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STREPHOBASIS: A SECTION OF PLEUROCERA

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The genus *Strephobasis* was erected by Lea<sup>1</sup> as a relief for the overloaded *Melania*. Tryon<sup>2</sup> considered it as occupying a position between *Lithasia* and *Goniobasis* and dealt with it as a subgenus of *Lithasia*.<sup>3</sup> In his first catalogue of *Strephobasis*<sup>4</sup> he recognized these species:

*S. curta* Hald.  
*pumila* Lea  
*carinata* Lea  
*olivaria* Lea

*S. lyoni* Lea  
*plena* Anth.  
*cornea* Lea  
*corpulenta* Anth.  
*bitaeniata* Conrad

Later, in his monograph, he placed *Melania solida* Lea in the synonymy of *curta*, *S. spillmanii* in that of *plena*, and *S.*

<sup>1</sup> "Shell cylindrical; aperture subquadrate; columella thickened and retrocaniculate below.

"Operculum commencing spiral, corneous.

"The mollusk for which I propose this genus was sent to me by William Spillman, M.D., of Columbus, Miss., and I have before me over a dozen specimens from a third to nearly an inch in length. The very great number of the species of the genus *Melania* makes it desirable to eliminate any group, with characters sufficiently distinct to permanently recognize it. The very remarkable retrorse callus at the base of the column, causing a lateral sinus, is characteristic of this genus."—Lea, Proc. Acad. Nat. Sci., Phila., XIII, 1861, p. 96.

<sup>2</sup> Smithsonian. Misc. Coll., No. 253, 1873, p. xxxv.

<sup>3</sup> *Ibid.*, p. 40.

<sup>4</sup> Amer. Journ. Conchol., I, 1865, pp. 329-330.

*clarkii* Lea under *bitaeniata*. Several years before this *solida* had been placed by H. & A. Adams in the subgenus *Megara* (of *Gyrotoma*),<sup>5</sup> the group including also *alveare* Con., *harpa* Lea, *impressa* Lea; *undulata* Say, together with certain exotic Melanians.

Lewis<sup>6</sup> suggested a formidable synonymy for *curta*, the species being:

<i>Melania turgida</i> Lea	<i>Trypanostoma bivattatum</i> Lea
<i>picta</i> Lea	<i>moriforme</i> Lea
<i>solida</i> Lea	<i>trochulus</i> Lea
<i>Trypanostoma simplex</i> Lea	<i>Strephobasis solida</i> Lea
<i>minor</i> Lea	<i>olivaria</i> Lea
<i>pumilum</i> Lea	<i>hartmaniana</i> Lea (MSS.)

Tryon<sup>7</sup> replied to Lewis in somewhat the tone with which an indignant property-owner might address trespassers who had made free with his roses. He declared that he had gone over his collections again and in all instances found himself correct. In the appendix to the Tryon monograph is a letter from Dr. Lewis saying that he had reviewed the subject and *curta* was not the legitimate head of the synonymy he had mustered, but a species of Say's which had been overlooked. He did not name it there, but did write it upon labels, that species being *M. conica*.

The next writing to appear upon *Strephobasis* was by Pilsbry.<sup>8</sup> He pronounced it to be "a mere section of *Pleurocera*" and "reducible to some two or three species." He recognized *plena* Anth. and *lyonii* Lea. *Plena*, he said, "includes as

<sup>5</sup> With his permission I quote from a letter of Dr. Bryant Walker: "I have been looking up *Megara* and it reveals a rather interesting situation. Adams' group (*Gen. Rec. Moll.*, I, 1858, p. 306) was made up of a miscellaneous lot of species, mostly *Goniobasis*. They did not specify a type. But Hannibal (*Pr. Mal. Soc.*, X, 1912, pp. 169 & 179) did so and designated *lima* Con. as such. In doing this 'he bulded better than he knew.' He makes it a synonym of *Pleurocera* on the assumption that *verrucosa* Raf. was the type of that genus. In this he was wrong (see Walker, *Occ. Pap., Mus. Zool., Univ. Mich.*, 1917, p. 38) but his action results in making *Megara* a synonym of *Angitrema* (1841). This buries it as it should be."

<sup>6</sup> *Amer. Journ. Conchol.*, VI, 1871, p. 224.

<sup>7</sup> *Ibid.*, 1872, p. 88.

<sup>8</sup> *Proc. Acad. Nat. Sci., Phila.*, 1896, pp. 496, 499.

synonyms *S. spillmanii*, *clarkii* and *cornea* of Lea, all from the same region and in the same river system.”

Hinkley<sup>9</sup> mentions collecting *S. plena* in the Tennessee River at Florence, Alabama, and *S. curta* at Florence in the Tennessee and Shoals Creek. Walker<sup>10</sup> reprints Lea's description of *Strephobasis*, naming *Melania plena* Anth. as the type, and later briefly reviews the group as it stood in the literature up to May, 1918.

It seems clear to me that Pilsbry is right in pronouncing *Strephobasis* to be a section of *Pleurocera*. The shells resemble *Pleurocera* much more than they do any other genus. Sometimes the demarkations between members of the *canaliculatum-undulatum* group of *Pleurocera* and specimens of *Strephobasis* are exceedingly faint. This is particularly true of some Cumberland River forms and of shells taken in the Holston River at McMillan, above Knoxville, Tennessee.

I agree almost entirely with Lewis' decisions on the synonymy of *curtum*, but consider the evidence insufficient for displacing that species with *conica*. It will be seen later that I have gone farther than Lewis. I have had the opportunity to study the large Walker collection of *Strephobasis*, consisting not only of the vagrant material which comes to a collector, but also of shells from Lewis, all the freshwater mollusks brought together by Wetherby and Mrs. Andrews and generous representations of the *Strephobases* taken by Hinkley and Barber. The Alabama Museum of Natural History sent those collected by Herbert H. Smith at Muscle Shoals. Types in the U. S. National Museum and the Museum of Comparative Zoology were examined. I have also collected these shells in the field.

As Tryon says,<sup>11</sup> “Prof. Haldeman is in error in assigning Ohio River as the habitat of *St. curta*. It has never been found there, but is one of the most plentiful shells of the Tennessee River.” It is fairly certain that *Strephobases* occur

<sup>9</sup> *Nautilus*, XX, 1906, p. 41.

<sup>10</sup> *Misc. Pub. Mus. Zool., Univ. Mich.*, 1918, pp. 36, 153.

<sup>11</sup> *Smithson. Misc. Coll.*, No. 253, 1873, p. xlv.

only in the waters of the Tennessee and some of its tributaries and in the Cumberland. Tryon included *M. bitaeniata* Conrad, a species from the Black Warrior River, in this group. It does not belong there, nor does *M. pumila* Lea, also assigned to Strephobasis, have a place in this section. *Pumila* is the same as *Pleurocera alveare* Conrad. The habitat of these mollusks ordinarily is quite shallow water that runs swiftly the greater part of the year. They colonize with Anculosa, Eurycaelon and the larger species of Pleurocera.

Hartman<sup>12</sup> describes the opercula of Trypanostoma, Strephobasis, Lithasia and Io (apparently considering all these alike) as "similar in structure" to Goniobasis, Eurycaelon, Schizostoma and Leptoxis. This study inclines me to believe there are characters in the operculum of Strephobasis which differentiate it even from that of the particular Pleurocera to which the group is nearest akin.

The operculum is quite small for so large a shell, is usually broadly ovate and so thin that lines on the stage of the microscope show through under ordinary lighting. The color is light reddish-brown to dark brown. The polar point is pitted, sometimes so deeply that the area shows as a projection on the reverse side. Whorls three. The spiral lines, rather widely coiled, are close to the base and join the margin at the base instead of at the left margin as is usual in Pleurocerid opercula. As additions to growth are made, fan-wise, the new growth close to the base is nearly as wide as at the apex, so that a fairly thick layer of material always remains on the left side between the spiral lines and the margin. The fan-like manner of growth is not conspicuous in the younger examples. There is no wearing at the left margin as is the case particularly in Anculosa and Eurycaelon.

Compared with the operculum of *P. undulatum* Say, with which Strephobases are commonly associated, that of this section is wider proportionately, the spiral lines are larger; there is an incurving of the left margin near the apex which is absent in *undulatum*. The appearance of the latter is leaf-like,

<sup>12</sup> Amer. Journ. Conchol., VI, 1871, p. 317.

that of the former sometimes pear-shaped. The operculum of *Lithasia verrucosa* Raf., occurring with *Strepobasis* in the upper Tennessee, is elongate, dark; the spiral lines tightly coiled and close to the left margin.

The opercula of *curtum* from Knoxville and of *corpulentum* from Florence, Alabama, are identical. There is the same similarity between *Strepobases* of the Tennessee River and the Cumberland.

### *Pleurocera curtum* (Haldeman)

*Melania curta* Haldeman, Monog. Limiades, No. III, July, 1841, p. 3 of cover; Binney, Check List, 1860, No. 80; Reeve, Monog. Melania, 1860, sp. 345; Lewis, Amer. Journ. Conchol., VI, 1871, p. 224.

*Trypanostoma curta* Haldeman, Lewis, Amer. Journ. Conchol., VI, 1871, p. 224; Lewis, appendix to Tryon, Monog. Strepom., 1873, p. 424.

*Strepobasis curta* Haldeman, Tryon, Monog. Strepom., 1873, p. 40; Hinkley, Nautilus, XX, 1906, p. 41.

*Pleurocera curtum* Haldeman, Walker, Univ. of Mich. Misc. Pub., No. 6, 1918, pp. 153, 154.

*Melania turgida* Lea, Proc. Amer. Phil. Soc., II, Nov., 1841, p. 82; Trans. Amer. Phil. Soc., IX, 1844, p. 18; Obs. Gen. Unio, IV, 1848, p. 18; IX, 1863, p. 104; Journ. Acad. Nat. Sci., Phila., V, n. s., 1862, p. 282; Wheatley, Cat. Shells U. S., 1845, p. 27; Binney, Check List, No. 278; Brot, List, 1862, p. 33; Lewis, Amer. Journ. Conchol., VI, 1871, p. 224.

*Pleurocera turgidum* Lea, Tryon, Monog. Strepom., 1873, p. 133.

*Melania picta* Lea, Proc. Amer. Phil. Soc., II, Nov., 1841, p. 82; Trans. Amer. Phil. Soc., IX, 1844, p. 19; Obs. Gen. Unio, IV, 1848, pp. 19, 25; Wheatley, Cat. Shells U. S., 1845, p. 26; Reeve, Monog. Melania, 1860, sp. 290; Binney, Check List, 1860, No. 205; Lewis, Amer. Journ. Conchol., VI, 1871, p. 224.

*Pleurocera pictum* Lea, Tryon, Monog. Strepom., 1873, p. 119.

*Melania solida* Lea, Proc. Amer. Phil. Soc., IV, 1845, p. 166; Trans. Amer. Phil. Soc., X, 1848, p. 83, pl. 9, fig. 27; Obs. Gen. Unio, IV, 1848, p. 83, pl. 8, fig. 27; Binney, Check List, 1860, No. 80; Reeve, Monog. Melania, 1861, sp. 454; Brot, List, 1862, p. 32; Lewis, Amer. Journ. Conchol., VI, 1871, p. 224.

*Megara solida* Lea, H. & A. Adams, Genera, I, 1858, p. 306.

*Strepobasis solida* Lea, Journ. Acad. Nat. Sci., Phila., V, n. s., 1862, pp. 266, 356, pl. 35, fig. 77; Lewis, Amer. Journ. Conchol., VI, 1871, p. 224.

*Melania plena* Anth., Ann. Lyc. N. H. New York, VI, Mch., 1854, p. 121, pl. 3, fig. 21.

*Strepobasis plena* Anth., Tryon, Monog. Strepom., 1873, p. 44; Pilsbry, Proc. Acad. Nat. Sci., Phila., 1896, pp. 496, 499; Hinkley, Nautilus, XX, 1906, p. 41.

*Pleurocera plenum* Anth., Walker, Univ. of Mich. Misc. Pub., No. 6, 1918, p. 154.

*Melania glans* Anth. (non von dem Busch, date ?), Ann. Lyc. N. H. New York, VI, Mch., 1854, p. 123, pl. 3, fig. 23.

*Melania glandulum* Anth., Proc. Acad. Nat. Sci., Phila., Feb., 1860, p. 60; Binney, Check List, 1860, No. 124; Reeve, Monog. Melania, 1861, sp. 393; Brot, List, 1862, p. 39; Walker, Univ. of Mich. Misc. Pub., No. 6, 1918, p. 152.

*Pleurocera glandulum* Anth., Tryon, Monog. Strepom., 1873, p. 109.

*Strophobasis cornea* Lea, Proc. Acad. Nat. Sci., Phila., XIII, 1861, p. 96; Journ. Acad. Nat. Sci., Phila., V, n. s., p. 265, pl. 35, fig. 75; Obs. Gen. Unio, IX, 1863, p. 87, pl. 35, fig. 75; Tryon, Monog. Strepom., 1873, p. 45.

*Strophobasis spillmanni* Lea, Proc. Acad. Nat. Sci., Phila., XIII, p. 96; Journ. Acad. Nat. Sci., Phila., V, 1862, p. 264, pl. 35, fig. 74; Vol. VI, 1866, p. 151; Obs. Gen. Unio, IX, 1863, p. 86, pl. 35, fig. 74; XI, 1867, p. 107; Tryon, Monog. Strepom., 1873, p. 44.

*Strophobasis clarkii* Lea, Proc. Acad. Nat. Sci., Phila., XIII, 1861, p. 66; Journ. Acad. Nat. Sci., Phila., V, 1862, pp. 265, 355, pl. 35, fig. 76; Obs. Gen. Unio, IX, 1863, pp. 87, 177, pl. 35, fig. 76.

*Strophobasis bitaeniata* Con., Tryon, Monog. Strepom., 1873, p. 47.

*Melania picturata* Reeve, Monog. Melania, 1861, errata; Brot, List, 1862, p. 38.

*Strophobasis olivaria* Lea, Proc. Acad. Nat. Sci., Phila., XIV, 1862, p. 273; Journ. Acad. Nat. Sci., Phila., V, n. s., 1862, pp. 290, 356, pl. 39, fig. 229; VI, 1866, p. 151; Obs. Gen. Unio, IX, 1863, pp. 112, 178, pl. 39, fig. 229; XI, 1867, p. 107; Tryon, Monog. Strepom., 1873, p. 43.

*Strophobasis carinata* Lea, Proc. Acad. Nat. Sci., Phila., XIV, 1862, p. 273; Journ. Acad. Nat. Sci., Phila., V, n. s., 1862, p. 355, pl. 39, fig. 228; Obs. Gen. Unio, IX, 1863, p. 177, pl. 39, fig. 228; Tryon, Monog. Strepom., 1873, p. 43; Walker, Univ. of Mich. Misc. Pub., No. 6, p. 151.

*Trypanostoma minor* Lea, Proc. Acad. Nat. Sci., Phila., XIV, 1862, p. 174; Journ. Acad. Nat. Sci., Phila., V, n. s., 1862, p. 278, pl. 36, fig. 95; Obs. Gen. Unio, IX, 1863, p. 100, pl. 36, fig. 95; XI, 1867, p. 99; Lewis, Amer. Journ. Conchol., VI, 1871, p. 224.

*Trypanostoma pumilum* Lea, Proc. Acad. Nat. Sci., Phila., XIV, 1862, p. 174; Journ. Acad. Nat. Sci., Phila., V, n. s., 1862, p. 279, pl. 36, fig. 96; VI, 1866, p. 143; Obs. Gen. Unio, IX, 1863, p. 101, pl. 36, fig. 96; XI, 1867, p. 99; Lewis, Amer. Journ. Conchol., VI, 1871, p. 224.

*Pleurocera pumilum* Lea, Tryon, Monog. Strepom., 1873, p. 134; Walker, Univ. of Mich. Misc. Pub., No. 6, 1918, p. 152.

*Trypanostoma bivittatum* Lea, Proc. Acad. Nat. Sci., Phila., XIV, 1862, p. 175; Journ. Acad. Nat. Sci., Phila., V, n. s., 1862, p. 278, 279, 280, pl. 36, fig. 98; Obs. Gen. Unio, IX, 1863, pp. 100, 101, 102, pl. 36, fig. 98; Lewis, Amer. Journ. Conchol., VI, 1871, p. 224; Tryon, Monog. Strepom., 1873, p. 83.

*Trypanostoma trochulus* Lea, Proc. Acad. Nat. Sci., Phila., XIV, 1862, p. 175; Journ. Acad. Nat. Sci., Phila., V, n. s., 1862, p. 282, pl. 36, fig. 103; Obs. Gen. Unio, IX, 1863, p. 104, pl. 36, fig. 103; Lewis, Amer. Journ. Conchol., VI, 1871, p. 224.

*Pleurocera trochulus* Lea, Tryon, Monog. Strepom., 1873, p. 137.

*Strophobasis lyonii* Lea, Proc. Acad. Nat. Sci., Phila., XVI, 1864, p. 5; Journ. Acad. Nat. Sci., Phila., VI, 1866, p. 151, pl. 23, fig. 65; Obs. Gen. Unio, XI, 1867, p. 107, pl. 23, fig. 65; Tryon, Monog. Strepom., 1873, p. 46.

*Pleurocera lyonii* Lea, Pilsbry, Proc. Acad. Nat. Sci., Phila., 1896, p. 498; Walker, Univ. of Mich. Misc. Pub., No. 6, 1918, p. 154.

*Trypanostoma napoidesum* Lea, Proc. Acad. Nat. Sci., Phila., XVI, 1864, p. 112; Journ. Acad. Nat. Sci., Phila., VI, 1866, p. 143, pl. 23, fig. 54; Obs. Gen. Unio, XI, 1867, p. 99, pl. 23, fig. 54.

*Pleurocera napoideum* Lea, Tryon, Monog. Strepom., 1873, p. 137; Walker, Univ. of Mich. Misc. Pub., No. 6, 1918, p. 152.

*Pleurocera bicinctum* Tryon, Amer. Journ. Conchol., II, 1866, p. 4, pl. 2, fig. 2; Walker, Univ. of Mich. Misc. Pub., No. 6, 1918, p. 151.

*Strepobasis hartmaniana* Lea (MSS.), Lewis, Amer. Journ. Conchol., VI, 1871, p. 224; Walker, Univ. of Mich. Misc. Pub., No. 6, 1918, p. 154.

*Pleurocera canaliculatum* (Say), Hannibal, Proc. Malacol. Soc., X, 1912, p. 171.

*Pleurocera bitaeniata* (Con.), Hannibal, Proc. Malacol. Soc., X, 1912, p. 172.

Haldeman's description of *curtum* is meager and so I have here described a specimen which is probably close to the form the author had before him:

Shell conical, apex eroded, base flattened, whorls smooth, flattened above the periphery, slightly convex at the sutures, their number three; the last whorl faintly constricted, bluntly rounded. Growth lines very fine and usually regularly spaced. Sutures rather irregular, not deeply impressed. Color of epidermis olive-green and unbroken by bands. Aperture elliptical. Columella white, stout below the center, being only a wash of callus above the center. Outer lip sinuous; the scars of former lips are dark and prominent, inclined to be slightly nodulous at the base. Sinus well-marked and channeled backward.

Alt., 18 mm.; dia., 11 mm. Aperture—alt.,  $7\frac{1}{8}$  mm.; dia.,  $3\frac{1}{2}$  mm.

This specimen is from a lot in the Walker collection, formerly of the Andrews collection. The label is missing, but the locality is probably Tennessee River, Little River Shoals, Knox County, Tenn.

*Remarks:* The variation of this species is extreme. The same colonies carry bulbous as well as cylindrical shells, conic specimens and some in the borderland between typical *Pleurocera* and *Strepobasis*. The whorls are occasionally maleated. They vary from nearly flat to decidedly convex. From young specimens it is concluded that the number of whorls may be eleven or twelve. The constriction of the last whorl is far from constant. Early whorls are seldom so marked.

The surface sculpture varies little. Growth lines are fine, closely spaced. In young shells a cross-hatching effect is to be observed, later disappearing.

Color is ordinarily a bright shining yellow or olive yellow. Old shells may become brown and rusty. The melanic forms occur in the Tennessee from Knoxville to below Chattanooga, and judging by the many specimens examined this trait is commoner in the middle reaches of the Tennessee than elsewhere, assuming Knoxville to be the head of distribution and

Florence, Alabama, the end. No dark shells from the Cumberland were seen.

The aperture varies with the form of the shell. The typical *curtum* forms have apertures less elongate than the others.

The columella seems always to be white or bluish-white. It is late in obtaining full development. In one large ventricose specimen the columella has a projection just below the center and, at the top, a node as in *Gyrotoma*. An apparent twisting of the columella in many examples disappears when examined under the glass. I take it to be an effect of light.

The outer lip is sinuous as a rule, but is sometimes straight, meaning nearly parallel with the axis of the shell; at times sharply angled, that is, projecting decidedly from top to base. The conic specimens have the lip sinuous or angled, while in the cylindrical forms the lip tends to become straight.

The sinus, the character upon which *Strephobasis* was builded, is not dependable, but in the center of distribution, Knoxville to Florence, it is usually well defined.

*The Young*: Early whorls are carinate slightly at the periphery and sometimes have a carina at the top in addition. They are usually more finely sculptured than older shells, smoother and more regularly developed, indicating that a change of habit occurs as growth proceeds.

The number of color bands in young *curtum* is usually five. As the mollusks grow older, some of these bands may divide, some may disappear. In the Walker collection, thirteen different formulae were noted, all probably modifications of a five-band rule.

The form which Lea described as *solida* occurs more commonly than the typical *curtum*. The Cumberland River forms are more conic, not so heavy or so variable as the Tennessee River shells; they have a small aperture, flattened whorls and base.

The largest shell found among those examined, belonging to the Walker collection, was alt., 28½ mm.; dia., 12¼ mm. A single, very ventricose shell from the Tennessee River, Little



River shoals, measured 23 x 14 mm. The following measurements are of *curtum* from the Tennessee at Knoxville:

27½	mm. x 13	mm.—6	whorls remaining.	
27¼	x 13	—7	“	“
26½	x 13	—7	“	“
25¼	x 12½	—7	“	“
24	x 11½	—7	“	“
24	x 11	—7	“	“
21½	x 11	—6	“	“

Because of erosion fewer whorls are likely to be found in full-grown specimens than in half-grown.

*Distribution*: Holston-Tennessee River from McMillan, Knox County, Tennessee, to the Muscle Shoals area in Alabama, and probably below it; Cumberland River in the vicinity of Nashville, Tennessee, and Caney Fork near Carthage, Tennessee. It has been found sub-fossil in Wayne County, Kentucky, more than one hundred feet above the present level of the Cumberland. Dr. Walker has specimens credited to the Cumberland at Pineville, which is above the Falls. I believe this is an error. Dr. Ortmann, W. J. Clench, P. S. Remington and I have collected at this place and nearby at different times and have not found it there. The only Pleuroceridae we did find were Goniobases. *Curtum* also enters Clinch River, Little River and Little Tennessee River for a few miles above their mouths and in Alabama, the Paint Rock and Flint rivers, which are tributaries of the Tennessee.

*Discussion of the Synonymy of curtum*: *M. turgida* Lea: “Young, short and wide” (Lewis). Lea puts much emphasis on the color bands. They are those common to *curtum*. The types in the U. S. National Museum, No. 122,189, are the same as Haldeman’s species.

*M. picta* Lea: “Banded variety” (Lewis). Not fully grown. Lea says it has “rather a large sinus.” Reeve’s illustration is a good one of a form of *curtum* and Tryon says his text-cut was drawn from Reeve. Four lots in the U. S. National Museum, formerly belonging to the Lea collection, are all *curtum*.

*M. solida* Lea: "Adult, wide and solid; apex eroded" (Lewis). The commonest form of *curtum*. Tryon, Halde- man and Anthony, besides Lewis, considered *solida* to be a synonym. Redescribed in 1862 as a *Strephobasis*.

*M. plena* Anth.: The Anthony material in the Museum of Comparative Zoology is *curtum*. It is a form occurring from Knoxville into Alabama. Pilsbry considered it distinct. The big series I have examined easily warrants putting the species in the synonymy.

*M. glandulum* Anth.: Mentioned as a synonym on a Lewis label. He was doubtless correct. The species appears to be a dark-colored and immature form of *curtum* of the bulbous variety. The name *glandulum* was substituted for *glans* pre-occupied.

*S. cornea* Lea: The Lea types are *curtum*. Considered by Pilsbry the same as *plena*. Differs from *spillmanii* mostly in color of epidermis and in being without bands.

*S. spillmanii* Lea: Apparently erected on its cylindrical shape and its "dark brown or greenish" color. Held to be the same as *plena* by Tryon and Pilsbry. Equals *curtum*.

*S. clarkii* Lea: The types, No. 118,200, U. S. Nat. Mus., are *curtum*. Thought by Tryon to equal *M. bitaeniata* Con., a shell of the Black Warrior River. Lea considered it to be different from *cornea* and *spillmanii* in being shorter, more regularly cylindrical and in having three color bands. Pils- bry made it a synonym of *plena*.

*M. picturata* Reeve: A name proposed by Reeve to take the place of Lea's *picta*, a name previously used by Hinds.

*S. olivaria* Lea: "Adult, slender variety" (Lewis). The types are a familiar form of *curtum* occurring at Knoxville. Several specimens of this form were taken by Andrews and Barber.

*S. carinata* Lea: U. S. Nat. Mus., No. 118,201, one specimen, young. It appears almost certainly to be *curtum*. The body whorl of many of the *curtum* collected in the Clinch River at Kingston, Tennessee, is slightly carinate.

*T. minor* Lea: "Young shells, no bands, var." (Wheatley). The Lea shells in the U. S. National Museum, received from Troost, No. 122,139, are *curtum*.

*T. pumilum* Lea: "I have specimens from the Holston River, labeled *Try. pumilum* Lea by Mr. Lea" (Lewis). Described from only two specimens. The species is half-grown *curtum*.

*T. bivittatum* Lea: "Two-banded, young" (Wheatley). Tryon considered this species to be the young of *Pleurocera hartmanii* (Lea) and this, in turn, a form of *Pleurocera incrassum* (Anth.). Lewis' and Wheatley's understanding of the shell was correct. The types are *curtum*.

*T. trochulus* Lea: "Wide, young, apex entire" (Lewis). Described from one specimen and this from the Holston River. Lea said it was received from Dr. Troost "a long time since, with *M. turgida*." The type, No. 122,164, U. S. Nat. Mus., is *curtum*.

*S. lyonii* Lea: Lea compares the species with *spillmanii* so particularly that he appears to have forgotten his older species *solida*, of which *lyonii* is a fairly common form. The types, No. 118,208, are *curtum*. Tryon's text-cut (p. 46) is of *Eurycaelon umbonatum* Lea.

*T. napoideum* Lea: Placed in the synonymy by Lewis (on a label). Described from two specimens. They are No. 121,968 in the U. S. Nat. Mus., and are *curtum*. This species is one of the fruits of Lea's overhauling of his cabinet, about 1861-62.

*P. bicinctum* Tryon: Described as having an "angular periphery, which is carinate, and a second carina, less distinct, below it." In other regards the species is much like common *Strephobasis*. In the Walker collection are specimens of *curtum* which have developed carinae on the body whorl and I have seen others that were taken in the Clinch by Paul Adams. This appears to be merely an aberrant character. The specimen in the National Museum, formerly of the Lea collection, was received from Tryon. It is the same as *curtum*.

*S. hartmaniana* Lea (MSS.): "Slender, solid variety; Tenn. r." (Wheatley and Lewis). Never described. Dr. Walker

has specimens so labeled. They came from Lewis, and are *curtum*.

Tryon, in the appendix to his monograph of the Streptomatidae, prints a letter from Dr. Lewis in which that naturalist says, "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 considered as superfluous) was really entitled to take precedence of *curtum*."

The species of Say that Lewis had in mind was *conica*. It was considered by Tryon to be the same as *canaliculatum* Say. I have seen no shells from the Ohio River, and this is the type stream for *conica*, which definitely can be pronounced Strephobasic. Among both *undulatum* and *canaliculatum* are occasional shells resembling *curtum*. Such specimens occur in material from the Ohio, the Licking, the Elk of Alabama—to specify localities. But the resemblance is superficial. Of course, Lewis may have seen true Strephobases from the Ohio. But their absence from the collections I have examined warrants a Scotch verdict "not proven" for Lewis' contention.

Another Ohio River shell which Lewis has placed under *conica-curtum* is *Trypanostoma simplex* Lea. The types, being No. 121,631 in the U. S. National Museum, are underdeveloped *canaliculatum*. *Trypanostoma moriforme* Lea is still another shell which Lewis believed synonymous with *curtum*. I have seen the types and they do not belong to Strephobasis.

#### *Pleurocera curtum roanense* (Lea)

*Trypanostoma roanensis* Lea, Proc. Acad. Nat. Sci., Phila., XVI, Jan., 1864, p. 4; Journ. Acad. Nat. Sci., Phila., VI, 1866, p. 142, pl. 23, fig. 52; Obs. Gen. Unio, XI, 1867, p. 98, pl. 23, fig. 52.

*Pleurocera roanense* Lea, Tryon, Monog. Strepom., 1873, p. 108.

*Trypanostoma cylindraceum* Lea, Proc. Acad. Nat. Sci., Phila., XVI, Jan., 1864, p. 4; Journ. Acad. Nat. Sci., Phila., VI, 1866, p. 142, pl. 23, fig. 51; Obs. Gen. Unio, XI, 1867, pp. 98, 99, pl. 23, fig. 51.

*Pleurocera cylindraceum* Lea, Tryon, Monog. Strepom., 1873, pp. 108, 109.

The aperture of this subspecies is ovate and no specimen has been seen by me which has the lengthened aperture, fairly common in *curtum*, that has been illustrated by Lea in his figure of *spillmanii*. The columella is narrower than in *curtum*, smoother, and without nodes. The sinus is not so pronounced a character. Revolving lines of color, usually five, are present in most individuals.

The types of *roanense* came from the Emory River (government maps spell this both as Emory and Emery), Roane County, Tennessee. Ferris and I, several years apart, collected it at Oakdale, Morgan County, in the same river. My largest specimen from this locality measures  $24\frac{1}{4} \times 12$  mm.; the narrowest,  $23\frac{1}{2} \times 9\frac{1}{2}$  mm. I have a single small, rather rough specimen from Little River, Tennessee, and eight comparatively small, dark specimens that were taken in the Little Tennessee River, Tallasee, Blount County, Tennessee.

The name *roanense* is here used in preference to *cylindraceum* because this latter designation offers chances for the confusion of the subspecies with the elongate forms of *curtum* such as Lea put under *S. olivaria*. Besides this, the author's figure of *roanense* is of a more typical specimen than is that illustrated as *cylindraceum*.

*Pleurocera corpulentum* (Anth.)

*Melania corpulenta* Anth., Ann. Lyc. N. H. New York, VI, Mch., 1854, p. 127, pl. 3, fig. 28; Binney, Check List, 1860, No. 70; Brot, List, 1862, p. 32.

*Strophobasis corpulenta* Anth., Tryon, Monog. Strepom., 1873, p. 47.

*Pleurocera bitaeniata* (Con.), Hannibal, Proc. Malacol. Soc., X, 1912, p. 172.

Anthony's shell appears to have been a rarity for a long time. At least it was not collected in numbers until Hinkley in 1904 and H. H. Smith in 1909 "worked" the Tennessee River near Florence, Alabama, intensively. The type, I judge, came from the vicinity of Bridgeport, Jackson County, Alabama, and was well described by its author. The follow-

ing description is of a Florence specimen, being from No. 22014, Walker collection:

Shell ovate, smooth, shining; upper whorls slightly convex, body whorl large, slightly flattened in the center, rounded at top and base. Growth lines fine, inclined to be irregularly spaced on the body whorl, occasionally crossed by discontinuous waved lines. Sutures impressed. Six whorls remaining. Color citrine (Ridgeway), color bands five, those at top and at base of aperture being darker than the others. Aperture narrowly elliptical. Columella white, well developed from base nearly to the center, consisting only of a bluish-white wash of callus above that; slightly projecting inward, ending with a well-defined sinus, projecting backward. Outer lip sharp edged, firm, slightly incurved near the top, curving broadly outward and then inward again to the sinus.

Altitude, 20 $\frac{1}{4}$  mm.; diameter, 10 $\frac{3}{4}$  mm.; aperture—alt., 11; dia., 4.  
Collector, A. A. Hinkley, 1904.

The young of the Florence shells are distinctly carinated for six or seven whorls, quite conic, and then become suddenly bulbous. They can be told readily from the young of *curtum*. Most of the specimens from Florence are banded, but a few have been seen that are without these markings, the shell, especially when damp, being of a bright green color. Of three specimens from Bridgeport, two are identical with the Florence form, one is slightly more cylindrical and suggestive of the *curtum* occurring at Chattanooga. Two shells from Jackson County, Alabama, and probably taken at Bridgeport, carry Lewis' identification of *corpulentum*. They are olive-yellow and without bands. They measure 26 $\frac{1}{2}$  x 12 $\frac{3}{4}$  mm. and 21 x 11 $\frac{3}{4}$  mm. In the autumn of 1923, I collected the species in Battle Creek at Ketchall, Marion County, Tennessee. This stream empties into the Tennessee River not far north of Bridgeport. The form is solid, usually dark, without bands and is less constricted than the Florence shells. It may be considered transitional.

#### *Pleurocera walkeri*, new species

*Shell*: Elongate conic, apex eroded, base rounded. The whorls, of which four remain, are smooth, slightly convex; the last one flattened in the center. Growth lines very fine. Rest scars, dark, narrow, not conspicuous. The only other sculpture consists of three or four microscopic, discontinuous lines on an upper whorl. Sutures well impressed. Color buckthorn brown. The shell has no color bands. Aperture narrow, elliptical, having a pinched-in effect. Columella white, narrow, twisted, complete only from center to base. Outer lip sharp-edged, bordered with black, incurved from suture to below the periphery. Sinus well-marked, channelled to the left.

*Operculum*: Strophobasic.

*Measurements of shell*: Altitude,  $21\frac{1}{2}$  mm.; diameter,  $8\frac{3}{4}$  mm. Aperture—Alt., 10 mm.; dia., 4 mm.

*Type locality*: Sequatchie River, Jasper, Marion County, Tenn. Collected in August, 1923.

Type in the Museum of Zoology, University of Michigan, No. 37452; paratypes in that museum and in the collection of Dr. Bryant Walker.

Three or four of the shells from the type locality are somewhat darker than the type. In some instances the color below the sutures is lighter than on the rest of the whorl. Only one shell, a juvenile, has been found with color bands. These are three faint lines above the periphery and one below it. The characters of this species are so constant in the places it has been collected that I have felt fully justified in describing it in spite of the variability of the group in most situations.

The species was taken also in the Little Sequatchie River, five or six miles north of Marion, near the small town of Sequatchie. These are very like the Jasper shells save that there are a greater number of dark specimens among them. A few months after collecting these mollusks I received the same species from Paul Adams, of Knoxville, Tennessee, who found it in the Cumberland River at Granville, Jackson County, Tennessee. These shells are larger than the Sequatchie forms whorl for whorl, are of a shining chestnut brown and, as in the case of *curtum* of the Cumberland, the sinus is not so deeply channelled. The Alabama Museum contains material from the Tennessee River at Muscle Shoals and Shoals Creek, Lauderdale County, Alabama.

Measurements:

$24\frac{1}{2}$ mm.	x	$10\frac{1}{2}$ mm.	Sequatchie River, Jasper.
$22\frac{1}{2}$	x	$8\frac{1}{2}$	“ “ “
20	x	$9\frac{1}{2}$	“ “ “
20	x	$8\frac{1}{4}$	“ “ “
$28\frac{1}{2}$	x	$9\frac{3}{4}$	Cumberland River, Granville.
26	x	10	“ “ “
23	x	$8\frac{3}{4}$	“ “ “

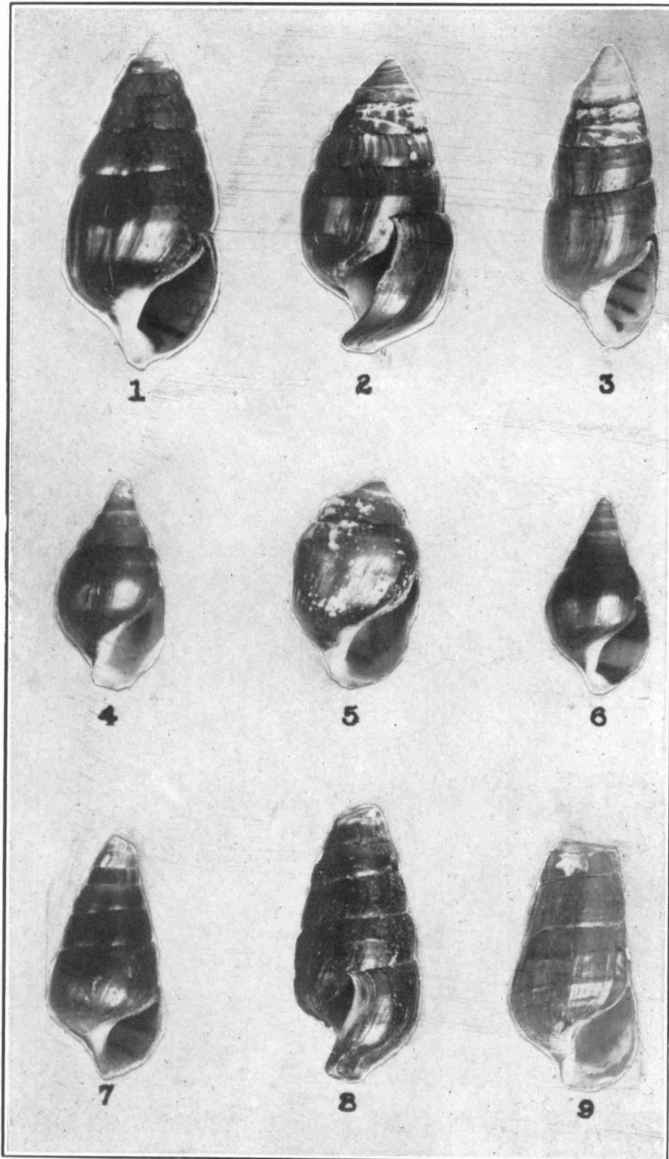
## PLATE I

FIGS. 1-6. *Pleurocera curtum* (Haldeman). Tennessee River, Knoxville, Tennessee.

FIGS. 7, 8. *Pleurocera curtum* (Haldeman). Cumberland River, Horseshoe Bottom, Russell County, Kentucky.

FIG. 9. *Pleurocera curtum roanense* (Lea). Little Tennessee River, Tennessee.





## PLATE II

FIGS. 10, 12. *Pleurocera corpulentum* (Anthony). Tennessee River, Florence, Alabama.

FIGS. 11, 14. *Pleurocera curtum* (Haldeman). Juveniles. Cumberland River, Horseshoe Bottom, Russell County, Kentucky.

FIG. 13. *Pleurocera walkeri* nov. sp. Type. Front view. Sequatchie River, Jasper, Marion County, Tennessee.

FIG. 15. *Pleurocera walkeri* nov. sp. Type. Side view.

FIGS. 16, 17. *Pleurocera walkeri*. Cumberland River, near Granville, Jackson County, Tennessee.

