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THE PLEURO CERIDAE OF THE OHIO RIVER
DRAINAGE SYSTEM*

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It is proposed to bring together in this paper certain findings on the taxonomy of the Pleuroceridae of that drainage basin which contains the greatest number of genera and the largest number of described species. The genera, it will be seen, are little reduced from those which Tryon recognized in his monograph of 1873 on the Strepomatidae. On the other hand, a vast reduction will be observed in the number of specific names. Also, transfers will be found to have been made from one genus to another. According to Pilsbry (1896), Tryon himself came to the belief that there were not more than a tenth as many good species as there were names. It seems likely that the estimate was more conservative than it need have been. Unities exist among pleurocerids of a genus of a given stream that have not been realized until recent years. Some of the shell characters that once were considered immutable have proved to be secondary and more or less evanescent. Differences in size, for example, have virtually no meaning in the matter of specific distinction, and differences in proportions tend to point to close relationships rather than to dissimilarities. Gradations occur

* This is the third paper written in preparation for a molluscan check list that is to be compiled by the American Malacological Union.

in height of spire, so that low-spired forms are seen to merge into high-spired forms, and frequently there are gradations in sculpture. Plicate sculpture, apparently of ancient origin, counts for a great deal more than spiral sculpture, which, in many instances, simply is brought about by adventitious folds in that part of the mantle which is occupied by shell-secreting glands.

By dividing the species *Io fluviialis* (Say) into a number of forms and linking the formae to stream ecology, Dr. C. C. Adams (1915) has shown that variations follow a system of an orderly sort. Some of the Anculosae and Lithasiae have been studied with regard to their positions in streams (1934) and a somewhat similar treatment has been accorded to *Pleurocera* (Goodrich, 1934 and 1937). The same course followed by Adams might with advantage permit an arrangement of some of the species of *Goniobasis*, as their characteristics vary with ecological variations. In the meantime, the synonymy indicated in the text of this paper may be taken to represent intimate biological relationships.

Types of the Pleuroceridae herein discussed have been examined wherever available, sometimes repeatedly. Upon these examinations most of the decisions as regards synonyms are based.

IO

Io fluviialis (Say), 1825. Occurs in the Tennessee River and four of its main tributaries in Virginia and eastern Tennessee, together with two lesser streams belonging to them. A seventh stream, Little River, is reported to contain *Io*, but the purported finding has not been verified. Reduced by Adams to the following fourteen forms:

<i>powellensis</i>	<i>nolichuckensis</i>
<i>clinchensis</i>	<i>recta</i>
<i>fluviialis</i>	<i>spinosa</i>
<i>lyttonensis</i>	<i>angitremoides</i>
<i>paulensis</i>	<i>unakensis</i>
<i>verrucosa</i>	<i>loudenensis</i>
<i>brevis</i>	<i>turrita</i>

Synonyms:

fusiformis Lea, 1831
inermis, Anthony, 1860
lurida Reeve
tenebrosa Lea, 1841

spirostoma Anthony, 1860
gibbosa Anthony, Reeve, 1861
rhombica Anthony, Reeve, 1861
lurida Reeve, 1861

LITHASIA

The genus is separable into four groups. Three of them are distinguishable one from another by peculiarities of the nodulous sculpture. The fourth group consists almost entirely of smooth shells of greatly varying shape, but in instances there is a reversion to the plicate or axial sculpture and aberrantly there are nodulous individuals.

GROUP 1

Mollusks in which the sculpture is either confined to the periphery of the shell or is there most pronounced; merging into nonsculptured forms. Shells consistently high-spined.

Lithasia armigera (Say), 1821. Lower Ohio River, lower Wabash River; Cumberland River from above Burnside, Pulaski County, Kentucky, to branches in Trigg County, Kentucky; Tennessee River in the vicinity of Florence, Lauderdale County, Alabama.

Synonyms:

Melania pallidula Anthony,
1854

Mesochiza grosvernorii Lea,
1864

Lithasia armigera stygia (Say), 1829. Branches of Cumberland River as a race; occasionally in the river as aberrants.

Synonyms:

Melania tuberculata Lea, 1831
Melania spixiana Lea, 1836
Melania nodata Reeve, 1861

Lithasia downiei Lea, 1862
Angitrema angulata Wetherby,
1876

Lithasia armigera parva (Wetherby), 1876. Stone's River, Rutherford County, Tennessee. The locality as given is the same as that of Wetherby's *A. angulata*. Whether it is a dis-

tinct race or is merely a dwarfed form occurring with *angulata* is unknown.

Lithasia jayana (Lea), 1841. Forks of Cumberland River; Caney Fork, Tennessee, near mouth.

Synonym:

Melania robulina Anthony, 1850

Lithasia duttoniana (Lea), 1841. Duck River, Bedford County to Humphreys County; two tributaries in Bedford County—all in Tennessee.

Synonym:

Io fasciolata Reeve, 1860

Lithasia lima (Conrad), 1834. Elk River, Tennessee and Alabama; branch of Elk River in Franklin County, Tennessee; Tennessee River, Alabama, Muscle Shoals and three near-by creeks.

Synonym:

Angitrema wheatleyi Tryon, 1866

GROUP 2

Shells bearing tubercles at the shoulder of whorls, sometimes with additional nodes just below; spires, increasing in height as shells merge into smooth forms.

Lithasia salebrosa (Conrad), 1834. Tennessee River and Cypress Creek, Lauderdale County, Alabama; lower Cumberland River, Montgomery County, Tennessee, to Trigg County, Kentucky.

Lithasia salebrosa subglobosa (Lea), 1861. Tennessee River, Muscle Shoals, Alabama.

Lithasia salebrosa florentiana (Lea), 1861. Tennessee River, Muscle Shoals, Alabama, and a near-by tributary; Elk River, Tennessee and Alabama.

Synonyms:

Anculosa squalida Lea, 1845; *Lithasia toumeyii* Lea, 1861
one of three types *Lithasia imperialis* Lea, 1861

Melania grisea Anthony, 1860

Lithasia geniculata Haldeman, 1840. Cumberland River,

above Burnside, Pulaski County, Kentucky, to points below Nashville, Davidson County, Tennessee; branches in Tennessee; Duck River, Maury County to mouth, and lower part of Buffalo River, Tennessee.

Synonyms:

Melania corneola Anthony, *Melania vesicula* Lea, 1861
1860

Eurycaelon umbonatum Lea, 1864

Lithasia geniculata fuliginosa (Lea), 1841. Duck River, Bedford County, to below Maury County; Buffalo River; lower part of Harpeth River; Red River, Robertson County—all in Tennessee.

Synonyms:

Melania densa Anthony, 1850 *Melania abbreviata* Anthony,
Lithasia dilatata Lea, 1861 1850

Lithasia geniculata venusta (Lea), 1861. Upper and middle part of Harpeth River, Tennessee.

Lithasia geniculata pinguis Lea, 1852. Caney Fork and branches; Duck River, Coffee County, Tennessee.

GROUP 3

With several rows of tubercles, sometimes confluent or absent; nodes, either pronounced at the periphery or above it; spire, high to low, but never on the same plane as in *salebrosa* or *geniculata*.

Lithasia verrucosa (Rafinesque), 1820. Branch of Ohio River near Cincinnati to lower part of river; lower Wabash River; lower parts of East Tennessee head streams of Tennessee River to Marshall County, Kentucky; Black and Spring rivers, Arkansas.

Synonyms:

Melania nupera Say, 1829 *Melania fusiformis* Lea, 1841
Melanopsis semigranulosa *Melania procissa* Anthony,
Deshayes, 1840 1854
Melania aequalis Haldeman, *Goniobasis auricoma* Lea,
1841 1861
Melania holstoniana Lea, *Goniobasis stewardsoniana*
1841 Lea, 1861

Lithasia curta Lea, 1868. Tennessee River, Muscle Shoals; Shoals Creek, Lauderdale County, Alabama.

GROUP 4

Usually smooth, bearing plicae or spiral lines if sculptured; spire, high to low; shell, conical, cylindrical, or ventricose. More varied than any others of the genus.

Lithasia obovata (Say), 1829. Ohio River and branches, Pennsylvania to Illinois; particularly common in Green River, Kentucky; branches of Cumberland River. Some of the pronounced forms might be put down as subspecies since in places they are true races.

Synonyms:

<i>Melania hildrethiana</i> Lea, 1841	<i>Melania laticostans</i> Anthony, 1854
<i>Melania nucleola</i> Anthony, 1850	<i>Melania chalybea</i> Anthony, Brot
<i>Melania gibbosa</i> Lea, 1852	<i>Anculosa lewisii</i> Lea, 1861
<i>Melania elegantula</i> Anthony, 1854	<i>Goniobasis gabbiana</i> Lea, 1862
<i>Melania coronilla</i> Anthony, 1854	<i>Goniobasis infantula</i> Lea, 1863
<i>Melania tabulata</i> Anthony, 1854	<i>Goniobasis louisvillensis</i> Lea, 1863

Lithasia obovata depygis (Say), 1830. Ohio River and some of its tributaries.

Synonym:

Melania vicina Anthony, 1854

Lithasia obovata microlineata (Goodrich), 1921. Rough River, Kentucky; Wabash River, Posey County, Indiana.

Lithasia obovata curvilabris (Anthony), 1854. Green River and tributaries, Kentucky; Ohio River, Louisville, Kentucky.

Synonym:

Goniobasis informis Lea, 1863

Lithasia obovata undosa (Anthony), 1854. Green River and tributaries, Kentucky.

Synonym:

Melania rarinodosa Anthony, Reeve, 1860

Lithasia obovata sordida (Lea), 1841. Branches of Green River, Kentucky; tributaries of Cumberland River, Tennessee; Elk River, branches and springs, Tennessee.

Synonyms:

? <i>Melania perfusca</i> Lea, 1841	<i>Melania incurta</i> Anthony,
<i>Melania saffordi</i> Lea, 1852	Reeve, 1860
<i>Melania rhombica</i> Anthony,	<i>Trypanostoma tennesseense</i>
1854	Lea, 1862

Lithasia obovata consanguinea (Anthony), 1854. Ohio River, Indiana; Green River, Kentucky.

Lithasia obovata planospira (Anthony), 1854. Green River, Kentucky.

Lithasia plicata Wetherby, 1876. Upper Kentucky River, Kentucky; branches of Cumberland River, Overton County, Tennessee. Occurs apparently as a true race in places, oftener as an aberrant phase of *L. obovata*.

Melania versipellis Anthony, 1860, and *M. cognata* Anthony, 1860, are young examples of *Lithasia*; to what species they belong is unknown.

PLEUROCERA

The genus consists of one fairly well-defined section *Strophobasis*, one species of varying shape and degree of ornamentation which has retained the axial sculpture, and then a number of species and subspecies that can be divided roughly into a few groups. Most of these last shells are of simple characters, but vary greatly as to size and proportions. In places, there is a merging or hybridization between groups. The genus as a whole shows a ready response to ecological influences, and in the matter of radula and concavity of the maturing whorls certain signs that in other families of mollusks have been interpreted as degeneration.

GROUP OF PLEUROCERA (*STREPHOBASIS*) *CURTUM*

Pleurocera curtum (Haldeman), 1841. Upstream tributaries of the Tennessee River; the main river Knoxville, Tennessee, to Muscle Shoals, Alabama, together with larger

branches; Cumberland River, above Burnside, Pulaski County, Kentucky, to vicinity of Nashville, Davidson County, Tennessee; Caney Fork, Tennessee.

Synonyms:

<i>Melania turgida</i> Lea, 1841	<i>Trypanostoma minor</i> Lea, 1862
<i>Melania picta</i> Lea, 1841	
<i>Melania solida</i> Lea, 1845	<i>Trypanostoma pumilum</i> Lea, 1862
<i>Melania plena</i> Anthony, 1854	
<i>Melania glans</i> Anthony, 1854	<i>Trypanostoma bivittatum</i> Lea, 1862
<i>Melania glandulum</i> Anthony, 1860	<i>Trypanostoma trochulus</i> Lea, 1862
<i>Strephobasis spillmanii</i> Lea, 1861	<i>Strephobasis lyonii</i> Lea, 1864
<i>Strephobasis clarkii</i> Lea, 1861	<i>Trypanostoma napoideum</i> Lea, 1864
<i>Strephobasis picturata</i> Reeve, 1861	<i>Pleurocera bicinctum</i> Tryon, 1866
<i>Strephobasis olivaria</i> Lea, 1862	<i>Strephobasis hartmaniana</i> Lea (Mss.), 1871
<i>Strephobasis carinata</i> Lea, 1862	

Pleurocera curtum roanense (Lea), 1864. Tributaries Tennessee River in East Tennessee.

Synonym:

Trypanostoma cylindraceum Lea, 1864

Pleurocera corpulentum (Anthony), 1854. Tennessee River, Muscle Shoals, Alabama; Battle Creek, Marion County, Tennessee.

Pleurocera walkeri Goodrich, 1928. Sequatchie and Little Sequatchie rivers, Tennessee; Tennessee River, Muscle Shoals, Alabama; Cumberland River, Jackson County, Tennessee.

GROUP OF *PLEUROCERA ALVEARE*

Pleurocera alveare (Conrad), 1854. Lower parts of Ohio, Wabash and Green rivers, together with a few tributaries; Cumberland River, above Burnside, Pulaski County, Kentucky, to tributaries of the river in Trigg County, Kentucky; Tennessee River, Muscle Shoals, and nearby creeks, Alabama; streams of north Arkansas and southern Missouri. Separable into a few subspecies or formae.

Synonyms:

- | | |
|--|---|
| ? <i>Melania formosa</i> Conrad,
1834 | <i>Melania grossa</i> Anthony, 1860 |
| <i>Melania torquata</i> Lea, 1842 | <i>Melania abscida</i> Anthony,
1860 |
| <i>Melania producta</i> Lea, 1842 | <i>Pleurocera plicatum</i> Tryon,
1863 |
| <i>Melania pumila</i> Lea, 1845 | <i>Trypanostoma lesleyi</i> Lea,
1864 |
| <i>Melania pernodosa</i> Lea, 1845 | |

GROUP OF *PLEUROCERA CANALICULATUM*

Pleurocera canaliculatum (Say), 1821. Ohio River from vicinity of Pittsburgh, Pennsylvania, to Illinois; Wabash River and its tributaries; aberrantly in the Tennessee River system. The Walker collection contains specimens from Omaha, Nebraska.

Synonyms:

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|---|---|
| <i>Melania conica</i> Say, 1821 | ? <i>Melania valida</i> Anthony,
1860 |
| <i>Melania elevata</i> Say, 1821 | <i>Trypanostoma troostii</i> Lea,
1862 (in part) |
| <i>Melania exarata</i> Menke, 1830 | <i>Trypanostoma virida</i> Lea,
1862 |
| <i>Melania ligata</i> Menke, 1830 | <i>Trypanostoma ligatum</i> Lea,
1862 |
| ? <i>Melania substriata</i> Halde-
man, 1841 | <i>Trypanostoma clarkii</i> Lea,
1862 (in part) |
| ? <i>Melania curvatum</i> Lea, 1843 | <i>Trypanostoma simplex</i> Lea,
1862 |
| ? <i>Melania incrassata</i> Anthony,
1854 | |
| <i>Melania altipetum</i> Anthony,
1854 | |

Pleurocera canaliculatum undulatum (Say), 1829. Typical in Kentucky River, Kentucky. Carinate or angled forms in lower Ohio River and tributaries; Cumberland and Tennessee rivers and branches. The Walker collection contains specimens from Rock River, Illinois, which discharges into the Mississippi.

Synonyms:

- | | |
|--|--|
| <i>Melania ponderosum</i>
Anthony, 1860 | <i>Trypanostoma thornntonii</i> Lea,
1862 |
| <i>Io robusta</i> Lea, 1861 | <i>Trypanostoma anthonyi</i> Lea,
1862 |
| <i>Trypanostoma dux</i> Lea, 1862 | |

Trypanostoma toumeyi Lea, 1862 *Trypanostoma cinctum* Lea, 1864

Trypanostoma subrobustum
Lea, 1864

Pleurocera canaliculatum filum (Lea), 1845. Upper Cumberland River to a point above Nashville, Davidson County, Tennessee; Duck River, Coffee County, to near the mouth, Tennessee; aberrant in Tennessee River.

Synonyms:

Melania eximia Anthony, 1854 *Trypanostoma affine* Lea, 1864

Pleurocera canaliculatum excuratum (Conrad), 1834. Commonest in Tennessee River at Muscle Shoals, Alabama, and lower parts of a few near-by tributaries; Cumberland River, Nashville, Tennessee, to parts of river in Kentucky; aberrant in Clinch and Wabash rivers.

Synonyms:

Melania rorata Reeve, 1860 *Trypanostoma moniliferum*
Io modesta Lea, 1861 Lea, 1862
Io spillmanii Lea, 1861 *Trypanostoma florense* Lea, 1862

Pleurocera canaliculatum alabamense (Lea), 1862. Tributaries of Tennessee River in North Alabama. Somewhat more slender forms may be set down as synonyms:

Trypanostoma striatum Lea, 1862 *Trypanostoma rostellatum*
Lea, 1862

Pleurocera canaliculatum moriforme (Lea), 1862. Apparently occurring as a true race in Tennessee River, Muscle Shoals, Alabama.

Synonym:

Trypanostoma pyb asii Lea, 1862

Pleurocera nobile (Lea), 1845. Tennessee River, Jackson County, to Marion County, Alabama; Sequatchie River, Tennessee, near mouth; Flint Creek, Morgan County, Alabama.

Synonym:

? *Io variabilis* Lea, 1861 (types are juveniles)

Pleurocera nobile nodosa (Lea), 1861. Tennessee River, above Chattanooga, Hamilton County, Tennessee.

Pleurocera parvum (Lea), 1862. Tributaries of Tennessee River, East Tennessee; apparently extending into South Carolina. *P. ocoënis* Lea, 1841, may possibly replace it.

Synonyms:

<i>Trypanostoma vanuxemii</i> Lea,	<i>Trypanostoma strictum</i> Lea,
1862	1862
<i>Trypanostoma luteum</i> Lea,	<i>Trypanostoma knoxense</i> Lea,
1862	1862
<i>Trypanostoma carolinense</i>	<i>Trypanostoma modestum</i> Lea,
Lea, 1862	1862

Pleurocera postelli (Lea), 1862. Small streams of North Alabama in the vicinity of Muscle Shoals.

The following are more or less slender offshoots of the *canaliculatum* complex that resemble *P. parvum*, but which are unknown with the exception of the types:

<i>Melania fastigiatum</i> Anthony,	<i>Melania validum</i> Anthony,
1854	1860
<i>Melania infrafasciatum</i>	<i>Trypanostoma christyi</i> Lea,
Anthony, 1860	1862

GROUP OF *PLEUROCERA PYRENELLUM*

Pleurocera pyrenellum (Conrad), 1834. Tributaries of Tennessee River in Morgan and Limestone counties, Alabama, and Walker County, Georgia.

Synonym:

Melania planogyrum Anthony, 1854

Pleurocera viridulum (Anthony), 1854. Chickamauga Creek, Walker County, Georgia, below artificial lake containing *pyrenellum*. Possibly only a fast water modification.

Pleurocera brumbyi (Lea), 1852. Springs and streams of Tennessee River in Madison, Limestone and Courtland counties, Alabama.

Synonym:

Trypanostoma terebrale Lea, 1868

Pleurocera currierianum (Lea), 1863. Possibly a depauperate form of *brumbyi*. Described as from Florence, Lauderdale

County, Alabama. Found in "Swan Lake," near Decatur, Limestone County, Alabama, and discharge of a spring in Madison County—the spring containing *brumbyi*.

Pleurocera trochiformis (Conrad), 1834. Tennessee River, Bridgeport, Jackson County, to Florence, Lauderdale County, Alabama; tributaries in Walker County, Georgia, to those near Muscle Shoals, Alabama.

Synonym:

Trypanostoma incurvum Lea, 1862

A possible member of this group is *Melania elongata* Lea, 1831. The type is from western Tennessee.

GROUP OF *PLEUROCERA UNCIALE*

Pleurocera uncialis (Haldeman), 1841. Upper tributaries of Tennessee River in Virginia and eastern Tennessee.

Synonyms:

<i>Melania regulare</i> Lea, 1841	<i>Trypanostoma henryanum</i>
? <i>Melania sulcosa</i> Lea, 1841	Lea, 1862
<i>Melania bicostata</i> Anthony, 1854	<i>Trypanostoma sycamorensis</i>
	Lea, 1862
<i>Melania tenebrocinctum</i>	<i>Trypanostoma knoxvillense</i>
Anthony, 1860	Lea, 1862
<i>Trypanostoma estabrookii</i>	<i>Trypanostoma carinatum</i> Lea,
Lea, 1862	1864
<i>Trypanostoma subulaeformis</i>	
Lea, 1862	

Pleurocera uncialis hastatum (Anthony), 1854. A cylindrical phase of *uncialis* occurring in "pure" colonies in North and South Fork of Holston River, Sullivan County, Tennessee.

The following are transition forms between the *uncialis* and *canaliculatum* groups, occupying parts of the upper Tennessee River system that are transition zones also for *Io* and *Anculosa*:

<i>Melania exarata</i> Lea, 1841,	<i>Melania aratum</i> Lea, 1841, re-
non <i>M. exarata</i> Menke, 1830	placing <i>M. exarata</i> Lea, pre-
<i>Melania gradatum</i> Anthony,	occupied
1854	<i>Trypanostoma curatum</i> Lea,
	1863

GROUP OF *PLEURACERA ACUTA*

Pleurocera acuta Rafinesque, 1831. Ohio River headstreams and tributaries. Great Lakes and tributaries; Mississippi River and westward to Nebraska and Kansas; through the Erie Canal into the basin of Hudson River. Forms indistinguishable from it have been taken in branches of the Cumberland and Duck rivers, Tennessee. The synonymy of *acuta* is dealt with in the treatment of the Pleuroceridae of the St. Lawrence drainage basin.

Pleurocera acuta lewisii Lea, 1862. Illinois River, Illinois. Usually striate, but not always.

GONIOBASIS

The genus is divisible into a number of groups, each of which is considered a natural one by the writer, but which may prove to be otherwise when thorough anatomical work on the several species is carried out.

GROUP OF *GONIOBASIS CATENARIA*

Goniobasis striatula (Lea), 1842. Springs of Monroe County, a reservoir near Cleveland, Bradley County, Tennessee.

Synonym:

Melania striata Lea, 1841

Goniobasis arachnoidea (Anthony), 1854. Small streams of East Tennessee.

Synonyms:

Melania intertexta Anthony, 1860 *Goniobasis undulata* Tryon, 1866

Melania rigida Anthony, 1860

Goniobasis strigosa (Lea), 1841. Small streams near Knoxville, Knox County, Tennessee.

Goniobasis troostiana (Lea), 1841. Mossy Creek, Jefferson County, Tennessee.

Goniobasis porrecta Lea, 1863. Springs and streams of Claiborne County, Tennessee.

Synonym:

Goniobasis vittatella Lea, 1863

Goniobasis rubella Lea, 1862. Reported originally from Cherokee County, North Carolina, and not found there since. May be the same as *porrecta*.

Goniobasis arachnoidea spinella (Lea), 1862. Small streams of Lee and Scott counties, Virginia, and Claiborne County, Tennessee.

Goniobasis teres (Lea), 1841. Small streams of Walden Ridge, Tennessee, flowing eastward.

Synonyms:

Melania rufa Lea, 1841

Melania rufescens Lea, 1841

Goniobasis nassula (Conrad), 1834. Springs and spring branches of Madison and Colbert counties, Alabama.

GROUP OF *GONIOBASIS LAQUEATA*

Goniobasis laqueata (Say), 1829. Green River and tributaries, Kentucky; tributaries of middle parts of Cumberland River, Tennessee; Duck River and branches, Tennessee; tributaries of Tennessee River, Tennessee and Alabama.

Synonyms:

Melania obtusa Lea, 1841

Melania paucicostata

Melania monozonalis Lea,
1841

Anthony, 1860

Melania deshayesiana Reeve,
1860

Melania gracilis Lea, 1841

Goniobasis olivella Lea, 1862

Melania blanda Lea, 1841

Goniobasis mediocris Lea,
1862

Melania nitens Lea, 1841

Goniobasis duttonii Lea, 1862

Melania plicatula Lea, 1841

Goniobasis viridicata Lea,
1862

Melania decora Lea, 1841

Goniobasis lindsleyi Lea,
1862

Melania terebralis Lea, 1841

?*Melania sculptilis* Lea, 1841

Melania nitida Lea, 1841

?*Melania nodulosa* Lea, 1841

Melania deshayesiana Lea,
1842

Goniobasis difficilis Lea, 1862

Goniobasis sparus Lea, 1862

Melania substricta Haldeman,
1844

Goniobasis cerea Lea, 1862

Melania mutata Brot

Goniobasis ornatella Lea,
1862

Goniobasis lyonii Lea, 1862

Goniobasis laqueata costulata (Lea), 1841. Green River of

Kentucky and branches; branches of the Duck River, Tennessee.

Synonyms:

Melania athleta Anthony, 1854 *Goniobasis goodrichi* Hinkley, 1920

Goniobasis laqueata tortum (Lea), 1845. Headwaters of Big Creek, Lawrence County, Tennessee.

Synonym:

Melania clarkii Lea, 1845

Goniobasis laqueata castanea (Lea), 1841. Headwaters of Duck River, Tennessee.

Synonym:

? *Melania subcylindracea* Lea, 1841

Goniobasis interveniens Lea, 1862. Tributaries of Tennessee River in North Alabama.

Synonyms:

Goniobasis amoena Lea, 1862 *Goniobasis proletaria* Lea, 1862
Goniobasis continens Lea, 1862

Goniobasis pybasii Lea, 1862. Springs and streams of North Alabama.

Synonyms:

Goniobasis thorntonii Lea, 1862 ?*Goniobasis gouldiana* Lea, 1868

Goniobasis curreyana (Lea), 1841. Green River, Kentucky, and tributaries; streams of Cumberland River, middle Tennessee.

Goniobasis paupercula Lea, 1862. Creeks of North Alabama.

Synonyms:

Goniobasis tuomeyi Lea, 1862 ?*Goniobasis spillmanii* Lea, 1862

?*Goniobasis cruda* Lea, 1862

Goniobasis costifera (Haldeman), 1841. Tributaries Ohio River in Kentucky and Illinois.

Synonyms:

Melania intersita Haldeman, 1841 *Melania eliminata* Anthony, 1854

Goniobasis acuta (Lea), 1830. Springs and creeks of North Alabama.

Synonyms:

Goniobasis bifasciata Lea, 1868 *Goniobasis clathara* Lea, 1868

Goniobasis acuta clavula (Lea), 1868. Tributaries Tennessee River in Madison County, Tennessee, and Jackson County, Alabama.

Goniobasis perstriata (Lea), 1852. Springs and small streams of North Alabama.

Goniobasis perstriata crispa Lea, 1862. In "pure" colonies in Lawrence County, Alabama; aberrants in Madison County, Alabama.

Goniobasis perstriata decampii (Lea), 1863. Madison County, Alabama. Possibly only an aberrant form.

Goniobasis edgariana (Lea), 1841. Streams of Cumberland, Duck and Elk rivers, Tennessee.

Synonyms:

<i>Melania columella</i> Lea, 1841	<i>Melania rugosa</i> Lea, 1842
<i>Melania corrugata</i> Lea, 1841	<i>Melania sellersiana</i> Lea, 1852
<i>Melania caliginosa</i> Lea, 1841	<i>Melania baculum</i> Anthony,
? <i>Melania circincta</i> Lea, 1841	1854
<i>Melania concinna</i> Lea, 1841	<i>Melania glauca</i> Anthony,
<i>Melania crebricostata</i> Lea,	1860
1841	<i>Goniobasis cinerella</i> Lea, 1862
<i>Melania coracineta</i> Anthony,	<i>Goniobasis purpurella</i> Lea,
1850	1862

Goniobasis plicata-striata Wetherby, 1876. Small branches of Cumberland River, Tennessee and Kentucky; Big Richland Creek of Tennessee River, Humphreys County, Tennessee.

GROUP OF *GONIOBASIS SIMPLEX*

Goniobasis simplex (Say), 1825. Headwaters of Tennessee River system in Virginia, Tennessee and North Carolina;

Beaver Fork of Bluestone River of Kanawha River, Mercer County, West Virginia.

Synonyms:

<i>Melania warderiana</i> Lea, 1841	<i>Goniobasis vanuxemii</i> Lea, 1862
<i>Melania subsolida</i> Lea, 1841	<i>Goniobasis prestoniana</i> Lea, 1864

Goniobasis clavaeformis (Lea), 1841. Tributaries of upper Tennessee River in Virginia, Tennessee and North Carolina; does not make the westward turn around Walden Ridge.

Synonyms:

<i>Melania acutocarinata</i> Lea, 1841	<i>Melania adusta</i> Anthony, 1860
<i>Melania glabra</i> Lea, 1841	? <i>Melania funelabris</i> Anthony, 1860
<i>Melania approximata</i> Halde- man, 1841	<i>Goniobasis estabrookii</i> Lea, 1862
<i>Melania torulosa</i> Anthony, 1854	<i>Goniobasis cumberlandensis</i> Lea, 1863
<i>Melania nigrocincta</i> Anthony, 1854	<i>Goniobasis pulla</i> Lea, 1864
<i>Melania hybrida</i> Anthony, 1860	? <i>Goniobasis graminea</i> Halde- man, 1865
? <i>Melania lavaeformis</i> Lea, Reeve, 1860	

Goniobasis proxima (Say), 1825. Mountain country of North and South Carolina; highland streams of eastern Tennessee. Possibly some of these simplified forms are derived out of *G. symetrica*, closely related to *virginica* of eastern drainage basins.

Synonyms:

<i>Melania carinata</i> Ravenal, 1834	<i>Melania bicincta</i> Anthony, 1860
<i>Melania pulcherrima</i> Anthony, 1854	<i>Melania assimilis</i> Anthony, 1860
<i>Goniobasis rubricata</i> Lea, 1862	

Goniobasis aterina Lea, 1863. Springs and small streams of Claiborne and Hancock counties, Tennessee.

GROUP OF *GONIOBASIS EBENUM*

Goniobasis ebum (Lea), 1841. Cumberland River above the Falls; Smith's Shoals, Pulaski County, Kentucky; springs

and small streams of this river downstream to Dickson County, Tennessee.

Synonyms:

Melania dubia Lea, 1841 (in part) *Melania dubiosa* Lea, 1842 (in part)

Trypanostoma lyonii Lea, 1863

Goniobasis ebenum emeryensis (Lea), 1864. In "pure" colonies in branches of Cumberland River, eastern Kentucky and Tennessee. Not in tributary of the Tennessee River as first reported.

GROUP OF *GONIOBASIS SEMICARINATA*

Goniobasis semicarinata (Say), 1829. Tributaries of Ohio River, Scioto River, Ohio, to Big Blue River, Indiana; Licking River to Salt River in Kentucky; two creeks of Green River of Kentucky.

Synonyms:

<i>Melania exilis</i> Haldeman, 1841	<i>Melania bicolorata</i> Anthony, 1850
<i>Melania kirtlandiana</i> Lea, 1841	<i>Melania iota</i> Anthony, 1854
<i>Melania babylonica</i> Lea, 1841	<i>Melania angustispira</i> Anthony, 1860
<i>Melania succinulata</i> Anthony, 1850	<i>Melania angusta</i> Reeve, 1860
<i>Melania pulchella</i> Anthony, 1850	<i>Goniobasis ohioensis</i> Lea, 1862
<i>Melania brevispira</i> Anthony, 1850	<i>Goniobasis interlineata</i> Anthony, 1865

GROUP OF *GONIOBASIS LIVESCENS*

Goniobasis livescens (Menke), 1830. Tributaries of Ohio River, east of Scioto River in Ohio; Wabash River and branches, west to Illinois River. Especially common in the St. Lawrence basin. The Walker Collection, in the University of Michigan, contains specimens from Des Moines River, Iowa. The synonymy and subspecies of *livescens* is dealt with in a paper on the Pleuroceridae of the St. Lawrence River system.

GONIOBASES REPRESENTING INVASIONS FROM THE ALABAMA RIVER SYSTEM

Goniobasis interrupta (Haldeman), 1840. Hiwassee River and its streams, North Carolina and eastern Tennessee. Ap-

<i>Melania inflata</i> Lea, 1838	<i>Anculosa affinis</i> Haldeman, 1841
<i>Anculotus kirtlandianus</i> Anthony, 1840	<i>Leptoxis rapaeformis</i> Haldeman, 1843
<i>Anculotus carinatus</i> Anthony, 1840	? <i>Anculosa patula</i> Anthony, 1860
? <i>Anculosa viridula</i> Anthony, 1860	

Nitocris ornata (Anthony), 1860. Hiwassee River, North Carolina.

Nitocris trilineata (Say), 1829. Ohio River, Cincinnati, Ohio, to Louisville, Kentucky; Little Miami River, Ohio, near mouth; Five-mile Creek, Campbell County, Kentucky.

Synonyms:

<i>Anculotus costata</i> Anthony, 1840	<i>Melania viridis</i> Lea, 1841
	<i>Melania occidentalis</i> Lea, 1841

Nitocris minor (Hinkley), 1912. Tennessee River, Muscle Shoals, Lauderdale County, Alabama.

Nitocris virgata (Lea), 1841. Holston River and its forks, Sullivan County to Knox County, Tennessee; Tennessee River, Knox County, Tennessee, to Jackson County, Alabama.

ANCULOSA

Anculosa praerosa (Say), 1824. Ohio River, below Cincinnati, Ohio, to Elizabethtown, Illinois, together with a few tributaries; Cumberland River and branches; Duck River, Coffee County, Tennessee, to mouth; Tennessee River, and lower parts of tributaries.

Synonyms:

<i>Melania cruentata</i> Menke, 1828	<i>Melania cincinnatiensis</i> Lea, 1838
<i>Melania angulosa</i> Menke, 1828	<i>Anculosa squalida</i> Lea, 1845 (in part)
<i>Melania ovularis</i> Menke, 1828	<i>Anculosa tintinabulum</i> Lea, 1845
<i>Anculotus angulatus</i> Conrad, 1834	
<i>Melanopsis neritiformis</i> Deshayes, 1838	<i>Anculosa tryoni</i> Lewis, 1870

Anculosa subglobosa (Say), 1825. Tennessee River basin, head streams and tributaries.

Synonyms:

- Anculosa littorina* Haldeman, *Melania globula* Lea, 1841
 1840 *Melania gibbosa* Lea, 1841
Melania pilula Lea, 1841

Anculosa harpethensis Pilsbry, 1896. Harpeth River, Tennessee. The *Anculosa* of the Duck River may belong to this species.

Anculosa umbilicata Wetherby, 1876. Stone's River, Red River, and Ringgold Creek of the Cumberland River, all in Tennessee; Elk River, Franklin County, Tennessee.

EURYCAELON

Eurycaelon anthonyi (Budd, Redfield), 1854. Tennessee River, Knox County, Tennessee, to Lauderdale County, Alabama; lower French Broad and Clinch rivers, eastern Tennessee; Elk River, Alabama; smaller tributaries of Tennessee River from Little Tennessee River, Tennessee, to Limestone County, Alabama.

Synonyms:

- Melania cristata* Anthony, *Anculosa turbinata* Lea, 1861
 1854

Eurycaelon crassa (Haldeman), 1841. Powell River, near mouth; Clinch River, Anderson, Knox, and Roane counties, all in Tennessee.

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