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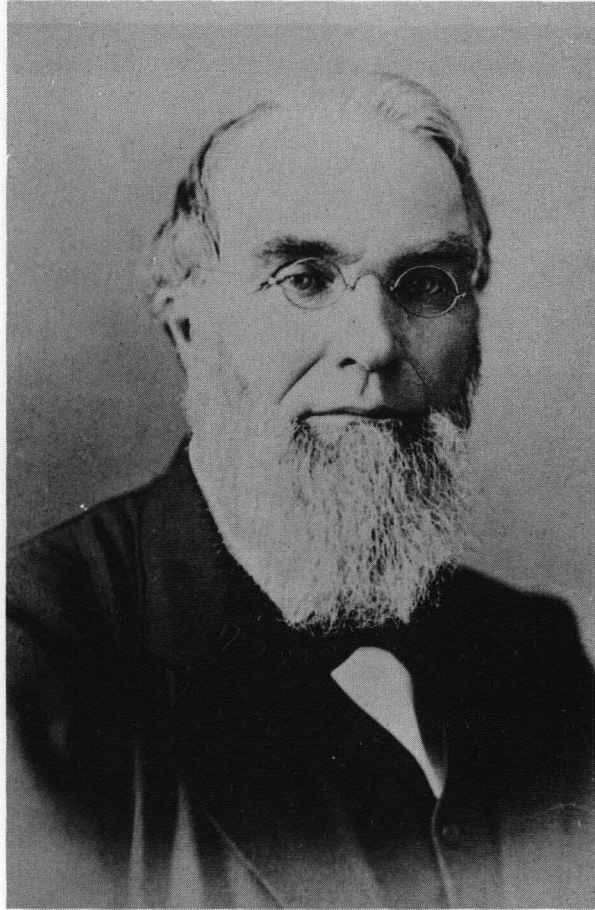
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GEORGE W. DEAN (1820-1901), AMATEUR
MALACOLOGIST IN OHIO

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George W. Dean was born in Wayne Township of Ashtabula County, Ohio, on 20 August 1820. He was educated in the common schools of that township and at the Western Reserve Academy at Farmington. As a young man he followed in his father's footsteps as a shoe-maker in Wwyne Township and later at Auburn. On 1 September 1852 he was married to Maria L. Jones. They had one daughter, Lillian, born in 1853, who shared her father's interest in horticulture and natural history.

In 1855 Dean established a nursery at Troy, in Geauga County, which he operated for eight years. Then in 1864 he moved to Franklin Township of Portage County where he established another nursery and a greenhouse just east of Kent. He raised general nursery stock, fruit trees, small fruits, and for a while, flowers. He was one of the first nurserymen in Portage County and a founder of the Portage County Horticulture Society. This Society was organized on 6 February 1879 with 14 charter members, and Dean's family became as-

sociated with it longer than any other. Dean was the first vice-president and served for six years. He was then elected president in 1888. At the first regular meeting of the Society Dean read an essay on 'Tree Planting.' On occasions the group held its monthly meeting at Dean's home and greenhouse. For a period of time he served as chairman of the Committee on Ornithology and Entomology. (See Dexter, 1961a, for the work of this committee and the controversies which arose). Among his reports to the Society was one entitled 'Economic Ornithology--Usefulness of Birds and Insects.' His daughter Lillian served frequently as chairman of the Committee on Flowers and eventually she, too, became president of the Society and was the only person to retain membership throughout the entire period of its existence (1879-1932).

Some of Dean's scientific associates were George J. Streater, a nurseryman, naturalist, and malacologist from Garrettsville; Prof. G. H. Colton of Hiram College; Prof. J. W. Pike, a science lecturer

from Mahoning; and Prof. E. W. Claypole from Buchtel College in Akron. All of these men became members of the Ohio State Academy of Science during its first year of existence (1892), and Dean and Claypole were among the 59 charter members. Dean, Streater, and Luther were fellow shell collectors. They often collected together and exchanged specimens. Friendly arguments frequently developed over identification of shells they collected. It was Streater who first recognized that Dean's separation of *Unio radiatus* and *U. luteolus* was incorrect. Later, *U. luteolus* proved to be a synonym of *U. radiatus* (See Dexter 1961b and 1963).

Dean's collection contained approximately 1,350 species of marine, fresh-water, and land shells. He also collected fossils, minerals, and arrowheads. He was one of the first students of land and fresh-water shells in Portage County. Unfortunately, only a fragment of his collection has been traced to date.

His publications on mollusks are as follows:

Distribution of Unionidae in the Three Rivers, Mahoning, Cuyahoga, and Tuscarawas, Ohio. *Nautilus* 4: 20-22, 1890.

On the distinguishing characters of *Unio radiatus* and *Unio luteolus*. *Nautilus* 5: 77-78, 1891.

More about *Unio luteolus* and *U. radiatus*. *Nautilus* 5: 112-113, 1892.

Catalogue of the Shell-bearing Mollusca of Portage County, Ohio. *American Naturalist* 26: 11-23, 1892.

The last paper was based upon ten years of collecting in which Dean was aided by the help of George Streater and S. M. Luther. A total listing of 89 land and fresh-water snails and 34 fresh-water clams was compiled with notes on distribution, abundance, and habitat.

Even though Dean was an amateur naturalist, he was thorough in his methods and objective in his outlook. At a meeting of the Portage County Horticultural Society he once stated, 'I love science because it is the pursuit of the real.'

Dean died on 10 April 1901 following a long illness. The *Ravenna Republican* eulogized him as 'a noted nurseryman and authority on horticultural and natural science. ---- A man of profound thought and extensive information.' In the Proceedings of the Portage County Horticultural Society he was characterized as 'an earnest student, a sound thinker, conscientiously honest, loyal to his convictions of right, and who made valuable contributions to the thought and work of horticulture.' We might add that he was one of the pioneers in the study of mollusks in northeastern Ohio, and his publications have become important base-line studies in that area.

LITERATURE CITED

DEXTER, RALPH W. (1961a) Birds and insects in relation to horticulture in northeastern Ohio, 1879-1899. -- *The Biologist*, 44: 1-6.

----- (1961b) George J. Streater's cruise of the *Thomas Say* in 1885. -- *Sterkiana* 5: 39-42.

----- (1963) Some interesting molluscan records of George J. Streater, 1881-1909. -- *Sterkiana* 12: 9-14.

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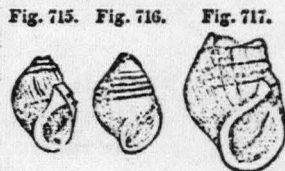
??*Leptoxis*, RAFINESQUE, Jour. de Phys., lxxviii, p. 424, 1819. HALDEMAN, Monog. Lept. H. & A. ADAMS, Genera, 1, p. 307, Feb., 1854. CHENU, Man. de Conchyl., 1, p. 294, 1859. BINNEY, Check List, p. 10, June, 1860. BROT, List, p. 23, 1862. *Mudalia*, HALDEMAN, Suppl. to Monog. Limn., Oct., 1840. *Nitocris*, H. & A. ADAMS, Genera, 1, p. 308, Feb., 1854.

1. *Tuberculata* species.

1. *A. plicata*, CONRAD.

Anculotus plicatus, CONRAD, New Fresh-Water Shells, p. 61, t. 8, f. 18, 1834. DEKAT, Moll. N. Y., p. 103. JAY, Cat., 4th edit., p. 276. REEVE, Monog., t. 3, f. 22. MÜLLER, Synopsis, p. 40, 1836. *Anculosa plicata*, CONRAD, WHEATLEY, Cat. Shells U. S., p. 23. *Leptoxis plicata*, CONRAD, BINNEY, Check List, No. 379. HALDEMAN, Monog. Lept., p. 3, t. 2, f. 35-39. ADAMS, Genera, 1, p. 307. *Anculosa bella*, LEA, Philos. Proc., ii, p. 83, Oct., 1811. WHEATLEY, Cat. Shells U. S., p. 28. *Anculosa tuberculata*, LEA, Philos. Proc., ii, p. 83, Oct., 1811. Phil. Trans., ix, p. 21. Obs., iv, p. 21. WHEATLEY, Cat. Shells U. S., p. 23. BINNEY, Check List, No. 392. *Anculotus smaragdinus*, REEVE, Monog., t. 3, f. 23, April, 1850.

Description.—Shell suboval, with a short spire, only one whorl of which is entire, rounded; body-whorl slightly ventricose, with oblique plaits or lines, which are crenulated on the margins of a slight, spiral groove near the suture; lines of growth prominent; epidermis greenish or blackish, with spiral bands; aperture elliptical.



Habitat.—Inhabits tributaries of the Tennessee River in Alabama, adhering to stones.—*Conrad*.

Here follow descriptions of the synonymes:—

Anculosa bella.—Shell subglobose, rather thin, tuberculate above, banded, greenish-brown; spire short; sutures linear; whorls three, convex; aperture subrotund, bluish within; columella maculated.

Habitat.—Warrior River, Alabama; Professor Brumby.—*Lea*.

Figure 715 is a copy of one in Prof. Haldeman's Monograph, which, as he says, is labelled "bella" in Mr. Lea's cabinet. It is a good figure of the original type.

Anculosa tuberculata.—Shell ovate, thick, above tuberculate, brown; spire short; sutures scarcely impressed; whorls slightly convex; aperture ovate, within flesh-colored; columella thick and spotted.

Habitat.—Warrior River, Alabama.

Diameter, .28; length, .50 of an inch.

Observations.—The above description is made from a single specimen, which is truncate at the apex; as the species of this genus usually are. Three whorls are visible. In a perfect state, it probably has four. The specimen before me has two rows of tubercles. On the superior part of the whorl, and below these, are two parallel, indistinct lines, which may, in other individuals, rise into tubercles. In the interior, two purple bands are visible. On the middle of the columella there is a large, purple spot. This may not occur in all specimens. The aperture is about two-thirds the length of the shell.—*Lea*.

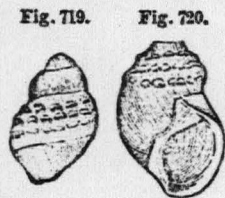
Anculotus smaragdinus.—Shell ovately turbinate, sometimes rather solid, bright green; spire tumidly exerted; whorls slopingly convex, smooth, encircled round the upper part with three ridges; ridges oblong-granuled; aperture ovate; columella broadly callous.

Habitat.—Alabama.

Observations.—This species has been confounded by Mr. Haldeman with the preceding.

It is of a peculiar bright green color, not plicated from the sutures, but encircled with three spiral ridges, swollen with transversely oblong grains, and there is no purple stain upon the columella.—*Reeve*.

As this species is very variable in outline and ornamentation, four other figures are here given, all of which are from specimens from the Coosa River, Alabama. Messrs. Haldeman and Reeve, both make *tuberculata* a synonyme of *plicata*; M. Brot does the same, and adds *smaragdinus*, Reeve; *bella*, Lea, is written a synonyme by Prof. Haldeman.



2. *Sulcata* species.

2. *A. Showalterii*, LEA.

Anculosa Showalterii, LEA, Proc. Acad. Nat. Sci., p. 83, 1850. Jour. Acad. Nat. Sci., 2d ser., v, pt. 3, p. 253, t. 35, f. 62, March, 1853. Obs., ix, p. 77, t. 35, f. 62. *Leptoxis Showalterii*, LEA, BINNEY, Check List, No. 383. BROT, List, p. 25. *Anculotus sulcosus*, ANTHONY, MSS., REEVE, Monog. Anculotus, t. 6, f. 44, April, 1851. *Leptoxis sulcosa*, ANTHONY, BROT, List, p. 26.

Description.—Shell much ribbed, suborbicular, thick, very dark brown, almost black, very finely striate; spire very short; sutures much impressed; whorls inflated, covered with seven transverse ribs; aperture large, nearly round, subangular above, with dark bands inside; columella thick, flattened, dark brown; outer lip very much expanded and very much crenulate.

Operculum ovate, thin, with the polar point on the inner inferior edge.

Habitat.—Coosa River, Uniontown, Alabama; Dr. E. R. Showalter. Diameter, .37; length, .40 of an inch.

Observations.—Several specimens of this very remarkable *Anculosa* were sent to me by Dr. Showalter. It differs from all the species I have seen in its peculiar, large ribs which girt it with great strength. The apices being eroded, the number of whorls cannot be ascertained, but there are probably only three. On the second whorl only three ribs appear above the suture. It reminds us at once of *Paludomus loricata*, Reeve, but the transverse ribs are not beaded like that shell. It is also a diminutive shell compared with that, and has a more depressed spire. The ribs are very large, and sometimes obscurely maculate. They are accompanied on the inside with dark brown bands which terminate at the edge of the lip, each in a small furrow, which produces the crenulations of the lip.—*Lea*.



The following is Mr. Reeve's description:—

Anculosa sulcosus.—Shell ovate, rather thin, inflated, dirty-fulvous; spire very short, flat; whorls spirally keeled; keels very large, rounded, distant, with the interstices broadly excavated; aperture ovate, large, wide, open; columella short.

Habitat.—Alabama.

Observations.—A very remarkable Purpura-shaped species, composed of largely defined, winding, keel-like ribs, broadly excavated in the interstices.—*Reeve*.

As the species is very uniform and Mr. Anthony's types before me do not in the least differ from those of Mr. Lea, I have not considered it necessary to give a figure of *sulcosa*.

3. *A. canalifera*, ANTHONY.

Anculosa canalifera, ANTHONY, Proc. Acad. Nat. Sci., p. 68, Feb., 1860.
Anculotus canaliferus, ANTHONY, REEVE, Monog. Anculotus, t. 5, f. 39.
Leptoxis canalifera, ANTHONY, BINNEY, Check List, No. 345. BROU, List, p. 24.

Description.—Shell ovate, costate, of a brown color, thin; spire acutely elevated, composed of 5-6 sharply carinated whorls; sutures not very distinct; aperture about half the length of the shell, ovate, banded inside; columella deeply indented; sinus none.



Habitat.—North Carolina, in Dan River.

Observations.—One of our most curious and beautiful species, which no one can easily mistake; the whole shell is crossed with sharp, elevated costæ running round the whorls and corresponding deep grooves between them; about five costæ on the body-whorl; a less number on the spire volutions; these ribs appear as dark bands in the interior of the aperture, and there is a broad, non-elevated band at the base of the shell; differs from *Anculosa costata* (nobis) by the size and prominence of its ribs and by its elevated spire.—*Anthony*.

Figure 722 is from Mr. Anthony's type. This species is very closely allied to *Melania proscissa*, Anthony, from the same locality, and may prove to be a variety of that shell with a shorter spire. It is a very beautiful species.

3. *Striate species.*

4. *A. littorina*, HALDEMAN.

Anculosa littorina, HALDEMAN, Spec. Number of Monog. Cover of No. 1, Monog. July, 1840.
Leptoxis littorina, HALDEMAN, Monog. Lept., p. 4, t. 4, f. 110. BINNEY, Check List, No. 358. BROU, List, p. 24.
Melania pilula, LEA, Philos. Proc., ii, p. 15, Feb., 1841. Philos. Trans., viii, p. 186, t. 6, f. 50. Obs., iii, p. 24, t. 6, f. 50. DEKAY, Moll. N. Y., p. 99.
 TROOST, Cat. Moll. Tenn. WHEATLEY, Cat. Shells U. S., p. 26.
 BINNEY, Check List, No. 204. CATLOW, Conch. Nomencl., p. 188.
 ADAMS, Genera, i, p. 367.



Description.—Shell solid, conical, olivaceous, encircled with transverse lines; whorls four, flattened; apex eroded; sutures scarcely excavated; aperture somewhat rounded, angulated above.

Habitat.—Holston River, Virginia.
Length, $\frac{1}{2}$ of an inch.—Haldeman.

The accompanying figure is from Prof. Haldeman's Monography of *Leptoxis*. As Mr. Lea's figure of *Melania pilula* is precisely similar, it is not necessary to reproduce it here; his description is as follows:—

Melania pilula.—Shell striate, subglobose, thick, dark brown; sutures somewhat impressed; whorls convex; aperture ovate, large, angular at the base, within purplish.

Habitat.—Tennessee.

Diameter, .34; length .43 of an inch.

Observations.—This is a very distinct species, and is quite as globose as *M. subglobosa*, Say. Two specimens were received, the spires of which are not perfect. I should presume that when perfect they would be found to have four whorls. The raised striæ are very distinct, and consist of eighteen in these two individuals. The aperture is about half the length of the shell. One specimen is dark purple within the aperture. The other is bluish with a tinge of purple on the columella.—Lea.

This species resembles somewhat a striate variety of *dilatata*.

5. *A. costata*, ANTHONY.

Anculotus costatus, ANTHONY, Bost. Jour. Nat. Hist., iii, p. 273, t. 3, f. 1, Jan., 1840.

DEKAY, Moll. N. Y., p. 102, t. 7, f. 139. REEVE, Monog. Anculotus, t. 5, f. 41.

Anculosa costata, ANTHONY, List of Shells of Cincinnati, 2d edit. WHEATLEY, Cat. Shells U. S., p. 23.

Leptoxis costata, ANTHONY, BINNEY, Check List, No. 349.

Melania occidentalis, LEA, Philos. Proc., ii, p. 12, Feb., 1841. Philos. Trans., viii, p. 172, t. 5, f. 20. Obs., iii, p. 10, t. 5, f. 20. DEKAY, Moll. N. Y., p. 95. WHEATLEY, Cat. Shells, U. S., p. 26. JAY, Cat., 4th edit., p. 274. BINNEY, Check List No. 184. CATLOW, Conch. Nomenc., p. 138.

Nitocris costata, Lea, H. and A. ADAMS, Genera, i, p. 303.

Nitocris occidentalis, Lea, ADAMS, Genera, i, p. 303.

Description.—Shell subglobose, with a depressed, convex spire; body-whorl ventricose, with about five costæ revolving Fig. 725. Fig. 726. around it; color olivaceous; aperture obovate; base regularly rounded; purplish within.



Observations.—Found on pebbly shores near the city of Cincinnati.—Anthony.

Melania occidentalis.—Shell smooth, subglobose, rather thick,

green; spire short, pointed; sutures linear; whorls four, somewhat convex; aperture ovate, large, within, purple or white.

Habitat.—Vicinity of Cincinnati, Ohio.

Diameter, .30; length, .37 of an inch.

Observations.—This is a fine species about the size of *Melania subglobosa*, Say (*Anculosa*), and it has been confounded with it. I have specimens of *subglobosa* which were brought by Prof. Vanuxem from the Holston, at the time he gave them to Mr. Say for description. They certainly do not appear to me to be the same, although in many characters they agree. The animal of *occidentalis* I have not seen; the operculum is spiral; at present I prefer to place it among the *Melania*. Some of the varieties before me are very beautifully furnished with raised revolving striæ. When there is a single one, it gives the shade the appearance of being carinate, as it appears near the centre of the whorl. In some specimens these striæ are more numerous; in a single one I have counted fifteen. There appear to be no bands on the outside, but sometimes purple lines on the inside mark the places of the exterior striæ. There is generally more or less color in the interior and about the columella the base of which is disposed to be angular. The aperture is nearly three-fourths the length of the shell.*—Lea.

The nomenclature of this species is singularly confused. Mr. Lea described the quite young shell of *A. prærosa*, which is then carinate, as *Melania Cincinnatiensis*, and he has considered *costatus* to be the mature form and a synonyme, and distributed shells so labelled. Prof. Haldeman, in his monograph of *Leptoxis*, declares *costatus*, Anthony, and *occidentalis*, Lea, to be synonymes of *trilineatus*, Say; and succeeding authors have acquiesced in these views. *Costatus* is, however, a young shell of which *occidentalis* is the mature form. That it is perfectly mature is shown by the deposit of enamel upon the columella of some of the specimens before me. The striæ still appear on the old shell, when the surface is not too much worn. *A. trilineatus* is never costate and has three broad, brown bands, and Mr. Anthony informs me that it has never been found in the upper Ohio River, while *costatus* is plentiful at Cincinnati. The figures of *costatus* are from specimens fur-

*Since the above was written I have seen in the "Boston Journal of Science" the description and figure by Mr. Anthony of *Anculotus costatus* which in some respects answers to this shell. Mr. A. says that his shell has "about five costæ revolving around it."

nished by Mr. Anthony. The largest one is from one of his types.

6. *A. rubiginosa*, LEA.

- Anculosa rubiginosa*, LEA, II, p. 83, Oct., 1841. Philos. Trans., ix, p. 20. Obs., iv, p. 20. BROT, Mal. Blatt, ii, p. 111, July, 1840.
Anculotus rubiginosus, Lea, JAY, Cat., 4th edit., p. 276. REEVE, Monog. Anc., t. 2, f. 12; t. 6, f. 47.
Leptoxis rubiginosa, Lea, HALDEMAN, Monog. Lept., f. 59-70. BINNEY, Check List, No. 333. CHENU, Manuel, i, f. 2035, 2036. ADAMS, Genera, i, p. 307.
Anculosa Griffithiana, LEA, Philos. Proc., ii, p. 83, Oct., 1841. Philos. Trans., ix, p. 20. Obs., iv, p. 20. WHEATLEY, Cat. Shells U. S., p. 23.
Anculotus Griffithianus, Lea, REEVE, Monog. Anculotus, t. 1, f. 8.
Leptoxis Griffithiana, Lea, BINNEY, Check List, No. 362. ADAMS, Genera, i, p. 307.

Description.—Shell ovately gibbous, thick, smooth, rusty color; spire rather elevated; sutures impressed; whorls flattened; aperture irregularly ovate, within whitish; columella thick, dark purple.

Habitat.—Warrior River, Alabama.

Diameter, .40; length, .60 of an inch.

Observations.—A single, and not a very perfect, specimen is before me. The middle of the whorl is flattened, indeed a little impressed, and this causes a curve in the outer lip. It is obscurely banded, and the whole of the columella is purple. The aperture is nearly two-thirds the length of the shell. The spire is more exerted than usual in the

Fig. 727. Fig. 728.



Fig. 729. Fig. 730.



Fig. 731. Fig. 732. *Anculose*, but not perfect in this specimen. Four whorls are perceptible.—
 Lea.



Fig. 733. Fig. 734. Fig. 735. The following description of *A. Griffithiana* by Mr. Lea will better exhibit the usual state of the species.



Anculosa Griffithiana.—Shell ovately gibbous, thick, closely and transversely striate, banded; sutures impressed; whorls four, flattened; aperture ovate, within banded; columella thick, dark purple.

Habitat.—Coosa River, Alabama.

Diameter, .50; length, .60 of an inch.

Observations.—The distinctive characters of this species are the transverse striæ and the flattened side. This flatness causes a nob

tuse angle below, and one above. One of the two specimens, under examination, is more banded, and has a less number of striæ than the other. The aperture is nearly three-fourths the length of the shell.—*Lea*.

Prof. Haldeman figured this last shell in his Monograph as a variety, but an examination of thousands of specimens from Coosa River, Alabama, proves the entire identity of the two forms by intermediate ones. Perhaps not one specimen in one hundred is entirely smooth, and some are almost costate. The columella is always tinged with purple, and the substance of the shell generally slightly so. It appears to be a very abundant and very distinct species. Among the Coosa River specimens several occurred with the top of the body-whorl plicate.

Mr. Reeve is in error when he says at sp. 47 that sp. 12 does not represent this shell, they equally represent it; also in quoting *A. ampla*, Anthony, as a synonyme of *rubiginosa*, and *Melania compacta*, Anthony, as a synonyme of *A. Griffithiana*.

4. *Angulated species.*

7. *A. carinata*, BRUGUIERE.

- Bulimus carinatus*, BRUG., Ency. Meth., vers, i, p. 301, 1792.
Paludina dissimilis, SAY, Nicholson's Encyc., 3d Am. edit., 1819.
Anculotus dissimilis, Say, RAVENEL, Cat., p. 11. JAY, Cat., 4th edit., p. 276. REEVE, Monog. Ancul. t. 4, f. 27.
Anculosa dissimilis, Say, WHEATLEY, Cat. Shells U. S., p. 23. HALDEMAN, in Ruppell's Lancaster County, p. 479.
Nitocris dissimilis, Say, ADAMS, Genera, i, p. 308.
Leptoxis dissimilis, Say, HALDEMAN, Monog. Lept., p. 4, t. 4, f. 85-100. BROT, List, p. 24. BINNEY, Check List, No. 333. CHENU, Manuel, i, f. 2049-54.
Helix subcarinata, WOOD, Index, Test. Suppl., t. 7, f. 13. Lister, t. 111, f. 5.
Anculotus carinatus, DEKAY, Moll. N. Y., p. 101, 1843. JAY, Cat., 4th edit., p. 276.
Anculosa carinata, DeKay, WHEATLEY, Cat. Shells U. S., p. 28.
Leptoxis carinata, DeKay, BINNEY, Check List, No. 343. BROT, List, p. 24.

Variety a.

- Anculosa carinata*, LEA, Proc. Philos., ii, p. 34, April, 1841. Philos. Trans., ix, p. 15. Obs., iv, p. 15.
Leptoxis carinata, Lea, BINNEY, Check List, No. 344.
Nitocris carinata, Lea, ADAMS, Genera, i, p. 308.
Anculosa variabilis, LEA, Philos. Proc., ii, p. 34, April, 1841. Philos. Trans., ix, p. 15. Obs., iv, p. 15. WHEATLEY, Cat. Shells U. S., p. 23.
Leptoxis variabilis, Lea, CHENU, Manuel, f. 2037-39. BINNEY, Check List, No. 394.

BROT, List, p. 26. HALDEMAN, Monog. Le tox's, p. 4, t. 4, f. 103-0. ADAMS, Genera, i, p. 307.

Variety b.

Anculotus nigrescens, CONRAD, New Fresh-Water Shells, p. 64, t. 8, f. 17, 1834.
 DEKAY, Moll. N. Y., p. 102. WHEATLEY, Cat. Shells U. S., p. 23. JAY, Cat. 4th edit., p. 276. MÜLLER, Synopsis, p. 36, 1836.
Leptoxis nigrescens, Conrad, BINNEY, Check List, No. 372. ADAMS, Genera, i, p. 307.
Anculotus trivittatus, DEKAY, Moll., N. Y., p. 102, t. 7, f. 137, 1843.
Leptoxis trivittata, DeKay, BINNEY, Check List, No. 390. ADAMS, Genera, i, p. 307.

Variety c.

Anculotus monodontoides, CONRAD, New Fresh-Water Shells, p. 61, t. 8, f. 16, 1834.
 DEKAY, Moll. N. Y., p. 102. JAY, Cat., 4th edit., p. 276. WHEATLEY, Cat. Shells U. S., p. 23. REEVE, Monog. Anc., t. 5, f. 37. MÜLLER, Synopsis, p. 41, 1836.
Mudalia monodontoides, Conrad, CHENU, Manuel, i, f. 2048-9.
Leptoxis monodontoides, Conrad, HALDEMAN, Monog. Leptoxis, p. 5, t. 4, 5, f. 124-133. BINNEY, Check List, No. 370.
Nitocris monodontoides Conrad, ADAMS, Genera, i, p. 308.
Anculotus dentatus, COUTHUOY, Am. Journ. Sci., xxxvi, p. 390, July, 1839. Bost. Journ. Nat. Hist. ii, p. 185, t. 4, f. 7, Feb., 1839. REEVE, Monog. Anc. t. 5, f. 36.
 DEKAY, Moll. N. Y., p. 102. JAY, Cat., 3d edit., p. 63.
Anculosa dentata, Couthuoy, WHEATLEY, Cat. Shells U. S., p. 23.
Leptoxis dentata, Couthuoy, BINNEY, Check List, No. 352.
Nitocris dentata, Couth., ADAMS, Genera, i, p. 308.
Anculosa dentata, LEA, Philos. Proc. ii, p. 34, Apr. 1841.
Leptoxis dentata, Lea, BINNEY, Check List, No. 353.
Anculosa (Mudalia) affinis, HALDEMAN, Monog. Limniades, Cover of No. 3, March 13, 1841.
Anculotus affinis, Haldeman, REEVE, Monog. Anculotus, t. 6, f. 53.
Leptoxis affinis, Haldeman, BINNEY, Check List, No. 337. BROT, List, p. 23.
Nitocris carinata, Lea, ADAMS, Genera, i, p. 303.

Description.—Shell conic, dark horn-color or blackish; whorls about three, with obsolete, distant wrinkles, and an abrupt, acute prominent, carinated line, which revolves on the middle of the body-whorl, and is concealed on the spire by the suture; suture not indented; aperture oval, half as long as the shell, within sanguineous beneath the carina,



and at base and apex; columella emarginated, a little flattened at the base.



Length, about two-fifths of an inch.

Variety A. Carina obsolete on the ventral portion of the body-whorl.



Variety B. Carina distinct on the spiral whorls owing to their more oblique revolution.

Observations.—The surface of the whorls of this species is generally covered with unequal calcareous matter, resembling a fortuitous accumulation of mud or earth on that part, but which appears

to be superposed by the animal, probably with the intention of retaining a proper specific gravity. The apex is often truncated. This species was found by Mr. Thomas Nuttall, during a journey to Pittsburg.—*Say.*



Figure 737 represents a typical shell and figure 743 Mr. Say's variety B.

The following is Mr. DeKay's description of

Anculosa carinatus.—Shell short, pyramidal, thin and fragile; whorls with a distinct, elevated carina, rather suddenly attenuated to the apex, which is frequently eroded; the whorls are polished with incremental striæ ascending to the edge of the carina, where they become multiplied, especially on its lower aspect; suture canaliculate, by the elevated carinæ; aperture subrhomboidal; outer lip simple, angular reflected at the base; pillar lip concave, with a broad callus; outer lip above contiguous to the carina of the preceding whorl; color amber, darker towards the lip.

Length of shell, .45; extreme width of shell, .4 of an inch. Length of aperture, .45 of an inch.

Observations.—This very remarkable species, which may probably form the type of a new genus, is from Lake Champlain. My thanks are due to Dr. B. W. Budd, for an opportunity of adding this to the state collection. I have since obtained others from Cranesport, Broome County, in one of the tributaries of the Susquehanna. These are dark olive-green and many of them .5-.6 of an inch long. An eminent conchologist pronounces it identical with *A. dissimilis*, but I have not found the description of this species.—*DeKay.*



The figure is copied from that of Mr. DeKay. This species is of protean form and substance, being either thin or ponderous, large or small, carinate or smooth, with or without a tooth on the columella. It is not without much study of numerous individuals from many localities, that I propose to unite forms which eminent conchologists have always considered very distinct, but I find no characters in any of the so-called species here included, which do not become lost in transition forms. In certain parts of Eastern Virginia and Maryland the shell attains but a small growth, becomes stunted

and develops a fold on the columella. In this state it becomes *dentata*, Couthuoy, or *monodontoides*, Conrad; while in parts of the Potomac and Susquehanna it becomes large, heavy and inflated.

I have selected a number of figures to show the transition from one form to another. The shells Fig. 748. Fig. 747. Fig. 749. represented by figures 747, 748, 749 (collected by me, cohabiting with the typical species at Harper's Ferry, Virginia, and at Washington, D.C.), merge into Mr. Lea's *A. carinata* and *variabilis*. The descriptions of these species here follow accompanied by illustrations of the types.

Anculosa carinata.—Shell ovately conical, carinate, dark olive; spire rather short; sutures small; whorls six; aperture small, round, whitish, sulcate; columella rather thick, purple.

Fig. 750. Fig. 751. *Habitat*.—Roanoke River, Lafayette, Virginia.



Diameter, .33; length, .52 of an inch.

Observations.—A single specimen only of this interesting species was sent to me by Dr. Warder.

It has some resemblance to *Anculosa dissimilis*, Say. It differs in having a smaller and rounder aperture and in having three carinae, the middle one being the largest. The aperture is rather more than one-third the length of the shell. The carinae are acute.—*Lea*.



Anculosa variabilis.—Shell obtusely conical, thick, either banded or horn-colored, carinate or smooth; sutures linear; whorls six, flattened; aperture large, nearly round; columella thick white or purple.

Fig. 754. Fig. 755.



Habitat.—Roanoke River, Lafayette, and near Shenandoah Spring Brook.

Observations.—Three specimens are before me, all of which differ more or less. Two of them are rather acutely carinate, with a dark epidermis and three rather large bands, the other is of a rather light horn-color with indistinct bands in the interior, and having no carina on the lower whorl. On the columella there is a slight swelling. The aperture is about one-half the length of the shell.—*Lea*.



Anculotus nigrescens.—Shell subconical, truncated or much eroded at the apex; superior whorl hardly convex; body-whorl elongated, contracted above on the labrum; columella flattened, obtusely rounded at the base; aperture obovate, rather more than half the length of

Fig. 759. Fig. 760. Fig. 763. Fig. 761. Fig. 762. Fig. 764. Fig. 765.



the shell; epidermis blackish; within dark purple. I am indebted to Mr. Hyde for this shell; he informs me it inhabits rivers in Maryland.

—*Conrad*.

The cut (fig. 762) is from a type specimen.

Anculosa trivittata.—Shell elliptical; whorls about five, convex; suture impressed; spire short, often eroded, and about the length of the aperture; inner lip arcuated, with a callus; aperture oval, rounded beneath, acute above; color dark olive, with three dark purple, revolving lines on the carina, the central band very narrow.

Length of shell, .5 of an inch. Length of aperture, .25 of an inch.

Observations.—These species were obtained from Cranesport, in company with the preceding. In some, the bands are obscure or wanting. It appears to be closely allied to *A. melanoides* of Conrad, but is distinguished by the greater number of its volutions.—*DeKay*.



The above figures will suffice to show the mutation of form from the carinate varieties, through *trivittata*, DeKay, and *nigrescens*, Conrad, into the small shells with a toothed columella.

The following is Mr. Conrad's description of

Anculotus monodontoides.—Shell subglobose; body-whorl ventricose, not abruptly rounded above; apex eroded; columella with a large, pyramidal tooth at the base; epidermis horn-colored, with obscure bands; aperture effuse.



Habitat.—Inhabits streams in Virginia; Mr. Hyde.

Observations.—I received a specimen of this curious species from Prof. Green of Jefferson college.—*Conrad*.

Figure 770 is from a type specimen; figure 768, light green in color and a much thinner shell, was collected by me at Richmond, Virginia. Entirely identical



with *monodontooides* is *A. dentatus*, Couthouy, a description of which follows:—

Anculotus dentatus.—Animal much like that of *Melania*; foot broad, short, rounded and thick; body and head black, the latter suborbicular, terminating in a short, probosciform mouth, and furnished with two short, rather stout and pointed tentacula, black posteriorly and with faint, grayish, transverse bands on their anterior side; eyes minute, situated on a slight enlargement of the tentacula near their external base.

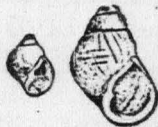
Operculum elongated, unguiform, thick, corneous, blackish or brown, opaque; spire terminal, increment, coarse and apparent.

Shell rounded or obtusely conical, subdiaphanous, very irregular in its conformation, frequently gibbous and distorted; the color varies from light olive-green to black, according to the age of the specimens; whorls five or six in number, the last constituting the greater portion of the shell, very much inflated and ventricose, and sometimes ornamented with two or three dark brown, transverse bands; spire obtuse, always considerably eroded, unless in very young shells; incremental striæ oblique, in some Fig. 772. Fig. 771. individuals barely apparent, and in others forming strong ridges on the last whorl; aperture rounded, effuse at the base; right lip thin, sharp and broadly everted; columella dark brown or purple, flattened, strongly arcuated, with a dentiform projection near the base, which forms a subangular sinus or indentation below it. Adjoining the columella is a strongly marked lacuna or fossa, most conspicuous in very old shells, but apparent in every stage of growth, and extending from the base of the shell to the centre of the lower whorl. There is no umbilicus, properly speaking, that region being consolidated by the columella. The internal color is chiefly greenish or brownish, with occasional shades of yellowish-white in old shells.

Habitat.—Inhabits the rapids of the Potomac River, Virginia.

Height, ten-fortieths; diameter of last whorl, eleven-fortieths inch.

Observations.—This shell at first sight might be taken for *Anculotus monodontooides*, Conrad, of Alabama, but may be distinguished from it by the peculiar flattening of the columella, which is deep purple or brown instead of white, and the remarkable fossa in the umbilical region. In that species, moreover, the tooth is situated on the middle of the columella and resembles a plait or fold at that part



whereas in ours it is formed by an oblique, inward projection of the columella near the base. The external conformation is exceedingly irregular, varying from subconical to globose, sometimes compressed on the back, at others strongly gibbous. The aperture is also frequently distorted. Young specimens are of a light olive-green color, while older ones are nearly black, and usually covered with an earthy coating. The lower whorl is invariably marked at its base by a broad, dark brown band, and has frequently one on the middle and one on the superior portion. Some of the varieties of this shell, when undistorted, have so great an external resemblance to some of the varieties of *Turbo palliatus*, Say, that a figure of one might answer very well for both. It was found in abundance on the rocks, at the rapids, about a mile above the falls of the river Potomac, apparently delighting in situations where one would imagine it difficult for it to adhere. The only shells found in company with it were *Melania Virginica*, Say, and *Anculotus nigrescens*, Conrad, which latter was in great abundance and variety of form. Some of its less angular varieties closely approached *A. dentatus* in their general appearance, but were easily distinguished by the form of the aperture and the absence of the columellar lacuna.—Couthouy.

No. 772 is a copy of the original figure, and No. 771 is one selected from a number of Maryland specimens kindly loaned to me for examination by Mr. Anthony.

The following description of *Anculosa dentata* was published by Mr. Lea in the Phil. Proc., but suppressed in Philos. Trans., probably because it was discovered to be a synonyme.

Anculosa dentata.—Shell subglobose, thick, blackish; spire short, obtuse; sutures impressed; whorls convex; aperture large, subrotund; columella thickened, dentate.

Habitat.—Vicinity of Richmond, Virginia; J. A. Warder, M.D.

The following is the only description of *Anculosa affinis*, Fig. 773. Haldeman. Its claim to specific rank was yielded by that gentleman, probably, for otherwise he would have published a diagnosis for it.



Anculosa (Mudalia) affinis.—I propose this name for a shell allied to *Paludina dissimilis*, Say; but which differs from it in having a slight tooth upon the columella.

Habitat.—Ohio; Mrs. Say.

The following opinions have been advanced concerning the synonymy of this species:—

Professor Haldeman, Mr. Reeve and Dr. Brot concur in considering *nigrescens* a synonyme of *dissimilis*. The first and last named gentlemen write *carinata*, Lea, and *Nickliniana*, Lea?, synonymes of *A. variabilis*, Lea (*Nickliniana* is a true *Goniobasis*, G. W. T., Jr.). Messrs. Jay, Haldeman and Brot make *dentatus*, Couthuoy, a synonyme of *monodontoides*, Con. Professor Haldeman makes *dentata*, Lea, to be the same as Couthuoy's species.

8. *A. dilatata*, CONRAD.

Melania dilatata, CONRAD, New Fresh-Water Shells, Appendix, p. 6, t. 2, f. 5, 1834.

Anculotus dilatatus, Conrad, REEVE, Monog. Anculotus, t. 5, f. 33.

Anculosa dilatata, CONRAD, Am. Jour. Sci., n. s., i, p. 407. HANLEY, Conch. Misc., t. 5, f. 38.

Mudalia dilatata, Conrad, CHENU, Manuel de Conchyl., i, f. 2043-5.

Nitocris dilatata, Conrad, ADAMS, Genera, i, p. 308.

Leptoxis dilatata, Conrad, HALDEMAN, Monog. Leptoxis, p. 4, t. 4, f. 111-120. BINNEY, Check List, No. 354. BROTH, List, p. 21. CHENU, Manuel, i, f. 2043-5.

Melania Rogersii, CONRAD, New Fresh-Water Shells, Appendix, p. 7, t. 2, f. 7, 1834. JAY, Cat., 4th edit., p. 274.

Anculotus Rogersii, Conrad, REEVE, Monog. Anculotus, t. 4, f. 23.

Leptoxis Rogersii, Conrad, BINNEY, Check List, No. 392.

Nitocris Rogersii, Conrad, ADAMS, Genera, i, p. 308.

Anculotus carinatus, ANTHONY, Bost. Jour. Nat. Hist., iii, pt. 3, p. 394, t. 3, f. 5, July, 1840. REEVE, Monog. Anculotus, t. 5, f. 43.

Leptoxis carinata, ANTHONY, BINNEY, Check List, No. 342.

Anculotus Kirtlandianus, ANTHONY, Bost. Jour. Nat. Hist., iii, pt. 3, p. 295, t. 3, f. 4, July, 1840. JAY, Cat., 4th edit., p. 276. REEVE, Monog. Anculotus, t. 4, f. 29.

Anculosa Kirtlandiana, Haldeman, WHEATLEY, Cat. Shells U. S., p. 23.

Nitocris Kirtlandianus, ANTHONY, ADAMS, Genera, i, p. 308.

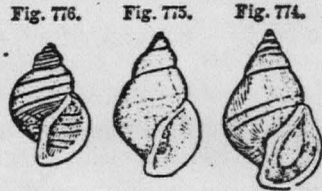
Melania inflata, LEA, Philos. Trans., vi, p. 17, t. 23, f. 98. Obs., ii, p. 17. WHEATLEY, Cat. Shells U. S., p. 25. BINNEY, Check List, No. 147. TROSCHEL, Archiv fur Naturgesch., ii, p. 226.

Nitocris inflatus, Lea, ADAMS, Genera, i, p. 308.

Leptoxis rapaformis, HALDEMAN, Monog. Leptoxis, p. 4, t. 4, f. 123. BROTH, List, p. 25.

Melania dilatata.—Shell subovate, ventricose; spire conical; whorls convex; body-whorl angular in the middle; aperture subovate, half the length of the shell.

Habitat.—Inhabits rivers in Munroe County, Virginia; Mr. William B. Rogers.—Conrad.



A. Rogersii, Conrad, universally considered to be a young variety of the preceding is thus described:—

Melania Rogersii.—Shell subovate, with rather distant, prominent spiral lines; whorls convex; body-whorl ventricose; aperture subovate, half the length of the shell; columella obtusely angular at the base.



Variety *A.* Destitute of revolving lines; whorls gibbous.

Observations.—Inhabits with the preceding species. It was given me by Professor William B. Rogers, to whom I have dedicated the species.—Conrad.

A. carinatus, Anthony, *A. Kirtlandianus*, Anthony, and *A. inflata*, Lea, are all variations of this protean species. Their descriptions follow:—

Anculotus carinatus.—Shell oblong; spire as long as the aperture; volutions four, convex; suture not remarkable; body-whorl angularly ventricose; color olivaceous; from 4-5 elevated, black carinae, commencing at the upper part of the aperture, traverse the body-whorl; aperture within bluish-white and translucent, the carinae being very apparent through it.

Fig. 777a.



Extreme length of shell, $\frac{3}{4}$; breadth, $\frac{1}{2}$ of an inch.

Observations.—For this beautiful species of *Anculotus* I am indebted to Mrs. Say, who found it at the Falls of the Kanawha, a few weeks since, and kindly presented me with specimens of it for description.—Anthony.

Anculotus Kirtlandianus.—Shell turreted, with four convex whorls; spire truncated, the truncation generally destroying one of the volutions; the body-whorl slightly ventricose; color dark olive; aperture subovate; base attenuated, within clouded purple and banded.

Fig. 777b. Fig. 777c.



Length of shell, $\frac{3}{4}$; breadth, $\frac{1}{2}$ of an inch.

Observations.—Another species which I owe to the kindness of Mrs. Say. It is found in the same situations as *A. carinatus* (Falls of the Kanawha); it resembles very much a *Melania*, the spire being quite as much elevated as in most of the species of that genus; the young are very beautifully banded.—Anthony.

Melania inflata.—Shell conical, inflated, dark horn-color; apex

obtuse; whorls five, rather convex; columella marked; outer lip spread out.

Habitat.—Indian Creek, Virginia, west of Alleghany Mountains.

Diameter, .4; length, .6 of an inch.

Observations.—I am indebted to Mr. Nicklin for this new species, it having been found by him in Indian Creek, between the Salt and Red Sulphur Springs. The sinus is so small that at first view it may easily escape observation. The aperture is large, and in this it has some resemblance to a *Paludina*. Near the base of the columella a purple spot may be usually observed. It resembles most in outline the *M. tuberculata* (nobis), but differs in not being angulated, and in being entirely without tubercles. In color it differs entirely. Some individuals have three colored purple bands in the interior, while others are devoid of them.—*Lea*.



Figure 778 is a copy of that of Mr. Lea's. No. 779 is called by Professor Haldeman variety *striata*; No. 780 he names variety *sinuata*; No. 781 variety *iostoma*; No. 782 variety *glauca*; No. 783 variety *solidula* and No. 784 variety *rapaeformis*. The last two Prof. Haldeman considers with doubt as new species, and they have been so quoted since by other authors. Messrs. Haldeman and Brot quote the following as synonymes of *dilatata*, Conrad:—*Rogersii*, Conrad; *inflata*, Lea; *Kirtlandianus*, Anthony; *carinatus*, Anthony.

Mr. Lea writes as follows in the Philosophical Transactions, viii, p. 171:—

“Within a few days I have observed in the Boston Journal of Natural History, vol. 3, No. 3, descriptions of two new species of *Anculosa* by Mr. Anthony, *Anculotus carinatus* and *Anculotus Kirtlandianus*, both from the Falls of the Kanawha. Judging from the description and figures, I am led to the conclusion, that both these are identical with *M. inflata*, and from the great variety of this protean species, I am not surprised at its being mistaken. The peculiar character, however, of the angle and channel of the base in this species, is evident throughout. I am not



Fig. 783.

Fig. 782.



Fig. 785.

Fig. 784.



aware of the animal having been yet observed; when examined it may prove to be a true *Anculosa*. If so, the synonymy will stand thus:—

- Anculosa inflata*, Lea.
- Melania dilatata*, Conrad.*
- Melania Rogersii*, Conrad.
- Anculotus carinatus*, Anthony.
- Anculotus Kirtlandianus*, Anthony.

The following is from Proc. Bost. Nat. Hist. Soc., i, p. 5, Feb. 3, 1841.

“The president read a letter from S. J. Whittemore, in which was an extract from a letter from J. G. Anthony, Esq., of Cincinnati, stating that the *Anculotus Kirtlandianus* of Anthony was identical with the *Melania Rogersii* of Conrad.”

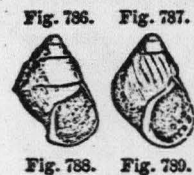


Fig. 786.

Fig. 787.



Fig. 788.

Fig. 789.

It is proper to add, in concluding this very long description that the material from which I have drawn my conclusions (be they good or bad) has been ample, probably much more so than that of which any conchologist has been able heretofore to avail himself; and that these conclusions were irresistibly forced upon me against my preconceived convictions. Should any conchologist differ from me, the value of this article will still be scarcely impaired, for I have been careful, particularly with that object in view, so to arrange the order of the descriptions that, whilst they exhibit the natural sequence of the species and its varieties as far as possible, they still conform to the ideas which have heretofore been current regarding them; thus, they may be divided into two, three, four or more species, and the intermediate descriptions will be found still to represent the synonymy of each preceding species so selected. Varieties of this shell approach very closely to *dissimilis*, and the two species may be identical. The western species is heavier; but differs principally in the aperture being produced and recurved in front.

Fig. 790. Fig. 791. Fig. 792.



* This description was published prior to Mr. Lea's, and should therefore head the list, unless it should be degraded to a synonyme, because published as a *Melania* instead of an *Anculosa*.

9. *A. corpulenta*, ANTHONY.

Anculosa corpulenta, ANTHONY, Proc. Acad. Nat. Sci., p. 68, Feb., 1860.
Anculotus corpulentus, ANTHONY, REEVE, Monog. Anculotus, t. 1, f. 9.
Leptoxis corpulenta, ANTHONY, BINNEY, Check List, No. 348. BROT, List, p. 21.

Description.—Shell ovate, or broad ovate, smooth, thick; spire rather elevated; composed of 4-6 subconvex whorls; suture decidedly impressed; aperture very broad, ovate, ample, banded inside; columella well rounded, slightly covered with white callus, and with a slight indication of sinus at base.

Habitat.—North Carolina.

Observations.—Cannot well be confounded with any of its congeners; it is unusually elevated for an *Anculosa*, resembling more a *Paludina* in that respect; the whorls are regularly but not abruptly shouldered, and are often excavated with a narrow channel in the middle; striæ and even indistinct carinæ are often visible, but are not a constant character; the bands within the aperture are not always well defined and are sometimes wanting altogether; when present they are generally five in number, and are arrested by a narrow white space at the outer lip; body-whorl often subangulated. Occurs in Dan River, North Carolina, in company with *Anculosa canalifera* (nobis), and appears to be common. Several hundred specimens of various ages are now before me.—Anthony.

Fig. 793.



A very distinct and beautiful species most nearly allied to heavy, obsoletely angulated forms of *dissimilis*. The figure is from the type specimen. Other specimens before me are of somewhat larger size and more distinctly angulated.

10. *A. melanoides*, CONRAD.

Anculotus melanoides, CONRAD, New Fresh-Water Shells, p. 64, t. 8, f. 19, 1834.
 DEKAY, Moll. N. Y., p. 102. WHEATLEY, Cat. Shell. U. S., p. 26. REEVE, Monog. Anculotus, t. 6, f. 48. MÜLLER, Synopsis, p. 42, 1836.
Leptoxis melanoides, Conrad, HALDEMAN, Monog. Leptoxis, p. 5, t. 5, f. 145, 146. BINNEY, Check List, No. 369.
Nitocris melanoides, Conrad, ADAMS, Genera, 1, p. 303.
Anculosa (Mudalia) turgida, HALDEMAN, Supplement to No. 1, Monog. Linnæides, Oct., 1840. WHEATLEY, Cat. Shells U. S., p. 23.
Leptoxis turgida, HALDEMAN, Monog. Leptoxis, p. 5, t. 5, f. 151. BINNEY, Check List, No. 393. BROT, List, p. 26.
Leptoxis turgida, Hald., ADAMS, Genera, 1, p. 307.

Description.—Shell conical, with three entire volutions; apex eroded; whorls flattened, rounded only at the sutures; lines of growth prominent; body-whorl abruptly rounded; epidermis blackish, obscurely banded; aperture elliptical, about half the length of the shell.



Habitat.—Inhabits rivers in North Alabama. Length, $\frac{1}{2}$ of an inch.—Conrad.

Figure 794 is from a type specimen in the possession of Mr. Anthony. The shell has been cleaned, exhibiting a light green epidermis. *Leptoxis turgida* of Haldeman is identical with this species. The following is the description:—

Leptoxis turgida.—Shell composed of four flat turns; spire and aperture of equal length; posterior (upper) end of the labrum advanced upon the body-whorl which swells into the aperture at this point; color light green, translucent.

Fig. 796.



Habitat.—Alabama. Length, $\frac{1}{2}$ of an inch.

Observations.—Resembles somewhat the *Paludina (Mudalia) dissimilis*, Say.—Haldeman.

5. *Shell smooth, globose, or flattened above.*

11. *A. trilineata*, SAY.

Melania trilineata, SAY, New Harmony Dissem., No. 18, p. 227, Sept. 9, 1829. SAY'S Reprint, p. 19, 1840. BINNEY'S edition, p. 144. CATLOW, Conch. Nomencl., p. 189.
Anculosa trilineata, Say, DEKAY, Moll. N. Y., p. 100. WHEATLEY, Cat. Shells U. S., p. 27. JAY, Cat. Shells, 3rd edit., p. 62.
Anculotus trilineatus, Say, JAY, Cat., 4th edit., p. 276. REEVE, Monog. Anculotus, t. 5, f. 41b.
Leptoxis trilineata, Say, HALDEMAN, Monog. Leptoxis, p. 5, t. 5, f. 134-144. BINNEY, Check List, No. 389. BROT, List, p. 26.

Variety.

Melania viridis, LEA, Philos. Proc., II, p. 12, Feb. 1841. Philos. Trans., VIII, p. 172, t. 5, f. 19. Obs., II, p. 12. DEKAY, Moll. N. Y., p. 95. WHEATLEY, Cat. Shells U. S., p. 27. BINNEY, Check List, No. 292. CATLOW, Conch. Nomencl., p. 189.

Description.—Shell subglobose oval, yellowish, more or less tinged with brown; volutions about four, rounded, somewhat wrinkled; spire short, rather more than half the length of the aperture; suture not very deeply impressed; body-whorl with three brownish-black revolving lines, of which the two inferior ones are nearest together,

the middle one widest, and the superior one placed nearest the suture and revolving on the spire; the middle one is concealed on the spire by the suture; aperture much dilated, ovate, acute above; labium a little flattened; labrum widely and regularly rounded, without any protrusion near the base; base slightly angulated, without any sinus or undulations; umbilicus none.

Habitat.—Inhabits Falls of the Ohio.

Length, less than $\frac{1}{2}$ of an inch.

Variety A. Inferior band obsolete.

Variety B. Bands obsolete.

Observations.—This species is allied to the preceding (*M. isogona*), but is obviously distinct in its general appearance; the volutions are destitute of a shoulder, and the aperture is ovate, acute above. It is a pretty shell, the bands being very conspicuous, strongly contrasting with the yellow general color, particularly in the young and half grown shell. I obtained about a dozen specimens on the rocky flats of the falls of the Ohio at the lower end of the island which is nearest to Louisville.—Say.

Melania viridis described by Mr. Lea is the same as Mr. Say's variety B of *trilineata* and does not exhibit distinctive characters amounting to specific weight. The following is the description:—

Melania viridis.—Shell smooth, subfusiform, rather thick, green; spire short, obtusely conical; sutures linear; whorls five, somewhat convex; aperture ovate, rather large, white.



Habitat.—Vicinity of Cincinnati, Ohio.

Diameter, .27; length, .32 of an inch.

Observations.—Inhabits with the *M. occidentalis*, herein described, and resembles it. It is a smaller species, has one more whorl, has a higher spire, and among nine individuals before me I see no indications of transverse striae. The aperture is rather more than half the length of the shell.—Lea.

In treating *viridis* as a synonyme of *trilineata* I follow the opinions expressed with reference to it by Messrs. Haldeman, Brot, Binney and Anthony. The two former gentlemen together with Dr. Jay, unite in considering *costatus*, Anthony, and *occidentalis*, Lea, as synonymes also. In this opinion I cannot coincide; the two species appear to me to be well sep-

arated by the costate surface of Mr. Anthony's species and the uniformly smooth surface of *trilineatus*. Mr. Reeve's figure of *trilineatus* is very poor; the bands are so represented as to appear like ribs. It is by no means certain that *trilineata* is an *Anculosa*. Its small size and smooth surface and general outline suggest its pertinence to the *Amnicolidæ*, to which family several small species, hitherto considered to be *Anculosæ* have been recently removed. It differs from all the *Amnicolidæ*, however, in possessing colored bands. The figure of *trilineata* is from Mr. Say's type in possession of Mr. Anthony. *Viridis* is a copy of Mr. Lea's excellent figure.

12. *A. subglobosa*, SAY.

Melania subglobosa, SAY, Journ. Acad. Nat. Sci., v, p. 128, Sept., 1825. BINNEY'S edit., p. 116. BINNEY, Check List, No. 254. CATLOW, Conch. Nomencl., p. 188. JAY, Cat., 3rd edit., p. 62.

Anculotus subglobosus, SAY, CONRAD, New Fresh-Water Shells, p. 60, t. 8, f. 14. DEKAY, Moll. N. Y., p. 103. REEVE, Monog. Anculotus, t. 1, f. 10. JAY, Cat., 4th edit., p. 276.

Anculosa subglobosa, SAY, WHEATLEY, Cat. Shells U. S., p. 23.

Leptoxis subglobosa, SAY, HALDEMAN, Monog., p. 3, t. 2, f. 40-53. CHENU, Manuel de Conchyl., i, f. 2040-42. BINNEY, Check List, No. 287. BROT, List, p. 25. ADAMS, Genera, i, p. 307.

Melania subglobosa, LEA, TROOST, Cat. Shells Tenn., p. 42.

Anculosa gibbosa, LEA, Philos. Proc., ii, p. 34, April, 1841. Philos. Trans., ix, p. 15. Obs., iv, p. 15. WHEATLEY, Cat. Shells U. S., p. 23.

Anculotus gibbosus, LEA, REEVE, Monog. Anculotus, t. 1, f. 3.

Leptoxis gibbosa, LEA, BINNEY, Check List, No. 361. BROT, List, p. 25. ADAMS, Genera, i, p. 307.

Melania globula, LEA, Philos. Proc., ii, p. 12, Feb., 1841. Philos. Trans., viii, p. 174, t. 5, f. 22. Obs., iii, p. 12. DEKAY, Moll. N. Y., p. 95. TROOST, Cat. Shells Tennessee. WHEATLEY, Cat. Shells U. S., p. 25. BINNEY, Check List, No. 126.

CATLOW, Conch. Nomencl., p. 187.

Leptoxis globula, LEA, ADAMS, Genera, i, p. 307.

Variety.

Anculosa tintinnabulum, LEA, Philos. Proc., iv, p. 167, Aug., 1845. Philos. Trans., x, p. 67, t. 9, f. 51. Obs., iv, p. 67.

Anculotus tintinnabulum, LEA, REEVE, Monog. Anculotus, t. 2, f. 13.

Leptoxis tintinnabulum, LEA, ADAMS, Genera, i, p. 307.

Melania virgata, LEA, Philos. Proc., ii, p. 13, Feb., 1841. Philos. Trans., viii, p. 175, t. 5, f. 25. Obs., iii, p. 13. DEKAY, Moll. N. Y., p. 95. TROOST, Cat. Shells Tennessee. BINNEY, Check List, No. 290. CATLOW, Conch. Nomencl., p. 189.

WHEATLEY, Cat. Shells U. S., p. 27.

Leptoxis virgata, LEA, ADAMS, Genera, i, p. 307.

Description.—Shell subglobose, brownish horn-color; spire but little elevated, not half the length of the aperture; volutions about

four; aperture rounded, nearly as broad as long; within more or less tinged with dull red; labium a little flattened.

Length, three-fifths; greatest breadth, eleven-twentieths of an inch.

Observations.—Professor Vanuxem found this curious shell in the north fork of the Holston River, Virginia, where they are extremely abundant. In the old shells the surface, and particularly that of the spire, is considerably corroded, presenting the appearance of having received a fortuitous deposition of calcareous matter. This corrosion, however, does not extend to the destruction of any of the whorls, as is the case with many shells, but its effects seem to be confined to the exterior. It is a second species of my proposed genus *Anculotus*. All the striae of the operculum are concentric to the superior angle.—*Say*.



This species, which inhabits an extensive range in Virginia, Tennessee, Alabama and north Georgia, is somewhat variable in outline and ornamentation. The southwest Virginia specimens, which are unicolorous, may retain the name of *subglobosa*, as the typical shells, and the young of these = *globula*, Lea, a description of which species follows:—

Melania globula.—Shell smooth, subglobose, dark brown, banded; spire short; sutures impressed; whorls four, rather convex; aperture large, nearly round, within bluish.

Habitat.—Tennessee; Dr. Troost.

Diameter, .22; length, .25 of an inch.

Observations.—This is a small, globose species, with two very broad bands, one immediately over and the other below the middle of the body-whorl. The columella is white, inclined to a rusty hue. The interior of the base is reddish. Some of the specimens are small, and present a variety in which the columella is redder, and the epidermis more yellow, with the same distinctive bands. The aperture is nearly two-thirds the length of the shell.—*Lea*.

The following is the description of

Anculosa gibbosa.—Shell subglobose, gibbous, thick, nearly black, thickly striate; spire short; sutures impressed; whorls rather flattened; aperture subquadrangular, flesh-colored or whitish.

Habitat.—Tennessee.

Diameter, .50; length, .68 of an inch.

Observations.—This species is about the size of *Anculosa subglobosa*, Say. It is not so regularly rounded, being flattened on the

upper part of the whorl. The striae are minute, and seem to be formed by the lines of growth. There is quite a callus on the superior part of the columella, the middle part being deeply impressed. The number of whorls could not be ascertained from my specimens, all of them being more or less eroded.—*Lea*.



Anculosa tintinnabulum, Lea, is a much stronger variety than the last and may for convenience retain its name, under that of *subglobosa*. It is characterized by the whorls becoming wider, heavier, flattened above the middle and having two broad, dark bands, or maculate with brown. The description of this shell is appended, and also that of its young state, called by Mr. Lea *Melania virgata*.

Anculosa tintinnabulum.—Shell smooth, obtusely conical, bell-shaped, banded, very thick, yellow; spire short; sutures impressed; whorls five, impressed; aperture rather large, round; columella very thick, callous above.

Habitat.—Tennessee: Tuscaloosa, Ala.

Diameter, .48; length, .70 of an inch.

Observations.—The peculiar, constricted lower whorl, giving a campanulate form to this shell, will distinguish it at once from other species. Six specimens before me are all yellow, with broad, brown bands. A single specimen is perfect enough in the spire to make out five whorls. Two of the specimens are white on the columella, and four are tinted with brown. The outline is very remarkable, in its campanulate form. The mouth, in the perfect specimen, is about two-thirds the length of the shell.—*Lea*.

Melania virgata.—Shell smooth, rounded, rather thin, yellow, double-banded, shining; spire short; sutures linear; whorls convex; aperture large, elliptical, whitish.

Habitat.—Tennessee.

Diameter, .20; length, .30 of an inch.

Observations.—A single specimen of this small species was sent



to me by Dr. Troost. It seems to be mature, and is remarkable for the two broad bands which nearly cover the whorls. The aperture is about half the length of the shell.—*Lea*.

Mr. Reeve's figure of *subglobosa* represents a shell very closely approaching the variety *tintinnabulum*, while his figures of *tintinnabulum* represent respectively, fig. 13a, variety *gibbosa*, banded; fig. 13b, probably a young *Leptoxis crassus* of Haldeman.

Professor Haldeman was the first naturalist who detected the specific identity of the shells I have grouped together above, and other gentlemen have since adopted his opinion regarding them.

13. *A. prærosa*, SAY.

Melania prærosa, SAY, Jour. Acad. Nat. Sci., ii, p. 177, Jan., 1824. BINNEY'S edit. p. 70. CATLOW, Conch. Nomencl., p. 188. SOWERBY, Conch. Man., f. 314.
Anculotus prærosus, SAY, CONRAD, New Fresh-Water Shells, p. 59, t. 8, f. 13. JAY, Cat., 4th edit., p. 276. REEVE, Monog. Anculotus, t. 2 f. 15, 16.
Anculotus prærosus, SAY, WOODWARD, Mannel, t. 8, f. 28.
Anculosa prærosa, SAY, RAVENEL, Cat., p. 11. WHEATLEY, Cat. Shells U. S., p. 28. ANTHONY, List, 1st and 2d edits. KIRTLAND, Rep. Zool. Ohio, p. 174. DEKAY, Moll. N. Y., p. 103.
Leptoxis prærosa, SAY, HALDEMAN, Monog. Lept., p. 2, t. 1, f. 1-18. CHENU, Manuel, i, f. 2030-34. BINNEY, Check List, No. 330. BROU, List, p. 25. ADAMS, Genera, i, p. 307. MORCH, YOLDI, Cat., p. 56.
Melania angulosa, MENKE, Syn. Meth., 1st edit., p. 81, 1828. 2d edit., p. 135, 1830. BINNEY, Check List, No. 15.
Melania cruentata, MENKE, Syn. Meth., 1st edit., p. 80, 1828. 2d edit., p. 134, 1830.
Melania ovalis, MENKE, Syn. Meth., 1st edit., p. 80. 2d edit., p. 134. BINNEY, Check List, No. 194.
Melanopsis neritiformis, DESHAYES, Encyc. Meth. Vers., ii, p. 438, No. 14. Anim. Sans Vert., 2d edit., viii, p. 492, 1838.
Lithasia neritiformis, DESHAYES, ADAMS, Genera, i, p. 303.
Anculotus angulatus, CONRAD, New Fresh-Water Shells, p. 60, t. 8, f. 15, 1834. DEKAY, Moll. N. Y., p. 102. WHEATLEY, Cat. Shells U. S., p. 27. REEVE, Monog. Anculotus, t. 6, f. 51. JAY, Cat. Shells, 4th edit., p. 276. MÜLLER, Synopsis, p. 40, 1836.
Leptoxis angulata, CONRAD, BINNEY, Check List, No. 340. ADAMS, Genera, i, p. 307.
Melania Cincinnatiensis, LEA, Philos. Proc., i, p. 66, Dec., 1838. Philos. Trans., viii, p. 190, t. 6, f. 58. Obs., iii, p. 28. JAY, Cat., 4th edit., p. 273. CATLOW, Conch. Nomencl., p. 186.
Anculotus Cincinnatiensis, LEA, DEKAY, Moll. N. Y., p. 95. TROOST, Cat. Shells Tennessee.
Leptoxis Cincinnatiensis, LEA, BINNEY, Check List, No. 346.

Description.—Shell subglobular, oval, horn-color; volutions three or four, wrinkled across; spire very short, much eroded in the old shell, so much so as to be sometimes not prominent above the body-

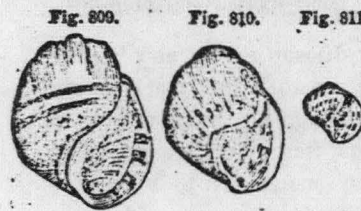
whorl; body-whorl large, ventricose, with a very obtuse, slightly impressed, revolving band; aperture suboval, above acute and effuse; within on the side of the exterior lip about four revolving, purplish lines, sometimes dotted, sometimes obsolete or wanting; labium thickened, particularly at the superior termination near the angle, and tinged with purplish; base of the columella somewhat elongated and incurved, meeting the exterior lip at an angle.

Habitat.—Inhabits Ohio River.

Length, about four-fifths of an inch.

Observations.—Found in plenty at the falls of the Ohio. The spire is remarkably curious in the older shells, and the penultimate whorl, between the aperture and the spire, is also remarkably eroded in many older shells. The spire in the young shell is entire, and but

little prominent, though acute, and the bands are distinct on the exterior of the shell. This shell does not seem to correspond with the genus to which I have for the present referred it, and owing to the configuration of the base of the columella, if it is not a *Melanopsis*, it is probable its station will be between the genera *Melania* and *Acathina*. I propose for it the generic name of *Anculosa*.—*Say*.



The various species described by Menke and Deshayes all appear to be synonymes of *prærosa* judging from the descriptions, translations of which are here given. Prof. Haldeman and Mr. Anthony both agree with me in this opinion. *Melania Cincinnatiensis*, *Lea*, is only a quite young *prærosa*, as is proved by the extensive suite of specimens before me, for which I am indebted to Mr. Anthony. *Angulatus*, Conrad, represents, as Professor Haldeman truly remarks, a half grown shell in which the carina still lingers. This variety is found only in Alabama. The species is very common, and ranges through Ohio, Indiana, Kentucky, Tennessee, northern Georgia and Alabama.

Melania angulosa.—Shell ovate, truncated, perforated, variable, striatè, greenish-brown; whorls five, the last obsolete angulated above; columella callous, violaceous; lip acute, produced against the columella above.

Habitat.—Ohio River near Cincinnati; Bescke.

Longitude, 8; latitude, 6½ lin.

Melania cruentata.—Shell subglobose, acute at the apex, variable, striated, green, maculate seriately, conspicuously at the ovate oblique aperture, banded with blackish-purple; columella with a reddish callus; lip simple, produced above.

Habitat.—Ohio River near Cincinnati; Bescke.

Longitude, 5; latitude, 4½ lin.—*Menke*.

Melania ovularis.—Shell ovately conoidal, variable, substriate, rather shining greenish, becoming brownish-red, with apex truncate with age; aperture ovate; columella subcallous above; lip rounded above.

Habitat.—Ohio River near Cincinnati.

Longitude, 1 poll.; latitude, 7 lin.

Melanopsis neritiformis.—Shell globose, neritiform; apex very obtuse, reddish-black, smooth; aperture ovately semi-lunar; base scarcely emarginate; columella contorted, callous above, depressed in the middle; outer lip doubly sinuated.

Habitat.—The Ohio and Wabash.—*Deshayes*.

Anculotus angulatus.—Shell subglobose; body-whorl ventricose, contracted above, biangulated; spire very short; volutions carinated at the suture; color olivaceous, with about four series of dark, quadrangular spots on the body-whorl.

Fig. 812.



Observations.—Inhabits Flint River, Morgan County, Alabama, adhering to stones and is common.—*Conrad*.

Melania Cincinnatiensis.—Shell carinate, much depressed, below compressed, brown, three-banded, with two carinae, pointed at the apex; whorls four; aperture rounded.

Habitat.—Near Cincinnati, Ohio.

Diameter, .14; length, .16 of an inch.

Observations.—This is a very minute species recently taken in the vicinity of Cincinnati, by my brother T. G. Lea. It is very remarkable for its roof-shaped spire, and two carinae, which are colored. More recently found by Dr. Troost in the Holston, Tennessee.—*Lea*.

Leptoxis retusa, Rafinesque, has been doubtfully referred to this species by Prof. Haldeman.

14. *A. tæniata*, CONRAD.

Anculotus tæniatus, CONRAD, New Fresh-Water Shells, p. 63, 1834. DEKAY, Moll. N. Y., p. 103. JAY, Cat., 4th edit., p. 276. REEVE, Monog. Anculotus, t. 6, f. 50, non t. 2, f. 15. MÜLLER, Synopsis, p. 41, 1835.

Anculosa tæniata, Conrad, WHEATLEY, Cat. Shells U. S., p. 23. *Leptoxis tæniata*, Conrad, HALDEMAN, Monog. Leptoxis, t. 3, f. 71-73. BINNEY, Check List, No. 328. BROU, List, p. 25. ADAMS, Genera, i, p. 307.

Anculosa Coosaensis, LEA, Proc. Acad. Nat. Sci., p. 54, 1861. Jour. Acad. Nat. Sci., v, pt. 3, p. 237, t. 30, f. 63, March, 1863. Obs., ix, p. 76.

Description.—Shell oval, or oblong, olivaceous, with dark green spiral bands, four on the body-whorl; one whorl of the spire not eroded, often longitudinally produced.

Fig. 813. Fig. 814.



Length, ¾ of an inch.

Observations.—Inhabits friable calcareous banks of the Alabama River, at Claiborne. It is a pretty species, remarkable for its dark bands, which resemble those of *Melania olivula* (nobis) of the same locality.—*Conrad*.

This shell resembles *rubiginosa* and *prærosa* and appears to occupy a somewhat intermediate position between the two. A number of specimens before me, from the Alabama and Coosa Rivers, including author's examples from the former stream, indicate the changes which age produces in this species. When half grown it appears to be identical with *Coosaensis*, Lea, whose description and figure are copied below.

Anculosa Coosaensis.—Shell smooth, obtusely conical, thick, dark horn-color, very much banded; spire elevated, obtuse at the apex; sutures very much impressed; whorls four, very much constricted below the sutures, the last large; aperture rounded, white, much banded within; columella thickened, incurved, dark purple; outer lip acute and expanded.

Fig. 815.



Operculum rather large, elliptical, dark brown, with the polar point close to the left edge towards the base.

Diameter, .34; length, .55 of an inch.

Observations.—This species is more nearly allied to *tintinnabulum* (nobis) than any other. It differs in being more elongate, having a higher spire, having a less dilate aperture, and in usually having four bands, the *tintinnabulum* usually having two bands, or being without any. In two of the *Coosaensis*, out of six specimens before me, the

bands are interrupted, changing them to rows of square maculations. Some of the specimens are slightly umbilicate. The aperture is rather more than half the length of the shell.—*Lea*.

15. *A. Troostiana*, LEA.

Anculosa Troostiana, LEA, Philos. Proc., II, p. 34. Philos. Trans., IX, p. 15. Obs., IV, p. 15. WHEATLEY, Cat. Shells U. S., p. 23.
Anculotus Troostianus, LEA, REEVE, Monog. Anculotus, t. 4, f. 30.
Leptoxis Troostiana, LEA, HALDEMAN, Monog. Leptoxis, p. 4, t. 3, f. 81. BINNEY, Check List, No. 391. BROU, List, p. 26. ADAMS, Genera, I, p. 207.

Description.—Shell ovately conical, thick, minutely rugose, dark brown; spire somewhat elevated; sutures rather impressed; whorls flattened; aperture rounded, within bluish; columella thick, white or flesh-colored.

Habitat.—Tennessee.

Diameter, .50; length, .60 of an inch.

Observations.—There are many specimens before me, all of which in form are unusually alike, for a species of *Anculosa*. It differs from other species which have come under my notice in its spire, which is quite elevated, giving it the aspect of the genus *Melania*. Small, irregular wrinkles, or granulations, may be observed over the whole surface in most specimens, and I believe this will generally be found to be more or less the case with most of the species.—*Lea*.

Fig. 878.



This is a small, ponderous, compact species, with a peculiarly dark epidermis, and is not likely to be confounded with any other. The figure is from one of Mr. Lea's types, which he kindly presented to me. *Anculosa Melanoides*, Conrad (*turgida*, Haldeman), differs from this in being narrower, and in the aperture being produced instead of rounded at the base.

16. *A. pinguis*, LEA.

Melania pinguis, LEA, Philos. Trans., X, p. 301, t. 30, f. 11. Obs., V, p. 57. BINNEY, Check List, No. 206. BROU, List, p. 40. REEVE, Monog. Melania, sp. 355.

Description.—Shell smooth, inflated, almost round, very thick, dark brown; spire very obtusely conical; sutures impressed; whorls a little convex; aperture very large and rounded, within either white or purple; columella incurved and thickened.

Habitat.—Lebanon, Wilson County, Tennessee.

Diameter, .34; length, .53 of an inch.

Observations.—I have three specimens before me from Mr. Safford; two of them are purple within and one white. None of them are

perfect on the apex, but I presume that the number of whorls must be five. One of the specimens has four. In Fig. 817. outline it is very much like *M. inflata* (nobis), but it differs totally in the form of the columella. In that species the columella is twisted backwards, and makes an angular, oblique channel; in the *pinguis* it is regularly curved, with scarcely a perceptible indentation in place of a channel. The aperture is fully one-half the length of the shell.—*Lea*.



This shell is certainly an *Anculosa*, and is intermediate in its characters between *viridula*, Anthony; and *Kirtlandiana*, Lea. When well cleaned it frequently exhibits a greenish hue. It is rather a common species, and somewhat variable in its proportions, being sometimes prolate and in other specimens from the same locality oblate. Mr. Lea's figure is copied.

17. *A. contorta*, LEA.

Anculosa contorta, LEA, Proc. Acad. Nat. Sci., p. 137, 1860. Jour. Acad. Nat. Sci., V, pt. 3, p. 253, t. 33, f. 63, March, 1831. Obs., IX, p. 80.
Leptoxis contorta, LEA, BINNEY, Check List, No. 347. BROU, List, p. 21.

Description.—Shell smooth, ovately rounded, thick, yellowish horn-color; spire raised; sutures deeply impressed; whorls inflated, obscurely and transversely striate; aperture small, nearly round, constricted, yellowish-white within; columella thickened; outer lip acute and expanded.

Habitat.—Coosa River, at Wetumpka, Alabama.

Diameter, .36; length, .50 of an inch.

Observations.—A single specimen only was received from Dr. Showalter, which, being much eroded at the apex, prevents Fig. 818. a perfect description being made. But the number of whorls appears to be about four. The form is remarkable for an *Anculosa*, the outline presenting the appearance of a *Paludina*; but the callus on the columella and its whole massiveness forbid its being placed in that genus, while the regular rotundity of the whorls is similar in some measure to it. The aperture is about half the length of the shell.—*Lea*.



18. *A. vittata*, LEA.

Anculosa vittata, LEA, Proc. Acad. Nat. Sci., p. 188, 1860. Jour. Acad. Nat. Sci., v, pt. 3, p. 236, t. 33, f. 63, March, 1863. Obs., ix, p. 78.
Leptoxis vittata, Lea, BINNEY, Check List, No. 397. BROD, List, p. 26.

Description.—Shell smooth, subglobose, thick, yellowish, very much banded; spire obtuse; sutures impressed; whorls four, inflated, the last large and very much inflated, aperture round, very much contracted in the throat, banded within; columella very much thickened, flattened and purplish; outer lip sharp and expanded.

Habitat.—Coosa River, at Wetumpka, Alabama; E. R. Showalter, M.D.

Diameter, .30; length, .33 of an inch.

Observations.—This is a very remarkable species, perhaps more like a much-banded *prærosa*, Say, than any other. It entirely differs from that species in the columella being very thick and flattened, and which nearly fills up half the aperture. The banded varieties of *prærosa* differ very much from each other, while this seems Fig. 319. to be exceedingly regular. The five specimens before me have each four dark brown bands nearly covering up the yellow ground. The upper one is placed immediately under the suture, and is broader than the next two, which are approximate, revolving on the middle of the whorl. The fourth is larger again and revolves near to the base. I have no doubt, judging from the five individuals before me, that the characters of this little species will not be changeable, for they present no difference in phase whatever, although they are of several ages. The aperture is about two-thirds the length of the shell.—Lea.



19. *A. planospira*, ANTHONY.

Melania planospira, ANTHONY, AND. Lyc. Nat. Hist. N. Y., vi, p. 123, t. 3, f. 24, March, 1854. BINNEY, Check List, No. 208. BROD, List, p. 40. HANLEY, Conch. Misc. Melania, t. 8, f. 67.
Anculotus planospira, Anthony, REEVE, Monog. Anculotus, t. 2 f. 11.

Description.—Shell short-ovate, smooth, rather thick, light horn-colored; body-whorl large, occupying nearly the entire volume of the shell; spire nearly flat, consisting of 4-5 perfectly plane whorls, scarcely elevated above the body-whorl; aperture long narrow ovate; columella rounded, ending in a slight sinus.

Habitat.—Tennessee.

Diameter, .32 (8 millim.); length, .50 of an inch (13 millim.). Length of aperture, .36 (9 millim.); breadth of aperture, .18 of an inch (4½ millim.).

Observations.—Cannot be confounded with any other species; its Fig. 820. remarkably flat whorls rising like steps, but little above each other, with a distinct and slightly raised rim around the periphery, will alone be sufficient to characterize the species. It seems more like an *Anculosa* in form, but is nevertheless a true *Melania*. Two bands are visible on the body-whorl and also within the aperture.—Anthony.

There are, in Collection Smithsonian, several hundred specimens of this shell from Green River, Kentucky. It is allied to *prærosa*, but appears distinct in the plane spire.

20. *A. ampla*, ANTHONY.

Anculosa ampla, ANTHONY, Ann. N. Y. Lyc. Nat. Hist., vi, p. 159, t. 5, f. 22, 23.
Leptoxis ampla, Anthony, BINNEY, Check List, No. 339. BROD, List, p. 23.

Variety a.

Anculosa elegans, ANTHONY, Proc. Acad. Nat. Sci., p. 69, Feb., 1860.
Anculotus elegans, Anthony, REEVE, Monog. Anculotus, t. 6, f. 49.
Leptoxis elegans, Anthony, BINNEY, Check List, No. 356. BROD, List, p. 24.

Variety b.

Anculosa formosa, LEA, Proc. Acad. Nat. Sci., p. 187, 1860. Jour. Acad. Nat. Sci. v. pt. 3, p. 254, March, 1863. Obs., ix, p. 78.
Leptoxis formosa, Lea, BINNEY, Check List, No. 358. BROD, List, p. 24.

Description.—Shell ovate-globose, olive-green, with four dark colored bands; spire very short, eroded; whorls 2-3, the last one shouldered, and peculiarly flattened just before completion, and having the shoulder raised into a few very slightly defined tubercles, which in some individuals are hardly perceptible; suture deeply excavated; aperture ovate, showing the dark bands of the exterior; columella brown, excavated and flattened, without basal sinus, giving that portion of the shell much resemblance to a *Littorina*.



Habitat.—Alabama.

Diameter, .42 (11 millim.); length, .62 of an inch (16 millim.). Length of aperture, .42 (11 millim.); breadth of aperture, .35 of an inch (9 millim.).—Anthony.

This very beautiful and rather abundant species, although differing very much from all others in its broad, flattened columella, covering the umbilicus completely, in the mouth being broadly inflated and rounded below, and in the whorls being rounded instead of slanting, varies much in itself; so much so in fact as to have caused marked specimens to be described as new species. Among these, the first is *A. elegans*, Anthony, of which the following is the description:—

Anculosa elegans.—Shell subglobose, smooth, thick; spire depressed, consisting of 3-4 flat whorls; color fine, glossy, dark yellow, ornamented with darker bands, of which five are on the body-whorl; aperture obliquely ovate and banded within; columella deeply curved, with a very callous deposit; sinus very small.



Habitat.—Alabama.

Observations.—A highly ornamental species, which cannot be compared with any other; its bands on a yellow ground render it very lively; it is heavier and smoother than *A. ampla* (nobis), not so broad in the aperture, and far more beautiful; neither is it so much shouldered as that species.—Anthony.

An examination of numerous specimens convinces me that *ampla* and *elegans* are only variations of one species. The figures given are all drawn from type specimens. The figure published by Mr. Lea of his *A. formosa*, which is herein copied, is a young *ampla* in form, only differing from the type specimens of that shell in the maculations; but I figure one of the adult shells mentioned by Mr. Lea in his description, which, on account of the very light color, impressed lines and maculations, may remain under the name of *formosa* as a variety.

The following is Mr. Lea's description:—

Anculosa formosa.—Shell smooth, globose, rather thin, semi-transparent, yellowish or saffron color, very much banded and maculate; spire depressed, scarcely conspicuous; sutures depressed; whorls three, the last large and very ventricose; aperture large, rounded; within pale saffron, with dark bands; columella thickened below and above and pale purple; outer lip sharp and very much expanded.

Operculum small, thin, with the polar point below the centre towards the inner edge.

Habitat.—Coosa River, Shelby County, Alabama.

Diameter, .38; length, .44 of an inch.

Observations.—I have three specimens before me of this very beautiful species. While it has much resemblance to the rounded varieties or that protean species, *prærosa*, Say, it may be distinguished by its being still more globose than its most globose varieties, by its delicacy, smoothness and brilliancy. Dr. S. says in his letter that he thinks it decidedly distinct from all others he has out of many thousands, and that "it is more rotund than any other." The largest specimen is four-fifths of an inch long, has four well-marked, continuous bands, with rows of maculation between them. The middle-aged specimen is quite saffron, has the same number of bands with the rows of maculation, but these bands are somewhat broken up, and the maculations are not so regular. In the third, the youngest one, the maculations are almost entirely absent. The largest specimen has a number of impressed, revolving lines, stronger towards

Fig. 826. Fig. 827.



the base. The description of the operculum is made from the middle-aged, the only one which accompanied the three, and in the older ones this may differ much. In all the specimens before me, the upper whorls are almost entirely covered by the last one. In the full grown one, the deep color of the upper band on the inside continues over on to the callus of the columella. Two other specimens accompanying these are considered by Dr. S. to be the same. They are apparently about half-grown. They differ slightly in form, and totally in the colored bands, which in these specimens are replaced over the whole surface with oblong maculations which, at the upper portion of the whorl, run together, and form an irregular, longitudinal band between low plications. I have been disposed to think that these two specimens may prove to be varieties of *picta*, Conrad, which puts on so many various kinds of bands, but the form is more globose than any *picta* I have seen. The aperture is nearly the whole of the length of the shell. Two adult specimens, received since the above was written, have coarse, transverse striæ and one is without any colored bands, the whole surface being a yellowish horn-color. The aperture is about five-sixths the length of the shell.—Lea.

21. *A. zebra*, ANTHONY.

Anculosa zebra, ANTHONY, Proc. Acad. Nat. Sci., p. 69, Feb., 1860.
Anculotus zebra, ANTHONY, REEVE, Monog., t. 6, f. 52.
Leptoxis zebra, ANTHONY, BINNEY, Check List, No. 398. BROTH, List, p. 26.

Description.—Shell subglobose, smooth, moderately thick; spire obtusely elevated, but slightly decorticated, and composed of four convex whorls; sutures distinctly impressed; aperture broad, ovate, within bluish, with the epidermal colors seen faintly through; columella rounded, covered with callus, which is thickened at the upper part.

Habitat.—Alabama.

Observations.—This species presents an appearance not often seen in the genus, by its mottled, variegated epidermis; the general ground color is gamboge yellow, but it is varied by blotches of very dark brown or reddish, often running into diagonal lines, which gives the shell a very lively and pleasant look. Only one other species is described as being similarly marked, viz.: *A. flammata*, Lea; that species I have never seen, but the description does not warrant me in considering the two identical. In old specimens the spire is often produced and somewhat nodulous, while the longitudinal bands become broken into irregular lines, so interrupted as to become scarcely more than quadrangular spots; it is one of our most beautiful species. About a dozen specimens are before me.—Anthony.



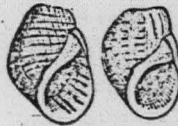
This species resembles *A. picta*, Conrad, particularly that variety described by Mr. Lea as *flammata*, so much, that its specific distinction may be considered doubtful.

22. *A. picta*, CONRAD.

Anculosa picta, CONRAD, Am. Jour. Sci., 1st ser., xxx, p. 342, t. 1, f. 15, Jan., 1834.
 WHEATLEY, Cat. Shells U. S., p. 23. HANLEY, Conch. Misc. Melania, t. 5, f. 39.
 MÜLLER, Synopsis, p. 39, 1836.
Anculotus pictus, CONRAD, New Fresh-Water Shells, p. 62, 1834. REEVE, Monog. Anculotus, t. 3, f. 26. JAY, Cat., 4th edit., p. 276. DEKAY, Moll. N. Y., p. 103.
Leptoxis picta, Conrad, HALDEMAN, Monog. Lept., t. 3, f. 74-80. BINNEY, Check List, No. 377. BROTH, List, p. 25. ADAMS, Genera, l, p. 397.
Anculosa Foremani, LEA, Philos. Proc., ii, p. 243, Dec., 1842. Philos. Trans., ix, p. 29. Obs., iv, p. 29. WHEATLEY, Cat. Shells U. S., p. 23.
Leptoxis Foremani, Lea, BINNEY, Check List, No. 359.
Anculosa flammata, LEA, Philos. Proc., ii, p. 243. Philos. Trans., ix, p. 29. Obs., iv, p. 30.

Anculotus flammatus, Lea, REEVE, Monog. Anculotus, t. 3, f. 18.
Leptoxis flammata, Lea, BINNEY, Check List, No. 357. Conrad, ADAMS, Genera, l, p. 307.

Description.—Shell oval; spire short, convex; apex eroded; body-whorl slightly compressed in the middle; epidermis horn-colored, spots distinct within the labrum; aperture obovate; base regularly rounded.



Habitat.—Inhabits pebbles on the bars in the Alabama River, near Claiborne.

Length, five-eighths of an inch.—Conrad.

Mr. Conrad's description applies only to a stunted or immature form of this species, which grows considerably larger and assumes some variety in marking. Mr. Lea's descriptions of *A. Foremani* and *A. flammata* are subjoined.

Anculosa Foremani.—Shell smooth, ovately gibbous, thick, yellow, transversely lined; spire very short; sutures impressed; whorls somewhat flattened; columella very thick; aperture rather large, elliptical, whitish.

Habitat.—Alabama.

Diameter, .40; length, .50 of an inch.

Observations.—Two of the three specimens under examination have very distinct, capillary, revolving, deep brown lines between the top of the aperture and the base. Above that the space is nearly filled up with two indistinct, interrupted lines which give a clouded appearance to that portion of the shell. The third specimen is of a brighter yellow, with all the lines nearly obliterated. In form this species very closely resembles *A. flammata* herein described, but the capillary lines distinguish it at once, and the columella is thicker at the base. In all the three specimens a slight tinge of brown may be distinguished on the middle of the columella. I dedicate the species to Dr. Foreman, who kindly placed a specimen in my cabinet.—Lea.

Fig. 831.



Anculosa flammata.—Shell smooth, ovately gibbous, thick, yellowish, obliquely flammulate; spire very short; sutures impressed; whorls somewhat flattened; columella very thick above; aperture rather large, elliptical, whitish.

Habitat.—Alabama.

Diameter, .33; length, .49 of an inch.

Observations.—A single specimen, broken on the outer lip, is before me. The middle of the whorl is slightly flattened. The spire is eroded, and little more than one whorl is presented. The epidermis on this part is nearly perfect, and exhibits a fine, yellow ground with thickly set, oblique, flammulate, brown bands. This species is very distinct from any I know, not being aware that flammulate bands have been before observed in any of this genus. In a single species of *Melania*, somewhat similar bands exist, the *M. brevisformis* (Pareyss) from New Holland.—*Lea*.

Fig. 833.



A. picta attains a larger size than the specimens figured. The figure of *A. Foremani* is from a very good specimen named by Mr. Lea; *A. flammata* is drawn from Mr. Reeve's illustration of that shell. I have been doubtful whether or not to include *A. zebra*, Anthony, in the synonymy of this species, but as the shell is much more globose in form than *picta* with a shorter spire and larger aperture proportionally, I conclude to separate it, with, however, a doubt of its specific distinction.

23. *A. ornata*, ANTHONY.

Anculosa ornata, ANTHONY, Proc. Acad. Nat. Sci., p. 67, Feb., 1860.
Anculotus ornatus, ANTHONY, REEVE, Monog. Anculotus, t. 3, f. 24.
Leptoxis ornata, ANTHONY, BINNEY, Check List, No. 373.

Description.—Shell conic, rather thick, smooth; spire elevated, composed of about five convex whorls; suture distinct; color dark yellow, polished, with dark brown bands revolving around the shell; three bands visible on the body-whorl and only one upon the volutions of the spire; aperture ovate, livid and banded within; columella furnished with a callus, often tinted with rose color; sinus very small.

Fig. 834.



Habitat.—North Carolina.

Observations.—A fine species, so much elevated as readily to be taken for a *Melania*; the dark bands on a yellow ground give it a lively appearance; about one hundred specimens are before me, and present very little variation; the dark bands within the aperture are very conspicuous, one being near the upper angle, two others near each other, but widely separated from the first, and a fourth

near the base of the shell; the middle bands are often confluent, and all of them are arrested by a broad area before they reach the outer edge.—*Anthony*.

The figure is from a type specimen. The body-whorl is slightly angulated in most of the specimens before me.

24. *A. Lewisii*, LEA.

Anculosa Lewisii, LEA, Proc. Acad. Nat. Sci., p. 51, 1861. Jour. Acad. Nat. Sci., v, pt. 3, p. 257, t. 35, f. 64, March, 1863. Obs., ix, p. 79.

Description.—Shell smooth, elliptical, rather thick, somewhat inflated, yellowish horn-color; spire obtuse, scarcely exerted, acuminate; sutures scarcely impressed; whorls five, the last very large; aperture large, regularly ovate, whitish within; columella incurved, a little thickened above and below; outer lip acute, somewhat expanded and slightly sinuous.

Operculum rather large, very dark brown, ovate, with the polar point very near the base on the left.

Habitat.—Tennessee; James Lewis, M.D.

Diameter, .30; length, .53 of an inch.

Observations.—Dr. Lewis sent me three specimens for examination;

Fig. 834.



I presume all he had received from Tennessee. It is quite distinct from any *Anculosa* I have seen. It verges toward the genus *Lithasia* in some of its characters. It reminds one of *Melania obovata*, Say, which probably should be removed from that genus to this. The aperture is more rounded at the base than in that shell, and the spire is much more obtuse, giving the outline of the two shells a very different appearance. It reminds one of the genus *Chilina*, Gray, but cannot be mistaken for that genus. The last whorl is so large that it nearly covers up the spire and leaves only a small portion extruded. Two of the specimens exhibit near the apex quite a disposition in the young to be carinate. In an immature state, therefore, they would present quite a different appearance, as the shoulder would be quite square.—*Lea*.

25. *A. squalida*, LEA.

Anculosa squalida, LEA, Philos. Proc., iv, p. 167, Aug., 1845. Philos. Trans., x, p. 66, t. 9, f. 50. Obs., iv, p. 66.
Leptoxis squalida, LEA, BINNEY, Check List, No. 386. BROT, List, p. 25. ADAMS, Genera, i, p. 307.

Description.—Shell smooth, rounded or elliptical, very thick, dark horn-color; spire obtuse; sutures scarcely impressed; aperture small, nearly round, within white; columella very thick.

Habitat.—Tuscaloosa, Alabama.

Diameter, .45; length, .77 of an inch.

Observations.—Dr. Budd submitted five specimens to me, and, as is frequently the case, in this genus, I do not find any two of the five exactly of the same outline. One is nearly round and presents but a single whorl. Another, a younger and more perfect specimen, is somewhat elliptical, and presents five whorls and a mammilate form. A third specimen is quite elliptical, the spire being obtusely conical. It is a very solid species, with a broad, thick columella, and a considerable callus above. All the five are obscurely banded. This species is allied to *A. prerosa*, Say, but differs somewhat in form, and has bands, not spotted lines. In some of the specimens the aperture is nearly the whole length of the shell.—*Lea*.

Fig. 835.



26. *A. patula*, ANTHONY.

Anculosa patula, ANTHONY, Proc. Acad. Nat. Sci., p. 68, Feb., 1860.

Anculotus patulus, ANTHONY, REEVE, Monog. Anculotus, t. 4, f. 32.

Leptoxis patula, ANTHONY, BINNEY, Check List, No. 376. BROT, List, p. 25.

Description.—Shell ovate, of a uniform, dark horn color, rather thin; whorls 4-5, convex; sutures very distinct; aperture semicircular, within whitish; columella only slightly rounded, somewhat flattened by a callous deposit, more or less tinged with dirty red.

Habitat.—Tennessee.

Observations.—Resembles none other of the genus; its color,

which is of a dull, dark brown, and its semicircular mouth,



remarkable for its length and breadth, are prominent marks of distinction; the body-whorl is very much inflated and angulated or subangulated; the interior aperture is often blotched with regular, dirty brown spots; spire elevated and acute, rapidly diminishing to the apex; the lines of growth are strong, and on some specimens a single prominent varix may be noticed.—*Anthony*.

27. *A. viridula*, ANTHONY.

Anculosa viridula, ANTHONY, Proc. Acad. Nat. Sci., p. 68, Feb., 1860.

Anculotus viridulus, ANTHONY, REEVE, Monog. Anculotus, t. 4, f. 34.

Leptoxis viridula, ANTHONY, BINNEY, Check List, No. 396.

Description.—Shell ovate, of a uniform, dark green color, rather thin; spire much elevated, composed of 4-5 convex whorls; sutures very distinct; aperture ovate, large, about half the length of the shell, livid inside; columella well rounded; has a broad, but not well defined sinus.

Fig. 837.



Habitat.—Tennessee.

Observations.—In form and coloring this species resembles *Paludina decisa*, Say, when that is about half grown, and but for its operculum one would hardly deem it an *Anculosa*; it is a plain, unadorned species, not liable to be confounded with any other; its body-whorl is large and subangulated; lines of growth well defined and close; it has a slight disposition to shouldering at the suture; it is not an abundant species so far as at present known.—*Anthony*.

This shell is figured like all the rest of Mr. Anthony's species, from the original type, for the use of which I am indebted to him. Mr. Reeve thinks this species is identical with *Rogersii*, Conrad; and Dr. Brot believes it to be the same as *dilatata*. It is a distinct species, but approaches closely to *Kirtlandiana*. It is found also in North Carolina.

28. *A. ligata*, ANTHONY.

Anculosa ligata, ANTHONY, Proc. Acad. Nat. Sci., p. 67, Feb., 1860.

Anculotus ligatus, ANTHONY, REEVE, Monog. Anculotus, t. 3, f. 19.

Leptoxis ligata, ANTHONY, BINNEY, Check List, No. 367. BROT, List, p. 24.

Description.—Shell ovate, smooth, of a dark green color, rather thick; spire obtusely elevated, composed of about four whorls; suture very distinct; upper whorls flattened; body-whorl constricted at the middle, banded; aperture ovate, banded within; columella deeply indented, callous; no sinus at base.



Habitat.—Alabama.

Observations.—This species, of which I have some twenty or thirty individuals before me, seems remarkably constant in character for an *Anculosa*; and not readily mistaken for any other; its color,

which is a dirty dark green, is but poorly relieved by the faint bands on the whorl; nevertheless it is an interesting species, and one which will always attract attention; its most prominent character is the constriction on the body-whorl, which gives the appearance of a cord being drawn tightly around it while in a yielding state.—
Anthony.

This species does not resemble very closely the shell described by Mr. Lea as *Anculosa Coosaensis*, although that species possesses (in a less marked degree) the peculiar structure of the body-whorl. *Ligata* differs in texture and color, and generally possesses three bands only, and none of the numerous specimens I have seen are maculate. *Coosaensis* appears to grow larger and heavier, and is more slender in its proportions, although swelling out more towards the periphery.

DOUBTFUL AND SPURIOUS SPECIES.

- A. (Paludina) nuclea*, LEA, = *Amnicola*.
- A. (Paludina) virens*, LEA, = *Amnicola*.
- A. Spixiana*, LEA, REEVE and BROU, = *Angitrema*.
- A. incisa*, LEA, HALDEMAN, Monog., = *Schizostoma*.
- A. cingenda*, ANTHONY, MSS., = young of *carinata*, LEA, a variety of *dissimilis*.
- A. planulata*, LEA, WHEATLEY, Cat. Shells, p. 23, Alabama (desc. not published), = *ampla*, ANTHONY?
- Mel. carinata*, RAVENEL, Cat., p. 11, Yadkin River, N. C.
- Mel. costata*, RAVENEL, Cat., p. 11, Dan River, Va., = *dissimilis*?
- A. subcarinata*, RAVENEL, Cat., p. 11, Susquehanna, = *dissimilis*?
- A. integra*, SAY, = *Somatogyra*.
- A. subglobosa*, SAY, = *Somatogyra*.
- A. (Paludina) altilis*, LEA, = *Somatogyra*.
- Paludina altilis*, RAVENEL, = *Somatogyra*.
- Paludina humerosa*, ANTHONY, Proc. Acad. Nat. Sci., p. 71, 1860.

APPENDIX.

THE following extracts from a letter recently received from my esteemed correspondent, Dr. James Lewis, who has devoted much time to the study of the Melanians, possess great interest in connection with the uncertainty which pervades the synonymy of the family. Dr. Lewis is well known to conchologists as an acute observer and philosophical naturalist, and his opinions and suggestions are correspondingly valuable.

G. W. T., JR.

MOHAWK, N. Y., Aug. 15, 1873.

MR. TRYON,

DEAR SIR:

* * * * *

I do not consider *Goniobasis castanea* to be the same as *G. simplex*. It is more likely (if possible) that *simplex* covers shells that have been named to me by correspondents *G. aterina*, Lea, *G. graminea*, Hald., etc. Probably Haldeman was right when he thought *G. acuto-carinata*, Lea, was a variety of *simplex*. I suspect that it is so for the reason that in the two (contiguous) localities from which I have *acuto-carinata* it occurs associated with species which, in nearly every other station, are living with mollusks that have been variously referred to *aterina*, Lea, and *graminea*, Hald. And as this association of similar types with a certain group of species extends over a large area each side of the Holston River, from Jefferson County southwest to Roane County, it seems to me to indicate that the varying forms, of which *aterina* and *acuto-carinata* are types, are simply one species, varied somewhat conspicuously in size and perfection of development, and still more varied in degree of carination of the upper whorls, while the texture and color of the epidermis and of the shells are less varied than might be expected.

The same mode of reasoning that would fit *aterina*, *graminea*, *acuto-carinata*, etc., and refer them to *simplex*, would make a unit of all the various shells I refer to *castanea*, including a large mass of unreduced synonymy in which, perhaps, *G. glabra*, Lea, may be a leading term. Of this last, however, I have yet to assure myself. You will observe,

In passing over some of the earlier descriptions of shells of this group, that many are referred, locally, to the Holston River, or some other river. I have failed to verify these references thus far, and get *Goniobasis* only from creeks, springs, etc. This discrepancy, as referring to *G. glabra*, Lea, renders my endeavors to identify that species just enough uncertain to be always a matter of doubt. Many local references to other early described species are vague and do not define the station at all. Now, so far as this element goes, it is apparently an important one in the identification or rediscovery of a species or a type. As regards the group of forms to which Anthony's *G. arachnoidea* belongs, it is spread out over a vast territory. Assuming that Mr. Lea's *Trypanostoma Sycamorensis* belongs to this type, we shall find the shells ranging from the northern limits of East Tennessee, along the streams that flow into the main channels of drainage down to Loudon, perhaps farther. The type is pretty constant in two remarkable features combined (*striate-undulate* upper whorls), though sometimes the undulations become obsolete. The synonymy of this type is greater than at present I dare presume to assert.

G. porrecta, Lea, has a pretty suggestive synonymy. Mr. Lea described a small shell from Claiborne, Sycamore County, Tennessee, that was associated with *T. Sycamorensis*, just as we find *porrecta* with *arachnoidea* in half a dozen places (to be within limits). The association of species is here suggestive, as in a former case.

As to the Trypanostomas of the creeks of East Tennessee, they are a perfect series of differentiations of carinated apices. One cannot tell where to assign limits. Limits are apparently obliterated and species have no existence. They are a confused mass and must be referred to one type. It begins with shells that are carinate, doubly, triply carinate down nearly to the last whorl, and ends with shells that have a faint carina sketched on the first three or four whorls. I have not the facilities for determining who is to be regarded as the patron of this group.

* * * * *

You remember, perhaps, my unfortunate treatment of *Trypanostoma curtum*, Hald. You also remember that you considered the paper in which it occurred of sufficient importance to honor it with a critique. Interested by your suggestions, I again went over the ground covered by the synonymy I suggested, only to flounder in more deeply, and finally to ascertain that one of Say's species (hitherto treated as superfluous) was really entitled to take precedence of *curtum*. * * *

* * * * * I am aware that where so much is uncertain scarcely any one can make announcements that will be received absolutely. We are very largely at the mercy of opinions, some of which, no doubt, are but the reflex of the idiosyncrasies of the persons with whom they originate.

In regard to *Io*, I might make a few suggestions, which, when carried to the extent of my investigations, would, perhaps, offer

original views. Here again I am restrained as before, and shall not enter into full details. I am of the opinion that Say's *Melania armigera* is an *Io*. Beyond this, I am unprepared to admit more than one species, though I am aware that others claim more on apparently good grounds. The genus *Io*, as heretofore limited by yourself, is spread out over the Upper Tennessee drainage. It occurs in the principal confluents that unite, forming the Tennessee River, above Chattanooga, and a few specimens have also been found in that portion of the Tennessee River that flows through Jackson County, Alabama. In Clinch River, I have, by Miss Law's aid, obtained perhaps three well marked varieties, one of which, certainly, most naturalists would call a good species. In the Holston and Tennessee I also find varieties one of which seems to have been derived from French Broad River, where only a single form appears. You are aware that a smooth variety (which I have not yet obtained) occurs in the Upper Holston, and varies so much as to be regarded as two species. Following Say's *Melania armigera* through its somewhat extensive distribution, I find that it begins to appear where the conventional *Io* disappears, and takes the place of "*Io*" in the Lower Tennessee River, Cumberland River, Wabash River, etc., etc. In the different stations where found, it varies pretty nearly as the typical *Io* does. In some instances it has varied so much as to have been redescribed as a distinct species, and in one instance (one of my correspondents suggests) a young shell was the occasion of the erection of a new genus. Now taking the parallel between the typical *Io* and Say's *armigera*, what shall we do? Shall we admit all the species and genera proposed, or will it suffice to write all there is of *Io* under two species, *fluvialis* and *armigera*? And while we have before us this question of the variability of species, let us inquire how many species are there of Say's *Melania nupera*? This species varies in different stations quite as much as *fluvialis* and *armigera*. Specimens entirely smooth are not rare. Others that are undulate contrast with the more numerous nodulous specimens. Colors and bands offer contrasts as in *fluvialis* and *armigera*. Now does not analogy have some weight with us sometimes? But, if it does, can we say that we treat these things consistently?

Let us consider the univalves of the Alabama drainage, say of the Black Warrior, Alabama, Coosa and Cahawba Rivers. I have tried to identify these, or some of these univalves, with those of the Tennessee drainage that circles through northern Alabama, and with the one exception of a MELANTHO, which I believe you separate as a distinct species, I find nothing identical. Perhaps there may be something identical in SOMATOGYRUS, but I have not had opportunity to make satisfactory comparisons. This leads me to question your identification of *Strophobasis Clarkii* (of the Tennessee drainage) with *S. bitaniata* (of the Alabama drainage = Black Warrior River).

I find evidence that leads me to unite *T. annuliferum* and *prasinatum*.

In following out this particular type I am led to infer a considerable number of other synonymes which do not appear in your "Synonymy" published some years ago.

In the Coosa River, abundant studies of synonymy await the patient student who may be favored with unprejudiced duplicates [without labels]. One species of *Goniobasis promises* nearly a dozen synonymes, and if we do not forget the lessons taught us in analogies elsewhere, we shall reduce *Schizostoma* to within a fifth part of its present limits.

And now let us inquire into the "origin of species," not in the Darwinian sense, but with a view of finding an explanation of the huge synonymy that I plainly see is dawning upon us.

During the last twenty years I have collected many shells and have also received many from correspondents. It has sometimes been my duty to assist my correspondents to identify their species. In many cases in which I have been called on to name species, my correspondents have assorted their shells down to the last variety, and believing each variety to be a species, have insisted to have each named separately. This is the key to the origin of many of our species. In other instances, perhaps, parties whose interests increase with the number of species they have at their disposal submit their isolated varieties separately for identification. What wonder, then, that the descriptive naturalist should unwittingly fall into a very natural mistake and describe these shells as *new species*?

Very truly yours.

JAMES LEWIS.

ERRATA.

P. MODESTUM, Lea, p. 130. This species must bear the name of its synonyme *P. KNOXENSE*, Lea, because *IO MODESTA*, Lea, previously described, is also a *Pleurocera*.

P. TORTUM, Lea, p. 84. This species may be called *P. PARKERI*, nob., after Mr. Charles F. Parker, a conchologist of Camden, New Jersey. *P. TORTUM*, Lea, p. 117, will stand as a species.

G. INOSULATA, Lea, p. 302, read *G. OSCULATA*, Lea.

G. NIGRINA, Lea, p. 280, is made a synonyme of *G. DRAYTONII*, but should be cancelled. This species I now consider distinct and I have so treated it, *vide* p. 214.

PAL. NUMEROSA, Anth., p. 421, read *HUMEROSA*.

INDEX.

ABBREVIATIONS. Anc., Aculosa. Ang., Angitrema. E., Eur., Eurycalon. G., Goniobasis. L., Lithasia. M., Meseschiza. P., Pleurocera. Sch., Schizostoma. St., Strepobasis.

Abbevillensis, (G.) Lea, 186
 abbreviata, (G.) Anth., 159
 abjecta, (G.) Hald., 287
 abruptum, (P.) Lea, 117
 abscondita, (G.) Anth., 311
 acuta, (G.) Lea, 205
 acuta, (G.) Lea, Bell., 282
 acutocarinata, (G.) Lea, 228
 adusta, (G.) Anth., 272
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 Alabamensis, (G.) Lea, 303
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 altipetum, (P.) Anth., 122
 alveare, (P.) Conr. 50
 ambusta, (G.) Anth., 317
 amoena, (G.) Lea, 169
 ampla, (Anc.) Anth., 412
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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 I.—SYNOPSIS

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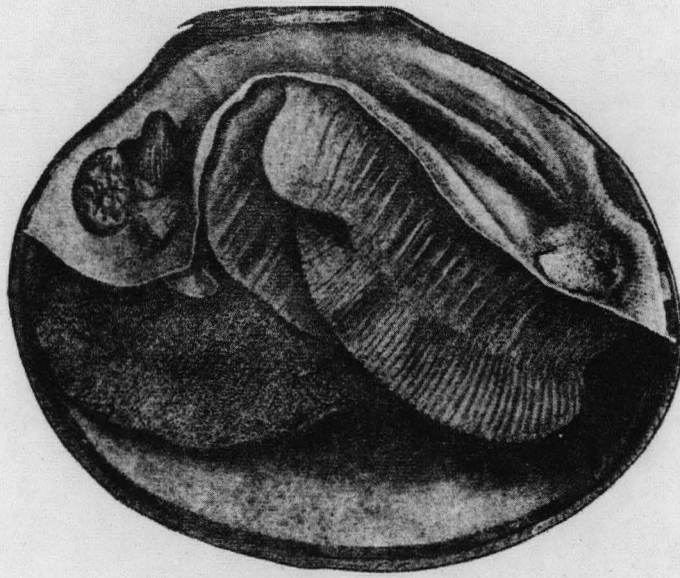
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ALEXANDER G. RUTHVEN,
Director of the Museum of Zoology,
University of Michigan.



DROMUS DROMAS (LEA).

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 Sphaeriidæ" (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.

Dated July 1, 1918.

BRYANT WALKER.

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.....*Ilymnæidæ*.
- 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 *Polyrhynchis*.
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)*.

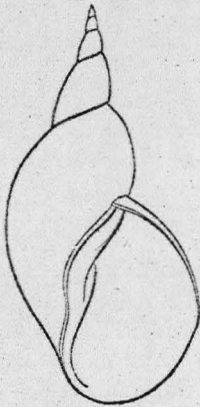


Fig. 1

Subgenus LYMNÆA s. s.

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.

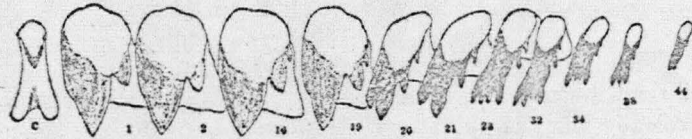


Fig. 2

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.

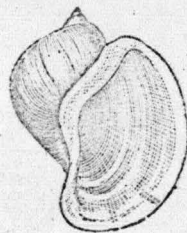


Fig. 6

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."

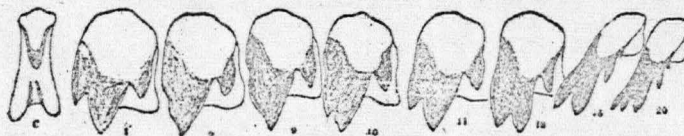


Fig. 7

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

Subgenus BULIMNEA Haldeman, 1841.

Shell large and solid, bulimiform, with an imperious 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 tricuspoid."

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

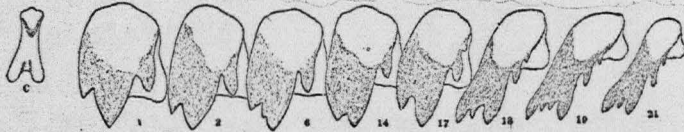


Fig. 9



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

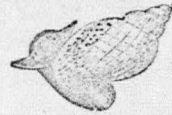


Fig. 16

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. 17. Radula, fig. 18.



Fig. 17

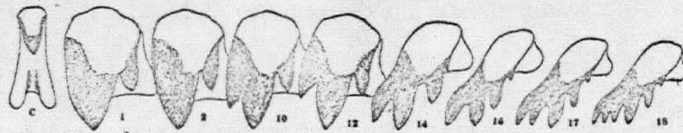


Fig. 18

Section POLYRHYTIS Meek, 1876.

Shell longitudinally costate. Soft anatomy unknown.

Type: *L. kingii* Meek.

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

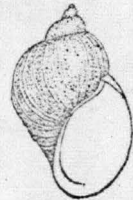


Fig. 19

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 *Planorbina*.

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.

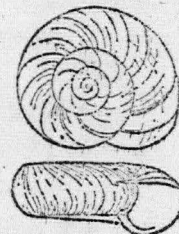


Fig. 20

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.

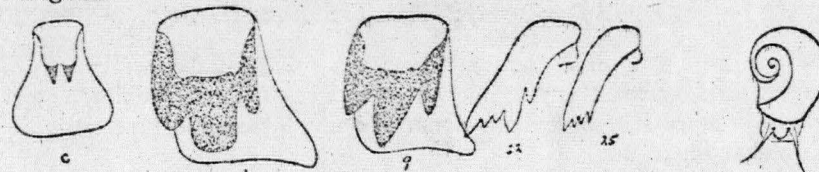


Fig. 22

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.

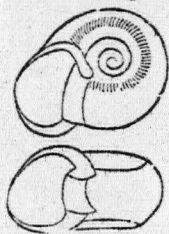


Fig. 24

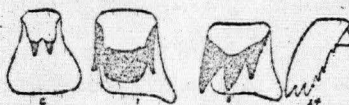


Fig. 25

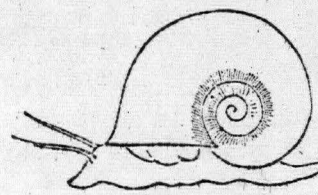


Fig. 26

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

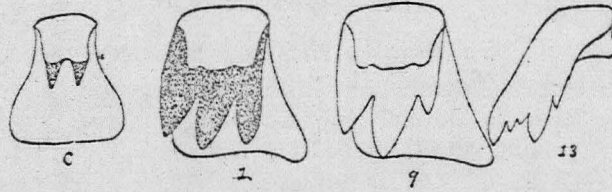


Fig. 28

Subgenus TROPIDISCUS Stein, 1850.

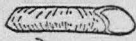
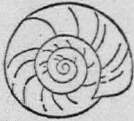


Fig. 29

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.

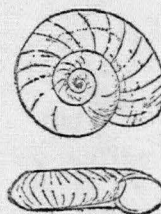


Fig. 31

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

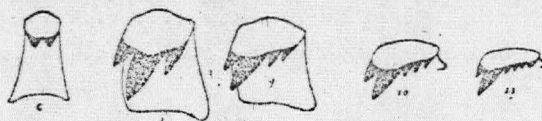


Fig. 33

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

Section ARMIGER Hartmann, 1840.

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

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

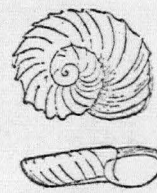


Fig. 34

Genus SEGMENTINA Fleming, 1817.

Shell discoidal, dextral, whorls few, rounded or carinated above and below, with one or more sets of laminae 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.

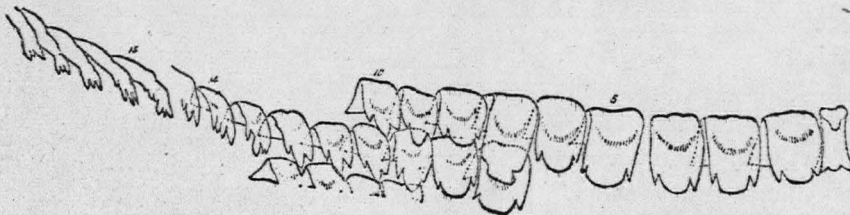


Fig. 39

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 simliar to that of *Pompholyx*.

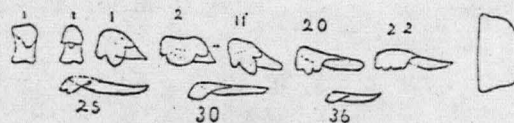


Fig. 41

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.

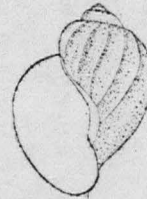
Type: *P. costata* Newc., fig. 45.

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

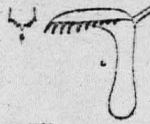


Fig. 47



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 *Lymnaea* with two accessory plates. Radula also lymnaeid 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

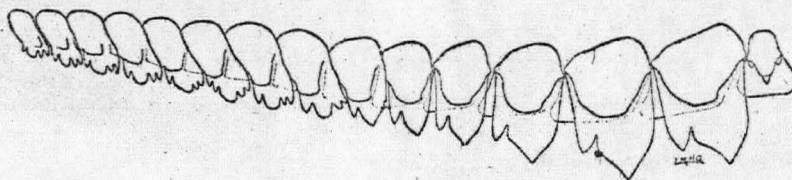


Fig. 51

Subgenus WALKEROLA Hannibal.

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

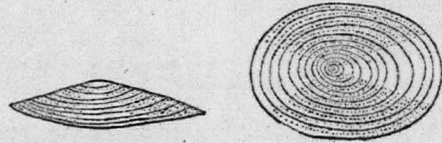


Fig. 52

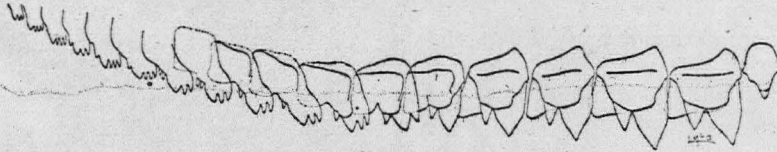


Fig. 53

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.

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

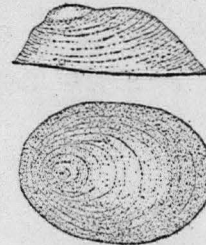


Fig. 54

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

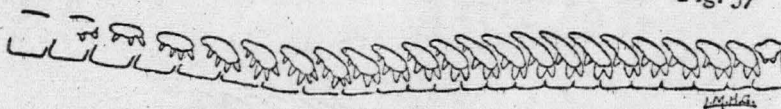


Fig. 58

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 bicuspoid 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.

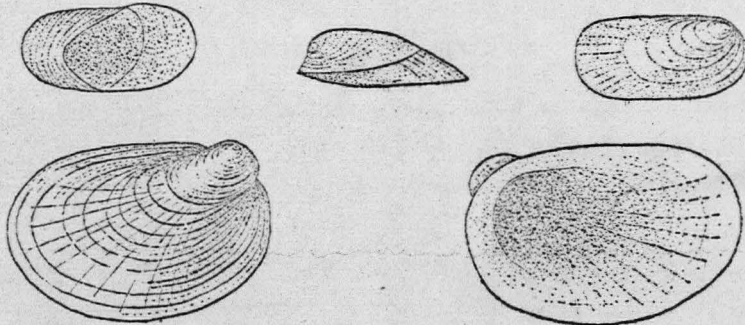


Fig. 59

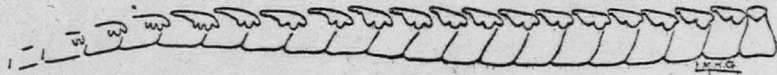


Fig. 60

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

Subgenus KINCAIDELLA Hannibal, 1912.

Apex radially striate.

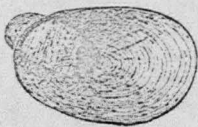


Fig. 61

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.