (27, p. 45) that Tryon himself admitted this obvious error and considers it to be a var. of *gyrina*. Baker (5, p. 492) considers it to be simply an immature stage of typical *gyrina*.

PHYSA OSCULANS Haldeman.

Includes *mexicana* Phil. according to Fischer and Crosse (38, p. 100), Pilsbry (91, p. 323) and von Martens (73, p. 370). "*Physa osculans* is readily distinguishable from the eastern forms, *P. heterostropha*, *integra* and *gyrina*; but several described Californian Physas present no differences from the Mexican species and must be considered synonyms." (Pilsbry, l. c.)

PHYSA PARVA Lea.

Physa parva Lea, Pr. A. N. S. P., 1864, p. 115; Jour. A. N. S. P., VI, 1866, p. 177, pl. 24, fig. 104; Obs., XI, 1866, p. 133, pl. 24, fig. 104.

Type locality: Verdigris River and Roca Creek, Kans.

Is doubtfully referred to *P. malleata* Try. as a variety by Cooper (25, p. 97).

Probably a young *grosvernori*, Tryon (128, p. 169); is *gyrina*, Tryon (132, p. 162); probably a young *anatina*, Crandall (27, p. 71).

PHYSA POLITISSIMA Tryon.

Physa politissima Tryon, Am. J. of Con., I, 1865, p. 226, pl. 23, fig. 13.

Type locality: Sacramento, Cal.

Is a variety of *P. binneyana* Ancey (*P. diaphana* Try.) according to Cooper (25, p. 97).

Is probably a synonym of *triticea*, and both are "dwarfed and arrested aspect (s)" of *gyrina* according to Stearns (122, p. 51).

PHYSA POMILIA Conrad.

Physa pomilia Conrad, Am. J. of Sci., XXV, 1834, p. 343; Am. J. of Con., II, 1866, p. 278, pl. 15, figs. 1-3.

Type locality: Randon's Creek, Claiborne, Ala.

Includes *showalteri* Lea according to Tryon (132, p. 162) and Crandall (27, p. 90).

PHYSA PRIMEANA Tryon.

Physa primeana Tryon, Am. J. of Con., I, 1865, p. 227, pl. 23, fig. 12.

Type locality: Long Island, N. Y.

Is *heterostropha* according to Crandall (27, p. 29).

PHYSA PROPINQUA Tryon.

Physa propinqua Tryon, Am. J. of Con., I, 1865, p. 223, pl. 23, fig. 5.

Type locality: Jordan Creek, Idaho.

PHYSA RIVALIS Sowerby.

Physa rivalis Sowerby, Con. Icon., Physa, 1873, Sp. 31, pl. 4, fig. 31.

Type locality: Columbia River.

This is not the *P. rivalis* of Maton and Rackett (1807) nor of Sowerby (1821-6). Clessin (20, p. 331) considers it a synonym of *hildrethiana* Lea.

PHYSA SAFFORDII Lea.

Physa saffordii Lea, Pr. A. N. S. P., 1864, p. 115; Jour. A. N. S. P., VI, 1866, p. 166, pl. 24, fig. 87; Obs., XI, 1866, p. 123, pl. 24, fig. 87.

Type locality: Lebanon, Wilson Co., Tenn.; Verdigris River, Kans., and Nashville, Tenn.

Is *gyrina* according to Tryon (132, p. 162).

PHYSA SHOWALTERI Lea.

Physa showalteri Lea, Pr. A. N. S. P., 1864, p. 115; Jour. A. N. S. P., VI, 1866, p. 170, pl. 24, fig. 92; Obs., XI, 1866, p. 126, pl. 24, fig. 92.

Type locality: Uniontown, Ala.

PHYSA SMITHSONIANA Lea.

Physa smithsoniana Lea, Pr. A. N. S. P., 1864, p. 115; Jour. A. N. S. P., VI, 1866, p. 169, pl. 24, fig. 97; Obs., XI, 1866, p. 125, pl. 24, fig. 91.

Type locality: Loup Fork of the Platte River.

Is *gyrina* according to Crandall (27, p. 54).

PHYSA SPARSESTRIATA Tryon.

Physa sparsestriata Tryon, Am. J. of Con., I, 1865, p. 224, pl. 23, fig. 10.

Type locality: San Joaquin Valley, Cal.

PHYSA SUBROTUNDA Sowerby.

Physa subrotunda Sowerby, Con. Icon., Physa, 1873, Sp. 87, pl. 10, fig. 87.

Type locality: North America.

PHYSA TENUISSIMA Lea.

Physa tenuissima Lea, Pr. A. N. S. P., 1864, p. 114; Jour. A. N. S. P., VI, 1866, p. 167, pl. 24, fig. 86; Obs., XI, 1866, p. 123, pl. 24, fig. 86.

Type locality: Alexandria, La.

Is referred to *Aplexa* by Tryon (132, p. 17). See Crandall (27, p. 71). His shell now in my collection is a dead, bleached specimen of *Aplexa hypnorum*.

PHYSA TRASKII Lea.

Physa traskii Lea, Pr. A. N. S. P., 1864, p. 115; Jour. A. N. S. P., VI, 1866, p. 163, pl. 24, fig. 80; Obs., XI, 1866, p. 119, pl. 24, fig. 80.

Type locality: Rio Los Angeles, Cal.

Is a synonym of *P. virgata* Gld. according to Pilsbry and Ferriss (108, p. 198).

PHYSA TRITICEA Lea.

Physa triticea Lea, Jour. A. N. S. P., VI, 1866, p. 177, pl. 24, fig. 103; Obs., XI, 1866, p. 132, pl. 24, fig. 103.

Type locality: Shasta Co., Cal.

Is a form of *gyrina* and probably includes *politissima* Tryon, according to Stearns (122, p. 51).

PHYSA TROOSTIANA Lea.

Is *elliptica* according to Tryon (132, p. 163) and Crandall (27, p. 55).

PHYSA VENUSTA Lea.

Physa venusta Lea, Pr. A. N. S. P., 1864, p. 116; Jour. A. N. S. P., VI, 1866, p. 168, pl. 24, fig. 89; Obs., XI, 1866, p. 124, pl. 24, fig. 89.

Type locality: Fort Vancouver, Oregon.

Very closely allied to, if not identical with, *P. virginea* Gld. according to Tryon (128, p. 170), who also remarks in 1870 (Mon., p. 138) that it groups with *gyrina* Say.

PHYSA VINOSA Gould.

Crandall (27, p. 42) considers this to be a var. of *ancillaria*, but it seems to be sufficiently distinct.

PHYSA VIRGATA Gould.

Listed from Muscatine, Ia., by Nelson (76, p. 182). In all probability an erroneous identification. Is a variety of *P. humerosa* Gld. according to Cooper (25, p. 98).

Widely, if sparsely, distributed in Arizona and New Mexico according to Pilsbry and Ferriss (107, p. 144).

PHYSA VIRGATA ALBA Cockerell.

Physa virgata mut. *alba* Cockerell, Jour. Mal., IX, 1902, p. 138.

Type locality: Salt River, Tempe, Ariz.

The varietal name is preoccupied by Crandall, *P. heterostropa alba*, 1901.

PHYSA WALKERI Crandall.

Physa walkeri Crandall, Naut., XV, 1901, p. 57, pl. II, fig. 5.

Type locality: Petoskey, Mich.

Types No. 3483 Coll. Walker.

PHYSA WARRENIANA Lea.

Physa warreniana Lea, Pr. A. N. S. P., 1864, p. 115; Jour. A. N. S. P., VI, 1866, p. 163, pl. 24, fig. 81; Obs., XI, 1866, p. 120, pl. 24, fig. 81.

Type locality: Long Fork of the Platte River; Milwaukee, Wis.; Grand Rapids, Mich.

Is a var. of *sayii* according to Crandall (27, p. 44).

PHYSA WHITEI Lea.

Physa whitei Lea, Pr. A. N. S. P., 1864, p. 114; Jour. A. N. S. P., VI, 1866, p. 172, pl. 24, fig. 96; Obs., XI, 1866, p. 128, pl. 24, fig. 96.

Type locality: Walker Co., Ga.; Verdigris River, Kans.

Is *forsheyi* according to Crandall (27, p. 69).

PHYSA WOLFIANA Lea.

Physa wolfiana Lea, Pr. A. N. S. P., 1869, p. 125; Jour. A. N. S. P., VIII, 1874, p. 63, pl. 21, fig. 20; Obs., XIII, 1874, p. 67, pl. 21, fig. 20.

Type locality: Hot Springs, Colo.

Genus APLEXA Fleming, 1822.

APLEXA HORDACEA (Lea).

Physa hordacea Lea, Pr. A. N. S. P., 1864, p. 116; Jour. A. N. S. P., VI, 1866, p. 176, pl. 24, fig. 102; Obs., XI, 1866, p. 132, pl. 24, fig. 102.

Type locality: Vancouver Island, Oregon.

Referred to *Aplexa* by Tryon (132, p. 170), and doubtfully by Dall (32, p. 113), but its generic position still remains to be definitely settled by an examination of the animal. Dall (l. c.) states that the types came from Vancouver, Wash. and not from Vancouver Island, B. C.

Is a variety of *P. venusta* Lea according to Cooper (25, p. 97).

APLEXA HYPNORUM L.

Clessin (20, p. 287) distinguishes the American form (*P. elongata* Say) on the ground that the European form has a more slender shell and never a short spire as is the case with both the American varieties recognized by him, but the concensus of opinion is against him.

APLEXA HYPNORUM ARCTICA (Clessin).

Physa elongata arctica Clessin, Con. Cab., Linnæiden, 1886, p. 287, pl. 41, fig. 5.

Type locality: Hudson Bay.

APLEXA HYPNORUM GLABRA (DeKay).

Physa glabra DeKay, N. Y. Moll., 1843, p. 80, pl. 5, fig. 83.

Physa elongatina Lewis, Pr. B. S. N. H., V, 1855, pp. 122, 298.

Range: Conn., N. Y., and Michigan.

This form seems to be entitled to recognition as a well marked race.

APLEXA HYPNORUM TRYONI (Currier).

Bulinus tryoni Currier, Am. J. of Con., III, 1867, p. 112, pl. 6, fig. 2.

Type locality: Grand Rapids, Mich.

Family ANCYLIDÆ.

For a revision of the patelliform genera of this family, see Walker, No. 160.

Subfamily LANCINÆ Hannibal, 1914.

Genus LANX Clessin, 1880.

LANX ALTUS (Tryon).

Ancylus altus Tryon, Am. J. of Con., I, 1865, p. 230, pl. 22, fig. 15.

Type locality: Klamath River, Cal.

Is probably only a var. of *newberryi* according to Pilsbry (95, p. 65).

LANX CRASSUS (Haldeman).

Ancylus crassus Haldeman, Mon., 1844, p. 14, pl. 1, fig. 8.

LANX KOOTANIENSIS (Baird).

Ancylus kootaniensis Baird, Pr. Zool. Soc., Lond., 1863, p. 69; W. G. Binney, L. and F. W. Shells, II, 1865, p. 144, fig. 242; Tryon, Mon., 1870, p. 227, pl. 11, figs. 11-12.

Ancylus (Lævapex) kootaniensis Dall, Alaska, XIII, 1905, p. 110, fig. 82.

Is doubtfully referred to *L. crassus* Hald. as a variety by Cooper (25, p. 100).

LANX NEWBERRYI (Lea).

Ancylus newberryi Lea, Jour. A. N. S. P., VI, 1866, p. 185, pl. 24, fig. 116; Obs., XI, 1866, p. 141, pl. 24, fig. 116.

LANX NUTTALLII (Haldeman).

Velletia nuttallii Haldeman, Mon., 1841, pt. 3, p. 3 of cover.

Acroloxus nuttallii Binney, L. and F. W. Shells, II, 1865, p. 147.

LANX PATELLOIDES (Lea).

Ancylus patelloides Lea, Jour. A. N. S. P., VI, 1866, p. 185, pl. 24, fig. 117; Obs., XI, 1866, p. 141, pl. 24, fig. 117.

Is not a marine species as stated by Tryon (132, p. 230). See Pilsbry (93, p. 60).

Includes *altus* Try. and *subrotundus* Try. and doubtfully *newberryi* Lea as varieties according to Cooper (25, p. 100).

LANX PRÆCLARUS (Stimpson). (Mss.?)

Ancylus præclarus "Stimpson" Lea, Obs. XI, 1866, p. 141.

This apparently undescribed species is referred to and distinguished from *newberryi* by Lea.

LANX SUBROTUNDUS (Tryon).

Ancylus subrotundus Tryon, Am. J. of Con., I, 1863, p. 230, pl. 22, fig. 14.
Type locality: Umpqua River, Oregon.

Subgenus WALKEROLA Hannibal, 1912.

LANX (WALKEROLA) KLAMATHENSIS Hannibal.

Lanx (Walkerola) klamathensis Hannibal, Pr. Mal. Soc. Lond., X, 1912,
p. 149, pl. VIII, fig. 25.

Type locality: Upper Klamath Lake, Ore.

Genus FISHEROLA Hannibal, 1912.

FISHEROLA LANCIDES Hannibal.

Fisherola lancides Hannibal, Pr. Mal. Soc. Lond., X, 1912, p. 152, pl. VIII,
fig. 35.

Type locality: Snake River, Washington.

Genus ACROLOXUS Beck.

Does not occur in our fauna. Of the two species referred to it by Binney, one, *A. nuttallii*, is a *Lanx* and the other, *A. flosus*, is a *Rhodacmea*.

Subfamily FERRISSIINÆ Walker, 1917.

Genus FERRISSIA Walker, 1903.

FERRISSIA BOREALIS (Morse).

Ancylus borealis Walker, Naut., XVIII, 1904, p. 80, pl. 6, figs. 14-16.

FERRISSIA CAURINA ("W. Cooper," W. G. Binney).

Ancylus caurinus, J. G. Cooper, Pr. Cal. Acad. Sci., IV, 1870, p. 100.

Tryon (132, p. 229) refers this species to *fragilis*, but it is an error.

Is doubtfully referred to *Ferrissia fragilis* Try. as a variety by Cooper (25, p. 100), but later (26, p. 83) he considers it distinct. Dall (32, p. 110) also doubtfully refers it to *fragilis*.

FERRISSIA CAURINA SUBALPINA (J. G. Cooper).

Ancylus caurinus subalpinus J. G. Cooper, Pr. Cal. Acad. Sci., (2), III, 1890,
p. 82, pl. I, figs. 27-28.

Type locality: Yosemite Valley and Bloody Canyon, Cal. Also Oregon.

FERRISSIA FRAGILIS (Tryon).

As suggested by J. G. Cooper (26, p. 83), and Hannibal (53, p. 148), this is probably the non-septate form of *Gundlachia californica*.

FERRISSIA HALDEMANI (Bourguinat).

Ancylus haldemani Walker, Naut., XVIII, 1904, p. 78, pl. 6, figs. 9-13.

FERRISSIA HENDERSONI (Walker).

Ancylus hendersoni Walker, Naut., XXI, 1908, p. 138, pl. 9, figs. 8-10.

Type locality: Lake Waccamaw, N. C.

FERRISSIA NOVANGLIÆ (Walker).

Ancylus novangliæ Walker, Naut., XXI, 1898, p. 138, pl. 9, figs. 5-7.

Type locality: Cambridge, Mass.

FERRISSIA OVALIS (Morse).

Ancylus ovalis Walker, Naut., XVIII, 1904, p. 79.

FERRISSIA PARALLELA (Haldeman).

Ancylus parallelus Walker, Naut., XVIII, 1914, p. 77, pl. 5, figs. 1-9.

FERRISSIA PUMILA (Sterki).

Ancylus pumilus Sterki, 8th Ann. Rep. O. St. Acad. Sci, 1900, p. 36; separate, p. 7; Walker, Naut., XVIII, 1904, p. 82, pl. 6, figs. 20-22.

Type locality: Tuscarawas River, Tuscarawas Co., O.

It is possible that this will prove to be the non-septate form of *Gundlachia meekiana*.

FERRISSIA RIVULARIS (Say).

Ancylus rivularis Walker, Naut., XVIII, 1904, p. 25, pl. 1, figs. 1-10, 13-14.

FERRISSIA SHIMEKII (Pilsbry).

Ancylus obliquus Shimek, Bull. Lab. Nat. Hist., St. Univ. Ia., I, 1890, p. 214, pl. III, figs. 5a-c, non Broderip and Sowerby (1832), nor C. B. Ads. (1850), nor Krauss (1853).

Ancylus shimekii Pilsbry, Naut., IV, 1890, p. 48; Walker, Naut., XVIII, 1904, p. 81, pl. 6, figs. 17-19.

Type locality: Deadman's Run, Lincoln, Neb.

Pilsbry (l. c. and 54, p. 63) has suggested that this may be the non-septate form of a *Gundlachia*, perhaps *meekiana*. This was controverted by Walker (l. c.), but nevertheless may be correct.

FERRISSIA TARDA (Say).

Ancylus tardus Walker, Naut., XVIII, 1904, p. 27, pl. I, figs. 11-12, 16-23;
pl. II, figs. 1-23.

FERRISSIA WALKERI (Pilsbry and Ferriss).

Ancylus walkeri Pilsbry and Ferriss, Pr. A. N. S. P., 1906, p. 564, fig. 5.
Type locality: Rogers, Benton Co., Ark.

Subgenus LÆVAPEX Walker, 1903.

FERRISSIA DIAPHANA (Haldeman).

Ancylus diaphanus Walker, Naut., XVII, 1903, p. 17, pl. II, figs. 13-18.

FERRISSIA EXCENTRICA (Morelet).

Ancylus excentricus Morelet, Test. Noviss., II, 1851, p. 17; Pilsbry, Naut.,
III, 1889, p. 64, pl. I, fig. 4; Walker, Naut., XVII, 1903, p. 27, pl. I,
figs. 19-21.

Type locality: Lago de Ita, Peten, Guatemala. Also Comal Creek, New
Braunfels and Barton Creek, Travis Co., Texas.

FERRISSIA FUSCA (C. B. Adams).

Ancylus fuscus Walker, Naut., XVII, 1903, p. 15, pl. I, fig. 1-9.

FERRISSIA FUSCA EUGRAPTA (Pilsbry).

Ancylus eugraptus Pilsbry, Naut., IX, 1896, p. 139.

Ancylus fuscus eugraptus Walker, Naut., XVII, 1903, p. 17, pl. I, figs. 13-18.
Type locality: Illinois River, Havana, Ills.

FERRISSIA HEMISPHERICA (Walker).

Ancylus hemisphaericus Walker, Naut., XXI, 1908, p. 140, pl. 9, figs. 14-16.
Type locality: Georgia. Also Decatur, Ala.

FERRISSIA KIRKLANDI (Walker).

Ancylus kirklandi Walker, Naut., XVII, 1903, p. 29, pl. II, figs. 1-12.
Type locality: Grand Rapids, Mich.

FERRISSIA OBSCURA (Haldeman).

See Walker (Naut., XVII, 1903, p. 25, pl. I, figs. 16-18) for the Floridan
form doubtfully referred to this. Rediscovered in the south fork of the
Powell River at Big Stone Gap, Wise Co., Va., by Goodrich (48, p. 92), and
quite different from the supposed Florida examples.

FERRISSIA PENINSULÆ (Pilsbry and Johnson).

Ancylus peninsulae Pilsbry and Johnson, Naut., IX, p. 138; Walker, Naut., XVII, 1903, p. 28, pl. II, figs. 19-21.

Type locality: St. John's River, Fla.

SPECIES INCERTÆ SEDIS.

ANCYLUS CALCARIUS DeKay.

ANCYLUS OREGONENSIS Clessin.

Ancylus oregonensis Clessin, Con. Cab., Ancylinen, 1882, p. 66, pl. 8, fig. 1.
Type locality: Salem, Oregon.

Also listed from the Sacramento River, Reading, Shasta Co., by Pilsbry (93, p. 60).

Genus GUNDLACHIA Pfeiffer, 1849.

The validity of this genus has been a subject of considerable discussion. See Dall (31, p. 97) and Walker (148, p. 14, and 160, p. 3). Dall has also published a very interesting series of observations on the relations of *Ancylus* and *Gundlachia* (34, p. 175).

Subgenus GUNDLACHIA s. s.

GUNDLACHIA ANCYLIFORMIS Pfeiffer.

Gundlachia ancyliformis Pfeiffer, Zeitsch. für Mal., 1849, p. 98; Ibid, 1853, p. 180, pl. I, figs. 1-16.

Type locality: Lagune Injino, San Vincente, Cuba.

Listed by Simpson (117, p. 96), from Palma Sola, Fla.

GUNDLACHIA HJALMARSONI Pfeiffer.

Gundlachia hjalmarsoni Pfeiffer, Mal. Blätt., V, 1858, p. 197.

Type locality: Santa Rosa, Honduras.

Has been recorded and figured by Clapp (18, p. 77), from the drift of the Rio Grande, at Brownsville, Texas.

Subgenus KINCAIDELLA Hannibal, 1912.

This group includes: *G. meekiana* Stimp., *californica* Row., and *stimpsoniana* S. Smith.

GUNDLACHIA STIMPSONIANA S. Smith.

Gundlachia stimpsoniana S. Smith, Ann. N. Y. Lyc. Nat. Hist., IX, 1870, p. 399, fig. 6; Walker, Naut., XXI, 1907, p. 15, pl. IV.

Type locality: Greenport, Long Island, N. Y. Also on Shelter Island, N. Y.

Subfamily RHODACMEINÆ Walker, 1917.

Genus RHODACMEA Walker, 1917.

Subgenus RHODACMEA s. s.

RHODACMEA FILOSA (Conrad).

Ancylus filorus Conrad, New F. W. Shells, 1834, p. 57; Haldeman, Mon., 1844, p. 10, pl. I, fig. 9; Binney, L. and F. W. Shells, II, 1865, p. 147, fig. 248; Walker, Naut., XVIII, p. 75, pl. 6, figs. 7-8.

Acroloxus filorus Tryon, Mon., 1870, p. 232.

Type locality: Black Warrior River, south of Blount Springs.

RHODACMEA CAHAWBENSIS Walker.

Ancylus filorus Walker, Naut., XVIII, 1904, p. 76, pl. VI, figs. 1-6.

Rhodacmea cahawbensis Walker, Naut., XXXI, 1917, p. 7, pl. I, figs. 4-6.

Type locality: Cahawba River, Gurnee, Shelby Co., Ala.

RHODACMEA ELATIOR (Anthony).

Ancylus elatior Anthony, Ann. N. Y. Lyc. Nat. Hist., VI, 1855, p. 158, pl. V, fig. 20; Binney, L. and F. W. Shells, II, 1865, p. 140, fig. 234; Walker, Naut., XVIII, 1904, p. 78, pl. V, figs. 10-12.

Type locality: Green River, Ky.

RHODACMEA HINKLEYI Walker.

Ancylus rhodaceus "Walker," Hinkley, Naut., XX, 1906, p. 40, not described.

Ancylus hinkleyi Walker, Naut., XXI, 1908, p. 139, pl. IX, figs. 11-13.

Type locality: Ohio River, Golconda, Ills.

Section RHODOCEPHALA Walker, 1917.

RHODACMEA RHODACME Walker.

Rhodacmea rhodacme Walker, Naut., XXXI, 1917, p. 8, pl. I, figs. 1, 2 and 8.

Type locality: Coosa River, Williamsville, Shelby Co., Ala.

RHODACMEA GWATKINIANA Walker.

Rhodacmea gwatkiniana Walker, Naut., XXXI, 1917, p. 9, pl. I, figs. 3, 7 and 9.

Type locality: Coosa River, Butting Ram Shoals, Coosa Co., Ala.

Subfamily NEOPLANORBINÆ Hannibal, 1912.

Genus NEOPLANORBIS Pilsbry, 1906.

NEOPLANORBIS CARINATUS Walker.

Neoplanorbis carinatus Walker, Naut., XXI, 1908, p. 127, pl. 9, figs. 17-18.

Type locality: Duncan's Riffle, Coosa River, Coosa Co., Ala.

NEOPLANORBIS SMITHII Walker.

Neoplanorbis smithii Walker, Naut., XXI, 1908, p. 126, pl. 9, figs. 1-2.

Type locality: Higgin's Ferry, Coosa River, Chilton Co., Ala.

NEOPLANORBIS TANTILLUS Pilsbry.

Planorbis tantillus "Pilsbry" Hinkley, Naut., XVIII, 1904, p. 54. Nude name.

Neoplanorbis tantillus Pilsbry, Naut., XX, 1906, p. 51, pl. 3, figs. 3-5.

Type locality: Wetumpka, Ala.

NEOPLANORBIS UMBILICATUS Walker.

Neoplanorbis umbilicatus Walker, Naut., XXI, 1908, p. 126, pl. 9, figs. 3-4.

Type locality: The Bar, Coosa River, Chilton Co., Ala.

Genus AMPHIGYRA Pilsbry.

Amphigyra Pilsbry, Naut., XX, 1906, p. 49.

Type: *Amphigyra alabamensis* Pils.

AMPHIGYRA ALABAMENSIS Pilsbry.

Amphigyra alabamensis Pilsbry, Naut., XX, 1906, p. 50, pl. III, figs. 1-2.

Type locality: Wetumpka, Ala.

Subclass STREPTONEURA.

Order PECTINIBRANCHIA.

Suborder TÆNIOGLOSSA.

Superfamily PLATYPODA.

Family AMPULLARIDÆ.

Genus AMPULLARIA Lamarck, 1799.

AMPULLARIA BOREALIS Valenciennes.

W. G. Binney (12, p. 430), has definitely ascertained that this species was based on the well known *Natica heros* Say.

AMPULLARIA CALIGINOSA Rve.

Ampullaria caliginosa Reeve, Con. Icon., Ampullaria, 1856, pl. XXV, fig 118.

Type locality: Unknown. Not listed by Sowerby in his recent catalogue (119, pp. 345-362).

Listed from several localities in Florida by Dall and Simpson.

AMPULLARIA MIAMIENSIS Pilsbry.

Ampullaria miamiensis Pilsbry, Pr. A. N. S. P., 1899, p. 365.

Type locality: Miami, Dade Co., Fla.

AMPULLARIA PALUDOSA Say.

This name must be used for Say's species as his first name *depressa* was preoccupied by Lamarck.

AMPULLARIA PINEI Dall.

Ampullaria pinei Dall, Naut., XII, 1898, p. 75.

Type locality: Homosassa River, Fla.

AMPULLARIA ROTUNDATA Say.

Sowerby has recently (119, p. 357) referred this species with doubt to *paludosa*, overlooking Say's statement that the operculum was calcareous and Binney's figure in his edition of Say, pl. 75. It is no doubt an Old World species as suggested by Binney. In a recent letter, Mr. Sowerby says that he has "not the slightest doubt that it is a small specimen of the Indian *A. globosa* Sw."

Family VIVIPARIDÆ.

Genus VIVIPARUS Montfort, 1810.

VIVIPARUS CONTECTUS (Millet).

This European species has become fully acclimatized at Washington, D. C., and at Philadelphia, Pa. (Bailey, 2, p. 60).

VIVIPARUS CONTECTOIDES W. G. Binney.

Tryon's contention (132, p. 17) that this species should be known as *V. lineata* Kuster *non* Val. (Con. Cab., Paludina, 1852, p. 10, pl. 2, figs. 6-9) is not well founded. *Lineata* is preoccupied and *linearis* (Ibid, p. 19) is "of course" a misprint for *lineata* as stated by Tryon (131, p. 197) and Binney (13, p. 295).

This species has been introduced and fully acclimated in Fairmont Park, Philadelphia, Pa. (Vanatta, 139, p. 84), and in the Public Garden in Boston, Mass. (Johnson, 62, p. 72).

VIVIPARUS CONTECTOIDES COMPACTUS Pilsbry.

Viviparus conctectoides compactus Pilsbry, Naut., XXX, 1916, p. 42.

Type locality: Doherty, Ga.

VIVIPARUS CONTECTOIDES IMPOLITUS Pilsbry.

Viviparus conctectoides impolitus Pilsbry. Naut., XXX, 1916, p. 41.

Type locality: Paint Rock River, Jackson Co., Ala.

VIVIPARUS GEORGIANUS ALTIOR Pilsbry.

Vivipara georgiana altior Pilsbry, Naut., V, 1892, p. 142.

Type locality: Hitchin's Creek, Fla.

VIVIPARUS GEORGIANUS FASCIATUS Tryon.

Vivipara georgiana fasciata Tryon, Mon., 1870, p. 17.

Type locality not specified.

VIVIPARUS GEORGIANUS LIMNOTHAUMUS Pilsbry.

Vivipara georgiana limnothauma Pilsbry, Naut., VIII, 1895, p. 116.

Type locality: Hitchin's Creek, Fla. Also Lake George, opposite Drayton's Island, Fla.

VIVIPARUS HALDEMANIANUS "Shuttleworth" Frauenfeld.

Vivipara haldemania "Shuttleworth" Frauenfeld, Verh. k. k. zool.-bot. Gesell. Wien, 1862, p. 1162.

Type locality: Black Creek, Fla.

Tryon (130, p. 374) says that this is "doubtless" *V. lineata* Val. (*conctectoides* W. G. Binn.), but this is not likely as that species does not range so far south. It is more probable that it is either *georgianus* (Lea) or *waltonii* Try. If the latter, it would have priority. Tryon (131, p. 197) suggests that the Florida *conctectoides* listed by Binney are "perhaps" his *waltonii*.

VIVIPARUS HALEANUS (Lea).

This is apparently a valid species as stated by Tryon. It also occurs in Itchaway-Notchway Creek, Baker Co., Ga., and fossil in a peat bed at Lake Panasoffkee, Fla.

VIVIPARUS INTERTEXTUS (Say).

Hannibal (53, p. 193) has proposed a new subgenus, *Callina*, having this species as the type. The distinction seems to be based on the rounded whorls and perforate shell of this species as compared with the imperforate shell and subcarinate body-whorl of typical *Viviparus*. But as the embryonic

young of *intertextus* are strongly angulated and those of *V. viviparus* are quite acutely carinated the distinction does not seem to be well taken. If, however, for any valid reason, it should be found desirable hereafter to separate the two groups, the name will be available.

VIVIPARA LINEATA (Valenciennes).

W. G. Binney (13, p. 295) from an examination of the type states that this is the *V. bengalensis* (Lam.) from India.

VIVIPARUS MALLEATUS Reeve.

This Japanese species has been introduced into a number of localities on the Pacific coast and has been listed under various names:—

Paludina japonica Wood, Naut., V, 1892, p. 114; Ibid, VI, 1892, p. 51.

Vivipara stelmaphora Stearns, Naut., XV, 1901, p. 91.

Vivipara lecythoides Hannibal, Naut., XXII, 1908, p. 33.

Viviparus malleatus Hannibal, Naut., XXV, 1911, p. 31.

Hannibal (53, p. 194) has made this species the type of a new subgenus, *Cipangopaludina*, which he refers to *Idiopoma* Pils., (98, p. 189) originally proposed as a subgenus, but which he raises to generic rank. As the validity of both of these changes must be ultimately determined by a study of the Asiatic species, they may well be held in abeyance until that has been done.

VIVIPARUS JAPONICUS v. Martens.

This species has been introduced into British Columbia (Pilsbry and Johnson, 110, p. 144) and California (Hannibal, 52, p. 32).

It has also recently appeared in the Muddy River, Brookline, Mass. (Johnson, 60, p. 35 and 61, p. 48).

Hannibal (53, p. 194) refers it to *Idiopoma* Pils.

VIVIPARA MULTICARINATA (Haldeman).

This name was proposed by Haldeman for the *Paludina carinata* Val., which was erroneously stated by the author to be from Mexico, *carinata* having already been used by Swainson for an Indian species of the same genus. W. G. Binney (12, p. 430), states that the types in the Jardin des Plantes, Paris, are labelled in Valenciennes' handwriting "Philippines." It is undoubtedly a form of *V. burroughianus* Lea.

VIVIPARUS WALKERI Pilsbry and Johnson.

Viviparus walkeri Pilsbry and Johnson, Naut., XXVI, 1912, p. 48, pl. XXX, figs. 6-7.

Type locality: Juniper Creek, Lake Co., Fla.

VIVIPARUS WALTONII Tryon.

Vivipara waltonii Tryon, Am. J. of Con., II, 1866, p. 108, pl. 10, fig. 2.

Type locality: St. John's River, Fla.

VIVIPARUS WAREANUS (Shuttleworth).

This species is distinct from *georgianus* Lea.

Genus CAMPELOMA Rafinesque, 1819.

Melanthro W. G. Binney *non* Bowditch.

Pilsbry has recently (105, p. 111) proposed to substitute *Ambloxis* Raf. for *Campeloma* Raf. For the same reasons that I have urged in support of the retention of *Anculosa* Say, it seems to me that the preference should be given to *Campeloma*.

CAMPELOMA DECISUM (Say).

The undescribed forms of this species from Michigan listed as vars. *flava* Currier MSS. and *melanostoma* Currier MSS. (Walker, 142, p. 138) are of doubtful validity.

Binney is in error in referring the following species to *decisum* as synonyms: *integrum* Say, *geniculum* Con., *milesii* Lea, *obesum* Lewis, *rufum* Hald., and *subsolidum* Anth.

Melanthro fecunda mentioned, but purposely left undescribed, by Lewis in 1868 (66, p. 135) and listed as a distinct species in 1869 (67, p. 34) does not seem to be separable from *decisum*, judging from the author's original specimens now in my collection. Call's remark (17, p. 135) that this is the female of *obesum* Lewis is wholly wrong.

CAMPELOMA FLORIDENSE Call.

"*Campeloma floridense* Call MSS." (as synonym of *C. limum*), Call, Bull. Washb. Coll. Lab. of Nat. Hist., I, 1886, p. 159, pl. 6, fig. 7; Pilsbry, Naut., XXX, 1917, p. 42.

Type locality not specified. Apparently restricted to the St. John's River and tributary creeks in Florida.

It has very generally been considered to be the *C. limum* (Anth.).

CAMPELOMA GENICULUM (Con.).

The exact status of this species still remains to be settled. Call at one time considered it a valid species (15a, p. 157), but later (17, p. 134) treated it as a variety of *decisum*. Lewis remarks (71, p. 41) that all the Alabama species exhibit this peculiarity. Under this aspect of the case, the species, to which Conrad's form should be referred, can only be determined by an examination of his original type.

CAMPELOMA INTEGRUM (Say).

Is a valid species and quite distinct from *decisum*.

CAMPELOMA INTEGRUM OBESUM ("Lewis" Tryon).

? *Paludina obesa* "Lewis" W. G. Binney, L. and F. W. Shells, III, 1865, p. 47, fig. 95.

Melantho obesa Lewis, Am. J. of Con., IV, 1868, p. 134.

Melantho obesus Lewis, Pr. A. N. S. P., 1875, p. 336, pl. XXIII, figs. 4-5.

Vivipara obesa "Lewis" Tryon, Mon., 1870, p. 25, pl. 13, fig. 6.

Type locality: Ohio Canal, Columbus, O., and Michigan.

Tryon seems to have been the first to have formally described this well marked form, although Lewis had already referred to it by that name in his papers on *Melantho* in 1868 and 1869. Binney figured what he supposed to be it, but Lewis seems to think (l. c.) that he did not do so. Binney states that "*Paludina obesa*" is preoccupied, but I have not been able to check the reference. If that is true and Binney's figure represents the true *obesa* of Lewis, his remarks and figure are sufficient to fix that name on the form and consequently it would have to receive a new name.

Typically very distinct, this form seems to bear the same relation to *integrum* that *gibbum* does to *rufum*.

Call's statement (17, p. 135) that Lewis' type of this form is the male and the type of his undescribed *fecunda* the female of the same species is an error.

CAMPELOMA LEWISII Walker.

Campeloma lewisii Walker, Naut., XVIII, 1915, p. 126, pl. V, fig. 3.

Type locality: Yallahusha River, Grenada, Miss.

This is the *Melantho coarctata* of W. G. Binney. For full synonymy see Walker, 154, p. 126.

CAMPELOMA LIMUM (Anthony).

According to Pilsbry (103, p. 43) *Melantho decampii* W. G. Binn. is a synonym of this species, which has been very generally misunderstood. The Florida form usually known by this name is *C. floridense* Call.

CAMPELOMA MILESII (Lea).

Is apparently a valid species. If not, it should be referred to *decisum* rather than to *subsolidum*. See Walker, 146, p. 121.

CAMPELOMA PONDEROSUM COARCTATUM (Lea).

This is the *Paludina coarctata* and *P. incrassata* of Lea and the *Vivipara nolani* of Tryon.

For full synonymy see Walker, 154, p. 125.

CAMPELOMA RUFUM (Haldeman).

Is a valid species.

CAMPELOMA RUFUM GIBBUM (Currier).

Melantho gibba Currier, Am. J. of Con., III, 1867, p. 112, pl. 6, fig. 3.
Type locality: Grattan, Mich.

CAMPELOMA RUFUM GENICULIFORME Pilsbry.

Campeloma rufum geniculiforme Pilsbry, Naut., XXX, 1916, p. 42.
Type locality: Dooley Co., Ga.

CAMPELOMA RUFUM MERIDIONALE Pilsbry.

Campeloma rufum meridionale Pilsbry, Naut., XXX, 1916, p. 42.
Type locality: Crozier's Branch, Cabarrus Co., N. C. Also Little Sugar Creek, N. C. and Georgia.

CAMPELOMA SPILLMANII (Lea).

Paludina spillmanii Lea, Pr. A. N. S. P., 1867, p. 81; Jour. A. N. S. P., VI, 1868, p. 343, pl. 44, fig. 29; Obs., XII, 1868, p. 103, pl. 44, fig. 29.
Lioplax spillmanii Tryon, Mon., 1870, p. 35, pl. 14, fig. 7; pl. 15, fig. 8.
Type locality: Jackson Co., Ala.

Tryon (l. c.) gives the type locality as Jackson Co., Miss. Numerous specimens from several streams near Mooresville, Limestone Co., Ala., collected by Rev. H. E. Wheeler agree with the descriptions and figures given by Lea and Tryon and are *Campelomæ*. The embryonic young are strongly and acutely bicarinated, differing in this respect from all the other species of the genus. The operculum is wholly concentric. These shells agree very exactly with the cotypes of *C. decampii* W. G. Binn. in the DeCamp collection. If this identification and approximation are correct, *spillmanii* Lea will follow *decampii* into the synonymy of *C. limum* (Anth.).

CAMPELOMA SUBSOLIDUM (Anthony).

Is a valid species. Whether the *Paludina exilis* of Anthony is a sexual form as believed by Lewis and others or an individual or local mutation is unsettled. The fact that it has not been found in southwestern Michigan, where the species is a common one would seem to cast a doubt on its being a sexual variation.

Genus LIOPLAX Troschel, 1856.

LIOPLAX ELLIOTTII (Lea).

Is a valid species.

LIOPLAX PILSBRYI Walker.

Lioplax pilsbryi Walker, Naut., XVIII, 1905, p. 133, pl. IX, figs. 1-3.
Type locality: Chipola River, Fla. Also Econfine River and Mud Creek, Fla.

Genus TULOTOMA Haldeman, 1840.

TULOTOMA ANGULATA (Lea).

The opinion of Lewis (71, p. 24) and Wetherby (164, p. 207) that this is specifically distinct from *magnifica* Con. is no doubt correct.

TULOTOMA COOSAENSIS (Lea).

This species described as a *Paludina* and referred to *Vivipara* by Binney and to *Lioplax* by Tryon (132, p. 36) is a *Tulotoma* as stated by Wetherby (164, p. 212).

Family VALVATIDÆ.

Genus VALVATA O. F. Müller, 1774.

VALVATA BICARINATA Lea.

Is a valid species. See Walker, 146, p. 124 and 147, p. 29.

VALVATA BICARINATA CONNECTANS Walker.

Valvata bicarinata connectans Walker, Naut., XX, 1906, p. 30.

Type locality: Lake Michigan, New Buffalo, Mich.

VALVATA BICARINATA NORMALIS Walker.

Valvata bicarinata normalis Walker, Naut., XV, 1902, p. 125, fig. 5.

Type locality: Not specified.

Habitat: Muscatine, Ia. and Utica, Ills.

VALVATA BICARINATA PERDEPRESSA Walker.

Valvata bicarinata perdepressa Walker, Naut., XX, 1906, p. 30, pl. I, figs. 15-16.

Type locality: Lake Michigan, Michigan City, Ind.

VALVATA CALLI Hannibal, Naut., XXIII, 1910, p. 107.

Type locality: Marl-deposit, Upper Lahontan Quaternary, Summer Lake, Or.

VALVATA HUMERALIS CALIFORNICA Pils.

Valvata humeralis californica Pilsbry, Naut., XXII, 1908, p. 82.

Type locality: Bear Lake, San Bernardino Co., Cal.

VALVATA LEWISI Currier.

Valvata striata Lewis, Pr. A. N. S. P., 1856, p. 260; *non striata* Philippi, 1836-1844; Binney, L. and F. W. Shells, Pt. III, 1865, p. 13, fig. 18.

Valvata lewisi Currier, Kent Sci. Inst. Misc. Pub., 1868, p. 9.

Type locality: Little Lakes, N. Y.

VALVATA LEWISI HELICOIDEA Dall.

Valvata lewisi helicoidea Dall, Rep. Harriman Exp., XIII, 1905, p. 123, pl. II, figs. 1-2.

Type locality not specified.

Range: "With the type form, to some extent everywhere, but especially toward the Northwest".

VALVATA MERGELLA West.

Valvata mergella Westerlund, Vega Exped. Vetens. Iakt., IV, 1885, p. 209, pl. V, figs. 22 a-d.

Type locality: Port Clarence, near Bering Strait, Alaska.

VALVATA OBTUSA Drap.

This European species has been listed from the mouth of the Genessee River, N. Y., by Baker (3, p. 71).

VALVATA PISCINALIS Müller.

This European species has recently been found by Latchford (65, p. 10) at Honisher Bay, Toronto, Ont.

VALVATA SINCERA DANIELSI Walker.

Valvata sincera danielsi Walker, Naut., XX, 1906, p. 28, pl. I, figs. 10-11.

Type locality: Cannon Lake, Rice Co., Minn.

VALVATA SINCERA NYLANDERI Dall.

Valvata (sincera var.?) nylanderi Dall, Rep. Harriman Exp., XIII, 1905, p. 122.

Type locality: Aroostook Co., Me.

VALVATA TERRÆ-NOVÆ Ferussac.

Type locality: ?

Specimens under this name are in the Museum of Paris according to Binney (12, p. 430), but it does not appear to have ever been described.

VALVATA TRICARINATA Say.

This species is the type (by designation) of the subgenus *Tropidina* H. and A. Adams, 1858, but as it is based upon the carinated whorls of the typical form and the species varies from ecarinate to tricarinate, it does not seem worthy of recognition.

VALVATA TRICARINATA BASALIS Vanatta.

Valvata tricarinata basalis Vanatta, Naut., XXVIII, 1915, p. 105, fig.
Type locality: Hudson River, N. Y.

VALVATA TRICARINATA INFRACARINATA Vanatta.

Valvata tricarinata infracarinata Vanatta, Naut., XXVIII, 1915, p. 104, fig.
Type locality: White Pond, N. J.

VALVATA TRICARINATA PERCONFUSA Walker.

Valvata tricarinata confusa Walker, Naut., XV, 1902, p. 124, fig. 2, non *V. confusa* West. (1897).
Valvata tricarinata perconfusa Walker, Naut., XXXI, 1917, p. 36.
Type locality not specified.

VALVATA UTAHENSIS Call.

Valvata sincera utahensis Call, Bull. U. S. Geol. Surv., No. 11, 1884, p. 44, pl. VI, figs. 1-3.
Valvata utahensis Call, Pr. Davenport A. N. S., V, 1886, p. 4, pl. I, figs. 1-3.
Type locality: Utah Lake, Utah.

Family AMNICOLIDÆ.

Subfamily BYTHININÆ Stimpson, 1865.

Genus BYTHINIA Leach, 1818.

BYTHINIA PERFECTA Frauenfeld.

Bythinia perfecta Frauenfeld, Verh. der k. k. zool-bot. Ges. Wien, 1862, p. 1154; Ibid, 1865, p. 527, pl. IX.
Type locality: Columbia, North America.

Frauenfeld states that as the types are without the opercula, he could not tell whether the species was a *Bythinia* or an *Ammicola*. If the locality is correct, it is surely not a *Bythinia*. It may be a *Flumimicola*.

BYTHINIA TENTACULATA (L.).

This well known European species has been introduced by commerce and has spread from the Hudson west to Lake Michigan.

Subfamily AMNICOLINÆ Gill, 1871.

Genus AMNICOLA Gould and Haldeman, 1840.

AMNICOLA AUGUSTINA Pilsbry.

Amnicola augustina Pilsbry, Naut., XVII, 1904, p. 113; Walker, Naut., XIX, 1906, p. 117, pl. V, figs. 13-14.

Type locality: St. Augustine, Fla. Also at Tuscomb, Ala., and fossil in a peat deposit at Lake Panasoffkee, Fla.

AMNICOLA BAKERIANA Pilsbry, Naut., XXXI, 1917, p. 44.

Type locality: Oneida Lake, N. Y.

AMNICOLA BAKERIANA NIMIA Pilsbry.

Amnicola bakeriana nimia Pilsbry, Naut. XXXI, 1917, p. 45.

Type locality: Oneida Lake, N. Y.

AMNICOLA CLARKEI Pilsbry.

Amnicola clarkei Pilsbry, Naut., XXXI, 1917, p. 45.

Type locality: Oneida Lake, N. Y.

AMNICOLA COMALENSIS Pilsbry and Ferriss.

Amnicola comalensis Pilsbry and Ferriss, Pr. A. N. S. P., 1906, p. 171, fig. 37; Pilsbry, Naut., XIII, 1910, p. 98.

Type locality: Comal Creek, New Braunfels, Texas. Also Guadalupe River at the same place.

AMNICOLA DESERTA Pilsbry.

Amnicola deserta Pilsbry, Naut., XXIX, 1916, p. 111.

Type locality: Washington Co., Utah.

AMNICOLA FERRUGINEA Calkins.

Amnicola ferruginea Calkins, Valley Nat., II, 1880, p. 6, text fig.

Type locality: Calumet River, Ill.

Baker (4, p. 331) refers this to *A. limosa* Say.

AMNICOLA FLORIDANA Frauenfeld.

Amnicola floridana Frauenfeld, Verh. der k. k. zool.-bot. Ges. Wein., 1863, p. 1028; Ibid, 1865, p. 529, pl. X.

Type locality: East Florida.

AMNICOLA FLORIDANA CONVEXA Pilsbry.

Amnicola floridana convexa Pilsbry, Trans. Wag. Free Inst. Sci., III, Pt. II, 1892, p. 338.

Type locality: Pliocene marl of the Caloosahatchie and Shell Creek, Fla.; also living in the fresh-water of Florida at the present time.

AMNICOLA HARPERI Dall.

Amnicola harperi Dall, Naut., XXIV, 1913, p. 2.

Type locality: Marl deposit, Lake Panasoffkee, Fla.

AMNICOLA JOHNSONI Pilsbry.

Amnicola johnsoni Pilsbry, Naut., XIII, 1899, p. 21.

Type locality: St. Augustine, Fla. Also fossil at Lake Panasoffkee, Fla.

AMNICOLA LIMOSA (Say).

Includes *A. ferruginea* Calkins according to Baker.

The figure given for this species by Dall (32, p. 117, fig. 84) is incorrect, being a copy of Binney's figure (No. 165) of *A. pallida* Hald.

AMNICOLA LIMOSA PORATA (Say).

Includes *A. orbiculata* Lea as a synonym according to Pilsbry (92, p. 44).

AMNICOLA LUSTRICA Pilsbry.

Amnicola lustrica Pilsbry, Naut., IV, 1890, p. 53.

Type locality not specified.

Range: "New York to Illinois and Minnesota".

AMNICOLA MICROCOCCUS Pilsbry.

Amnicola micrococcus Pilsbry, N. Am. Fauna, No. 7, Pt. II, 1893, p. 277, fig. 1; U. S. Nat. Mus., XXIV, 1901, p. 286, fig. 4.

Type locality: Oasis Valley, Nev. Also Death Valley, Inyo Co., Cal.

AMNICOLA MILIARIA Parreys.

Frauenfeld (40, p. 1027) states that in the Cuming Collection there is a set of this European species labelled "Spring Garden Lake, East Florida". He considers the shells to belong to this species without doubt, so that as he suggests there has probably been a mixing of labels.

AMNICOLA MISSOURIENSIS Pilsbry.

Amnicola missouriensis Pilsbry, Naut., XII, 1898, p. 43.

Type locality: Carter Co., Mo.

AMNICOLA NEOMEXICANA Pilsbry.

Amnicola neomexicana Pilsbry, Naut. XXIX, 1916, p. 111.

Type locality: Socorro, New Mexico.

AMNICOLA NUTTALLIANA "Lea" Frauenfeld.

Amnicola nuttalliana Frauenfeld, Verh. der k. k. zool.-bot. Ges. Wien., 1863, p. 1029.

The form thus listed by Frauenfeld from Silver Spring, Fort King, Fla., is probably *Gillia wetherbyi* Dall, as suggested by Dall (28, p. 258).

AMNICOLA OLIVACEA Pilsbry.

Amnicola olivacea Pilsbry, Naut., VIII, 1895, p. 115.

Type locality: Huntsville, Ala.

AMNICOLA ONEIDA Pilsbry.

Amnicola oneida Pilsbry, Naut., XXXI, 1917, p. 46.

Type locality: Oneida Lake, N. Y.

AMNICOLA PALLIDA Haldeman.

The figure given by Dall for this species (32, p. 117, fig. 85) is a copy of Binney's figure (No. 168) of *A. cincinnatiensis*.

AMNICOLA PARVA Lea.

Is a valid species. See Pilsbry, 92, p. 44.

AMNICOLA PILSBRYI Walker.

Amnicola parva Marsh, Con. Ex., II, 1888, p. 91.

Amnicola pilsbryi Walker, Naut., XIX, 1906, p. 116, pl. V, figs. 11 and 16.

Type locality: Rockford, Ills.

AMNICOLA SANCTIJOHANNIS Pilsbry.

Amnicola sanctijohannis Pilsbry, Naut., XIII, 1899, p. 20.

Type locality: St. John's River, Astor, Fla. Also Silver Spring Run, Marion Co., and Wekiva River, Fla.

AMNICOLA SCHROKINGERI Frauenfeld.

Amnicola schrokingeri Frauenfeld, Verh. der k. k. zool.-bot. Ges. Wien, 1863, p. 1030; Ibid, 1865, p. 528, pl. X.

Type locality: Massachusetts.

If the specimens from several localities in Maine are correctly identified, this species seems to be distinct from *limosa*, to which it is referred by Tryon (132, p. 52).

Closely related to, but very much smaller than *A. winkleyi* according to Pilsbry (102, p. 1).

AMNICOLA WALKERI Pilsbry.

Amnicola walkeri Pilsbry, Naut., XII, 1898, p. 43; Walker, Naut., XIX, 1906, p. 117, pl. V, fig. 12.

Type locality: High Island Harbor, Beaver Ids., Lake Michigan.

Range: Upper St. Lawrence drainage from Ottawa, Ont., to Lake Michigan.

AMNICOLA WINKLEYI Pilsbry.

Amnicola winkleyi Pilsbry, Naut., XXVI, 1912, p. 1, pl. I, figs. 9-10.

Type locality: Saco, Me.

Section CINCINNATIA Pilsbry, 1891.

AMNICOLA CINCINNATIENSIS (Anth.).

Amnicola scarboroughi Tryon MSS. is a synonym according to Tryon (132, p. 54).

Baker's remark (4, p. 336), that Binney's fig. 162 is an error is incorrect. That figure does not represent this species, but is the radula of *A. sayana* Anth. (*Pomatiopsis cincinnatiensis* Lea). The same author (loc. cit., pp. 335 and 343) has reversed the synonymy of the two species, which explains his remark that Haldeman's figures of the two species are interchanged.

The figure given for this species by Dall (32, p. 118, fig. 87) is also incorrect, being Binney's fig. 166 of *A. limosa*.

AMNICOLA EMARGINATA (Kuster).

Paludina obtusa Lea, Pr. Am. Phil. Soc., II, p. 34, (1841), non *P. obtusa* Phil. (1837).

Pauldina emarginata Kuster, Con. Cab., Paludina, 1852, p. 50, pl. 10, figs. 3-4.

Cincinnatia binneyana Hann., Pr. Mal. Soc. Lond., X, 1912, p. 190.

There seems to be no valid ground for the new name proposed by Hannibal.

AMNICOLA PERACUTA Pilsbry and Walker.

Amnicola peracuta Pilsbry and Walker, Pr. A. N. S. P., 1889, p. 88, pl. III, fig. 20.

Type locality: Spivey's Lake, Navarro Co., Texas.

Genus PALUDESTRINA d'Orbigny, 1841.

Bythinella Moq.-Tand, 1851.

Stimpsonia Clessin, Mal. Blätt., XXV, 1878, p. 151.

Except as noted, all the species referred to *Bythinella* by Binney belong to this genus.

PALUDESTRINA ACUTISSIMA "Whit." (Frauenfeld).

? *Ammicola acutissima* "Whit.", Frauenfeld, Verh. der k. k. Zool.-bot. Ges. Wien, 1863, p. 207.

Hydrobia acutissima "Whit.", Frauenfeld, Ibid, 1863, p. 1021.

Type locality: ?

Frauenfeld queries as to who "Whit." is. The fact that *Pal. emarginata* and other North American species are in the Cuming Collection named by "Whit." makes it a possibility that this is also an American species. It is possible that "Whit." stands for T. J. Whittemore, who was a well known collector in Massachusetts in 1840.

PALUDESTRINA ÆQUICOSTATA (Pilsbry).

Bythinella æquicostata Pilsbry, Pr. A. N. S. P., 1889, p. 86, pl. III, fig. 16.

Type locality: Sumpter Co. and Haulover Canal, Fla.

PALUDESTRINA ALDRICHI (Call and Beecher).

Bythinella aldrichi Call and Beecher, Bull. Wash. Coll., I, 1886, p. 190, pl. VII, figs. 11-14.

Type locality: Tributary of Black River, Reynolds Co., Mo.

PALUDESTRINA BREVISSIMA (Pilsbry).

Bythinella brevisissima Pilsbry, Naut., IV, 1890, p. 64.

Type locality: Haulover Canal, Indian River, Fla.

"HYDROBIA" CALIFORNICA Tryon.

Hydrobia californica Tryon, Am. J. of Con., I, 1865, p. 221, pl. 22, fig. 11.

Is an *Assimonia* according to Pilsbry (96, p. 123).

PALUDESTRINA CORRIGATA (Frauenfeld).

Hydrobia corrigata Frauenfeld, Verh. der k. k. Zool.-bot. Ges. Wien, 1863, p. 1021; Ibid, 1865, p. 525, pl. VIII.

Type locality: Boston, Mass.

PALUDESTRINA DIABOLI Pilsbry and Ferriss.

Paludestrina diaboli Pilsbry and Ferriss, Pr. A. N. S. P., 1906, p. 170, fig. 36.

Type locality: Devil's River, Val Verde, Texas. Also Rio San Filipe in the same county.

PALUDESTRINA HEMPHILLI (Pilsbry).

Bythinella hemphilli Pilsbry, Naut., IV, 1890, p. 63.

Type locality: Kentucky Ferry, Snake River, Idaho.

PALUDESTRINA IMITATOR Pilsbry.

Paludestrina imitator Pilsbry, Naut., XII, 1899, p. 124.

Type locality: Santa Cruz, Cal.

PALUDESTRINA LONGINQUA (Gould).

Ammicola longinqua Gould, Pr. B. S. N. H., V, 1855, p. 130.

Pomatiopsis intermedia Tryon, Am. J. of C., I, 1865, p. 220, pl. 22, fig. 8.

Bythinella intermedia Tryon, Mon., 1870, p. 49.

See Pilsbry, 96, p. 122.

PALUDESTRINA MINUTA (Totten).

Turbo minutus Totten, Am. Jour. Sci., O. S., XXVI, 1834, p. 369, fig. 6.

Cingula minuta Gould, Rep. Invert. Mass., 1841, p. 265, fig. 171.

Type locality: Mass. and Rhode Island.

This species is referred to *Paludestrina* by Pilsbry (99, p. 90).

PALUDESTRINA MONAS Pilsbry.

Paludestrina monas Pilsbry, Naut., XIII, 1899, p. 21.

Type locality: Wekiva River, Fla.

PALUDESTRINA MONROENSIS (Dall).

Bythinella monroensis Dall, Pr. U. S. Nat. Mus., VIII, 1885, p. 256, pl. 17, fig. 99.

Type locality: Brook from Benson's mineral spring into Lake Monroe, Enterprize, Fla.

PALUDESTRINA NICKLINIANA (Lea).

This species is the type of Clessin's genus *Stimpsonia*.

PALUDESTRINA NICKLINIANA ATTENUATA (Haldeman).

Ammicola attenuata Hald., Mon., pt. 4, 1842, p. 3 of wrapper; Mon., 1844, p. 22, pl. I, fig. 13.

Bythinella attenuata Binney, L. and F. W. Shells, pt. III, 1865, p. 68, fig. 132.

PALUDESTRINA PROTEA (Gld.).

Ammicola protea Gould, Pr. Bost. S. N. H., V, March, 1855, p. 129.

Melania exigua Conrad, Pr. A. N. S. P., April, 1855, p. 269.

Tryonia protea Binney, L. and F. W. Shells, III, 1865, p. 72, fig. 140.

Bythinella protea Stearns, N. Am. Fauna, No. 7, Pt. II, 1893, p. 278.

Paludestrina protea Stearns, Pr. U. S. Nat. Mus., XXIV, 1901, p. 277, pl.

Hydrobia seemani Frauenfeld, Verh. der k. k. zool.-bot. Gesell. Wien, 1863, p. 1025; *Ibid*, 1865, p. 525, pl. VIII.

Bythinella seemani Pilsbry, N. Am. Fauna, No. 7, Pt. II, 1893, p. 278.

For an elaborate and fully illustrated account of the variation of this protean species, see Stearns' paper cited above.

PALUDESTRINA SALSA Pilsbry.

Paludestrina salsa Pilsbry, Naut., XIX, 1905, p. 90, pl. III, fig. 10.

Type locality: Cohasset, Mass., in brackish water.

PALUDESTRINA STEARNSIANA Pilsbry.

Paludestrina stearnsiana Pilsbry, Naut., XII, 1899, p. 124.

Type locality: Oakland, Cal. Also Marin, Tuolumne, Contra Costa and Santa Cruz Counties, Cal. Also Ash Canyon and Tanner Canyon, Huachuca Mts., Ariz., Pilsbry and Ferriss (106a, p. 516).

Genus TRYONIA Stimpson, 1865.

Pilsbry (96, p. 122), states that *Tryonia* is probably only a subgenus of *Paludestrina*.

TRYONIA CIATHRATA Stimpson.

This species, described from fossil specimens, has been found living in the Pahranaagat Valley, Nev. (Stearns, 123, p. 281).

Genus PYRGULOPSIS Call and Pilsbry, 1886.

Pyrgulopsis Call and Pilsbry. Pr. Davenport A. N. S., V, 1886, p. 9.

Type: *Pyrgula nevadensis* Stearns.

PYRGULOPSIS LETSONI (Walker).

Annicola letsoni Walker, Naut., XIV, p. 113 (1901); Letson, Bull. Buffalo Soc. Nat. Sci., VII, 1901, p. 241, fig. 165.

Type locality: Post-Glacial deposit, Goat Island, Niagara River, N. Y. Also fossil at Bowmanville, Ills. and living at La Plaisance Bay, Lake Erie, Monroe Co., Mich.

Goodrich (*in lit.*) has suggested that this species should be referred to *Pyrgulopsis* and I fully agree with him.

PYRGULOPSIS NEVADENSIS (Stearns).

Pyrgula nevadensis Stearns, Pr. A. N. S. P., 1883, p. 173, text fig.; Call and Beecher, Am. Nat., XVIII, 1884, pp. 851-855; Call and Pilsbry, Pr. Davenport Acad. Nat. Sci., V, 1886, p. 10, pl. II, figs. 1-10.

Type locality: Walker and Pyramid Lakes, Nev.

PYRGULOPSIS SCALARIFORMIS (Wolf).

Pyrgula scalariformis Wolf, Am. J. of Con., V, 1869, p. 198, pl. 17, fig. 3.

Pyrgulopsis scalariformis Shimek, Bull. Lab. Nat. Hist. St. Univ. Ia., II, 1892, p. 168, pl. xiii, figs. 3a-d.

Pyrgula scalariformis mississippiensis Pilsbry, Am. Nat., 1886, p. 5. No description.

Pyrgulopsis mississippiensis Call and Pilsbry, Pr. Davenport A. N. S., V, 1886, p. 13, pl. II, figs. 14-16; Walker, Naut., XIX, 1906, p. 116, pl. 5, fig. 15.

Type locality: Illinois River, Tazwell Co., Ills. Holocene.

According to Shimek (l. c.) *mississippiensis* is a synonym of *scalariformis*.

PYRGULOPSIS OZARKENSIS Hinkley,

Pyrgulopsis ozarkensis Hinkley, Pr. U. S. Nat. Mus., 49, 1915, p. 588, pl. 78, fig. 2.

Type locality: North Fork of White River, above Norfolk, Ark.

PYRGULOPSIS SHELDONI (Pilsbry).

Amnicola sheldoni Pilsbry, Naut., IV, 1890, p. 52.

Type locality: Lake Michigan, Racine, Wis.

This species seems to be a *Pyrgulopsis* rather than an *Amnicola*.

PYRGULOPSIS WABASHENSIS Hinkley.

Pyrgulopsis wabashensis Hinkley, Naut., XXI, 1908, p. 117.

Type locality: Wabash River, The Chains, Posey Co., Ind.

Genus POTAMOPYRGUS Stimpson, 1865.

POTAMOPYRGUS CORONATUS (Pfeiffer).

Paludina coronata Pfeiffer, Wieg. Archiv., I, 1840, p. 253.

Type locality: Cuba.

Listed from Miami River, Fla., by Rhoads (113, p. 47).

POTAMOPYRGUS SPINOSUS (Call and Pilsbry).

Pyrgulopsis spinosa Call and Pilsbry, Pr. Davenport A. N. S., V., 1886, p. 14, pl. II, fig. 17-19.

Hydrobia texana Pilsbry, Ibid, V, 1886, p. 33, pl. III, fig. 1-6.

Type locality: *spinosa*, Comal Creek, Texas; *texana*, Guadelupe River and Comal Creek, Tex.

According to Pilsbry (91, p. 327) this species is a *Potamopyrgus* and is doubtfully distinct from *coronatus*. *Texana* is the ecarinate form.

Genus LITTORIDINA Souleyet, 1852.

LITTORIDINA MONROENSIS (Frauenfeld).

Hydrobia monroensis Frauenfeld, Verh. der k. k. Zool.-bot. Gesell. Wien, 1863, p. 1023; Pilsbry, Pr. A. N. S. P., 1889, p. 88, pl. III, figs. 17-19.

Bythinella monroensis Tryon, Mon. 1870, p. 48.

Type locality: Lake Monroe, Fla.

The generic position of this species, which was doubtfully referred to *Littoridina* by Pilsbry (94, p. 22) has since been confirmed by him. It is not the *Bythinella monroensis* of Dall (28, p. 256).

Subfamily LYTHOGLYPHINÆ Fischer, 1885.

Genus COCHLIOPA Stimpson, 1865.

COCHLIOPA ROWELLI Tryon.

The occurrence of this species in California is considered doubtful by Pilsbry (100, p. 91) and by Pilsbry and Ferriss (106, p. 172). Rowell however insists that the types were collected by him "near Baulinas Bay (not Clear Lake), Marin Co., Cal." (114, p. 10).

It is known to inhabit Nicaragua.

COCHLIOPA RIOGRANDENSIS Pilsbry and Ferriss.

Cochliopa riograndensis Pilsbry and Ferriss, Pr. A. N. S. P., 1906, p. 171, pl. IX, figs. 10-13.

Type locality: Rio San Filipe, near the Rio Grande, Val Verde Co., Texas. Also Devil's River in the same county.

Genus FLUMINICOLA Stimpson, 1865.

Hannibal (53, p. 186) has proposed a new subgenus *Heathella*, "readily distinguished by its globose form," having *F. seminalis* Hds. as the type and including *F. fusca*, *merriami*, *erythropoma*, *columbiana* and *minutissima*.

FLUMINICOLA COLUMBIANA Hemphill.

Fluminicola columbiana "Hemphill," Pilsbry, Naut., XII, 1899, p. 125; Pr., U. S. Nat. Mus., XXIV, 1901, p. 285, fig. 3.

Type locality: Columbia River, Washington, near Wallula and near mouth of Snake River; Snake River, near Weiser, Idaho.

FLUMINICOLA ERYTHROPOMA Pilsbry.

Fluminicola fusca minor Stearns, N. Amer. Fauna, No. 7, Pt. II, 1893, p. 282. No description.

Fluminicola erythropoma Pilsbry, Naut., XII, 1899, p. 125.

Type locality: Ash Meadows, Nye Co., Nev.

FLUMINICOLA MERRIAMI Pilsbry and Beecher.

Fluminicola merriami Pilsbry and Beecher, Naut., V, 1892, p. 143; Stearns, N. Am. Fauna, No. 7, pt. II, 1893, p. 282, fig. 2.

Type locality: Pahrnagat Valley, Nev.

FLUMINICOLA MINUTISSIMA Pilsbry.

Fluminicola minutissima Pilsbry, Naut., XXI, 1907, p. 76, pl. IX, fig. 1.

Type locality: Price Valley, Weiser Canyon, Washington Co., Idaho.

FLUMINICOLA MODOCI Hannibal.

Fluminicola modoci Hannibal, Pr. Mal. Soc. Lond., X, 1912, p. 187, pl. VII, fig. 30.

Type locality: Fletcher's Spring, south end of Goose Lake, Cal.

FLUMINICOLA NEVADENSIS Walker.

Fluminicola nevadensis Walker, Occ. Pap. Mus. Zool., Univ. Mich., No. 29, 1916, p. 6, text-fig.

Type locality: Cortez foot-hills, Humboldt Valley, Elko Co., Nev.

FLUMINICOLA SEMINALIS (Hinds).

Paludina seminalis Hinds, Voy. Sulphur, 1844, p. 59, pl. 16, fig. 22.

Lithoglyphus cumingii Frauenfeld, Verh. der k. k. Zool.-bot. Ges. Wien., 1863, p. 195; *Ibid*, 1865, p. 530, pl. XI.

Amnicola tubiniformis Tryon, A. J. of Con., I, 1865, p. 219, pl. 22, fig. 5.

Type locality: *seminalis*, Sacramento River, Cal.

cumingii, California.

tubiniformis, Crane Lake Valley and Surprise Valley, Cal.

This synonymy is according to Pilsbry (96, p. 123).

FLUMINICOLA SEMINALIS DALLI (Call).

Amnicola dalli Call, Bull. U. S. Geol. Surv., No. XI, 1884, p. 45, pl. VII, figs. 4-6.

Fluminicola seminalis dalli Pilsbry, Naut., XIII, 1899, p. 123.

Type locality: Mountain streams near Pyramid Lake, Nev.

Genus SOMATOGYRUS Gill, 1863.

For a description of the peculiar apical sculpture of this genus, see Walker, 156.

SOMATOGYRUS ALDRICHI Walker.

Somatogyrus aldrichi Walker, Naut., XIX, 1901, p. 114, pl. V, fig. 9.

Type locality: Coosa River, Chilton Co., Ala.

SOMATOGYRUS AMNICOLOIDES Walker.

Somatogyrus amnicoloides Walker, Naut., XXIX, 1915, p. 52, fig. 3.

Type locality: Ouachita River, Arkadelphia, Ark.

SOMATOGYRUS AUREUS Tryon.

Somatogyrus aureus Tryon, A. J. of Con., I, 1865, p. 220, pl. 22, fig. 9.

Type locality: Tennessee River.

SOMATOGYRUS BIANGULATUS Walker.

Somatogyrus biangulatus Walker, Naut., XIX, 1906, p. 99, pl. V, fig. 6.

Type locality: Tennessee River, Florence, Ala.

SOMATOGYRUS CONSTRICTUS Walker.

Somatogyrus constrictus Walker, Naut., XVII, 1904, p. 135, pl. V, fig. 3.

Type locality: Coosa River, Wetumpka, Ala.

SOMATOGYRUS COOSAENSIS Walker.

Somatogyrus coosaensis Walker, Naut., XVII, 1904, p. 137, pl. V, figs. 6-8.

Type locality: Coosa River, Wetumpka, Ala.

SOMATOGYRUS CRASSILABRIS Walker.

Somatogyrus crassilabris Walker, Naut., XXIX, 1915, p. 53, fig. 4; Hinkley, Pr. U. S. Nat. Mus., XLIX, 1915, p. 589, pl. 78, fig. 1.

Type locality: North Fork of White River, Norfolk, Ark.

SOMATOGYRUS CRASSUS Walker.

Somatogyrus crassus Walker, Naut., XVII, 1904, p. 138, pl. V, figs. 11-12.

Type locality: Coosa River, Wetumpka, Ala.

SOMATOGYRUS CURRIERIANUS (Lea).

Annicola currieriana Lea, Pr. A. N. S. P., 1863, p. 118; Jour. A. N. S. P., VI, 1866, p. 186, pl. XXII, fig. 118; Lea, Obs., XI, 1866, p. 142, pl. XXII, fig. 118.

Somatogyrus currierianus Walker, Naut., XVII, 1904, p. 137, pl. II, figs. 8-9.

Type locality: Huntsville, Ala.

SOMATOGYRUS DECIPIENS Walker.

Somatogyrus decipiens Walker, Naut., XXII, 1909, p. 80, pl. I, figs. 10-11.

Type locality: Coosa River, The Bar, Chilton Co., Ala.

SOMATOGYRUS EXCAVATUS Walker.

Somatogyrus excavatus Walker, Naut., XIX, 1906, p. 100, pl. V, fig. 7.
Type locality: Shoal Creek, Florence, Ala.

SOMATOGYRUS GEORGIANUS Walker.

Somatogyrus georgianus Walker, Naut., XVII, 1904, p. 139, pl. V, fig. 13.
Type locality: Chattooga River, Chattooga Co., Ga.

SOMATOGYRUS HENDERSONI Walker.

Somatogyrus hendersoni Walker, Naut., XXII, 1909, p. 87, pl. VI, fig. 2.
Type locality: Coosa River, Duncan's Riffle, Chilton Co., Ala.

SOMATOGYRUS HINKLEYI Walker.

Somatogyrus hinkleyi Walker, Naut., XVII, 1904, p. 135, pl. V, figs. 1-2;
Naut., XXII, 1909, p. 87, pl. VI, fig. 8-9.
Type locality: Coosa River, Wetumpka, Ala.

SOMATOGYRUS HUMEROSUS Walker.

Somatogyrus humerosus Walker, Naut., XIX, 1906, p. 98, pl. V, fig. 2.
Type locality: Tennessee River, Florence, Ala.

SOMATOGYRUS INTEGER (Say).

Includes *Paludina fontinalis* Phil. erroneously referred to *subglobosus* by Binney. Both *integer* and *fontinalis* are referred to *Lithoglyphus* by Frauenfeld (39, pp. 194 and 179).

SOMATOGYRUS NANUS Walker.

Somatogyrus nanus Walker, Naut., XVII, 1904, p. 136, pl. V, fig. 4.
Type locality: Coosa River, Wetumpka, Ala.

SOMATOGYRUS OBTUSUS Walker.

Somatogyrus obtusus Walker, Naut., XVII, 1904, p. 138, pl. V, fig. 10.
Type locality: Coosa River, Farmer, Ala.

SOMATOGYRUS PARVULUS Tryon.

Somatogyrus parvulus Tryon, A. J. of Con., I, 1865, p. 221, pl. 22, fig. 10.
Type locality: Powell's River, Tenn.

Binney's figure of "*Gillia* sp?" (L. and F. W. Shells, III, p. 115, fig. 230) is this species according to Tryon (131, p. 198).

SOMATOGYRUS PENNSYLVANICUS Walker.

Somatogyrus pennsylvanicus Walker, Naut., XVII, 1904, p. 140, pl. V, figs. 15-16; Naut., XIX, 1906, p. 116, pl. 5, figs. 17-18.

Type locality: Columbia, Pa. Also Potomac River, Harper's Ferry, Va.

SOMATOGYRUS PILSBRYANUS Walker.

Somatogyrus pilsbryanus Walker, Naut., XVII, 1904, p. 142, pl. V, figs. 20-21.

Type locality: Tallapoosa River, Tallassee, Ala.

SOMATOGYRUS PUMILUS (Conrad).

Anculotus pumilus Conrad, New F. W. Shells, 1834, p. 62; Binney, L. and F. W. Shells, III, 1865, p. 80.

Anculosa pumila Conrad, A. J. of Con., II, 1866, p. 278, pl. XV, fig. 5.

Somatogyrus pumilus Walker, Naut., XIX, 1906, p. 115, pl. V, fig. 10.

Type locality: Black Warrior River, Ala. Also Cahatchee Creek, Shelby Co., Ala.

In his original description, Conrad quotes his species from Bayou Teche, La., but for some reason did not in his subsequent one in 1866.

SOMATOGYRUS PYGMÆUS Walker.

Somatogyrus pygmæus Walker, Naut., XXII, 1909, p. 88, pl. VI, fig. 3.

Type locality: Coosa River, The Bar, Chilton Co., Ala.

SOMATOGYRUS QUADRATUS Walker.

Somatogyrus quadratus Walker, Naut., XIX, 1906, p. 98, pl. V, figs. 3-4.

Type locality: Tennessee River, Florence, Ala.

SOMATOGYRUS SARGENTI Pilsbry.

Somatogyrus sargenti Pilsbry, Naut., VIII, 1895, p. 102; Walker, Naut., XVII, 1904, p. 139, pl. V, fig. 14.

Type locality: Mud Creek, a tributary of the Tennessee River, Ala.

SOMATOGYRUS STRENGI Pilsbry and Walker.

Somatogyrus strengi Pilsbry and Walker, Naut., XIX, 1906, p. 99, pl. V, fig. 5.

Type locality: Tennessee River, Florence, Ala. Also Wabash River, Posey Co., Ind.

SOMATOGYRUS SUBGLOBOSUS (Say).

Subglobosus (1825) has priority over *isogonus* (1829). *Paludina fontinalis* Phil. doubtfully referred to this species by Binney is a synonym of *integer* Say.

SOMATOGYRUS SUBSTRIATUS Walker.

Somatogyrus substriatus Walker, Naut., XIX, 1906, p. 97, pl. V, fig. 5.
Type locality: Tennessee River, Florence, Ala.

SOMATOGYRUS TENNESSEENSIS Walker.

Somatogyrus tennesseensis Walker, Naut., XIX, 1906, p. 114, pl. V, fig. 8.
Type locality: Shoal Creek, Florence, Ala.

SOMATOGYRUS TROTHIS Doherty.

Somatogyrus trothis Doherty, Quar. J. of Con., I, 1878, p. 341, pl. IV, fig. 1.
Type locality: Ohio River, Campbell Co., Ky.

SOMATOGYRUS UMBILICATUS Walker.

Somatogyrus umbilicatus Walker, Naut., XVII, 1904, p. 137, pl. V, fig. 5.
Type locality: Coosa River, Wetumpka, Ala.

SOMATOGYRUS VIRGINICUS Walker.

Somatogyrus virginicus Walker, Naut., XVII, 1904, p. 141, pl. V, figs. 18-19.
Type locality: Barnard's Ford, Rapidan River, Va.

SOMATOGYRUS WALKERIANUS Aldrich.

Somatogyrus walkerianus Aldrich, Naut., XVIII, 1905, p. 140, text-fig.
Type locality: Conecut (Conecuh?) River, Escambia Co., Ala.

SOMATOGYRUS WHEELERI Walker.

Somatogyrus wheeleri Walker, Naut., XXIX, 1915, p. 51, figs. 1-2.
Type locality: Ouachita River, Arkadelphia, Ark.

Genus GILLIA Stimpson, 1865.

GILLIA WETHERBYI (Dall).

Hydrobia ? *wetherbyi* Dall, Pr. U. S. Nat. Mus., 1885, p. 258, pl. XVII,
fig. 10.

? *Ammicola nuttalliana* Frauenfeld, Verh. der k. k. Zool.-bot. Ges. Wien,
1863, p. 1029.

Type locality: Lake Eustis, Fla.

Genus CLAPPIA Walker, 1909.

Clappia Walker, Naut., XXII, 1909, p. 89.

Type: *Clappia clappi* Walker.

CLAPPIA CLAPPI Walker.

Clappia clappi Walker, Naut., XXII, 1909, p. 89, pl. VI, figs. 1, 4 and 7.
Type locality: Coosa River, Duncan's Riffle, Chilton Co., Ala.

Subfamily LYOGYRINÆ Pilsbry, 1916.

Genus LYOGYRUS Gill, 1863.

LYOGYRUS BROWNII (Carpenter).

Amnicola brownii Carpenter, Central Falls (R. I.) Weekly Visitor, April, 1872.

Valvata (Lyogyrus) brownii Carpenter, Naut., III, 1889, p. 69.

Type locality: Cunliff's Pond, Elmville, R. I.

The citation of this species from Minnesota by Sargent (115, p. 126) is no doubt erroneous.

LYOGYRUS DALLI Pilsbry and Beecher.

Lyogyrus dalli Pilsbry and Beecher, Naut., VI, 1892, p. 62.

Type locality: Wekiva River, Fla.

LYOGYRUS GRANUM (Say).

Paludina grana Say, J. A. N. S. P., II, 1822, p. 378.

Amnicola granum W. G. Binney, L. and F. W. Shells, III, 1865, p. 86, fig. 170.

This species is known only from the Atlantic drainage in southeastern Pennsylvania and New Jersey. Western records for it and *L. brownii* are in all probability based upon some of the smaller species of *Amnicola*.

LYOGYRUS LEHNERTI Ancey.

Lyogyrus lehnerti Ancey, Con. Ex., II, 1887, p. 79.

Type locality: Potomac River, Washington, D. C.

According to Pilsbry (87, p. 113) and part of the original lot in my collection, this is a reversed *Amnicola limosa* Say.

Genus HORATIA Bourguignat, 1887.

Horatia Bourguignat, Etude sur les noms gen. des petites Paludinidees &c., 1887, p. 47.

Westerlund (163, 4th Supp., p. 23) remarks that these small shells have the form of the smallest Pseudamnicolas, the structure of Lithoglyphus, the color of many Bythinellas and are allied to the Valvatas in their operculum. Typical *Horatia* is not represented in the North American fauna.

Subgenus HAUFFENIA Pollonera, 1898.

Hauffenia Pollonera, Boll. Mus. Zool. ed. Anat. Comp. Univ. Torino, XIII, 1898, p. 3.

HORATIA (HAUFFENIA) MICRA (Pilsbry and Ferriss).

Valvata micra Pilsbry and Ferriss, Pr. A. N. S. P., 1906, p. 172, pl. IX, figs. 7-9.

Horatia (Hauffenia) micra Pilsbry, Naut., XXX, 1916, p. 83.

Type locality: Guadalupe River, New Braunfels, Texas.

HORATIA MICRA NUGAX (Pilsbry and Ferriss).

Valvata micra nugax Pilsbry and Ferriss, Pr. A. N. S. P., 1906, p. 173, pl. IX, fig. 6.

Horatia (Hauffenia) micra nugax Pilsbry, Naut., XXX, 1916, p. 83.

Type locality: Guadalupe River, New Braunfels, Texas.

Subfamily POMATIOPSINÆ Stimpson, 1865.

Genus POMATIOPSIS Tryon, 1862.

POMATIOPSIS BINNEYI Tryon.

Pomatiopsis binneyi Tryon, Pr. A. N. S. P., 1863, p. 148, pl. I, fig. 10.

Bythinella binneyi W. G. Binney, L. and F. W. Shells, III, 1865, p. 69, figs. 136-137.

This species is a true *Pomatiopsis* according to Pilsbry (96, p. 123).

POMATIOPSIS CALIFORNICA Pilsbry.

Pomatiopsis californica Pilsbry, Naut., XII, 1899, p. 126.

Type locality: San Francisco, Cal.

POMATIOPSIS CININNATIENSIS (Lea).

Cyclostoma cincinnatiensis Lea, Pr. Am. Phil. Soc., I, 1840, p. 289.

Amnicola sayana "Anthony" Haldeman, Mon., 1844, p. 19, pl. I, fig. 11.

This species having proved to be a *Pomatiopsis*, Lea's name takes precedence over that of Anthony which was proposed on the supposition that the species was an *Amnicola*.

Baker (4, p. 343) has erroneously attributed the species to Anthony and his description, figures and synonymy are those of *Amnicola cincinnatiensis* Anth.

POMATIOPSIS HINKLEYI Pilsbry, Naut., X, 1896, p. 37.

Type locality: Black Falls, Florence, Ala.

POMATIOPSIS LAPIDARIA (Say).

Paludina lustrica Say, quoted as *Amnicola lustrica* by Haldeman and authors generally and as *Pomatiopsis lustrica* by Binney according to Pilsbry (89, p. 53) is the young of this species.

POMATIOPSIS ROBUSTA Walker.

Pomatiopsis robusta Walker, Naut., XXI, 1908, p. 97, text-fig.

Type locality: Jackson Lake, Wyo.

PLEUROCERIDÆ.

It has been suggested that the family name should be properly *Pleuroceratidæ*. But Stejneger (Herpetology of Japan, Bull. 58, U. S. Nat. Mus., p. 24) in a similar case has decided that the change is not necessary.

The errata given by Tryon on p. 427 of his "Strepomatidæ" are not included in his index and have, therefore, been noted under the several species as they are likely to be overlooked.

Pilsbry (Pilsbry and Rhoads, 111, p. 496) has proposed the following rearrangement of this family:

Genus IO Lea.

Type *Fusus fluvialis* Say.

Genus LITHASIA Haldeman.

Type *Anculosa (Lithasia) geniculata* Hald.

Section ANGITREMA Haldeman.

Type *Melania armigera* Say.

Genus PLEUROCERA Rafinesque.

Type ?

Section STREPHOBASIS Lea.

Types *S. spillmani*, *cornea* and *clarkii* Lea (all = *plena* Anth.)

Genus ELIMIA H. and A. Adams.

Type *Melania acutocarinata* Lea.

Genus GYROTOMA Shuttleworth.

Genus ANCULOSA Say.

Dr. Pilsbry has more recently decided that *Goniobasis* should be restored to its former position as a generic term, on the ground that *Elimia* was a composite group.

It will be noticed that no mention is made of *Eurycalon* in this arrangement. While, as Tryon remarks (134, p. 341), the genus as aggregated by him is made up of incongruous elements and upon a revision of the family will no doubt be dismembered, the typical group, of which *anthonyi* and *crassa* are leading terms form a very distinct group, which seems entitled to recognition.

Genus LITHASIA Haldeman, 1840.

LITHASIA CURTA Lea.

Lithasia curta Lea, Pr. A. N. S. P., 1868, p. 153; Lea, Jour. A. N. S. P., VI, 1868, p. 340, pl. 54, fig. 24; Obs., XII, 1868, p. 100, pl. 54, fig. 24.

Type locality: Northern Alabama and Tuscumbia.

LITHASIA CYLINDRICA Lea.

Lithasia cylindrica Lea, Pr. A. N. S. P., 1866, p. 133; Jour. A. N. S. P., VI, 1868, p. 341, pl. 54, fig. 26; Obs., XII, 1868, p. 101, pl. 54, fig. 26.

Type locality: Coosa River, Ala.

LITHASIA OBOVATA (Say).

Pilsbry (101, p. 47) has figured the operculum of this species.

For an account of the early stages of growth in this species, see Walker, No. 143.

LITHASIA OBOVATA BICONICA Pilsbry.

Lithasia obovata biconica Pilsbry, 27th Ann. Rep. Dep't. Geol. & Nat. Resc. Ind., 1908, p. 604, fig. 23a.

Type locality: Wabash River, Gibson Co., Ind.

LITHASIA PLICATA Wetherby.

Lithasia plicata Wetherby, Jour. Soc. N. H. Cin., 1876, p. 9, pl. I, fig. 1.

Type locality: Green River, Jackson Co., Ky.

LITHASIA PURPUREA Lea.

Lithasia purpurea Lea, Pr. A. N. S. P., 1868, p. 153; Jour. A. N. S. P., VI, 1868, p. 340, pl. 54, fig. 23; Obs., XII, 1868, p. 100, pl. 54, fig. 23.

Type locality: Cahawba River, Centreville, Bibb Co., Ala.

LITHASIA WHEATLEYI Lea.

Lithasia wheatleyi Lea, Pr. A. N. S. P., 1866, p. 133; Jour. A. N. S. P., VI, 1868, p. 341, pl. 54, fig. 25; Obs., XII, 1868, p. 101, pl. 54, fig. 25.

Type locality: Cahawba River, Ala.

Section ANGITREMA Haldeman, 1841.

LITHASIA ANGULATA (Wetherby).

Angitrema angulata Wetherby, Jour. Cin. Soc. N. H., 1876, p. 11, pl. I, fig. 5.

Type locality: Stone's River, Rutherford Co., Tenn.

LITHASIA PARVA (Wetherby).

Angitrema parva Wetherby, Jour. Cin. Soc. N. H., 1876, p. 9, pl. I, fig. 2.

Type locality: Stone's River, Rutherford Co., Tenn.

PLEUROCERA Rafinesque, 1818.

Pilsbry (105, p. 114) from a consideration of the literature concludes that the type of *Pleurocera* Raf. is *verrucosa* Raf. and that it consequently takes the place of *Angitrema* Hald. and that for this group *Ceriphasia* Sw. should be used. This has been controverted by Walker, No. 161, who argues that the type of *Pleurocera* had never been properly designated and designates *P. acuta* Raf. as the type, thus retaining the name for the group with which it has commonly been known. In a similar case, Dall (29, p. 1141) had already taken the same position as advocated by Walker.

PLEUROCERA ACUTA Rafinesque.

Pleurocera acuta Rafinesque, Enumeration and Account, 1831, p. 3; Walker, Occ. Pap. Mus. Zool., U. of M., No. 38, p. 8.

Is identical with and has precedence over *P. subulare* Lea and is the type of *Pleurocera* Raf. It includes according to Goodrich (49, p. 122) *tractum* Anth., *neglectum* Anth., *intensum* Rve., *pallidum* Lea and *labiatum* Lea.

PLEUROCERA AFFINE (Lea).

Trypanostoma affine Lea, Obs., XI, 1866, p. 101, pl. 23, fig. 57.

PLEUROCERA ALTIPETUM (Anthony).

Trypanostoma corneum Lea, Obs., XI, 1866, p. 104, pl. 23, fig. 63.

PLEUROCERA ALVEARE (Conrad).

Includes *P. plicatum* Tryon.

PLEUROCERA ARATUM (Lea).

Trypanostoma cinctum Lea, Obs., XI, 1866, p. 103, pl. 23, fig. 60.

PLEUROCERA BICINCTUM Tryon.

Pleurocera bicinctum Tryon, Am. J. of Con., II, 1866, p. 4, pl. II, fig. 2.
Type locality: Bridgeport, Ala.

PLEUROCERA CARINATUM (Lea).

Trypanostoma carinatum Lea, Obs., XI, 1866, p. 104, pl. 23, fig. 62.

This species as suggested by Tryon is probably the young of some other species. If, however, it should prove to be a valid one, it will have to be renamed as *Pleurocera* (*Strophobasis*) *carinatum* Lea has priority.

PLEUROCERA CASTANEUM (Lea).

Trypanostoma castaneum Lea, Pr. A. N. S. P., 1868, p. 152; Jour. A. N. S. P., VI, 1868, p. 338, pl. 54, fig. 20; Obs., XII, 1868, p. 98, pl. 54, fig. 20.

Type locality: Coosa River, Ala.

PLEUROCERA CURRIERIANUM (Lea).

Trypanostoma currierianum Lea, Obs., XI, 1866, p. 103, pl. 23, fig. 61.

PLEUROCERA CYLINDRACEUM (Lea).

Trypanostoma cylindraceum Lea, Obs., XI, 1866, p. 98, pl. 23, fig. 51.
Includes *P. roanense* Lea, according to Pilsbry (III, p. 498).

PLEUROCERA EXIMIUM (Anthony).

Has priority over *gradatum* (Anth.).

PLEUROCERA GLANDULUM (Anthony).

Is undoubtedly the young of one of the earlier described species of *Strophobasis* included in the synonymy of *plena*.

PLEUROCERA GRADATUM (Anthony).

Trypanostoma curtatum Lea, Jour. A. N. S. P., VI, 1866, p. 143, pl. 23, fig. 53; Obs., XI, 1866, p. 99, pl. 23, fig. 53.

PLEUROCERA LESLEYI (Lea).

Trypanostoma lesleyi Lea, Obs., XI, 1866, p. 102, pl. 23, fig. 59.

PLEUROCERA LEWISII (Lea).

As suspected by Tryon this form is only a striate variety of *elevatum*.

PLEUROCERA LYONII (Lea).

Trypanostoma lyonii Lea, Jour. A. N. S. P., VI, 1866, p. 144, pl. 23, fig. 55;
Obs., XI, 1866, p. 100, pl. 23, fig. 55.

PLEUROCERA NAPOIDEUM (Lea).

Trypanostoma napoideum Lea, Obs., XI, 1866, p. 99, pl. 23, fig. 54.

PLEUROCERA NUCIFORME (Lea).

Trypanostoma nuciforme Lea, Pr. A. N. S. P., 1868, p. 152; Jour. A. N. S. P., VI, 1868, p. 337, pl. 54, fig. 19; Obs., XII, 1868, p. 97, pl. 54, fig. 19.

Type locality: Connesauga Creek, Whitfield Co., Ga.

PLEUROCERA PUMILUM (Lea).

Is probably the young of some other species. If valid however, it will have to be renamed as *Pleurocera* (*Strophobasis*) *pumilum* Lea has priority, unless that too should prove to be a synonym.

PLEUROCERA ROANENSE (Lea).

Trypanostoma roanense Lea, Obs., XI, 1866, p. 98, pl. 23, fig. 52.

PLEUROCERA SUBROBUSTUM (Lea).

Trypanostoma subrobustum Lea, Obs., XI, 1866, p. 97, pl. 23, fig. 50.

PLEUROCERA TEREBRALE (Lea).

Trypanostoma terebrale Lea, Pr. A. N. S. P., 1868, p. 153; Jour. A. N. S. P., VI, 339, pl. 54, fig. 22; Obs., XII, 1868, p. 99, pl. 54, fig. 22.

Type locality: Jackson Co., Ala.

PLEUROCERA UNDULATUM (Say).

Includes *M. excurata* Con. and *rorata* Rve., *T. moniliferum* Lea and *spillmani* Lea, and *Io nobilis* Lea, *nodosa* Lea, *robusta* Lea and *variabilis* Lea according to Pilsbry (III, p. 497).

PLEUROCERA UNIVITTATUM (Lea).

Trypanostoma univittatum Lea, Obs., XI, 1866, p. 101, pl. 23, fig. 58.

PLEUROCERA VENUSTUM (Lea).

Trypanostoma venustum Lea, Pr. A. N. S. P., 1864, p. 12; Jour. A. N. S. P., VI, 1866, p. 149, pl. 23, fig. 66; Obs., XI, 1866, p. 107, pl. 23, fig. 66.

Type locality: Big Prairie Creek, Ala.

PLEUROCERA WHEATLEYI (Lea).

Trypanostoma wheatleyi Lea, Pr. A. N. S. P., 1868, p. 153; Jour. A. N. S. P., VI, 1868, p. 338, pl. 54, fig. 21; Obs., XII, 1868, p. 99, pl. 54, fig. 21.

Type locality: Coosa River, Ala.

Section STREPHOBASIS Lea, 1861.

PLEUROCERA CURTUM (Haldeman).

Dr. James Lewis (68, p. 224) suggested a long synonymy for this species, "not as being conclusive, but as being in many particulars deserving of inquiry". Tryon (133, p. 88) in a review of Lewis' paper, states that upon the invitation of Dr. Lea, he had re-examined the types of the species included in the proposed synonymy, which resulted in a renewed assurance that his original determinations respecting them were correct. Later, (Tryon, 134, p. 424) Lewis states that on reviewing the matter, he had ascertained "that one of Say's species (hitherto treated as superfluous) was really entitled to take precedence of *curtum*".

PLEUROCERA BITERNIATUM (Conrad).

According to Pilsbry (III, p. 499) *Strophobasis clarkii* Lea is not a synonym of this species, but of *plena* Anth.

PLEUROCERA LYONII (Lea).

Strophobasis lyonii Lea, Jour. A. N. S. P., VI, 1866, p. 151, pl. 23, fig. 65; Obs., XI, 1866, p. 107, pl. 23, fig. 65.

The figure given by Tryon (134, p. 46, fig. 93) for this species is erroneous and is that of *Eurycaelon umbonatum* (loc. cit. fig. 658).

If *Pleurocera (Trypanostoma) lyonii* Lea is a valid species, it has priority over this one, which, if also a valid species, will have to have a new name. But in the present chaotic state of our knowledge of the family, it does not seem advisable to propose one until the double question of synonymy is definitely settled.

PEUROCERA PLENUM (Anthony).

Includes *clarkii* (Lea), *corneum* (Lea) and *spillmani* (Lea) according to Pilsbry (III, p. 499) and *P. glandulum* (Anth.).

"STREPHORASIS" HARTMANIANA Lea MSS.

Is listed by Lewis (l. c.) among the probable synonyms of *P. curtum* (Hald.). It does not appear to have ever been described.

Genus GONIOBASIS Lea, 1862.

Hannibal (53, p. 179) has designated *G. osculata* Lea as the generic type.

GONIOBASIS ACUTIFILOSA (Stearns).

Melania (? *Goniobasis*) *acutifilosa* Stearns, Pr. U. S. Nat. Mus., XIII, 1890, p. 211, pl. XV, fig. 9.

Type locality: Eagle Lake, Cal.

GONIOBASIS ACUTIFILOSA SISKIYOUENSIS Pilsbry.

Goniobasis acutifilosa siskiyouensis Pilsbry, Naut., XIII, 1899, p. 65.

Type locality: Fall River, Siskiyou Co., Cal.

GONIOBASIS ALBANYENSIS Lea.

Goniobasis albanyensis Lea, Pr. A. N. S. P., 1864, p. 4; Jour. A. N. S. P., VI, 1866, p. 140, pl. 23, fig. 49; Obs., XI, 1866, p. 97, pl. 23, fig. 49.

Type locality: Albany and Blue Spring, Baker Co., Ga.

GONIOBASIS ARACHNOIDEA (Anthony).

Includes *baculum* Anth. according to Lewis (69, p. 114).

GONIOBASIS ARATA Lea.

Goniobasis arata Lea, Pr. A. N. S. P., 1868, p. 151; Jour. A. N. S. P., VI, 1868, p. 329, pl. 54, fig. 4; Obs., XII, 1868, p. 89, pl. 54, fig. 4.

Type locality: Connesauga Creek, Whitfield Co., Ga.

GONIOBASIS ATERINA Lea.

Goniobasis aterina Lea, Jour. A. N. S. P., VI, 1866, p. 136, pl. 23, fig. 42; Obs., XI, 1866, p. 92, pl. 23, fig. 42.

GONIOBASIS BACULOIDES Lea.

Goniobasis baculoides Lea, Pr. A. N. S. P., 1869, p. 125; Jour. A. N. S. P., VIII, 1874, p. 62, pl. 21, fig. 18; Obs., XIII, 1874, p. 66, pl. 21, fig. 18.

Type locality: Coosa River, Ala.

GONIOBASIS BIFASCIATA Lea.

Goniobasis bifasciata Lea, Pr. A. N. S. P., 1868, p. 151; Jour. A. N. S. P., VI, 1868, p. 331, pl. 54, fig. 7; Obs., XII, 1868, p. 91, pl. 54, fig. 7.

Type locality: Jackson Co., Ala.

GONIOBASIS BOYKINIANA (Lea).

Includes *hallenbeckii* Lea according to Pilsbry (90, p. 124). See also *catenaria*.

GONIOBASIS BULBOSA (Gould).

Includes *newberryi* Lea according to Pilsbry (95, p. 66).

GONIOBASIS CALIFORNICA (Clessin).

Melania californica Clessin, Mal. Blætt., V, 1882, p. 189, pl. 4, figs. 9-9.

Type locality: California.

See *nigrina*.

GONIOBASIS CATENARIA (Say).

Includes *G. subilirata* (Con.), *floridensis* (Rve.), *etowahensis* (Lea), *papillosa* (Anth.), and *downiciana* Lea and probably also *boykiniana* (Lea), *hallenbeckii* Lea, *bentonensis* Lea and *couperi* Lea, according to Pilsbry (90, p. 124).

GONIOBASIS CINGENDA Anthony.

Goniobasis cingenda Anthony, Am. J. Con., II, 1866, p. 146, pl. 7, fig. 3.

Type locality: North Carolina.

GONIOBASIS CIRCUMLINEATA Tryon.

Goniobasis circumlineata Tryon, Am. J. of Con., II, 1865, p. 244, pl. 24, figs. 14-15.

Type localities: Mission San Antonio, Shasta Co.; Pit River and Feather River, Cal.

Probably only a variety of *G. nigrina* according to Pilsbry (95, p. 66).

GONIOBASIS CLATHRATA Lea.

Goniobasis clathrata Lea, Pr. A. N. S. P., 1868, p. 151; Jour. A. N. S. P., VI, 1868, p. 331, pl. 54, fig. 8; Obs., XII, 1868, p. 91, pl. 54, fig. 8.

Type locality: Jackson Co., Ala.

GONIOBASIS CLAVULA Lea.

Goniobasis clavula Lea, Pr. A. N. S. P., 1868, p. 152; Jour. A. N. S. P., VI, 1868, p. 335, pl. 54, fig. 15; Obs., XII, 1868, p. 95, pl. 54, fig. 15.

Type locality: Jackson Co., Ala.

GONIOBASIS COCHLIARIS Lea.

Goniobasis cochliaris Lea, Pr. A. N. S. P., 1868, p. 152; Jour. A. N. S. P., VI, 1868, p. 336, pl. 54, fig. 16; Obs., XII, 1868, p. 96, pl. 54, fig. 16.

Type locality: Shelby Co., Ala.

GONIOBASIS COLUMBIENSIS Whiteaves.

Goniobasis columbiensis Whiteaves, Naut., XIX, 1905, p. 61, pl. II, figs. 11-12.

Type locality: Upper Columbia River, B. C.

This is probably only a form of *livescens*.

GONIOBASIS COMALENSIS Pilsbry.

Goniobasis pleuristriatus comalensis Pilsbry, Naut., IV, 1890, p. 49.

Goniobasis comalensis Pilsbry and Ferriss, Pr. A. N. S. P., 1906, p. 167, fig. 24-31.

Type locality: Comal Creek, New Braunfels, Texas.

Melania pleuristriata Say is a *Pachycheilus* and is not found in Texas. All the Texan records of that species refer to *comalensis*.

The var. *marmocki* mentioned, but not described by Wetherby (Am. Nat. XII, 1868, p. 254) seems to have been abandoned by him. His shells came from Helotes, Bexar Co., Texas and the set of "*pleuristriata*" in his collection, now in my possession, includes both the striate and smooth forms. There are none labelled var. *marmocki*.

GONIOBASIS COMALENSIS FONTINALIS Pilsbry and Ferriss.

Goniobasis comalensis fontinalis Pilsbry and Ferriss, Pr. A. N. S. P., 1906, p. 168, figs. 32-35.

Type locality: Spring, New Braunfels, Texas.

GONIOBASIS CONNESAUGAENSIS Lea.

Goniobasis connesaugaensis Lea, Pr. A. N. S. P., 1868, p. 152; Jour. A. N. S. P., VI, 1868, p. 333, pl. 54, fig. 11; Obs., XII, 1868, p. 93, pl. 54, fig. 11.

Type locality: Connesauga Creek, Whitfield Co., Ga.

GONIOBASIS CONTIGUA Lea.

Goniobasis contigua Lea, Pr. A. N. S. P., 1868, p. 152; Jour. A. N. S. P., VI, 1868, p. 334, pl. 54, fig. 12; Obs., XII, 1868, p. 94, pl. 54, fig. 12.

Type locality: Connesauga Creek, Whitfield Co., Ga.

GONIOBASIS CRANDALLI Pilsbry.

Goniobasis crandalli Pilsbry, Pr. A. N. S. P., 1890, p. 301, pl. V, fig. 4-5.

Type locality: Mammoth Spring, Ark.

GONIOBASIS CUMBERLANDENSIS Lea.

Goniobasis cumberlandensis Lea, Pr. A. N. S. P., 1863, p. 155; Jour. A. N. S. P., VI, 1866, p. 132, pl. 23, fig. 35; Obs., XI, 1866, p. 88, pl. 23, fig. 35.

Tryon (134, p. 272) considers this a synonym of *G. adusta* (Anth.), and erroneously quotes it as *G. cumberlandiensis*.

GONIOBASIS DECAMPII Lea.

Goniobasis decampii Lea, Jour. A. N. S. P., VI, 1866, p. 138, pl. 23, fig. 45; Obs., XI, 1866, p. 94, pl. 23, fig. 45.

GONIOBASIS DEPYGIS (Say).

Is considered a variety of *livescens* by Baker (4, p. 327) and Sterki (124A, p. 385), but is distinct.

GONIOBASIS EMERYENSIS Lea.

Goniobasis emeryensis Lea, Pr. A. N. S. P., 1864, p. 3; Jour. A. N. S. P., VI, 1866, p. 127, pl. 23, fig. 43; Obs., XI, 1866, p. 93, pl. 23, fig. 43.

Type locality: Rocky Creek, Head Branch of Emery River, Tenn.

GONIOBASIS FRATERNA Lea.

Goniobasis fraterna Lea, Pr. A. N. S. P., 1864, p. 111; Jour. A. N. S. P., VI, 1866, p. 139, pl. 23, fig. 46; Obs., XI, 1866, p. 95, pl. 23, fig. 46.
Type locality: Bibb Co. and Cahawba River, Ala.

GONIOBASIS GESNERI Lea.

Goniobasis gesneri Lea, Pr. A. N. S. P., 1868, p. 151; Jour. A. N. S. P., VI, 1868, p. 330, pl. 54, fig. 5; Obs., XII, 1868, p. 90, pl. 54, fig. 5.
Type locality: Uchee River, Ala.

GONIOBASIS GOULDIANA Lea.

Goniobasis pulchella Lea, Pr. A. N. S. P., 1868, p. 151, *non pulchella* Anth. (1850).
Goniobasis gouldiana Lea, Jour. A. N. S. P., VI, 1868, p. 332, pl. 54, fig. 9; Obs., XII, 1868, p. 92, pl. 54, fig. 9.
Type locality: North Alabama.

GONIOBASIS GRANATOIDES Lea.

Goniobasis granatoides Lea, Pr. A. N. S. P., 1868, p. 152; Jour. A. N. S. P., VI, 1868, p. 335, pl. 54, fig. 14; Obs., XII, 1868, p. 95, pl. 54, fig. 14.
Type locality: Connesauga Creek, Whitfield Co., Ga.

GONIOBASIS INDIANENSIS Pilsbry.

Goniobasis indianensis Pilsbry, 27th Ann. Rep. Dep't. Geol. and Nat. Res. Ind., 1903, p. 606, fig. 28.
Type locality: Blue River, Wyandotte, Crawford Co., Ind.

GONIOBASIS LÆVIGATA (Lea).

This species, if a valid one, will have to be called *leaii* Brot as *Melania lævigata* is preoccupied by Lamarck.

GONIOBASIS LAQUEATA (Say).

Includes *deshayesiana* (Lea) and "probably" also *cerea*, *corrugata*, *costulata*, *cinerella*, *circincta*, *lyonii*, *plicatula*, *rugosa* and *sparus*, all of Lea and *athleta* and *glauca* of Anthony according to Pilsbry (III, p. 499).

GONIOBASIS LAWRENCEI Lea.

Goniobasis lawrencei Lea, Pr. A. N. S. P., 1869, p. 125; Jour. A. N. S. P., VIII, 1874, p. 62, pl. 21, fig. 17; Obs., XIII, 1874, p. 66, pl. 21, fig. 17.
Type locality: Washita River, Hot Springs, Ark.

GONIOBASIS LUTEOCELLA Lea.

Goniobasis luteocella Lea, Pr. A. N. S. P., 1868, p. 151; Jour. A. N. S. P., VI, 1868, p. 332, pl. 54, fig. 10; Obs., XII, 1868, p. 92, pl. 54, fig. 10.
Type locality: Connesauga Creek, Whitfield Co., Ga. and Oconee River.

GONIOBASIS MILESII Lea.

Goniobasis milesii Lea, Jour. A. N. S. P., VI, 1866, p. 135, pl. 23, fig. 40; Obs., XI, 1866, p. 90, pl. 23, fig. 40.

GONIOBASIS MURRAYENSIS Lea, Pr. A. N. S. P., 1868, p. 152; Jour. A. N. S. P., VI, 1868, p. 334, pl. 54, fig. 13; Obs., XII, 1868, p. 92, pl. 54, fig. 13.

Type locality: Swamp Creek, Whitfield Co., Ga.

GONIOBASIS NIGRINA Lea.

Includes *californica* (Cless.) and *draytonii* Lea and perhaps should be included in *bulbosa* (Gld.) according to Pilsbry (95, p. 66).

GONIOBASIS ORNATA Lea.

Goniobasis ornata Lea, Pr. A. N. S. P., 1868, p. 152; Jour. A. N. S. P., VI, 1868, p. 337, pl. 54, fig. 18; Obs., XII, 1868, p. 97, pl. 54, fig. 18.
Type locality: Connesauga Creek, Whitfield Co., Ga.

GONIOBASIS OSCULATA Lea.

Erroneously printed as "*inosculata*" by Tryon (134, p. 302) but corrected in the errata. Is the type by designation of *Goniobasis* Lea.

GONIOBASIS OZARKENSIS Call.

Goniobasis ozarkensis Call, Bull. Washburne Coll., I, 1886, p. 189, pl. 7, fig. 1-10.
Type locality: Blue Spring, Shannon Co., Mo.

GONIOBASIS PENNSYLVANICA Pilsbry.

Goniobasis pennsylvanica Pilsbry, Naut., XXX, 1916, p. 4.
Type locality: Ohio River, Coraopolis, Pa.

GONIOBASIS PLEBEIUS Anthony.

Is a valid species and includes *cubicoides* (Anth.) according to Pilsbry (97, p. 458).

GONIOBASIS PLICATA-STRIATA Wetherby.

Goniobasis plicata-striata Wetherby, Jour. Cin. Soc. Nat. Hist., 1876, p. 10, pl. I, fig. 3.

Type locality: Stone River and Mill Creek, Rutherford Co. and Sinking Creek, Shelbyville, Tenn.

GONIOBASIS PLICIFERA Lea.

Includes *silicula* (Gld.), *rudens* (Rve.), *bairdiana* Lea and *shastensis* (Lea) according to Pilsbry (95, p. 66).

GONIOBASIS PLICIFERA BULIMOIDES Tryon.

Goniobasis plicifera bulimoides Tryon, Am. J. of Con., I., 1865, p. 238, pl. 24, figs. 5-6.

Type locality: Wahlamat River, Ore.

GONIOBASIS PLICIFERA OREGONENSIS Tryon.

Goniobasis plicifera oregonensis Tryon, Am. J. of Con., I., 1865, p. 238, pl. 24, fig. 4.

Type locality not specified.

GONIOBASIS PORRECTA Lea.

Goniobasis porrecta Lea, Jour. A. N. S. P., VI, 1866, p. 139, pl. 23, fig. 47; Obs., XI, 1866, p. 25, pl. 23, fig. 47.

GONIOBASIS PROXIMA (Say).

Includes *symmetrica* as a variety according to Pilsbry (111, p. 499).

Reeve in his errata states that the shell figured by him (Fig. 275) as this species does not represent it according to Anthony. The figure is not cited by Tryon and has not, apparently, been identified.

GONIOBASIS PULLA Lea.

Goniobasis pulla Lea, Pr. A. N. S. P., 1864, p. 112; Jour. A. N. S. P., VI, 1866, p. 130, pl. 23, fig. 32; Obs., XI, 1866, p. 86, pl. 23, fig. 32.

Type locality: Cumberland Gap, Tenn.

GONIOBASIS PUPÆFORMIS Lea.

Goniobasis pupæformis Lea, Pr. A. N. S. P., 1864, p. 112; Jour. A. N. S. P., VI, 1866, p. 130, pl. 23, fig. 31; Obs., XI, 1866, p. 86, pl. 23, fig. 31.

Type locality: Coosa River, Ala.

GONIOBASIS ROMÆ Lea.

Goniobasis romæ Lea, Pr. A. N. S. P., 1864, p. 111; Jour. A. N. S. P., VI, 1866, p. 129, pl. 23, fig. 3^c; Obs., XI, 1866, p. 85, pl. 23, fig. 3^d.

Type locality: Rome, Ga.

GONIOBASIS RUFESCENS (Lea).

Reeve in his errata states that he had been informed by Anthony that the shell figured by him as this species (Fig. 279) does not represent the species. This figure is not cited by Tryon and, apparently, has not been identified.

GONIOBASIS SIMILIS Lea.

Goniobasis similis Lea, Pr. A. N. S. P., 1868, p. 151; Jour. A. N. S. P., VI, 1868, p. 328, pl. 54, fig. 2; Obs., XII, 1868, p. 88, pl. 54, fig. 2.

Type locality: Connesauga Creek, Whitfield Co., Ga.

GONIOBASIS SMITHSONIANA Lea.

Goniobasis smithsoniana Lea, Pr. A. N. S. P., 1864, p. 112; Jour., A. N. S. P., VI, 1866, p. 137, pl. 23, fig. 44; Obs., XI, 1866, p. 93, pl. 23, fig. 44.

Type locality: North Georgia and East Tennessee.

GONIOBASIS STEARNSIANA Call.

Goniobasis stearnsiana Call, Pr. Davenport Acad. Nat. Sci., V, 1886, p. 6, fig. 43.

Type locality: Dyke's Creek, Floyd Co., Ga.

GONIOBASIS SUBRHOMBICA Lea.

Goniobasis subrhombica Lea, Pr. A. N. S. P., 1864, p. 111; Jour. A. N. S. P., VI, 1866, p. 132, pl. 23, fig. 34; Obs., XI, 1866, p. 88, pl. 23, fig. 34.

Type locality: Hog Creek, North Georgia.

GONIOBASIS SULCATA Lea.

Goniobasis sulcata Lea, Pr. A. N. S. P., 1868, p. 151; Jour. A. N. S. P., VI, 1868, p. 329, pl. 54, fig. 3; Obs., XII, 1868, p. 89, pl. 54, fig. 3.

Type locality: Cahawba River, Ala.

GONIOBASIS UNDULATA Tryon.

Goniobasis undulata Tryon, Am. J. of Con., II, 1866, pl. II, fig. 4.

Type locality: Georgia.

GONIOBASIS VENUSTA Lea.

Goniobasis venusta Lea, Pr. A. N. S. P., 1868, p. 152; Jour. A. N. S. P., VI, 1868, p. 336, pl. 54, fig. 17; Obs., XII, 1868, p. 96, pl. 54, fig. 17.

Type locality: Coosa River, Ala.

GONIOBASIS VERSA Lea.

Melania blanda Lea, Pr. A. N. S. P., 1861, p. 122, *non blanda* Lea (1841).

Goniobasis blanda Lea, Jour. A. N. S. P., V, 1863, p. 242, pl. 35, fig. 44; Obs., IX, 1863, p. 64, pl. 35, fig. 44.

Goniobasis versa Lea, Jour. A. N. S. P., VI, 1866, p. 127; Obs., XI, 1867, p. 93.

Goniobasis leai Tryon, L. and F. W. Shells, Pt. IV, 1873, p. 163, *non Brot* (1862-8).

Type locality: Yellowleaf Creek, Ala.

GONIOBASIS VIRGINICA Gmelin.

Add to the synonymy, *Gon. virginica bilirata* De Gregorio (35, p. 39).

GONIOBASIS VIRIDISTRIATA Lea.

Goniobasis viridistriata Lea, Pr. A. N. S. P., 1864, p. 4; Jour. A. N. S. P., VI, 1866, p. 140, pl. 23, fig. 48; Obs., XI, 1866, p. 96, pl. 23, fig. 48.

Type locality: Flint River, Ga.

GONIOBASIS WHEATLEYI Lea.

Goniobasis wheatleyi Lea, Pr. A. N. S. P., 1868, p. 151; Jour. A. N. S. P., VI, 1868, p. 328, pl. 54, fig. 1; Obs., XII, 1868, p. 88, pl. 54, fig. 1.

Type locality: Coosa River, Ala.

GONIOBASIS WHITFIELDENSIS Lea.

Goniobasis tenebrosa Lea, Pr. A. N. S. P., 1868, p. 151, *non Mel. tenebrosa* Lea (1841).

Goniobasis whitfieldensis Lea, Jour. A. N. S. P., VI, 1868, p. 330, pl. 54, fig. 6; Obs., XII, 1868, p. 90, pl. 54, fig. 6.

Type locality: Connesauga Creek, Whitfield Co., Ga.

Genus GYROTOMA Shuttleworth, 1845.

Schizostoma Lea (1842), *non* Brown (1835).

GYROTOMA LEWISII (Lea).

Schizotoma lewisii Lea, Pr. A. N. S. P., 1869, p. 125; Jour. A. N. S. P., VIII, 1874, p. 61, pl. 21, fig. 16; Obs., XIII, 1874, p. 65, pl. 21, fig. 16.

Type locality: Coosa River, Ala.

GYROTOMA SHOWALTERI (Lea).

Schizostoma showalteri Lea, Pr. A. N. S. P., 1864, p. 112; Jour. A. N. S. P., VI, 1866, p. 149, pl. 23, fig. 56; Obs., XI, 1866, p. 105, pl. 23, 56.

This is a different species from that described by Lea under the same name in 1860, which proved to be a synonym of *G. cariniferum* (Anth). The name being preoccupied, this species will have to be re-named, if it should prove to be a valid one on a revision of the genus.

GYROTOMA WHEATLEYI (Lea).

Schizostoma wheatleyi Lea, Pr. A. N. S. P., 1868, p. 153; Jour. A. N. S. P., VI, 1868, p. 342, pl. 54, fig. 27; Obs., XII, 1868, p. 102, pl. 54, fig. 27.

Type locality: Coosa River, Ala.

Genus ANCULOSA Say, 1821.

Pilsbry has recently come to the conclusion (105, p. 109) that *Leptoxis* Raf. should be preferred for this genus. In my paper on *Pleurocera* (161, p. 1) I reluctantly acquiesced in his conclusion on the ground that the question was zoological rather than one of Code construction. Since that time I have again gone carefully over the ground and have become satisfied that, if all incompetent evidence is eliminated, there is not sufficient grounds to justify the change. I have therefore retained Say's well known name for the genus.

ANCULOSA ARKANSENSIS Hinkley.

Anculosa arkansensis Hinkley, Pr. U. S. Nat. Mus., 49, 1915, p. 587, pl. 78, fig. 3.

Type locality: North Fork of White River, above Norfolk, Ark.

ANCULOSA DOWNIEI Lea.

Anculosa downiei Lea, Pr. A. N. S. P., 1868, p. 153; Jour. A. N. S. P., VI, 1868, p. 342, pl. 54, fig. 28; Obs., XII, 1868, p. 102, pl. 54, fig. 28.

Type locality: Connesauga Creek, Whitfield Co., Ga. and Coosa River, Ala.

ANCULOSA HARPETHENSIS Pilsbry.

Anculosa harpethensis Pilsbry, Pr. A. N. S. P., 1896, p. 499.

Type locality: Big Harpeth River, Bellevue, Tenn.

ANCULOSA MINOR Hinkley.

Anculosa minor Hinkley, Naut., XXVI, 1912, p. 47, pl. I, figs. 7-8.

Type locality: Tennessee River, Florence, Ala.

ANCULOSA SUBGLOBOSA Say.

Does not include *A. tintinnabulum* Lea and *virgata* Lea as stated by Tryon (134, p. 404). See Walker (150, p. 110).

ANCULOSA TINTINNABULUM Lea.

Is a valid species and does not include *virgata* Lea. See Walker (1. c.).

ANCULOSA TRYONI Lewis.

Anculosa tryoni Lewis, Am. J. of Con., VI, 1870, p. 221, pl. 12, fig. 8.

Type locality: Holston River, Tenn.

Tryon (133, p. 87) considers this to be the *teniata* Con., but the approximation is at the best very doubtful.

ANGULOSA UMBILICATA Wetherby.

Anculosa umbilicata Wetherby, Jour. Cin. Soc. Nat. Hist., 1876, p. 11, pl. I, fig. 4.

Type locality: Stone River, Rutherford Co., Tenn.

ANCULOSA VIRGATA Lea.

Is not the young of *tintinnabulum* as stated by Tryon (134, p. 404), but is a valid species. See Walker (150, p. 110).

Genus MESECHIZA Lea.

Has no standing. The type species is the young of *Angitrema ferrucosa*. See Hinkley (57, p. 56).

Family NERITIDÆ.

Genus NERITINA Lamarck, 1809.

NERITINA RECLIVATA Say.

v. Martens (73, p. 472) considers that this is only a variety of *N. lineolata* Lam.

NERITINA RECLIVATA PALMÆ Dall.

Neritina reclivata palmæ Dall, Pr. U. S. Nat. Mus., 1885, p. 259.

Type locality: Palma Sola, Fla.

Genus LEPYRIUM Dall, 1896.

Lepyrium Dall, Naut., X, 1896, p. 15.

Type: *Neritina showalteri* Lea.

LEPYRIUM SHOWALTERI CAHAWBENSIS Pilsbry.

Lepyrium showalteri cahawbensis Pilsbry, Naut., XX, 1906, p. 51.

Type locality: Cahawba River, Ala.

Class LAMELLIBRANCHIA.

Order EULAMELLIBRANCHIA.

Suborder SUBMYTILACEA.

Family MARGARITANIDÆ.

Ortmann (79, p. 223) has raised the genus *Margaritana* to the rank of a family and (80, p. 13) has proposed a new genus, *Cumberlandia*, for *M. monodonta* (Say), both based upon anatomical peculiarities

For the distribution of the genus in this country, see Walker, Nos. 152 and 153, Ortmann (80, p. 14) and Utterback (135, p. 99).

MARGARITANA MARGARITIFERA (L.).

Unio ocmulgeensis dominus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 13, pl. 7, fig. a-c.

Family UNIONIDÆ.

Simpson's "Descriptive Catalogue of the Naiades" brings the subject down to January 1, 1913.

For the revised classification so far as it has progressed, see Part I.

In view of the relatively small number of species that have been examined anatomically and the consequent element of uncertainty as to the systematic position of the remainder that must continue until the animals can be critically examined, it has seemed better, for convenience of reference, in this portion of the work to retain the generic names given by Simpson, noting, however, under such species as have been examined anatomically their proper place in the revised classification.

Recent attempts to revive Rafinesque's names for many of the species have created considerable confusion as to the proper nomenclature to be followed.

Vanatta's valuable paper on "Rafinesque's Types of Unio" (140, p. 549), reviewed by Walker (158, p. 43), has given definite information as to what Rafinesque in 1831 understood or claimed to be the species that he had described in 1820.

It has been too hastily assumed by some that these determinations have definitely settled the validity of all of the Rafinesqueian species involved. This is far from correct. It is not claimed, except in one instance, that the so-called types in the Poulson collection are the original types of Rafinesque. And, even if they were, reference to them for the purpose of determining an otherwise unidentifiable description is prohibited by the International Code (Op. Int. Co., I). The requisites for a sufficient description are definitely specified by the Code (Art. 25) and these provisions as defined by the decisions of the International Committee must be applied to each individual case.

Dr. Pilsbry in Vanatta's paper has very aptly stated the situation as follows: "The use of a Rafinesquian name depends upon whether it could be identified by descriptions published prior to any other recognizable name for the same species. That it can be recognized from the types or other specimens from Rafinesque does not entitle his names to acceptance unless the published descriptions are adequate. This question of the adequacy of published diagnoses must be considered for each species separately."

In the same connection, see Walker, (157, p. 74).

Subfamily UNIONINÆ (Swainson, 1840), Ortmann, 1910.

Genus QUADRULA Rafinesque, 1820.

QUADRULA ASKEWI (Marsh).

Frierson (41, p. 136) refers this to *beadleiana* Lea. But Ortmann (81, p. 21) states that it does not group with that species, but is a *Fusconaia* of the *undata* group.

QUADRULA BEADLEIANA (Lea).

Includes *Q. chickasawhensis* (Lea) and *askewi* (Marsh) according to Frierson (41, p. 136). But Ortmann (79, p. 268) says that it is an *Elliptio*.

QUADRULA BURSAPASTORIS (B. H. Wright).

Is a *Fusconaia* according to Ortmann (81, p. 90).

QUADRULA COCCINEA (Conrad).

Is a *Pleurobema* according to Ortmann (77, p. 101) and a variety of *Q. obliqua* (Lam.) (78, p. 117 and 79, p. 263).

Utterback (135, p. 190) quotes *catillus* Con., which Simpson has considered a synonym of *Q. coccinea*, as a variety of *Q. obliqua* (Lam.) and on p. 193 of the same paper considers it identical with *Q. solida* (Lea), having priority and gives it specific rank as such.

QUADRULA COOPERIANA (Lea).

At first referred to *Pleurobema* by Ortmann (78, p. 117), this species is now included in *Plethobasus* by him (79, p. 261).

QUADRULA CYLINDRICA (Say).

Unio cylindricus propetypicus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 11, pl. 4, fig. 1.

Unio cylindricus acrispatus De Gregorio, Ibid, p. 11, pl. 4, fig. 2.

Vanatta (140, p. 556) states that the *Unio solenoides* Raf. of the Poulson collection is this species.

QUADRULA EBENUS (Lea).

Is *Obovaria obovalis* Raf. of the Poulson collection according to Vanatta (140, p. 558). If identifiable from the original description, *obovalis* would have precedence.

QUADRULA FRIERSONI (B. H. Wright).

Is a *Pleurobema* according to Ortmann (81, p. 30).

QUADRULA HEROS (Say).

This species is the type of *Megaloniaias* Utterback.

Frierson (45, p. 61) has identified Barnes' *Unio giganteus* as this species and gives it priority.

QUADRULA INTERMEDIA (Conrad).

Unio tuberosus perlobatus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 9, pl. I, fig. 3.

QUADRULA KIRTLANDIANA (Lea).

Is a variety of *Q. subrotunda* (Lea) according to Ortmann (78 p. 116).

QUADRULA LACHRYMOSA (Lea).

This species has been identified as the *Obliquaria quadrula* Raf. by Say, Conrad and others and Vanatta (140, p. 556) states that the shell so labelled in the Poulson collection is Lea's *asperrimus*. If identifiable from the original description, it would have priority.

QUADRULA LACHRYMOSA CONTRARYENSIS Utterback.

Quadrula lachrymosa contraryensis Utterback, Amer. Mid. Nat., IV, 1915, p. 138, pl. XVIII, figs. 47a-b.

Type locality: Lake Contrary, St. Joseph, Mo.

PLEUROBEMA MISSOURIENSIS (Marsh).

The type of this species has been figured by Walker (155, p. 140, pl. V, figs. 1-2) and it appears to be a *Quadrula* allied to *Q. subrotunda* (Lea).

QUADRULA OBLIQUA (Lam.).

Includes *pyramidata* Lea, *cocinea* Con., and *plena* Lea according to Ortmann (78, p. 117 and 79, p. 264) and is a *Pleurobema*. Vanatta states (140, p. 557) that the *Obliquaria lateralis* Raf. of the Poulson collection is this species.

QUADRULA PERUVIANA (Lamarck).

Lamarck in his original description refers to the figure in the Encyc. Meth., pl. 248, fig. 7, but the reference was overlooked by Simpson in his Synopsis, but was supplied in the Desc. Catalogue. The species is the form commonly called *plicata* Say by collectors and is characterized by its prominent beaks. It is quite different from *plicata* Say from Lake Erie.

QUADRULA RARIPLICATA (Lamarck).

This species, which has been referred to *plicata* Say by Simpson and authors generally, is neither typical *peruviana* (Lam.) nor typical *plicata* (Say). The type which is still preserved in the Museum at Geneva, Switzerland, is the Ohio River form, which has commonly passed as *plicata* (Say), and is sufficiently distinct to have varietal rank at least. There is some reason to believe that Say's *plicata* is an off-shoot from this race rather than of *undulata* Bar. as has been suggested by Ortmann (79, p. 246). It is also possible that it rather than *undulata* should be considered the *costata* Raf.

QUADRULA PPLICATA (Say).

As stated by Ortmann (79, p. 246) the type of this species came from Lake Erie and is undoubtedly the form described by Lea as *Unio hippopæus*. It has been referred to *undulata* Bar. by Ortmann (l. c.), but there is apparently some ground for considering it as more closely allied to *rariPLICATA* (Lam.). Pending the settlement of this question, it would seem better to keep it separate from either.

QUADRULA PLENA (Lea).

According to Ortmann (78, p. 117) this is probably only a form of *obliqua* (Lam.). Vanatta states (140, p. 558) that the *Obovaria cordata* Raf. of the Poulson collection is this species. If identifiable from the original description, Rafinesque's name would have priority.

QUADRULA PUSTULATA (Lea).

According to Vanatta (140, p. 557) the *Obliquaria nodulata* Raf. of the Poulson collection is this species. If identifiable from the original description, *nodulata* would have precedence.

QUADRULA PUSTULOSA (Lea).

According to Vanatta (140, p. 556) the *Obliquaria retusa* Raf. of the Poulson collection is "probably" this species. The specific name is not pre-occupied by *Unio retusa* Lam. and, if identifiable from the original description, Rafinesque's name would have priority.

Utterback (135, p. 131) has suggested that the species should be known as *bullata* Raf., but see next note.

QUADRULA PUSTULOSA PERNODOSA (Lea).

According to Vanatta (140, p. 557) the *Obliquaria bullata* Raf. of the Poulson collection is this form, but the name is preoccupied by *Obliquaria flexuosa bullata* Raf. and Lea's name will stand.

QUADRULA PYRAMIDATA (Lea).

Unio plenus interduos De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 18.

According to Ortmann this is probably only a form of *obliqua* (Lam.). Vanatta states (140, p. 557) that the *Obliquaria rubra* Raf. of the Poulson collection is this species. If identifiable from the original description, *rubra* would have priority.

QUADRULA REFULGENS (Lea).

Includes *sphaerica* (Lea) according to Frierson (41 p. 136).

QUADRULA RUBIGINOSA (Lea).

Unio validus continuus De Gregorio, Moll. di aq. di Amer., 1914, p. 21.

This species has been identified as the *Obliquaria flava* Raf. by Say, Conrad and others. According to Vanatta (140, p. 557) the *O. flava* Raf. of the Poulson collection is this species. If identifiable from the original description, Rafinesque's name would have priority.

According to Ortmann (78, p. 116) *rubiginosa* is a variety of *undata* (Bar.).

FUSCONAIA SELECTA Wheeler.

Fusconaia selecta Wheeler, Naut., XXVIII, 1914, p. 76, pl. IV.

Type locality: Cache River, Nemo, Craighead Co., Ark.

QUADRULA SPHÆRICA (Lea).

Is a synonym of *refulgens* (Lea) according to Frierson (41, p. 136).

QUADRULA SUBROTUNDA (Lea.)

According to Vanatta (140, p. 558) the *Obliquaria sintoxia* Raf. of the Poulson collection is this species. If identifiable from the original description, *sintoxia* would have precedence. The species is a *Fusconaia* according to Ortmann (79, p. 244).

FUSCONAIA SUBROTUNDA LEUCOGONE Ortmann.

Fusconaia subrotunda leucogone Ortmann, Naut., XXVII, p. 89.

Type locality: Elk River, Gassaway, Braxton Co., W. Va.

QUADRULA TRAPEZOIDES (Lea).

Bariosta ponderosus Raf. is a synonym and *Bariosta* Raf. is a synonym of *Amblema* Raf., unless the species should prove to be generically distinct according to Frierson (42, p. 7).

FUSCONAIA UNDATA TRIGONOIDES "Frierson" Utterback.

Fusconaia undata trigonoides "Frierson" Utterback, Amer. Mid. Nat., IV, 1915, p. 107, pl. XV, figs. 30A-D.

Type locality: Platte River, Agency Ford, Mo.

QUADRULA UNDULATA (Barnes).

This species has been identified as the *Amblema costata* Raf. by Conrad, Frierson and others. Vanatta states (140, p. 556) that the *Amblema costata* Raf. of the Poulson collection is also this species. If identifiable from the original description, Rafinesque's name would have priority. In considering this question attention should be given to the possibility that *costata* Raf. may be the *rariPLICATA* Lam.

Costata has been designated by Frierson (42, p. 7) as the type of *Amblema* Raf.

QUADRULA UNDULATA PILSBRYI (Marsh).

According to Utterback (135, p. 119) this is a synonym of *Q. perPLICATA quintardii* (Cragin).

Genus TRITOGONIA Agassiz, 1852.

The recent discovery of Sterki ('07, p. 48) that in the type species, *T. tuberculata*, all four of the gills are utilized for marsupia, removes the genus from the *Digenæ* of Simpson to the *Tetragenæ*. But in view of the remarkable dimorphism of the species, which is apparently a sexual and not a senile character as has been suggested by Ortmann, the subordination of the genus to *Quadrula* as proposed by him would seem to be inexpedient.

TRITOGONIA TUBERCULATA (Barnes).

Quadrula tritogonia Ortmann, Naut., XXII, 1909, p. 101.

Quadrula parkeri Geiser, The Academician I, 1911, p. 15.

The new names proposed by Ortmann and Geiser can not be used, even if the species is referred to *Quadrula*. If *Rotundaria*, with *tuberculata* Raf. as its type, be given generic rank, Barnes' name can still be used in *Quadrula* (Ortmann, 78, p. 116); but if not, the species would take the name of *obesa* Simp. (Vanatta, Naut., XXIII, 1910, p. 102).

Obliquaria verrucosa Raf. is identified as this species by Conrad and the shells so labelled in the Poulson collection are also that species according to Vanatta (140, p. 554). If identifiable from the original description Rafinesque's name has priority.

Genus AMBLEMA Rafinesque, 1820.

Amblema Rafinesque, Monographie, 1820, p. 314.

Crenodonta Schluter, Verz. meiner Conch., 1836, p. 33; Simpson, Syn., 1900, p. 766; Desc. Cat., 1914, p. 813.

Type: *Amblema costata* Raf.

Genus MEGALONAIAS Utterback, 1915

Megalonaias Utterback, Amer. Mid. Nat., IV, 1915, p. 123.

Type: *Unio heros* Say.

Genus ROTUNDARIA Rafinesque, 1820.

Rotundaria Rafinesque, Monographie, 1820, p. 308; Simpson, Syn., 1900, p. 794; Desc. Cat., 1914, p. 903.

Type: *Obliquaria tuberculata* Raf.

Genus FUSCONAIA Simpson, 1900.

Fusconaia Simpson, Syn., 1900, p. 784; Desc. Cat., 1914, p. 865.

Type: *Unio trigonus* Lea.

Genus PLETHOBASUS Simpson, 1900.

Plethobasus Simpson, Syn., 1900, p. 764; Desc. Cat., 1914, p. 805.

Type: *Unio aesopus* Green.

Genus PLEUROBEMA Rafinesque.

PLEUROBEMA ÆSOPUS (Green).

This species has been referred to *Obliquaria cyphya* Raf. by Conrad, Call, Ortmann and others. Vanatta (140, p. 556) states that the shell in the Poulson collection so labelled is this species. If identifiable from the original description, *cyphya* would have priority.

This species is the type of Simpson's section *Plethobasus*, which Ortmann (79, p. 259) has raised to generic rank.

PLEUROBEMA ARGENTEUM PANNOSUM Simpson.

This is a *Fusconaia* and a synonym of *F. ozarkensis* (Call) according to Ortmann (84, p. 63).

PLEUROBEMA BARNESIANUM (Lea).

Is a *Fusconaia* and includes *meredithii* Lea, *pudicum* Lea, *lyonii* Lea, *tellocoensis* Lea and *lenticulare* Lea according to Ortmann (84, p. 59).

PLEUROBEMA BIGBYENSE (Lea).

Is a *Fusconaia* and a variety of *F. barnesiana* (Lea) and includes *estabrookianum* Lea, *fassinans* Lea and *fassinans rhomboidea* Simp. according to Ortmann (84, p. 59).

PLEUROBEMA BREVE SUBELLIPTICUM Simpson.

Is a *Fusconaia* and a synonym of *F. ozarkensis* (Call) according to Ortmann (84, p. 63).

PLEUROBEMA CLAVUS (Lamarck).

Unio consanquineus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 16.

Unio anaticulus ohiensis De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 21, pl. 10, fig. 3.

Vanatta (140, p. 555) states that *Unio elliptica* Raf., *Obliquaria scalenia* Raf. and *Pleurobema cuneata* Raf. as labelled in the Poulson collection are this species and expresses the opinion that *Pleurobema mytiloides* Raf. is also.

PLEUROBEMA CONRADI Vanatta.

This species was originally described by Conrad as *Unio maculatus*, but, as shown by Vanatta (140, p. 559), that name had already been used by Rafinesque for a variety of his *Unio nigra* and he has proposed *conradi* as a specific name for the *Pl. maculatum* (Con.) of Simpson's Desc. Catalogue.

PLEUROBEMA COR (Conrad).

The types of this species came from the Flint and Elk rivers in northern Alabama and as Frierson (44, p. 102) has shown is closely related to, if not identical with, *edgarianum* Lea or some other species of that group.

PLEUROBEMA CRUDUM (Lea).

Is a synonym of *Fusconaia barnesiana tumescens* (Lea) according to Ortmann (84, p. 59).

PLEUROBEMA ESTABROOKIANUM (Lea).

Is a *Fusconaia* and a synonym of *F. barnesiana bigbyensis* (Lea) according to Ortmann (84, p. 59).

PLEUROBEMA DOLLABELLOIDES (Lea).

Unio tornhatonii duckensis De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 20, pl. 11, figs. 2a-c.

PLEUROBEMA FASSINANS (Lea).

This species and its variety *rhomboides* Simp. are *Fusconaias* and synonyms of *F. barnesiana bigbyensis* (Lea) according to Ortmann (84, p. 59).

PLEUROBEMA LENTICULARIS (Lea).

Is a *Fusconaiia* and a synonym of *F. barnesiana* (Lea) according to Ortmann (84, p. 59).

PLEUROBEMA LEWISII (Lea).

That this species is distinct from *P. cor* (Con.), to which it was referred by Simpson, has been shown by Walker (160, p. 114) and *U. crapulus* Lea, if not distinct, is made a synonym.

PLEUROBEMA MEREDITHII (Lea).

Is a *Fusconaiia* and a synonym of *F. barnesiana* (Lea) according to Ortmann (84, p. 59).

LAMPSILIS OZARKENSIS (Call).

Is a *Fusconaiia* and includes *Pleurobema argenteum pannosum* Simp., *breve subellipticum* Simp. and *utterbacki* Fr. according to Ortmann (84, p. 63).

PLEUROBEMA PUDICUM (Lea).

Is a *Fusconaiia* and a synonym of *F. barnesiana* (Lea) according to Ortmann (84, p. 59).

PLEUROBEMA SIMPSONI Vanatta.

Pleurobema simpsoni Vanatta, Pr. A. N. S. P., 1915, p. 559.

Originally described as *Unio striatus* Lea. Lea's name is not preoccupied by Rafinesque, but as suggested to me by Frierson it seems to have been by Goldfuss for a fossil species. I have not been able to examine, or to have examined, Goldfuss' original description. Lea refers to Goldfuss' species in his Synopsis, but as usual gives no exact citation. A palaeontological friend has supplied the following references, which seem sufficient to settle the question. Goldfuss' description of his *Unio striatus* is to be found in his "Pertrefakten Deutschlands," II, 1839, p. 182, pl. 132, fig. 3. Bronn in his "Index Paleontologicus," II, p. 1345, includes the species among his "*omnia dubii generis*". D'Orbigny in his "Prodrome de Paleontologie" includes it in his genus *Hesione* (1847). These facts were probably known to Lea and explain why he did not rename his species, as in other

instances he had claimed that the reference of the prior species in such cases to another genus "liberated" his own subsequent name. This under the Code is quite erroneous.

PLEUROBEMA UTTERBACKI Frierson.

Pleurobema utterbacki Frierson, Amer. Mid. Nat., IV, 1915, p. 197, pl. V, figs. 12a-b and pl. XX, figs. 63a-d.

Type locality: White River, Hollister, Mo.

This species is a *Fusconaia* and a synonym of *F. ozarkensis* (Call) according to Ortmann (84, p. 63).

Genus LEXINGTONIA Ortmann, 1914.

Lexingtonia Ortmann, Naut., XXVIII, 1914, p. 28.

Type: *Unio subplanus* Conrad.

"This genus stands near *Pleurobema* and *Elliptio* and differs from either chiefly by the subcylindrical, red placenta, and by the beak sculpture."

Genus UNIO Retzius, 1788.

UNIO COMPLANATUS (Dill).

Unio pullatus majusculus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 27, pl. 8, figs. a-d.

Haas has recently (50, p. 54) figured the original type of Spengler's *Unio violaceus*, which appears to be an abnormal specimen of this species and proposes to give precedence to Spengler's name. I have shown elsewhere (162, p. 3) that this is not competent under the Code and that Dillwin's name should be retained.

UNIO CRASSIDENS Lam.

According to Ortmann (79, p. 266) this is the *Unio nigra* Raf. Vanatta (140, p. 555) states that the shell so labelled in the Poulson collection is this species. If identifiable from the original description, Rafinesque's name would have priority. Utterback (135, p. 199) has quoted me as authority for the statement that *Quadrula trapezoides* (Lea) should be considered as the *Unio crassidens* of Lamarck. I have expressed that opinion in correspondence and if the process of elimination could be strictly applied that would be the result. But Dr. Pilsbry has suggested that the provisions of the Code in regard to designating generic types apply equally well to the cases of composite species, of which this is an example, and that, if this rule does apply, Lea's statement (Obs., I, p. 199) of his examination of Lamarck's types in 1832 amounted to such a designation and can not now

be changed. Pending further consideration and final decision of the questions involved, it would be better to allow the accepted identification of *crassidens* to stand.

UNIO GIBBOSUS Barnes.

Unio propeverutus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 8, pl. 3, figs. 1a-c.

This species has been referred to *Unio dilatata* Raf. by Conrad and others. Vanatta states (140, p. 355) that both *U. dilatata* Raf. and *Obliquaria sinuata* Raf. as represented in the Poulson collection are this species. If identifiable from the original descriptions, both of Rafinesque's names have priority. *Dilatata* has page priority in his Monograph.

UNIO PUSILLUS Lea.

Lea's name is not preoccupied in *Unio* by *Obliquaria pusilla* Raf. (1820) as stated by Vanatta (140, p. 555) and will stand.

UNIO RAFINESQUEI Vanatta.

Unio fuscatus Lea, Simpson, Desc. Cat., 1914, p. 643.

Vanatta has shown (140, p. 559) that *fuscata* was twice used by Rafinesque as varietal names for species of *Unio* and has proposed the name given above for Lea's species.

UNIO TUOMEYI Lea.

Unio arctior fisheropsis De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 15, pl. 5, figs. 3a-c.

Genus LASTENA Rafinesque, 1820.

From an examination of the soft anatomy, Ortmann has recently (81, p. 106) shown that this group belongs in the *Unioninae* and not in the *Anodontinae*.

Hemistena Raf. is a synonym according to Frierson, (42, p. 7).

LASTENA LATA Raf.

Unio dehiscens oriensopsis De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 39, pl. 7, figs. 2a-b.

This variety (?) is made the type of a new genus or subgenus, *Sayunio*, the author does not seem to know which it should be considered.

Genus GONIDEA Conrad, 1857.

Ortmann has recently found from an examination of the soft anatomy (83, p. 50) that this genus belongs to the *Unioninae*.

Subfamily ANODONTINÆ Ortmann, 1912.

Genus STROPHITUS Rafinesque, 1820.

STROPHITUS EDENTULUS (Say).

Anodonta foliopsis De Gregorio Moll. di aq. dul. di Amer., 1914, p. 33, pl. XI, figs. 4a-b.

There seems to be some uncertainty as to the proper name to be used for this species. Say described his *edentulus* in 1829. Swainson had already in 1822 described his *Anodon rugosus* from the "United States." Lea (Obs., I, p. 39) says that "it is well known" that Swainson's *rugosus* is the adult of Say's *undulata*, which has priority. Simpson, who considers *undulatus* and *edentulus* distinct, for some unexplained reason includes Swainson's species under *edentulus* as a synonym. Dall (32, p. 127) "on the face of the returns" gives the species to Swainson. I have not been able to examine Swainson's description and figure myself. Ortmann (78, p. 118) unites both species under the prior name of *undulatus*. If this is correct, the exact identity of Swainson's species becomes immaterial. Otherwise his description and figure should be critically examined again to determine, if possible, to which species it belongs.

STROPHITUS EDENTULUS SHÆFFERIANUS (Lea).

This seems to be a well marked race characteristic of the Tennessee drainage and as such entitled to varietal rank.

Genus ANODONTA Lamarck, 1799.

ANODONTA CATARACTA Say.

Anodonta ? subcylindracea propexilis De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 33, pl. XII, figs. 1a-e.

ANODONTA GRANDIS Say.

Anodonta venusta De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 35, pl. XII, fig. 2.

This species founded on a single deformed valve is made the type of a new subgenus, *Nayadina*.

ANODONTA IMBECILIS Say.

Anodonta phalena De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 34, pl. XI, figs. 3a-e.

This species is *Lastena ohioensis* Raf. and a *Lastena* according to Utterback (135, p. 260).

ANODONTA SUBORBICULATA Say.

According to Utterback (135, p. 256) this species is a *Lastena*.

Genus ANODONTOIDES Simpson, 1898.

ANODONTOIDES FEUSSACIANUS (Lea).

Anodonta ferussaciana incertopsis De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 34, pl. XI, fig. 5.

Genus LASMIGONA Rafinesque, 1831.

Symphynota Simpson (non Lea), Syn., 1890, p. 662; Desc. Cat., 1914, p. 480.

Frierson (Naut., XXVIII, 1914, p. 40) has shown that the original type of Lea's *Symphynota* was *Unio alatus* Say and it is therefore a synonym of *Proptera* Raf. and that consequently *Lasmigona* Raf. as the earliest available name becomes the generic type.

Subgenus PLATYNAIAS Walker, 1918.

Platymaias Walker, Occ. Pap., Mus. Zool., U. of M., No. 49, 1918, p. 1.

Type: *Symphynota compressa* Lea.

As the result of the disappearance of *Symphynota* Lea from this genus, the group typified by *S. compressa* Lea was left without any name and *Platymaias* has been proposed for it.

LASMIGONA COMPRESSA (Lea).

Unio compressa ? *lindus* De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 14, pl. 6, figs. 1a-d.

Frierson (43, p. 57) has argued that Rafinesque's *Unio viridis* is this species and consequently has priority. This has been contested by Walker (157, p. 74). Vanatta (140, p. 554) states that Poulson's shell labelled *Unio viridis fuscata* from the Kentucky River, is the *Sym. viridis* Con. of Simpson's Synopsis. This I have verified from a personal inspection of the shell. For the reason stated by Walker, (l. c., p. 78) Lea's name is not superseded by *alasmodontina* Stimp. and will stand as the specific name.

LASMIGONA VIRIDIS Rafinesque.

For the conflicting opinions in regard to this species see the preceding note. Under all of the evidence that has been adduced I think that Rafinesque's name should be given precedence, with *subviridis* Con. (24, App. p. 4), *viridis* "Con." Simp. and *tappanianus* Lea as synonyms.

Subgenus ALASMINOTA Ortmann, 1914.

Alasminota Ortmann, Naut., XXVIII, 1914, p. 41.

Type: *Margaritana holstonia* Lea.

Frierson (42, p. 7) has identified Rafinesque's *Alasmodon badium* as this species and has designated it as the type of *Sulcularia* Raf. If the species is identifiable from the original description and is Lea's *holstonia*, *Sulcularia* has precedence over *Alasminota*.

Genus ALASMIDONTA Say, 1818.

Subgenus PRESSODONTA Simpson, 1900.

I have recently (162, p. 2) proposed to supercede this name with that of *Calceola* Sw., 1840, on the ground of priority. Dr. Dall has since called my attention to the fact that *Calceola* had already been used by Lamarck in 1799 for a coral. Simpson's name will therefore stand.

Subgenus PROLASMIDONTA Ortmann, 1914.

Prolasmidonta Ortmann, Naut., XXVIII, 1914, p. 44.

Type: *Unio heterodon* Lea.

Subgenus PEGIAS Simpson, 1900.

According to Ortmann (81, p. 45) this group is a subgenus of *Alasmidonta*.

Subgenus RUGIFERA Simpson, 1900.

ALASMIDONTA MARGINATA Say.

Unio calceolus sciotincola De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 24, pl. IX, fig. 3.

Frierson (42, p. 7) has identified *Alasmodon scriptum* Raf. with this species, but Say's name has priority.

ALASMIDONTA RAVENELIANA (Lea).

Frierson (42, p. 7) has identified *Alasmodon atropurpureum* Raf. as being this species. If identifiable from the original description, it has priority.

On the basis of these identifications, he would substitute *Decurambis* Raf., 1831, for *Rugifera* Simp. as the subgeneric name.

Genus SIMPSONICONCHA Frierson, 1914.

Hemilastena Simpson, non Agassiz, Syn., 1900, p. 673; Desc. Cat., 1914, p. 323.

Simpsonaias Frierson, Naut., XXVIII, 1914, p. 7. (Preoccupied.)

Simpsoniconcha Frierson, Naut., XXVIII, 1914, p. 40.

Type: *Alasmodonta ambigua* Say.

For note on this name, see Walker, 162, p. 4.

Subfamily LAMPSILINÆ Ortmann, 1912.

Genus PTYCHOBANCHUS Simpson.

Frierson, having identified (42, p. 7) *Obliquaria fasciolaris* Raf. with *P. phaseolus* (Hild.), has designated it as the type of *Ellipsaria* Raf. and gives the latter priority as the generic name.

PTYCHOBANCHUS PHASEOLUS (Hild.).

Unio compressissimus performosus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 23, pl. V, fig. 2.

Unio lanceolatus blandus De Gregorio, Ibid, p. 22, pl. VIII, fig. 2.

Unio imperitus De Gregorio, Ibid, p. 15, pl. IX, fig. 1.

Say, Conrad and Frierson (1914, p. 7) have identified the *Obliquaria fasciolaris* Raf. as this species and Vanatta (140, p. 554) states that the shell so labelled in the Poulson collection is also that species. If identifiable from the original description, Rafinesque's name would have priority.

PTYCHOBANCHUS SUBTENTUS (Say).

Unio subteritus purcheornatus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 31, pl. IX, fig. 2.

Genus CYPROGENIA Agassiz, 1852.

CYPROGENIA IRRORATA (Lea).

Is *Obovaria stegaria* Raf. according to Conrad and Vanatta (140, p. 554) states that the shell so labelled in the Poulson collection is this species. If identifiable from the original description *stegaria* has priority.

Genus PLAGIOLA (Rafinesque, 1819) Agassiz.

PLAGIOLA DONACIFORMIS (Lea).

Unio zig-zag illius De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 11, pl. IV, fig. 3.

Is an *Amygdaloniaias* according to Ortmann (81, p. 67).

PLAGIOLA ELEGANS (Lea).

Unio elegans elegantopsis De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 11, pl. IV, fig. 6.

Unio elegans magnelegans De Gregorio, Ibid, p. 11, pl. V, figs. 1a-c.

This species is an *Amygdaloniaias* according to Ortmann, (79, p. 328).

Say and Conrad have identified the *Truncilla truncata* as this species. Vanatta states (140, p. 553) that both the *T. truncata* Raf. and *Unio meta-plata* Raf. as represented in the Poulson collection are this species. If identifiable from the original description, *truncata* would have precedence. *Meta-plata* is subsequent to both.

PLAGIOLA SECURIS (Lea).

Both *Obliquaria depressa* Raf. and *O. lineolata* Raf. are identified by Say and Conrad as this species and both authors give the preference to *lineolata* as the specific name. According to Vanatta (140, p. 553) these two species and also *O. ellipsaria* Raf. as represented in the Poulson collection are *securis* Lea. If identifiable from the original description, any one of Rafinesque's names would have priority.

Genus PARAPTERA Ortmann, 1911.

The type of this genus is *U. gracilis* Bar. If, as claimed by Frierson and others, this is the *Unio fragilis* Raf., which the latter in 1831 made the type of his genus *Lasmonos*, this name would have priority over *Paraptera*.

Frierson (42, p. 6) has suggested that if *leptodon* Raf. should prove to belong to this genus, *Leptodea* Raf., of which *leptodon* is the type, would have to be used.

Genus OBOVARIA Rafinesque, 1819.

OBOVARIA CIRCULUS (Lea).

Oblivaria subrotunda Raf. has been identified as this species by Say and Conrad and the latter adds *Obovaria striata* Raf. as a synonym. The specimens under both of these names in the Poulson collection, according to Vanatta (140, p. 552), are this species. If identifiable from the original descriptions, either of Rafinesque's names would have priority.

OBOVARIA ELLIPSIS (Lea).

Conrad has identified *Amblema olivaria* Raf. as this species and according to Vanatta (140, p. 553) so also is the shell in the Poulson collection under that name. If identifiable from the original description Rafinesque's name has priority.

OBOVARIA LENS (Lea).

According to Ortmann (79, p. 323) this species is not specifically distinct from *O. circulus* (Lea). Vanatta (140, p. 552) states that the shell labelled *Unio levigata* Raf. in the Poulson collection is this species. If identifiable from the original description, *levigata* would have precedence.

OBOVARIA RETUSA (Lam.).

According to Vanatta (140, p. 552) this is the *Obovaria torsa* Raf. of the Poulson collection.

Genus CARUNCULINA Simpson, 1898.

This group is clearly entitled to generic rank as stated by Ortmann (81, p. 68), who has shown that the type is *Unio parvus* Bar. and not *texasensis* Lea.

Frierson (42, p. 7) has identified *C. glans* (Lea) as the *Unio* (*Toxolasma*) *lividus* Raf. and consequently substitutes *Toxolasma* Raf. for *Carunculina* Simp.

Genus LAMPSILIS Rafinesque, 1820.

LAMPSILIS ALATA (Say).

Vanatta (140, p. 552) states that the shell labelled *Metaptera megaptera* Raf. in the Poulson collection is this species. *Alata* is the type of *Proptera* Raf.

LAMPSILIS ANODONTOIDES (Lea).

This species belongs to *Lampsilis* s. s. according to Ortmann (79, p. 346). It has been identified with *U. teres* Raf. by Say, Conrad and others.

LAMPSILIS ARKANSENSIS (Lea).

This species is a *Micromya* according to Ortmann (81, p. 54).

LAMPSILIS AMÆNA (Lea).

Is a synonym of *L. nebulosa* (Con.) according to Ortmann (81, p. 64).

LAMPSILIS BOREALIS (Gray).

The citation of this species from Oneida Lake by Baker, (9, p. 257) has proved to be erroneous. See Baker, (10, p. 75).

LAMPSILIS BREVICULA (Call).

Is a *Micromya* according to Utterback (135, p. 434).

LAMPSILIS CAPAX (Green).

Is a *Proptera* according to Coker and Surber, (21, p. 179) and Ortmann (81, p. 67).

LAMPSILIS CARIOSA (Say).

Unio pallescens Lea var. De Gregorio, Moll. di aq. dul. di Amer., p. 9, non Lea, 1845.

LAMPSILIS CONSTRICTA (Con).

Is a *Micromya* according to Ortmann (81, p. 66).

LAMPSILIS ELLIPSIFORMIS (Con.).

Is a *Nephronaias* according to Utterback (135, p. 341).

LAMPSILIS FALLACIOSA Smith.

Is a *Lampsilis* s. s. and doubtfully distinct from *L. anodontoides* according to Ortmann (79, p. 347). But Surber (127, p. 5) states that the glochidia of the two species differ both in size and shape.

CARUNCULINA GLANS (Lea).

Unio castus mirus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 27.

Frierson (42, p. 7) has identified *Unio* (*Toxoclasma*) *lividus* Raf. as this species. If identifiable, and it is not at all certain that it might not be the *pullus* of Lea, it would have priority. If it can not be definitely determined what species it is, it should be rejected for indefiniteness.

LAMP SILIS GRACILIS Barnes.

This species has been identified by Frierson (42, p. 7) and others as the *Unio fragilis* Raf. (1820) and *Lasmonos fragilis* Raf. (1831) and either of these names, if identifiable from the original description, would have priority. The example under this name in the Poulson collection according to Vanatta (140, p. 552) is *gracilis* Bar.

Fragilis Raf. (1831) is the monotype of his genus *Lasmonos*.

LAMP SILIS IRIS (Lea).

Is a *Micromya* according to Ortmann (79, p. 341).

LAMP SILIS LEPTODON (Raf.).

Unio shepardianus f. *duttonianus* De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 25.

This species is the type of *Leptodea* Raf. by designation (Frierson, 42, p. 6).

LAMP SILIS LIENOSA (Con.).

Is a *Micromya* according to Ortmann (79, p. 340).

LAMP SILIS LIGAMENTINA (Lam.).

Unio tecomensis De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 26.

This species was at first referred to *Obovaria* by Ortmann (78, p. 119) and later to *Nephronaias* (79, p. 325). It should rather be referred to *Actinonaias* F. and C.

According to the specimens in the Poulson collection (Vanatta, 140, p. 551) *U. crassa* Raf., *fasciata* Raf. and *pallens* Raf. are this species.

LAMP SILIS LUTEOLA (Lam.).

Vanatta (140, p. 551) states that *L. fasciola* Raf. is this species.

LAMP SILIS NEBULOSA (Con.).

Is a *Micromya* according to Ortmann (81, p. 64).

LAMP SILIS NIGERRIMA (Lea).

Is a variety of *L. concestator* Lea according to Frierson (41, p. 135).

LAMP SILIS OCCIDENTALIS (Con.).

Is *Ptychobronchus clintonensis* Simp. and has priority according to Utterback (135, p. 317).

LAMP SILIS ORBICULATA (Hild.).

Belongs to *Lampsilis* s. s. and does not group with *L. ligamentina* Lam. according to Ortmann (79, p. 353).

LAMP SILIS OZARKENSIS (Call).

Is a *Nephronaias* according to Utterback (135, p. 344). Ortmann (84, p. 62) has more recently determined it to be a *Fusconaia*.

LAMP SILIS PARVA (Bar.).

Unio pertenuis De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 31, pl. VI, figs. 4a-f, non Lea, 1863.

This species is the true type of *Carunculina* according to Ortmann (81, p. 68).

LAMP SILIS PERDIX (Lea).

Is a *Nephronaias* according to Ortmann (79, p. 326). It is rather an *Actinonaias*.

LAMP SILIS PERPURPUREA (Lea).

Is a *Micromya* according to Ortmann (81, p. 63).

LAMP SILIS PICTA (Lea).

Is a *Micromya* according to Ortmann (79, p. 342).

LAMP SILIS PLEASII (Marsh).

Is a *Nephronaias* according to Utterback (135, p. 343). It is rather an *Actinonaias*.

LAMP SILIS RADIATA (Gmel.).

Unio muhlfeldianus plurimaffinis De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 8, pl. III, figs. 2a-d.

LAMP SILIS RADIATA ONEIDENSIS Baker.

Lampsilis borealis Baker, Tech. Pub. N. Y. Coll. For., 4, 1916, p. 257, fig. 44, nos. 1-4.

Lampsilis radiata oneidensis Baker, Naut., XXX, 1916, p. 74, pl. II.

Type locality: Oneida Lake, N. Y.

LAMP SILIS RECTA (Lam.).

Unio sageri Conrad, Mon., VI, 1836, p. 53, pl. xxix, fig. 1.

Lampsilis recta sageri Simpson, Desc. Cat., 1914, p. 96.

Lamarck's type came from Lake Erie and is the small form characteristic of the Great Lakes that Conrad described as *Unio sageri*. The large, normal form from the Ohio and elsewhere may be distinguished under Rafinesque's name.

LAMP SILIS RECTA LATISSIMA (Raf.).

Unio latissima Rafinesque, Mon., 1820, p. 297, pl. lxxx, figs. 14-15.

Unio angustatus cuniculus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 22, pl. X, fig. 1.

Type locality: Ohio River.

This is the form represented in the Poulson collection (Vanatta 140, p. 551).

LAMP SILIS SIMPSONI Ferriss.

Belongs to *Lasmonos* Raf. according to Utterback (135, p. 367).

LAMP SILIS SUBROSTRATA (Say).

Belongs to *Eurynia* s. s. according to Ortmann (81, p. 55).

LAMP SILIS TENERA (Ravenel, Mss.) Mazyck.

Lampsilis tenerus (Rav. Mss.) Mazyck, Cat. Moll. S. C., 1913, p. 23.

Type locality: Santee Canal, St. John's, Berkeley, S. C.

The specific name is preoccupied by Lea, 1840.

LAMP SILIS TRABALIS (Con.).

Is a *Micromya* according to Ortmann (79, p. 340).

LAMP SILIS VANUXEMENSIS (Lea).

Is a *Micromya* according to Ortmann (79, p. 342; 81, p. 65).

LAMP SILIS VENTRICOSA (Bar.).

According to Say and Conrad this is the *L. cardium* Raf., 1820, and if so, the latter name has priority. Vanatta (140, p. 551) states that the shell so labelled in the Poulson collection is the *ventricosa* Bar.

According to Ortmann (79, p. 351) it "is probably only a variety of *L. ovata* (Say).

LAMP SILIS VENTRICOSA COHONGORONTA Ortmann.

Lampsilis ventricosa cohongoronta Ortmann, Naut., XXVI, 1912, p. 53.

Type locality not specified. Found in the Potomac River, Hancock, Washington Co., Md., and in the South Branch of the Potomac at Southbranch and Romney, W. Va., and in the Shenandoah River, Harper's Ferry, W. Va.

LAMP SILIS VENTRICOSA SATURA (Lea).

Frierson (41, p. 136) says that this is not a variety of *L. ventricosa*, but is the same as *L. excavata* Lea and has priority as the proper specific name. I do not agree with this. Ortmann (81, p. 56) deals with it as a form of *ventricosa* and intimates a "suspicion" that it may prove to be a distinct species.

LAMPASILIS VENUSTA (Lea).

Is a variety of *L. ellipsiformis* (Lea) according to Utterback (135, p. 343).

LAMPASILIS VIBEX (Con.).

Is a *Micromya* according to Ortmann (79, p. 340).

Genus MICROMYA (Agassiz, 1852) Simpson.

MICROMYA CÆLATA Conrad.

Unio propecalatus De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 30, pl. VIII, figs. 1a-d.

This species has been identified by Frierson (42, p. 7) and Ortmann (82, p. 39) as *Unio* (*Lemiox*) *rimosus* Raf. and the latter (l. c.) has raised *Lemiox* to generic rank. The identification seems too doubtful (Walker, 162, p. 4) to be relied upon, the species should therefore retain Conrad's name and a new generic name proposed.

MICROMYA FABALIS (Say).

Unio donacopsis De Gregorio, Moll. di dul. di Amer., 1914, p. 30, pl. X, figs. 5a-b.

Genus TRUNCILLA Rafinesque, 1819.

TRUNCILLA CURTISII Frierson and Utterback.

Truncilla curtisii Frierson and Utterback, Am. Mid. Nat., IV, 1916, p. 453, pl. VI, figs. 14a-d, pl. XXVIII, figs. 109A-D.

Type locality: White River, Hollister, Mo.

This is the form that was collected by Ferriss in 1900 and distributed by him as *T. deviata* (Anth.). It has also been found in Bear Creek, Franklin Co., Ala., a tributary of the Tennessee. It does not seem to be more than a light colored form of that species.

TRUNCILLA LEFÈVREI Utterback.

Truncilla lefevrei Utterback, Am. Mid. Nat., IV, 1916, p. 455, pl. VI, figs. 13 -d, pl. XXVIII, figs. 108A-D.

Type locality: Black River, Williamsville, Mo.

TRUNCILLA FOLIATA (Hild.).

This species has been identified as Rafinesque's *Obliquaria flexuosa* by Conrad and the specimen in the Poulson collection under that name is stated by Vanatta (140, p. 550) to be this species. If identifiable from the original description, Rafinesque's name would have priority. It has also been identified by Frierson (42, p. 7) as Rafinesque's *Epioblasma biloba*.

TRUNCILLA BREVIDENS (Lea).

Vanatta (140, p. 550) states that the shell in the Poulson collection labelled *Obliquaria interrupta* Raf. is this species. If identifiable from the original description, Rafinesque's name has precedence.

TRUNCILLA PERPLEXA (Lea).

This species has been identified by Conrad and others as *Amblema torulosa* Raf. and *Amblema gibbosa* Raf. According to Vanatta (140, p. 550) the shells so labelled in the Poulson collection are this species. Either name, if identifiable from the original description, would have priority.

TRUNCILLA SULCATA (Lea).

Unio stewardsoni stevensoni De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 15, pl. VI, fig. 3.

Unio propesulcatus De Gregorio, Ibid, p. 30, pl. X, fig. 2.

Vanatta (140, p. 550) states that the shell in the Poulson Collection under the name of *Obliquaria obliquata* Raf. is this species. If identifiable from the original description, it would take precedence.

TRUNCILLA TRIQUETRA Rafinesque.

Unio triangularis pergibbosa De Gregorio, Moll. di aq. dul. di Amer., 1914, p. 10, pl. II, fig. 4.

Unio triangularis longiusculus De Gregorio, Ibid, p. 10, pl. II, fig. 5.

TRUNCILLA TRIQUETRA TRIANGULARIS (Barnes).

Barnes' types of his *Unio triangularis* came from Bois Blanc Island in the Detroit River and the form is fairly entitled to varietal rank, being like nearly all of the *Unionidae* of the Great Lakes a characteristically depauperate race.

TRUNCILLA WALKERI Wilson and Clark.

Truncilla walkeri Wilson and Clark, Bur. of Fish. Doc. No. 781, 1914, p. 46, pl. I, fig. 1.

Type locality: East Fork of Stone's River, Waltherville, Tenn.

Subgenus DYSNOMIA Agassiz, 1852.

Frierson (42, p. 7) identifies Rafinesque's *Unio* or *Epioblasma biloba* with *T. foliata* (Hild.) and consequently replaces Agassiz' subgeneric name by *Epioblasma* Raf.

Genus *incertæ sedis*.

COKERIA Marshall, 1916.

Cokeria Marshall, Naut., XXIX, 1916, p. 133.

Type: *Cokeria southalli* Marshall.

COKERIA SOUTHALLI Marshall.

Cokeria southalli Marshall, Naut., XXIX, 1916, p. 133, pl. IV.

Type locality: James River, Huron, S. D.

This genus and species are founded on an unique specimen collected by the U. S. Bureau of Fisheries. It seems to combine the characters of both *Quadrula* and *Lampsilis*, although the preponderance of the characters appear to be *Quadruline*. Indeed, but for the hinge teeth, which are quite like those of *Lampsilis*, it would be considered a *Quadrula*. It is quite possibly an abnormality of *Quadrula undulata* (Bar.). Unfortunately nothing is known of the soft parts. Additional material is greatly to be desired.

Family CYRENIDÆ.

Genus CYRENA Lamarck, 1818.

Section POLYMESODA Rafinesque, 1820.

CYRENA ALABAMENSIS Clessin.

Cyrena alabamensis Clessin, Con. Cab., Cycladeen, 1869, p. 114, pl. XVIII, figs. 3-4.

Type locality: Alabama.

CYRENA DONACIFORMIS Sowerby.

Cyrena donaciformis Sowerby, Con. Icon., Cyrena, 1878, p. 108, pl. XIX, fig. 108.

Type locality: Florida.

Is *floridana* Con. according to von Martens (Zool. Rec., Moll., 1877, p. 81) and Dall (29, p. 1447).

CYRENA PROTEXTA Conrad.

Cyrena protexta Conrad, Am. J. of Con., V, 1869, p. 107, pl. XII, fig. 3.

Type locality: Tampa Bay, Fla.

Is *floridana* Con. according to Tryon, (A. J. of C., V, 1870, p. 227) and Dall (29, p. 1447).

Family SPHÆRIIDÆ.

Sterki's "Preliminary Catalog" (125, p. 429) has brought the subject down to July 1, 1916.

For valuable papers on the anatomy, reproduction and growth of *Sphærium* and *Musculium*, see Drew (36, p. 173) and Gilmore (46, p. 16).

Genus SPHÆRIUM Scopoli, 1777.

SPHÆRIUM LENTICULARE Sowerby.

Sphærium lenticularis Sowerby, Con. Icon., Sphærium, Sp. 6, pl. I, fig. 6.
Type locality: ?

SPHÆRIUM MAGNUM Sterki Mss.

Sphærium magnum "Sterki", Springer, Pr. A. N. S. P., 1902, p. 513.

This undescribed species is quoted from Arroyo Pecos, Las Vegas, N. M. (pleistocene) by Springer.

SPHÆRIUM MEDIUM (Sowerby).

Cyclas medium "Sowerby", Richardson, Fauna Bor. Amer. III, 1836, p. 316.
Type locality: Methy Lake, Athabaska.

Probably never described, see Dall (32, p. 140).

SPHÆRIUM RUGOSUM "Whitmore" Sowerby.

Sphærium rugosum "Whitmore" Sowerby, Con. Icon., Sphærium, Sp. 16,
pl. II, fig. 16.

Type locality: ?

SPHÆRIUM STAGNICOLUM (Sowerby).

Cyclas stagnicola "Sowerby" Richardson, Fauna Bor. Amer. III, 1836, p.
316.

Type locality: Methy Lake, Athabaska.

Probably never described, see Dall (32, p. 140).

Genus MUSCULIUM Link, 1807.

Musculium Link, Besch. Rostock Samm I, 1807, p. 152.

Calyculina Clessin, Mal. Blätt., XIX, 1871, p. 150.

Frimella Cooper, Pr. Cal. Acad. Sci., (2), III, 1891, p. 82.

MUSCULIUM COOPERIANUM (Prime) Mss.

Sphærium cooperianum Prime, Cat. Corbic., Am. J. of Con., V, 1869, p. 152.

Type locality: Johnson's Pass, Eldorado Co., Cal.

Listed as a new species, but never described. Probably the young of *M. raymondi* according to Cooper (26, p. 81).

MUSCULIUM ERRANS (Lewis).

Cyclas errans Lewis, *Ubi*?

Lewis (Pr. A. N. S. P., 1872, p. 105) says that he "proposed" this species a number of years before, but that Prime considered it a synonym of *rosaceum*. That from further study, he is "induced" to reclaim his species. I have been unable to find any other reference to the species.

Genus PISIDIUM C. Pfeiffer, 1821.

The use of *Corneocyclas* Fer. for this genus proposed by Dall (30, p. 7 and 29, p. 1459) is disputed by Woodward (165, p. 367 and 166, p. 1) and has not been followed by Sterki (125, p. 473) and until the question has been definitely settled, it seems preferable to use the name that has been in common use for so many years.

PISIDIUM BOREALE Westerlund.

Pisidium boreale Westerlund, Kongl. Sv. Vet. Ak. Forh., 1877, p. 70, fig. 23.
Type locality: Lusino, Siberia. ? Port Clarence, Alaska.

PISIDIUM CALIFORNICUM (Newcomb?).

Listed by Berry (Naut., XXIII, 1909, p. 79) from Bluff Lake, San Bernardino Co., Cal. I have not been able to find any other reference to it.

PISIDIUM COMPRESSUM LIMNICOLUM Sterki.

Pisidium compressum limnicolum Sterki, Naut., XIX, 1905, p. 81.
Type locality: Fox River, Wis.

PISIDIUM COMPRESSUM SMITHII Sterki.

Pisidium compressum smithii Sterki, Naut., XIX, 1905, p. 83.
Type locality: Shoal Creek, Ala.

PISIDIUM NOVEBORACENSE PROCLIVE Sterki.

Pisidium noveboracense proclive Sterki, Naut. XIX, 1906, p. 119.
Type locality: New Philadelphia, O.

PISIDIUM OBTUSALE C. Pfeiffer.

This European species has been listed from near Lake James, Steuben Co., Ind. by Sterki (Naut., XVII, 1903, p. 43).

PISIDIUM SIBIRICUM Westerlund.

Pisidium sibiricum Westerlund Nachr. Blätt. Gess. 1876, p. 103; Clessin, Con. Cab., Cycladeen, 1877, p. 66, pl. VII, figs. 15-17.
Type locality: Yenesei River, Siberia.

? Port Clarence, Alaska according to Dall (32, p. 144). Dall's reference for this species in K. Svenska Vet. Ak. Forh. is erroneous. It should be p. 69, fig. 21, not p. 70, fig. 23.

Family CYRENELLIDÆ.

Genus CYRENELLA Deshayes, 1835.

CYRENELLA FLORIDANA (Dall).

Cyrenoida floridana Dall, Naut. X, 1896, p. 52; Pr. U. S. N. M. XXIII, 1901, p. 829, pl. XLII, fig. 7.

Type locality not specified.

Habitat: Brunswick, Ga., south to the Everglades on the east, and, on the west, north to Charlotte Harbor and vicinity.

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ADDENDA

Genus IO Lea, p. 149.

For an elaborate paper on "The Variations and Ecological Distribution of the Snails of the Genus IO" by Charles C. Adams, see, *Memoirs of the National Academy of Sciences*, XII, 1915, Part II, Second Memoir.

The following "races and forms" are recognized and described:—

NAME.	PAGE.	TYPE LOCALITY.
<i>Powellensis</i> C. C. Ads.	11.	Powell R., Olinger, Va.
<i>Clinchensis</i> C. C. Ads.	11.	Clinch R., Cleveland, Va.
<i>Fluvialis</i> Say.	11.	N. Fork, Holston R., Saltville, Va.
<i>Verrucosa</i> Rve.	12.	S. Fork, Holston R., Bluff City, Tenn.
<i>Lyttonensis</i> C. C. Ads.	12.	Powell R., Pennington Gap, Va.
<i>Paulensis</i> C. C. Ads.	12.	Clinch R., St. Paul, Va.
<i>Recta</i> Rve.	12.	Holston R., Kingsport, Tenn.
<i>Brevis</i> Anth.	12.	Clinch R., Kyle Ford, Tenn.
<i>Spinosa</i> Lea.	13.	Holston R., Morristown, Tenn.
<i>Unakensis</i> C. C. Ads.	13.	Nolichucky R., Conkling, Tenn.
<i>Nolichuckyensis</i> C. C. Ads.	13.	Nolichucky R., White Pine, Tenn.
<i>Angitremoides</i> C. C. Ads.	14.	Tennessee R., Looney's Id., Knoxville, Tenn.
<i>Loudonensis</i> C. C. Ads.	14.	Tennessee R., Loudon, Tenn.
<i>Turrita</i> Anth.	14.	Tennessee R., Bellefonte, Tenn.

Genus STROPHITUS Rafinesque, p. 56.

Add:—

Section JUGOSUS Simpson, 1914.

Shell with the dorsal slope strongly subradially plicate; teeth unusually strong.

Type: *S. wrightianus* Walker.

Genus SPHÆRIUM Scopoli, p. 188.

In his "Preliminary Catalog of the North American Sphæriidæ (125, p. 472) Sterki recognizes three subgenera, but they are not so defined as to be included in the systematic portion of this paper. They are:—

<i>Sphæriastrum</i> Bourguignat.	Type: <i>S. rivicolum</i> (Leach).
<i>Cyrenastrum</i> Bourguignat.	Type: <i>S. solidum</i> Normand.
<i>Corneola</i> Clessin.	Type: <i>S. corneum</i> (Linné).

The first is not represented in our fauna.

As *Tellina cornea* L. is the type of the genus *Sphaerium*, *Corneola* Cless. is equivalent to *Sphaerium s. s.* and is entirely superfluous.

Subject to this amendment, his arrangement is the same as that proposed by Dall (30, p. 7) in 1903.

Genus PISIDIUM C. Pfeiffer, p. 189.

Dall (l. c.) has proposed the following arrangement for *Corneocyclus* (*Pisidium*).

Genus CORNEOCYCLAS Ferussac, 1818.

Subgenus *Corneocyclus s. s.*

Section *Corneocyclus s. s.*

Type: *C. pusilla* Gmelin.

Section *Phymesoda* Rafinesque.

Type: *Tellina virginica* Gmelin.

Section *Pisidium* C. Pfeiffer, 1821.

Type: *Tellina amnica* Müller.

Section *Cyclocalyx* Dall, 1903.

Type: *Pisidium scholtzi* Clessin.

Subgenus *Cymatocyclus* Dall, 1903.

Type: *Pisidium compressum* Prime.

Subgenus *Tropidocyclus* Dall, 1903.

Type: *Pisidium henslowianum*

Sheppard.

Only the typical species are mentioned and no attempt is made to distribute the North American species among the different groups.

Sterki (l. c.) tentatively and without definition proposes the following "groups":—

Fluminina Clessin, 1879.

Type: *P. amnicum* (Müll).

This is equivalent to *Pisidium s. s.* and therefore unnecessary.

Lacustrina Sterki, 1916.

Type: *P. idahoense* Roper.

Rivulina (Clessin, 1879) Sterki.

Type: *P. supinum* A. Schmidt.

Fontinalina Sterki, 1916.

Type: *P. fontinale* Pfr.

Fossarina Clessin, 1879 (restricted). Type: *P. obtusale* Pfr.

PLEUROCERA, p. 151.

PLEUROCERA KNOXENSE (Lea).

According to Tryon (134, p. 427) this name will take the place of *P. modestum* (Lea), 1862, because *Io modesta* Lea, 1861, is also a *Pleurocera*. This, of course, is conditional upon the latter proving to be a valid species.

PLEUROCERA PARKERI Tryon.

This name has been proposed by Tryon (134, p. 427) for *Trypanostoma tortum* Lea (Ibid, p. 84), 1862, on the ground that *Melania torta* (Ibid, p. 117), 1845, has priority, being also a *Pleurocera*.

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