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LAND MOLLUSCA  
OF  
NORTH AMERICA  
(NORTH OF MEXICO)

By

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VOLUME I

PART 2

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## PREFACE

The present Part contains the remaining families of Helicacea, being mainly occupied with the Polygyridae.

This is the most ubiquitous and widely-spread North American family of helices, being found in all states of the Union but four (Wyoming, Colorado, Utah and Nevada), in Canada, Alaska and in Mexico. It is also more numerous in species than any other land snail family of our area, and it comprises many shells of large size.

The other family included here, Sagdidae, is a tropical group, represented in the United States mainly by stragglers from the West Indies and Mexico.

The name of my late assistant, Edward G. Vanatta, was inadvertently omitted from those to whom acknowledgments for assistance were made in Part I. Through many years he was my right hand in the long task of assorting, determining and labelling material on which this work is based. I am indebted also to Dr. Harald A. Rehder for the generous gift of a synopsis of his notes on the apical sculpture of Polygyridae in relation to taxonomy.

As in Part I, the photographic figures for this Part are by Miss Helen Winchester, the line drawings of anatomy and shells by the author.

July, 1940.

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NEW SUBFAMILIES, SECTIONS, SPECIES AND SUBSPECIES  
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**LAND MOLLUSCA OF NORTH AMERICA**  
**(NORTH OF MEXICO)**

ERRATUM

Page 829, second reference under *Triodopsis caroliniensis*, for *obstriata*  
read *obstricta*.

SYSTEMATIC TREATMENT (CONTINUED)

Family V. POLYGYRIDAE

Polygyrinae Pilsbry, 1895, *Man. Conch.*, 9, Index to Helices, p. 123.

Polygyridae Pilsbry, 1930, *Proc. Acad. Nat. Sci. Phila.*, 82: 310.

The one-colored (or rarely banded) shell varies from discoidal or lens-shaped to globose-conic; aperture with reflected lip and often toothed.

Genitalia without dart apparatus, the penis simple or continued in an epiphallus, with a very short flagellum or none. Talon exposed, tuberculose. Spermathecal duct of medium length or short, not branched.

Jaw ribbed. Central and lateral teeth with ectocones (except in some species of *Mesodon*).

Kidney narrow, about two or three times the length of the pericardium.

Free retractor muscles: ocular, pharyngeal and pedal muscles uniting into a single band posteriorly.

This family is more widely spread in North America than any other group of helicid snails. It occurs in eastern Canada, British Columbia and southern Alaska, and in all of the United States except Wyoming, Colorado, Utah, and Nevada. Southward it is well represented in Mexico; its total range is from about 13° N. Lat. to about 51° (James Bay) in the East, and to 60° (Yakutat) on the West Coast.

They are snails of humid country, with the exception of the genus *Ashmunella* which sometimes inhabits very arid mountains in New Mexico and Chihuahua. Most eastern Polygyridae are woodland snails, but practically all stations available for land mollusks in its area are occupied. Burrowing species occur in *Ashmunella*, and arboreal forms in *Praticolella*, but most species live under dead wood or leaves or under stones, chiefly limestone or shale, coming out in the open at night or in rain. The young snails wander abroad more freely than adults, and are often found on plants where the adults are under cover.

Their food is chiefly the mycelia of fungi.

The main evolution of Polygyridae appears to have been in the temperate zone, only two genera, *Polygyra* and *Giffordius*, being represented in the tropics. The family comprises all of the autochthonous Helicacea of eastern North America. As fossils, Polygyridae appeared in the Upper Cretaceous



of Alberta. Several species are known from the Miocene in Oregon and Florida.

Although the family is allied to the group I defined as Epiphallagona, it is rather divergent from that stock, and apparently is not directly related to the Ammonitellinae or Oreohelicinae, or to any tropical American Camaenidae. It will probably turn out to be a very old group in America.

In nearly all Polygyridae the shell is yellow to brown without color markings. A few have a dark band above the periphery (*Allogona profunda*, *Polygyra texasiana*, *Stenotrema fraternum fasciatum*, and rarely *Mesodon elevatus*). *Triodopsis multilineata* is many-banded. Some arboreal species of *Praticolella* are white with gray bands.

The apical sculpture appears to derive from a type with retractively radial striae, as in *Triodopsis notata*. There are many degrees in the closeness of the striae. By shortening of the striae the embryonic whorls, through various stages, become smooth except for radial ripples below the suture, and in many species these disappear, a smooth embryonic shell resulting in species of several genera. In other lines of differentiation the striae are broken into radially lengthened granules, as in most *Stenotremas* and some western species of other genera. Many stages in the transition from striae to granules are found. Rather coarse striae, from subcontinuous to interrupted into granules, occur in western *Triodopses* (*Cryptomastix*). As there are many transitions, and repetition of sculpture patterns in different genera, characters of the apical sculpture have only a limited value in taxonomy, though they are often characteristic of small systematic units.

Assuming the flagellum to be an ancestral structure of Polygyridae, it may be said that the western genera are less evolved than the eastern, nearly all having a vestigial flagellum to be seen in sections, or in *Ashmunella* a short one visible externally. In the East, presence of a flagellum has been demonstrated in only a single species, *Allogona profunda*. In various eastern *Triodopses* an epiphallus is indistinctly recognizable, the terminal part of the vas deferens being enlarged. In other eastern forms, such as the *Mesodons* and *Polygyrinae* generally, there is no such specialization of the vas deferens.

#### Key to Genera of Polygyridae

Except in part of the subfamily Polygyrinae, the genera of this family are distinguished primarily by features of the organs of reproduction, similar shell forms often occurring in several genera.

1. Penis without a sheath, the penial retractor and the vas deferens terminal; no flagellum (*Polygyrinae*) .....2
- Penis provided with a sheath (sometimes imperfect), the retractor muscle inserted on epiphallus or vas deferens, with strands running to the penis at end of the sheath (*Triodopsinae*) .....6

(POLYGYRINAE)

2. A well-developed epiphallus present.....*Trilobopsis*  
 No epiphallus; duct of the spermatheca slender .....3
3. Viviparous; prostate gland short, posterior; spermathecal duct of medium length.  
*Giffordius*<sup>1</sup>  
 Oviparous; prostate gland as long as the sacculate part of oviduct (uterus); duct  
 of spermatheca short.....4
4. Penis provided with a lateral sac or "appendix"; shell subglobose, the aperture  
 toothless or with a parietal tooth.....*Praticolella*  
 Penis simple, or if a lateral sac is present, the aperture of the depressed shell is tri-  
 dentate, with teeth on the lip.....5
5. Shell provided with a biramose parietal tooth, or with the edge of the parietal  
 callus raised.....*Polygyra*  
 Shell subglobose or carinate and lens-shaped, the aperture basal, narrow, in shape of  
 a reverse J; parietal tooth long.....*Stenotrema*  
 Shell globose-conic to carinate and lens-shaped, the aperture from toothless and  
 lunate to trilobed; parietal tooth when present either short or well curved.  
*Mesodon*

(TRIODOPSINAE)

6. A short but free flagellum present; spermatheca of medium length, not divided into  
 bulb and duct; epiphallus long; penial sheath imperfect, tenuous.....*Ashmunella*  
 No free flagellum; spermatheca distinctly divided into bulb and duct, short.....7
7. Penis containing a large "stimulator" (Fig. 510: 5a; sheath largely adnate..*Allogona*  
 No "stimulator" in the penis; sheath well developed; duct of the spermatheca  
 swollen.....8
8. A verge at apex of penial cavity.....*Vespericola*  
 No verge in the penis, which tapers somewhat distally, the limit of penis and epi-  
 phallus not obvious externally; duct of spermatheca swollen.....*Triodopsis*

*Guide to Groups of Polygyridae by Shell Features*

(Eastern; west to about the 100th meridian)

- Aperture small, with edge of parietal callus raised, and with a small parietal tooth,  
 no lip teeth; umbilicus wide.....*Polygyra*, p. 578
- Aperture contracted by a biramose parietal tooth, and with two or three lip teeth.  
*Daedalochila*, p. 591
- Aperture basal, narrow, with a long parietal tooth and often a notch in basal lip; shell  
 close-whorled, subglobose to lens-shaped, a short vertical buttress on axis within.  
*Stenotrema*, p. 639
- Aperture trilobed, with three teeth, the parietal straight or curved.  
 Umbilicate.....*Triodopsis*, p. 790  
 Imperforate or nearly so.  
 Tooth in basal lip tubercular.....*Inflectarius*, p. 766  
 Tooth in basal lip in form of a long, marginal lamina, truncate at junction  
 of basal and outer margins.....*Xolotrema*, p. 823

<sup>1</sup> *Giffordius* Pils. inhabits the island of Old Providence, in the western Caribbean,  
 and is included here to complete the key to genera of Polygyridae.

Aperture with 0, 1 or 2 teeth.

Depressed, imperforate, with a parietal tooth, the basal lip widened by a marginal lamina which is truncate at junction with outer arc of the lip.

*Patera*, p. 747

Depressed, with a rather large umbilicus; aperture rounded, toothless, or with small parietal and columellar teeth.

*Triodopsis*; *Appalachina*, p. 762; *Allogona*, p. 875

Depressed-globose to globose-conic, capacious shells, imperforate or with quite narrow umbilicus; toothless or with small parietal and sometimes columellar teeth.....*Mesodon*, p. 702; *Neohelix*, p. 834; *Praticolella*, p. 688

(Western; Mountain and Pacific States)

New Mexico, Arizona and southward.....*Ashmunella*, p. 912  
Montana, Idaho, Alaska to California.

Reflected outer lip well recurved at the edge.

Rather capacious shells, toothless, whorl not contracted behind the lip.

*Allogona*, p. 875

Aperture with 0 to 3 teeth; when toothless the whorl is strongly contracted behind the lip.....*Cryptomastix*, p. 852

Outer lip reflected, the edge not recurved.

Large, capacious, toothless shells, strongly striate or wrinkled, not hirsute.

*Allogona*, p. 875

Capacious, *Mesodon*-like shells of medium size, toothless or with a parietal tooth, not distinctly striate, usually hirsute.....*Vespericola*, p. 892

Rather small, hirsute or roughened shells, the aperture three-toothed.

*Trilobopsis*, p. 778

Small, narrowly umbilicate or imperforate, subdepressed, *Stenotrema*-like, with a rather long parietal tooth, no lip teeth; contracted behind the lip.....*Triodopsis germana* Group, p. 872

#### Subfamily POLYGYRINAE

The penis does not taper to the apex and has a simple wall without a sheath, the retractor muscle and vas deferens inserted at apex. There is no epiphallus differentiated from the vas deferens (except in *Stenotrema*), and no trace of a flagellum. The duct of the spermatheca is always slender.

With the exception of *Giffordius*, not occurring within our limits, and *Trilobopsis*, the genera are closely similar in internal anatomy, and on this account were at one time all subordinated to *Polygyra*. Genera throughout zoology are now more narrowly limited than formerly; and on account of the conspicuous differences in the shells, I am now recognizing several genera similar to those in Binney's classification of 1878, though with different limits.

#### POLYGYRA Say

*Polygyra* Say, 1818, Journ. Acad. Nat. Sci. Phila., 1: 276.—W. G. Binney, 1878, Terr. Moll., 5: 262.

Depressed to discoidal Polygyridae, umbilicate or perforate, the peristome continuous, the ends of the reflected lip connected by a raised parietal

lamina, or by the diverging branches of a v-shaped parietal tooth. Embryonic  $1\frac{1}{2}$  whorls either smooth or with fine ripples radiating below the suture.

The penis has a simple wall without a sheath or a continuation downward of the retractor muscle. No papilla or verge. The spermathecal duct is short and slender.

Jaw ribbed. Radula with ectocones on central and lateral teeth, the mesocone and ectocone usually bifid on the marginal teeth.

*Distribution*.—Southern United States, west about to the 100th meridian, or in Texas to the Big Bend of the Rio Grande; Mexico except much of the plateau; Cuba, Bahamas and Bermuda.

(Πολύ γύρος, many turns.)

This is by far the most widely distributed genus of the family. Our species are classified in two subgenera and several "sections" or groups of species, as follows:

- A. One parietal tooth, none within the lip; shell with widely open umbilicus.
  - Subgenus POLYGYRA
- AA. Lip having two or three teeth.....Subgenus DAEDALOCHILA
  - B. Edge of the parietal callus conspicuously raised; umbilicus narrow.
    - C. Parietal tooth of irregular form, scarcely or not penetrating in the aperture beyond basal lip.....*P. auriculata* Group
    - CC. Parietal tooth U-shaped, very deeply penetrating; basal lip heavily calloused.....*P. hippocrepis* Group
  - BB. Edge of the parietal callus adnate.
    - D. Parietal tooth triangular, squarish or tongue-shaped, prominent.
      - P. plicata* Group
    - DD. Parietal tooth obliquely v-shaped; two lip teeth, often divided; umbilicus small; the dark periostracum has hairs or processes.
      - P. pustula* Group
    - DDD. Parietal tooth obliquely v-shaped; umbilicus enlarging in last whorl; periostracum light, glossy, rib-striate or smooth, not hairy.
      - P. texasiana* Group

Subgenus POLYGYRA *s. str.*

*Polygyra* Say, 1818, Journ. Acad. Nat. Sci. Phila., 1: 276.—Herrmannsen, 1847 (Dec. 7), Ind. Gen. Malac., 2: 317, "typus *Helix septemvolva* Say."<sup>1</sup>—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 311.

*Helicodon* Sowerby, 1825, Catal. Shells Earl of Tankerville. p. 35, in part.<sup>2</sup>

*Cyclodoma* Swainson, 1840, Treatise on Malacology, p. 193, no species mentioned; *Polygyra septemvolva* Say, designated as type by Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 312.—Rehder, 1936, Nautilus, 49: 106.

*Ulostoma* Albers, 1850, Die Heliceen, p. 95; type *P. septemvolva* Say, designated by Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 312.<sup>3</sup>—Rehder, 1936, Nautilus, 49: 106.

<sup>1</sup> Information concerning the designation of genotype of *Polygyra* has been given by Rehder, 1936, Nautilus, 49: 106, and by the author, 1938, Nautilus, 52: 22.

<sup>2</sup> Since Sowerby definitely stated that he "followed as far as possible the arrangement of de Férussac", *Helicodon* may be considered to be an emendation of *Helicodonta* Fér., and not a new name. He emended *Anodonta* in the same way ("*Anodon*").

<sup>3</sup> *P. septemvolva* was not contained in Albers' list of species under *Ulostoma*, but he cited it as a synonym of *Helix cereolus* on p. 255, following Férussac, Tabl. Syst. Limaçons, p. 34, No. 108.

*Anchistoma* H. and A. Adams, 1855, Genera of Recent Mollusca, 2: 205; type *Helix volvoxis* Pfr., designated by Pilsbry, 1930. Not *Anchistoma* Herrmannsen, 1846, an emendation of *Angystoma* Schumacher.

Discoidal polygyras with angular or carinate, closely coiled whorls, the umbilicus broadly open; aperture small; the outer lip is toothless, the distinct or raised parietal callus bearing a short, oblique tooth.

The lung is very long in *P. septemvolva* and *P. cereolus*, and the kidney moderately so. In a specimen of *P. cereolus* 12.5 mm. in diameter, of  $7\frac{3}{4}$  whorls, the kidney is 9 mm. long, about 1 mm. wide in the middle, the heart about 2.7 mm. long.

The genitalia of *P. septemvolva* from Jacksonville, Florida (Fig. 378: 4) are long and slender. Penis is very large for a snail of this size, formed internally as described below for *P. cereolus*, the inner wall being diagonally ribbed in the upper third. The vagina is longer than the penis, but less lengthened than in *P. cereolus*. Length of penis 8 mm.; vagina 10.5 mm.; spermatheca and duct 2.5 mm. Diameter of shell 8 mm.;  $6\frac{1}{2}$  whorls (Jacksonville.)

The genitalia of *P. cereolus* (Fig. 378: 1, 1a, 1b, 1c Key West) show excessive elongation of the very slender vagina. It measures about 37 mm. to the origin of the spermatheca, which is only 3.7 mm. long, being short, as in normally proportioned Polygyridae. The vas deferens is slightly longer than the vagina which it follows closely. The uterine part of the oviduct is enlarged but only weakly sacculate. In species with fewer whorls the vagina is far less lengthened, as in *P. septemvolva velvoxis* (Fig. 378: 4).

The hermaphrodite duct is moderately convoluted. The short talon (Fig. 378: 1a) is slightly 4-lobed at the end, and similar to that of *Praticolella*. The prostate gland is as long as the enlarged portion of the oviduct. The penis is only moderately long (about 6 mm.), its cavity contracted by three fleshy ridges, two (numbered 1 and 2 in Figs. 378: 1b, 1c) continuing throughout, the third (3 in same figs.) occupying only the more swollen basal third of the penis. The space between ridges 1 and 2 is obliquely corrugated in the upper half of the cavity, the space between ridges 1 and 3 is smooth. Ridge 2 is trifid at the upper end of the cavity, forming a sort of valve at the entrance of the vas deferens. The long penial retractor is inserted on the vas deferens. Diameter of shell 13 mm., 8 whorls.

The free retractor muscles of *P. septemvolva* from Drayton's Island, Lake George, Florida, are drawn in Figure 378: 3. The two ocular retractors unite before joining the pharyngeal retractor. This part of the system is not especially long, but the united pharyngeal and ocular bands, accompanied by the distinct columellar muscle, are extremely long (only a small part being drawn in the figure). A short distance before the posterior insertion the columellar muscle unites with the other main band.

*Distribution.*—Coastal Plain, from the Sea Islands of Georgia to Matagorda Bay, Texas. Elsewhere in Bermuda (*P. plana* Dkr.<sup>1</sup>); the western Bahamas (*P. plana bahamensis* Van., 1919); Cuba, from Havana to Cárdenas, south to Cienfuegos and Isle of Pines (*P. lingulata* Desh.);

<sup>1</sup> *Polygyra plana* (Dkr.), 1843, includes *Helix microdonta* Desh., (1847?), *H. delitescens* Shuttl., in Bland, 1860, and *H. cheilodon* Say, in Bland, 1860. Cf. Vanatta, 1911, Proc. Acad. Nat. Sci. Phila., for 1910, p. 664.

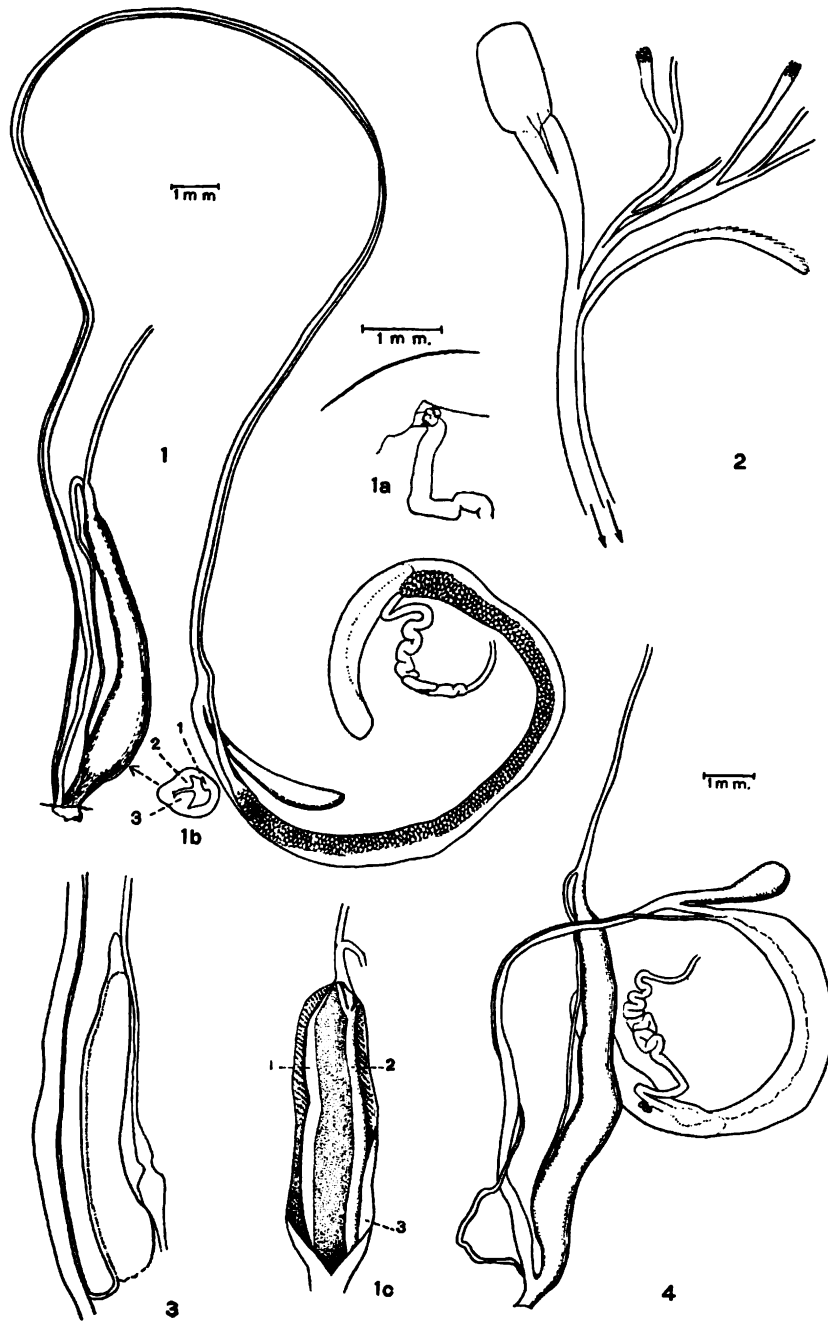


Fig. 378. *Polygyra cereolus*, Key West. Genitalia: 1a, base of hermaphrodite duct and talon; 1b, section of penis near base, the internal folds numbered as in fig. 1c; 1c, the penis opened. 2, *Polygyra septemvolva*, Drayton Island in Lake George, Florida, Free muscles, only the anterior part shown. 3, *Polygyra septemvolva volvox*, Jacksonville, Florida, Heart and kidney. 4, Genitalia.

Yucatan at Progreso and Puerto Moreles (? and state of San Luis Potosi in eastern Mexico, in the Alvarez Mountains at 7200 feet <sup>1</sup>) (*P. cereolus* form *carpenteriana*). It is present in the Caloosahatchie Pliocene in two species: *P. caloosaensis* Johnson (Nautilus, 13: 67), and "*P. cereolus microdonta* Desh.", (Dall, Trans. Wagner Free Inst. Sci., 3: 19). The latter needs re-examination.

***Polygyra cereolus* (Muhlfeld)**

Fig. 379.

*Helix cereolus* J. C. Megerle von Muhlfeld, 1818, Gesellschaft naturforschender Freunde zu Berlin, Magazin etc., 8: 11, pl. 2, fig. 18a, b.<sup>2</sup> — Binney, 1859, Terr. Moll., 4: 90, pl. 77, fig. 23 (copy from Muhlfeld).—Bland, 1860, Ann. Lyc. Nat. Hist. N. Y., 7: 137, fig. 2.—Dall, 1885, Proc. U. S. Nat. Mus., 8: 265.

*Polygyra cereolus* Muhlf., W. G. Binney, 1878, Terr. Moll., 5: 283, fig. 181.—Rhoads, 1899, Nautilus, 13: 44.—E. J. Post, 1899, Nautilus, 13: 53.—Vanatta, 1912, Nautilus, 26: 16-21, 31-34.—Walker, 1917, Nautilus, 31: 55-56 (Eau Gallie; Cape Canaveral).—Daniels, 1912, Nautilus, 26: 39, pl. 5, figs. 1-3 (abnormal).

*Helix cereolus* var. *laminifera* W. G. Binney, 1858, Proc. Acad. Nat. Sci. Phila., p. 200, nude name; cf. Bland, 1860, and Binney, 1869.

*Helix microdonta* Desh., W. G. Binney, 1859, Terr. Moll., 4: 91, in part.

*Helix carpenteriana* Bland, 1860, Ann. Lyc. Nat. Hist. N. Y., 7: 138.

*Polygyra carpenteriana* Bld., W. G. Binney, 1878, Terr. Moll., 5: 284, fig. 182, pl. vi, fig. m (teeth).

"The discoidal, umbilicate, white, delicately obliquely ribbed shell, flat on both sides, has a margined, one-toothed aperture.

"The thin, matt white shell,  $4\frac{1}{2}$  lines [=10 mm.] in diameter but hardly more than 1 line in height, and consisting of 8 whorls, is flat on both sides, but on the upper side, which is distinctly ribbed obliquely, the apex is somewhat elevated, whereby the umbilicus of the lower side, which appears only delicately striate obliquely, becomes that much deeper. The first [=last] whorl is somewhat keeled at its upper edge. The aperture is surrounded by a border, and where the inner lip is reflected and grown fast to the ventral surface it is provided with an erect white tooth, which is lacking in immature examples." (Muhlfeld.)

The discoidal shell is white with radial streaks or spots of gray or pale brown on the base, varying to nearly uniform wood brown or fawn. Upper surface varying from flat to low conoidal, obliquely, regularly rib-striate; base nearly flat or slightly concave, with a small vortex-shaped central pit; the whorls strongly convex and lightly striate. Periphery strongly angular to subcarinate. The first whorl emerged from the central pit is prominent, the width then becoming less. Last whorl somewhat swollen near the aperture, the keel weaker or obsolete there. Outer and basal margins of

<sup>1</sup> The occurrence of a *Polygyra* of this group in the Alvarez Mountains at 7200 feet seems quite improbable, though from a reliable collector, Dr. E. Palmer. I did not find it there in 1934. No other *Polygyra* is known from such an elevation, and the *cereolus* group only from near sea level.

<sup>2</sup> The month of publication is uncertain. The Magazin may have been issued in quarterly parts, but there is no definite indication; the dates given on pages [1, 89, 161, 241] are enigmatic. The date 1816 given by Binney (1859-1885) is certainly erroneous. That is the date of the *siebenter Jahrgang*; Muhlfeld's article is in the *achter Jahrgang*, dated 1818 on the title-page. The two volumes are bound together in the Academy's copy, which Binney consulted, and he took the date from the first title-page.

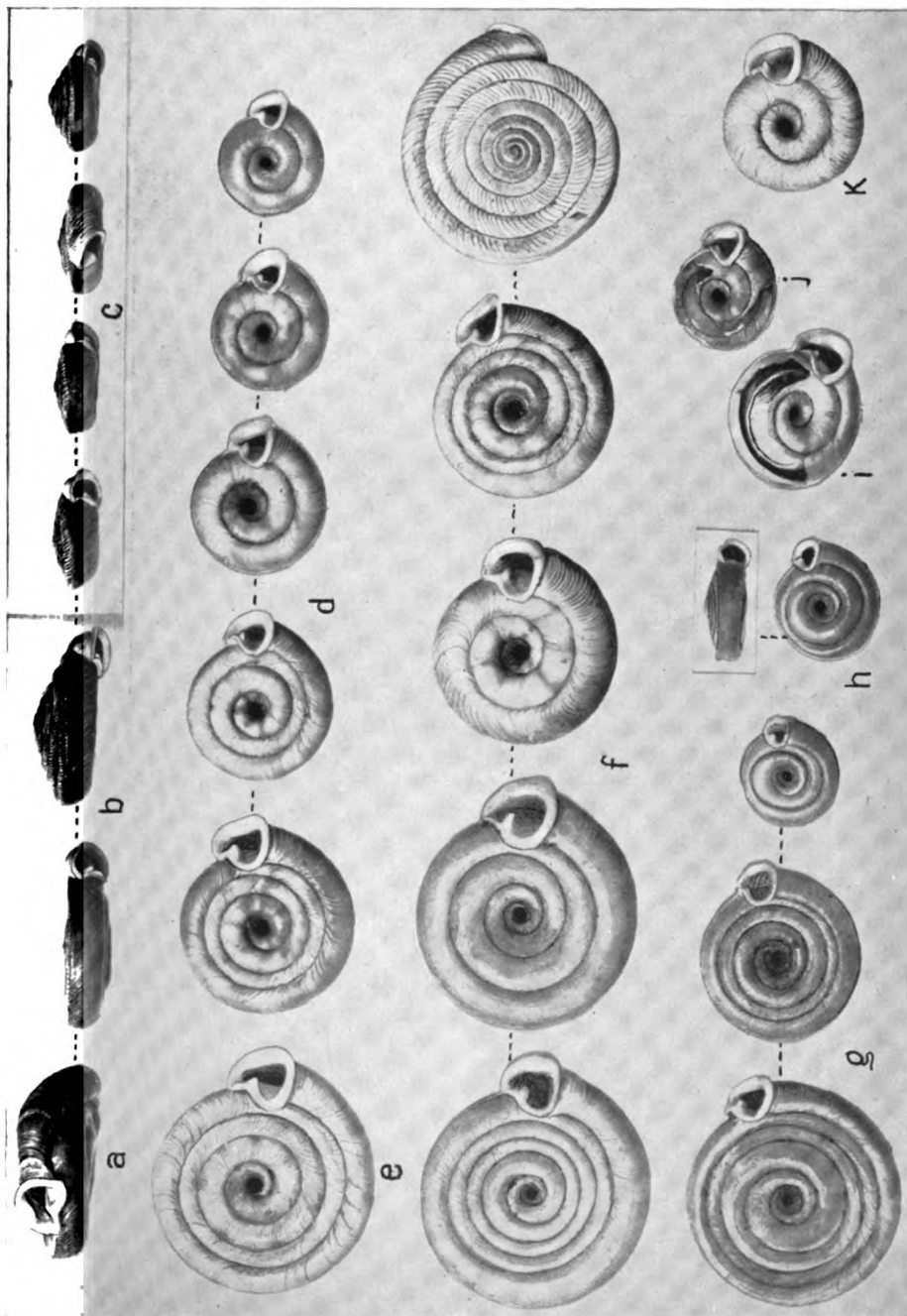


Fig. 379. *Polygyra cereolus*. a, b, c, d, Key West. e, Lignum Vitae Key. f, Clearwater Island. g, Palm Beach. h, Lantana. i, j, Miami. k, lectotype of *P. c. carpenteriana*, Key Biscayne. All  $\times 2$ .



peristome reflected and thickened within, parietal margin somewhat raised, free, bearing a short, oblique parietal tooth. Within the first half of the last whorl a narrow white lamina revolves on the parietal wall (Figs. 379 i, j).

Height 4.6 mm., diameter 14.5 mm.; 8 whorls. Key West.  
 Height 3.8 mm., diameter 13.3 mm.; 7½ whorls. Key West.  
 Height 3.5 mm., diameter 11.5 mm.; 7 whorls. Key West.  
 Height 4.5 mm., diameter 18.2 mm.; 8¼ whorls. Long Key.  
 Height 4 mm., diameter 15.3 mm.; 9 whorls. Palm Beach.  
 Height 3.6 mm., diameter 11.6 mm.; 8½ whorls. Palm Beach.

FLORIDA.<sup>1</sup> From Citrus and Seminole counties south to the keys. Citrus Co.: John's Island. Hernando Co.: Aripeka. Pinellas Co.: \*Boca Ceiga Bay, St. Petersburg; \*Pass-a-grille; Lake Maggiore; \*Clearwater and \*Clearwater I. Hillsborough Co.: \*Tampa; Safety Harbor; Ballast Point; \*Blind Pass. Manatee Co.: \*Mullett Key; \*Egmont Key. Sarasota Co.: \*Longboat Key; \*Sarasota; Osprey. Charlotte Co.: \*Gasparilla I.; \*Boca Grande Pass. Lee Co.: Olga; Fort Myers; Captiva I.; \*Sanibel Island; Estero Island; Josselyn Key. Collier Co.: Whitney River; Marco; Horr's Island; Addison's Key; Russell's Key; Panther Key; Ochopee; La Costa I.; Dismal Key; Buttonwood Key; Black Island; Gopher Key; Pelican Key and Turner's Key, near Chokoloskee; Fakahatchee Key; Little Marco; San Carlos Bay; Crawford's Key; Demorey Key; Mound Island; Mondongo Island; Dog Key; Pinecrest region. Monroe Co.: Pavilion Key; Mormon Key; Snake Key; \*Lossman's Key; Chatham R.; Gopher Key; Porpoise Point; \*Key opp. Flamingo; \*Middle Cape Sable; \*Key West; Stock Island; \*Boca Chica Key; Sugarloaf Key; Cudjoe Key; \*Summerland Key; \*Big Pine Key; Noname Key; \*Little Pine Key; Bahia Honda Key; Key Vaca; \*Grassy Key; \*Lignum Vitae Key; \*Long Key; \*Lower Matecumbe Key; \*Indian Key; \*Upper Matecumbe Key; Key Largo. Dade Co.: Long Pine Key; Royal Palm State Park; Homestead; Key Biscayne; \*Virginia Key. \*Coconut Grove; Miami; Little River; Arch Creek. Palm Beach Co.: \*S. end Lake Worth; Lantana; \*Palm Beach. Canal Point on L. Okeechobee. St. Lucie Co.: Wabasso. Brevard Co.: Micco. Seminole Co.: Sanford; Lake Harney.

*P. cereolus* differs from *septemvolva* by possessing an internal lamina; the central cavity of the umbilicus is smaller; it is also a more calcareous, solid shell, less acutely carinate. It inhabits the Keys and rim of the peninsula, being more restricted to calcareous formations than *septemvolva*.

Muhlfeld's description,<sup>2</sup> translated above, and his figures, are unsatisfactory. The color, "matt weiss" is that of bleached shells. The size, 10 mm., is the minimum for the many-whorled form, but the type figures show too many whorls for *carpenteriana*. *P. bahamensis* Van., which agrees in size and basal aspect, is more finely striate above. It appears that Muhlfeld had minimum specimens of the shell selected by Bland as *cereolus*, the diameter of which usually runs from 11 to 18 mm. The type was

<sup>1</sup> At localities starred in the following list, both large *cereolus* and small *carpenteriana* occur together; other records are for *carpenteriana* alone.

<sup>2</sup> W. G. Binney reprinted Muhlfeld's diagnosis and description in Terr. Moll. 4: 90, but with several errors, here mentioned for the benefit of those who do not have access to the original: 3rd line, 3rd word should be *genabelle*; 11th line, 1st word, *herum*; 13th line, 3rd word, *versehen*.

probably in the K. K. Naturlien-Kabinet zu Wien, of which Johann Karl Megerle von Muhlfield (1765-1840) was curator for over forty years. Key West is here selected as type locality.

The large *cereolus* is almost always found associated with the smaller shells (Fig. 379 c) known as *P. carpenteriana* (Bld.), and practically all large lots afford complete series of intergrading sizes and forms, although intermediate sizes may form a minority. Thus in a lot from on and near a cement sidewalk in Key West, taken by H. B. Baker, the diameter runs from 7.4 to 14.6 mm., 5½ to 8 whorls (Figs. 379 a-d). At Palm Beach in a lot collected by H. A. Pilsbry, the diameter runs from 7.2 to 15.3 mm., 6½ to 9 whorls (Figs. 379 g). In many lots I have collected both large and small under the same stone, or together under leaves or wood. There is nothing in the local conditions to which the disparity in size can be attributed.<sup>1</sup> As mentioned under *septemvolva*, I think that at any time after a certain minimum size has been reached any resting stage (aestivation) is followed by the formation of a peristome. The large specimens, then, are those which have enjoyed a long continuous growing season. This hypothesis may be invalidated by the fact that uniform colonies of the small *carpenteriana* occur in the same districts as mixed colonies, often where the conditions appear the same.

Typical *cereolus* occurs on the west coast from the region of Clearwater, Pinellas County, to Sanibel Island in Collier County. It is replaced by *carpenteriana* for the next hundred miles or more southward, reappearing in the calcareous Cape Sable region. It occurs on practically all of the keys from Key West to the Miami region mainland, and in a form deficient in lime, much farther north on the east coast.

There is a great variation in the caliber of the whorls in some colonies, as in Figs. 379 f, Clearwater Island. The specimens measure:

16 mm., 9 whorls. 16.3 mm., 8½ whorls.  
13.6 mm., 8½ whorls. 13.5 mm., 7½ whorls.

In some lots all of the shells are uniform walnut brown, thin, strongly carinate, with whorls of small caliber (Figs. 379 g Palm Beach); the size from 3 x 7.2 mm. to 3.6 x 15.3 mm. It was taken in woods under leaves, the place now built up. At Hypoluxo Island near Lantana Ave., the same depressed brown form with whorls of small caliber is abundant under leaves and debris in the woods, but here all are small, 2.1 x 6.8 to 3.3 x 8.4 mm., 6½ whorls. Similar shells occur at Wabasso, St. Lucie County. It is a local form possibly correlated with scarcity of lime.

Form *carpenteriana* (Bld.), (Figs. 379 i-k), is similar to *cereolus* in color and sculpture, but smaller, of fewer whorls, the last angular in front, sloping inward below the angle, but in its last half or third abruptly becoming swollen, the angle weaker or disappearing, the rib-striae extending to the base.

<sup>1</sup> See also Vanatta, 1912, *Nautilus*, 26: 16.

Height 4 mm., diameter 10 mm.,  $6\frac{1}{2}$  whorls. (Bland.)  
 Height 3 mm., diameter 7 mm.,  $5\frac{1}{2}$  whorls. (Bland.)  
 Height 4.6 mm., diameter 9.5 mm.,  $6\frac{1}{2}$  whorls. Miami.  
 Height 3 mm., diameter 7.5 mm.,  $5\frac{1}{2}$  whorls. Miami.  
 Height 2.2 mm., diameter 6 mm.,  $5\frac{1}{2}$  whorls. Long Pine Key.

The internal lamina may be either long or short, or reduced to a straggling series of papillae. It is sometimes absent, as an individual mutation. Key Biscayne may be taken as type locality. A specimen from that place, received from Bland, and agreeing with his first measurement, is here selected lectotype, 10972 A.N.S.P. This is about the maximum size of *carpenteriana*.

This form often occurs in pure colonies, without large *cereolus*, as in pine woods along Miami River (Figs. 379 i, j) and many places throughout the range of the species. In fact, *carpenteriana*, which occurs also in Yucatan and eastern Mexico, is the "normal" form of the species, which has locally produced the giant form *cereolus*.

***Polygyra cereolus floridana* Hemphill**

Fig. 380.

*Polygyra septemvolva* var. *floridana* Hemphill, in W. G. Binney, 1892, 4th Suppl., Bull. Mus. Comp. Zoöl., 22: 184.

"Shell deeply umbilicated, elevated, globose conic, light horn-color, with numerous fine ribs above, but smooth beneath; whorls  $5\frac{1}{2}$  or 6, the last subangular at the periphery; suture well impressed; spire greatly elevated with an obtuse apex; aperture lunate, well rounded, and nearly circular; peristome reflected, rounded in front, the margins joined by a triangular tooth on the parietal wall. Greater diameter 6 mm., altitude 5 mm." (Hemphill.)

"This is a small, very elevated form of the *P. cereolus* group." (Hemphill.)

FLORIDA: Oyster Bay (Hemphill).

"Oyster Bay" is a name found on some maps of about 1890-1903 for Estero Bay, in southern Lee County.

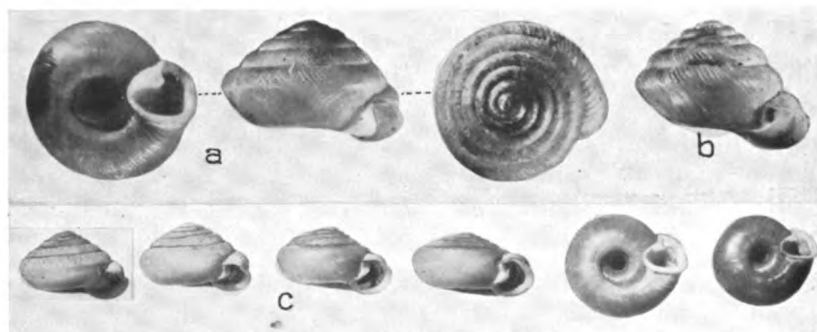


Fig. 380. *Polygyra cereolus floridana*. a, b, type and paratype, phot. California Academy; c, series from Rabbit Key. (All enlarged.)

The syntypes, two living specimens, are 5339 and 5340 California Academy of Sciences; both figured from photographs supplied by Dr. G. D. Hanna, who notes that the spire is high and dome-shaped, periphery angular, base full and rounded; umbilicus exposing about  $1\frac{1}{2}$  whorls. Sculpture of coarse growth striae. They measure, height 4 mm., diameter 6.9 mm., and 4.6 x 6.5 mm.

The types of *floridana* appear to be unusually elevated specimens of a weakly differentiated race which is known to me from Pine Island and Starvation Key, Lee County, and Rabbit Key, Monroe County. The spire is conoidal, but varies from nearly flat to elevated, h/d index about 47 to 62 (about 70 in Hemphill's highest type). The umbilicus is generally smaller than in *carpenteriana*, contained about  $2\frac{3}{4}$  times in the diameter. Peripheral angle rather blunt. The lateral face of the last whorl becomes more convex gradually, with little or nothing of the abrupt swelling at the middle or last third which characterizes *carpenteriana*. Finally, there is no internal lamina, or very rarely a trace is present as a short series of little papillae (found in one out of 40 opened). The Hemphill types have not been opened. Two from Rabbit Key measure: height 4.3 mm., diameter 6.9 mm., and 3.9 x 8 mm.

The above mentioned localities for this form lie both north and south of Hemphill's locality. A series of *carpenteriana* was taken on Estero Island by C. B. Moore.

**Polygyra septemvolva** Say

Fig. 381 a-g.

*Polygyra septemvolva* Say, 1818, Journ. Acad. Nat. Sci. Phila., 1: 278.<sup>1</sup>—Binney, 1878, Terr. Moll., 5: 281, fig. 180, pl. vi, fig. 1, pl. xv, fig. H (anatomy).—Vanatta, 1912, Nautilus, 26: 20, 31.—Rhoads, 1899, Nautilus, 13: 44.—Walker, Nautilus, 31: 56 (Eau Gallie, etc.).—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 312, figs. B, C, D; pl. 25, fig. 4 (anatomy).

*Helix septemvolva* Say, Binney, 1851, in part, Terr. Moll., 2: 196, pl. 38, upper, middle and lower figs.—Bland, 1860, Ann. Lyc. Nat. Hist. N. Y., 7: 132, 137, fig. 1; p. 441, pl. 4, fig. 20 (abnormal).

*Helix planorbula* Lamarck, 1822, Animaux sans Vertèbres, 6, pt. 2, p. 89.

*Helicodon septemvolutus* Sowerby, 1825, Catal. Shells Earl of Tankerville, p. 35.

*Polygyra cereolus sanctijohannis* Pilsbry, 1895, Nautilus, 9: 56.

"Shell much depressed, discoidal; spire not prominent; whorls seven, perfectly lateral, compressed, depressed, and marked with conspicuous lines and grooves above, a projecting carina on the upper edge of the body whorl, beneath which the lines and grooves are obsolete; aperture subreniform, not contracted; lips equal, elevated, outer one reflected, regularly rounded so as to describe two-thirds of a circle, pillar lip projecting inwards, into an angle or tooth, which is concave beneath; beneath, the four exterior volutions

<sup>1</sup> The exact date of Say's description of *P. septemvolva* is not known. His paper was read at the Academy meeting of May 25, and the headlines of the printed pages are dated June, 1818, presumably the date of printing.

18295

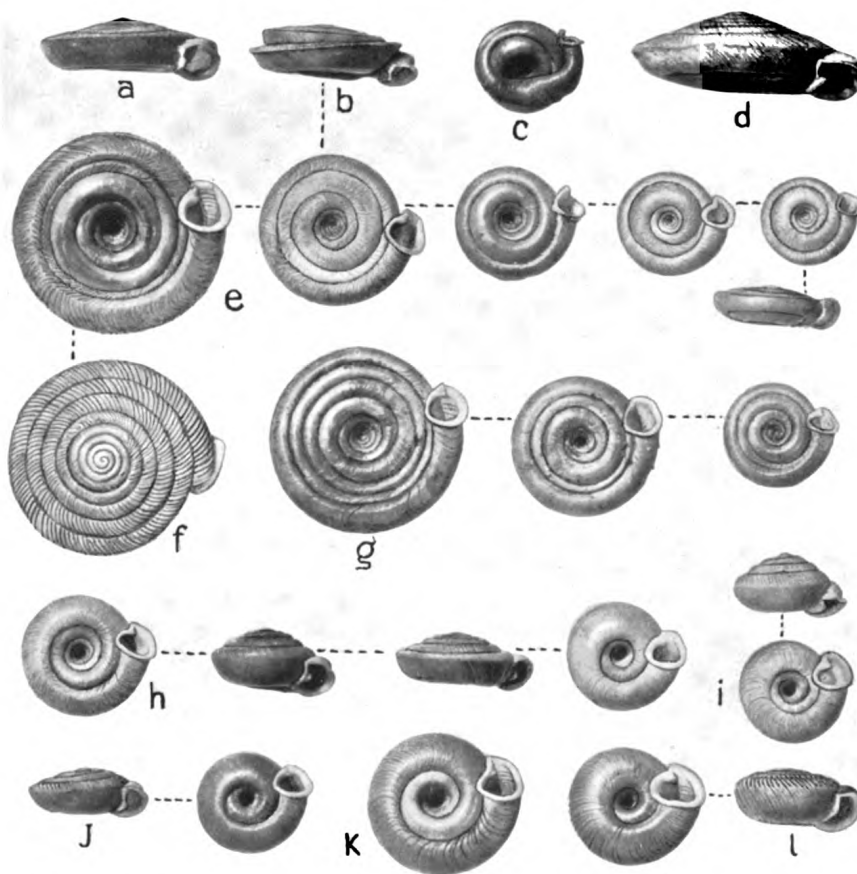


Fig. 381. a-g, *Polygyra septemvolva*: a, St. Augustine; b, Tick Island, abnormal; c, Longwood, abnormal; d, Fort Lauderdale Canal; e-f, Tick Island, Volusia Co.; g, Arippeka. h-k, *Polygyra septemvolva volvoxis*: h, St. Simon's Island; i, j, k, St. Augustine. l, *Polygyra septemvolva febigeri*, New Orleans. (All  $\times 2$ .)

equally prominent, transverse diameters, equal to those of the upper surface; umbilicus central, moderate, attenuated to the apex so as to exhibit the remaining volutions. "Breadth: female two-fifths, male three-tenths of an inch." (Say.)

Height 4 mm., diameter 14.3 mm.;  $9\frac{1}{2}$  whorls. Tick Island.

Height 3.5 mm., diameter 10 mm.;  $7\frac{1}{2}$  whorls. Tick Island.

Height 2.8 mm., diameter 7.8 mm.; 7 whorls. Tick Island.

Height 5.5 mm., diameter 15.6 mm.;  $9\frac{1}{2}$  whorls. Broward Co.

FLORIDA: Duval Co.: South Jacksonville. St. John's Co.: Old Fort Picolata (on the St. Johns River nearly due west from St. Augustine), (Say), type locality; St. Augustine. Putnam Co.: Palatka. Marion Co.: Ocala; Silver Spring; Drayton I.

Lake Co.: Astor. Volusia Co.: Seville Landing; Volusia; Tick Island; Wright's Landing; Lake Helen. Seminole Co.: Lake Jessup. Orange Co.: Lake Apopka; Orlando; Longwood. Citrus Co.: Crystal River, 25 mi. south of Cedar Keys. Hernando Co.: Aripeka; Little Blind Creek, below mouth Chassahowitzka River. Broward Co.: canal back of Fort Lauderdale. Dade Co.: everglades back of Miami; Lemon City; Royal Palm State Park. Monroe Co.: north end of Lossman's Key.

There are many other published records doubtless mainly correct, but I have not seen the specimens.

*P. septemvolva* differs from *P. cereolus* chiefly by the absence of an internal lamina within the last whorl. It is also usually more acutely carinate and less calcareous, and the central cavity of the base is more widely open. Its area is farther north as a whole, but the ranges overlap throughout much of the peninsula, *cereolus* occurring on calcareous, *septemvolva* on acid soils in the same districts.

Apparently the adult characters can be assumed anytime after about six whorls have been formed, as in a colony from Tick Island, where shells with adult apertures occur from 6.6 to 14.8 mm. in diameter, 6¼ to 9¾ whorls (Figs. 381 e, f). In the lots containing both large and small shells the transition in size is usually complete and very gradual whenever a good series was collected. Whether the time of forming a peristome is determined by the incidence of resting periods (temporary aestivation or hibernation) on individuals of varying ages, or to some other agency, has not been investigated experimentally. Moreover, the matter is complicated by the fact that colonies of small shells occur without large ones. Thus, at St. Augustine in a lot from the old cemetery the diameter runs from 7 to 9 mm. (none of these being *volvaxis*), while at Fort Marion there is far more difference, 9 to 14 mm. Frequently *P. septemvolva* occurs with *P. s. volvaxis* as at Ft. Marion, but more often they are in separate colonies. Binney records a sinistral specimen in the Museum of Comparative Zoölogy.

*P. septemvolva* was understood by Say to cover also the small form later named *volvaxis* Pfr., which he regarded as the male. As restricted to the St. John's river snail with "a projecting carina" *septemvolva* is equivalent to the form named *sanctijohannis*. It is quite thin, showing three or four whorls outside of the funnel-shaped umbilical cavity, the penult whorl generally very narrow, the preceding enlarged, as in Figure 381 g. The last whorl slopes rapidly inward below the thin keel; but it may also be subvertical there, these contours occurring in different parts of the same specimen.

Throughout the St. Johns valley and south to Broward County this typical form of *septemvolva* occurs as a pure race aside from variation in size. A lot from Silver Spring, on the west side of Lake George, Marion County, runs from 7 to 12.8 mm. diameter; Wrights Landing, 8.5 to 13.8 mm.; canal back of Ft. Lauderdale, Broward County, 9.3 to 15.5 mm. (Fig.

381 d). Say's type, which we take to be the specimen he considered the female, was a shell of intermediate size, about 10 mm. diameter.

At St. Augustine the keel is less exerted, and the whorl below it is fuller, more convex throughout, as in Figure 381 a. This appears to be a slightly different racial strain. It occurs over a larger territory than the typical St. Johns valley race, being found as far south as Royal Palm State Park and on the west coast from Aripeka, Hernando County, to Lossman's Key, Monroe County. The shell is stronger, somewhat calcareous in some places, such as St. Augustine, but often as thin as typical *septemvolva*. The size varies about the same: diameter 7 to 13 mm. at Aripeka, Hernando County; 8 to 12.2 mm. at Lemon City, where the larger shells predominate, or in some lots it is fairly uniform, 7 to 9.7 at Royal Palm State Park.

***Polygyra septemvolva volvoxis* (Pfeiffer)**

Fig. 381 h-k.

*Helix volvoxis* "Parreys" Pfeiffer, 1846, Symbolae ad Hist. Heliceorum, 3: 80 (Georgia); Syst. Conchylien-Cabinet, Helix, 1: 379, pl. 66, figs. 4-6. — Bland, 1860, Ann. Lyc. Nat. Hist. N. Y., 7: 135, 136, as var. of *septemvolva*. — Binney, 1878, Terr. Moll., 5: 282, as var. of *septemvolva*.

*Polygyra cereolus volvoxis* (Pfr.), Walker, 1928, Terr. Moll. Alabama, p. 12, fig. 14 (Alabama records).

Smaller than typical *P. septemvolva*; uniform cinnamon-buff; retractively costulate-striate above, the base smooth except for light growth-lines. Last whorl higher than in *septemvolva*, angular at the upper part, then somewhat flattened and sloping inward to the base. Umbilicus regularly conic, moderately enlarging in the last whorl, the penult whorl typically not prominent (Fig. 381 h), but often enlarged (Fig. 381 k). There is no spiral lamina within the last whorl.

Height 3.6 mm., diameter 7.7 mm.; 6 whorls. St. Simon's I.

Height 3.6 mm., diameter 8.7 mm.; 6½ whorls. St. Simon's I.

Height 4 mm., diameter 9.9 mm.; 6¾ whorls. Levy Co., Fla.

GEORGIA: St. Simon's Island (selected as type locality).

FLORIDA: Fernandina, Nassau Co. (W. E. Burnett). Jacksonville (Pilsbry). St. Augustine; Hawks Park, Volusia Co. (F. J. Keeley). Cedar Keys and vicinity, Levy Co. Pine Island and Punta Rassa, Lee Co. (C. B. Moore). Monroe Co. at Pavilion Key (B. R. Bales), and Rabbit Key (Moore). St. Andrews Sound, Calhoun Co. (Moore).

ALABAMA: Claiborne, Monroe Co. Healing Springs, Washington Co. Point Clear and Weeks Bay, Baldwin Co. Mobile and Alabama Port, Mobile Co. (Walker). Starke's Wharf, Mobile Bay (C. B. Moore).

While *P. septemvolva* sometimes occurs with *volvoxis*, they are generally in separate colonies. Small *septemvolva* differs from *volvoxis* of the same diameter by the smaller caliber of the whorls and consequently greater depression of the shell, and the greater number of whorls. However, ambiguous specimens are occasionally found. The smallest measured has diameter of 6.4 mm. I have never found *volvoxis* associated with *cereolus* or *carpenteriana*.

***Polygyra septemvolva febigeri* (Bland)**

Fig. 381 1.

*Helix febigeri* Bland, 1866, Amer. Journ. Conch., 2: 373, pl. 21, fig. 10.

*Polygyra febigeri* Bld., W. G. Binney, 1878, Terr. Moll., 5: 285, fig. 183, pl. vi, fig. J (teeth).

*Polygyra cereolus febigeri* (Bld.) Walker, 1928, Terr. Moll. Alabama, p. 11, fig. 13.

?*Polygyra cereolus volvoxis* Pfr., Strecker, Nautilus, 24: 5 (Matagorda Peninsula).

"Shell umbilicate, orbicular, flat, thin, shining, pale or reddish horn-colored, with rather distant rib-like striae above, finely striated beneath; spire almost level; suture deep; whorls  $5\frac{1}{2}$ -6, rather convex, regularly increasing, the last angular at the periphery, inflated below; umbilicus funnel-shaped; aperture oblique, kidney-shaped; peristome thickened, little reflected, the margins joined by a strong triangular callus. Diameter maj.  $8\frac{1}{2}$ , min  $7\frac{1}{2}$ , alt.  $3\frac{1}{2}$  mill. A small specimen measures: diameter maj.  $7\frac{1}{2}$ , min.  $6\frac{1}{2}$ , alt. 3 mill." (Bland.)

Height 4 mm., diameter 8.3 mm.;  $5\frac{3}{4}$  whorls. New Orleans.

ALABAMA: Mobile (W. G. Binney). Cedar Point, Minette Bay, Baldwin Co. (C. B. Moore).

MISSISSIPPI: mouth Mary Walker Bayou, near mouth of West Pascagoula River, Jackson Co. (C. B. Moore).

LOUISIANA: New Orleans (Maj. G. L. Febiger, U. S. A.), Cotypes 17924 MCZ.; (also Hemphill, Pilsbry and others). Cheniere au Tigre, Vermillion Parish (Wharton Huber).

TEXAS: Galveston (Pilsbry). Seabrook, Houston Co. (H. A. Wenzel). Black Shoals of Brazos R., Burlison Co. (C. W. Johnson).

The rib-striae of the upper surface stop abruptly at the bluntly angular periphery, the base appearing smooth, or under the lens very lightly, finely striate; but in a lot from the cemetery near Lake Ponchartrain the basal striae are well developed. Below the peripheral angle the whorl is convex, not flattened as is usual in *volvoxis*. As in all forms of this group the width of the umbilicus varies, but the central hole is rather narrower than in *volvoxis*. The parietal callus is either adnate or very little raised at the edge, much less than in *volvoxis*. The short, oblique parietal tooth is well developed.

Whether *P. septemvolva*, *volvoxis* and *febigeri* all occur at Mobile, as recorded by Walker, seems doubtful. A large series from that vicinity should be studied.

Subgenus DAEDALOCHILA Beck

*Daedalochila* Beck, 1837, Index Moll., p. 21, type *Helix auriculata* Say, designated by Herrmannsen, 1847, Ind. Gen. Malac., 1: 369.—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 314.

Polygyrae having a biramose parietal tooth, V- or U-shaped or irregular, and two teeth in the lip.

*Polygyra (Daedalochila) adamnis* (Dall), 1890, of the Upper Oligocene Silex beds of Ballast Point, Tampa Bay, Florida, is the oldest Polygyra known. The aperture resembles that of some Mexican species.



*P. AURICULATA* GROUP (Section *Daedalochila*, s. str.)

The shell is perforate, becoming umbilicate in the last whorl, depressed, with ear-shaped aperture. The upper limb of the parietal tooth and the upper termination of outer lip meet in a projecting point. The parietal callus is often raised, a cavity under it. The long biramose parietal tooth is tongue-shaped or irregular, outer lip-tooth receding or immersed, broad, with a terminal recurved point, or thickened at the end; basal tooth marginal.

The lower part of the genital system of *P. uvulifera* from Ballast Point, Tampa Bay, Florida, is figured (Fig. 383: 4-4d). The large penis contains a fleshy pilaster in the upper two-thirds of its length, with a small, thin ridge opposite, as in Figs. 4c, 4d. Below these there is a short, thick, fleshy body, shown in Fig. 4b. The vagina is quite short, as is also the spermatheca, the two together being hardly two-thirds as long as the penis.

The species differ remarkably from *Polygyra septemvolva* and *cereolus* by the short normal vagina, about as in northern species of *Triodopsis*.

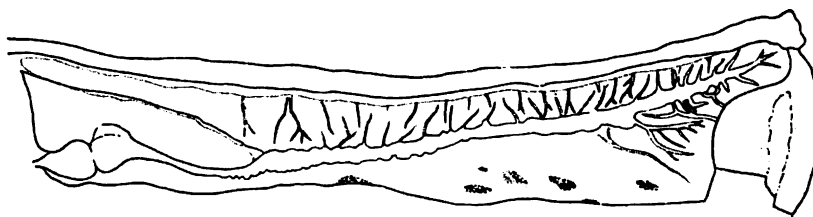


Fig. 382. Pallial organs of *Polygyra uvulifera*.

The pallial organs (Fig. 382) are less lengthened than in the *P. septemvolva* group.

This section is characteristic of the coastal plain from North Carolina to Texas, more especially in Florida, Georgia and Alabama. There are related but distinct groups in Mexico.

The confusion which had prevailed regarding the identity and limits of the older species was dispelled by Bland's paper of 1859, to which the student is referred for the early synonymy, now of only historic interest.

*Key to Species of Daedalochila s. str.*

1. Edge of the parietal callus near its axial termination closely appressed to the preceding whorl; axial end of aperture obstructed by a flat horizontal callus on the basal lip, and separated from the basal tooth by a deep, narrow sinus.....2
- Raised edge of the peristome continuous, no part of the parietal margin being appressed to preceding whorl.....5
2. Parietal margin with two projecting processes or horns, one at junction of upper branch of parietal tooth with end of outer lip, the other near the appressed part of parietal callus.....*P. u. bicornuta*
- Parietal margin with only one projecting process.....3
3. Surface smoothish.....*P. uvulifera*
- Surface distinctly, evenly striate.....4

4. Diameter about 11 to 14 mm.....*P. u. striata*  
 Diameter 15 to 16.5 mm.; last whorl higher.....*P. u. margueritae*
5. A furrow or concavity in last whorl parallel to and near umbilical suture.....6  
 No furrow parallel to umbilical suture; gutter behind the basal lip continuous; shell  
 hairy, diameter 5.4 to 7 mm.....*P. avara*
6. Larger, diameter 13 to 17 mm.....*P. auriculata*  
 Smaller, diameter 9 to 12 mm.....7
7. Gutter behind the basal lip crossed by a rounded ridge running towards the basal  
 tooth; umbilical end of basal tooth running inward and recurved....*P. postelliana*  
 Gutter behind basal lip scarcely interrupted; basal tooth only shortly running in-  
 ward, not recurved.....*P. auriformis*

***Polygyra uvulifera* (Shuttleworth)**

Fig. 384: 7.

*Helix uvulifera* Shuttleworth, 1852, Mittheil. naturforsch. Ges. Bern, p. 199.—Bland, 1857, Ann. Lyc. Nat. Hist. N. Y., 7: 34, fig. 3.

*Polygyra uvulifera* Shuttl., Binney, 1878, Terr. Moll., 5: 264, fig. 160, 161, pl. 6, fig. B (teeth).—Walker, 1917, Nautilus, 31: 55, 56 (Eau Gallie I. and above Cape Canaveral, Brevard Co.).—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 315, fig. 5 (pallial organs).—Gratacap, 1901, Bull. Amer. Mus. Nat. Hist., 14: 371, with var. *minor*? (Cedar Keys), nude name.

*Helix florulifera* Reeve, 1852, Conch. Icon., pl. 119, fig. 699.

The shell is perforate and rimate-umbilicate, the umbilicus contained nearly five times in the diameter; depressed, the spire slightly conic but very low; opaque, soiled white, often with gray radial streaks at the base. The last whorl contracts behind the lip, is narrowly grooved behind outer and basal margins, and is somewhat swollen behind the contraction. The surface is somewhat glossy, nearly smooth, with weak growth lines, and on the latter part of the last whorl some rather coarse striae. The irregularly triangular aperture has a broad, sinuous, reflected buff-whitish peristome with teeth formed about as in *P. auriculata*, but the raised inner border of the parietal process curves abruptly towards the orifice, and the columellar termination of the basal margin of lip is turned abruptly forward, is flatly reflected and of equal width to the end. The parietal wall has a strong callus which is adnate to the whorl except near the peripheral end, which is raised in a point at its junction with the outer lip.

"Alt. 7 mm., diameter maj. 12, min. 11 mm." (Shuttleworth.)

Height 6.6 mm., diameter 12 mm.; 5½ whorls. Longboat Key.

Height 7.8 mm., diameter 14.6 mm.; nearly 6 whorls. Longboat Key.

FLORIDA: Long (= Longboat) Key, Sarasota Bay (Rugel, L. E. Daniels, J. B. Clark and others); type in Shuttleworth's collection, Geneva. Pass-a-grille, Pinellas Co. (C. C. Allen and others). Clearwater Island (J. B. Clark, Pilsbry). Boca Grande, Gasparilla I. (T. Charlton & Julia Henry); Little Gasparilla I. (Morgan Hebard).<sup>1</sup>

The opaque, dirty white and nearly smooth shell is characteristic. The inner half of the parietal margin of the peristome is adnate to the whorl it rests on, not free and expanded, as in *P. auriculata*; and the end of the lip next the umbilicus is broad and flattened, not tapering as in *auriculata*. The recurved hook of the outer lip-tooth is rather short or sometimes in-

<sup>1</sup> Many published references to *uvulifera* are omitted because it is not certain which subspecies is referred to. The distribution given is therefore based on material examined only.

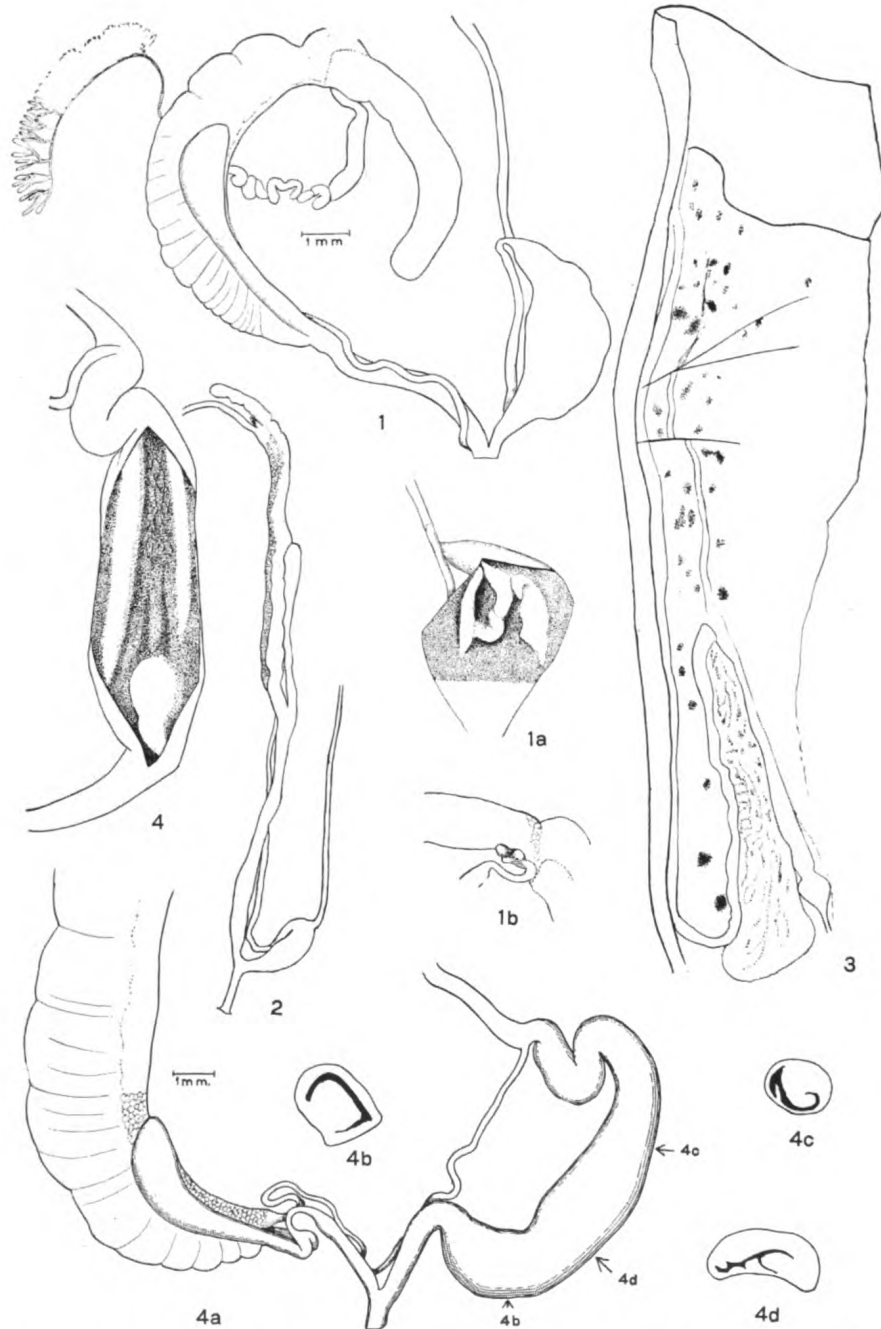


Fig. 383. 1, *Polygyra hippocrepis*, genitalia: 1a, the penis opened; 1b, the talon and parts adjacent; 2, genitalia of an immature individual; 3, pallial organs. 4, *Polygyra uvulifera*, the penis opened; 4a, lower part of genitalia; 4b, 4c, 4d, sections of penis.

distinct. Typically there is no spiral furrow on the last whorl within the umbilicus, but some shells show a weakly impressed furrow there.

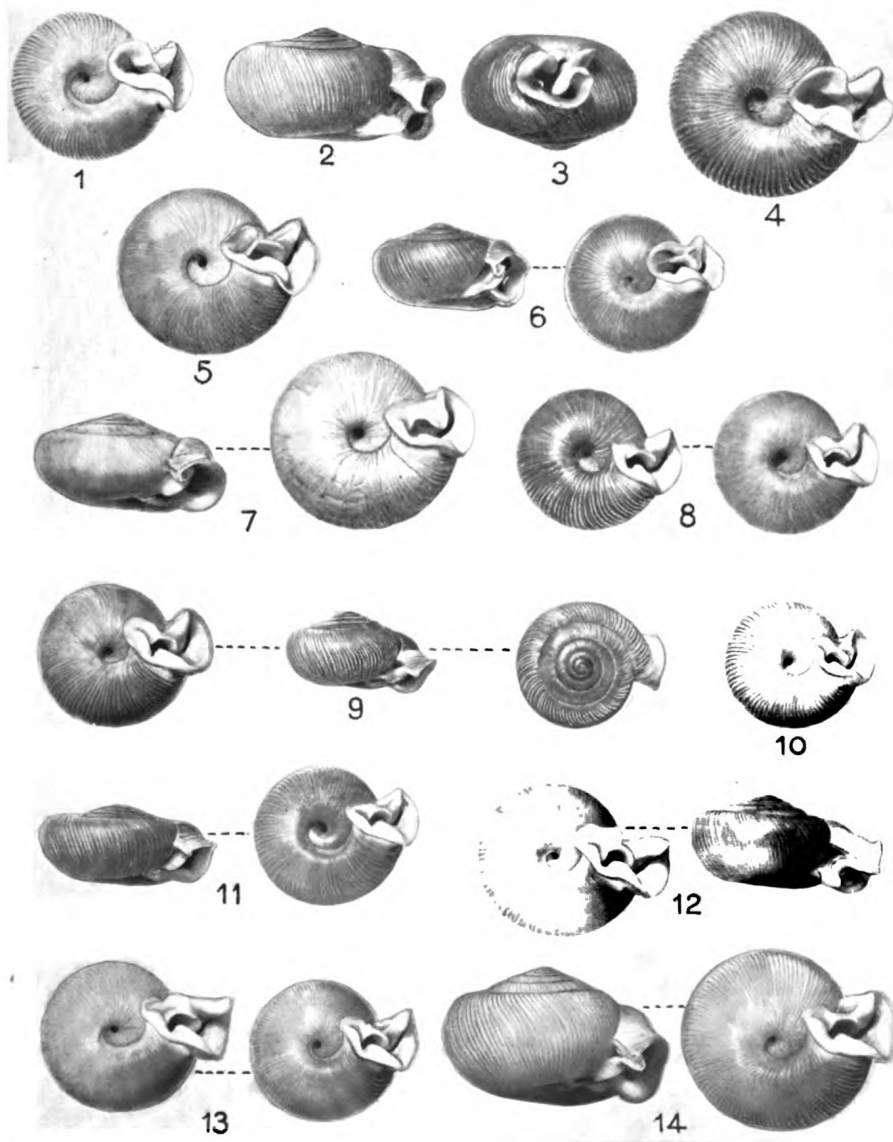


Fig. 384. 1, *Polygyra auriculata*, type; 2, Palatka; 3, Salt Run, Marion Co.; 4, one mile south of Tampa; 5, Hernando Co. 6, *P. auriculata* form *microforis*, 6 miles east of Gainesville. 7, *Polygyra uvulifera*, Long Key; 8, intermediate form, Long Key. 9, *Polygyra uvulifera striata*, Aripeka; 10, Sanibel Island; 11, Homestead. 12, 13, *Polygyra uvulifera bicornuta*, Aripeka. 14, *Polygyra uvulifera margueritae*, Pompano. (All  $\times 2$ .)

This race appears to be special to the low, sandy islands of the Gulf coast of Florida, from Clearwater to Gasparilla, about 90 miles. It has not been found on the mainland, but may occur there, otherwise its distribution seems peculiar. However, its insular localities were doubtless connected by the fall in sea level during Pleistocene glaciation. Binney's Corpus Christi record was evidently erroneous; Singley has stated that he could not find it there, or elsewhere in Texas, and Ferriss and the author saw nothing of it.

The typical *P. uvulifera* might be thought to be a "form" adapted to these sunny, dry islands, which have only rather low vegetation; and the opaque, whitish color usually following strong sun exposure is apparently thus explicable, but hardly the sculpture, since typically sculptured *P. u. striata* also occurs on the same islands, though perhaps in a different ecologic frame. However, there are some specimens intermediate between *uvulifera* and *striata* in sculpture and often of pale brown color (Fig. 384: 8). They do not reach the size of large typical *uvulifera*, the diameter being about 12 mm.

***Polygyra uvulifera striata* new subspecies**

Fig. 384: 9, 10, 11.

The shell is typically pale brown, glossy. The early whorls, after the glossy embryonic shell, are rather closely sculptured with weak, fine growth lines, the last  $1\frac{1}{2}$  whorls rib-striate, the ribs rounded, extending over the base. There are also minute spiral lines, rather widely spaced on the top of last whorl, close on the base. Aperture about as in *uvulifera*. The cavity in front of parietal callus is typically conspicuous (but sometimes filled up). Umbilicus small, contained about  $5\frac{1}{3}$  times in diameter, the last whorl weakly furrowed above and parallel to the umbilical suture (but often the furrow is weak or wanting).

Height 6.7 mm., diameter 12.5 mm.;  $5\frac{1}{2}$  whorls. Aripeka.

Height 6 mm., diameter 11 mm. Aripeka.

FLORIDA: West coast, from Aripeka, Hernando County (Geo. Pine), Type 77543 A.N.S.P., to Cape Sable; on islands and mainland, abundant. Big Pine Key (Pilsbry and others). East coast from Palm Beach to Long Pine Key in the Everglades.

This race is generally distributed in southern Florida. It differs from typical *uvulifera* by the strong, regular rib-striation of the last whorl. It varies widely in size. Specimens from Pinellas Park measure 12 to 14.3 mm. On Sanibel Island a small dirty-white form occurs, diameter 10.5 to 12 mm. (Fig. 384: 10). On the east coast at Palm Beach the diameter is about 13 mm.; the umbilicus somewhat wider, with a pronounced furrow on the last whorl. Similar shells occur southward. Around Miami a small form, diameter 9 to 11 mm. is abundant under stones in open pine woods. Shells of one lot from Homestead are characterized by the strongly depressed shape and large umbilicus, contained  $3\frac{1}{3}$  to 4 times in the diameter, and

deeply furrowed within. Height 5.7 mm., diameter 12.1 mm. (Fig. 384: 11). On Long Pine Key, in the Everglades, the size varies from 11 to 13 mm.

The average size on Big Pine Key is about 11 mm. in diameter, otherwise like typical *striata*. Binney mentions Key West, and states that it occurs "plentifully on the Florida Keys", but I have taken it only on Big Pine. Simpson figured this snail as *Polygyra auriculata*. In Lower Florida Wilds, plate facing p. 336. 1920.

Walker has reported *uvulifera* from as far north as Cape Canaveral, Brevard County, but I do not know just what form of the species he had.

***Polygyra uvulifera margueritae* Pilsbry**

Fig. 384: 14.

*Polygyra uvulifera margueritae* Pilsbry, 1936, Nautilus, 49: 109.

The shell has a higher, more inflated last whorl than *uvulifera*; surface regularly rib-striate on the last two whorls, those above smoothish. Umbilicus narrow, contained about 5 times in diameter, the last whorl not furrowed around it.

Height 10 mm., diameter 16.4 mm.; 6½ whorls. Type.

Height 9 mm., diameter 15 mm. Smallest topotype.

FLORIDA: Pompano, Broward County (Marguerite Robinson), Type and paratypes 166479 A.N.S.P.

Found near the beach in a rather thick growth of shrubs, vines and grass growing on white sand.

***Polygyra uvulifera bicornuta* Pilsbry**

Fig. 384: 12, 13.

*Polygyra uvulifera bicornuta* Pilsbry, 1900, Nautilus, 13: 107.

The shell is somewhat less depressed than *P. uvulifera*, very pale brown or buff, with the spire and an area behind the lip light brown; glossy, the last two whorls finely thread-striate, the striae rather low; minutely engraved with close spiral lines, chiefly on the base. Last whorl descends in front and runs out in a keel, and is contracted behind the broadly flaring outer lip. It is furrowed parallel to the umbilical suture. The basal margin of the reflected peristome has a deep, narrow sinus between the large basal tooth and the rather wide, flatly reflected part of the lip near the umbilicus. The parietal margin of the peristome is elevated and produced in two projecting processes or "horns", one at junction of outer lip with parietal margin, the other upon the parietal margin near its umbilical end, situated like the corresponding lobe in *P. auriculata*. The parietal fold bears a semicircular ridge, the proximal end entering the narrow sinus of the basal lip.

Height 7 mm., diameter 14 mm.; 5½ whorls. Type.

Paratypes: 7.2 x 14.5 mm. and 7.4 x 13 mm.

FLORIDA: Aripeka, Hernando County (Geo. Pine). Type and paratypes 77544 A.N.S.P. Longwood, Seminole County (Van Hyning). Orlando, Orange County (Chas. H. Baker).

In a second lot of 25 from Aripeka, on the west coast (T. Van Hyning), the shells average smaller, diameter 12 to 13.3 mm.; 9 have typical peristome, 2 are similar but with the two "horns" united by a lamina (Fig.

384: 13, left), and 14 have the parietal horn narrow and very small, umbilicus 5 times in diameter (Fig. 384: 13, right). Whether all are from one colony is not known.

A single specimen from Orlando is small, diameter 10.4 mm., with relatively wide umbilicus, contained  $3\frac{1}{2}$  times in diameter, and the parietal horn is short. With further material this may turn out to be a local race.

***Polygyra auriculata* Say**

Fig. 384: 1-5.

*Polygyra auriculata* Say, 1818, Journ. Acad. Nat. Sci. Phila., 1: 276.—Binney, 1878, Terr. Moll., 5: 263, fig. 159.—Simpson, 1889, Proc. Davenport Acad. Sci., 5: 65 (Manatee Co.).—Pilsbry, 1900, Nautilus, 13: 118 (Tampa).—Vanatta, 1920, Nautilus, 34: 31 (Orange Co.).—Walker, 1917, Nautilus, 31: 55, 56 (Chester Shoals Refuge Sta., Brevard Co.; Palm Beach).

*Helix auriculata* Say, Binney, 1851, Terr. Moll., 2: 186, in part; pl. 40, fig. 1 (right).—Bland, 1859, Ann. Lyc. Nat. Hist. N. Y., 7: 26, fig. 1.

*Polygyra auricularis* Abel, 1926, Amerikafahrt, pp. 112, 133, fig. 78, central (Vero I., St. Lucie Co.). Error for *auriculata*.

*Polygyra auriculata* var. *microforis* Dall, 1885, Proc. U. S. Nat. Mus., 8: 263.

The depressed shell is umbilicate, the umbilicus contained about  $3\frac{3}{4}$  times in the diameter, from a central perforation enlarging rapidly in the last three-fourths whorl, where there is a shallow furrow parallel to the umbilical suture; the spire is low, conoidal. Cream-buff to dilute isabella color. Last whorl strongly convex above the middle and around the umbilicus, descending in front, with narrow pits behind outer and basal borders of lip. Embryonic  $1\frac{1}{2}$  whorls smooth, glossy, following whorls finely rib-striate, the last whorl with rounded rib striae about equal to their intervals, and with microscopic spiral impressed lines which are most distinct at periphery and base. The ear-shaped aperture has broadly spreading upper and outer margins, and sinuous, strongly reflected basal margin. Within the outer margin there is a broad, retreating tooth, the edge bearing a recurved hook, projecting forward. Face of the basal margin is heavily calloused, with a rounded, inwardly projecting tooth. The whole parietal margin is free, and raised into a rounded lobe and an acute, pointed one, separated by a deep notch, and connecting with the tongue-shaped parietal tooth.

Height 7 mm., diameter 13.3 mm.;  $5\frac{1}{2}$  whorls. Type.

Height 7.8 mm., diameter 15.6 mm. St. Augustine.

Height 8.4 mm., diameter 16 mm., 6 whorls. Palatka.

Height 8.7 mm., diameter 17 mm. Sebastian.

Height 8.3 mm., diameter 14.9 mm. Homosassa.

FLORIDA:<sup>1</sup> Near St. Augustine (Say), Type 57066 A.N.S.P. Palatka, Putnam Co. (J. A. G. Rehn). Gainesville\* (J. B. Clark); Johnson's Sink (= Lake Helen)\*, (Dall and others), Alachua Co. West side of Lake George (Pilsbry), and Ocala, Marion Co. Lake Beauclair (C. H. Baker), and Blue Creek (Pilsbry), Lake Co. Tick Island, Volusia Co. (Pilsbry). Near Longwood\* (G. H. Clapp); Sanford\* (Pilsbry), and Enterprise (Binney), Seminole Co. Rockledge, Brevard Co. (E. B. Bartram). Homosassa, Citrus Co. (Van Hyning). Little Blind Creek, Hernando Co. (Van Hyning). One mile south of Tampa (L. E. Daniels).

<sup>1</sup> At localities starred (\*) the diameter of some or all specimens is less than 13 mm. (form *microforis*).

*P. auriculata* differs from *P. uvulifera bicornuta* chiefly by the shape of the basal lip, which in *auriculata* is nearly straight from the basal tooth to its umbilical insertion, with only a shallow bay in its front edge next the tooth. In *uvulifera* and its varieties the lip runs forward from the basal tooth, and its front edge has a deep, rather narrow sinus. Running towards this sinus there is a narrow ridge from the junction of the entering parietal fold and the suberect marginal parietal lobe. Typically, this ridge is quite weakly developed in *auriculata*, but it becomes strong in some lots from Marion County, Homosassa, Citrus County and elsewhere. It is strongly developed in all forms of *P. uvulifera*.

In a large, 16.5 mm., specimen from near Tampa the striation is coarser than in other lots.

Say's type was said by him to measure "nearly half an inch"; probably estimated, as the three specimens of the type lot are 13 to 13.3 mm. Some others from St. Augustine are larger, up to 15.6 mm. The umbilicus is often smaller than in the types, down to about  $4\frac{1}{2}$  times in diameter. In the localities starred in the above list, the size of part or all shells is below 13 mm. (form *microforis*); at Sanford, 11.4 to 12.2 mm. But other localities, such as Rockledge on the Indian River, 13 to 14 mm., and Blue Creek, Lake County, 12.8 to 13.5 mm., show complete transitions from *microforis* to the large form found in other localities mentioned above.

The form *microforis* Dall, (Fig. 384: 6), "is distinguished by its generally smaller size, max. diameter 12, min. diameter 10, alt. 6 mm., as compared with the type, and by being more closely rolled, thus having not only an actually smaller umbilicus, but one in which one-third less of the preceding whorl is visible; the specimens were uniform in this, and in all other respects were like the typical *auriculata*." (Dall.)

In specimens seen from the type locality, Johnson's Sink, Alachua County (now called Lake Helen), the diameter runs from 11.6 to 13 mm.; the smallest, diameter 10.9 mm., is from near Longwood. As the localities for small forms are scattered and there is complete intergradation with typical *auriculata* in some localities, we conclude that the reduced size of *microforis* is a function of the local conditions. It is not valid as a subspecies.

***Polygyra auriformis* (Bland)**

Fig. 385.

*Helix auriformis* Bland, 1859, Ann. Lyc. Nat. Hist. N. Y., 7: 37, fig. 5.

*Polygyra auriformis* Bld., Binney, 1878, Terr. Moll., 5: 265, fig. 162, pl. vi, fig. R (teeth).—Pilsbry and Ferriss, 1906, Proc. Acad. Nat. Sci. Phila., p. 127.—Walker, 1928, Terr. Moll. Alabama, p. 13, f. 15.

"Shell perforate, above depressed, with rib-like striae, beneath inflated, convex, almost smooth, and with microscopic spiral lines; white, or brown horn-color, thin; spire very short; whorls  $5\frac{1}{2}$  to 6, rather flat, the last deflected, and shortly turned outwards from the preceding whorl, constricted, scarcely scrobiculate; aperture sub-horizontal, ear-shaped, contracted; peri-



stome acute, continuous, the margins joined by a short linguiform fold, entering within the aperture; the right margin with an obtuse submarginal lamella, and the base with an oblique sinuous, tooth-like fold. Diameter maj.  $11\frac{1}{2}$ , min. 10, alt. 6 mm. Diameter maj. 9, min. 8, alt.  $4\frac{1}{2}$  mm." (Bland.)

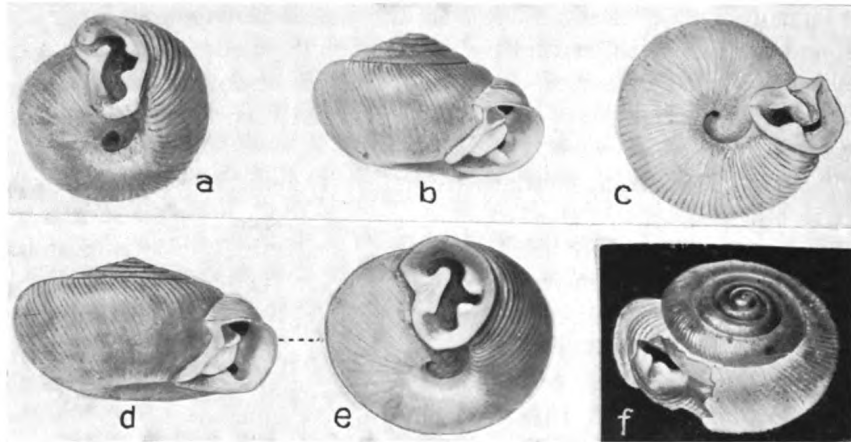


Fig. 385. *Polygyra auriformis*. a, New Orleans; b, Wadley, Ala.; c, Lake Charles, La.; d, e, Alabama, lectotype; f, San Antonio, Texas. ( $\times 3$ .)

Height 4.6 mm., diameter 7.8 mm., and 4 x 6.7 mm. City Park, New Orleans.

Diameter 6.8 to 9 mm. Near Lake Charles, La.

GEORGIA: Ware Co. (Postell). Savannah (John Elliott).

FLORIDA: Chipola R. 1 mile east of Marianna, Jackson Co. (C. W. Johnson).

ALABAMA: Foley, Magnolia Springs, Week's Bay and Ben Secour, Baldwin Co. Silas, Choctaw Co. Cragford, Clay Co. Selma, Dallas Co. Wetumpka, Elmore Co. Boligee, Greene Co. Monte Sano, Madison Co. Uniontown, Demopolis and Rembert's Landing, Marengo Co. Mobile, Irvington, Saraland, Mobile Co. Monroe, Monroe Co. Barachias, Montgomery Co. Hamburg, Perry Co. Wadley, Randolph Co. Calera, Shelby Co. Whitney, St. Clair Co. Livingston and Epes, Sumter Co. Childersburg, Talladega Co. Northport, Tuscaloosa Co.

LOUISIANA: New Orleans (Hemphill, Pilsbry and others). Lake Charles, Calcasieu Parish (Pilsbry).

TEXAS: Galveston (Ferriss). Austin (Pilsbry). Colorado River, Bastrop Co., near Travis Co. line (Julia Gardner). New Braunfels, Comal Co. (Pilsbry, H. B. Baker). San Antonio, Bexar Co. (Pilsbry and others). Burlison Co. at Black Shoals of Brazos R. (C. W. Johnson). Calhoun Co. (A. D. Brown). Comal and Bastrop counties (Singley).

The apertural teeth are not so strongly developed as in *P. postelliana*, the parietal callus is less elevated. The basal tooth is set diagonally on the lip; its umbilicad end turns inward a short distance (Fig. 385 e), but is not long and recurved as in *P. postelliana*. The outer lip tooth has no distinct hook. The umbilicus is small, the last whorl furrowed around it.

The upper surface and a space behind the lip are rib-striate, the rest of the base usually smoothish. There is no such pinched-up little ridge running to the lip across the furrow behind it, such as *postelliana* has; only a mere trace of it.

With all of these differences, some lots give a good deal of trouble. It seems that an ancestral *postelliana-espiloca-auriformis* stock spread from the southeast over the austroriparian belt to Texas. There are numerous slight local forms, which can generally be assigned to one or another of the "species" defined by Bland, but some lots seem more or less intermediate.

In most Texan shells the little branch from the inner end of the parietal tooth turning towards the columellar lip is distinctly developed. This branch is generally shorter in Alabama and Louisiana specimens.

Of Bland's localities for *auriformis* I select "Alabama" as type, as he figured one from that state. Figure 385 d, e, represents an Alabama specimen received from Bland. As his type cannot be definitely located, this shell, 11001 A.N.S.P., may be considered a lectotype. The Alabama localities cited above are in large part from Bryant Walker who recorded H. H. Smith's collections, remarking that it is "generally distributed in the southern part of the state, and extending as far north as Madison County."

***Polygyra postelliana* (Bland)**

Fig. 386: 5, 6, 6a.

[?] *Helix sayii* Wood, 1828, Index Testaceologicus, Suppl. pl. 7, fig. 34 (North America).

*Helix postelliana* Bland, 1859, Ann. Lyc. Nat. Hist. N. Y., 7: 35, fig. 4.

*Polygyra postelliana* Bld., Binney, 1878, Terr. Moll., 5: 266, fig. 163, pl. vi, fig. 8.—  
J. B. Henderson, 1907, Nautilus, 21: 8.

"Shell perforate, above slightly convex, with rib-like striae, wider apart and more prominent behind the aperture; beneath inflated, convex, almost smooth, and with microscopic spiral lines; brown horn color, thin, shining, subpellucid; whorls 5, gradually increasing, rather convex, the last deflected and turned outwards from the preceding one, scrobiculate,<sup>1</sup> constricted, grooved within the umbilical region; suture impressed; aperture white, oblique, ear-shaped, contracted; peristome acute, continuous, the margins joined by a tongue-shaped fold, excavated above, entering into the aperture, the right margin having a deeply-seated lamella, which terminates in a reflexed hook, the base with an erect lamelliform, scarcely oblique tooth, produced into, and recurved within the aperture. Diameter maj. 9½; min. 8½, mm. Alt. 5 mm." (Bland.)

**NORTH CAROLINA:** Beaufort, Carteret Co. and Wrightsville, New Hanover Co. (J. B. Henderson).

**SOUTH CAROLINA:** Yemassee, Beaufort Co. (J. B. Henderson). Sullivan's Island, Charleston Co. (W. G. Mazyck).

**GEORGIA:** Wayne and Glynn counties (A. D. Brown). "Wayne Co., Ware Co. (Type 17991 M.C.Z.) and St. Simon's Island (James Postell). Camden Co. (Bishop Elliott); and Glynn Co. (Wilson)" (Bland).

<sup>1</sup> That is, guttered.

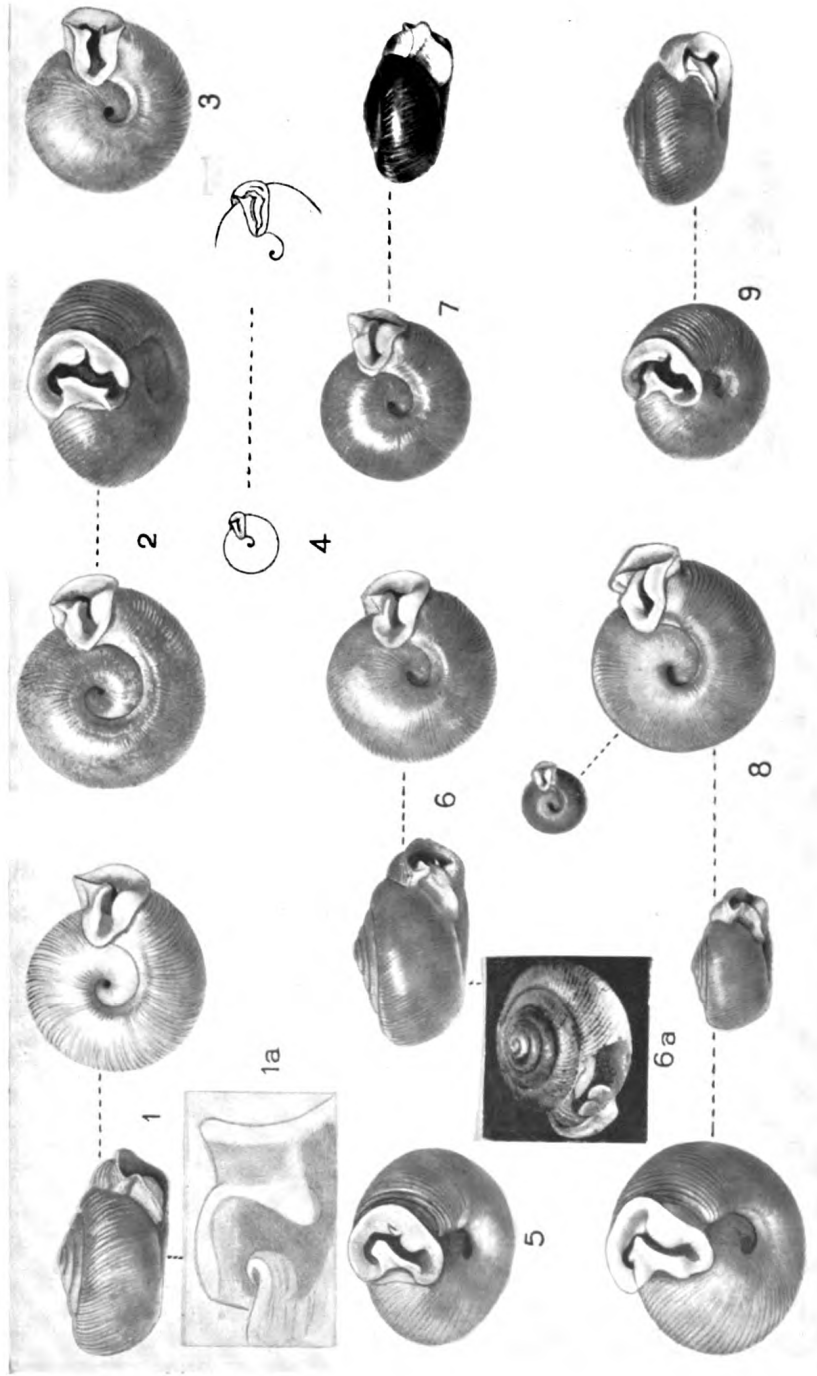


Fig. 386. 1. *Polygyra postcelliana carolina*, Beaufort. 1a, basal teeth seen from above. 2. same, Greenfield Pond, Wilmington, N. C. 3. *Polygyra postcelliana espatoca*, Sullivan's I. 4. same, Bland's figures. 5, 6, 6a, *Polygyra postcelliana*, Yemassee. 7. *Polygyra postcelliana pennsylvae*, Volusia Co., Fla. 8. *Polygyra postcelliana subclausa*. 9. *Polygyra postcelliana subclausa*. (Most figures  $\times 3$ .)

The parietal callus is raised in either a convex lobe or a short point in the region of the umbilical end of the parietal tooth. The end of the large basal tooth towards the umbilicus turns inward at a right angle and recurves; this is shown in Figure 386: 2, and also in Figure 386: 1a, which represents a part of the basal lip of *P. p. carolina* broken out, showing also the hook of the outer tooth. The strong development of the inward continuation of the basal tooth is the most important differential character of *P. postelliana*. A glimpse of it can be had in the aperture, but the full structure is seen only by opening the shell, as in Figure 386: 1a. The external furrow around the umbilicus is represented within by a distinct spiral ridge on the axis. In a basal view a short, pinched up, rounded ridge on the base is seen, running towards the outer end of the basal tooth, between the narrow pit behind the outer tooth and the wider one near the umbilicus. These several structures are not present in *P. avara*.

The degree of striation of the base is variable. Typical *P. postelliana* has very light basal striation except for a space near the outer lip; but Bland mentioned some from Ware County, Georgia, in which the striae are more conspicuous at the base, and in a Yemassee, South Carolina, lot some are strongly striate beneath, others very weakly. Another variable character is the width of the umbilicus, which may be contained 5 times in the diameter or but little over 4 times.

According to Mr. Postell, the Wayne County specimens were "found upon the slopes of the hills, near the base, where the earth is always moist, under fallen pines, and in most cases between the bark and trunk of the trees."

I think that this species is probably the *Helix sayii* of Wood, but as several conchologists to whom I submitted the question did not agree, it appears best to retain the established name *postelliana*.

A synoptic view of the subspecies of *P. postelliana* follows:

- 1. Entering part of the basal tooth long and recurved.....2  
 Entering part of the basal tooth shorter, but slightly concave towards the outer tooth; umbilicus narrow.....*P. p. espiloca*
- 2. Outer lip erect in the peripheral region.....3  
 Outer lip reflected in peripheral region; parietal callus high.....*P. p. peninsulae*
- 3. Umbilicus wide, 3 to 3½ times in diameter.....*P. p. carolina*  
 Umbilicus narrower, 4 to 5 times in diameter.....4
- 4. Aperture narrow, mouth parts strongly developed.....*P. p. subclausa*  
 Aperture wider, mouth parts moderately developed.....*P. postelliana*

***Polygyra postelliana carolina* new subspecies**

Fig. 386: 1, 1a, 2.

*Polygyra espiloca* 'Rav.' Bld., Burnett, 1931, Nautilus, 44: 143.

The shell has the apertural characters of *P. postelliana*, but differs by the wider umbilicus, contained 3 to 3½ times in the diameter.

Height 4.8 mm., diameter 9 mm. Type.

Height 5 mm., diameter 10 mm. Paratype.

NORTH CAROLINA: Around Greenfield Pond, near Wilmington (Pilsbry), Type 95003 A.N.S.P.  $1\frac{1}{2}$  miles inland from Southport (Pilsbry). Beaufort (W. E. Burnett).

Mr. Burnett found this species in the northeastern outskirts of Beaufort, farther north than any locality for *Daedalochila* on the east coast. The place is "about 100 yards from shore of bay, at edge of dense thicket of holly (*Ilex vomitoria*). This spot is rather damp and shady. Specimens were found under dead leaves and grass."

***Polygyra postelliana espiloca* (Bland)**

Fig. 386: 3, 4

*Helix espiloca* "Ravenel" Bland, 1860, Ann. Lyc. Nat. Hist. N. Y., 7: 115, pl. 4, figs. 1, 2.

*Polygyra espiloca* Rav., Binney, 1878, Terr. Moll., 5: 267, fig. 164, pl. vi, fig. P (teeth).—Mazyck, 1897, Nautilus, 10: 106.—Walker, 1928, Terr. Moll. Alabama, p. 13.

"Shell perforate, above slightly convex, beneath convex, striated, reddish-horn colored, thin, with very short hairs; spire scarcely elevated; whorls 5, rather convex, the last deflected and turned outwards from the preceding one, scrobiculate, constricted, grooved within the umbilical region; aperture very oblique, subreniform, contracted; peristome acute, continuous, the margins joined by a lamella, excavated above, and produced into a tongue-shaped tooth; the right margin having a broad hooked lamella, and the base an erect lamelliform tooth produced into and recurved within the aperture. Diameter maj. 9, min. 8, alt. 4 mm." (Bland.)

"Diameter maj. 7, min. 6, alt. 3 mm., var. *minor*." (Bland.)

Height 4.2 mm., diameter 7.7 mm. Sullivan's Island.

SOUTH CAROLINA: Sullivan's Island (Dr. E. Ravenel). Type 18004 M.C.Z.

Bland considered *espiloca* specifically distinct from *postelliana*. The entering part of the basal tooth is shorter than in that species, about intermediate between *postelliana* and *auriformis*. Figure 386: 3 is from a specimen taken by Mr. Mazyck about half a mile from where the original lot was collected. Bland gave the following notes: "In the form of the parietal process it is intermediate between *H. postelliana* and *H. avara*, but most like the latter; the teeth of the peristome are very similar to those in the former, but beneath it is less inflated, the umbilical region is wider, showing more of the penultimate whorl, and it is hirsute." Bland's figures (copied in my Fig. 386: 4) show a small umbilicus, contained about 4.8 times in the diameter, about like the topotype (Fig. 386: 3).

For *P. espiloca* Binney gave the localities Sullivan's I., South Carolina; St. Simon's I., Georgia; New Orleans, Louisiana; and Indianola, Texas. Were the last two based upon *P. auriformis*? Walker gives the locality Mobile, Alabama. I do not know just what form he had. *P. espiloca* has been recorded from Matagorda Peninsula, Texas (Strecker, Nautilus, 24: 5), but as he did not mention *auriformis*, I presume that he had that species.

The same may possibly apply to Hinkley's record from Lake Ponchartrain (Nautilus, 26: 36), although he states that Bland identified his specimens. Probably Wetherby's records from Orange, Texas, and Brashear City, Louisiana, were *auriformis*. I think that *espiloca* is probably restricted to the coastal plain and sea islands of North Carolina to Georgia.

I have not seen actually hirsute specimens, but many show rather faint dots which seem to be hair scars.

***Polygyra postelliana subclausa* Pilsbry**

Fig. 386: 8.

*Polygyra postelliana subclausa* Pilsbry, 1899, Nautilus, 12: 141.

All of the oral obstructions are more strongly developed than in *postelliana*. The parietal fold enters more deeply; the upper lip-tooth is further in and is strongly hooked. The apertural orifice is narrower throughout. The surface is rib-striate below as well as above.

Height 5.8 mm., diameter 10.4 mm.; 5½ whorls.

Others down to 8.8 mm. in diameter.

FLORIDA: Bauldingsville<sup>1</sup> (T. Bland), Type 57082 A.N.S.P. Baldwin, Duval County (E. W. Hubbard). Imri, Hamilton County (E. B. Chope).

The single shell seen from Imri is nearly smooth on the base in front of the aperture, as it usually is in typical *postelliana*.

***Polygyra postelliana peninsulae* new subspecies**

Fig. 386: 7.

The parietal callus is more elevated than in *postelliana*, and the outer part of the lip is strongly reflected, bent back almost against the peripheral part of the whorl. The outer lip tooth is more immersed. Umbilicus is contained about 4¼ times in diameter. Base smoothish.

Height 4 mm., diameter 7.6 mm.; 5 whorls.

FLORIDA: Volusia County near Lake Helen (G. W. Webster), Type and paratypes 57081 A.N.S.P.

***Polygyra avara* Say**

Figs. 386: 9; 387 a-c.

*Polygyra avara* Say, 1818, Journ. Acad. Nat. Sci. Phila., 1: 276.—Binney, 1878, Terr. Moll., 5: 268, fig. 165, pl. xv, fig. 1 (teeth).—Rhoads, 1899, Nautilus, 13: 44 (Miami).

*Helix avara* Say, Férussac, 1822, Hist. Nat. Moll. Terr. et Fluv., pl. 50, fig. 2.—Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 7: 30, fig. 2.

The shell is small, umbilicate, depressed, with convex spire and evenly rounded periphery, the last whorl abruptly descending in front, deeply guttered behind the outer and basal lips; dilute cinnamon colored. Embryonic 1½ whorls smooth and glossy. Last 1½ whorls rather closely hairy, the hairs short, partly in forwardly descending series, leaving distinct scars when deciduous; growth striae weak, but becoming distinct in a small area behind the lip. There is also a microscopic lineolation parallel to growth lines, most distinct on the base. The ear-shaped aperture has a free, continuous, thin, pale brown peristome, the outer margin regularly arcuate,

<sup>1</sup>I have not been able to locate this place on maps at hand. The specimens were collected 60 years ago or more.

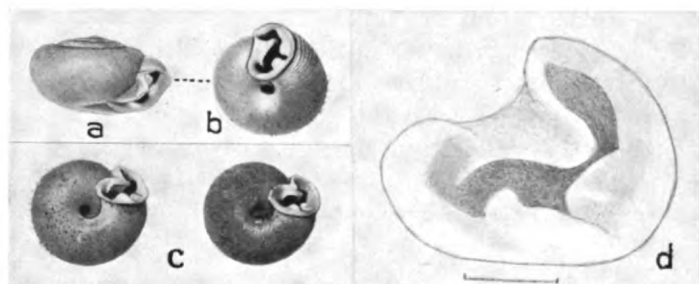


Fig. 387. a, b, c, *Polygyra avara*: a, Kissimee; b, Aripeka; c, Astor ( $\times 2$ ). d, Undetermined *Polygyra* from Cedar Keys, (scale line = 1 mm).

basal margin somewhat straightened, the two lip teeth separated by a deep, narrow sinus, the outer tooth usually broad and having a small recurved hook at the end (often filled up, forming a little triangular or rounded knob), and continued peripherad in a callous ridge. Inner tooth simple, placed obliquely on the inner margin of lip. The parietal fold is straight or incurved at the ends, and is broadly connected with the raised edge of the parietal callus, under which there is a pit.

Height 3.6 mm., diameter 6.2 mm.; 5 whorls. Aripeka.

Height 3 mm., diameter 5.4 mm.;  $4\frac{1}{2}$  whorls. Aripeka.

Height 3.8 mm., diameter 7 mm. Miami.

Height 4.4 mm., diameter 7.2 mm.; 5 whorls. Palatka.

FLORIDA: "Orange groves of Mr. Fatio", on the St. Johns River, near Remington, St. Johns Co. (T. Say). St. Augustine (Dorman, C. W. Johnson and others). South Jacksonville, Duval Co. (S. N. Rhoads). Palatka, Putnam Co. Drayton Island and Silver Spring, Lake George, Marion Co. Astor, Lake Co. Tick Island and Volusia, Volusia Co. (Pilsbry and Johnson). Oak Hill, Volusia Co. (W. G. Binney). Sanford, Seminole Co. (Pilsbry). Kissimee (Jos. Willcox). Aripeka, Hernando Co. (Geo. Pine). Lemon City and Miami, Dade Co. (S. N. Rhoads).

It is usually found more or less coated with dirt, as in Figure 387 c. It has no spiral groove in the last whorl around the umbilicus, and no pits behind the lip, at positions of the teeth. The hairs are characteristic, but readily lost after death. The striation is rather distinct in some specimens from Palatka.

It occurs on black soil or shell heaps throughout the St. Johns valley, but at present there are blanks on the map between the St. Johns River and Aripeka on the west coast, and between Polk County and the vicinity of Miami, where it is rare.

(*Avarus*, greedy.)

*Polygyra*, species undetermined.—*Helix oppilata* Morelet,<sup>1</sup> (1849, Testacea Novissima, 1: 8), was from Yucatan, on the shore. A var.  $\beta$ , "in Florida (Shuttleworth)", was noted by Pfeiffer, (1859, Monographia

<sup>1</sup> Not *Moricand*, as it stands in Terr. Moll., 5: 278, and other publications of W. G. Binney.

*Heliceorum Viventium*, 4: 314), and repeated by W. G. Binney, (1869, *Land and Freshwater Shells North America*, 1: 101). The same author, (1878, *Terrestrial Mollusks*, 5: 278), states that he dissected a specimen from Cedar Keys, Florida, and figured the teeth, (pl. xvi, fig. D). The peristome only of this specimen is preserved as No. 39214 U.S.N.M. I have drawn it in Figure 387 d, (x 12). The general tooth pattern is that of *P. avara* and its allies, except that the front edge of the parietal callus is not raised, as in those forms, and the trough of the v-shaped parietal tooth is thus deeper. The broad retreating tooth in the outer lip has a terminal thickening and a median ridge (representing the hook, which in this group is often adnate). The basal tooth is not quite like any of the known species, being short, stout and somewhat entering, and running into a callous ridge along the lip, towards the outer tooth. The aperture is 3 mm. wide.

Unless this is an abnormal shell, which seems doubtful, it appears to represent a species or race on Cedar Keys which I have not seen elsewhere. This specimen is certainly not *P. oppilata* (Morel.) or any other known Mexican species. It is of Floridan type.

*P. oppilata* (Morel.) with several races or very closely allied species, is common in eastern Mexico, one form occurring as far north as Gonzalez, Tamaulipas.

#### POLYGYRA PUSTULA GROUP (Section *Lobosculum*)

*Lobosculum* Pilsbry, 1930, *Proc. Acad. Nat. Sci. Phila.*, 82: 319, type *Helix pustula* Fér.

The small, depressed shell is rounded peripherally, and narrowly umbilicate or almost covered; the umbilicus not enlarging in the last whorl. Embryonic  $1\frac{1}{2}$  whorls with delicate oblique striae, or smooth except for striae radiating from suture; subsequent whorls not distinctly striate, more or less hairy. Aperture with a v-shaped parietal tooth and two or three teeth on the lip; edge of parietal callus thin, appressed. Within there is either a callous spiral ridge or a vertical buttress on the axis a fourth of a whorl in.

The genitalia of *P. pustula* are much as in *Praticolella*, there being a large "appendix" on the penis and a short spermathecal duct. The penial retractor is simple and terminal. Pallial organs as in typical Polygyrae, the kidney long and narrow, the lung with a single vein, no secondary venation.<sup>1</sup> (Fig. 424: 5-8a.)

In *P. leporina* there is no appendage on the penis, which is quite stout in figure and contains large longitudinal fleshy ridges (Fig. 392 B, C). The shell is so much like *P. pustula* that I am disposed to consider them closely related, the "appendix" of *P. pustula* being a specialization of the capacious penis occurring in many Polygyrae.

<sup>1</sup> The value to be placed upon the lung venation is uncertain. In general a plain lung is found in small species, one with secondary veins in large; but there are conspicuous exceptions. Until a larger body of observations is available, the character cannot be given much weight.



*Distribution*.—Austro-riparian area of the Lower Austral zone, Georgia to Texas, and north in the Mississippi Valley to Indiana and Arkansas.

These helices differ from nearly all other species of *Polygyra* by lacking distinct striae, which in the polygyras are almost invariably present on the upper surface. In sculpture, but not in internal structure, *Lobosculum* has therefore more similarity to the genus *Giffordius*.

### Key to Species

Shell umbilicate.

Diameter 4 to 5 mm.; a spiral furrow in last whorl behind columella; a spiral ridge on the axis within.....*P. pustula*

Diameter 5 to 5.5 mm.; no furrow behind columella; a vertical buttress on the axis within.....*P. pustuloides*

Shell with umbilicus nearly covered.....*P. leporina*

### *Polygyra pustula* (Férussac)

Figs. 388, 389.

*Helix pustula* "Say" Férussac, 1822, Hist. Nat. Moll. Terr. et Fluv., livr. 22, expl. pl. 50, fig. 1.—Deshayes, 1851, *ibid.* p. 78.—Pfeiffer, 1846, Symbolae ad Hist. Hel., 3: 81.—Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 6: 346, fig. 1.—W. G. Binney, 1859, Terr. Moll., 4: 94, pl. 77, fig. 12.

*Polygyra pustula* Fér., Binney, 1878, Terr. Moll., 5: 286, fig. 184.—Walker, 1928, Terr. Moll. Alabama, p. 14, fig. 17.—Rhoads, 1899, Nautilus, 13: 44.

*Lobosculum pustula* (Fér.), Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 320, fig. 8; pl. 27, figs. 5-8a (anatomy).

The shell is very small, umbilicate, depressed, with convex spire and rounded periphery, dilute cinnamon-buff, paler beneath, or between that color and pale olive-buff. Whorls closely coiled, the last descending steeply



Fig. 388. *Polygyra pustula*. a, Miami; b, St. Augustine. ( $\times 3$ )

in front, constricted behind the outer and basal margins of the lip, and with a deep spiral groove which forms a ledge around the umbilicus. Embryonic shell of  $1\frac{1}{2}$  whorls, the initial fourth of a whorl smooth, short radial ridgelets then appear, the last embryonic whorl becoming closely covered with retractively radial wrinkle-striae. Later whorls are more coarsely but weakly striate, in places often showing interstitial sculpture of microscopic wrinkles, running more obliquely, and in fresh shells, irregularly placed stiff hairs, mostly curved. The aperture is narrow, irregularly lobed. Peristome white, thickened within, the outer and basal margins reflected. Outer margin with a rounded tooth broadly connected with the narrower outer-basal tooth, which is separated from the inner-basal tooth by a deep sinus.

Within the last half whorl there is a strong spiral callous ridge on the axis, corresponding to the external furrow around the umbilicus, its forward end visible in the aperture. The parietal callus is heavy, and bears a long tooth, from the outer end of which a ridge runs to the insertion of the outer lip. The dilated columellar lip impinges upon the umbilicus.

Height 2.7 mm., diameter 4.4 mm.;  $4\frac{1}{2}$  whorls. Cedar Keys.

Height 3 mm., diameter 4.7 mm. Pensacola.

Height 2.3 mm., diameter 4 mm. Tick I., Volusia Co.

SOUTH CAROLINA: Wando River.

GEORGIA: near Savannah and St. Simon's I.

FLORIDA: Jacksonville, Duval Co. Tallahassee, Leon Co. Quincy, Gadsden Co. Pensacola, Escambia Co. Green Cove Springs, Clay Co. St. Augustine, St. Johns Co. Welaka, Putnam Co. Arredonda and Gainesville, Alachua Co. Cedar Keys, Levy Co. Salt Run, Marion Co. Tick Island and Hawk's Park, Volusia Co. Crystal River, Homosassa and Lecanto, Citrus Co. Istachatta, Hernando Co. Clearwater and St. Petersburg, Pinellas Co. Manatee Co. Osprey, Sarasota Co. Mondongo Island, Lee Co. Boynton, Palm Beach Co. Miami, Dade Co.

ALABAMA: Evergreen, Conecuh Co. Magnolia Springs and Point Clear, Baldwin Co. Mobile.

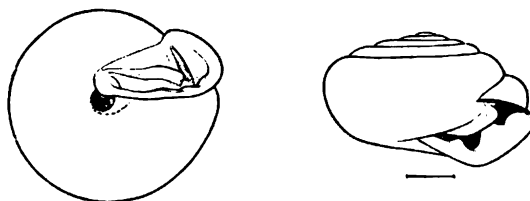


Fig. 389. *Polygyra pustula*, St. Augustine, Florida. (Line indicates diameter.)

This snail of the coastal plain will doubtless be found in all of the southern tier of counties in Georgia and Alabama, probably also into Mississippi. I have never found it on the Florida Keys, or the mainland south of Miami, where Rhoads found it rare and local, under vegetable debris in an oak hammock. It is a calciphile, often found on Indian shell mounds. The Alabama records are from Walker, all of the rest from specimens in the Academy museum.

It is smaller than *Polygyra pustuloides* or *P. leporina*, and differs by the deep spiral groove around the umbilicus and the internal spiral callous ridge on the axis, as Bland first pointed out. The microscopic sculpture of fine wrinkles is also less developed than in those species.

There is considerable variation in the teeth. Frequently the tooth within the outer lip is not distinct, the callous ridge above the outer-basal tooth being straight or tapering upward, not toothed at its upper end. The lip is frequently brown towards the edge, or in living ones roseate. The hairs of the surface are readily lost, sometimes in living snails.

The penis (Fig. 424: 8) is very long (5 mm.) with thin, transparent walls which are smooth within except for transverse rugae for a short distance at the apex and a slight internal thickening extends down one side nearly to the appendix. At about the middle a large glandular appendix opens into the penis. It has thick walls and a large cavity, and is bilobed distally (Figs. 424: 8, 8a). The vas deferens enters the penis terminally. The retractor is terminal, about 2 mm. long, and attached to the diaphragm. The prostate gland is as long as the distended part of the oviduct. The talon is very small, simple and adnate on the hermaphrodite duct. The oblong spermatheca is on a short duct, the whole about 2 mm. long.

The lung (Fig. 424: 5) is long and narrow, more or less maculate with black, plain, without secondary veins. The kidney is narrow, two to three times as long as the pericardium and about one-third the length of the lung. The retrograde ureter is distinct, but that along the hindgut faintly marked and probably open.

The diameter of the shell corresponding to Figure 424: 8 is 4.5 mm.

In some specimens the appendix is rather small, with a median contraction (Fig. 424: 6, Gainesville). In another opened from Miami, it is very large and inserted low on the penis (Fig. 424: 7).

No locality was given by Férussac, but according to Deshayes his specimens were from Say. As Say collected at St. Augustine, that place is taken as type locality.

(*Pustula*, a blister or pustule.)

***Polygyra pustuloides* (Bland)**

Fig. 390.

*Helix pustula* Binney, 1851, Terr. Moll., 2: 201, pl. 39, fig. 3. Not of Férussac.

*Helix pustuloides* Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 6: 350, fig. 2.

*Polygyra pustuloides* Bld., Binney, 1878, Terr. Moll., 5: 287, fig. 185, pl. vi, fig. c (teeth).—J. B. Henderson, 1907, Nautilus, 21: 8 (Yemassee).—Walker, 1928, Terr. Moll. Alabama, p. 15, fig. 18.

“Shell widely umbilicate, planorboid, thin, rufous or pale horn-colored, delicately striated, with thin sparingly hirsute epidermis; spire scarcely elevated; whorls 4-4½, slightly convex, gradually increasing, the last sub-

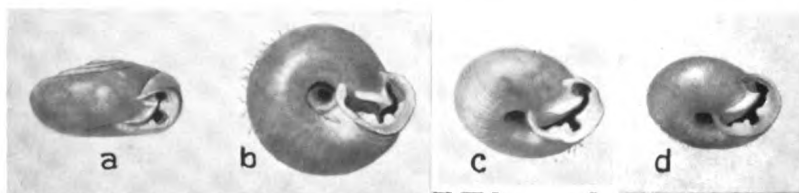


Fig. 390. *Polygyra pustuloides*. a, Georgia; b, Gastonberg, Ala. c, Alberta, Ala.; d, Wadley, Ala. (× 3.)

angular at the periphery, at the aperture gibbous, constricted, suddenly deflexed, beneath devious; suture rather deeply impressed; umbilicus wide, equal to one-third of the larger diameter of the shell, showing all, but especially the penult whorl; aperture oblique, crescentic, with erect, oblique,

white parietal lamelliform tooth, joined to the upper angle of the aperture by a slightly arcuate, filiform callus; peristome reflexed, with margins approaching, and having two dentiform lobes separated by a deep fissure.

Diameter maj.  $5\frac{1}{2}$  min.  $4\frac{1}{2}$ , alt.  $2\frac{1}{2}$  mm." (Bland.)

Height 2.7 mm., diameter 5.5 mm.; 5 whorls. Darien, Ga.

Height 2.5 mm., diameter 5 mm. Calera, Ala.

SOUTH CAROLINA: Yemassee (Henderson).

GEORGIA: Chatsworth, Murray Co. (C. C. Allen). Chattahoochee R. about 7 mi. above Fort Gaines, Clay Co. (C. B. Moore). Lee Co. (A. Binney). Near Darien, McIntosh Co. (Dr. S. W. Wilson), Cotypes 18026, 18029 M.C.Z.

TENNESSEE: Little Tennessee R., Monroe Co. (J. H. Ferriss).

ALABAMA: "In all parts of the State" (H. H. Smith and others). Bryant Walker enumerates localities in 32 counties.

FLORIDA: Tallahassee, Leon Co. (Van Hyning).

MISSISSIPPI: According to Bryant Walker.

Bland's description states that the umbilicus is one-third the diameter, and his figure shows it larger than in any specimens I have seen, including two lots received from Bland himself. In these examples, measured from suture to suture, the umbilicus is about one-fourth of the diameter. The last whorl is excavated behind the columellar lip. The callus above the outer tooth tapers upward and is usually a little abrupt at its upper end, but not toothed there. The inner basal tooth has a sloping or sometimes dentiform callus on its columellar side. On the internal axis near the aperture there is a vertical callous rib or "fulcrum".

I have found no localized records for Mississippi, where Walker states that it occurs. The Darien locality is on a low bluff facing the sea, among live oaks and palmetto undergrowth, the soil covered with oyster shells left there by the Indians.

(*Pustuloides*, similar to *pustula*.)

***Polygyra leporina* (Gould)**

Fig. 391.

*Helix leporina* Gould, 1848, Proc. Bost. Soc. Nat. Hist., 3: 39.—Binney, 1851, Terr. Moll., 2: 199, pl. 40a, fig. 1.—Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 6: 348.—Simpson, 1888, Proc. U. S. Nat. Mus., 11: 450.—Singley, 1893, Geol. Surv. Texas, 4th Ann. Rep., p. 306.

*Polygyra leporina* Gld., Binney, 1878, Terr. Moll., 5: 288, pl. vi, fig. F (teeth).—Sampson, 1893, Ann. Rep. Geol. Surv. Ark. for 1891, 2: 186; 1913, Trans. Acad. Sci. St. Louis, 22: 89.—Hinkley, 1906, Nautilus, 20: 34.—Walker, 1928, Terr. Moll. Alabama, p. 16, fig. 19.—F. C. Baker, 1906, Bull. Ill. State Lab. Nat. Hist., 7: 114.—Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 449; 1903, p. 195.—Pleas, 1893, Nautilus, 7: 68.—Daniels, 24th Ann. Rep. State Geol. Indiana, p. 579.—Strecker, 1910, Nautilus, 24: 5.

*Lobosculum leporinum* Gld., Hubricht, 1938, Missouri Bot. Garden Bull., 26: 56.

The shell is narrowly, nearly covered, umbilicate, depressed with rounded periphery, the spire low but convex; pale brown (to olive-buff) colored. The last whorl is most convex in the upper part, descends abruptly in front and has a deep furrow behind the outer and basal margins of the lip. Embryonic whorls  $1\frac{1}{2}$ , the first half whorl smooth, the rest with a zone of

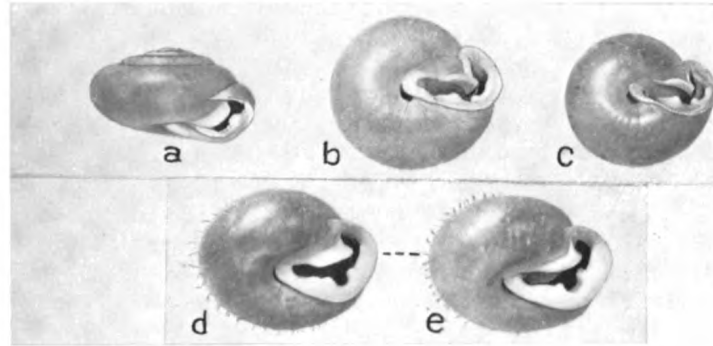


Fig. 391. *Polygyra leporina*. a, Indiana; b, Arkansas, from Bland; c, Cedar Point, Mobile Bay; d, e, Frierson, La. ( $\times 3$ .)

short, retractive striae below the suture. Last whorl having rather weak growth wrinkles, and somewhat sparse papillae, which in young individuals bear short hairs, often lost in the adult stage. The lip is expanded above, reflected in the outer and basal margins, calloused within, white; at the columellar insertion dilated over and almost closing the umbilicus. The rounded outer tooth is continued upward in a callous ridge, which typically has a very low tooth at its upper end. Basal tooth stands on a strong ridge continued towards the axial insertion, where it ends rather abruptly. The parietal callus bears a nearly straight tooth, from the outer end of which a lower curved callous ridge runs to the insertion of the outer lip. A short distance within there is a strongly developed vertical buttress or "fulcrum" on the axis, its free edge convex or irregular.

Height 3.7 mm., diameter 6 mm.; 5 whorls. Paratype.

Height 3.7 mm., diameter 6.5 mm. Lee Co., Texas.

Height 3.2 mm., diameter 5.7 mm. Frierson, La.

Height 2.8 mm., diameter 5 mm.;  $4\frac{2}{3}$  whorls. Cedar Pt., Mobile Bay.

TENNESSEE: Memphis (G. A. Lathrop).

ALABAMA: Elamville, Barbour Co. Jackson, Clarke Co. Florence, Lauderdale Co. Mobile and Mt. Vernon, Mobile Co. Epes, Livingston, York and Suwannee Creek, Sumter Co. Tuscaloosa, Holt and Elrod, Tuscaloosa Co. Junction Lost and Wolf creeks, Walker Co. Calvert, Washington Co. Silas, Black Bluff, Choctaw Co. Evergreen, Conecuh Co. Squaw Shoals, Jefferson Co. Marengo Co. Coalfire, Pickens Co. (Walker).<sup>1</sup> Boligee, Greene Co. (Hinkley).

MISSISSIPPI: Columbus, Lowndes Co. Abbeville, Lafayette Co. (Hinkley).

ILLINOIS: Jackson and Hardin Counties (Hinkley).

INDIANA: North Vernon, Jennings Co. New Harmony, Posey Co. (L. E. Daniels). Green Co. (Bland). Hany Co. (E. Pleas).

MISSOURI: Monett, Barry Co. Cape Girardeau Co. Neeleyville, Butler Co. (Sampson). St. Louis (Hubricht).

ARKANSAS: White Rock Springs (Gould), type locality. Near Helena (Bland); Near Camden, Ouachita Co. Wampoo Landing, Arkansas R., Pulaski Co. Keller place Landing, Calhoun Co. Carloch place, Ashley Co. (C. B. Moore). Horatio, Sevier Co.

<sup>1</sup> Walker's records are mainly from the collections of H. H. Smith.

Rocky Comfort, Little River Co. (Ferriss). Crawford, Sebastian, Franklin, Conway, Clark and Perry Counties (Sampson).

LOUISIANA: Grand Cane and Frierson, DeSoto Parish (L. S. Frierson).

OKLAHOMA: Ft. Gibson, Muskogee Co. Eucaula, McIntosh Co. Limestone Gap (C. T. Simpson). Poteau and Antlers (Pilsbry).

TEXAS: Houston, Harris Co. (Pilsbry). DeKalb, Bowie Co. Mt. Pleasant, Titus Co. (Ferriss). 6 mi. northwest of Dallas (Archer). Richmond, Fort Bend Co. (J. Bequaert). Matagorda Peninsula, Matagorda Co. (Strecker). Anderson, Lee, Washington and Fort Bend Counties (Singley).

This species is similar to *P. pustuloides*, but differs by the narrower, nearly closed umbilicus. In some specimens it is closed except for a very minute crevice behind the lip. The internal buttress on the axis projects out farther than in *pustuloides*, and has a convex edge. The hairs are delicate and easily rubbed off. Sometimes the apical sculpture described above is almost wholly wanting, leaving a smooth "corneous" embryonic shell.

Binney mentions Georgia as in its range, but without a specific locality. Gould's original specimens were from "Mississippi and Arkansas," but as some were from White Rock Springs, Arkansas, that place was taken as type locality (Binney, 1885, Manual, p. 486).

According to Sampson it "inhabits low or bottom lands and is not abundant anywhere. At Argenta, Pulaski County, Arkansas, it occurred under all cedar logs at the railroad yards, but none under pine." At Mt. Pleasant, Texas, Ferriss took it "in damp places under logs and stones; active in winter." In Indiana Daniels found it "under logs at the borders of woods."

Specimens dissected (Fig. 392 B) were collected by Archer at Tuscaloosa, Ala. The penis is very stout, containing three large, fleshy ridges (Fig. 392 b). The penial retractor is inserted on the vas deferens. The oblong spermatheca has a very short duct. Hermaphrodite duct is very large. Length of penis 2 mm., spermatheca and duct 2 mm.

(*Leporinus*, hare-like—but why?)

#### POLYGYRA TEXASIANA GROUP

The lip teeth are marginal, the outer one continued upward in a callus or buttress along the inner margin of the lip; parietal tooth v-shaped, in a basal view not reaching inward past the basal lip. Front edge of the parietal callus closely appressed, not thick or raised. Upper termination of outer lip inserted on preceding whorl.

The genitalia of *P. texasiana* (Fig. 392 A) are characterized by a large penis which is swollen or sacculate in the middle third, where there are irregular fleshy ridges inside (Fig. 392 a), one narrow pilaster extending to the apex. The vas deferens and the penial retractor are terminal. The vagina is long. Talon short, tuberculose as usual. Length of penis 9 mm., vagina 3.5 mm., spermatheca and duct 4 mm.

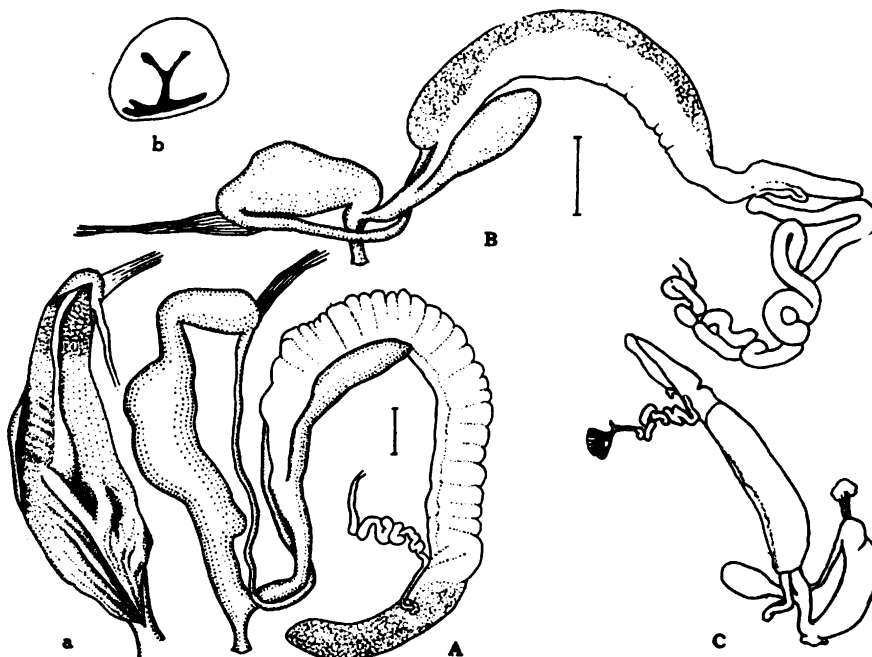


Fig. 392. A, *Polygyra texasiana*, Dallas; a, penis opened. B, *Polygyra leporina*, Tuscaloosa, Ala; b, section of penis. C, same, near Dallas, Texas, drawn by A. F. Archer. Scale lines = 1 mm.

The following Mexican species, credited to Texas by Binney and others, are to be dropped from our list. No definite confirmation of the old records could be obtained in the U. S. National Museum, the Museum of Comparative Zoölogy, the Academy of Natural Sciences of Philadelphia, the American Museum of Natural History or elsewhere.

*Helix hindsii* Pfeiffer (1845, Proc. Zool. Soc. Lond., p. 132), was said to be "from Mexico (Hinds), and Texas (Sowerby)." The same localities were repeated in *Terrestrial Mollusks*, vols. 3, 4 and 5, and *Manual of American Land Shells*, pp. 368, 485. The specimen from Texas recorded on p. 485 is a small *P. texasiana* (Binney Coll., no. 39191 U.S.N.M.). *P. hindsii* is considered a variety of *P. ventrosula* Pfeiffer by von Martens. Both are known from western Mexico.

*Polygyra hindsii* Pfr. var. was recorded by G. D. Harris from the Galveston deep well at 2158 feet, supposed to be Miocene, in 4th Ann. Rep. Geol. Surv. Texas for 1892, p. 118. It was omitted from his later paper on this formation, as he decided that the specimens were recent, brought from the surface in the water pumped down during boring. I cannot trace the specimens, but doubtless the identification was erroneous.

*Helix ventrosula* Pfeiffer (1845, Proc. Zool. Soc. Lond., p. 131). "From Mexico (Hinds) and Texas (Sowerby)." These localities were repeated in the works of W. G. Binney. The specimen, no. 39190 U.S.N.M., Binney

Collection, figured in *Terrestrial Mollusks*, 4: 73, pl. 77, fig. 14 is not stated to be from Texas on the label. A specimen labelled Texas, Bland Collection, is in the Museum of Comparative Zoölogy. No definite locality in the United States has been given. It is a well known species of western Mexico.

*Helix ariadnae* Pfeiffer (1848, *Zeitschrift für Malakozoologie* 5: 120). Habitat unknown. Binney (1869, p. 104), reported it "In the region of the Rio Grande, both in Texas and Tamaulipas", and placed *Helix couchiana* Lea, 1857, described from Tamaulipas, as a synonym. The same information is repeated in Binney's later works; but there has been no definitely localized Texan record. A specimen of the Binney Collection, no. 39220 U.S.N.M., is labelled "type of *couchiana* Lea, Berlandier; Texas." The species is known from Tamaulipas.

*Polygyra bicruris* (Pfeiffer) was reported from Brownsville and mouth of the Rio Grande by R. E. C. Stearns (*North American Fauna* no. 7, p. 273). I am informed by Dr. Bartsch that these shells, 123168 and 123594 U.S.N.M., are *P. texasiana*.

*Polygyra matermontana* Pilsbry (1896, *Proc. Acad. Nat. Sci. Phila.*, p. 16, pl. 3, figs. 10-12), described from Colima, and known from other places in western Mexico, is in the collection of A. D. Brown (4357 A.N.S.P.) labelled "Texas", received by him as "*H. ventrosula* Pfr." from the Museum of Comparative Zoölogy. Those who have been over the intervening territory in Sonora, Chihuahua and Coahuila need not be told that the occurrence in Texas of this or the other above-mentioned west Mexican species is practically impossible.

*Key to Texan Polygyras*

- 0. No teeth within the outer lip.....*P. septemvolva febigeri*  
Two teeth on or within the outer lip.....1
- 1. Parietal margin of aperture raised in a thin lamina.....2  
Parietal margin adnate to preceding whorl.....3
- 2. Periphery angular; parietal tooth U-shaped, entering.....*P. hippocrepis*  
Periphery rounded; parietal tooth irregular, not entering.....*P. auriformis*
- 3. Umbilicus nearly covered by the reflected lip.....*P. leporina*  
Umbilicus open.....4
- 4. Lip teeth somewhat immersed; biamose parietal tooth squarish in front view.  
*P. dorfeuilliana*  
Lip teeth not immersed; parietal tooth v-shaped.....5
- 5. A distinct furrow in the last whorl near and parallel to the umbilical suture; whorls closely coiled; a tubercle on the columellar axis a short distance within.....6  
No distinct furrow parallel to umbilical suture.....7
- 6. Diameter 6.5 to 8 mm.; umbilicus narrow.....*P. mooreana*  
Diameter 9 to 11 mm.; umbilicus wide.....*P. tholus*
- 7. Two lip teeth widely spaced.....*P. triodontoides*  
Lip teeth separated by a deep but narrow sinus.....8
- 8. Surface finely and evenly striate above and below, without coarser striae behind the lip.....*P. latispira*  
Surface smoothish or nearly smooth.....9  
Surface rib-striate above.....*P. texasiana*
- 9. Outer lip tooth rather thick.....*P. t. texasensis*  
Outer lip tooth thin, concave.....*P. chisosensis*



**Polygyra triodontoides** (Bland)

Fig. 393.

*Helix triodontoides* Bland, 1861, Ann. Lyc. Nat. Hist. N. Y., 7: 424, pl. 4, figs. 11, 12.—Singley, 1893, Geol. Surv. Texas, 4th Ann. Rep., p. 306.—Simpson, 1889, Proc. U. S. Nat. Mus., for 1888, 11: 450.

*Polygyra triodontoides* Bld., W. G. Binney, 1878, Terr. Moll., 5: 271, fig. 169.—Sampson, 1893, Ann. Rep. Geol. Surv. Ark., for 1891, 2: 184; 1913, Trans. Acad. Sci. St. Louis, 22: 100.

“Shell perforate, globose-depressed, thin, subpellucid, pale horn-colored, with partially obsolete rib-like striae above; base convex, smooth; spire short; whorls 5, somewhat convex, the last plicately ribbed near the aperture,

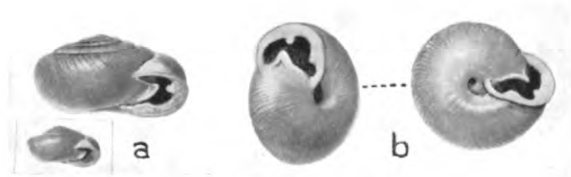


Fig. 393. *Polygyra triodontoides*: a, Seabrook, Texas; b, Calcasieu Parish, La. (Actual size and  $\times 2$ .)

deflexed anteriorly; aperture roundly lunate, oblique, contracted; perist. reflected, callous, the margins joined by a sharp linguiform triangular tooth, the right with a tooth on the margin of the callus, basal with an oblique tooth, both teeth small and far apart. Diameter maj.  $9\frac{1}{2}$ , min. 8, alt. 5 mill.” (Bland.)

Height 5.3 mm., diameter 10 mm. Seabrook, Texas.

Height 5.5 mm., diameter 8.7 mm. Calcasieu Parish, Louisiana.

Height 4.9 mm., diameter 9 mm. Corpus Christi, Texas.

Height 6.5 mm., diameter 11 mm. Grand Cane, Louisiana.

MISSOURI: Monett, Barry Co. (Sampson).

ARKANSAS: Washington and Sebastian Counties (Sampson).

OKLAHOMA: “Pine Hill, Choctaw Nation” (Binney), Eufaula and near Kiowa (Simpson).

LOUISIANA: West of Lake Charles, Calcasieu Parish (Pilsbry).

TEXAS: Jefferson Co. (Singley). Between Ames and Dayton, Liberty Co. (Pilsbry). Seabrook, Houston Co. (H. A. Wenzel). Galveston, on both island and mainland (Pilsbry, Singley). DeWitt Co. (Dr. Newcomb), Type 18130 M.C.Z. Corpus Christi (Bland).

*P. triodontoides* “is a more delicate shell than *texasiana* and does not attain the same size. It is not as distinctly ribbed, is somewhat more elevated, and the aperture is more round. *The two lip teeth are much farther apart* than in *P. texasiana*.” The basal tooth is somewhat skewed, its outer slope being longer than the inner. A callous ledge extends above the outer tooth, tapering upward. The umbilicus widens in the last whorl, its width contained 5 to 6 times in the diameter. The sculpture is usually rather weak, but in a lot labelled, with a query, Grand Cane, Louisiana, the

shell is strongly striate both above and below. Some from Liberty County, Texas, are also distinctly striate throughout.

The Louisiana and Texas localities are in the low, humid coastal plain. In both states I found it under fallen wood and old railroad ties. The localities in southwestern Missouri, northwestern Arkansas and the adjacent part of Oklahoma, recorded by Sampson, Simpson and Binney, are widely separated from the Gulf coastal area, but possibly there may be a connection somewhere. I have not seen these northern specimens.

***Polygyra texasiana* (Moricand)**

Fig. 394 a-e.

*Helix (Helicodonta) texasiana* Moricand, 1833, Mém. Soc. Phys. et Hist. Nat. de Genève, 6: 538, pl. 1, fig. 2 (Mexique, dans la province de Texas).

*Helix texasiana* Moric., Binney, 1851, Terr. Moll., 2: 191, pl. 45, fig. 1.—W. G. Binney, 1869, L. & Fr. W. Sh. N. A., 1: 93.—Roemer, 1859, Texas, p. 455.—Singley, 1893, Geol. Surv. Texas, 4th Ann. Rep., p. 306.—(?) Auclair, 1889, Revue Sci. du Bourbonnais et du Centre France, 2: 86 (living in France).

*Polygyra texasiana* Moric., W. G. Binney, 1878, Terr. Moll., 5: 270, pl. vi, fig. a (teeth).—Von Martens, 1892, Biol. Centr.-Amer., Moll., p. 170.—Pilsbry & Ferriss, 1896, Proc. Acad. Nat. Sci. Phila., p. 534; 1906, ibid. p. 128, pl. 5, figs. 16, 17, 20.—Crandall, 1893, Nautilus, 6: 103 (Belton, Tex., subfossil).—Ferriss, 1900, Nautilus, 14: 28 (Ark.); 1906, 20: 17 (Oklahoma City).—Strecker, 1908, Nautilus, 22: 65 (McLennan Co., Tex.); 24: 4, 5 (Waco and Matagorda Penins., Tex.).—Greeger, 1915, Nautilus, 29: 89 (Payne Co., Okla.).—B. Walker, 1915, Occ. Pap. Mus. Zool. Univ. Mich., No. 15, pp. 6-8.

*Polygyra texasiana tillandsiae* Cockerell, 1917, Nautilus, 21: 36.

*Tridopsis tridonta* "Chr. et J.", Beck, 1837, Index Moll., p. 22, new name for *texasiana* Moric. and *plicata* Say; here restricted to the former.

The shell is perforate, expanding in the last whorl to an umbilicus contained slightly over 4 times in the diameter; strongly depressed, the spire low or nearly flat, periphery rounded. Pale brown or light buff, usually lighter or whitish at base, and often having a faintly darker band above the periphery, the last whorl descending abruptly in front, rather deeply and narrowly contracted behind the lip. The embryonic whorls are smooth except for faint short striae radiating from the suture and microscopic, very close, crenulated spiral striae, often lost by wear. Later whorls with fine growth striae, the last two rib-striate above, the base smoothish, only weakly striate except near the outer lip, where the riblets of the upper surface become stronger and pass over the periphery and base. The lip forms about two-thirds of a circle, is reflected and rather thick, its inner margin with two teeth rather near together, one on the base, the other in the outer margin, a callous ridge above it. Parietal callus bearing a two-branched tooth.

Height 5 mm., diameter 10 mm.; 5½ whorls. (Moricand.)

Height 5.2 mm., diameter 11 mm.; 5½ whorls. Brownsville.

ARKANSAS: Rocky Comfort, Little River Co., Petit Jean (Ferriss). Sebastian and Nevada Counties (Sampson).

OKLAHOMA: Oklahoma City (Ferriss). Cimmaron R., Ripley (E. C. Case) and Perkins (D. K. Greeger), Payne Co. Wichita Mts., Comanche Co. (E. C. Case). Fort Gibson (Hubbard). Near Eufaula (Simpson). Opposite Fort Smith, Ark. (Sampson).

LOUISIANA: Frierson, De Soto Parish (L. A. Frierson).

TEXAS: De Kalb, Bowie Co. (Ferriss). Dallas Co. (Ferriss). Fort Worth (Sampson). Waco (Ferriss). 8 miles west of Abilene, Taylor Co. (E. B. Howard), fossil, 20-25 ft. below surface). 8 miles southeast of Aspermont, Stonewall Co. South of Dundee, Archer Co. (E. C. Case). Belton, Bell Co. (Crandall). San Marcos, Hays Co. (Pilsbry). Austin (Pilsbry). Lee Co. (Singley). Shepp's Ferry, Bastrop Co. (C. W. Johnson). Flatonia, Fayette Co. (H. A. Wenzel). Galveston (Pilsbry). Del Rio, Val Verde Co. (Pilsbry). Sabinal, Valde Co. (G. H. Clapp). Richmond, Ft. Bend Co. (J. Bequaert). New Braunfels, Comal Co. (Pilsbry). Bexar Co., at San Antonio (Singley), and Maedona (Wenzel). Frio Co., at Frio (Julia Gardner), and Derby (Singley). Victoria, Victoria Co. (J. Bequaert). Corpus Christi, Nueces Co. (Singley, Crandall). Calhoun Co. (A. D. Brown). Guadalupe R., Jackson Co. (J. D. Mitchell). Atascosa R., Live Oak Co. and Webb Co. (J. Gardner). Rio Grande City, Starr Co., and Donna, Hidalgo Co. (Ferriss). Brownsville, Cameron Co. (Pomeroy and others).

This is the only banded *Polygyra* of our fauna. It is a variable species. As Berlandier lived at Matamoras and gave Texas as the locality, we take the vicinity of Brownsville to be the type locality (Figs. 394 a, b).

In lots known to be from a single colony the size varies about as follows: Fort Worth, diameter 9.2 to 10.4 mm.; Houston, 8 to 10 mm.; Austin, 9 to 10.9 mm.; Victoria, 7.6 to 10 mm. In many museum lots, either known or presumed to have been picked up in various places around a given locality, there is greater variation, as in a Brownsville lot, diameter 6.5 to 11.6 mm.

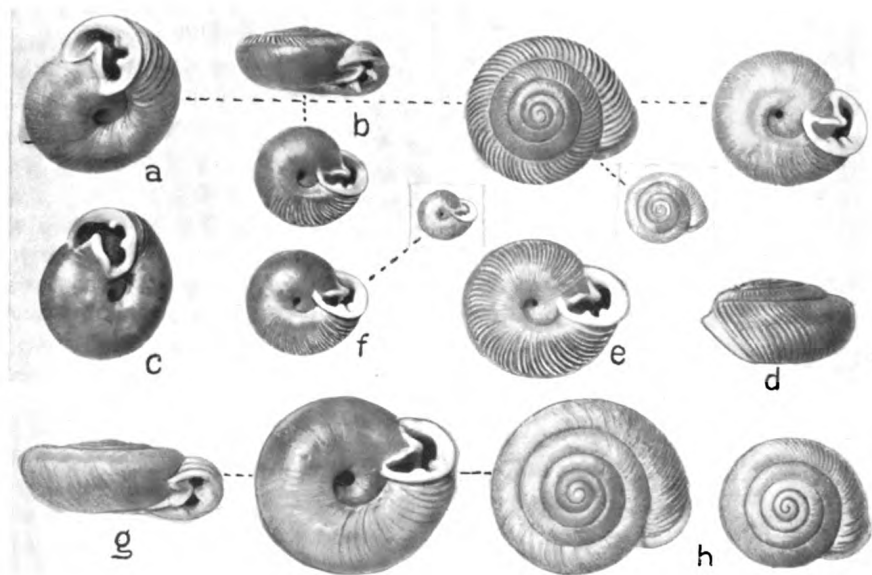


Fig. 394. a-c, *Polygyra texasiana*: a, b, Brownsville; c, Oklahoma City, Okla.; d, New Braunfels; e, Calhoun Co.; f, form *tillandsiac*, San Benito. g, *Polygyra texasiana texasensis*, Sanderson; h, Devil's river, "*hyperolia*". (Enlarged and actual size.)

Naturally extremes of size are often found in river drift lots; thus, in a lot of several hundred from drift of Frio River above Frio the diameter runs by easy stages from 6 to 11.2 mm., those under 9 mm. predominating.

In some specimens from Calhoun County (Fig. 394 e, no. 229 A.N.S.P., A. D. Brown), the rib-striae of the upper surface pass over undiminished onto the base; but in material seen, this is a somewhat rare mutation. I found similar but less strongly costulate specimens at Houston, and it occurs also at Brownsville. There are also transitions to the usual basal sculpture.

The group of stronger riblets passing over the periphery behind the outer lip varies rather widely in single lots. There may be fewer than half a dozen riblets there, or over three times that number.

The characters of the aperture show but little variation. In the northern localities, Oklahoma and Arkansas, the two lip teeth are perceptibly more widely spaced than in typical *texasiana*.

Form *tillandsiae* Cockerell (Fig. 394 f), is similar to typical *texasiana* in sculpture and teeth, very dilute cinnamon colored, not banded, but differs by its diminutive size, diameter 7.3 to 8 mm., the type 3.6 x 7.7 mm., 4 $\frac{3}{4}$  whorls. Found on *Tillandsia*, San Benito, Cameron County, Texas (Wilmatte P. Cockerell), Type 116250 A.N.S.P. This is provisionally considered to be a dwarf form owing to some quality of its station. It is one of the few arboreal polygyras.

A large number of similar shells, down to 6 mm. in diameter, was taken by Julia Gardner in Frio river drift 1 mile above Frio, together with all intergrades up to the usual size of *texasiana*. In some places large and small apparently occur in proximity, though possibly not together, as in a lot from Victoria collected alive by J. Bequaert, measuring from 7.6 to 10 mm. in diameter.

***Polygyra texasiana texasensis* Pilsbry**

Fig. 394 g, h.

*Polygyra texasensis* Pilsbry, 1902, Nautilus, 16: 31.

*Polygyra texasiana texasensis* Pilsbry & Ferriss, 1908, Proc. Acad. Nat. Sci. Phila., p. 129, pl. 5, figs. 11, 12.

*Polygyra texasiana hyperolia* Pilsbry & Ferriss, 1908, Proc. Acad. Nat. Sci. Phila., p. 128, pl. 5, figs. 13-15.

*Polygyra texasiana* Moric., Pilsbry, 1899, Nautilus, 13: 79, cf. Cockerell, ibid. p. 84 (as *P. triodontoides*), and 1905, Nautilus, 19: 69 (New Mexico).

The shell is somewhat more depressed than *P. texasiana*, with a somewhat wider umbilicus, contained 3 $\frac{3}{4}$  to 4 times in the diameter. The surface is almost smooth, being very finely striate (but sometimes weakly rib-striate) above and below, with a few rib-striae behind the lip-constriction. Uniform pale brown, or whitish at base; without a band. Last whorl a little narrower than in *texasiana*.

Height 5.6 mm., diameter 13.7 mm.; 5 $\frac{1}{4}$  whorls. Colorado City.

Height 5.6 mm., diameter 12.6 mm.; 5 $\frac{1}{4}$  whorls. Colorado City.

Height 5 mm., diameter 12.9 mm.; 5 $\frac{1}{2}$  whorls. Sanderson.

Height 4.8 mm., diameter 10.3 mm.; form *hyperolia*. Sanderson.

Height 4.3 mm., diameter 10 mm.; 4½ whorls; type of *hyperolia*.

Height 3.4 mm., diameter 9 mm.; topotype of form *hyperolia*.

TEXAS: Lyford, Cameron Co. (Ferriss). Laredo, Webb Co. (Singley). Faniass ranch, Maverick Co. (Julia Gardner). 12 miles east of Brackettville, Kinney Co. (Ferriss). Between Taut City and mouth of San Christobal Creek, Live Oak Co. (J. Gardner). Hondo River near Hondo, Medina Co. (Pilsbry). High mesa west of Devil's River, Type of *hyperolia*, 91363 A.N.S.P., and Pecos R. region, etc., Val Verde Co. (Pilsbry & Ferriss). Colorado City, Mitchell Co. (Ferriss), Type 83258 A.N.S.P. McCamey, Upton Co. (Cheatum). Sanderson, Pecos Co. Alpine, Brewster Co. (Ferriss).  
NEW MEXICO: Near Roswell, in a deposit probably Pleistocene (Tinsley).

This smoothish race was first recognized in specimens of maximum size from Colorado City. Subsequently the small specimens of the Devil's River and lower Pecos were called *P. texasiana hyperolia*. The distinction is not valid, as in many places, such as Sanderson, both large and small occur, diameter 11 to 13 mm. In a lot of the small form from Devil's River the diameter runs 8.2 to 11 mm. The size perhaps bears a direct relation to the humidity of the station.

In the high land west of Devil's River we found it living under prostrate yucca trunks and sometimes concealed under the downward-drooping dead leaves of standing yuccas. In one place near the mouth of the Pecos it was taken on agave. It is abundant in the drift debris of the Pecos and Devil's River. The specimens from the lower Rio Grande counties may be drift shells; none of those seen were collected alive.

In New Mexico Prof. J. D. Tinsley collected it on South Spring Creek, near Roswell, in the Pecos valley, where it occurred fossil in a bed of white marl, three to four feet below the surface (Cockerell, *Nautilus*, 19: 69). This is the only record of *Polygyra* from New Mexico. A single specimen picked from drift debris of the Red River at DeKalb, Bowie County, Texas, may have floated from the headwaters in western Texas. Evidently the race will be found to range north of localities now known.

***Polygyra chisosensis* Pilsbry**

Fig. 395 a, b.

*Polygyra chisosensis* Pilsbry, 1936, *Nautilus*, 49: 100.

The shell is depressed, about like *P. texasiana* in shape, the umbilicus contained about 4½ times in the diameter; light brown, feebly translucent, of 5 convex whorls, the last equably rounded at periphery, descending rather deeply in front, constricted behind the outer and basal margins of lip. Surface glossy, the first whorl smooth, the rest with very low, unequal ripples of growth, and close behind the peristome with a group of sharp but fine striae. Under the microscope a minute granulation is seen on post-embryonic whorls, weak or nearly effaced on the last whorl. The aperture is strongly oblique, the outer and basal margins of the peristome reflected, the basal conspicuously recurved. Within the outer margin there is a broad, inwardly bent, concave ledge, which is thickened at its lower

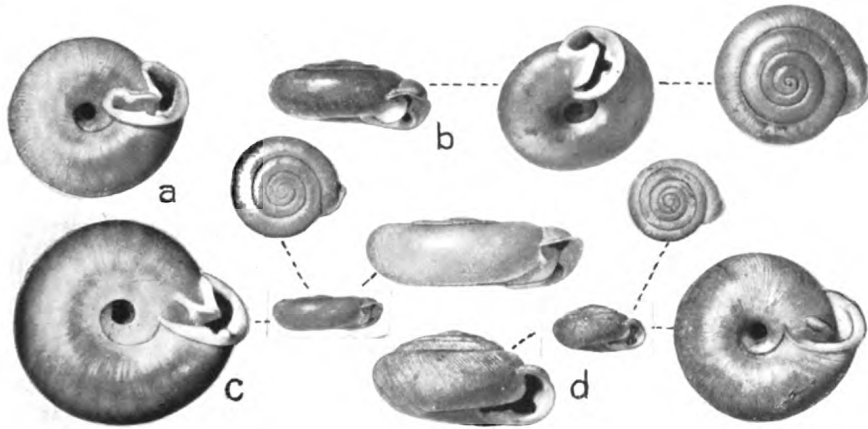


Fig. 395. a, b, *Polygyra chisosensis*, type (a) and paratypes, ( $\times 2$ ). c, *Polygyra chisosensis discobolus*, type. d, *Polygyra latispira*, type. (Actual size and  $\times 2$ .)

edge into a rounded, projecting tooth. In the basal margin an erect, narrower tooth stands. There is on the parietal wall a biramose or v-shaped tooth, the branch towards the columella being very high and longer than that towards the upper lip-insertion. A short distance within a callous tubercle stands on the wall of the columellar axis.

Height 5 mm., diameter 11.8 mm.

TEXAS: Chisos Mountains, Brewster County (Ferriss and Pilsbry, 1922), the Type 166077 A.N.S.P., from a northeast slope N.E. of Naill's ranch house.

*P. texasiana* has stronger sculpture and differs in shape of the tooth in the outer lip, which in *P. chisosensis* forms a concave, inflected plate. The smoothish western forms of *texasiana* have coarser riblets behind the lip, besides the difference in teeth. All forms of that species differ by lacking an internal tubercle on the columella. *P. mooreana* has a callous tubercle on the columella, within, doubtless homologous with that of *P. chisosensis*.

It occurs in moderately humid stony talus slopes in some abundance, and was hibernating under the top layer of stones when we were there late in November. The extremes of size in a large lot are 9.5 to 13.4 mm. in diameter.

***Polygyra chisosensis discobolus*** Pilsbry

Fig. 395 c.

*Polygyra chisosensis discobolus* Pilsbry, 1936, Nautilus, 49: 101.

The shell is flatter and usually larger than *P. chisosensis*, the umbilicus wider, contained  $3\frac{2}{3}$  times in the diameter. The parietal tooth is further from the columellar lip, which does not bend forward at its insertion. Internal axial tubercle weaker.

Height 4.8 mm., diameter 14.2 mm. Type.  
 Height 4.5 mm., diameter 12.3 mm. Smallest shell.

TEXAS: Foothills of the south side of the Chisos Mountains, in the Blue Creek region, Brewster County (J. H. Ferriss, 1925), Type 144355 A.N.S.P.

***Polygyra latispira*** Pilsbry

Fig. 395 d.

*Polygyra latispira* Pilsbry, 1896, Proc. Acad. Nat. Sci. Phila., p. 16, pl. 3, figs. 13-16.

Shell depressed, with convex spire, rounded but noticeably shouldered periphery and convex base; umbilicated, the umbilicus within deep and cylindrical, about .8 mm. diameter, at the last whorl rapidly enlarging, 2.3 mm. diameter, or contained about five times in the diameter of the shell; around it the last whorl is conspicuously grooved. Surface very closely and regularly rib-striate, moderately shining. Light yellow or buff in color. Whorls closely coiled, slowly widening, rather convex, having an oblique impression behind the outer, and an excavation behind the basal lip. Suture well impressed, descending only a trifle at the aperture. Aperture quite oblique, roundly lunate, the lip forming two-thirds of a circle, rather narrowly reflexed; outer lip bearing an inwardly projecting pointed tooth which is set somewhat obliquely on the lip; basal lip with a slightly keeled face along its outer half, the inner part bearing a rather long, low, flat-topped tooth with the summit a trifle flanged outwardly. The inner end of this tooth runs inward, connecting with a short spiral callous ridge on the axis; in the aperture appearing like a deeply placed tooth. Parietal tooth small, V-shaped, the outer ridge of the V extremely short.

Height 6.3 diameter 11.9 mm.; 5½ whorls.

TEXAS: Great Bend of the Rio Grande, or near El Paso (H. C. Wood), Type and paratype 57224 A.N.S.P.

The closely coiled whorls and the fine, even striation, as well as the different aperture, at once separate this species from *P. texasiana* and *P. chisosensis*. It agrees with *P. helictomphala* (Pfr.), in the form of the umbilicus, which is far wider within and less enlarged in the last turn than in *texasiana*, but the lip teeth differ and the striation of *latispira* is finer. Perhaps it belongs to the Mexican group of *P. yucatanica* (Morel.), although the shape of the basal tooth and the presence of an internal ridge on the columellar axis are discrepant features.

Two specimens were collected about 1880 by Dr. Horatio C. Wood, either in the "Great Bend" of the Rio Grande or near El Paso, exact locality not noted. In more than forty years since this snail was described, no additional specimens have turned up. However, the Big Bend country is still almost unknown malacologically except for small areas in Brewster County. Neither of the specimens is fully mature.

(*Latispira*, wide spire.)

***Polygyra mooreana*** (W. G. Binney)

Fig. 396 a-d.

*Helix mooreana* W. G. Binney, 1857, Proc. Acad. Nat. Sci. Phila., p. 184; 1859, Terr. Moll., 4: 80, pl. 78, fig. 24.—J. A. Singley, 1893, Geol. Surv. Texas, 4th Ann. Rep., p. 306.

*Polygyra mooreana* W. G. Binney, 1878, Terr. Moll., 5: 271, fig. 170, pl. 6, fig. q (teeth).—O. A. Crandall, 1892, Nautilus, 6: 103.—Gratacap, 1901, Bull. Amer. Mus. Nat. Hist., 14: 373, with var. *minor*.—Pilsbry & Ferriss, 1906, Proc. Acad. Nat. Sci. Phila., p. 129, pl. 5, figs. 4-10.—Strecker, 1908, Nautilus, 22: 65, 66; and 1910, 24: 5.

The depressed shell is narrowly umbilicate, the umbilicus well-like, in the last whorl widening to about three times its earlier diameter, contained about 4 to  $4\frac{1}{2}$  times in the diameter; the last whorl deeply furrowed parallel to the umbilical suture. Spire convex, of slowly increasing whorls, the last shortly descending in front, the periphery well above the middle, narrowly rounded, the surface below it slanting in towards the convex base; rather deeply and narrowly guttered behind the lip. Pale brown, the base lighter and slightly translucent. First whorl with curved striae radiating from suture about half way across the whorl, following whorls lightly striate or weakly ribbed, the ribs becoming strong on the last two whorls, and stronger

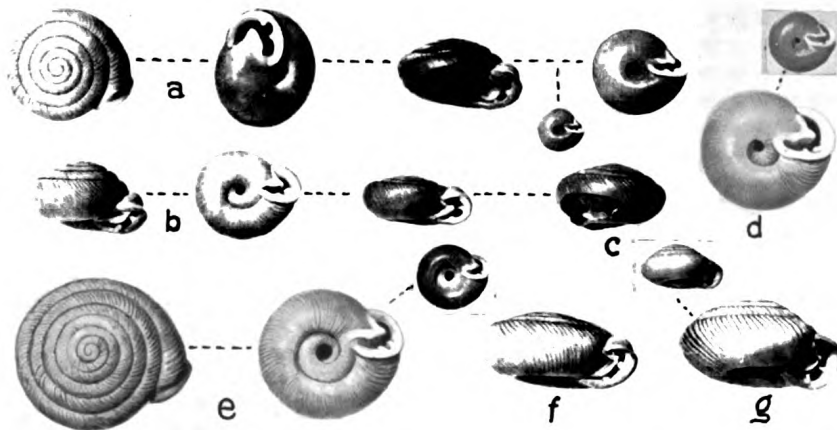


Fig. 396. a-d, *Polygyra mooreana*: a, Austin; b, c, Hondo; d, Fort Worth. e, *Polygyra tholus*, Washington Co.; f, g, specimens from Binney. (Enlarged and actual size.)

for a short distance behind the lip; the base smooth, with growth lines only (or quite weakly ribbed). The lip forms about two-thirds of a circle and is strongly reflected in the outer and basal margins, thickened within, its inner edge bearing two laterally compressed subequal teeth separated by a deep sinus, the outer tooth at middle of the lip-arc, a low ledge within the lip above it. The widely separated lip-insertions are joined by a parietal callus bearing a v-shaped tooth. About one-fifth of a turn within there is a callous tubercle on the columellar axis, standing upon a spiral ridge which corresponds to the furrow within the umbilicus.

“Greater diameter  $8\frac{1}{2}$ , lesser 7, alt. 3 mm.” (Binney.)

Height 4.2 mm., diameter 8 mm., 6 whorls. Washington County.

Height 4.5 mm., diameter 8.8 mm., 6 whorls. Fort Worth.

Height 3.2 mm., diameter 6.5 mm.,  $5\frac{1}{4}$  whorls. New Braunfels.

Height 4.7 mm., diameter 7 mm. New Braunfels.



TEXAS: Fort Worth, Tarrant Co. (Sampson). Waco, McLennan Co. (Strecker, Ferriss). Belten, Bell Co., subfossil (Crandall). Galveston (Ferriss). Austin (Pilsbry). San Marcos, Hays Co. (Ferriss & Pilsbry). Smithville, Bastrop Co. (Ferriss & Pilsbry). Elm Creek, Lee Co. (C. W. Johnson). Washington Co., type locality (Dr. Francis Moore). New Braunfels, Comal Co. (Pilsbry, Singley, H. B. Baker and others). Macdona, Bexar Co. (H. A. Wenzel). Hondo, Medina Co. (Pilsbry & Ferriss). Matagorda Peninsula (Strecker). Reported by J. A. Singley from the following counties also: Burlson, Brazos, Anderson, Williamson, Lampasas, Burnet, Fayette, Waller, Austin, Wharton, Fort Bend, Webb, Nueces, Starr, and Hidalgo.

The whorls increase more slowly than in *texasiana*, the last being but little wider than the penult. In shells of equal diameter there is one whorl more in *mooreana*. Within the last whorl there is a callous nodule or tubercle on the axis, quite near the aperture, not present in *texasiana*. This tubercle varies widely in size, and rarely it is absent.

Binney's description of this snail is inexact in several respects. He termed it "subcarinated", but only the most depressed examples can be called obtusely subangular. The color is "white" only when bleached. While *P. mooreana* is mainly a species of the humid division of the Lower Austral zone, it extends far into the semiarid division southward, if Singley's records are to be trusted. Ferriss did not find it in the lower Rio Grande counties. It seems possible that Singley's material from those counties is *P. texasiana* form *tillandsiae*. Binney stated that *P. mooreana* occurs "also in the neighboring Mexican states", but there is no more definite Mexican record. In Comal County it is very abundant in the river valley, where the humid country flora and fauna extend in narrow digitations into the semiarid region along the border of the Edwards Plateau. In Medina and Bastrop counties also I have taken it only along streams.

In Comal County the diameter runs from 6.6 to 7.5 mm., and 7.7 to 8.2 mm. in different lots taken along the Guadalupe River. They average decidedly smaller than in counties northeastward. The elevation of the spire varies widely in nearly all lots examined. In some lots there are specimens with rather wide umbilicus, as in Figure 396 b, from Hondo. Mr. Singley found a sinistral shell at New Braunfels.

Mr. J. K. Strecker (*Nautilus*, 22: 66) reported that he "found specimens of a variety of this species with a hirsute epidermis" near the gravel pit north of Waco. Possibly what he had was *P. leporina* (Gld.).

The "var. *minor*" of Gratacap was defined as "mature but smaller shells." No locality.

(Named for Dr. Francis Moore, a Texan correspondent of Mr. Binney.)

***Polygyra tholus*** (W. G. Binney)

Figs. 396 e, f, g.

*Helix tholus* W. G. Binney, 1857, Proc. Acad. Nat. Sci. Phila., p. 186; 1859, Terr. Moll., 4: 81, pl. 77, fig. 21; 1878, Terr. Moll., 5: 272, fig. 171, as synonym of *P. mooreana*.

*Helix mooreana* var. *tholus* W. G. B., Singley, 1893, Geol. Surv. Texas, 4th Ann. Rep., p. 306.

*Polygyra mooreana tholus* W. G. B., Pilsbry, 1906, Proc. Acad. Nat. Sci. Phila., p. 130, pl. 5, figs. 1-3.

The shell is larger than *P. mooreana*, with far wider umbilicus, showing a full turn, and contained about  $2\frac{1}{2}$  times in the diameter (or smaller,  $3\frac{1}{2}$  times). At the umbilicus the last whorl is deeply furrowed parallel to the umbilical suture. Upper surface rib-striate, the sculpture weaker on the base. Spire low dome-shaped, of closely coiled whorls. Aperture as in *P. mooreana*. Within the last whorl the axis has a ridge corresponding to the furrow around the umbilicus, with a strong tubercle upon it one-fourth of a turn behind the aperture.

"Greater diameter 11, lesser 9, height 4 mm." (Binney.)

Height 6 mm., diameter 10.4 mm.,  $6\frac{1}{2}$  whorls. From W. G. B.

Height 4.7 mm., diameter 10.3 mm.,  $6\frac{1}{2}$  whorls. Washington County.

Height 5.2 mm., diameter 9.1 mm.,  $6\frac{1}{2}$  whorls. Calhoun County.

Height 5.7 mm., diameter 11.2 mm.,  $7\frac{1}{4}$  whorls. Washington County.

TEXAS: Brazos and Fort Bend Counties (Singley); Washington and Calhoun Counties (A. D. Brown); Galveston (Ferriss).

This form holds such a relation to *P. mooreana* as *P. d. sampsoni* to *P. dorfeuilliana*, being very openly coiled beneath, with a deep and very long groove on the last whorl within the umbilicus. The internal tubercle on the axial ridge is like that of *P. mooreana*.

It seems to be comparatively local in distribution and is certainly rare. I have never seen a fresh specimen. It was described from "Texas" with some doubt, from a single specimen in Bland's collection, the collector unknown.

It is typically quite distinct from *P. mooreana*. I have never seen a truly intermediate example, and Singley doubted the propriety of ranking it as a variety of *mooreana*. In the small series seen there is a good deal of variation in the width of the umbilicus, but it remains larger than in any *mooreana* compared. In Binney's woodcut it is about like the narrowest mentioned in the above description. It may be best to allow this snail specific standing until adequate collections clarify its relation to *mooreana*.

The specimens Ferriss found at Galveston are old "bones" and may have drifted down. Dr. E. von Martens states that a worn specimen was found at Vera Cruz by Friedel; if identified correctly, it probably drifted into the Gulf from some Texan river.

(*θόλος*, a dome.)

#### POLYGYRA PLICATA GROUP

This series comprises Polygyrae of the Cumberland Plateau and the Ozarkian uplift, but some species extend beyond those regions into the austroriparian belt, reaching the Gulf coast in Alabama and Texas. The species are so complexly interrelated that no satisfactory sequence is obvious.

After the early descriptions of Say and Lea, American as well as European authors went far astray in their identifications and synonymy of these snails. The clear-headed and orderly Bland revised the group as then known in 1858. His results were quoted (without acknowledgment) by W. G. Binney, and are still accepted practically unchanged. The early synonymy can be found in his essay, and need not be repeated here.

The following key is artificial, some nearly related forms being separated, while others less closely related are brought together.

*Key to species*

1. V-shaped parietal tooth very long, its ramus towards columella without a projecting angle; outer palatal tooth deeply immersed; Ozarkian.....2  
Ramus of parietal tooth towards columella having a salient angle.....3
2. Base smoothish; umbilicus small, about 4½ to over 5 times in diameter; two lip teeth subequal.....*P. jacksoni*  
Base ribbed; umbilicus large, about 2½ times in diameter; basal tooth marginal.  
*P. peregrina*
3. Basal tooth decidedly smaller than the outer tooth; surface ribbed; Cumberlandian. 4  
Basal and outer teeth subequal in width.....5
4. Periphery strongly carinate.....*P. fatigiata*  
Periphery not carinate.....*P. troostiana*
5. Upper palatal tooth deeply immersed; a distinct projection on outer ramus of parietal tooth; Cumberlandian.....*P. plicata*  
Upper palatal tooth only moderately immersed; no projection on outer ramus of the squarish parietal tooth; Ozarkian, etc. ....*P. dorfeuilliana*

***Polygyra plicata* Say**

Fig. 397: 1, 2, 13.

*Polygyra plicata* Say, 1821, Journ. Acad. Nat. Sci. Phila., 2: 161.

*Polygyra plicata* Say, Binney's reprint, p. 21.—Pilsbry, 1897, Nautilus, 11: 83.—Wheeler, 1912, Nautilus, 25: 123.—Price, Nautilus, 14: 75.—Walker, 1928, Terr. Moll. Alabama, p. 17, fig. 20.—Daniels, 1903, 27th Ann. Rep. Indiana Dept. Geol. etc., p. 580.

*Helix hazardi* Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 6: 291, pl. 9, figs. 27-30.—W. G. Binney, 1859, Terr. Moll., 4: 84, pl. 78, fig. 13.

*Polygyra hazardi* Bld., Binney, 1878, Terr. Moll., 5: 276, fig. 176, pl. vi, fig. o (teeth).

The shell is perforate, expanding in the last whorl into a wide umbilicus, contained 2¼ to 3 times in diameter; depressed, with a slightly convex (or nearly flat) spire and a rounded periphery, most convex above the middle; buckthorn brown with some golden gleam. After a small initial smooth space the embryonic shell has little radial ridges narrower than their intervals for a half whorl, then becoming closer, retractive striae. Last whorl has moderately coarse rib striae above and below, and a few short hairs, usually preserved only in the umbilicus and behind the lip. The last whorl descends abruptly in front. Behind the upper margin of the lip a shallow curved pit runs backward, and with the deep furrow close behind the basal lip, defines a smooth convex area at the periphery. The last whorl is somewhat excavated above the umbilical suture and behind the columellar lip. The reflected peristome forms about three-fourths of a circle. Immersed within the outer margin there are two teeth, one in the outer lip more deeply placed, curved, the concavity outward, its lower end

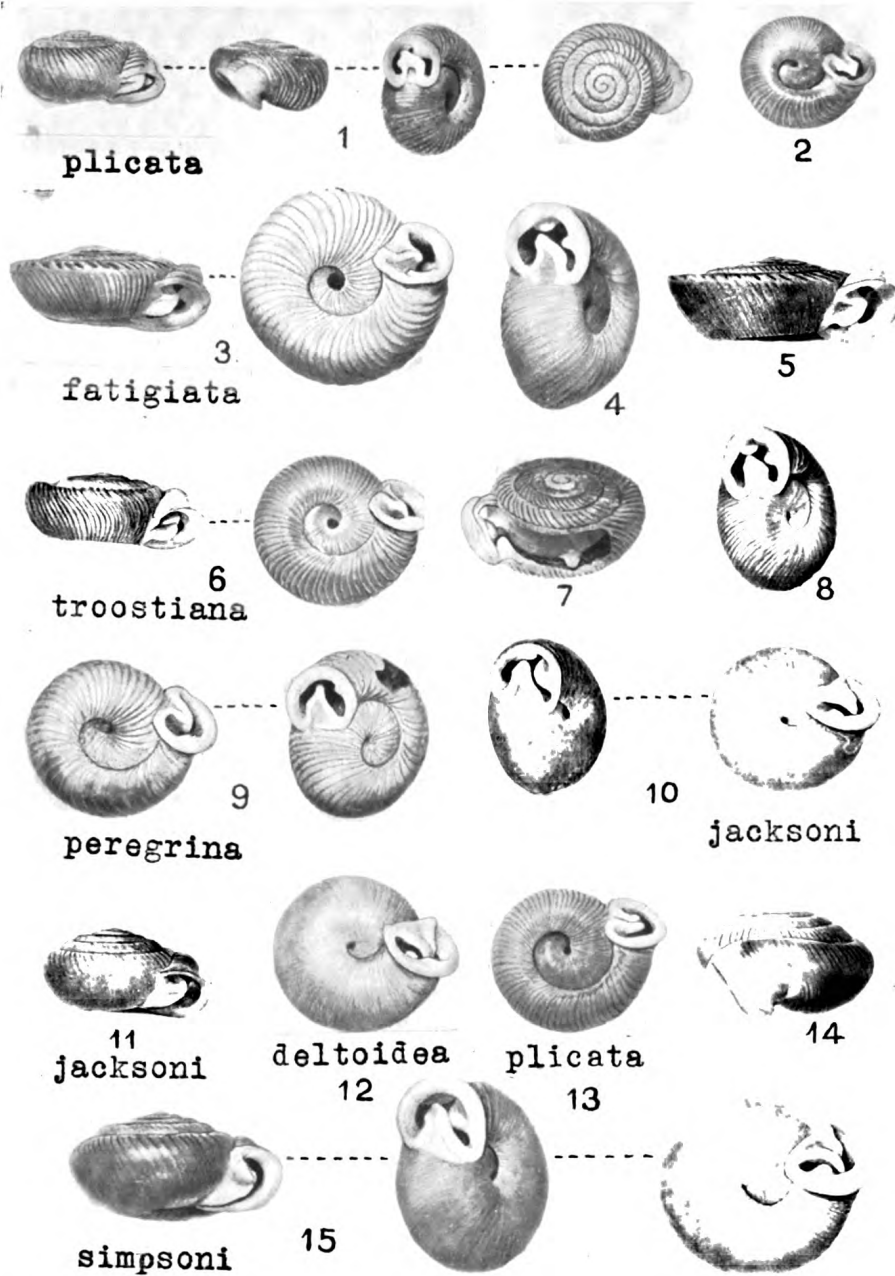


Fig. 397. 1. *Polygyra plicata*, near Huntsville, Ala.; 2, near Cave City, Ky. 3. *P. fatigiata internuntia*, Clarksville, Tenn. 4. *P. fatigiata*, type; 5. Nashville, Tenn. 6. *P. troostiana*, Lauderdale Co., Ala; 7. Tennessee; 8. Davison Co., Tenn. 9. *P. peregrina*, paratypes. 10, 11, *P. jacksoni*, Ft. Gibson, Okla. 12. *P. j. deltoidea*, paratype. 13. *P. plicata*, Mumfordsville. 14, 15, *P. jacksoni simpsoni*, Wyandotte, Okla. (All  $\times 3$ .)

concealed by the heavy, convex tooth a short distance within the basal lip. The inner end of this tooth turns abruptly inward, runs obliquely toward the columella which it joins some distance within. The parietal tooth is irregular Fig. 397: 1, having two rami running to the lip-ends and a narrow entering branch. In a basal view it appears to have a prominence on the side towards the upper margin of lip.

“Breadth one-fourth of an inch.” (Say.)

Height 2.8 mm., diameter 6.1 mm. 5 whorls. Mobile.

Height 3 mm., diameter 6.7 mm. Mobile.

Height 3.1 mm., diameter 7.7 mm. Mumfordsville, Kentucky.

Height 2.8 mm., diameter 5.5 mm. Near Cave City, Kentucky.

INDIANA: North bank Ohio River near Clarksville, Floyd Co. (L. E. Daniels).

KENTUCKY: Brooklyn Bridge, Butler Co. (C. R. Crosby). Mumfordsville, Hart Co. (A. O. Currier). Near Cave City, Barren Co. (J. B. Clark). Burnside, Pulaski Co. (H. E. Sargent).

TENNESSEE: Cowan, Franklin Co. (Archer). Marion Co. at Dove and near Jasper (H. B. Baker); South Pittsburgh (H. H. Smith); Sequatchie valley (Bishop Elliott). W. Pikeville, Bledsoe Co. (H. B. Baker). Roane Co. at Harriman (S. N. Rhoads), and 2 miles west of Kingston (Clench & Archer). Campbell Co. (A. R. Cahn). North of Fountain City, Knox Co. (H. B. Baker). Citico, Monroe Co. (A. G. Wetherby).

ALABAMA: (Say). Recorded by Walker from localities in the following counties: Bibb, Colbert, Cullman, Fayette, Franklin, Jackson, Jefferson, Lauderdale, Madison, Marion, Mobile, Pickens, Tuscaloosa.

GEORGIA: Chatsworth, Murray Co. (C. C. Allen).

The localities are scattered over middle Kentucky, middle and eastern Tennessee, all of Alabama except the southeastern quarter, and a single place in northwestern Georgia.

This species resembles *P. jacksoni* in having a small, smooth, convex area behind the outer lip, but differs in the wide umbilicus and the sculpture. Say's specimens, 11027 A.N.S.P., were labelled by him, and are mounted on one of the cards he used, but the locality given is Kentucky. Unless this was an error, they may not be the original types, but specimens he acquired subsequently. They agree with his description, where the locality Alabama was assigned.

*Helix hazardi* was a substitute name for *plicata*, which had been used for a species of “*Helix*”, but not in *Polygyra*. The name *plicata* refers to the fold-like striae.

#### ***Polygyra fatigiata* Say**

Fig. 397: 4, 5.

*Polygyra fatigiata* Say, 1829, New Harmony Disseminator, 2: 229.—Binney's reprint, p. 37.

*Helix fatigiata* Say, Binney, 1851, Terr. Moll., 2: 193 (in part), pl. 39, fig. 4.—Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 6: 283, pl. 9, figs. 17-20.

*Polygyra fastigiata* (Say in original MS., according to W. G. B.), Bland, *l. c.*, footnote.

*Helix fastigans* L. W. Say, Bland, 1860, Ann. Lyc. Nat. Hist. N. Y., 7: 141; n. n. for “*Helix fastigiata*” Say not Hutton.—Binney & Bland, 1869, L. & Fr. W. Sh. N. A., 1: 97, fig. 173.

*Polygyra fastigans* L. W. Say, Binney, 1878, Terr. Moll., 5: 273, fig. 173, pl. 6, fig. H (teeth).

The shell is openly perforate, becoming broadly umbilicate in last whorl ( $2\frac{3}{4}$  times in diameter), strongly depressed, the upper surface flat or nearly so, base convex; dilute cinnamon-buff, the base somewhat paler. Last whorl is carinate throughout, contracted behind the peristome. Embryonic shell at first nearly smooth, with short radial threads near suture; becoming striate across the last embryonic whorl. Last whorl strongly rib-striate above, the intervals wider than the ribs, showing indistinct spirals and irregular microscopic wrinkle-granulation. Base smoother, only weakly striate, with microscopic lineolation and spirals, and a few widely scattered papillae, probably hair-scars. The aperture is as described for *troostiana*, the outer lip-tooth receding, rounded, about twice the width of the basal tooth; but the upper ramus of the parietal process has a straighter edge than in *troostiana*. On the columellar axis one-fourth of a turn within there is a high tubercle, as in *P. troostiana*.

Height 3.6 mm., diameter 10.2 mm.; 6 whorls. Type.

Diameter 9.5 to 10.4 mm. Nashville.

INDIANA: vicinity of New Harmony (Lesueur), Type 11045 A.N.S.P.

KENTUCKY: Henry Co. (W. G. Binney).

TENNESSEE: Clarksville, Montgomery Co.; Nashville; Franklin Co. (W. G. B.).

The nearly flat spire and strongly carinate periphery are highly characteristic. It is closely related to *P. troostiana* by the sculpture of the upper surface, the apertural structure and the internal tubercle on the axis. It differs by the carinate periphery, the larger size and the weakness of the basal sculpture; as Say said, "the elevated lines are obsolete below the carina." Of these differences, the first only is constant in the series seen; the others vary. In Say's type the base appears smooth, but under the lens shows traces of weak striae. In Nashville *fatigiata* the striation of the base varies from weak to moderate.

(Name is an error for *fastigiata*, sharpened at the top. It is a case where adherence to the original spelling is rather stupidly meticulous.)

***Polygyra fatigiata internuntia*** new subspecies

Fig. 397: 3.

*Helix troostiana* var. b., *carinata* and var. c, *minor* Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 6: 290. Not *Helix carinata* Hombron et Jacquinot.

In shells from Clarksville, Tennessee (Type 67654 A.N.S.P.) the base is strongly ribbed, the ribs continued from the upper surface, few being added (or in some individuals numerous striae are intercalated below the carina, about doubling the number). The size runs from 2.9 x 8.4 mm. to 3.4 x 9.3 mm.

I have seen a number of unlocalized Tennessee lots; the distribution of this race or "form", is even less fully known than that of *P. fatigiata* proper. Bland evidently had the same ribbed form, which he referred to *troostiana*. He recognized two varieties described thus:

"Var. b,—*carinata*. Diameter maj. 9, min. 8, alt. 3 mm." His remark in another place on the same page apparently refers to this form:—"I have moreover two specimens in my cabinet, both hirsute, which are as acutely carinated as *fatigiata*, with the striae as prominent below as above, in one more numerous, but both having the parietal tooth of *troostiana*."

"Var. c,—*minor*. Carinate, and with striae below more numerous than above, an additional one being intercalated between nearly every pair passing over the carina. Diameter maj. 8, min. 7, alt. 3."

Bland gave no localities, and his names are not valid, as both had previously been used in *Helix*. Whether this basally ribbed shell is referable to *fatigiata* or to *troostiana* is a question for further investigation, with much larger collections from middle Kentucky and Tennessee than are now available.

(*Internuntia*, a go-between.)

***Polygyra troostiana* Lea**

Fig. 397: 6, 7, 8.

*Polygyra troostiana* Lea, 1839, Trans. Amer. Philos. Soc., 6: 107, pl. 24, fig. 119 (Tennessee).—Binney, 1878, Terr. Moll., 5: 275, fig. 175, pl. vi, fig. D, pl. xv, fig. 1 (teeth and genitalia).—Walker, 1928, Terr. Moll. Alabama, p. 20, fig. 22.

*Helix troostiana* Lea, Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 6: 288, pl. 9, figs. 21-23.

The shell is openly perforate, in the last whorl expanding into a wide umbilicus showing one turn, and contained  $2\frac{1}{2}$  times in the diameter; strongly depressed, with slightly convex or nearly flat spire; upper surface of the last whorl is very convex; periphery above the middle; color buckthorn brown. Embryonic shell of  $1\frac{1}{2}$  whorls, the first half turn having interrupted little radial ridges, followed by fine, retractive striae. The last whorl has strong, retractive rib striae with slightly wider intervals on the upper surface, and passing over upon the base. There are a few hairs in the most perfectly preserved specimens. The peristome forms two-thirds of a circle with the terminations joined by an irregular entering parietal process which bears three projections towards the lip. The outer lip has a short callous flange on its face below the middle; above the somewhat abrupt end of this flange a rounded tooth may be seen a short distance within. On the inner margin of the basal lip there is a smaller tooth. About one-fourth of a turn within there is an erect nipple-shaped tubercle on the columella, seen only by breaking the shell (Fig. 397: 7).

Height 3.6 mm., diameter 8.1 mm.;  $5\frac{3}{4}$  whorls.

Height 3.4 mm., diameter 6.7 mm.;  $5\frac{1}{2}$  whorls. Davison Co.

TENNESSEE: Nashville, (J. B. Clark) and Glendale Hills, southward (Archer), Richland Creek (S. N. Rhoads), Davison Co. Alexandria, DeKalb Co. (Pilsbry). Murfreesboro, Rutherford Co. (W. G. Binney).

ALABAMA: Choocolocco Mts., Germania Spring, Calhoun Co. Craig Mt., Cherokee Co. Dugger Mt., Cleburne Co. Cedar Island and Florence, Lauderdale Co. Huntsville, Gurley, Monte Sano and Normal, Madison Co. (Walker<sup>1</sup>).

A species of middle Tennessee, northern and northeastern Alabama. It is smaller than *P. fatigiata*, and with the upper surface less flattened, and is readily distinguished from *P. plicata* by having the ribs extend to the peristome, without a smooth convex area behind the lip, such as *plicata* has. It differs also by having a tubercle on the columellar axis within, as in *peregrina fatigiata* and *dorfeuilliana*.

<sup>1</sup> Walker's localities are mainly or entirely from collections of H. H. Smith.

Typically the striae are continuous from upper surface to base, but in some lots a nearly equal number is intercalated, so that the lateral and basal surfaces have more and closer striae than the upper surface.

The vicinity of Nashville, Tennessee, may be considered type locality. (Named for Girard Troost, 1776-1850, eminent geologist of Tennessee.)

***Polygyra peregrina* Rehder**

Fig. 397: 9.

*Polygyra peregrina* Rehder, 1932, *Nautilus*, 45: 130, fig. 1.

"Shell in form and sculpture like *P. troostiana* Lea, but tending to average slightly larger; whorls about 6 to 6½, about half a whorl more than in specimens of *troostiana* of the same size. Color generally pale corneous, somewhat glossy. Umbilicus smaller than in *troostiana*. The important difference, however, is in the teeth. The parietal tooth is more pointed and prominent; the basal tooth is further out on the lip, not as deep as in *troostiana*, and is longer and not as conical; the superior palatal tooth is deeper and broader. These differences in the teeth are the important characters, and may easily be seen in figures. Alt. 3.5 mm., diameter maj. 8 mm., min. 6.9 mm.; 6 whorls." (Rehder.)

Paratypes measure 3.1 x 8.2 mm., 6 whorls, and 3.8 x 8.4 mm., 6½ whorls.

ARKANSAS: Foot of dolomitic bluffs of White River at Calico Rock, Izard County (Ernest J. Palmer). Type 81349 M.C.Z., paratypes 157620 A.N.S.P. and in collection of H. Rehder.

This species unites characters of *P. troostiana* and *P. plicata*, being allied to the latter by the deeply immersed tooth within the outer lip which is marked externally by an oblique furrow. This furrow together with a pit marking the place of the basal tooth, bounds an oblique, convex, smooth little area behind the lip in the peripheral region, such as *plicata* and *jacksoni* possess. *P. peregrina* is similar to both *plicata* and *troostiana* in shape and sculpture, but it differs from both in the narrower parietal tooth, which has the apex more prolonged inward. It possesses a small tubercle on the columellar axis about a fourth of a turn within, seen only by breaking the shell. This is a character of *troostiana*, wanting in *plicata*. The umbilicus is contained about 2½ times in the diameter.

(*Peregrina*, a stranger.)

***Polygyra jacksoni* (Bland)**

Fig. 397: 10, 11.

*Helix jacksoni* Bland, 1866, *Amer. Journ. Conch.*, 2: 371, pl. 21, fig. 8.

*Helix (Polygyra) jacksoni* Bland, Simpson, 1889, *Proc. U. S. Nat. Mus.*, 11: 449.

*Polygyra jacksoni* Bld., W. G. Binney, 1878, *Terr. Moll.*, 5: 275, fig. 174.—F. A. Sampson, 1893, *Nautilus*, 7: 34; 1894, 8: 18, 36; 1893, *Kansas Review of Science and Industry*, 6: 23; 1887, *Amer. Nat.*, p. 85; 1893, *Ann. Rep. Geol. Surv. Ark.* for 1891, 2: 185; 1911, *Nautilus*, 25: 40; 1913, *Trans. Acad. Sci. St. Louis*, 22: 100.—Ferriss, 1900, *Nautilus*, 14: 28.—Pilsbry, 1903, *Proc. Acad. Nat. Sci. Phila.*, p. 196.—Pilsbry & Ferriss, 1907, *Proc. Acad. Nat. Sci. Phila.* for 1906, p. 538, pl. 20, figs. 1-5.

"Shell narrowly umbilicate, depressed, shining, dark or pale horn-colored, little elevated above, striated, convex beneath, with finer almost obsolete



striae; whorls 6, slightly convex, gradually increasing, the last suddenly deflected, contracted and above gibbously inflated behind the aperture; suture impressed; aperture oblique, lunate-circular, with three teeth; peristome thickened, brownish-red, shortly reflected, with the scarcely approaching margins joined by a white, linguiform, bicrural, deeply entering tooth, the basal margin with a strong oblique, sinuous fold, the right with a deeply seated tooth. Diameter maj. 7, min. 6, alt. 4 mill." (Bland.)

Height 3.9 mm., diameter 8.2 mm. Van Buren, Ark.

Height 3.6 mm., diameter 7 mm. Fort Gibson, Okla.

Diameter 6.3 to 7.3 mm. Wyandotte, Okla.

MISSOURI: Greene Co. at Ash Grove (Sampson), and Springfield (Ferriss). Grand Falls, Jasper Co., Split Log, Macdonald Co., and Cassville, Barry Co. (Sampson). Newton Co. at Chester (Ferriss), and south of Shoal Creek (R. W. Jackson). Dade and Camden counties (Sampson).

ARKANSAS: Eureka Springs, Carroll Co. (F. A. Sampson). South of Winslow (Sampson), and Sulphur City, Washington Co. (A. J. Brown). Porter and Van Buren, Crawford Co. (Sampson), Franklin Co. (Sampson). Blue Mt. Station and Petit Jean Mts., Logan Co. (Pilsbry & Ferriss).

OKLAHOMA: Fort Gibson, Muskogee Co. (V. B. Hubbard), Type 1806 M.C.Z. Wyandotte, Ottawa Co. (Ferriss & Pilsbry).

*P. jacksoni* has about the size of *P. plicata*, with which it agrees in having a small convex patch behind the lip, defined by shallow furrows marking the positions of the immersed teeth. It differs from *plicata* by the far smaller umbilicus contained  $4\frac{1}{2}$  times in diameter, the weaker sculpture, the base being nearly smooth, and by the *emerging* columellar end of the basal tooth and the longer, more deeply entering parietal fold.

There is no internal callus or tubercle on the axis. The tooth of the outer lip is deeply immersed and long, curving inward and downward past the upper end of the obliquely entering basal tooth. The embryonic  $1\frac{1}{2}$  whorls have short striae radiating from the suture but are otherwise smooth.

At Eureka Springs Mr. Sampson found *P. jacksoni* abundant, scattered among gravel and small stones and rarely under large stones on the hillsides, north and east exposures. Elsewhere it was found in similar situations. As now known, this very distinct snail inhabits a relatively small area in southwestern Missouri, northeastern Oklahoma and northwestern Arkansas, in all about 150 miles in greatest extent. It was collected by a son of Dr. Hubbard of Tottenville, Staten Island, and was named for a fellow army surgeon, Dr. R. M. S. Jackson.

***Polygyra jacksoni deltoidea*** (Simpson)

Fig. 397: 12.

*Helix (Polygyra) jacksoni* . . . var. *deltoidea* Simpson, 1889, Proc. U. S. Nat. Mus., 11: 450.

*Polygyra jacksoni deltoidea* (Simpson), Pilsbry & Ferriss, 1907, Proc. Acad. Nat. Sci. Phila., for 1906, p. 539, pl. 20, figs. 6, 7.

The edge of the parietal callus is elevated in a callous triangle with highest point at junction of the upper ramus of the entering fold; axis perforate. 3.4 x 7.5 mm. to 3.7 x 8 mm.

OKLAHOMA: Near Fort Gibson (C. T. Simpson). Lectotype 11048 A.N.S.P. (Fig. 397: 12).

(*Deltoidea*, like the Greek letter  $\Delta$ .)

***Polygyra jacksoni simpsoni*** Pilsbry & Ferriss

Fig. 397: 14, 15.

*Polygyra jacksoni simpsoni* Pilsbry & Ferriss, 1907, Proc. Acad. Nat. Sci. Phila., for 1906, p. 539, pl. 20, figs. 8-11.

Larger than *P. jacksoni* and wholly imperforate, though the axis is hollow except in the penult whorl, and the young shells therefore are perforate. Aperture as in *jacksoni*.

Height 4.7 mm., diameter 9.3 mm.;  $5\frac{3}{4}$  whorls; umbilicus contained about  $5\frac{3}{4}$  times in diameter.

OKLAHOMA: Wyandotte, Ottawa County, on a steep, rocky bluff facing north, south bank of Grand River (Pilsbry & Ferriss), Type and paratypes 84642 A.N.S.P. Near Fort Gibson (V. B. Hubbard, C. T. Simpson). Limestone Gap, Pittsburg Co. (Simpson).

ARKANSAS: Mena, Polk Co. (Ferriss).

At Wyandotte we found this imperforate race in abundance on the moderately humid bluff. Under stones in the dry, stony woodland on top, only typical *P. jacksoni* was taken, perforate, and 5.8 to 7.3 mm. diameter. The large and small forms were nowhere found together. V. B. Hubbard,

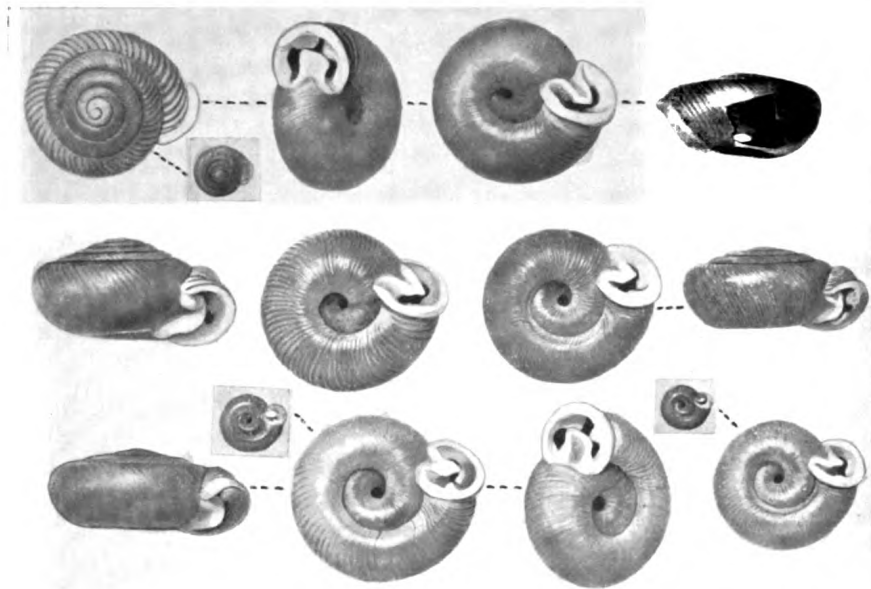


Fig. 398. Upper four figures, *Polygyra dorfeuilliana*, Allentown, St. Louis County, Mo. Middle line, left figure, Frierson, La. Second figure, form *percostata*; two figures on right, form *perstriata*, Tuskahoma. Lower line, left and middle figures, *P. dorfeuilliana sampsoni*, Lectotype and paratypes; right figure, 6 miles northeast of Findley, Okla. (Small figures are actual size.)

who collected at Fort Gibson over 70 years ago, found "large dead specimens brought down from the upper country by the streams." Simpson found it "on limestone mountains near Fort Gibson", 9 to 9.5 mm. in diameter. In and near Fort Gibson he took typical *jacksoni*, diameter 7 mm. The small and large races are not known to occur together, and if it were only a matter of size, *simpsoni* would be considered an ecologic "form" rather than a subspecies; but the difference in umbilicus can scarcely be thought owing to humid or dry stations.

Although *P. j. simpsoni* occurs within *jacksoni* territory in northeastern Oklahoma, it appears to extend farther south in Oklahoma and Arkansas. Ferriss and I did not find it in a day spent at Limestone Gap, Oklahoma. (Named for Charles Torrey Simpson.)

***Polygyra dorfeuilliana* Lea**

Fig. 398, upper four figures.

*Polygyra dorfeuilliana* Lea, 1838, Trans. Amer. Philos. Soc., 6: 107, pl. 24, fig. 118.—W. G. Binney, 1878, Terr. Moll., 5: 278, fig. 178, pl. vi, fig. 1 (teeth); 1885, Man. Am. L. Sh., p. 374, with var. *sampsoni*, p. 375.—F. A. Sampson, 1893, Nautilus, 7: 34; 1894, 8: 18; 1912, 26: 91-2 (Fern Glen, St. Louis Co., and Ironton, Iron Co., Mo.); 1893, Ann. Rep. Geol. Surv. Ark. for 1891, 2: 185, with var. *sampsoni*; 1913, Trans. Acad. Sci. St. Louis, 22: 99.—F. C. Baker, 1898, Nautilus, 12: 36 (Arcadia, Mo.); 1933, Nautilus, 47: 4-7 (occurrence in Ill.).—Ferriss, 1900, Nautilus, 14: 28, with varr. *percostata* and *sampsoni*.—Strecker, 1908, Nautilus, 22: 65 (McLennan Co., Tex., with *P. d. sampsoni*); 1910, Nautilus, 24: 5 (Mata-gorda Peninsula and Palacio, Texas).—Hanna, 1909, Nautilus, 23: 82 (Douglas Co., Kansas).—Wheeler, 1918, Nautilus, 31: 115 (Arkadelphia, Ark.).—Walker, 1928, Terr. Moll. Alabama, p. 19, fig. 21.

*Helix dorfeuilliana* Lea, Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 6: 294, pl. 9, figs. 24-26.—Sargent, 1892, Nautilus, 6: 77 (valley near Woodville, Ala.).

*Polygyra dorfeuilliana percostata* Pils., 1899, Nautilus, 13: 37; 1907, Proc. Acad. Nat. Sci. Phila., 1906, p. 538, pl. 20, fig. 23 (Red River near Texarkana, Ark.).

The depressed shell is perforate, the perforation expanding in last whorl to an umbilicus contained  $3\frac{3}{4}$  times in the diameter; dilute buckthorn brown, glossy. The spire is weakly convex; periphery rounded, at the upper third of the height. Embryonic  $1\frac{1}{2}$  whorls are smooth except for fine, short striae radiating from the suture. Last whorl is rather coarsely but weakly ribbed above, where in front there are between 3 and 4 ribs in 1 mm.; below the periphery they become weaker or partly obsolete; the smoothish base is closely engraved with spiral lines. The pale brown or white peristome forms two-thirds of a circle, is reflected and strongly thickened throughout. There are two lip teeth, separated by a deep notch, the outer one somewhat more immersed, concave in front, the basal tooth nearly as large as the outer and less immersed. The parietal fold is squarish in front view. About one-fourth of a turn within there is a callous tubercle on the axis.

Height 3.8 mm., diameter 8 mm.;  $5\frac{1}{2}$  whorls. Allenton, Mo.

Height 4.5 mm., diameter 8.8 mm. Frierson, La.

Height 3.7 mm., diameter 8 mm. Limestone Gap, Okla.

Height 3.5 mm., 7.8 mm. Denison, Tex.

ILLINOIS: <sup>1</sup> Bluffs along the Mississippi River, at about 700 ft. and upward, from near Valmeyer, Monroe Co. (Hubricht), south to Prairie du Rocher, Randolph Co.; again 40 miles southward on Fountain Bluff, Jackson Co. (F. C. Baker and others).

<sup>1</sup> At localities starred, *P. d. sampsoni* occurs also.

MISSOURI: Miller, St. Charles Co. (Hubricht). Allentown (Hubricht), and Fern Glen (Sampson), St. Louis Co. Ironton (Sampson), and Arcadia (Woodruff), Iron Co. Texas Co. (C. J. Miller). Warsaw, Benton Co. (Crandall). Springfield, Greene Co. (Sampson). Chadwick, Christian Co. (Pilsbry). Seligman, Barry Co. (Ferriss). North of Noel, Macdonald Co. (Hubricht). Also Camden, Howell, Douglas and Jasper counties (Sampson). Henry Co. (Britts).

KANSAS: Grouse Creek, Cowley Co., near Arkansas City (Ferriss). Douglas Co. (Hanna).

ARKANSAS: Rogers, Benton Co. (Pilsbry). Eureka Springs\*, Carroll Co. (Sampson). Mammoth Spring, Fulton Co. and Hardy, Sharp Co. (Ferriss). Sulphur City, Washington Co. (A. J. Brown). Porter, Van Buren (Sampson), and Chester (Ferriss), Crawford Co. Carrion Crow Mt., Pope Co. (Ferriss). Springfield, Conway Co. (S. Weller). Hartford, and Poteau Mts., Sebastian Co. (Pilsbry). Summit of Magazine Mt., 2823 ft., Petit Jean Mts. and Blue Mt. Station, Logan Co. (Pilsbry). Rich Mt., Hatton Gap, and Cove, Polk Co. (Ferriss). Hot Springs, Garland Co. (Sampson, Ferriss). Sevier Co. at Ultima Thule, Horatio, Chapel Hill and Gilham (Ferriss). Morris Ferry and Rocky Comfort, Little River Co. (Ferriss). Also recorded from Hope, Hempstead Co., Nevada, Washington\*, Franklin\*, Pulaski\*, Johnson\* and Perry\* counties (Sampson).

OKLAHOMA: Wyandotte\*, Ottawa Co. (Pilsbry). Fort Gibson\*, Muskogee Co. (Simpson). Le Flore Co., at Poteau, Wister, Sugarloaf Mt.\* (Pilsbry and Ferriss). Stanley and Antlers, Pushmataha Co. (Ferriss). Red Fork, Tulsa Co. (Ferriss). Limestone Gap (Pilsbry and Ferriss).

LOUISIANA: Nachitoches, Nachitoches Parish (C. W. Johnson). Frierson, DeSoto Parish (L. S. Frierson). Mt. Lebanon, Bienville Parish (T. W. Vaughan).

TEXAS: DeKalb, Bowie Co. (Ferriss). Denison, Grayson Co. (Sampson, Ferriss). Dallas (J. Boll). Waco (Hemphill, Ferriss). Galveston (Ferriss). Also reported from Cooke, Tarrant, Burleson and Brazos counties (Singley); Washington Co. (W. G. Binney); Matagorda Peninsula (Strecker).

*P. dorfeuilliana* is related to *P. troostiana*, which is much more strongly ribbed and has a distinct projection on the upper limb of the parietal fold, lacking in *dorfeuilliana*.

The type of *dorfeuilliana* has the lower surface "nearly smooth", "having only very delicate striae with microscopic impressed spiral lines"; but throughout its range from Missouri to Texas, many lots show quite distinct basal radial striation, or both striate and smoothish shells may be selected from single lots. I regard the striate condition as the older state of the species, smoothish mutations occurring sporadically and sometimes becoming the dominant form locally. The size of the umbilicus varies from moderately narrow to the very widely open *sampsoni* by imperceptible stages in some lots; but usually a lot can be referred to one or the other category, so that *sampsoni* is allowed to stand as a subspecies, although it does not have a definite range exclusive of *dorfeuilliana* proper.

In describing this species, Dr. Lea gave the locality as "Ohio, Mr. Dorfeuille, Cincinnati." W. G. Binney stated that "Mr. J. G. Anthony obtained from Mr. Dorfeuille some facts concerning the original discovery of this species which prove beyond all doubt that it was accidentally brought

from Kentucky." It is on the strength of this that he reported it from "Kentucky, opposite Cincinnati." Binney also recorded *dorfeuilliana* from "Coosa River, Alabama," and H. E. Sargent reported it from near Woodville, Ala. A. G. Wetherby, Geo. W. Harper and their students hunted shells in Kentucky for years, without finding this species, and inquiries I made in 1906 brought only negative replies. Sargent's record from Jackson County, Alabama, must have been an erroneous identification; it is significant that *P. plicata* and *P. troostiana* which occur in that region were not mentioned in his list. The sole reliable record from east of the Mississippi is that of F. C. Baker, in Illinois, where the specimens are closely similar to those on the Missouri side of the river in St. Charles and St. Louis counties.

In the form *percostata* Pilsbry, (Fig. 398), the rib-striae of the upper surface extend over the base, which is more strongly striate than in typical *dorfeuilliana*. The lot of 56 was collected on the Red River not far from Texarkana, Arkansas, on a dry mountain side under slabs of sandstone and small logs. It contains one albino. The diameter runs from 6.7 to 8.6 mm. Occasional specimens of the lot are as weakly striate as typical *dorfeuilliana*, and most of them could easily be matched in large lots from elsewhere. It is a matter of degree. As mutations of *dorfeuilliana* with rather strong ribs are of common occurrence elsewhere, *percostata* as a recognizable race is deleted.

(Mr. Dorfeuille, for whom this shell was named, was proprietor of a museum and place of amusement known in 1827 as "Dorfeuille's Hell." Mrs. Trollope, in *Domestic Manners of the Americans*, states that "Cincinnati has not many lions to boast, but among them are two museums of natural history; both of these contain many respectable specimens, particularly that of Mr. Dorfeuille, who has moreover some highly interesting Indian antiquities. He is a man of taste and science.")

***Polygyra dorfeuilliana sampsoni* Wetherby** Figs. 398, below, left and middle figs.

*P.[olygyra] sampsoni* Wetherby, 1881, Journ. Cincinnati Soc. Nat. Hist., 4: 332 (Eureka Springs, Ark.).

*Polygyra dorfeuilliana perstriata* Pilsbry & Ferriss, 1907, Proc. Acad. Nat. Sci. Phila. for 1906, p. 538, pl. 20, figs. 20, 21, 24.

More depressed than *dorfeuilliana*, with the umbilicus broader in the last whorl, where it exhibits about one turn and is contained  $2\frac{1}{2}$  to 3 times in the diameter. Striation of the base weak or almost obsolete.

Height 3.7 mm., diameter 8.7 mm., to 3.3 x 7.2 mm. Eureka Springs, Arkansas.

3.5 x 8.5 to 3.7 x 9.7 mm. Wyandotte, Oklahoma.

Wetherby did not describe his *P. sampsoni*, but defined it by a quotation from Bland, which did not mention the essential feature of *sampsoni* and

related to specimens of uncertain locality. However, Wetherby was writing of shells from Eureka Springs, Arkansas, sent out by F. A. Sampson, and since widely known in collections under the name *sampsoni*. As nothing in the quotation expressly excludes it, and there is no question as to the race intended, the inadequate introduction of the name may be overlooked. No. 11029 A.N.S.P. is taken as lectotype of the subspecies.

This openly umbilicate race occurs over parts of Missouri and adjacent counties of Arkansas, usually but not always in pure colonies, although *dorfeuilliana* inhabits the same region also. Localities for *sampsoni* are starred in the list on page 635. When collecting in that country years ago, Ferriss and I could not trace any constant ecologic distinctions, yet the race or form appears rather distinct in that region. Exceptionally it occurs more or less typically developed as far south as Waco, Texas. In northeastern Oklahoma the shells are rather heavier than typical Eureka Springs *sampsoni*, more distinctly striate on the base, and wherever a large series was collected they vary from the *dorfeuilliana* form, in which but one whorl or a little less is exposed beneath, to the *sampsoni* form of base; most specimens being intermediate in these characters. Localities of *sampsoni* are starred in the locality paragraph for *dorfeuilliana*.

(Named for Francis Asbury Sampson, 1842-1918. Nautilus 31: 137.)

In southeastern Oklahoma and southwestern Arkansas there is another incipient race of *dorfeuilliana* which was described as *P. d. perstriata* Pilsbry & Ferriss (Figs. 398, Tuskahoma, type locality), characterized by being widely open beneath, as in *sampsoni*, but finely and closely striate there. The type, 81438 A.N.S.P., measures 3.8 x 7.9 mm., but in some places, as near Finley, Oklahoma, the shells run smaller, 3 x 6.5 mm., 5½ whorls. The localities for *perstriata* follow. Arkansas: Polk Co. at Mena (Ferriss), and Big Fork, Ouachita Nat. Forest (Pilsbry). Oklahoma: Tuskahoma (Ferriss, and 6 miles northeast of Finley (Pilsbry), both in Pushmataha County. The Mena lot runs into small *dorfeuilliana*, typical in sculpture and umbilicus, as in Proc. Acad. Nat. Sci. Phila. 1906, pl. 20, fig. 22.

On account of the similar variation in sculpture to be seen sporadically throughout the range of *dorfeuilliana*, I am leaving *perstriata* as a locally abundant mutation of *sampsoni*.

#### POLYGYRA HIPPOCREPIS GROUP (Section *Upsilonodon*)

*Upsilonodon* Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 315; type *Helix hippocrepsis* Pfr.

The shell differs from that of all other groups of *Polygyra* by having the parietal tooth curved inward in a horse-shoe or U-shape; the two lip-teeth curving and approaching inward, slightly interrupted at their union, together forming another U. The shell is narrowly umbilicate, depressed and carinate.

The 17 mm. long lung (Fig. 383: 3) is narrow and maculate with black, often more profusely than in that figured. There are no secondary veins, thus differing from *P. uvulifera*. The kidney is about 7.7 mm. long, and very narrow.

The genitalia, (Fig. 383: 1-1b). The ovotestis is a long group of branching caeca. Hermaphrodite duct strongly convoluted as usual. The talon (Fig. 383: 1b) is a little longer than in other *Polygyrae* examined, consisting of several short lobes. Prostate gland as long as the uterus, as usual. The penis is rather short and ample, its walls extremely thin. It contains (Fig. 383: 1a) in the upper half a very high longitudinal ridge connected below by a transverse ridge to a lower fleshy ridge. These are separated by a narrow space from a third longitudinal ridge, the upper end of which is recurved in a free point. The retractor muscle is very long, attached at the entrance of the vas deferens. The vagina is longer than in *P. uvulifera*. Spermatheca oblong, on a moderately short duct. Length of penis 5 mm.; vagina 4.5 mm.; spermatheca 5 mm. Diameter of shell dissected, 11 mm.

Another example opened had not reached maturity. The organs are all very slender (Fig. 383: 2).

The single species of this section is known only from near New Braunfels, Comal County, Texas.

***Polygyra hippocrepis* (Pfeiffer)**

Fig. 399.

*Helix hippocrepis* Pfeiffer, 1848, Zeitschr. für Malak., 5: 119; Conchyl.-Cabinet, Helix, 2: 333, pl. 131, figs. 4-6.—Singley, 1893, Geol. Surv. Texas, 4th Ann. Rep., p. 307.

*Polygyra hippocrepis* Pfr., W. G. Binney, 1878, Terr. Moll., 5: 273, fig. 172.—Pilsbry & Ferriss, 1906, Proc. Acad. Nat. Sci. Phila., p. 127, figs. 3, 4.—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 316, fig. 6, pl. 26, figs. 1-1b, 2, 3 (anatomy).

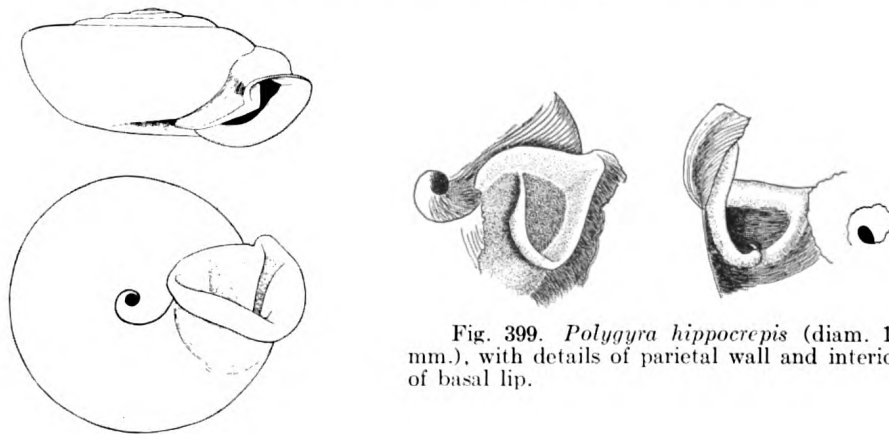


Fig. 399. *Polygyra hippocrepis* (diam. 11 mm.), with details of parietal wall and interior of basal lip.

The lens-shaped shell is perforate, becoming narrowly umbilicate in the last whorl (umbilicus contained nearly 5 times in diameter), the spire convex, very low, the last whorl carinate above, strongly convex at base, abruptly and shortly descending in front, guttered behind the outer and

basal margins of lip, behind the gutter having a halfmoon-shaped swelling bounded by an arcuate whitish impression. The surface is light brown, dull. First whorl glossy, smooth except for short fine striae radiating from the suture, the following half turn with very fine retractive striae. Later whorls slowly increasing, with sculpture of very fine rib-striae which continue over the base. The aperture is subtriangular, the peristome continuous; outer and basal margins reflected, the basal with smooth, thickened inner edge. Within the outer lip is a thin, sharp, deeply entering fold which deep within curves to meet a shorter curved basal fold which runs inward from the umbilical end of the basal lip callus. Where the two entering teeth meet there is a notch and a delicate slender hook with the point projecting forward and curved towards the adjacent basal wall. The forward edge of the parietal callus forms a thin suberect lamina. Parietal tooth U-shaped, not entering quite as far as the arch formed by the lip teeth. On the columellar axis one-fourth whorl within there is a white tubercle.

Height 4.7 mm., diameter 11 mm., 4 $\frac{3}{4}$  whorls.

Height 5.5 mm., diameter 12 mm., 4 $\frac{1}{2}$  whorls.

TEXAS: New Braunfels, Comal County, in the pleasure gardens, and on rocky, wooded hillsides above the springs of Comal Creek; also along the Guadalupe River about 3 to 6 miles north of New Braunfels (Römer, Singley, Ferriss & Pilsbry, H. B. Baker).

It is an isolated, highly evolved snail, remotely related to the *P. plicata* group, apparently. Only one of the shells measured reached the diameter given by Pfeiffer, 12 mm. The usual size is about 11 mm.; the smallest measured 4.5 x 10.3 mm., 4 $\frac{1}{2}$  whorls. The parietal tooth is not V-shaped as in other polygyras, but U-shaped, hence the name *hippocrepis*—horseshoe.

The known range of this curious snail is exceedingly restricted. It has been found only near New Braunfels. We found it in abundance in April, 1903, on the west side of the Guadalupe River about four to six miles north of New Braunfels, under stones near and at the foot of the bluff, with *Holospira goldfussi*. Another place much nearer the town is on the rocky wooded hillside above the springs of Comal Creek. This place is just beyond the pleasure gardens.

#### STENOTREMA Rafinesque

*Stenotrema* Rafinesque, 1819, Journ. de Physique, de Chimie, d'Hist. Nat., 88: 425; "1 espèce, *S. convexa*".—W. G. Binney, 1878, Terr. Moll. 5: 200.—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila. 82: 324, 325; *S. convexa* = *H. stenotrema* designated type. Not *Stenotrema* Rafinesque, 1815, Analyse de la Nature, p. 136 (nude name for a serpulid annelid.)

*Stenostoma* Rafinesque, 1831, Enum. and Acc., etc. p. 3, for *S. convexa*.

*Tozotrema* Rafinesque, 1819, Journ. de Physique, de Chimie, d'Hist. Nat., 88: 425.—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 323; *H. hirsuta* Say designated type.

*Tozostoma* Rafinesque, 1831, Enum. and Acc., p. 3.—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 323; *H. hirsuta* Say designated type.

(?) *Chimotrema* Rafinesque, 1819, Journ. de Physique, de Chimie, d'Hist. Nat., 88: 425.—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 323.



The shell is from globose-conic to lens-shaped, compact, close whorled, with a narrow basal aperture, having a long radial parietal tooth and calloused basal lip, which is often notched in the middle or bluntly toothed. Axis with a vertical buttress (the "fulcrum") within the last whorl at its last fourth. Embryonic whorls generally with a dense pattern of radially lengthened granules, or sometimes radially striate.

Jaw having 8 to 13 broad, close ribs, much wider than their intervals (Fig. 400 b, *S. stenotrema*, Mammoth Cave). Central and lateral teeth with well developed ectocones.

Genitalia much as in other Polygyrinae, but the penis passes into a short epiphallus, differentiated from the vas deferens by its greater caliber. Cavity of the penis has several longitudinal ridges or pilasters. The oblong spermatheca has a short, slender duct. (Figs. 400 a, d.)

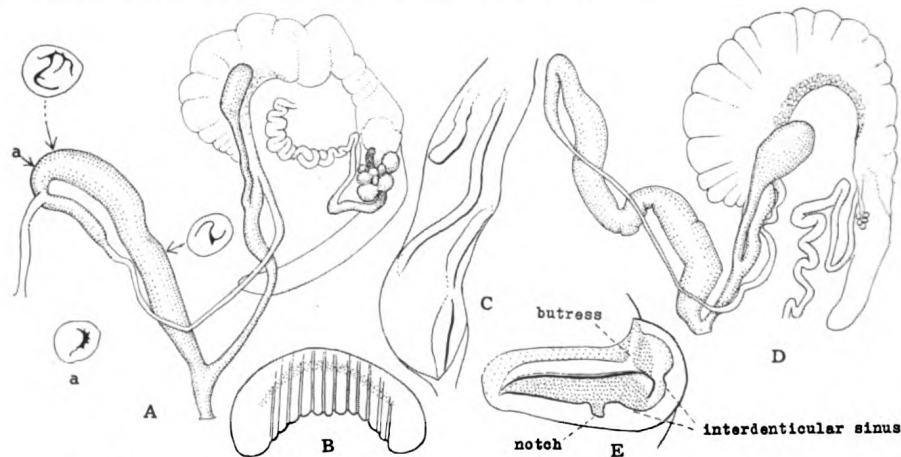


Fig. 400. A, a' *Stenotrema stenotrema*, Great Smoky Mountains, genitalia, with sections of the penis. B, jaw of Mammoth Cave specimen. C, D, *Stenotrema florida*, genitalia; at C a diagram of opened penis (inverted). E, diagram of aperture of *Stenotrema*.

*Distribution*.—Humid eastern United States and Canada from the boreal zone (at James Bay) to the Gulf of Mexico.

( $\Sigma\tau\epsilon\nu\delta\sigma$ , narrow;  $\tau\rho\eta\mu\alpha$ , aperture.)

Rafinesque composed no less than four etymologically excellent names for this group, perhaps all based on *S. stenotrema*, though about ten years ago I selected *S. hirsutum* as type of two of them. This however was a mere guess, not really a valid type designation, as the species was not recognizable from the generic descriptions, as the rules require. It is only by the subsequent work of Pfeiffer on Férussac's collection that *S. convexa* Raf. was recognized as *S. stenotrema*, though Rafinesque's account unmistakably indicated the genus.

*Stenotrema* is most nearly related to *Polygyra*, but it differs by the papillose or striate embryonic whorls and the forms of all the apertural

teeth, as well as by the broad ribs of the jaw. The internal buttress on the axis, or "fulcrum" as Lea called it, is found in all stenotremes, but also in various Polygyras.

The basal tooth of other Polygyridae is represented here by the callus which borders the basal lip from the columella to the lip-notch. Outside of the lip-notch the callus which runs to the middle of the outer arc of the lip represents the outer lip tooth of *Polygyra*, *Triodopsis* and other genera; it is divided into an outer and an inner denticle by a concavity, termed by A. F. Archer the "interdenticular sinus". Many other Polygyridae have the outer lip tooth so divided. Many species of *Stenotrema* have a "buttress" on the parietal tooth, running towards the superior termination of the outer lip. These structures are illustrated in Figure 400 E.

Under the microscope a minute lineolation in the direction of lines of growth is seen in greater or less degree in all of the species. This is usually not mentioned in the descriptions.

The sequence of species is an amplification of that of W. G. Binney.

#### Key to Species of *Stenotrema*

- A. Periphery carinate or strongly angular.
  - B. Notch in the basal lip either very small or indistinct.
    - C. Height less than half the diameter of 11-15 mm., lens-shaped. *S. spinosum*
    - CC. Height about equalling or exceeding half of the diameter of about 10 mm. or less.
      - D. Parietal tooth rather low, not reaching the level of the basal lip; no buttress.
        - E. Lens-shaped, height but little more than half the diameter.
          - F. No notch at junction of callus of basal lip with the columella; outer end of the callus emarginate; periphery and suture fringed .....*S. barbigerum*
          - FF. A rounded notch where callus of basal lip passes into the columella; none at outer end of callus. A Pleistocene fossil .....*S. hubrichti*
          - EE. Higher; periostracal processes less developed .....*S. edwardsi*
          - DD. Parietal tooth very high, a callus or buttress connecting it with end of outer lip; surface smoothish to the eye; carina acute. .*S. edgarianum*
  - BB. Notch in the basal lip strongly developed.
    - C. Reflected edge of basal lip adnate; height about  $\frac{1}{3}$  of the diameter; interdenticular sinus wide, not deep; Appalachian ...*S. magnifumosum*
    - CC. Reflected edge of basal lip noticeably raised; parietal tooth curving strongly into the rather narrow interdenticular sinus; in and around the Ozarks.
      - D. Surface smoothish to the eye .....*S. labrosum*
      - DD. Having several conspicuous spiral fringes of periostracal hairs. *S. pilsbryi*

- AA. Periphery rounded or quite bluntly angular.
- B. No notch or teeth in the basal lip.
- C. A high, laminar ridge within and parallel to the basal lip.  
*S. mazillatum*
- CC. Basal lip somewhat calloused, without internal lamina; parietal tooth straight at outer end, or but slightly curved .....*S. monodon* Group
- BB. Basal lip having a submedian notch or recess.
- C. Lip notch very wide and open; reflection of the basal lip with its outer edge free throughout.
- D. Notch large, U-shaped in front view .....*S. brevipila*
- DD. Notch amplified into a wide, open embayment .....*S. cohuttense*
- CC. Lip notch very small or subobsolete; parietal tooth slender; no buttress.
- D. Subglobose, periphery round; diameter 12-14 mm; western Florida.  
*S. florida*
- DD. Subglobose, periphery faintly angular; diameter 8 mm.; Tennessee.  
*S. waldense*
- CCC. Lip notch narrow but well developed.
- D. Outer end of parietal tooth having a transverse denticle, detached or conerescent, or an outwardly recurved hook; Ozarkian ..*S. uncifera*
- DD. Outer end of parietal tooth simple or hooked inward, but without an accessory denticle.
- E. Surface without trace of periostacial processes or hairs.
- F. Depressed, the height little more than half of the diameter; periphery very bluntly subangular; rather glossy; Ozarkian.  
*S. blandianum*
- FF. Height more than two-thirds the diameter; matt; Appalachian.
- G. Periphery distinctly angular; buttress present; diameter 6.4-9 mm. ....*S. magnifumosum*
- GG. Periphery round; globose-depressed, aperture very narrow; buttress present, diameter 10-11 mm.  
*S. stenotrema nudum*
- GGG. Globose-conic; aperture as wide as the lip reflection; no buttress .....*S. depilatum*
- EE. Surface having periostacial hairs or hair-papillae.
- F. Interdenticular sinus deep and narrow.
- G. Interdenticular sinus fitting closely around the deeply incurved end of parietal tooth.  
*S. exodon, S. deceptum*
- GG. Interdenticular sinus extending beyond end of the parietal tooth.
- H. Periphery well rounded; notch with a prominent callous border .....*S. pilula*
- HH. Periphery bluntly angular; hairs of base with spirally lengthened bases; no prominent callus around the notch .....*S. magnifumosum*

FF. Interdenticular sinus rounded, not so deep.

G. Parietal tooth strong, its outer end deeply curved into interdenticular sinus; aperture far narrower than the reflected basal lip .....*S. stenotrema*

GG. Parietal tooth slender, bowed and often slightly sinuous, but the end very little hooked into the shallow interdenticular sinus; aperture nearly as wide as reflected basal lip.

H. Larger, with conic spire .....*S. altispira*

HH. Smaller, spire low conoid .....*S. hirsutum*

STENOTREMA SPINOSUM GROUP

**Stenotrema spinosum** (Lea)

Fig. 401.

- Carocolla spinosa* Lea, 1830, Trans. Amer. Philos. Soc., 4: 104, pl. 15, figs. 35 a, b, c.  
*Helix spinosa* Lea, A. Binney, 1851, Terr. Moll., 2: 153, pl. 44, fig. 1.—W. G. Binney, 1869, L. & Fr. W. Sh. N.A., 1: 113, figs. 189, 190.  
*Stenotrema spinosum* Lea, Tryon, 1867, Amer. Journ. Conch., 3: 58—W. G. Binney, 1878, Terr. Moll., 5: 291, fig. 189, pl. vii, fig. B (teeth), pl. xiv, fig. H, genitalia.  
*Polygyra spinosa* Lea, Walker, 1928, Terr. Moll. Alabama, p. 45, fig. 53.

The shell is imperforate, lens-shaped, with low conoid spire, convex base and acutely carinate periphery; between cinnamon and cinnamon-brown in color. Surface matt, the embryonic sculpture of minute granules in obliquely radial trends, later whorls having dense microscopic lines in the direction of lines of growth, and widely spaced short ridges; at the peripheral keel a few short, flattened processes project in the most perfect examples. The base shows very weak spiral striae not visible on all specimens. The linear aperture has a long, curved parietal tooth leaning towards the basal lip, very high in the middle. Basal lip straightened, its thin outer edge reflected and adnate on the base, the basal notch very small. Outer lip arcuate, with narrowly free edge, the denticle within it usually small or indistinctly developed. The fulcrum is well developed, extending nearly one-third across the cavity.

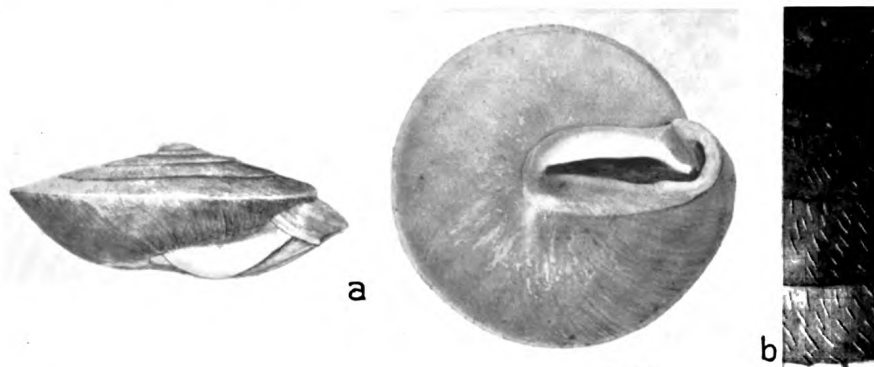


Fig. 401. a, *Stenotrema spinosum*, near Wetumpka, Alabama, diameter 14 mm. b, detail of specimen from Claiborne, Ala.

Height 6.4 mm., diameter 14.8 mm.  $5\frac{1}{3}$  whorls.

Height 6.5 mm., diameter 14 mm.;  $5\frac{2}{3}$  whorls. Near Wetumpka.

Height 5 mm., diameter 11.8 mm.;  $5\frac{1}{2}$  whorls. Smithers Mt., Ala.

VIRGINIA: Blackwater, Lee Co. Dona, Fairview and Powell's Mt., Scott Co.

TENNESSEE: Pikeville, Bledsoe Co. Cowan, Dawanee, Franklin Co. Chattanooga, Lookout Mt. and Walden Ridge, Hamilton Co. Kyle's Ford and North Fork Knob, Hancock Co. Knoxville, Knox Co. Fayetteville, Lincoln Co. Dove, Marion, Nickajack Cave, Kimball, Prior Cove and South Pittsburg, Marion Co.

GEORGIA: Greene Co.

ALABAMA: In the following counties: Blount, Calhoun, Chilton, Clarke, Colbert, Cullman, Dallas, DeKalk, Elmore, Etowah, Franklin, Jackson, Jefferson, Lauderdale, Madison, Marengo, Marshall, Mobile, Monroe, Perry, St. Clair, Talladega, Tuscaloosa, Walker and Wilcox. Type locality Claiborne, Monroe Co.

The large size, lens-like shape and the nearly obsolete notch in the basal lip are characteristic. The parietal tooth is much higher than in *S. barbigerum*.

***Stenotrema edgarianum* (Lea)**

Fig. 402.

*Carocolla edgariana* Lea, 1841, Proc. Amer. Phil. Soc., 2: 31; 1844, Trans. Amer. Phil. Soc., 9: 2; Obs., 4: 2.

*Helix spinosa* var. *edgariana* Lea, A. Binney, 1851, Terr. Moll., 2: 155, pl. 44, fig. 2.—Bland, 1862, Ann. Lye. Nat. Hist. N. Y., 7: 428, pl. 4, fig. 18.—Wetherby, 1881, Journ. Cincin. Soc. Nat. Hist., 3: 34.

*Stenotrema edgarianum* Lea, Tryon, 1867, Amer. Journ. Conch., 3: 59.—W. G. Binney, 1878, Terr. Moll., 5: 293, fig. 191; 1885, Man. Amer. L. Sh., p. 274, fig. 291.

*Polygyra edgariana* Lea, Walker, 1928, Terr. Moll Alabama, p. 46, fig. 55.

The imperforate shell is lens-shaped with conoidal spire of slightly convex whorls, convex base, and acutely carinate periphery; suture is distinctly impressed. Color between cinnamon-buff and isabella. Embryonic whorls with the usual granulation. Later whorls with microscopic radial lineolation and indistinct spirals, with scattered periostracal ridges, narrow and interrupted, in the direction of growth-lines, some of them projecting in short processes at the periphery in the most perfect examples. On the base are many short stiff hairs in oblique series (or when they are lost, distinct scars remain). The linear aperture is nearly closed by the very high strong and long parietal tooth, which leans towards the basal lip, and at its outer end becomes low, sinuous and abruptly curved inward. A strong buttress



Fig. 402. *Stenotrema edgariana*, Sequatche Valley, Tenn. (Enlarged and actual size.)

connects the parietal tooth with the termination of outer lip. The basal lip has a rather strong inner flange interrupted by a small median notch. The interdenticular sinus is rather deep, and the small tooth within the outer arc of the lip is distinct but blunt. The "fulcrum" on the axis a fourth whorl within is strongly developed with slightly convex edge.

Height 5 mm., diameter 9 to 9.4 mm.;  $5\frac{1}{2}$  whorls.

**TENNESSEE:** Cumberland County at Crab Orchard; Devilstop Hollow; Grassy Cove (Archer). Bledsoe County, southeast of Pikeville, in Fraley Gap and Skillon Cove (H. B. Baker). Scott County (Archer).

This snail is related to *S. spinosum*, but it is constantly smaller and relatively higher. The high parietal tooth projects beyond the level of the basal lip, its outer end curves into the aperture, and it is distinctly connected with the upper end of the lip. Archer found the size to vary from 9.1 x 4.7 to 10 x 5.1 mm. It inhabits a small area in the region of the Sequatchie River headwaters, at altitudes of about 1500 to 2000 feet. The original locality was "Cumberland Mountains, S. M. Edgar." Binney's statement, "distribution like *S. labrosum*" is incorrect.

**Stenotrema barbigerum** (Redfield)

Fig. 403.

*Helix barbiger* Redfield, 1856, Ann. Lyc. Nat. Hist. N. Y., 6: 171, pl. 9, figs. 4-7.—Gould in A. Binney, 1857, Terr. Moll., 3: 21.—W. G. Binney, 1859, Terr. Moll., 4: 63, pl. 77, fig. 2; L. & Fr. W. Sh. N. A., 1: 116, fig. 194.

*Stenotrema barbiger* Redfield, Tryon, 1867, Amer. Journ. Conch., 3: 60, pl. 9, figs. 32, 33.

*Stenotrema barbigerum* Redfield, W. G. Binney, 1878, Terr. Moll., 5: 294, fig. 193, pl. vii, fig. c (teeth).

*Polygyra barbiger* Redfield, Pilsbry, 1894, Man. Conch., 9: 78.—Walker, 1928, Terr. Moll. Alabama, p. 47, fig. 56—Clench & Banks, 1932, Nautilus, 46: 59 (Andrews, Cherokee Co., N. C.).

The imperforate shell is thick lens-shaped, the base more convex than the low-conoid spire, periphery acutely carinate; dilute cinnamon colored. The surface is matt, the apex, after the smooth tip, with minute, radially lengthened granules in obliquely radial trends, passing into fine striae; later whorls with periostracal ridges in the direction of growth lines, more or less interrupted, and produced at the suture and periphery in long flattened hair-like processes; the base with rather sparse short, erect, thorn-like hairs rising from radially lengthened bases. The narrow aperture has a long, very slightly curved parietal tooth, its distal end bent slightly inward, and without a buttress running towards the end of the outer lip. Basal lip reflected but its outer edge free or not closely appressed except close to the columella, inner edge thickened, uneven but not notched, and not excavated near the columella, the thickening terminating outward rather abruptly, somewhat tooth-like within the outer arc of the lip; interdenticular sinus only weakly indicated. The "fulcrum" on the axis one-fourth of a turn within is usually visible through the base.

Height 5 mm., diameter 9.3 mm. (exclusive of hairs); 5 whorls.

**NORTH CAROLINA:** Andrews; around Murphy, Cherokee Co. (Archer and others) Hayesville, Clay Co.

TENNESSEE: Sugarloaf Mountain, Parksville and Cherokee National Forest, Polk Co. (Archer).

SOUTH CAROLINA: Calhoun Falls, Abbeyville Co. (A. C. Billups). Columbia, Richland Co. (S. N. Rhoads).

GEORGIA: Habersham Co. (Bishop Elliott; type locality) Hall Co. Tocco Falls, Stephens Co. Presly and 2½ miles north of Hiawasse, Towns Co. (Archer).

ALABAMA: Northern half of the state in the following counties: Bibb, Blount, Calhoun, Cherokee, Clay, Cleburne, Franklin, Jefferson, Lauderdale, Marion, Randolph, St. Clair, Shelby, Talladega, Tuscaloosa and Walker (H. H. Smith, A. F. Archer).

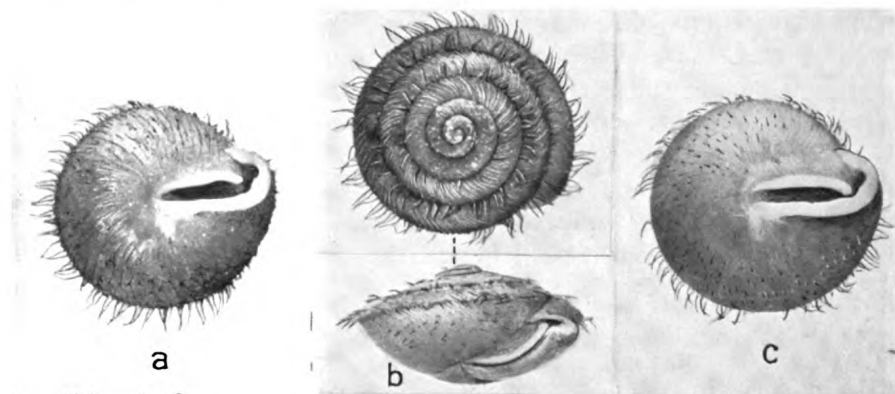


Fig. 403. *Stenotrema barbigerum*, Roanoke, Alabama. ( $\times 3$ )

It is related to *S. spinosum* by the shape, pattern of sculpture and structure of the basal lip. *S. barbigerum* is smaller, the extremes of diameter about 8.7 to 10 mm., the form less depressed; the parietal tooth is far lower and less curved, the reflected edge of the basal lip is largely free, and the cuticular ridges and fringe are more developed. It is more closely related to *S. edwardsi*, which is of higher form, with the periostracal processes less strongly developed. The fringe is lost in many adult examples. According to Archer, its range in altitude is from 450 to 2500 feet.

***Stenotrema edwardsi* (Bland)**

Fig. 404.

*Helix edwardsi* Bland, 1856, Ann. Lye. Nat. Hist. N. Y., 6:277, pl. 9, figs. 7-9.—  
Wetherby, 1881, Journ. Cincin. Soc. Nat. Hist., 3: 33.

*Stenotrema edwardsi* Bld., Tryon, 1867, Amer. Journ. Conch., 3: 59.

*Stenotrema edwardsi* Bld., Binney, 1878, Terr. Moll., 5: 293, fig. 192; pl. VIII, fig. D (teeth).

*Polygyra edwardsi* Bld., Clapp, 1913, Nautilus, 27: 12; 1917, 30: 139 (periostracal appendages).

The imperforate shell is thick lens-shaped, the spire conoidal, base convex, the periphery sharply angular; tawny-olive colored. Embryonic whorls with the usual minutely granulose sculpture. Later whorls have a microscopic lineolation in the direction of growth lines, over which short, interrupted little ridges in the same direction are profusely scattered; the base rather closely strewn with spirally lengthened bases of small, erect

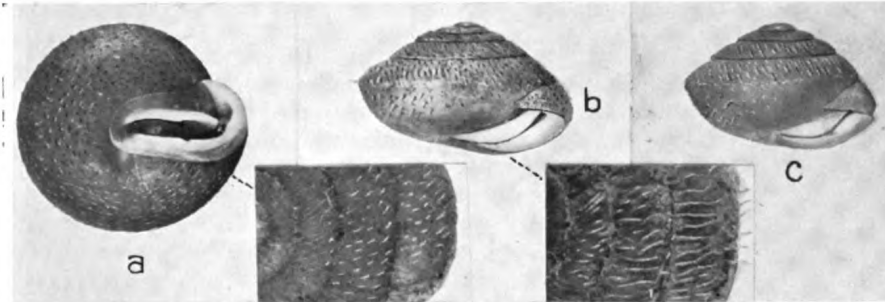


Fig. 404. *Stenotrema edwardsi*. a, north of Indian Springs, Tenn.; b, c, Pine Mountain, Harlan Co., Kentucky. Enlarged.

hairs (present only in the most perfect examples). The narrow aperture has a rather low, nearly straight parietal tooth, which turns inward rather abruptly at its outer end. There is no buttress connecting parietal lip with termination of the outer lip. The thin outer edge of the basal lip is adnate to the base for about half of its length, free in the outer half. The forward edge has a very slight median notch, scarcely visible in the basal view in the typical form (but more deeply cut in some Tennessee shells). The interdigital sinus is scarcely indicated. There is only the low indication of a tooth within the outer lip. Internal fulcrum moderately developed.

Height 5.4 mm., diameter 8 mm.;  $5\frac{1}{3}$  whorls.

Height 4.8 mm., diameter 7 mm. (Harriman.)

PENNSYLVANIA: Indiana Co. east of Blairsville (Archer).

WEST VIRGINIA: Mountains in Fayette or Greenbriar counties (W. H. Edwards, type locality). Kanawha, Kanawha Co. Spanishburg, Mercer Co. (Archer).

VIRGINIA: 4 miles east of Blackwater, Lee Co. (Archer). Norton, Wise Co. (O. S. Lewis).

KENTUCKY: Pine Mountain, Harlan Co. (Witmer Stone). King's Mountain, Lincoln Co. Berea, Madison Co. (Archer). Burnside, Pulaski Co. (Ferriss). Laurel and Whitley counties (Wetherby).

TENNESSEE: Coal Creek, Anderson Co. (Mrs. Geo. Andrews). Elizabethtown, Carter Co. Elk River, Franklin Co. Kyle's Ford, Hancock Co. Clifty Creek, Morgan Co. (Archer). Harriman, Roane Co. (H. E. Sargent). East of Indian Springs, Sullivan Co. (Archer).

The peripheral carination, the rather low parietal tooth, not projecting as far as the level of the basal lip, the very small basal notch, shallow interdigital sinus and absence of a buttress between parietal tooth and upper end of the lip, are its main characters. It is very near *S. barbigerum*, but higher with less developed fringe.

In specimens from Roane County, Tennessee, the basal notch is decidedly more developed than in the West Virginian shells, in which it is often not visible in a basal view, and very small in a front view. Many Tennessee shells have the periostracal sculpture strongly developed, with a well marked fringe of hairs at the periphery.



**Stenotrema waldense** Archer

Fig. 405.

*Stenotrema waldense* Archer, 1938, Nautilus, 51: 54, fig. 1.

"Shell small, imperforate, rather solid, subglobose, dull. Color varying from very light chestnut-brown on body-whorl to dull ivory on earlier whorls. Cuticle horny brown. Peristome and parietal lamella very pale ivory. Whorls 5, rather gently increasing, moderately convex, nuclear whorl somewhat convex. Suture gently impressed. Body whorl slightly bulging behind peristome, and having a faintly angular periphery. Base of body-whorl rather convex. Aperture narrow and transverse. Outer peristome flaring outwards, rather narrow, becoming increasingly narrow where it joins the body wall. Basal peristome rather narrow. Anal sinus gently rounded. Subanal denticle weakly angular. Interdenticular sinus quite broadly curved and having a flat surface. Outer and basal denticle on either side of the notch undifferentiated from inner rim of peristome. Notch v-shaped, very reduced and narrow. Parietal lamella simple, very gently arched and not prominent; proportionately short, its distal end not

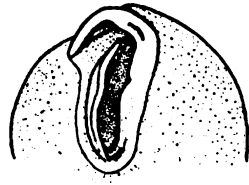


Fig. 405. *Stenotrema waldense*. (After Archer.)

descending deeply into the aperture in the vicinity of the interdenticular notch. Parietal callus rather narrow, curving upwards where it meets termination of outer peristome. Eroded nuclear whorl showing faint traces of axial striation. Succeeding whorls possessing fine axial riblets, a little irregularly spaced and occasionally interrupted. Beginning at about the fourth whorl and continuing to the edge of the peristome the surface is covered with fine, rather closely crowded spiral lines. Height 6 mm., greater diameter 8 mm., lesser diameter 7.8 mm." (Archer.)

TENNESSEE: Doaks Creek, Campbell County (A. R. Cahn). Type 168938 A.N.S.P.; paratypes in collection of the Museum of Zoology, University of Michigan.

"The specimens collected are all dead adults . . . . This species is evidently distinct from any other *Stenotrema*. It is quite probable that its nearest relative is *Stenotrema edwardsi* (Bland); its sculpture indicates that live specimens would probably have thorn-like cuticular hairs similar to those of *edwardsi*. It differs from the latter in the following ways.

*S. waldense*

1. Parietal lamella proportionately short, its distal end not deeply descending into the aperture.
2. Periphery rounded and blunt.
3. Shell subglobose.

*S. edwardsi*

1. Parietal lamella proportionately long, deeply descending into the aperture.
2. Periphery strongly angular.
3. Shell lenticular.

"The whorls are also more rapidly increasing than in *edwardsi*. *Stenotrema waldense* may be distinguished at once from *S. hirsutum* by the fact that the distal end of the parietal lamella does not descend deeply into the

aperture as in the case of the latter. In this respect it also differs from *S. stenotrema*, and also by the narrow basal peristome." (Archer.)

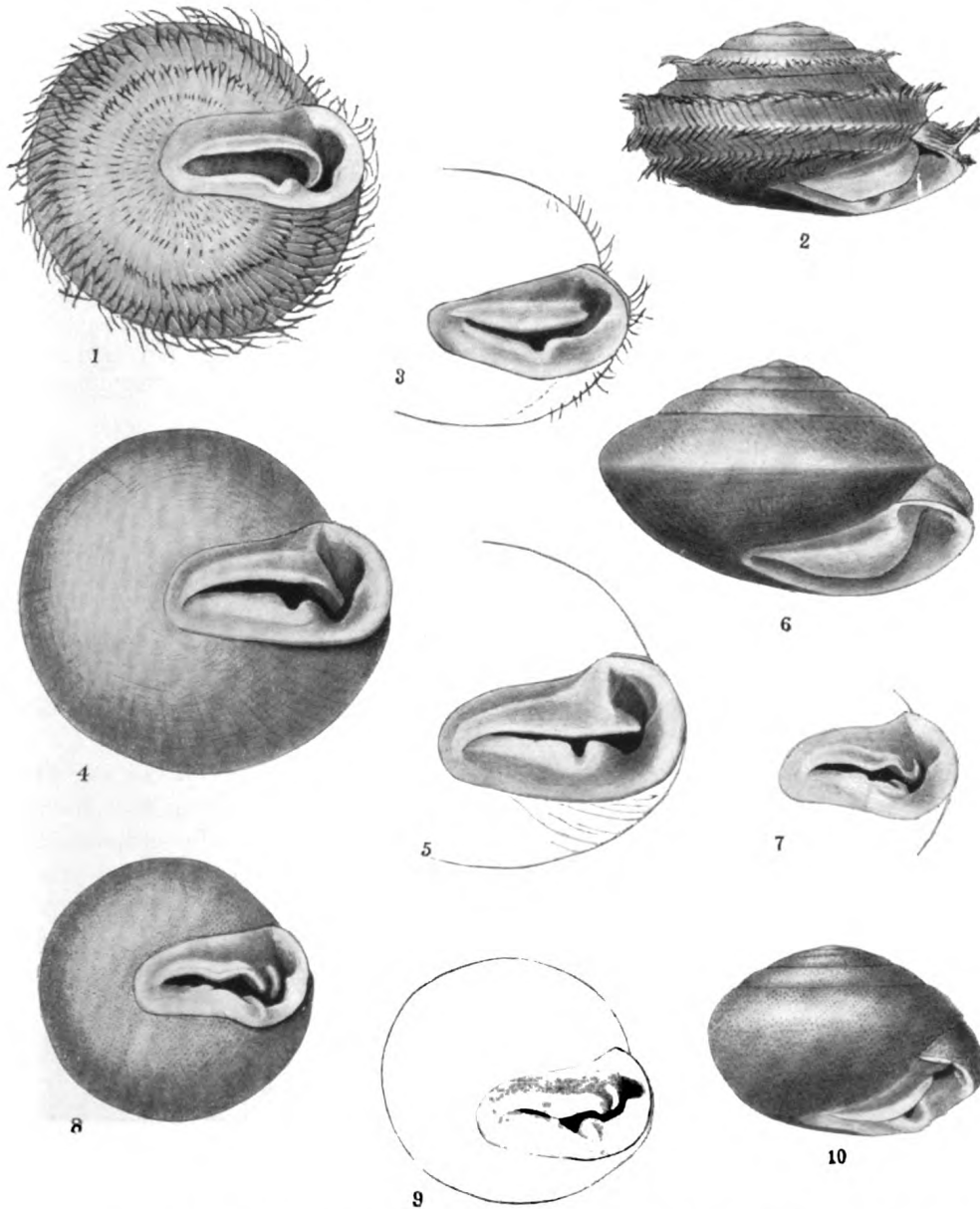


Fig. 406. 1, 2, 3, *Stenotrema pilsbryi*, type. 4, 5, 6, *Stenotrema labrosum*, Petit Jean Mountains, Ark. 7, *Stenotrema unciferum*, type, Mena; 8-10, Rich Mountain, Ark. (About 5 ×.)

**Stenotrema pilsbryi** (Ferriss)

Fig. 406: 1, 2, 3.

*Polygyra pilsbryi* Ferriss, 1900, Nautilus, 14: 29—Pilsbry, 1903, Proc. Acad. Nat. Sci. Phila., p. 201, pl. 9, figs. 1-3.

The imperforate shell is angular at the periphery, the spire convexly conoid, of rather weakly convex whorls, the base moderately convex. Color tawny-olive. Embryonic sculpture as in *S. labrosum*, followed by a smoothish stage of nearly one whorl, the later whorls having rather weak uneven rib-striae, which, at the outer third, bear a wreath of long, curved bristles, with triangular bases. There is a second wreath of bristles at the periphery, and three or four on the base, in all 5 or 6 on the last whorl. The apertural parts are roughened by fine granules and ridges. Parietal tooth is high and strongly bowed, the outer end turning rather abruptly inward at the interdenticular sinus. A low buttress connects with the end of outer lip. The basal lip has a thick, free and prominent edge, its face being slightly concave, and prominent around the moderately shallow and rather wide notch. The interdenticular sinus is deep and narrow. No distinct tooth within the outer arc of the lip. The internal fulcrum is rather short, its edge convex.

Height 5.6 mm., diameter 9.8 mm.; 5½ whorls.

Height 5.5 mm., diameter 9.7 mm.; 5½ whorls.

Height 5.3 mm., diameter 9.2 mm.

ARKANSAS: Rich Mountain, Polk County (Ferriss; Archer & Wheeler), Type 81474 A.N.S.P.

OKLAHOMA: North side of Rich Mountain near Page, Laflore County (Leslie Hubricht).

In shape this snail is nearer *S. labrosum* than any other species, but the strongly developed wreaths of bristles are unlike any other stenotreme. The measurements above do not include the fringe.

Up to this time it has occurred only on Rich Mountain. According to Dr. A. F. Archer, the original locality is on the road to the summit of Rich Mountain on the south side of the valley, near Rich Mountain Station. It was found within the first quarter mile after leaving the main highway, in a shallow, rocky ravine just beyond the beginning of the forest. This ravine is paved with large rocks and quartzite boulders, under which *S. pilsbryi* lives; also under charred wood upon the rocks, or rarely under old logs in stony places.

**Stenotrema labrosum** (Bland)

Fig. 406: 4, 5, 6.

*Helix labrosa* Bland, 1862, Ann. Lyc. Nat. Hist. N. Y., 7: 430, pl. 4, fig. 19.<sup>1</sup>

*Stenotrema labrosa* Bland, Tryon, 1867, Amer. Journ. Conch., 3: 59.—Binney, 1878, Terr. Moll., 5: 292, fig. 19.—Sampson, 1893, Ann. Rep. Geol. Surv. Ark., 2: 186; 1893, Nautilus, 7: 34; 8: 19.

*Polygyra labrosa* Bld., Pilsbry, 1903, Proc. Acad. Nat. Sci. Phila., p. 202, pl. 9, figs. 4-6.—Pilsbry & Ferriss, 1906, Proc. Acad. Nat. Sci. Phila., p. 540.—Sampson, 1911, Nautilus, 25: 40 (Winslow, 2 miles north of Brentwood). Walker, 1928, Terr. Moll. Alabama, p. 46, fig. 54.

*Polygyra labrosa fimbriata* Clapp, 1917, Nautilus, 30: 139.

<sup>1</sup> There is a prior *Helix labrosa* of Férussac and Wood, but this is only a new combination for *Bulimus labrosus* Olivier, not a new name.

The shell is imperforate, lens-shaped, the spire convexly conoid, of nearly flat whorls; base convex; periphery sharply angular throughout. Color, snuff brown to tawny olive. Embryonic sculpture of minute radially lengthened granules, partially confluent in radial striae. Later whorls with interrupted, mostly short, periostracal ridges or "prostrate hairs" as Bland termed them, lacking on the base. There are some very indistinct spiral striae. The aperture is narrow, the parietal tooth long, high and well curved, leaning towards the basal lip, its outer end curving well into the interdenticular sinus, its end curving into the aperture; axial end curving towards the basal lip but separated from it by a deep sinus. A rather low, short buttress connects the tooth with the termination of outer lip. The adnate lip is wide, its sloping face concave, its outer edge conspicuously thick and raised, inner edge thick, white, with a deep notch, denticulate on both sides of the notch. Interdenticular sinus deep and subangular. Denticle in outer lip blunt or sometimes obsolete.

Height 7.2 mm., diameter 12.7 mm. Montgomery Co., Ark.

Height 6.5 mm., diameter 12.5 mm.; 5½ whorls. (Bland.)

Height 6.6 mm., diameter 12.3 mm.; 5¾ whorls. Caddo Gap.

Height 6.5 mm., diameter 11 mm.; 5 whorls. Hot Springs.

Height 6.7 mm., diameter 10.5 mm.; 5¼ whorls. Magazine Mt.

Height 6.1 mm., diameter 10.5 mm.; 5¼ whorls. Magazine Mt.

MISSOURI: Seligman, Barry Co. (Pilsbry and Ferriss). Butler, Bates Co. (Archer). Cape Girardeau (Sampson). Chadwick, Christian Co. (Pilsbry). Springfield, Green Co. (Sampson). Barry, Cedar Gap, Wright Co. (Ferriss). Marble Cave, near Galena, Stone Co. (A.N.S.P.). Dade, Jasper and McDonald counties (Sampson).

ARKANSAS: Benton, Carroll, Conway, Crawford, Franklin, Fulton, Garland, Independence, Johnson, Logan, Montgomery, Perry, Polk, Pulaski, Sebastian, Van Buren, Washington and Yell counties.

OKLAHOMA: Sugarloaf Mountain, LeFlore Co. (Pilsbry).

LOUISIANA: Alexandria, Rapides Parish (M.C.Z.; river drift). Ouachita, Union Parish (M.C.Z.).

The thick, raised but adnate outer edge of the basal lip, the strongly angular or even keeled periphery, and the sculpture of interrupted narrow ridges, like those of *S. spinosum*, on the upper surface, are characteristic of this western species. In well-preserved young shells there are slender, tapering hairs, irregularly placed on or close to the peripheral keel, and rarely some traces of them remain in adult shells.

The form *fimbriatum* Clapp "differs from the type in having a well-developed peripheral fringe of two or three rows of hairs about 0.25 mm. in length, the hairs also showing as a sutural fringe, and the 'prostate hairs' of Bland's original description are much more elevated. On the base are spiral rows of short, erect bristles continuing to the umbilicus [presumably of immature shells]. Aperture typical. Diameter 11, alt. 6 mm., whorls 5. Sulphur City Washington County, Arkansas, collected by A. J. Brown, January 1917, Types No. 8112 of my collection." (Clapp.)

The localities of *S. labrosum* are all in hilly or mountainous country, chiefly in central and western Arkansas, barely reaching over the State border on the west, but extending some distance north into Missouri.

Nowhere does the species approach the lowlands of the Mississippi, so far as we know at present; but we are still practically without data on the land molluscan fauna of eastern Arkansas.

The localities in Louisiana, from specimens in Museum of Comparative Zoölogy, need confirmation. Ouachita is on the river of the same name, flowing from central Arkansas. River drift specimens from Alexandria are far beyond other records for the species. Bland's records "Tennessee" and "Alabama", repeated by some later authors, have not been confirmed, and are now discredited. In his original description Bland mentioned four localities for *H. labrosa*: Washita Springs and Hot Springs, Ark., Tennessee and Alabama. As neither was designated as typical, I suggested in 1906 that Hot Springs, Garland Co., Ark., be selected as the typical locality. It has been collected there by Ferriss and others. Dr. Clench (*in litt.*) has suggested that specimens from Ouachita, La., in the collection from Bland in the Museum of Comparative Zoölogy be taken as types. This cannot be done because Bland did not mention that locality in his original account. The Ouachita specimens were evidently some he acquired later. The record has not appeared in print before.

This species and the preceding are placed in the *spinorum* group on account of the angular periphery and the character of the sculpture, but in apertural characters they seem nearer *stenotrema*. They form a separate little group.

#### STENOTREMA STENOTREMA GROUP

##### *Stenotrema altispira* (Pilsbry)

Fig. 407 a, a'. b.

*Stenotrema hirsutum* Say, an elevated, somewhat carinated variety. Wetherby, 1881, Journ. Cincin. Soc. Nat. Hist., 4: 329; 1894, same Journal p. 212.

*Polygyra hirsuta altispira* Pilsbry, 1894, Nautilus, 7: 141.—Pilsbry & Rhoads, 1894, Proc. Acad. Nat. Sci. Phila., p. 493.—Winslow, 1921, Nautilus, 35: 42.

*Polygyra altispira* Pils., Walker & Pilsbry, 1902, Proc. Acad. Nat. Sci. Phila., p. 418, 427.—Clapp, 1907, Nautilus, 20: 111, pl. 5, figs. 5-7.—Banks, 1932, Nautilus, 45: 138.—Clench & Archer, 1933, Nautilus, 46: 91.—Archer, 1935, Nautilus, 48: 79, 81.

The imperforate shell is thin, globose-conic, with convex base and rounded periphery (which, however, may be just perceptibly subangular in front of the aperture). Tawny olive or somewhat browner. Embryonic shell minutely granulate. Later whorls microscopically lineolate, with rather short, stiff hairs rising from rather conspicuous basal scars, arranged in forwardly-descending trends; the base with similar pattern (Fig. 407 a'). The very narrow aperture has a rather low and slender buff parietal tooth, slightly curved or sinuous, not turning into the interdenticular sinus, which is moderately deep and rounded. The thin outer edge of the basal lip is wholly adnate; the calloused inner edge is prominent on both sides of the central notch, which is rather wide and deep. No tooth within the outer arc of the lip. The fulcrum is well developed, with nearly straight edge.

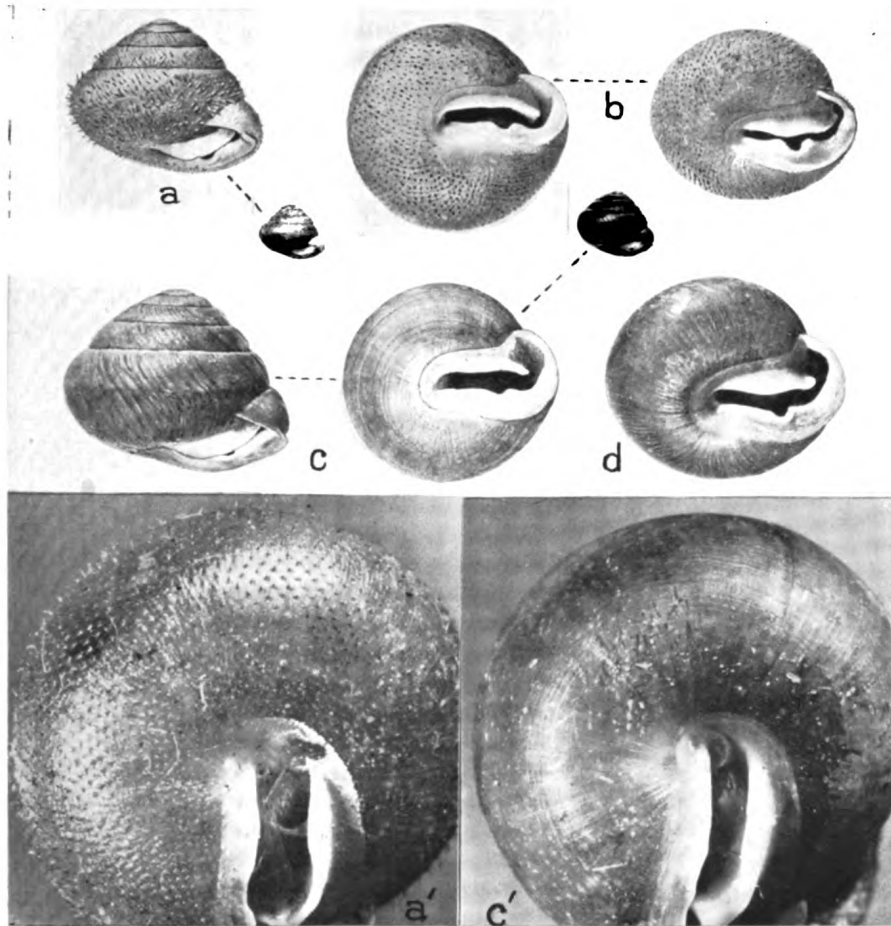


Fig. 407. a, a', b, *Stenotrema altispira*, type and paratype. c, c', d, *S. depilatum*, type and paratype. (Actual size and enlarged.)

Height 7.2 mm., diameter 9.7 mm.; 6 whorls. Type.

Height 6.7 mm., diameter 8.7 mm.; 5 $\frac{3}{4}$  whorls. Topotype.

Height 8.2 mm., diameter 11.2 mm.; 6 $\frac{1}{4}$  whorls. Mt. Mitchell.

TENNESSEE: Mt. LeConte, Sevier Co. (G. W. McClure). Northern outliers of Roan Mountain, Carter Co. (H. B. Baker).

NORTH CAROLINA: Roan Mountain in various places, to the top (H. B. Baker, and others); Type 175275 A.N.S.P. from "near Magnetic City" (Wetherby). Grandfather Mountain (G. S. Banks). Black Mountains at Mt. Mitchell, Cat-Tail Wilson's Meadow Cove, Tyson's, Ivy River and Bee Tree Cove (Walker and Ferriss); Step's Gap (Clench, Rehder and Archer). Bluff Mountain south of Paint Rock (Walker). Asheville (Archer). Near Newfound Gap, Mt. LeConte, Swain Co. (Archer). Jackson Co. (Ferriss). Rich Mountain, Bennett Gap Road, Wagon Gap Trail and Pink Beds, under oak and beech logs, Pisgah National Forest, Transylvania Co. (Mina Winslow).

It is generally larger than *S. magnifumosum*, with distinct hairs or hair-scars, not periostracal ridges in the direction of growth-lines, as on the upper surface of *magnifumosum*. *S. depilatum* differs by the total absence of hairs or their scars.

According to Archer, "the form occurring at Asheville differs from that occurring at higher altitudes in neighboring regions by being more depressed and having surface hairs that are larger and softer to the touch." The largest specimens seen are from Mt. Mitchell. Some from Swain and Jackson counties are smaller, down to 6.4 x 8.4 mm., Mt. LeConte, and 6 x 8.6 mm., Jackson County. Dr. Archer informs me that there are laminae among the hairs on the upper surface of specimens from Pisgah Forest.

***Stenotrema depilatum* (Pilsbry)**

Fig. 407 c, c', d.

*Polygyra stenotrema depilata* Pilsbry, 1895, *Nautilus*, 9: 16.—Ferriss, 1899, *Nautilus*, 12: 98.

*Polygyra depilata* Pilsbry, 1900, *Proc. Acad. Nat. Sci. Phila.*, p. 115; *Nautilus*, 14: 51, 55.—Walker & Pilsbry, 1902, *Proc. Acad. Nat. Sci. Phila.*, p. 420.

The imperforate shell is thin, globose-conic, with convex base and rounded periphery, similar in shape to *S. altispira*. Embryonic shell minutely granulose, the first post-embryonic whorl striate and with a few scattered papillae. Later whorls having a silky sheen, with sculpture of rather coarse, unevenly spaced striae over a microscopic lineolation; the base with rather close, very low spiral striation. The aperture is nearly like that of *S. altispira*, but is noticeably wider between parietal tooth and basal lip, and the basal notch is smaller.

Height 8 mm., diameter 10.2 mm.; 5½ whorls. Thunderhead.

Height 8.7 mm., diameter 11 mm. Andrews Bald.

TENNESSEE-NORTH CAROLINA: Great Smoky Mountains, Thunderhead from the summit to Cades' Cove, Blount County, Tenn.; Clingman Dome, near summit; Mt. Collins; Mt. Guyot (Ferriss & Pilsbry). Andrews Bald, Swain County (H. E. Sargent). Stratton Bald, Unaka Mountains, Graham County (Ferriss). Along Mill Creek, Mt. LeConte. At 3000 feet, Sevier County, Tenn. (S. C. Bishop). Type 65729 A.N.S.P. from Thunderhead.

In large series of this species and *S. altispira* I have seen no intergradation of the sculptural characters described above, and doubt whether such occurs. The silky sheen of living shells is soon lost in dead ones. The lowest stations for *depilatum* are at about 3000 feet, but most of the stations are on the mountain tops. It inhabits very wet places, and is occasionally found in bunches of moss on the trees, together with *Mesodon andrewsae altivaga*. Its range is mainly south and west of that of *S. altispira*. Both species have been found on Mt. LeConte, in at least one place under the same log.

**Stenotrema florida** new species

Fig. 408 b.

The large shell is depressed-globose with broadly rounded periphery; sayal brown colored; densely covered with short hairs. Embryonic whorls papillose, as usual. The long parietal tooth is slender, curves inward, and at the peripheral end is shortly, rather abruptly, hooked inward. There is

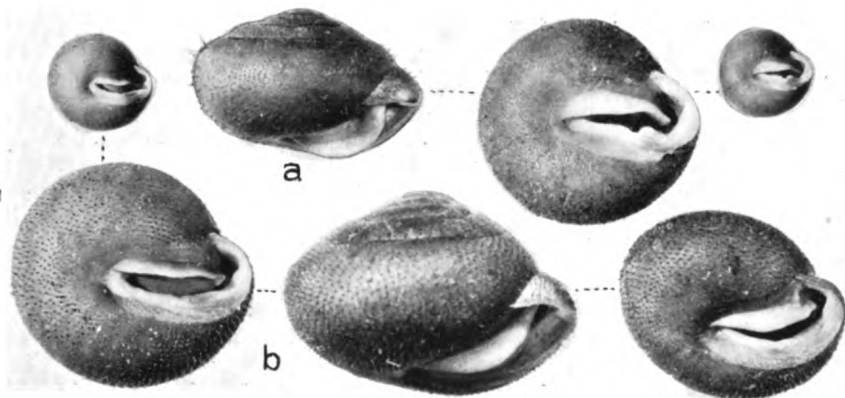


Fig. 408. a, *Stenotrema stenotrema* form *voluminosum*, paratypes. b, *S. florida*, type and paratypes. (Enlarged and actual size.)

no trace of a buttress running towards the upper lip insertion. The basal lip has a very small submedian notch, scarcely noticeable in some specimens. The interdenticular sinus is quite shallow.

Height 8.2 mm.; diameter 12.5 mm.; 5 $\frac{3}{4}$  whorls. Type.

Height 8.6 mm.; diameter 12.5 mm.; 5 $\frac{3}{4}$  whorls. Chattahoochee.

Height 8 mm.; diameter 11.8 mm. Chattahoochee.

Height 8.3 mm.; diameter 12 mm. Marianna.

FLORIDA: Bluffs along Appalachicola River, Torreya State Park (Leslie Hubricht), Type 174908 A.N.S.P. Chattahoochee, Gadsden County (O. C. and G. W. VanHyning). Marianna, Jackson County (C. W. Johnson).

While it is closely related to *S. stenotrema*, with the size of the form *voluminosum*, it differs by the very shallow interdenticular sinus, by the absence of any trace of a buttress on the parietal tooth opposite the insertion of the outer lip, and by the reduced but somewhat variable lip notch. By the slender parietal tooth and absence of a buttress it resembles *S. altispira*.

This is the only *Stenotrema* known to occur in Florida, where it appears to be restricted to the florally peculiar district along the Appalachicola and Chipola Rivers. It is named for the state.

**Stenotrema stenotrema** (Pfeiffer)

Fig. 409 a-e.

*Stenotrema convexa* Rafinesque, 1819, Journ. de Phys., Chim., d'Hist. Nat., 85: 425; in Binney & Tryon, Complete Writings of C. S. Rafinesque, p. 28. (Not defined).



- Stenostoma convexa* Rafinesque, 1831, Enum. and Account, etc., p. 2; Binney & Tryon, Complete Writings, p. 67. Not *Helix convexa* Raf., Deshayes, 1830, Encycl. Méth., 2: 253 (= *H. fraterna* Say). Cf. Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 325-6, footnotes.
- Helix hirsuta* var. *a*, *Stenotrema convexa* Rafinesque, Férussac, 1821, Tabl. Syst. Fam. Limaçons, no. 101, p. 34. (Nude name.)
- Helix stenotrema* (Fér. Mus.), Pfeiffer, 1842, Symbolae ad Hist. Hel., 2: 39 (Indiana).—Bland, 1864, Ann. Lyc. Nat. Hist. N. Y., 7: 427.—Harper & Wetherby, 1872, L. & Fr.-W. Sh. Vicin. Cincinnati, p. 2.—Wetherby, 1881, Journ. Cincin. Soc. Nat. Hist., 3: 34; 4: 32.
- Helix hirsuta* varietät, *Helix stenotrema* Fér. Mus., Pfeiffer, 1846, Syst. Conchyl.-Cab., Helix, 1: 375, pl. 65, figs. 12-14.
- Stenotrema stenotremum* Fér., Binney, 1878, Terr. Moll., 5: 295, pl. viii, fig. B, teeth.—Sampson, 1893, Nautilus, 7: 34; 1893, Ann. Rep. Geol. Surv. Ark., 2: 186.—Call, 1900, Indiana Geol. Surv. Rep. for 1899, p. 333, pl. 5, fig. 6.
- Polygyra stenotrema* Fér., Daniels, 1903, 27th Ann. Rep. Dept. Geol. and Nat. Resources Ind., p. 630.—Pilsbry & Ferriss, 1906, Proc. Acad. Nat. Sci. Phila., p. 540.—F. C. Baker, 1906, Ill. State Lab. Nat. Hist., 7: 117.—Sampson, 1913, Trans. Acad. Sci. St. Louis, 22: 97.—Walker, 1928, Terr. Moll. Alabama, p. 48, fig. 57.
- P[olygyra] stenotrema nuda* Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 129.
- Polygyra stenotrema seminuda* Clapp, 1904, Nautilus, 18: 86.
- Polygyra (Stenotrema)voluminosa* Clench & Banks, 1932, Nautilus, 46: 16, pl. 2, figs. 6-7.

The imperforate shell is depressed-globose, with low conoid spire, strongly convex base and rounded periphery; from buckthorn brown to cinnamon brown in color. Embryonic whorls with the usual sculpture, the later whorls unevenly striate, set with papillae bearing rather short hairs in forwardly descending trends; these continuing over the base, where they are finer near the axis. The narrow aperture has buff to brown borders. Parietal tooth high, but not rising to the level of the basal lip, leaning towards the latter, gently curved, its outer end turning into the interdenticular sinus (and often further curved into a very short hook at the end); a low and inconspicuous buttress between parietal tooth and termination of outer lip. The basal lip has a thin, wholly adnate outer margin; inner margin nearly straight in basal view, with a small but well marked median notch, with slightly raised, callous border. The interdenticular sinus is moderately deep and rather narrow. The outer lip bears a low tooth or none. The fulcrum is well developed with convex edge.

Height 6.8 mm., diameter 10 mm.; 5½ whorls. Indianapolis, Ind.

Height 5.3 mm., diameter 7.8 mm.; 5 whorls. Indianapolis, Ind.

Height 7.7 mm., diameter 11.8 mm., 5½ whorls. Gatlinburg, Tenn.

Height 6.8 mm., diameter 9.4 mm. Gatlinburg, Tenn.

Height 8.6 mm., diameter 12.8 mm., 5¾ whorls. Chambers' Ck., Graham Co., N. C.

Height 7 mm., diameter 10.6 mm.; 5¾ whorls. Chambers' Ck., Graham Co., N. C.

OHIO: Hamilton and Warren counties, in the southwestern angle of the state.

INDIANA: Generally distributed in the southern half of the state and as far north as Randolph and Tippecanoe counties.

ILLINOIS: Crawford Co.

MISSOURI: Brush Creek, 4 mi. east of Ashland, Boone Co. (L. Hubricht). Douglas Co. (Sampson). Pleistocene at Providence, Boone Co. (Hubricht).

ARKANSAS: Hardy, Sharp Co. (Ferriss). Independence Co. (Sampson). Petit Jean Mountains, Sebastian Co. (Pilsbry). Chastat Mountains, Polk Co. (Ferriss). Mablevale, Pulaski Co. (C. W. Johnson). Near Hot Springs, Garland Co. (Maxwell Smith). Clark Co. (Sampson).

OKLAHOMA: Fort Gibson (Hubbard). Wyandotte (Pilsbry).

LOUISIANA: Madison Parish (Bland). Rapides Parish.

VIRGINIA: Southwestern counties: Natural Bridge, Rockbridge Co. (Pilsbry and others); Wise Co. at Norton (S. S. Lewis) and Big Stone Gap (Clench and Archer).

WEST VIRGINIA: Spanishburg, Mercer Co. (Clench and Archer). Kanawha Co. (Archer).

NORTH CAROLINA: Western, from the Tennessee interstate boundary east to Stokes and Polk counties.

KENTUCKY: Eastern two-thirds, west to Jefferson, Hart and Barren counties.

TENNESSEE: Eastern two-thirds of the state.

SOUTH CAROLINA: Abbeville and Spartanburg counties (Archer).

GEORGIA: Chatsworth, Murray Co. (C. C. Allen). Shell Bluff, Savannah River, Burke Co. (Francis Harper). Also DeKalb, Habersham and Whitfield counties (Archer).

ALABAMA: Throughout the state.

MISSISSIPPI: Jackson, Hinds Co. Vicksburg, Warren Co., Pleistocene. Also Adams and Lownes counties.

Other northern localities found in some collections and lists seem improbable, and can scarcely be accepted until verified. Such are: East Aurora, New York; Monroe County, Michigan; McHenry County, Illinois.

*S. stenotrema* is larger than *S. hirsutum*, with a decidedly narrower aperture, a higher parietal tooth, a wider basal lip, and the interdenticular sinus is narrower and deeper.

It varies widely in size and shape, from rounded to bluntly subangular at the periphery, as in specimens figured from west bluff of Kentucky River opposite Frankfort, Kentucky, (Fig. 409 c). The surface generally is evenly set with hairs, but in many lots it varies to only sparsely hairy, the hairs readily lost, or represented only by minute papillae. Quite hairless examples occur, but in such cases series of the young should be examined. The apertural parts also vary in the width of the orifice and the size of the parietal tooth. Typically this does not rise to the level of the basal lip, but in many lots it is higher. These variations have not been definitely correlated with any ecologic factors or geographic location.

Pfeiffer's description<sup>1</sup> is unsatisfactory; he had a specimen denuded of hairs, and larger than any Indiana example known, a size of 12 mm. being reached only in some North Carolina, Tennessee, and Alabama localities, so far as I know.

The form described as *voluminosa* Clench and Banks (Fig. 408 a), from Blowing Springs, Cliff Ridge, Nantahala Gorge, Swain County, N. C., is the

<sup>1</sup> "T. imperforata, depressiuscula, minutim striata corneo-fusca; sutura impressa; anfr. 6 planiusculis, ultimo obsolete angulato, basi convexo, ad aperturam gibbo; aperture fere lineari, dentibus coarctata; dente 1 lato, linguiformi in toto pariete aperturali, pluribus irregularibus latis in margine inferiore; perist. subcalloso. Diam. 12, altit. 7 mill.—Indiana (Mus. Paris)."

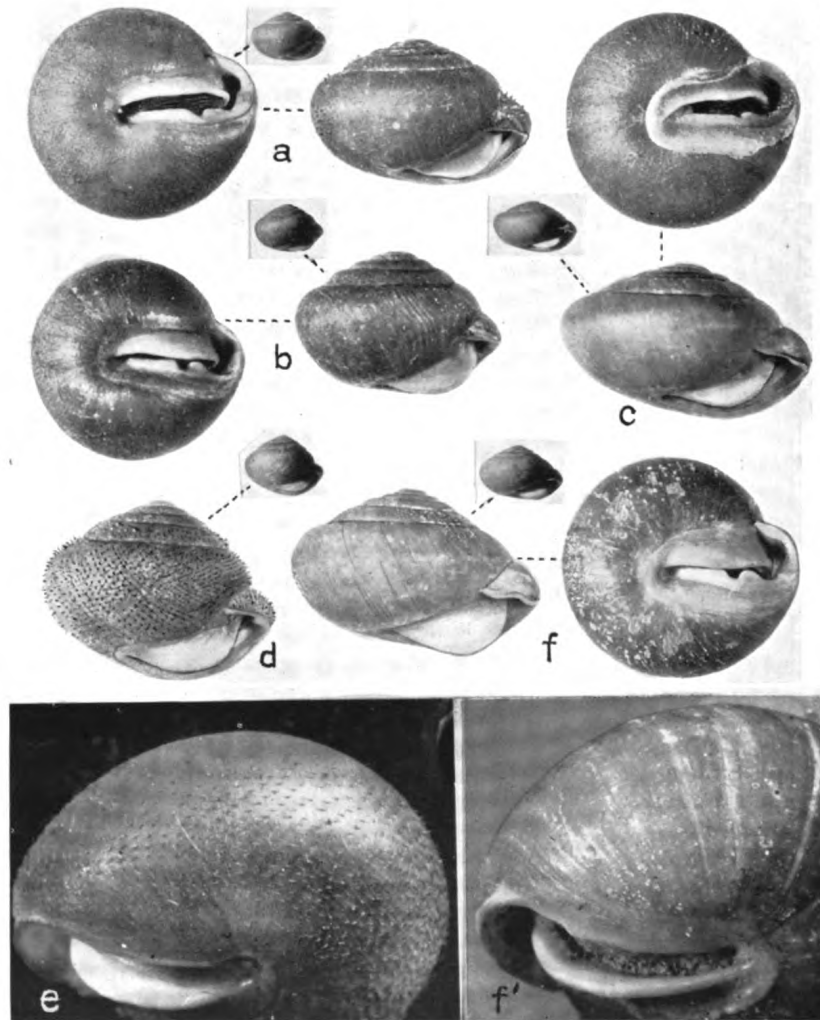


Fig. 409. a, e, *Stenotrema stenotrema*, Indianapolis; b, near Hamilton, Ala.; c, Frankford, Ky.; d, Wetumpka, Ala. (hairs badly rendered in retouching). f, f', *Stenotrema stenotrema nudum*, type and paratype, near Bellevue, Tenn. (Actual size and enlarged).

largest *Stenotrema* known, the type, 82530 M. C. Z., measuring: height 9.5, diameter 13.9 mm.;  $5\frac{1}{2}$  whorls. Others from the same place measure: 7.9 x 12.4 mm., and 7.8 x 11.7 mm.;  $5\frac{1}{2}$  whorls. The structure is that of *S. stenotrema*, the only peculiarity being the great size, which also seems to characterize other local forms of the Tennessee and North Carolina boundary counties. Large specimens of *S. stenotrema* from Sevier County, Monroe County and other places in Tennessee and in North Carolina,

measurements of which are given above, establish a transition to ordinary *S. stenotrema*. Notes on these large forms were given in my paper of 1900, pp. 131-2. *S. s. voluminosum* is not admitted as a subspecies because no distinctive limits of size or distribution can be assigned.

The form called *P. stenotrema seminuda* G. H. Clapp "differs from *nuda* in having *very short*, widely spaced hairs, in other particulars agreeing with var. *nuda*. As it appears to be a 'connecting link,' I have called it var. *seminuda*. In size it varies from  $5\frac{1}{2} \times 8$  to  $7 \times 10$  mm., the average diameter being  $9$  to  $9\frac{1}{2}$  mm.; color from greenish-white, almost albino, to dark reddish-brown. Types from Bangor, 4 miles north of Blount Springs, Blount Co., Ala., in coll. G. H. C. and A. N. S. P." (Clapp.)

Also taken at Calera, Alabama. The apertural characters appear to be typical of *stenotrema*; and since there is wide variation in the hairs of the species in different localities, it seems scarcely differentiated enough for a subspecies. The aperture of *seminudum* is not like that of *nudum*.

Form *nudum* Pilsbry. (Fig. 409 f, f'.) The surface has no hairs or papillae, under the microscope showing only the usual lineolation. The parietal tooth is very high and leans strongly towards the basal lip, leaving an extremely narrow aperture. Tooth between notch and interdenticular sinus strongly developed, being higher and shorter than in *stenotrema* proper. Periphery very indistinctly subangular,  $7 \times 9.8$  to  $10.8$  mm. Tennessee, near Belleview (Rhoads, Type 68590 A.N.S.P.) and other places in Davidson County. Johnson City, Washington County (Rhoads). This was at first thought to be a distinguishable subspecies, but rather similar forms occur sporadically elsewhere. Thus, north of Hamilton, Marion County, Alabama, there are shells with the aperture similar except that the tooth between notch and sinus slopes towards the latter, and there are some inconspicuous, small and scattered hair papillae.

*S. stenotrema* without a lip notch has been reported from Dalton, northwestern Georgia, and from "East Tennessee" (Nautilus, 14: 135), the specimens rather small, 8 to 8.7 mm. in diameter.

Genitalia (Fig. 400 A, a', Great Smoky Mts., Tenn.) with a penis in length about three-fourths of the shell diameter, tapering to a short epiphallus which is differentiated from the vas deferens by its larger caliber, and bears the retractor muscle close to its base. The penial cavity at first has one large pilaster and numerous small ridges (Fig. 400 a'), but additional unequal folds soon appear. In front of the middle there are two principal pilasters, on opposite sides. The vagina is quite long, about two-thirds of the shell's diameter. The talon is a rather large mass of globose nodules. The straightened last part of the hermaphrodite duct is longer than usual, in the figure shown passing under the talon. Length of penis 9 mm., retractor 4 mm., vagina 8 mm., spermatheca and duct 5.5 mm.; diameter of shell 11.5 mm. In a specimen from Frankfort, Kentucky, the vagina is 5.5 mm. long, otherwise as in that figured.

In *S. florida* the measurements are: length of penis 11 mm., vagina 3 mm.; spermatheca and duct 6 mm.; diameter of shell 13 mm. (Fig. 400 c, d).

**Stenotrema magnifumosum** (Pilsbry)

Fig. 410.

*Polygyra edwardsi magnifumosa* Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 130.—  
Ferriss, 1900, Nautilus, 14: 55.

*Polygyra magnifumosa* Pilsbry, Clench & Banks, 1932, Nautilus, 46: 58.

The imperforate shell has a convexly conoidal spire, strongly convex base and quite bluntly angular periphery, at least in front. Color wood's brown to cinnamon-brown. Embryonic shell with sculpture of radially lengthened pustules, much less crowded than in *S. stenotrema*. Later whorls with coarse, low, fold-like striae, with distinct to obsolete, discontinuous, periostracal ridges, over a microscopic lineolation (often indistinct). Base with rather widely spaced papillae rarely bearing short hairs; but in most specimens both papillae and hairs are obsolete. Aperture narrow. The parietal tooth is brown, high and curved, the outer third curving rather

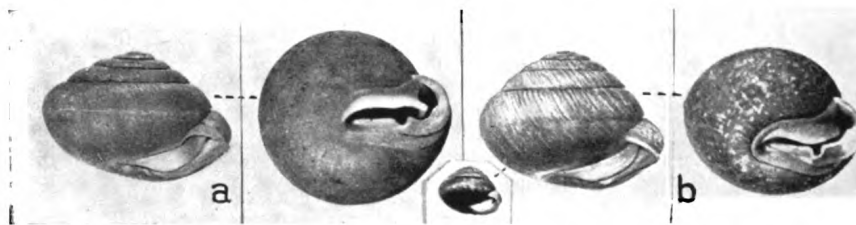


Fig. 410. *Stenotrema magnifumosum*: a, type; b (left), Macon Co., N. C.; (right), Hayesville, N. C. (Enlarged and actual size.)

deeply into the interdenticular sinus. Buttress connecting with termination of outer lip is well developed. The basal lip is brown, with thin, closely adnate outer margin; the inner margin is callous, denticulate on both sides of the rather deep notch. The interdenticular sinus is rather deeply rounded. A rather distinct tooth or a mere callus in the outer lip. The fulcrum is rather short with convex edge.

Height 5.5 mm., diameter 7.8 mm.; 5¼ whorls.

Height 6.2 mm., diameter 9 mm.; 5½ whorls. Swain County, N. C.

Height 4.7 mm., diameter 6.4 mm. Swain County, N. C.

TENNESSEE: Cade's Cove, Blount Co. (Pilsbry). Tellico Gorge, Monroe Co. (H. B. Baker).

NORTH CAROLINA: Paint Rock, Madison Co. (B. Walker). Cherokee National Park, Polk Co. (Archer). Chamber's Creek, Swain Co. (Ferriss). Big Bridge (Ferriss); Yellow Mountain west of Norton (Archer), Jackson Co. Highlands, Bear Pen Mt., Satulah Mt., Horse Cove, Black Gap, east of Gneiss, north of Topton, Lake Sequoyah, and other places in Macon Co. (A. F. Archer). Tuskegee Creek and Cheowah River near junction of Yellow Creek, Graham Co. Type 77630 A.N.S.P. (Ferriss). Hayesville (Annie E. Law, Sargent, Archer), Warne, and knobs 3 mi. west (Archer). 2 mi. east of Lake Toxaway, and Owen's Gap, 2 mi. north; Panther Mountain 10 mi. south of Brevard (Archer), Clay Co. Murphy, Cherokee Co. (Archer).

GEORGIA: Chestnut Ridge, Rabun Bald, Rabun Co. (Rehn & Hebard). 2½ mi. north of Hiawasse, Towns Co. (Archer). Near summit Blood Mountain, Union-Lumpkin Co. boundary (Francis Harper). Neal Gap, 13 mi. southeast of Blairsville, Union Co. (Archer). West side Cohutta Mountains near Ramhurst, Murray Co. (H. H.

Smith). Atlanta, Fulton Co. (Archer). Cherrylog 2500-3000 feet, and Ellijay, Gilmer Co. (Smith).

This abundant snail ranges from about 1600 to at least 4500 feet. It differs from *S. edwardsi* by the stronger development of all the mouth parts, the deep lip notch, deep interdenticular sinus and the bluntly angular periphery. *S. altispira* is usually larger, the interdenticular sinus is not so deep and the outer end of the parietal tooth, which is lower, does not curve so far inward.

Albinos of pale green color have been found at Yellow Mountain, Jackson County, North Carolina.

(*Magnus, fumosus*, great, smoky; for the mountains so named.)

***Stenotrema pilula*** (Pilsbry)

Fig. 411.

*Polygyra hirsuta pilula* Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 132.

*Polygyra pilula* Pils., Walker & Pilsbry, 1902, Proc. Acad. Nat. Sci. Phila., p. 428.— Walker, 1928, Terr. Moll. Alabama, p. 55, fig. 64.— F. C. Baker, 1931, Journ. Paleont., 5: 280.— Clench & Banks, 1932, Nautilus, 46: 58.— Clench & Archer, 1933, Nautilus, 46: 91.

The imperforate shell is subglobose with convexly conoid spire of rather strongly convex whorls, and rounded periphery; the color between buck-thorn brown and cinnamon brown. Sculpture of last whorl consisting of minute, short scale-like laminae in the direction of lines of growth, with rather long hairs in the peripheral region, the base with spirally lengthened low laminae from which hairs arise. The rather narrow aperture has reddish margins. Parietal tooth not rising quite to the level of the basal lip, sinuous, being bent outward opposite the notch, the inner end curving into the interdenticular sinus, often somewhat hooked there. The basal lip has a thin, adnate outer edge, the inner edge pale, calloused, the callus rather prominent around the deep, oblique notch, which has rather prominent teeth on both sides, the outer one more massive. The interdenticular sinus is deeply rounded. Tooth in the outer arc of the lip is bluntly conic and rather heavy. Fulcrum strongly developed.

Height 4.3 mm., diameter 5.7 mm.; 5 whorls.

Height 4.4 mm., diameter 6 mm. Cade's Cove.

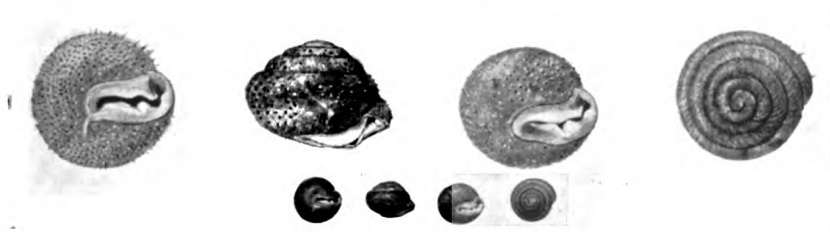


Fig. 411. *Stenotrema pilula*, type and paratypes. (Enlarged and actual size.)

TENNESSEE: Cade's Cove; summit of Thunderhead (Mrs. Geo. Andrews, Ferriss, Pilsbry and others), Type 67574 A.N.S.P. Rich Mountain, Blount Co. (Archer). Mt. LeConte, Sevier Co. (Clench and Archer).

NORTH CAROLINA: Paint Rock (Walker and Ferriss). Tuskegee Creek, Graham Co. (Ferriss). Welch Bald (Sargent) and Nantahala Gorge (Clench), Swain Co. Near Topton, Macon Co. (Archer). Clyde (Mrs. H. H. Buckman) and Crestmont, Mt. Sterling, Haywood Co. (Archer).

This smallest of the stenotremes has a higher spire than *S. hirsutum*, heavier mouth parts, a deeper basal notch which has a more heavily calloused rim, and the sculpture is quite different by the scale-like laminae below the suture and the spirally lengthened bases of the hairs on the lower surface.

(*Pilula*, a little ball or pill.)

***Stenotrema hirsutum* (Say)**

Fig. 412.

*Helix hirsuta* Say, 1817, Journ. Acad. Nat. Sci. Phila., 1: 17; 2: 161.—Binney, 1851, Terr. Moll., 2: 150, pl. 42, fig. 3.—Leidy, 1851, in Terr. Moll., 1: 257, pl. 11, figs. 5-6 (anatomy).—Wetherby, 1881, Journ. Cincin. Soc. Nat. Hist., 4: 329.—Stearns, 1889, Nautilus, 3: 81 (supposed occurrence on West Coast).

*Stenotrema hirsutum* Say, W. G. Binney, 1878, Terr. Moll., 5: 296, pl. 42, fig. 3; pl. vii, fig. F (teeth).—Call, 1886, Bull. Washburn Coll. Lab. Nat. Hist., 1: 202; Rep. Geol. Surv. Ind. for 1889, p. 383.

*Polygyra hirsuta* Say, Walker, 1906, Terr. Moll. Michigan, p. 470, fig. 22; 1928, Terr. Moll. Alabama, p. 53, figs. 61, 62.—Johnson, 1915, Occ. Pap. Boston Soc. Nat. Hist., 7: 197.—Gardner, 1894, Nautilus, 8: 75, (Long Island).—Clapp, 1894, Nautilus, 8: 24 (large lowland and small hill forms).

*Polygyra hirsuta nana* C. and A., Richards, 1934, Amer. Midl. Nat., 15: 86, "Culpeper, Va." (nude name).

*Polygyra hirsuta yarmouthensis* F. C. Baker, 1927, Nautilus 40: 115; 1928, Trans. Ill. State Acad. Sci., 20: 271-292; 1931, Journ. Paleont., 5: 277, pl. 32, figs. 17 A, B.

*Helix porcina* Say, 1824, App. Major Long's Second Exped., p. 257, pl. 15, fig. 2, "Northwest Territory". (An immature shell, never identified with certainty.)

The shell is depressed globose with rather low, convexly conoid spire, rounded periphery and strongly convex base; cinnamon-buff to clay color. After the initial smooth stage the embryonic shell has close, radially lengthened granules. The later whorls have short, moderately stiff hairs with rounded bases, arranged in oblique series, over the usual microscopic lineation. The parietal tooth is slightly bowed, rather high but lower than the level of the basal lip, slightly sinuous in the outer third, the end not turning towards the interdenticular sinus. The basal lip is rather broad, its outer edge closely appressed, the calloused inner edge having a large and deep, slightly oblique notch with slightly raised edges. The interdenticular sinus is rather broadly rounded. Tooth in the outer lip is rather well developed, bluntly conic.

Height 4.7 mm., diameter 7 mm.; 5 whorls. Type.

Height 4.3 mm., diameter 6.2 mm. Round Island, Clinton County, Pa.

Height 5.4 mm., diameter 8.2 mm. Wissahickon Creek, Pa.

Height 4.6 mm., diameter 6.5 mm. Wissahickon Creek, Pa.

Height 5.7 mm., diameter 9.6 mm. Selma, Mo.

ONTARIO: Point Pelee, Essex Co. (J. Oughton).

MASSACHUSETTS: Pittsfield, Berkshire Co. (Roper).

CONNECTICUT: Southbury, New Haven Co. (A. D. Brown). Farmington (A. D. Brown) and Grandby (Benton Holcomb), Hartford Co. 3 mi. northeast of Sandy Hook, Fairfield Co. (Archer). Weston and Greenwich (Johnson).

**NEW YORK:** Ithaca, Tompkins Co. (A. Jacot, G. Van Ingen). East Aurora, Erie Co. (E. J. Letson). Annandale (Teator), and Poughkeepsie, Dutchess Co. (G. Van Ingen).

**NEW JERSEY:** Many places in Warren and Sussex counties (B. Long, J. B. Clark, Pilsbry *et al.*). Trenton and Princeton, Mercer Co. Near Lambertville (Archer) and Split Rock Pond (Geo. Greene), Hunterdon Co.

**PENNSYLVANIA:** In the following counties: Adams, Allegheny, Beaver, Berks, Bucks, Chester, Clinton, Fayette, Forest, Franklin, Fulton, Greene, Lackawanna, Lancaster, Lehigh, Lycoming, Monroe, Montgomery, Montour, Northampton, Philadelphia, Pike, Schuylkill, Susquehanna, Union, Venango, Washington, Westmoreland, York.

**DELAWARE:** Various places in Newcastle Co.

**MARYLAND:** Allegany, Baltimore, Cecil, Cumberland, Dorchester, Harford, Montgomery, Morgan, and Washington counties.

**DISTRICT OF COLUMBIA.**

**VIRGINIA:** Amherst, Augusta, Craig, Culpepper, Fairfax, Greene, Nelson, Orange, Prince Edward, Prince William, Pulaski, Rockbridge, Shenandoah, and Wise counties.

**WEST VIRGINIA:** Doddridge, Jefferson, Mineral, Morgan, Randolph, Ritchie, Taylor, Wetzel, and Wirt counties.

**MICHIGAN:** Berrien, Branch, Cass, Jackson, Kent, Lenawee, Livingston, Monroe, Van Buren, Washtenau, and Wayne counties.

**WISCONSIN:** Crawford, LaFayette, Manitowoc, and Milwaukee counties.

**MINNESOTA:** Wright Co. Winona, Montgomery Co. (Holzinger).

**OHIO:** Adams, Ashtabula, Belmont, Clark, Cuyahoga, Fairfield, Franklin, Fulton, Greene, Guernsey, Hamilton, Huron, Jefferson, Licking, Lucas, Miami, Ottawa, Pickaway, Portage, Ross, Summit, Tuscarawas, Warren, Washington, and Wood counties.

**INDIANA:** Allen, Arlington, Crawford, Dearborn, Floyd, Franklin, Fulton, Henry, Jackson, Jefferson, La Porte, Marion, Marshall, Parke, Posey, Randolph, Starke, Tippecanoe, and Wabash counties.

**ILLINOIS:** Carroll, Champaign, Clark, Cook, Edwards, Fulton, Gallatin, Henderson, Jackson, La Salle, Lawrence, Logan, Menard, Mercer, Ogle, Sangamon, Washington, Will, Winnebago, and Woodford counties.

**IOWA:** Allamakee, Benton, Blackhawk, Clayton, Dubuque, Jackson, Johnson, Marshall, Muscatine, Polk, Scott, and Winneshiek counties.

**KANSAS:** Lawrence, Douglas Co. (Hanna). Wyandotte Co.

**MISSOURI:** Benton, Bellinger, Buchanan, Callaway, Cape Girardeau, Clay, Cole, Cooper, Franklin, Jackson, Jefferson, Monteau, Pettis, St. Louis, and Saline counties.

**KENTUCKY:** Cave City, Barren Co. (J. B. Clark). Quicksand, Breathitt Co. (Crosby, Funkhouser). Pine Mountain, Harlan Co. (W. Stone). Hart, Jefferson, Kenton, Wayne and Edmondson counties (Archer). Pulaski Co. (B. Walker).

**TENNESSEE:** Pikeville, Bledsoe Co. (H. B. Baker). North end Sequatchie Valley, Cumberland Co., and southeast of Gatlingburg, Sevier Co. (A. F. Archer). Overton Co. (Archer). Alexandria, DeKalb Co. (Pilsbry).

**NORTH CAROLINA:** Durham, New Hanover, Warren and Haywood counties.

**SOUTH CAROLINA:** Abbeville and Oconee counties (Archer).

**GEORGIA:** Burke and Muscogee counties.

**ALABAMA:** Bibb, Blount, Cherokee, Elmore, Etowah, Fayette, Franklin, Jefferson, Lauderdale, Marion, Shelby, Tuscaloosa and Walker counties.

**MISSISSIPPI:** Adams Co. (Archer). Vicksburg, Warren Co. (J. Greer). 9 mi. north-east of Smithville, Hawamba Co. (Archer).

Loess of Indiana, Illinois, Iowa, Missouri and Mississippi.



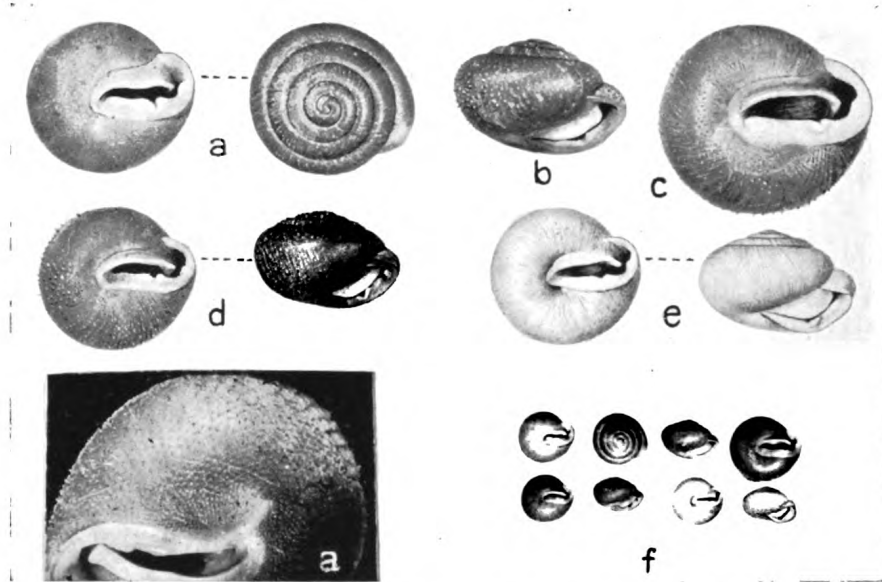


Fig. 412. *Stenotrema hirsutum*. a, type; b, c, Philadelphia; d, Clinton Co., Pa. e, form *yarmouthense*, paratype. f, actual size.

It is smaller than *S. stenotrema*, though there is a slight intergradation of size; the parietal tooth is not so high and its outer end is not at all turned into the interdenticular sinus. The notch is generally wider. This common species is generally spread in the humid division of the Upper Austral and Transition zones, from Massachusetts and Connecticut to Iowa and south to Alabama and Mississippi. It does not occur in the Ozarks or the Southern Appalachians, or in the coastal plain south of North Carolina.

It has long been recognized by collectors that *S. hirsutum* is represented in many localities by a small form of upland or dryer woodland, and a larger lowland form. Say's type specimens (11396 A.N.S.P., type Fig. 412 a, and 2 paratypes), described above, belong to the smaller form. Say gave only the locality "Pennsylvania," but his shells agree with those which can be collected today along Wissahickon Creek, Germantown, Philadelphia, which is here selected as the type locality. Fig. 412 c, the larger form, is also found in many places around Philadelphia. The small typical form has the normal *Stenotrema* sculpture of the embryonic shell, as described above. In the "lowland," or presumably more humid country form, the granulation of embryonic whorls is lost, leaving a smooth surface with rather coarse irregular and irregularly spaced radial striae coarser than the granulation of the small form. This would be an important difference if it were not that there seem to be some intermediate forms, in which a very

small granulose area is followed by the coarser, striate pattern. Further study of the anatomy of both forms is desirable. The variation in size may well be owing to the degree of humidity of the station, such as is well known to other snails, but the difference in sculpture of the embryonic shell can hardly be related to this ecologic factor.

At Wilmington, North Carolina, at the southern limit of *hirsutum* along the coast, there is a closely pilose form in which the basal notch is extremely small. Size, shape and apical sculpture as in the larger form of *hirsutum* elsewhere.

(*Hirsutus*, hairy).

The loess form described as *P. hirsuta yarmouthensis* by F. C. Baker (Fig. 412 e), while smaller than the prevalent living form of the same region, does not appear separable from recent specimens found farther north (such as Ann Arbor, Michigan, Archer). Its apical sculpture seems to be that of the larger or "lowland" form of *hirsutum*. Baker's description follows:

"Shell differing from recent *hirsuta* in being uniformly smaller, with a straighter parietal lamina which is shorter than in the typical form, the denticle on the peristome is smaller, the base of the shell not usually as convex, and the basal callus is not as heavy.

"Height 4.2; diameter 6.6 mm. Type.

"Height 4.1; diameter 6.5 mm. Paratype.

"Height 4.5; diameter 6.8 mm. Shawneetown Hill loess." (Baker.)

ILLINOIS: "Clark County, 3 miles southwest of Marshall, in loessal silt of Yarmouth age (Dr. Paul McClintock) Types: Museum Natural History, University of Illinois, P2085; A.N.S.P., 142707. Also occurs in the loess deposits of western Indiana (New Harmony and Mt. Vernon) and eastern Iowa. Stratigraphically it is known from Yarmouth to early Wisconsin time." (Baker.)

"This form of *hirsuta* is uniformly different from the large shell so abundant in Illinois and Indiana at the present time. Its smaller size (less than 7 mm. diameter) will always distinguish it from the recent form (8-8.5 mm. diameter), besides which the aperture armature is weaker and the base less convex. Specimens from Shawneetown (late Wisconsin) are larger than material from earlier interglacial deposits, indicating a variation toward the recent form." (Baker.)

***Stenotrema hirsutum barbatum* (Clapp)**

Fig. 413.

*Polygyra (Stenotrema) barbata* Clapp, 1904, Nautilus, 18: 85.—Walker, Terr. Moll. Alabama, p. 50, fig. 59.

Defined by the following comparison with *S. stenotrema*. "Viewed from above, the difference is at once apparent, as *barbata* has stiff hairs about  $\frac{1}{2}$  mm. in length which are widely spaced, and the diagonal series cross the lines of growth at nearly a right angle. The upper half of the outer lip is well reflected, not appressed as in *stenotrema* and there is a distinct con-

striction back of it. From below the difference is still more striking, as the width of the mouth in *barbata* is fully *double* that of *stenotrema*; in *barbata* the width, measured from the top of the tooth to the edge of the lip just below the notch, is 1 mm., while in a *stenotrema* of the same size it is only

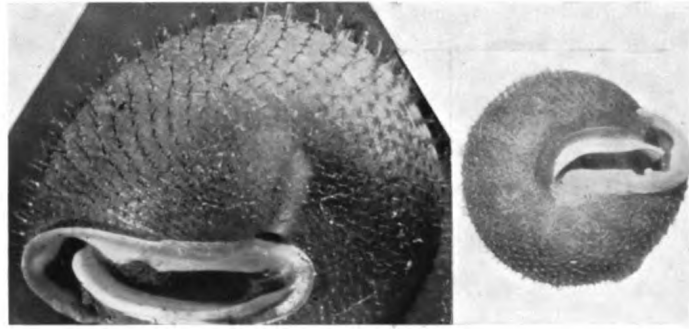


Fig. 413. *Stenotrema hirsutum barbatum*. Diameter 10 mm.

about  $\frac{1}{2}$  mm. The lamelliform tooth is more sinuous and less massive. The flattened upper lip, which is markedly concave, has a well pronounced tooth just opposite the upper end of the abruptly truncated parietal tooth. The "fulcrum," which is plainly visible through the shell, is the most pronounced feature, as it is 3 mm. in length, extending from the axis fully half way across the body-whorl. Embryonic whorls polished and obsolete ribbed, while in *stenotrema* they are *granulated*." (Clapp.)

"Greater diameter 11, lesser 10, altitude 7 mm.

"Greater diameter 10, lesser 9, altitude  $6\frac{1}{2}$  mm.

"Greater diameter 8, lesser  $7\frac{1}{2}$ , altitude  $5\frac{1}{2}$  mm.

"The average diameter is 9 to 10 mm. Whorls about  $5\frac{1}{2}$ ." (Clapp.)

ALABAMA: "Types from the flood-plain of the Tallapoosa River near the Montgomery Road about 5 miles southeast of Wetumpka, in collections of Geo. H. Clapp and Acad. Nat. Sci. Phila." (H. H. Smith), 94537 A.N.S.P.

The apertural structure is that of *S. hirsutum*. It differs from the larger form of that species by its usually greater size and the more strongly developed, stiffer, hairs.

"This most interesting species was found by Mr. Herbert H. Smith in November, 1903, and he reports it scarce and apparently very local. On Poole's Island in the Coosa River just below the Georgia line, in Alabama, Mr. Smith found a smaller form of *barbata* which differs slightly in the mouth being still wider and the lip notch weaker. It averages from 8 to 9 mm. diameter." (Clapp.)

(*Barbatus*, bearded).

***Stenotrema exodon*** (Pilsbry)

Fig. 414 a-d.

*Helix stenotrema subglobosa* Pilsbry, 1892, Man. Conch., (2), 8: 152, pl. 50, figs. 26, 27. Not *Helix subglobosa* Binney.

*Polygyra stenotrema subglobosa* Pils., Walker, 1928, Terr. Moll. Alabama, p. 50, fig. 58.

*Polygyra subglobosa* Pils., Hinkley, 1920, Nautilus, 20: 35.

*Polygyra stenotrema* var. *globosa* H. E. Sargent, 1892, Nautilus, 6: 77. (Nude.name.)

*Polygyra stenotrema exodon* Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 129.

The imperforate shell is more depressed than *S. stenotrema*, with low-conoid spire, rounded periphery with greatest convexity above the middle, and moderately convex base; pale olive-buff in color. Embryonic whorls have minute granulation, often indistinct in adult shells. The later whorls are closely set with short hairs or their rounded bases. The parietal tooth is long, bow-shaped, very high in the middle, rising beyond the level of the basal lip, towards which it leans. Its outer end turns deeply hook-like, into the interdenticular sinus. The buttress running towards termination of outer lip is rather strongly developed. The basal lip is very broad, with thin, appressed outer edge; inner edge callous, with a rather deep but narrow notch with a thickened callous rim. The interdenticular sinus is deep and rather narrow. The tooth in the outer lip is well developed, conic or blunt. Fulcrum rather long.

Height 6.3 mm., diameter 10.5 mm.;  $5\frac{2}{3}$  whorls. Type.

Height 5.5 mm., diameter 8.5 mm. Topotype.

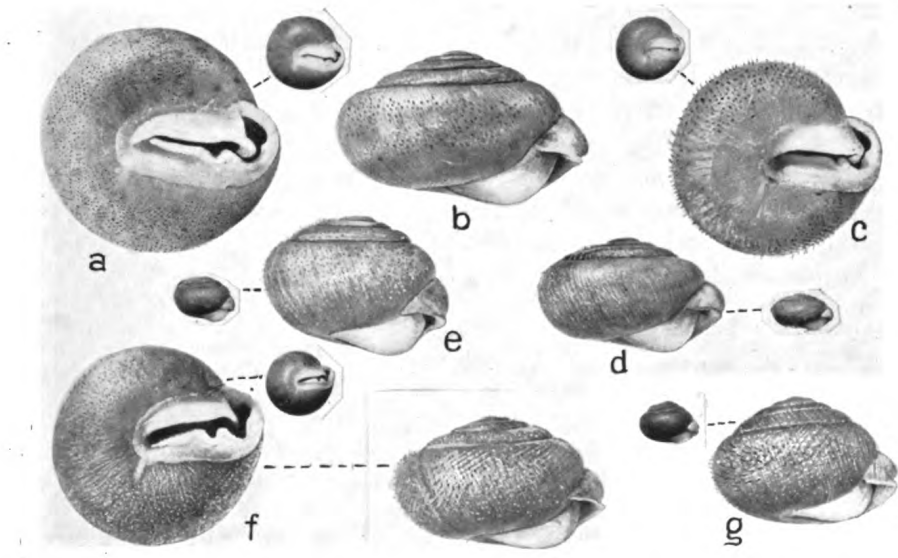


Fig. 414. a, b, *Stenotrema exodon*, type and paratype; c, d, Gurley. e, *S. exodon turbinella*, Valley Head; f, paratypes, near Woodville; g, Keel Mountain. (Enlarged and actual size.)

ALABAMA: Jackson Co. at Woodville (H. E. Sargent), Type and paratypes 68812 A.N.S.P. 2-4 mi. east of Woodville. Keel Mountain, Paint Rock (Clench & Archer). Bass, 5 mi. northwest of Stevenson (W. B. Jones). Lim Rock. Princeton (Archer). Madison Co. at Huntsville. Madkin Mountain. Shark's Cove. Monte Sano. Rainbow Mountain (Clench & Archer). Hills near Gurley (H. B. Baker). DeKalb Co., 8 mi. northeast of Fort Wayne. Gorge of Little River. Lookout Mountain (Archer). Marshall Co. in Kennamer Cove (Archer).

TENNESSEE: Dove, Marion Co. (Archer).

*S. exodon* differs from *S. stenotrema* by the narrower, deeper interdenticular sinus, in which the end of the parietal tooth is more deeply and strongly hooked, and by the longer fulcrum. In *S. deceptum* the interdenticular sinus cuts still more deeply into the peristome, the raised ridge around the lip notch is thinner, and the fulcrum is short.

(Ἐξω, outside, ὀδούς, tooth.)

***Stenotrema exodon turbinella*** (Clench & Archer)

Fig. 414 e, f, g.

*Polygyra (Stenotrema) turbinella* Clench & Archer, 1933, *Nautilus*, 46: 89, pl. 7, figs. 1-3.

The apertural features are as in *S. exodon*. Form decidedly more elevated and globose, the periphery more broadly rounded. Color cinnamon-buff.

Height 6.5 mm., diameter 9.6 mm. Type (Clench).

Height 5.4 mm., diameter 7.6 mm. Paint Rock.

ALABAMA: 2 to 4 mi. east of Woodville, Jackson Co. (Clench & Archer). Keel Mountain, Paint Rock (Clench & Archer). Near Valley Head (H. H. Smith).

GEORGIA: White Sulphur Springs, base of Lookout Mountain, Walker Co. (H. H. Smith).

According to a communication from Dr. A. F. Archer, this form, inhabiting the same localities as *exodon*, differs in station, and is therefore to be regarded as an ecologic form rather than a distinct race. "*S. exodon* inhabits the undercuts of low ledges in the dry red cedar area." The form *turbinella* "occurs in leaf mould on the tops, bases and ends of dry ledges as well as in the damper woods, but never inhabits the undercuts. The rock is mainly limestone, but it occurs also in sandstone."

(*Turbinella*, diminutive of turbo, a top.)

***Stenotrema deceptum*** (Clapp)

Fig. 415.

*Polygyra decepta* Clapp, 1905, *Nautilus*, 19: 25, text fig.; 1920, 33: 140. — Walker, 1928, *Terr. Moll. Alabama*, p. 54, fig. 53.

The imperforate shell is depressed-globose with conoid spire, rounded periphery and convex base; of the about the size and shape of *S. hirsutum*; cinnamon-buff colored. Embryonic shell with sculpture of extremely fine close, radially lengthened granules, partly coalescent into fine striae. Later whorls with a fine, close pile of short hairs. The parietal tooth is bowed, not rising to the level of the basal lip, the outer end curving strongly and



Fig. 415. *Stenotrema deceptum*, paratypes. (Enlarged and actual size.)

deeply into the interdenticular sinus; buttress running towards outer lip is moderately developed. The basal lip is wide, with thin, adnate outer margin; its inner margin calloused, with a wide and rather deep v-shaped notch, which is bounded by a well-raised callous rim. The interdenticular sinus is deep and rounded. Tooth in the outer lip is rather well developed. The fulcrum is quite short, and can be seen on the base to project very little beyond the adnate lip callus.

Height 4.75 mm., diameter 7 mm. (Clapp.)

Height 4.5 mm., diameter 6.25 mm. (Clapp.)

Height 4.7 mm., diameter 6.7 mm. Paratype.

ALABAMA: Blount Springs, Blount Co. (H. H. Smith), Type 5223 in collection of G. H. Clapp, paratypes in Museum of Zoology, University of Michigan, and 91037 A. N. S. P. Bibb Co. at Pratt's Ferry and the Sinks, 2½ mi. northwest of Six Mile (Archer). Dugger Mountain and Jacksonville, Calhoun Co. Ft. Payne and Lookout Mountain. DeKalb Co. Gadsden and Keener, Etowah Co. Around Woodville (Sargent, Clench and Archer), Jackson Co. Clay, Squaw Shoals, near Graysville and Trussville, Jefferson Co. (Archer). Gurley (H. B. Baker), Huntsville (Archer), Monte Sano and Rainbow Mountain, Madison Co. Guerne and Montevallo, Shelby Co. Bethel Church, Brush Creek, Duncanville and bluffs opposite Holt (Archer), Tuscaloosa Co. Forks of Warrior, Walker Co.

TENNESSEE: Fraley Gap and Skillen Cove east of Pikeville, Bledsoe Co. (H. B. Baker).

Except by its smaller size, this differs but little from *S. exodon turbinella* of the same region, but in large lots seen they appear to be distinct by the decidedly shorter fulcrum and the narrower interdenticular sinus. It is very abundant at Monte Sano, near Huntsville, near Woodville and around Gurley.

#### STENOTREMA UNCIFERUM GROUP

##### *Stenotrema blandianum* (Pilsbry)

Fig. 416.

*Polygyra blandiana* Pilsbry, 1903, Proc. Acad. Nat. Sci. Phila., p. 203, pl. 9, figs. 11-13.—Sampson, 1913, Trans. Acad. Sci. St. Louis, 22: 98.

The imperforate shell is depressed with low, convex spire and convex base, the periphery very bluntly subangular, or with the greatest convexity above the middle; cinnamon-buff or darker, nearly snuff brown. Embryonic



Fig. 416. *Stenotrema blandianum*, type. Diameter 8.3 mm.

shell very closely covered with fine radial striae, slightly interrupted in some places. Later whorls are somewhat glossy, without hairs or hair-scars. The narrow aperture has a long, rather high parietal tooth which leans somewhat towards the basal lip, curves rather strongly into the interdenticular sinus, and is noticeably thickened at the end in form of an ill-defined hook or process transverse to the tooth. The buttress running towards end of the outer lip is rather distinct. The outer edge of the basal lip is adnate to base from a half to three-fourths of its length; its inner edge calloused, having a deep oblique U-shaped notch. Interdenticular sinus is rather deep, rounded. The conic tooth in the outer lip is moderately strong. Fulcrum long, one-fourth whorl behind the aperture.

Height 4.5 mm., diameter 8.3 mm.; 5 whorls.

Height 4.3 mm., diameter 7.6 mm.

MISSOURI: Springfield, Greene County (Ferriss), Type and paratypes 81473 A.N.S.P. Seligman, Barry County (Ferriss). Ozark, Christian County, and Forsyth, Taney County (A. F. Archer).

While Bland's stenotreme is related to *S. uncifera* and *S. caddoense* by apertural structure, it differs by the strongly depressed shell and especially by the absence of hairs or their scars. The apical striation appears to be a case of coalescence of the radial granules of related forms. The outer end of the parietal tooth is modified much less than in *S. unciferum* or *S. caddoense*. It is a conspicuously distinct species.

(Named for Thomas Bland, 1809–1885, critical student and clear expositor.)

***Stenotrema unciferum* (Pilsbry)**

Figs. 406: 7-10.

*Polygyra hirsuta uncifera* Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 453.—Ferriss, 1900, Nautilus, 14: 30.

*Polygyra uncifera* Pils., Pilsbry & Ferriss, 1903, Proc. Acad. Nat. Sci. Phila., p. 202, pl. 9, figs. 7-10.

The imperforate shell is depressed-globose, with convex spire and rounded periphery; cinnamon-buff colored. Embryonic shell with close minute sculpture of radially lengthened granules. The later whorls are very closely pilose in oblique trends, the hairs very short, golden. The long parietal tooth leans towards the basal lip, but is not quite so high as that. It is sinuous, bending towards the basal lip in the middle, the outer end strongly bent towards the interdenticular sinus, and either connected with or slightly detached from a little lamella running from the end of the parietal tooth towards the posterior commissure of the aperture. The basal lip is broad, with slightly thickened but adnate outer edge. Inner edge is heavily calloused, with a deep and oblique U-shaped notch, bounded by a very heavy and prominent callous ridge. The interdenticular sinus is deep and rounded. Denticle in the outer lip angular and prominent. The fulcrum is strongly developed, with straight edge, notched above and below.

Height 5.8 mm., diameter 8.3 mm.; 5½ whorls. Mena Mt.

Height 5.6 mm., diameter 8 mm. Rich Mt.

Height 4.4 mm., diameter 6.7 mm. Chastat Mts.

ARKANSAS: Polk County in the Chastat Mountains, Mena Mountain and Rich Mountain (Ferriss), Type 78649 A.N.S.P. Montgomery County at Caddo Gap (Archer and Wheeler).

This very distinct little stenotreme differs from all others except the next by having the parietal tooth terminate in a distinct, outwardly curved hook, or a slightly detached short lamella, somewhat T-like at the end. The ridge around the basal notch is more elevated than in other species.

***Stenotrema unciferum caddoense*** (Archer)

Fig. 417.

*Polygyra* (*Stenotrema*) *caddoensis* Archer, 1935, *Nautilus*, 49: 19, text-fig.

"Shell imperforate, subglobose, rather thin. Color of shell very dull yellow, aperture ivory yellow. Whorls  $5\frac{1}{4}$ , very moderately increasing; nuclear whorl flattened; succeeding whorls moderately convex; body whorl convex with periphery set fairly high up towards the suture; base broad and rather flat. Aperture transverse. Edge of outer peristome raised and rounded. Basal peristome very moderately broad; its edge raised and prominent in distal half, but proximal half more subdued. Anal sinus moderately rounded. Subanal denticle (outer tooth) strongly angular. Interdenticular sinus broadly rounded. Outer denticle (on outside of lip-notch) well developed. Basal notch (lip-notch) slightly twisted; rim bordering it raised. Inner denticle simple, of usual type. Parietal lamella (tooth) not very prominent; its distal end very sinuous, and terminating in from downward-curving hook. Weakly developed buttress connecting parietal lamella with outer peristome. Parietal callus strongly thickened. Nuclear whorl minutely pustulose. Succeeding whorls covered with a soft mat of short hairs." (Archer.)

"Diameter 7.4 mm., height 4.9 mm., Holotype." (Archer.)

Paratypes measure: 5.1 x 7.8 mm., 4.9 x 7.2 mm., 4.8 x 7.8 mm.

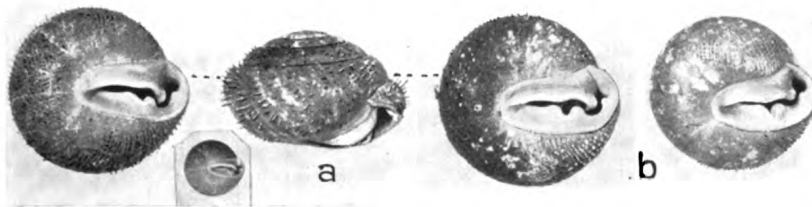


Fig. 417. a, *Stenotrema unciferum caddoense*, Caddo Gap. b, An oblique basal view, topotypes. (Enlarged and actual size.)

ARKANSAS: Caddo Gap, Montgomery County (H. E. Wheeler), Type and paratypes in Alabama Museum of Natural History. Cold Spring, 4 miles south of Bismark, Hot Spring County (Wheeler & Archer).

"This species is closest to *Polygyra uncifera* Pilsbry from Polk County, Arkansas. It may be readily distinguished from it in the following ways: the distal end of the parietal lamella is in the form of a sinuous downward-curving hook instead of being an upward-curving ridgelike hook as in *P.*



*uncifera*; throughout its middle portion the parietal lamella gently curves instead of being strongly twisted as in the case of the latter species; the inner denticle is simple and not separated from the ridge around the basal notch by a depression; finally, the ridge around the basal notch is moderately raised, not sharply prominent as in *P. uncifera*." (Archer.)

The terminal hook or denticle of the parietal tooth is more fully united with the parietal than is usual in *S. unciferum*, but this character varies in the latter.

#### STENOTREMA COHUTTENSE GROUP

##### *Stenotrema brevipila* (Clapp)

Fig. 418.

*Polygyra brevipila* Clapp, 1907, Nautilus, 20: 110, pl. 5, figs. 1-4.—Walker, 1928, Terr. Moll. Alabama, p. 51, fig. 60.

*Polygyra brevipila cherokeensis* Clapp, 1916, Nautilus, 30: 3.—Walker, 1928, Terr. Moll. Alabama, p. 52.

"Shell imperforate, globose, thin, light reddish-horn color; *densely hirsute with fine, short hairs*. Whorls five, those of the spire convex with a well-impressed suture; the body-whorl *very convex*, equally rounded above and below, *deeply impressed* in the umbilical region, abruptly deflected at the aperture and contracted behind the lip. Aperture transverse, narrow, *widening anteriorly*; parietal tooth large, strong but narrow, erect, with the sides nearly at right angles to the whorl and projecting beyond the lip, with which it is not parallel, *but diverges for three-fourths of its length*, when it is abruptly bent inward and downward, terminating opposite the second

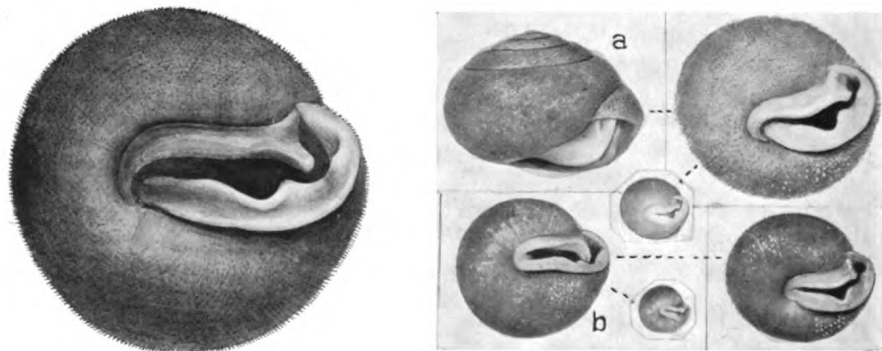


Fig. 418. Left, *Stenotrema brevipila*, type, after Clapp. a, paratypes; b, *S. brevipila cherokeensis*, paratypes. (Enlarged and actual size.)

notch in the lip, its distal or outer extremity connected with the end of the peristome by a ridge of callus, the axial end *sweeping around and 'pocketing'* the basal end of the lip; outer lip reflected back against the body-whorl, but with its *sharp edge free from the whorl its entire length*; very much thickened along its inner edge which forms a raised margin around the wide notch, and a well-developed tooth or fold beyond it, after which the margin is incurved around the outer extremity of the parietal tooth. *Fulcrum long*.

"An average shell measures, diameter  $8\frac{1}{2}$ , alt. 6 mm.

"The largest seen measures 9 x 6, and the smallest  $7\frac{3}{4}$  x  $5\frac{3}{4}$  mm." (Clapp.)

ALABAMA: Talladega ("Horseblock") Mountain, at about 2000 feet, Talladega County (H. H. Smith), Type in collection of Geo. H. Clapp; paratypes in the collections of the Academy of Natural Sciences of Philadelphia 92758, Bryant Walker, T. H. Aldrich and John B. Henderson, Jr.

The free outer edge of the reflected basal lip is a character found elsewhere only in *S. cohuttense*. The lip notch is far narrower than in *cohuttense*, but larger than in any other stenotreme. The long fulcrum can be seen in an oblique view through the notch. "The mountain sides, near the top, are littered, or rather piled with talus, big and little rocks; the shells are found almost invariably on the lower sides of these rocks, and generally they chose the biggest and heaviest; you turn over perhaps fifty to find one shell. They are obtained by sheer hard work." (H. H. Smith).

Form *cherokeense* Clapp (Fig. 418 b) differs by its smaller size.

Height 5 mm., diameter 7 mm., 5 whorls. (Clapp.)

Height 4.9 mm., diameter 6.5 mm. Paratype.

Height 4.8 mm., diameter 6.3 mm. Paratype.

ALABAMA: Near Pleasant Gap, Cherokee County, in a shady but dry ravine on the mountain side, about 1200 feet, generally under stones (Herbert H. Smith), Types 7871 collection of G. H. Clapp; paratypes in collections of Academy of Natural Sciences of Philadelphia, 113418, Alabama Museum of Natural History, and cabinet of Dr. Bryant Walker.

GEORGIA: A single specimen was found near Cave Spring, Floyd County, about 20 miles northeast of the Alabama locality.

***Stenotrema cohuttense* (Clapp)**

Fig. 419.

*Polygyra cohuttensis* Clapp, 1914, Nautilus, 28: 78, text-figs. — Walker, 1928, Terr. Moll. Alabama, p. 51, fig.

"Shell imperforate, thin, reddish-horn color; densely hirsute with very fine, short hairs. Whorls 5, those of the spire convex with a well-impressed suture; the body whorl with the periphery situated high, very convex below, impressed in the umbilical region, abruptly deflected at the aperture and contracted behind the lip. Aperture transverse, narrow, widening anteriorly; parietal tooth large, erect, parallel to the lip in its lower half, then curving outward and in the upper third inward, terminating in a *hook* which passes *under the lip* between the notch and the lip tooth, outer end connected with the peristome by a low ridge; outer lip reflected back against the body-whorl but *free its entire length*; lip notch stretched out so that it forms a regular curve in the lip for over half its length with the edge raised from the lip; beyond the notch the lip sweeps around the inner end of the parietal tooth and then forms a small tooth above; fulcrum medium.

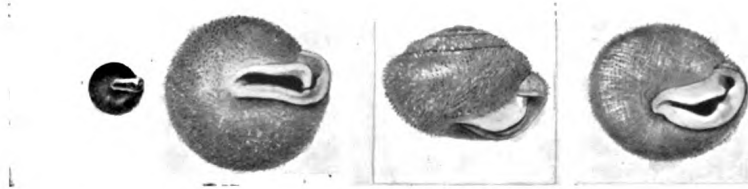


Fig. 419. *Stenotrema cohuttense*, paratypes. (Actual size and  $\times 3$ .)

“Largest shell (type), diameter  $7\frac{1}{4}$ , alt. 5 mm., smallest 6 x 4, average 7 x 5 mm.” (Clapp.)

GEORGIA: Fort Mountain and foothills, below 1500 feet, Cohutta Mountain, Murray County (H. H. Smith). Type in collection of G. H. Clapp, cotypes in collections of Academy of Natural Sciences of Philadelphia, 110919, Geological Survey of Alabama, and U. S. National Museum. Chatsworth (C. C. Allen). Cohutta Mountain in Gilmer and Fannin counties.

TENNESSEE: Sugarloaf Mountain, Parksville; Cherokee National Forest, Polk County (Archer).

The Cohutta Mountain stenotreme has an ample bay in the basal lip, representing the notch of other species. It is far more broadly curved than the large notch of *S. brevipila*, the only species nearly related. The lip varies in color from buff-pink to a much paler tint.

#### STENOTREMA MAXILLATUM GROUP (Section *Maxillifer* new section)

Stenotremes having a high ridge or lamina within and parallel to the basal lip; no lip notch. Outer end of parietal tooth with an outwardly recurved hook. The single species is depressed-globose with short, dense pile.

#### *Stenotrema maxillatum* (Gould)

Fig. 420.

*Helix maxillata* Gould, 1848, Proc. Boston Soc. Nat. Hist., 3: 38; 1852, in A. Binney, Terr. Moll., 2: 157, pl. 40a, fig. 2.

*Stenotrema maxillatum* Gld., Binney, 1878, Terr. Moll., 5: 297, pl. 40a, fig. 2.

*Polygyra maxillata* Gld., Walker, 1928, Terr. Moll. Alabama, p. 55, fig. 65.

The imperforate shell is depressed-globose with strongly convex to convexly conoid spire; cinnamon-buff to cinnamon-brown colored. Embryonic whorl with the usual sculpture of minute, radially lengthened granules. Later whorls densely pilose, the hairs short, in oblique trends. The aperture is very narrow. Parietal tooth long, with blunt summit, straight except near the outer end which is bent strongly into the aperture and then recurved in a strong hook running towards the end of the outer lip, towards which a strong buttress branches from the parietal tooth. The basal lip is thick throughout, not thinning towards the adnate outer edge; inner edge straight in basal view, not notched, terminating outwardly in a small, rounded sinus bounded by a conic tooth within the outer lip. A



Fig. 420. *Stenotrema maxillatum*, Roanoke, Alabama. (Enlarged and actual size.)

short distance within and parallel to the basal lip there is an erect lamina, which terminates in the outer lip tooth. The inside of this lamina is seen in Figure 420, at the right.

Height 5.2 mm., diameter 7 mm.; 5 whorls. Columbus, Ga.

Height 4.5 mm., diameter 6.5 mm.; 5 whorls. Monroe County, Ala.

Height 5 mm., diameter 7.3 mm. Lee County, Ala.

GEORGIA: Columbus, Muskogee Co. (Neisler). Hamilton, Harris Co., and southwest of La Grange, Troup Co. (A. F. Archer).

ALABAMA: Langdale, Chambers Co.; near Eutaw, Green Co.; Harrison, Hale Co.; Chewacle Park, Lee Co. (Archer). Randon's Creek, Monroe Co. (P. L. Marsh). Uniontown, Perry Co. (Schowalter; W. McGlamery). Roanoke, Randolph Co. (H. H. Smith). Pine Hill, Wilcox Co. (Archer).

This species is conspicuously distinct by the absence of lip-notch, the erect lamina a short distance within the basal lip, and the strong, recurved hook terminating the parietal tooth outwardly. In shape and the short, close pile of the surface it shows some resemblance to the *cohuttense* and the *unciferum* groups.

As the locality "Tennessee" originally assigned for *maxillatum* was clearly erroneous, Dr. Archer proposes to select Columbus, Georgia, as type locality.

(*Maxillatum*, having a jaw, in allusion to the erect ridge within the lip.)

#### STENOTREMA MONODON GROUP (Section *Euchemotrema* Archer)

*Euchemotrema* Archer, 1939, *Nautilus*, 52: 98; 53: 33. Type *S. monodon*.

Stenotremes without a tooth within the outer arc of the lip and with no notch in the basal lip. "Penis short and club-shaped, its length less than half the diameter of the shell; right pilaster very thick, prominent and blunt-edged." (Archer.)

The stenotremes of this group form an intricate maze of variable, closely related races, which are typically distinct enough, but intergrade through many perplexing forms. In the first critical review of them (*Proc. Acad. Nat. Sci. Phila.*, 1900, pp. 454-5) the author followed earlier authorities in considering all to be races of the single species *monodon*. Subsequently it was thought that *S. fraternum* Say could be distinguished as a species. This course has been generally followed, and with some misgivings is

perpetuated herein. By the recognition of fewer, more inclusive races, the taxonomic picture might be simplified, but at the cost of losing a true view of the multiform differentiation within the group.

Typically the races are distinguishable by the following key, but it does not provide for intermediate forms.

*Key to races of the Stenotrema monodon Group*

- A. Periphery acutely keeled; imperforate or nearly so.....*S. hubrichti*
- AA. Periphery rounded or bluntly angular.....B
  - B. Umbilicus rather broadly open.
    - C. Small, diameter 5.5 to 9 mm., very closely coiled; somewhat glossy; northern.....*S. monodon*
    - CC. Larger, diameter about 10 to 11 mm.; matt.
      - D. Northern; Canadian and Transition zones.....*S. f. cavum*
      - DD. Southern Appalachian.
        - E. Height half of the diameter; angular, banded.
          - S. f. fasciatum*
          - EE. Slightly higher; less angular, plain colored. *S. f. montanum*
  - BB. Imperforate or quite narrowly umbilicate.
    - C. Small, diameter 7.3 to 7.8 mm., subglobose, of 5¼ to 6 closely coiled whorls; southern.....*S. m. aliciae*
    - CC. Larger, diameter about 10 mm.
      - D. 6½ closely coiled whorls; base deeply impressed around the nearly closed umbilicus; southwestern.....*S. m. friersoni*
      - DD. 5½ less close whorls; moderately impressed around the narrow or rarely closed umbilicus; Ont. and Mass. to Mo. and Ala.
        - S. fraternum*
      - DDD. 5¼ whorls, the spire dome-shaped; base imperforate, only slightly impressed in the center; Ozarkian....*S. f. imperforatum*

**Stenotrema monodon** (Rackett)

Figs. 421 a, b.

*Helix monodon* Rackett, 1821, Trans. Linn. Soc. Lond., 13: 42, pl. 5, fig. 2.<sup>1</sup>

*Helix leai* "Ward, Ms." A. Binney, 1840, Boston Journ. Nat. Hist., 3: 362; 1851, Terr. Moll., 2: 149, pl. 41, 4th to 9th figs.

*Polygyra monodon* Rackett, Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 454.—Dall, Alaska Land & Fr.-W. Moll., p. 26.—Walker, 1906, Ill. Cat. Moll. Mich., 1: 471, fig. 24.

*Stenotrema monodon* var. *leaii* Ward, Binney, 1878, Terr. Moll., 5: 299, pl. 41, middle figures.

*Polygyra monodon peoriensis* F. C. Baker, 1927, Nautilus, 40: 115; 1928, Trans. Ill. State Acad. Sci., 20: 271-292.

<sup>1</sup> The Rev. Thomas Rackett's paper was read before the Linnean Society June 1st, 1819. According to Sherborn it was published in 1821. Another *Helix monodon* was proposed by Férussac in 1821, (Tabl. Syst. Fam. Limaçons, p. 35), as a new name for the prior *Helix unidentata* Drap., and *Helix cobresiana* Alten, a well-known central European species. I am not sure which author has priority; but as *monodon* Rackett grew into general use and *monodon* Férussac was practically still-born, I am allowing Rackett the right-of-way.

The umbilicate shell is depressed with low, convexly conoid spire of narrow, very closely coiled whorls; very bluntly subangular or rounded at periphery, which is above the middle, the base convex. Dilute isabella color, slightly translucent and somewhat glossy. Embryonic whorls with the usual fine sculpture of radially lengthened granules, often running into

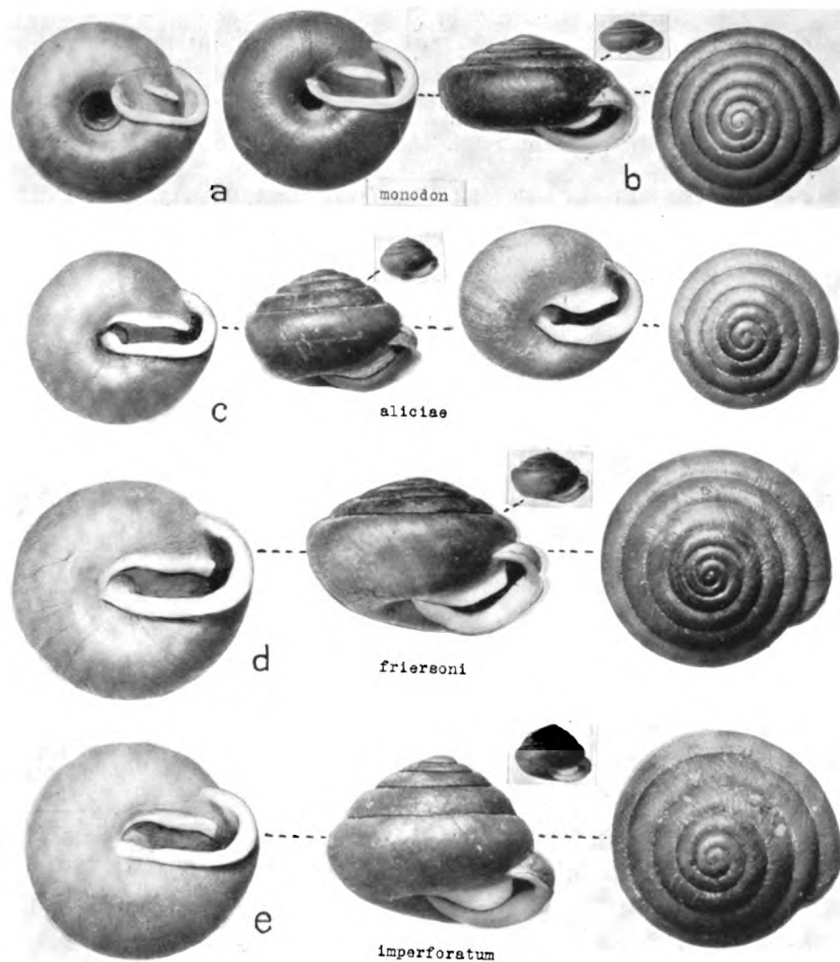


Fig. 421. a, *Stenotrema monodon*, Fentonville, Mich.; b, Sugar I., Alpena, Mich. c, *Stenotrema monodon aliciae*, type and paratypes, Lake Charles, La. d, *Stenotrema monodon friersoni*, type and paratypes, Frierson, La. e, *Stenotrema fraternum imperforatum*, type and paratypes. (Actual size and enlarged.)

striae, and generally almost or quite effaced in adult shells. Later whorls with faint lines of growth, the last having very short, delicate hairs rising from little acute bases, which alone remain in most adult shells. The oval-lunate, oblique aperture has a brownish or white peristome thickened

within, well reflected in its outer and basal margins. Parietal tooth short, white, straight, standing obliquely on the thin parietal callus, and typically not prolonged towards the columella. The fulcrum is quite short with convex edge.

Height 5.7 mm., diameter 8.6 mm.; 5½ whorls. Alpena, Mich.

Height 4.5 mm., diameter 8.4 mm.; 6¼ whorls. Fentonville, Mich.

Height 5.7 mm., diameter 9.4 mm. Marblehead, Ohio.

Height 3.9 mm., diameter 6.7 mm. Rawsonville, Mich.

ONTARIO: Moose Factory, James Bay (Dall); Point Pelee, Essex Co., and west of Delhi, Norfolk Co. (J. P. Oughton).

NEW YORK: Mohawk, Herkimer Co. (A. D. Brown). Rochester (Walton, F. C. Baker).

PENNSYLVANIA: Cresham Creek, Philadelphia Co. (J. A. Allen).

MARYLAND: Near Bittinger, Garrett Co. (J. B. Clark).

OHIO: Clark, Franklin, Green, Hamilton, Ottawa and Warren counties.

MICHIGAN: Alpena, Arenac, Berrien, Cheboygan, Emmet, Ingram, Jackson, Lenawee, Livingston, Monroe, Oakland, Saginaw, Washtenaw and Wayne counties.

INDIANA: Fulton, Henry, Kosciusko, LaPorte, Marshall, Posey and Steuben counties.

ILLINOIS: Adams, McHenry, Mercer, Rock Island, Williamson counties.

WISCONSIN: Brown Co.

MINNESOTA: Winona (Holzinger).

IOWA: Polk and Johnson counties.

SOUTH DAKOTA: Clay Co. (W. H. Over).

NEBRASKA: Near Loupe River (A. F. Gray).

KANSAS: Topeka (A. F. Gray). Near Manhattan, Riley Co. (R. E. Call).

MISSOURI: Courtney, Jackson Co. (Archer), and Kansas City (R. K. Smith). Jackson, St. Francois, Laclede, Morgan, Moniteau, Pettis, Cooper, Saline, Henry, Johnson, Holt, Callaway, Dade, Barton, Barry, Lawrence, Jasper, Camden, Gentry, St. Louis and Davies counties (Sampson).<sup>2</sup>

*S. monodon* differs from *S. fraternum* by the closer coils of the spire, usually having one more turn in specimens of about equal size; the umbilicus is typically larger, though variable; the surface is smoother, more or less glossy, hairs or their scars being delicate and generally almost or quite absent in adults. Typically the parietal tooth is shorter than in *fraternum*, but in long series this is found to be inconstant.

*S. monodon* is a snail of damp places near the water, while *S. fraternum* frequents dryer situations, chiefly in hardwood tracts under logs, bark or leaves, where the larger helices occur. Also in grass, in uncultivated orchards and pastures.

The Rev. T. Rackett wrote of the locality of *Helix monodon* and of other shells described in his paper as follows: "These testacea were found by Edmund Sheppard, Esq., of the Royal Artillery, in Canada in the year 1816; the *Mya* at Elliott's Point, a mile below the town of Malden, on the shore of Lake Erie; the remaining shells on the shore of Lake Huron, a little above

<sup>2</sup> Mr. Sampson's records apparently include *aliciae* as well as *monodon* proper.

Thunder Bay, where the beach is formed entirely of shells." As Thunder Bay appears on maps of the time, properly located and under that name, and was on the regular water route of trappers and other travellers to Mackinac Strait and the Sault Ste. Marie, there seems no reason to doubt that the type locality of *Helix monodon* was in what is now Alpena County, Michigan.

The record of *H. monodon* from Key West (Melvill, 1880, Journ. Conch., 3: 166) was owing to some confusion of labels or records.

A small form of *monodon* from the loess has been called *peoriensis* by F. C. Baker, and thus defined: "Shell differing from typical *monodon* in being smaller, with a smaller umbilical opening, a less elevated parietal lamina which is usually joined to the basal lip near the columella by a more or less well-developed callus. Height 3.9 mm., diameter 6.1 mm. Type." (Baker). Paratypes measure: 41 x 6 mm., 3.5 x 5.6 mm., and one from Curtis Creek, Adams County, 5 x 7 mm.

"This variety has been seen from Yarmouth to Peorian time. It occurs in Bureau, Adams, and Clark Counties, Ill., and at Mt. Vernon, Indiana. The latter is believed to represent Sangamon time. Types, Museum Natural History, Univ. Ill., P1910a; Acad. Nat. Sci. Phila., 142708," are from the municipal quarry near Quincy, Adams County, Illinois, Peorian loess.

This form does not appear to differ materially from many living specimens, such as some from Algonquin, Illinois, measuring 4 x 6.4 mm., Mercer County, diameter 6.8 mm., and also in other lots from Michigan and elsewhere. Probably to be regarded as an ecologic form.

***Stenotrema monodon aliciae* (Pilsbry)**

Fig. 421 c.

*Helix monodon* var. *aliciae* Pilsbry, 1893, Man. Conch., 8: 152.

*Polygyra monodon aliciae* Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 455; 1894, Man. Conch., 9: 78, pl. 3, figs. 22-24.—Ferriss, 1900, Nautilus, 14: 30.—Walker, 1923, Terr. Moll. Alabama, p. 56, fig. 66.

*Polygyra fraterna aliciae* Pilsbry & Ferriss, 1907, Proc. Acad. Nat. Sci. Phila. for 1906, p. 542.—Hanna, 1909, Nautilus, 23: 82.—Sampson, 1912, Nautilus, 24: 92; 1913, Trans. Acad. Sci. St. Louis, 22: 99.

*Polygyra monodon friersoni* Pilsbry, 1899, Nautilus, 13: 36; 1900, Proc. Acad. Nat. Sci. Phila., p. 454.—Ferriss, 1900, Nautilus, 14: 30.—Clench, 1925, Nautilus, 39: 12 (Lake Charlotte and Liberty, Texas).

*Polygyra fraterna friersoni* Pils., Pilsbry & Ferriss, 1906, Proc. Acad. Nat. Sci. Phila., p. 542.—Strecker, 1910, Nautilus, 24: 5 (Matagorda Peninsula, Texas).—Vanatta, 1926, Nautilus, 40: 16 (Travis-Bastrop County line, Texas).

The almost imperforate shell is subglobose, with rather high, convexly-conic spire of  $5\frac{1}{2}$  to 6 very closely coiled whorls; the base very strongly convex, impressed around the axis, the convexity of the periphery well above the middle; cinnamon-buff colored. Surface covered with close-set very short hairs, generally deciduous in part. The parietal tooth is higher than in *S. monodon*, and its axial end continues in a tapering ridge, at the end curving partly around the axis. The basal lip has a distinct callous thicken-



ing of the inner margin, the callus terminating abruptly at the columella and abruptly or gradually in the middle of the outer arc of the lip. The internal fulcrum is quite long, notched above and below.

Height 5.8 mm., diameter 7.8 mm.; 6 whorls. Type.

Height 5.3 mm., diameter 7.4 mm.; 5½ whorls. Paratype.

Height 5.2 mm., diameter 7.3 mm.; S.-W. of Lake Charles.

IOWA: Iowa City (Shimek) and Des Moines (T. Van Hyning),

KANSAS: Southeast of Winfield, Cowley Co. (E. P. Cheatum). Shawnee Co. (J. B. Quintard). Lawrence, Douglas Co. (G. D. Hanna).

MISSOURI: Monett, Barry Co. (Pilsbry). Chicopee, Carter Co. (R. K. Smith). Willard (R. W. Jackson), and Springfield (Van Ingen), Green Co. Countney, Jackson Co. (Archer). Jasper Co. (M. A. Mitchell). Fern Glen, St. Louis (Leslie Hulricht). Sedalia, Pettis Co. (Sampson).

ARKANSAS: Rocky Comfort, Little River Co. (Ferriss). Caddo Gap, Montgomery Co. (Pilsbry). Ultima Thule and Horatio, Sevier Co. (Ferriss). Petit Jean Mountains, Yell Co. (Ferriss). Sulphur City, Washington Co. (A. D. Brown).

OKLAHOMA: Cimmaron Creek and Little River (R. E. Call). Wister, South McAlester, Vinita, Wyandotte and Limestone Gap (Ferriss and Pilsbry).

TEXAS: DeKalb, Bowie Co. (Ferriss). Cross Timbers, Cooke Co. (Averell). New Braunfels, Comal Co. (Pilsbry). Dallas Co. (E. P. Cheatum). Mineola, Wood Co. (Wheeler and Archer).

LOUISIANA: Frierson, De Soto Parish (L. S. Frierson). Mt. Lebanon, Bienville Parish (T. W. Vaughan). Near Lake Charles, Calcasieu Parish (Pilsbry), Type and paratype 76753 A.N.S.P.

MISSISSIPPI: 9 mi. northeast of Smithville, Hawamba Co. (Archer).

ALABAMA: In Colbert, Jackson, Madison, Marengo and Perry counties (H. H. Smith, A. F. Archer and others). Barbour, Bibb, Choctaw, Dale, Dallas, Franklin, Greene, Macon, Madison, Marengo, Mobile, Perry, Pickers, Sumpter and Tuscaloosa counties (Bryant Walker).

TENNESSEE: Richland Creek (S. N. Rhoads) and Nashville (H. Cummins), Davidson Co. Dry tributary of Duck River, Maury Co. (A. R. Cahn). Raleigh, Shelby Co. (Rhoads).

KENTUCKY: Near Commer, Hart Co. (Clench).

ILLINOIS: Edwards and Mercer counties. Dubois, Washington Co. (Hinkley).

INDIANA: White Co. (L. E. Daniels).

VIRGINIA: Craig Co. at 4000 feet elevation (Wm. E. Hughes).

MARYLAND: Green to Polish Mountains, Allegany Co. (Pilsbry).

DISTRICT OF COLUMBIA: (E. Lehnert).

Pleistocene. Providence, Boone County, Mo., and Collinsville, Madison County, Ill. (Leslie Hulricht).

With the closely coiled whorls of *S. monodon*, this is a more globose form, very narrowly perforate or even imperforate, with the lip wider and the parietal tooth higher and prolonged towards the axis, the aperture therefore narrower.

The type lot came from the low and humid heavily wooded austroriparian border of Louisiana, but a few feet above sea level, in wet places such as *monodon* frequents in the Northern States. Farther north L. S. Frierson found it "on hills" around Frierson, Louisiana, typical in form.

In eastern Texas it is widely spread and varies from typical to a larger, more depressed form distinguishable from *fraterna* chiefly by the more closely coiled whorls. Two of a lot from De Kalb, Bowie County, Texas, measure: height 4.7, diameter 7 mm., and 6.2 x 9.5 mm. Such shells occur also in Oklahoma, western Arkansas, Missouri, and as far north as Iowa City and Des Moines, Iowa, where also typical *monodon* and transition forms occur. Similar shells are found in Illinois and Indiana.

East of the Mississippi, *aliciae* is found in Mississippi and Alabama, where it is usually somewhat larger.

Height 5 mm., diameter 7.5 mm. Near Demopolis, Marengo Co., Ala.  
 Height 6 mm., diameter 9 mm. Near Demopolis, Marengo Co., Ala.  
 Height 6 mm., diameter 8.5 mm. Near Woodville, Ala.

Still larger shells are in some Tennessee lots: 5.7 x 8.3 mm. to 6.5 x 10 mm.

Farther northeast a few specimens from mountains of Virginia and Maryland are practically typical *aliciae*. Also there is one specimen from Washington, D. C., received from E. L. Lehnert many years ago. It must be admitted that some of the large *aliciae* can be separated from *fraternum* with difficulty. There is no definite distinction.

(Named for the author's sister.)

The form named *friersoni* Pilsbry (Fig. 421 d) is rather closely similar to *aliciae* in structure but it is much larger, and the basal lip, seen from in front, is more deeply arched. The center is rather deeply impressed around the almost closed umbilical crevice.

Height 7.3 mm., diameter 10.7 mm.; 6½ whorls.  
 Height 6.3 mm., diameter 9.6 mm.; 6¼ whorls.

This special form was collected by L. S. Frierson "on alluvial land" at Frierson, Louisiana (Type and paratypes 76671 A.N.S.P.), and by E. P. Cheatum "in woodland along Trinity River," 10 miles northwest of Dallas, Texas. The lowland form is here the larger. When *monodon* and *fraternum* occur in one district, the lowland form is the smaller.

***Stenotrema fraternum* (Say)**

Fig. 422 a.

*Helix fraterna* Say, 1824, App. Maj. Long's Exped. to Peters River, p. 257, pl. 15, fig. 3.

*Helix convexa* Raf., Deshayes, 1830, Encycl. Méth., 2: 253.

*Helix monodon* of many authors, not of Rackett.

*Stenotrema monodon* Rackett, Binney, 1878, Terr. Moll., 5: 298, pl. 41, upper figs.; pl. xi, fig. 1 (genitalia), pl. vii, fig. H (teeth).

*Polygyra monodon fraterna* Say, Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 454.—Walker, 1928, Terr. Moll. Alabama, p. 57.

*Polygyra fraterna* Say, Walker, 1906, Ill. Cat. Moll. Mich., 1: 470, fig. 23.

*Polygyra fraterna* var. *albida* Walker, 1906, Ill. Cat. Moll. Mich., 1: 471.

The shell is imperforate or nearly covered perforate, with convexly conoid spire of closely coiled whorls, which are noticeably wider than in

*S. monodon*; the rather strongly convex base is impressed around the axis; the rounded periphery is above the middle. Color from cartridge buff to tawny olive. Embryonic whorl closely covered with radially lengthened granules, often somewhat indistinct. Later whorls densely covered with short hairs or their bases. Aperture much as in *S. monodon*: parietal tooth short, rather low, nearly straight but with the ends often a trifle turned towards the basal lip. Basal lip well thickened within. The fulcrum is rather short.

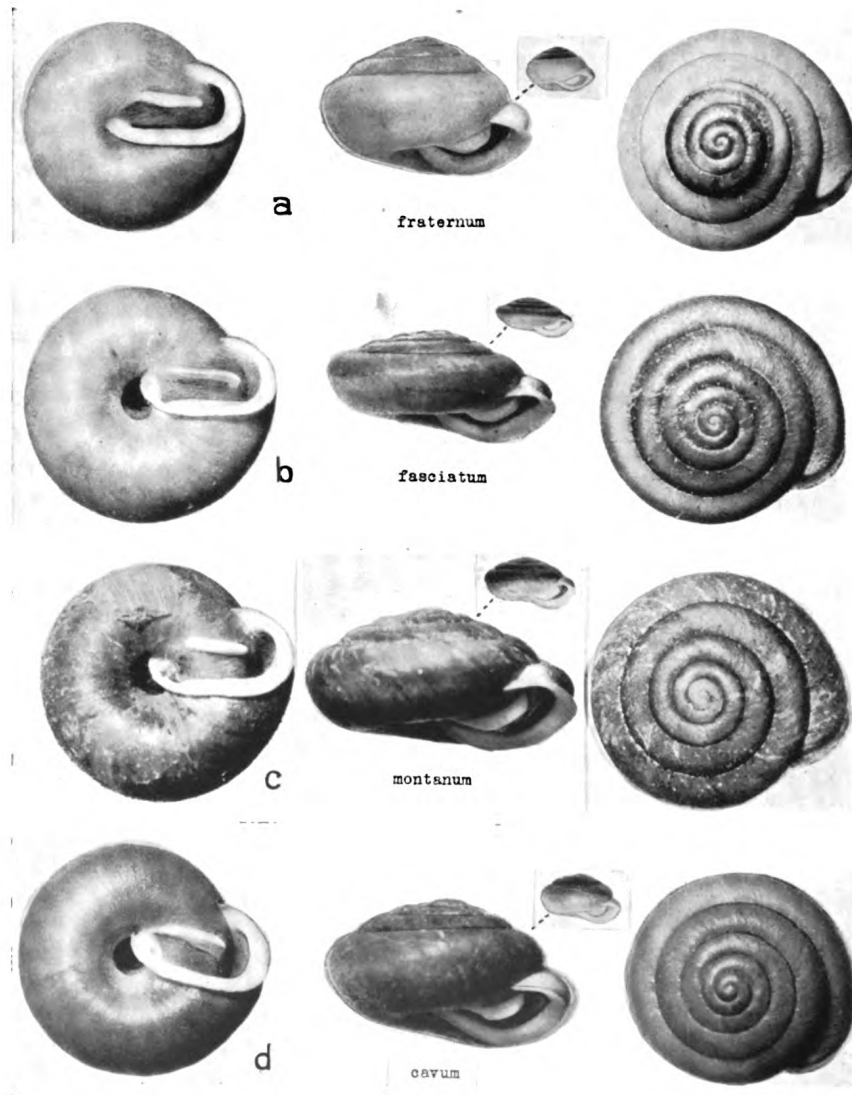


Fig. 422. a, *Stenotrema fraternum*, Philadelphia, neotype. b, *S. fraternum fasciatum*, paratype. c, *S. fraternum montanum*, topotype. d, *S. fraternum cavum*, type. Enlarged and actual size.

Height 6 mm., diameter 9 mm.;  $5\frac{1}{2}$  whorls. Neotype.  
 Height 6.8 mm., diameter 10.5 mm.;  $5\frac{3}{4}$  whorls. Topotype.  
 Height 5.2 mm., diameter 7.8 mm.; 5 whorls. Cave Town, Md.  
 Height 6.5 mm., diameter 8.9 mm.;  $5\frac{1}{2}$  whorls. Cave Town, Md.  
 Height 6.9 mm., diameter 10 mm.;  $5\frac{1}{2}$  whorls. Columbus, O.  
 Height 5.9 mm., diameter 10 mm.;  $5\frac{1}{2}$  whorls. Columbus, O.

**ONTARIO:** Go Home Bay, Muskoka District (E. M. Walker); near Lake Ontario, Ontario Co.; De Grassi Point, Simcoe Co., Toronto, and Pottageville, York Co., Bronte, Halton Co.; Vineland, Lincoln Co. (J. P. Oughton); Hamilton, Wentworth Co. (Robert Walker); Grand River, Paris, Brant Co. (T. Kurata and J. P. Oughton); Bruce Peninsula, Bruce Co. (J. F. M. Smith); Norfolk Co., at Turkey Point; between Point Dover and St. Williams; St. Williams; open slopes W. of Delhi (J. P. Oughton). Kettle Creek, St. Thomas, Elgin Co. (D. Brown); Rondeau Park, near Thames Valley, Kent Co. (J. P. Oughton).

**NEW HAMPSHIRE:**<sup>1</sup> East side of Mt. Willey, Carroll Co. (C. Norch); Exeter, Rockingham Co. (A. R. Allen).

**VERMONT:** North head of McNeil's Bay, Lake Champlain (Pilsbry); Chittenden, Rutland Co. (J. Bequaert); Fairlee, Orange Co. (J. L. Baily).

**MASSACHUSETTS:** Berkshire Co. (A. F. Gray); Bristol Co. (A. D. Brown).

**RHODE ISLAND:** Tiverton.

**CONNECTICUT:**  $2\frac{1}{2}$  mi. N.E. of Sandy Hook (A. F. Archer), and near Redding (G. B. Fairchild), Fairchild Co.; Farmington, Hartford Co. (Benton Holcomb).

**NEW YORK:** Generally spread; seen from the following counties: Columbia, Dutchess, Essex, Green, Hamilton, Herkimer, Monroe, Onondaga, Rensselaer, Tompkins, Ulster and Warren.

**NEW JERSEY:** Seen from Bergen, Hunterdon, Mercer, Morris, Sussex and Warren counties.

**PENNSYLVANIA:** Generally spread; seen from Adams, Allegheny, Bucks, Clinton, Fayette, Franklin, Fulton, Greene, Indiana, Lehigh, McKean, Monroe, Montgomery, Northampton, Pike, Potter, Somerset, Sullivan and Wyoming counties.

**DELAWARE:** New Castle Co. (S. N. Rhoads).

**MARYLAND:** Alleghany, Garrett and Washington counties.

**DISTRICT OF COLUMBIA:** Washington (E. Lehnert).

**VIRGINIA:** Natural Bridge, Rockbridge Co.; east of Blackwater, Lee Co.

**WEST VIRGINIA:** Morgan Co.

**NORTH CAROLINA:** Lake Waccamaw, Columbus Co. (Pilsbry).

**MICHIGAN:** Charlvois, Cheboygan, Emmet, Ingraham, Jackson, Lake, Leelanau, Livingston, Mackinac, Oakland, Tuscola, Washtenaw and Wayne counties.

**OHIO:** Throughout the state.

**KENTUCKY:** Quicksand, Breathitt Co. (W. D. Funkhouser). Pine Mountain, Harlan Co. (Witmer Stone); Bowling Green, Warren Co. (Sadie F. Price).

**INDIANA. ILLINOIS:** Generally spread.

**WISCONSIN:** Solen Springs, Douglas Co. (W. Stone).

**MINNESOTA:** Mankato, Blue Earth Co. (J. H. Slack).

**IOWA:** Des Moines, Johnson, Polk and Woodbury counties.

**MISSOURI:** Jackson Co. (A. F. Archer); Bird-point, Mississippi Co. (A. F. Satterthwait).

<sup>1</sup> For further localities in New England States see Johnson, 1915, Occ. Pap. Bost. Soc. Nat. Hist. 7, Fauna of New England, 13: 197. As part of Johnson's records pertain to *S. fraternum cavum*, I have not included them here.

TENNESSEE: Nashville (J. B. Clark).

ALABAMA: Barbour, Clark\*, Bibb\*, Chambers, Elmore, Madison, Mobile, Perry, St. Clair and Sumpter\* counties (H. H. Smith), according to Walker. Those seen by me are starred.

This very common and widely spread species differs from the several imperforate or nearly imperforate races of *S. monodon* chiefly by the noticeably wider whorls in an apical view. In many examples the outer end of the parietal tooth bends perceptibly towards the basal lip, but in other fully adult specimens of the same lots it may be perfectly straight, so that there seems to be no constant difference in the apertural parts between *fraternum* and *monodon*.

Say gave the locality "Pennsylvania," but states that numerous specimens were collected by Messrs Hyde and Mason. As these naturalists collected around Philadelphia, that place is selected as type locality, and as neotype, 20194 a, A.N.S.P., is selected (Fig. 422 a).

Dr. Bryant Walker has noted an albino mutation in Michigan as var. *albina*, of a "pale greenish white" color.

***Stenotrema fraternum cavum* (Pilsbry & Vanatta)**

Fig. 422 d.

*Polygyra monodon cava* Pilsbry & Vanatta, 1911, *Nautilus*, 25: 12.—Nylander, 1913, *Nautilus*, 27: 41.

*Polygyra fraterna cava* P. & V., Vanatta, 1920, *Nautilus*, 33: 97 (distribution in Maine).—MacMillan, 1939, *Nautilus*, 53: 48.

The shell is larger and more depressed than *S. fraternum*; more openly umbilicate, deeply impressed or excavated around the umbilicus. Parietal tooth either straight or slightly curved, short, its ends about equally remote from the terminations of the lip. Internal "fulcrum" well developed, notched above and below as in *fraternum*.

Height 6 mm., diameter 10.5 mm.; 5½ to 5¾ whorls.

NEW BRUNSWICK: St. Leonards (Nylander).

QUEBEC: Fairy Creek, Hull (G. E. Fairbairn).

ONTARIO: North of Palermo (J. Oughton). Ottawa (Latchford).

MAINE: Caribou and Woodland, Aroostock Co. (O. O. Nylander). On Kennebec River, Sydney Co. (Bayard Long). Hampden, Penobscot Co. (B. Long). Rockport, Knox Co. (Morgan Hebard). Fairfield, Somerset Co. (B. Long). Buckfield, Oxford Co. (J. A. Allen). Jefferson, Lincoln Co. (Archer). Sebago and Portland, Cumberland Co.

VERMONT: Hartland, Winsor Co. (W. Goodrich). Newfane, Windham Co. (W. H. Fluck). Willoughby Lake, Orleans Co. (A. D. Brown).

MASSACHUSETTS: North Adams, Berkshire Co. (Bayard Long).

NEW YORK: Chepachet, Herkimer Co. (A. Bailey). Chittenango Falls and Cazenovia, Type 90127 A.N.S.P., Madison Co. (Pilsbry). Dresden, Yates Co. (H. H. Thomas).

PENNSYLVANIA: Wintergreen Gorge, near Erie, Erie Co. (Ch. Wurtz).

MICHIGAN: Douglas Lake, Cheboygan Co. (H. B. Baker). Kent and Saginaw counties (Currier, Lathrop).

INDIANA: Posey and Marion counties (Daniels).

MINNESOTA: Albert Lea, Freeborn Co. (Hemphill).

IOWA: Des Moines, Polk Co. (Van Hyning). Marshalltown, Marshall Co. (A. B. Kendig).

When typically developed this form is easily distinguishable from *fraternum*; but the glaciated region it inhabits is new snail territory, and *cavum* has not yet been fully differentiated; the assigned characters are variable. So many lots of intermediate character are found that I am now inclined to think that its recognition as a subspecies is of little practical utility. However, the data are given for what they may be worth.

***Stenotrema fraternum montanum* Archer**

Fig. 422 c.

*Stenotrema fraternum montanum* Archer, 1939, *Nautilus*, 52: 98; 53: 33, pl. 7, fig. 9.

"This subspecies has the general specific characters of *S. fraternum* and *S. fraternum cavum* (P. & V.). Like the latter it is umbilicate, but differs from it in the following ways:

*S. fraternum montanum*

*S. fraternum cavum*

- |  |  |
|--|--|
| <p>1. Shell having an angulated periphery excepting the last <math>\frac{1}{4}</math> whorl).</p> <p>2. A brown peripheral band present.</p> | <p>1. Shell having a rounded or bluntly rounded periphery.</p> <p>2. Brown peripheral band absent.</p> |
|--|--|

"The shell of *montanum* is more or less lenticular, and due to this fact and to the presence of the brown peripheral band it has been confused with *S. monodon cinctum* (Lewis). In superficial aspect the two are quite convergent. The differences are as follows:

*S. fraternum montanum*

*S. monodon cinctum*

- |  |  |
|--|--|
| <p>1. Distal end of parietal lamella not strongly slanting into the aperture.</p> <p>2. Surface of the basal sinus (analogous to the interdenticular sinus) convex.</p> <p>3. Nuclear whorl finely beaded.</p> <p>4. Left pilaster of penis simple, slender.</p> | <p>1. Distal end of parietal lamella strongly slanting into the aperture.</p> <p>2. Surface of the basal sinus flattened, dished.</p> <p>3. Nuclear whorl axially striated.</p> <p>4. Left pilaster of penis thickened, indented; joined to the right pilaster below the mid zone by a commissure.</p> |
|--|--|

"Holotype of *montanum*: diameter 11.2 mm.; height 6.0 mm. Paratypes: Diameter 10.5–11.4 mm.; height 5.9–6.8 mm." (Archer.)

GEORGIA: Near Presly, Towns County (Jess White).

NORTH CAROLINA: Mitchell County (Archer). Unaka Mountains, Graham County (Ferriss). Knob at CCC camp NP-4, Smokemont, Swain County, 2800 feet elevation (Archer), Type Alabama Museum of Natural History, no. 101; paratypes in the Alabama Museum and A.N.S.P.

TENNESSEE: Blount County (Archer).

"This subspecies is confined to the southern part of the Blue Ridge Physiographic Province, chiefly in the Smoky and Black Mountains of western North Carolina and east Tennessee. It is apparently isolated from the main body of *S. fraternum*, and seems to be a definite geographical race.

"This snail evidently occurs between 2000 and 3000 feet in the lower montane forests. Its plant cover is chiefly xeric oak-history. It lives in hollows in humus under the leaf carpet and under quartzite slabs. It is also found under fallen bark around sprouting chestnut stumps and around the boles of white oak (*Quercus alba*) and tulip poplar." (Archer.)

***Stenotrema fraternum fasciatum* new name**

Fig. 422 b.

*Helix (Stenotrema) monodon* Racket var. *cincta* Lewis, 1874, Proc. Acad. Nat. Sci. Phila., p. 162. Not *Helix cincta* Müller, 1774.

*Helix monodon cincta* Lewis. Pilsbry, 1892, Man. Conch., 8: 152, pl. 50, figs. 28-30; 1900, Proc. Acad. Nat. Sci. Phila., p. 133.—Walker, 1902, Proc. Acad. Nat. Sci. Phila., p. 429.

The shell is rather openly umbilicate, strongly depressed, with low, convexly conoid spire, strongly angular periphery and rather weakly convex base; cinnamon-buff, paler at base, with an ill-defined dilute tawny band enclosing the suture and continued above the periphery of the last whorl, spreading on the ridge preceding outer and upper margins of the lip. Embryonic shell with axially elongate granules partially running into striae. Later whorls unevenly striate, with some granulation, the base densely covered with hair-bases, where least worn bearing short hairs. The strongly oblique aperture has a straight, rather short parietal tooth as in *S. monodon*, very weakly connected with the columella. Basal lip with a rather thick callus of the inner edge, extending from base of the columella to about the middle of outer arc of the lip where it gradually tapers. The fulcrum is long, less than a quarter turn inward.

Height 5.5 mm., diameter 11 mm.; 5½ whorls.

Height 4.9 mm., diameter 10.2 mm.; 5½ whorls.

Height 4.7 mm., diameter 9.4 mm.; 5½ whorls.

NORTH CAROLINA: Hayesville, Clay County (Annie E. Law), Paratypes 11419 A.N.S.P. Jackson County (Ferriss).

More depressed than any other stenotreme. The peripheral angle disappears a short distance behind the peristome.

***Stenotrema fraternum imperforatum* (Pilsbry)**

Fig. 421 c.

*Polygyra monodon* var. *imperforata* Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 455; 1903, *ibid.*, p. 204.

*Polygyra fraterna imperforata* Pils., Pilsbry & Ferriss, 1907, Proc. Acad. Nat. Sci. Phila. for 1906, p. 542.—Sampson, 1913, Trans. Acad. Sci. St. Louis, 22: 99.

The imperforate shell has a rather high, dome-shaped spire, depressed last whorl with periphery above the middle, and only moderately convex base, which is only very little impressed at the axis. The pile is close, short and rather harsh to the touch. The parietal tooth has a low curved extension at its axial end and is moderately high. Lip with a moderately wide inner callus.

Height 7.4 mm., diameter 10.3 mm.;  $5\frac{3}{4}$  whorls. Paratype.

Height 7.5 mm., diameter 10 mm. Type.

Height 6.7 mm., diameter 10.2 mm. Paratype.

ARKANSAS: Poteau Mountain south of Gwynn, Sebastian Co. (Pilsbry). Mena (Ferriss) and Rich Mountain, Polk Co. (Ferriss, Archer). Rocky Comfort, Little River Co. (Ferriss), Type and paratypes 78589 A.N.S.P.

OKLAHOMA: Page, Le Flore Co. (Archer).

MISSOURI: Ste. Genevieve, Ste. Genevieve Co., and Cape Girardeau, Cape Girardeau Co. (Sampson).

This Ozarkian race appears separable by the above characters. It appears to stand nearer to *fraternum* than to *monodon* where it was originally placed.

**Stenotrema hubrichti**, new species

Fig. 423

The imperforate shell is depressed, lens-shaped, acutely carinate, the height not much exceeding half of the diameter. Spire low conic, of slowly increasing whorls, the first two convex, the rest nearly flat, impressed above the keel; last whorl shortly descending in front. The base is flattened below the keel, then convex, and slightly impressed around the central axis. The embryonic whorls are most minutely granulose. Later whorls are lightly striate, the striae low, very unequal. Base with fainter striae and densely, minutely granulose. The aperture resembles that of *S. fraternum* but is



Fig. 423. *Stenotrema hubrichti*, actual size and enlarged. Type and paratypes.

narrower, the parietal tooth nearer to the basal lip, approaching it slightly towards the outer end; nearly straight, rather low, connecting with the end of the columellar lip by a low, curved ridge. The basal lip is reflected, rather strongly thickened within, the thickening narrowing at the passage of basal into columellar margin, forming a rounded sinus there; in the outer half of the basal margin it is wider, but narrows gradually at the position of the keel, not abruptly as in *S. barbigerum*.

Height 4.4 mm., diameter 9.6 mm.;  $4\frac{3}{4}$  whorls.

Height 4.7 mm., diameter 9.7 mm.; 5 whorls.

Height 3.8 mm., diameter 8.9 mm.;  $4\frac{1}{2}$  whorls.

ILLINOIS: Pleistocene talus just south of McCann School, 2 miles north-east of Aldridge, Union County (Leslie Hubricht), Type and paratypes 174941 A.N.S.P., other paratypes A5137 collection of L. Hubricht.



This is the most spectacular find in *Stenotrema* for a long time. It is the first carinate member of the *monodon* group. All other carinate stenotremes are found in or around mountainous regions.

While unmistakably related to *S. monodon* and *S. fraternum* by the characters of the aperture, the small count of whorls and the acute keel are conspicuous differential characters, constant in a large number collected.

It has a remarkable resemblance to *S. barbigerum*, but I believe the likeness to be superficial, and not an indication of direct relationship. *S. barbigerum* is slightly less depressed; the parietal tooth is noticeably longer, and the shape of the basal lip different, as the marginal thickening is not excavated at the passage of basal into columellar margin, and the peripheral end of the callus is abrupt, not gradually diminishing as in *S. hubrichti*. In a basal view *S. barbigerum* shows the distinct trace of an interdenticular sinus, but there is none in *S. hubrichti*.

Of its occurrence Mr. Hubricht writes: "At the place where these were collected the outer talus had been removed for road material, exposing the lower and older layers. It was only in these older layers that the shells were found. They probably belong to one of the interglacial periods. Associated with them were specimens of *Stenotrema hirsutum*, *Triodopsis tridentata frisoni*, *T. fosteri*, *Mesodon thyroidus*, *Omphalina friabilis*, *Anquispira alternata*, *Haplotrema concavum*, *Gastrocopta armifera*, and *Pomatiopsis lapidaria*. All, with the exception of the new species and *Triodopsis tridentata frisoni*, occurred also in the recent deposits."

#### PRATICOLELLA Von Martens

*Dorcasia* Binney, 1878, Terr. Moll., 5: 346. Not of Gray.

*Praticola* Strebel & Pfeffer, 1880, Beitr. Mex. Land- und Süßwasser-Conch., 4: 38. Not *Praticola* Swainson, 1837.

*Praticolella* Von Martens, 1892, Biol. Centr.-Amer., Moll., p. 138, substitute for *Praticola*.—Pilsbry, 1895, Man. Conch., 9: 67, type *P. ocampi* S. & P. = *P. ampla* Pfr.

The shell, of rather small size, is narrowly umbilicate, depressed-globose, with low conic spire of  $4\frac{1}{2}$  to  $5\frac{1}{2}$  whorls; periphery rounded. Aperture lunate, moderately ample, the peristome varying from scarcely expanded to narrowly reflected, more or less thickened within. Parietal wall plain or rarely with a curved tooth.

Genitalia having a penis without verge or papilla, bearing laterally an accessory hollow sac. Spermatheca oblong, on a short duct. Talon well developed and lobed, as in *Polygyra*.

The free retractor muscles (Fig. 424: 3, *P. berlandieriana*; 424: 4, *P. mobiliana*). Both tentacular and the pharyngeal bands unite into a common trunk about midway of their length. The pedal branches of the tentacular muscles are strongly developed, dividing into several bands. The columellar muscle unites with the others at the insertion on the axis. The right ocular band passes between the penis and vagina.

**TYPE:** *P. ampla* (Pfr.).

**Distribution.**—Nicaragua and eastern Mexico, north to northern Texas; Mississippi to Florida and North Carolina.

The herd of eastern Mexico and Texas is separated from that of the southeastern states by the Mississippi River and State of Louisiana, 300 miles more or less.

A small genus of about ten species with several subspecies. The shells are either pale cinnamon or translucent grayish, uniform or with a brown band above periphery, or they are opaque white, uniform or with brownish or translucent-gray bands. Those of uniform brownish color are partly ground snails, but others, together with the white and white-banded forms, ascend grass or bushes. Except for the strongly developed accessory sac of the penis, *Praticolella* is similar in anatomy to *Polygyra*.

Though most *Praticolellae* live in low country, I have collected it as high as 7800 feet, in a meadow at Pablillo, in the Cordillera Oriental of Nuevo Leon, Mexico.

The embryonic sculpture of *P. jejuna*, *P. lawae* and their immediate allies is strikingly unlike that of other Polygyridae. Species which are more evolved in genitalia, such as *P. mobiliana*, and *P. berlandieriana*, have the simplified, smooth apex found in some species of most genera of the family.

By the genitalia and the sculpture of embryonic whorls the species fall into four little groups, the first two closely similar.

APEX	GROUP	PENIAL APPENDAGE AND RETRACTOR
With spiral threads .....	Jejuna Group .....	} Long; retractor simple. Fig. 430 b.
Threads interrupted .....	Lawae Group .....	
Apex smooth .....	{ Ampla Group .....	} Long; retractor double or triple anteriorly. Fig. 424: 2.
	{ Mobiliana Group .....	

**KEY TO SPECIES OF PRATICOLELLA**

- A. Embryonic 1½ whorls smooth.
  - B. Southwestern species: Texas.
    - C. Lip but slightly thickened within; shell conspicuously banded.
      - D. Lip expanded; diameter 10-13 mm. .... *P. griseola*
      - DD. Lip hardly expanded; diameter 6 mm. .... *P. campi*
    - CC. Lip strongly thickened within.
      - D. Opaque white or banded ..... *P. berlandieriana*
      - DD. Pale olive-gray or brownish, subtranslucent ..... *P. b. pachyloma*
  - BB. Southern: Alabama to Florida; uniform cinnamon-buff.
    - C. Lip somewhat thickened within but not on the face ..... *P. mobiliana*
    - CC. Face of lip decidedly thickened ..... *P. m. floridana*

AA. Embryonic whorls having raised spiral threads: Florida.

B. Outer lip not expanded, no furrow behind it; diameter 6-9 mm. ....*P. jejuna*

BB. Outer lip expanded or reflected, a furrow behind it; diameter 10-11 mm.

*P. bakeri*

AAA. Embryonic whorls having lengthened papillae in irregularly spiral series; last whorl somewhat contracted behind the reflected lip; diameter about 5-6 mm.; North Carolina and Tennessee to Alabama.

B. A low parietal tooth present .....*P. lawae*

BB. No teeth present .....*P. l. tallulahensis*

**Praticolella griseola** (Pfeiffer)

Fig. 425.

*Helix griseola* Pfeiffer, 1841, Symbolae Hist. Hel., 1: 41, Conchyl. Cab., Helix, p. 342, pl. 60, figs. 17, 18; Monogr. Hel. Viv., 1: 337.

*Helix cicercula* Férussac, in coll.,=*griseola* according to Pfeiffer, Monogr. Hel. Viv., 1: 337.

*Helix splendidula* Anton, Verzeichnis, p. 36, not described, Pfeiffer, l. c. in synonymy of *griseola*.

*Bradybaena pisum* Beck, 1837, Index, p. 18, not described, Pfeiffer, l. c. in synonymy of *griseola*.

*Helix berlandieriana* var. *griseola* Pfr., Von Martens, 1892, Biol. Centr.-Amer., Moll., p. 140, pl. 7, figs. 15-17.

*Helix alboincta* A. Binney, 1851, Terr. Moll., 1: 109, 128, name only.

*Helix albo-zonata* A. Binney, 1857, Terr. Moll., 3, pl. 49, fig. 2.

*H. albolineata* "Binney", Gould, 1857, Terr. Moll., 3: 34 (referring to Terr. Moll. 3, pl. 49, fig. 2), as var. of *berlandieriana*.

*Dorcasia griseola* Pfr., W. G. Binney, 1878, Terr. Moll., 5: 348, fig. 231 (jaw), pl. vii, fig. v (teeth).

"The shell is umbilicate, depressed-globose, obliquely slightly striate, somewhat glossy; gray, encircled with pale tawny bands bordered with white. Spire short. Whorls 4 to 4½, slightly convex. Umbilicus very narrow. Aperture lunate. Peristome simple, white, a little reflected, the columellar margin somewhat expanded. Greater diameter 10, smaller 8½, height [of axis] 6 mm." (Pfeiffer, translation.)

MEXICO: At Vera Cruz (Hegewisch), type locality; Cordoba; south to Nicaragua.

TEXAS: Environs of Brownsville (Rehn and Hebard, Ferriss and others).

FLORIDA: Key West (B. R. Bales).

CUBA: Habana Province.

The shell is thinner than *P. berlandieriana* with the outer lip more decidedly, though quite narrowly, reflected, and only slightly thickened

Fig. 424. 1, *Praticolella berlandieriana*, Victoria, Texas, pallial organs. 2, Genitalia. At 2a, a section of the appendage at point marked with arrow. 3, Free muscles. col. columellar muscle. l.o., left ocular band. l.t., left tentacular band, r.o., r.t., right ocular and tentacular bands. 4, *Praticolella mobiliana*, free muscles. 5, *Polygyra pustula*, Gainesville, Florida, pallial organs. 6, Penis and appendage of the specimen from Gainesville. 7, Lower ducts of genitalia, specimen from Miami, Florida. 8, 8a, Genitalia of specimen from Gainesville, Florida. At 8a another view of the bipartite appendage.

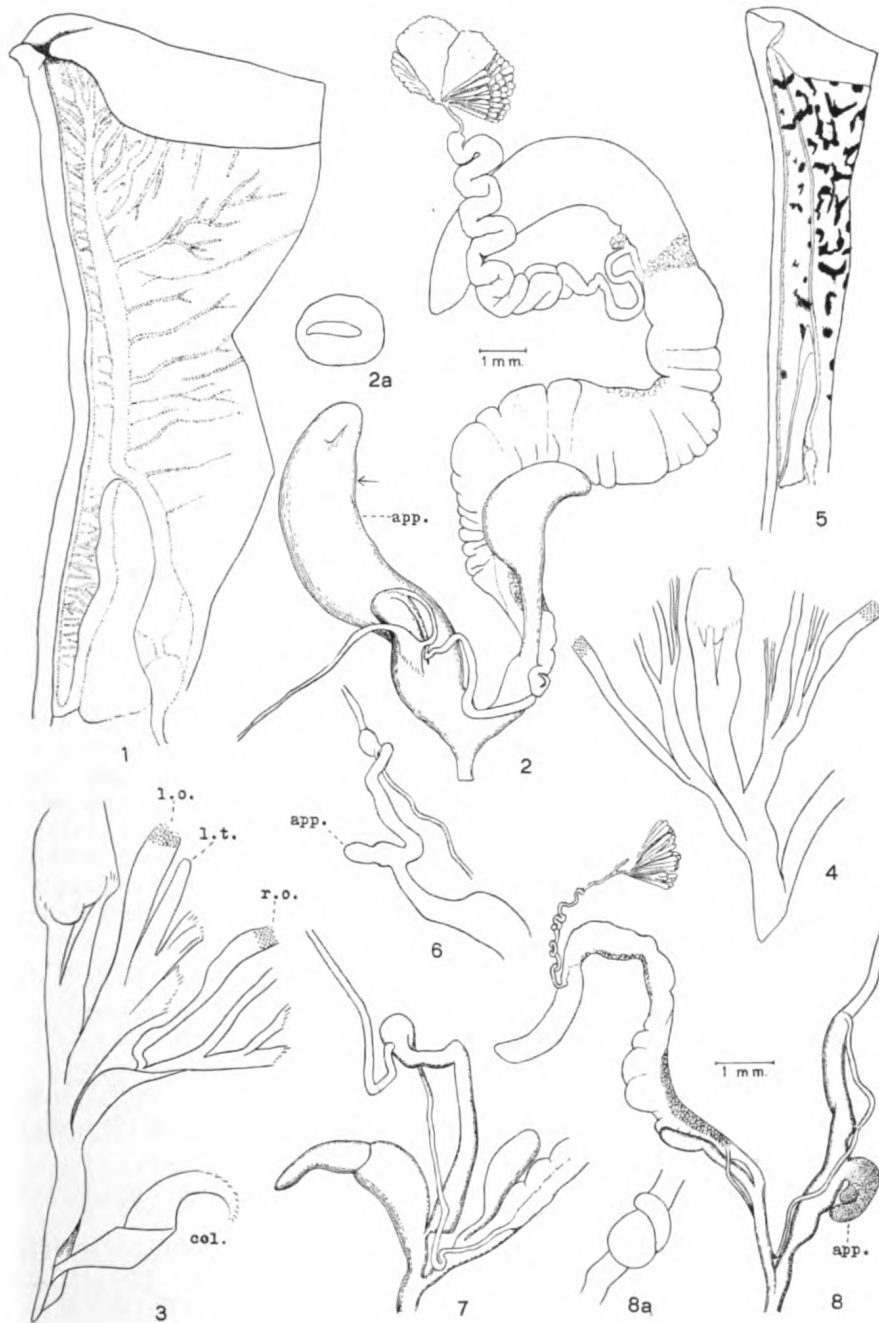


Fig. 424. See bottom of p. 690 for legend.

within. In *berlandieriana* it is expanded rather than reflected, very strongly thickened, and its upper margin is more strongly arched.

Pfeiffer's type was a small form, of which I have seen large numbers from Vera Cruz. One measures 7.2 x 10 mm.,  $4\frac{1}{2}$  whorls; but the diameter runs from 8 to 10 mm. Color as in Brownsville examples except that the upper white band usually does not extend to the suture, but is separated from it by a wide gray zone. However, in a few examples it extends to the suture as in the Texas shells.

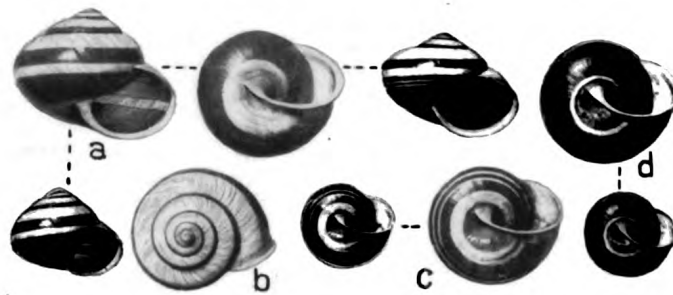


Fig. 425. *Praticolella griseola*, Brownsville, Texas. (Actual size and enlarged.)

Brownsville specimens have a broad white zone below the suture usually showing a few dark dots; this is followed by a brown or dilute brown band and then a white band at the periphery. The lower surface is dilute brown with a white band on the convexity around umbilicus, or there may be two or three narrow white bands between the circumumbilical and peripheral white bands. Sometimes the lower white band covers the whole umbilical region. The spire is often high and conic, but in others rather low, as in Pfeiffer's type. The size in Texas is usually greater than in Pfeiffer's type; several measure:

9.3 x 11.5 mm.; $5\frac{1}{4}$ whorls.	9.3 x 13 mm.; $5\frac{1}{4}$ whorls.
8.7 x 11.8 mm.; 5 whorls.	11 x 13.7 mm.; $5\frac{1}{3}$ whorls.
	11 x 12.7 mm.; $5\frac{1}{2}$ whorls.

W. G. Binney gave the localities Indianola (now Port Lavaca, Calhoun County) and Bosque County. The first may be correct, though it is doubtful; but Bosque County, in central Texas, is surely an error.

A. Binney's figures of *H. albozonata* were apparently from a Texan specimen.

This species has been naturalized in Cuba, probably from Vera Cruz, and in Key West. These shells are rather small, 9.5 to 11 mm. diameter, and may have reached Florida by way of Cuba.

**Praticolella campi** Clapp & Ferriss

Fig. 426: 1-4.

*Praticolella campi* G. H. Clapp & J. H. Ferriss, 1919, Nautilus, 32: 78, pl. 6, figs. 1-4.

“Shell narrowly umbilicated, globose, shining, opaque white with translucent corneous bands, usually one just above the periphery, one just below and numerous bands down to the umbilicus, or the shell may be all opaque or all translucent below the periphery. Whorls 4 with well impressed suture, body whorl rounded, periphery high, some shells showing a slight angularity

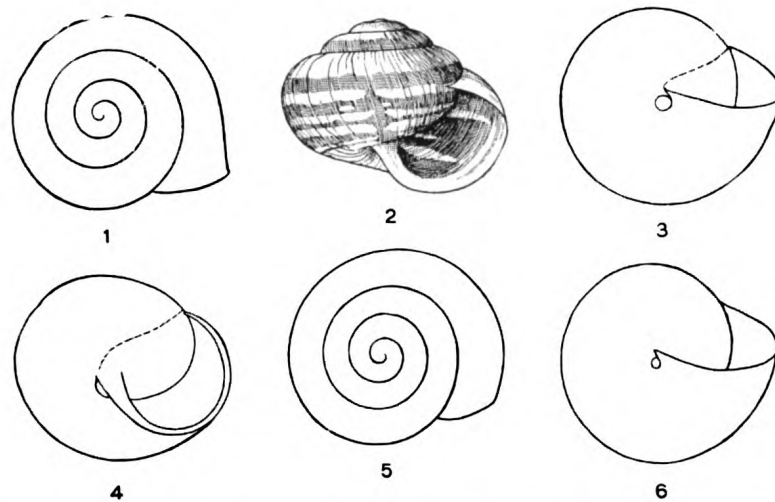


Fig. 426. 1-4, *Praticolella campi*, fig. 2 the type. 5, 6, immature *P. griseola* of similar size (figures 1, 3, 4-6 after Clapp). (All  $\times 5$ .)

at the periphery. Aperture lunate-rounded, slightly oblique, somewhat dilated above, lip thickened within and widely dilated at the columellar insertion; there is a distinct, though thin, callous deposit connecting the ends of the lip. Diameter 6, altitude 4 mm. There is a slight variation in size but above is about the average. Animal not observed.” (Clapp and Ferriss.)

TEXAS: Fort Brown, Brownsville, in sandy soil from 1 to 6 inches below the surface, at foot of the brick piers (Ferriss, midwinter, 1913-14), Type and paratypes 134810 A.N.S.P. Also in axils of bananas and in the soil, eastern side of parade ground; similar shells from Rio Grande City, Fordyce, and in Rio Grande drift (Ferriss and R. D. Camp).

“Mr. Ferriss noticed this form when first collected and insisted that it was not the young of either *P. berlandieriana* or *griseola* which were found with it; there was too much evidence of maturity, and its subsequent detection in drift from the Rio Grande confirms this opinion.

“It differs from the young of the other species in being more solid and less translucent, and by the *constantly thickened and dilated lip and the*

*presence of the callous deposit.* The umbilicus is also wider, being nearly double the diameter of that of the young shells. The aperture is wider and more rounded, that of the young of the above-named species being distinctly subangular at the base. As a rule the spire of the young shells is more prominent and the suture deeper, the young shells are also *distinctly angular at the periphery.*" (Clapp and Ferriss.)

This form may prove to be a winter resting stage of young *P. berlandieriana*, as I thought when Ferriss submitted them to me years ago; but without collecting on the spot to obtain living material one cannot be positive. If the genitalia are found to be mature, the view of Clapp and Ferriss will be confirmed. Meantime it is allowed to stand as a species provisionally. The color pattern of the type is that of *P. berlandieriana taeniata*. If proved identical the name *campi* will replace *taeniata*.

(Named for Mr. R. D. Camp, collector of mammals and reptiles, who was Mr. Ferriss' companion in southern Texas.)

**Praticolella berlandieriana** (Moricand)

Fig. 427 a, b, c.

*Helix (Helicogena) berlandieriana* Moricand, 1833, Mém. Soc. Physique et d'Hist. Nat. de Genève, 6: 537, pl. 1, fig. 1 (Texas).

*Helix berlandieriana* Moric., Leidy, 1851, Terr. Moll. 1: 255, pl. 8, fig. xi (genitalia).—Pfeiffer, 1853, Monogr. Hel. Viv. 3: 227.

*Dorcasia berlandieriana* Moric., W. G. Binney, 1878, Terr. Moll. 5: 347.

*Helix berlandieriana* Moric., Von Martens, 1892, (in part), Biol. Centr.-Amer., Moll., p. 140.

*Praticolella berlandieriana* (Moric.) Pilsbry, 1906, Proc. Acad. Nat. Sci. Phila., p. 125, figs. 1, 2.—Vanatta, 1915, *ibid.*, p. 194, fig. 1 (genitalia).

The shell is solid, very narrowly umbilicate, globose-depressed with low conic spire; white (or gray to light buff), typically with an isabella colored or gray band above the periphery, but this may be wanting, or there may be additional bands or streaks. Embryonic whorls glossy, young shells sometimes showing excessively fine, faint spiral lines. Subsequent whorls weakly striate. The last whorl is rounded at periphery, descends a little in front, and is somewhat contracted behind the lip. The oblique aperture is lunate, about as high as wide. Peristome white, narrowly expanded, strongly thickened within.

Height 7.5 mm., diameter 10 mm.; 5 whorls. Monterey, Mexico.

Height 9.2 mm., diameter 12 mm.; 5 whorls. Victoria, Texas.

ARKANSAS: Washita Springs (A. Binney).

TEXAS: Waco, McLennan Co. Austin, Travis Co. Bastrop Co. San Marcos, Hays Co. New Braunfels, Comal Co. Seguin, Guadalupe Co. San Antonio and Macdona, Bexar Co. Hondo, Medina Co. Del Rio, Val Verde Co. Victoria, Victoria Co. Live Oak Co. Robstown, Neuces Co. Hidalgo, Hidalgo Co. Brownsville, Cameron Co. Singley reported *berlandieriana* from the following counties, but he did not distinguish the races now admitted: Goliad, Cameron, Duval and Harris (Asher). Lee, Washington, Waller, Fort Bend, Austin, Brazos, Galveston, Anderson, Neuces and Hidalgo counties (Singley).

MEXICO: In the States of Tamaulipas and Nuevo Leon.

*P. berlandieriana* is generally distributed over the semiarid division of the Lower Sonoran Zone in Texas, and in the similar parts of Tamaulipas and Nuevo Leon. In rainy weather it commonly occurs on bushes such as mesquite and other plants, sometimes on grass. In dry weather it burrows in the soil or retires under wood or rubbish. There are several incipient races.

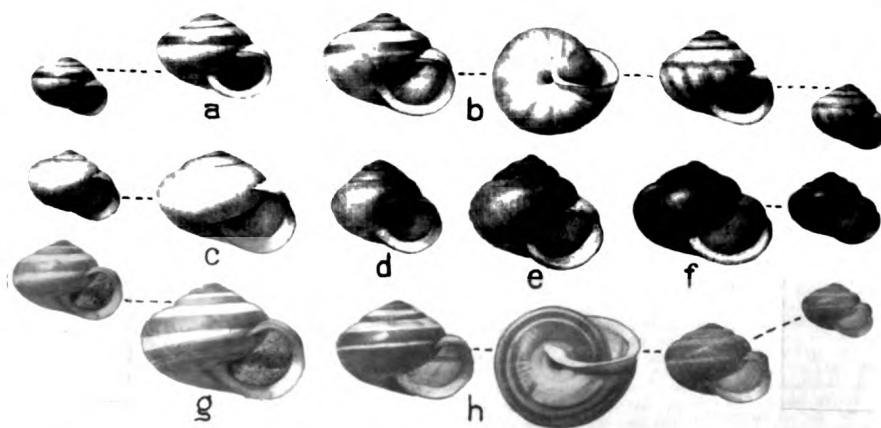


Fig. 427. a, *Praticolella berlandieriana*, Topo Chico, Nuevo Leon; b, near New Braunfels; c, Victoria; d, *P. berlandieriana pachyloma*, Lee County; e, Gregory; f, Seabrook. g, h, *P. berlandieriana taeniata*, Brownsville. (Enlarged; the right and left figures actual size.)

Moricand's type was a rather small form with a single band, such as Figure 427 a from Topo Chico, near Monterey, Nuevo Leon. The usual form in central southern Texas (Fig. 427 b) is somewhat more globose, white with a gray band above periphery, the base plain white to pale gray, or with white rays on a gray ground. In some places, as around Victoria, there are many plain opaque white shells (Fig. 427 c); also others with the patterns just described. The diameter runs from 9.8 to 11.7 mm.

Dr. Von Martens believed that "*H. berlandieriana* and *H. griseola* are connected by many intermediate forms . . . and cannot be maintained as distinct"; but his figures of the former (Biol. Centr.-Amer. p. 7, figs. 12-12 b, Vera Cruz) seem to me to be really *griseola*. I have collected hundreds of these snails in Texas and Mexico, and have found no connecting links; but it is true that they form an ecologic pair, *griseola* in a warmer, more humid region, *berlandieriana* in cooler, moderately dry to semiarid country. Their ranges overlap in the southern counties of Texas, but perhaps they occupy different ecologic niches there. I have not collected in that angle of the State.



*Helix virginalis* "Jan", which Pfeiffer confused with "*berlandieriana*" in 1848, *Monographia Heliceonum Viventium*, 1: 165, and described in *Systematisches Conchylien-Cabinet*, *Helix*, 1: 260, pl. 38, figs. 18, 19, giving the locality "Texas", was said by Villa, a friend of Jan, to be a Sicilian snail. It belongs to the *Helicella* group.

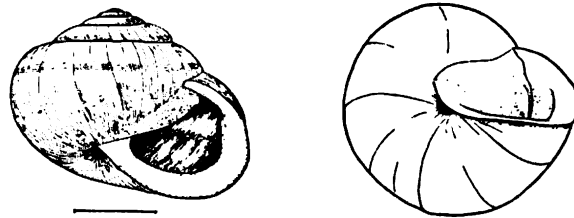


Fig. 428. *Praticolella berlandieriana*. Guadalupe River near New Braunfels, Texas. ( $\times 3$ .)

There is frequently a short lamellar tooth or callous ridge on the parietal wall near the suture, a short distance within, as shown in Figure 428.

The specimen dissected is from Victoria, Texas, 76209 A.N.S.P. The pallial organs (Fig. 424: 1) are proportioned about as in *Triodopsis*. The lung has a large, strongly developed pulmonary vein and rather weak but distinct secondary veins, most profusely developed anteriorly. The kidney is narrow and long (6 mm.) as in the *Polygyrae*, about twice the length of the heart.

The ovotestis (Fig. 424: 2) is a compact mass of long caeca. Hermaphrodite duct is relatively large and strongly knotted. The talon is short, 0.35 mm., rounded with weakly lobed surface. Prostate gland as long as the uterus. The penis is rather short, the vas deferens entering at the apex. Retractor muscle is divided, one slender branch inserted at the apex, a wider one about at the middle of the penis, near the insertion of the lateral sac. This (Fig. 424: 2; ap.) is very large, banana-shaped. The vagina is short. The large spermatheca has a very short duct. Length of penis 3.5 mm.; appendix 6 mm.; vagina 2.5 mm.; spermatheca 4.5 mm.; diameter of shell 11.5 mm.

This species differs from the genotype, *P. ampla*, by having a double, not a triple, insertion of the penial retractor.

(Named for Jean Louis Berlandier, 1805-1851, known chiefly as a botanist; in Texas from 1828 to 1839.)

***Praticolella berlandieriana taeniata* new subspecies**

Fig. 427 g, h.

White with a wide, translucent, dilute-brown band above periphery and several on the base. In other specimens the brownish bands may be crescent wholly or in part. Sometimes the bands are translucent gray. Lip strongly thickened within.

Height 10 mm., diameter 14.3 mm.;  $5\frac{1}{4}$  whorls. Brownsville.

Height 9.8 mm., diameter 12.7 mm.;  $5\frac{1}{4}$  whorls. Rio Grande City.

Height 8.8 mm., diameter 10.8 mm.;  $5\frac{1}{4}$  whorls. Donna.

Height 7.2 mm., diameter 9.3 mm.;  $4\frac{3}{4}$  whorls. Donna.

TEXAS: Brownsville, Type 134308 A.N.S.P., and Lyford, Cameron County; Donna and Samfordyce, Hidalgo County; Rio Grande City, Starr County; Corpus Christi, Nueces County. Also many places in the States of Tamaulipas and Nuevo Leon, Mexico.

The coloration is that of *P. griseola*, from which it seems constantly different by the internally thickened lip.

(*Taeniata*, banded.)

**Praticolella berlandieriana pachyloma** ('Menke' Pfeiffer) Fig. 427 d, e, f.

*Helix pachyloma* "Menke," Pfeiffer, 1847, Zeitschr. für Malak., 4: 32 (Texas); 1848, *ibid.*, 5: 115.

*Praticolella pachyloma* (Mke.), Vanatta, 1915, Proc. Acad. Nat. Sci. Phila., p. 195, fig. 2 (genitalia).

The shell is shaped like *P. berlandieriana*, but it is of a uniform pale olive-gray tint, somewhat translucent, or in some localities a slightly translucent cinnamon-buff, without opaque white bands or streaks. The peristome is thickened within, but none seen has a callous ridge within the mouth, on the parietal wall below suture.

Height 8 mm., diameter 9.8 mm. Lee Co.

Height 9.7 mm., diameter 11.7 mm. San Patricio Co.

Height 11.7 mm., diameter 14.5 mm., 5½ whorls. Eagle Lake, Nueces County.

TEXAS: Dallas County; Seabrook, Houston County; Navasoto, Grimes County; Lee County; Flatonia, Fayette County; Houston, Harris County; La Marque and Virginia Point, Galveston County; Pearland, Brazoria County; Gregory, San Patricio County; Corpus Christi and Eagle Lake, Nueces County.

Its range is mainly eastward of that of *berlandieriana* proper, in more humid country, but the scattered records indicate some overlap.

#### PRATICOLELLA JEJUNA GROUP (new section *Filapex*)

Type *P. jejuna*.

**Praticolella jejuna** (Say)

Fig. 429 e, f.

*Helix jejuna* Say, 1821, Journ. Acad. Nat. Sci. Phila., 2: 158.—Binney, Complete Writings Thomas Say, p. 19.—Webster, 1892, Nautilus, 5: 119 (Lake Helen).

*Mesodon jejuna* Say, W. G. Binney, 1878, Terr. Moll. 5: 335.

*Helix mobiliana* Lea, A. Binney, 1851, in part, Terr. Moll. 3: 172, pl. 42, fig. 2.

*Praticolella jejuna* Say, Pilsbry, 1906, Nautilus, 20: 32, fig. 1 (genitalia).—Johnson, Nautilus, 20: 46.—Walker, 1928, Terr. Moll. Alabama, p. 58, figs. 68, 71; 1917, Nautilus, 31: 55.

*Praticolella jejuna clavis* Vanatta, 1915, Proc. Acad. Nat. Sci. Phila., p. 197 (Noname Key).

The shell is minutely umbilicate, moderately solid, depressed-globose with low conoid spire; cinnamon-buff (to dilute isabella color), with a cinnamon (or sometimes nearly white) streak behind the lip. Embryonic shell of 1½ whorls, the first half whorl smooth, the next with about 6 to 10

somewhat irregular spiral threads; following whorl smoothish, having faint lines of growth and an uneven, very close microscopic wrinkling more oblique than growth lines. The last whorl is rounded peripherally, scarcely descends in front, and is not contracted behind the lip. The aperture is broadly

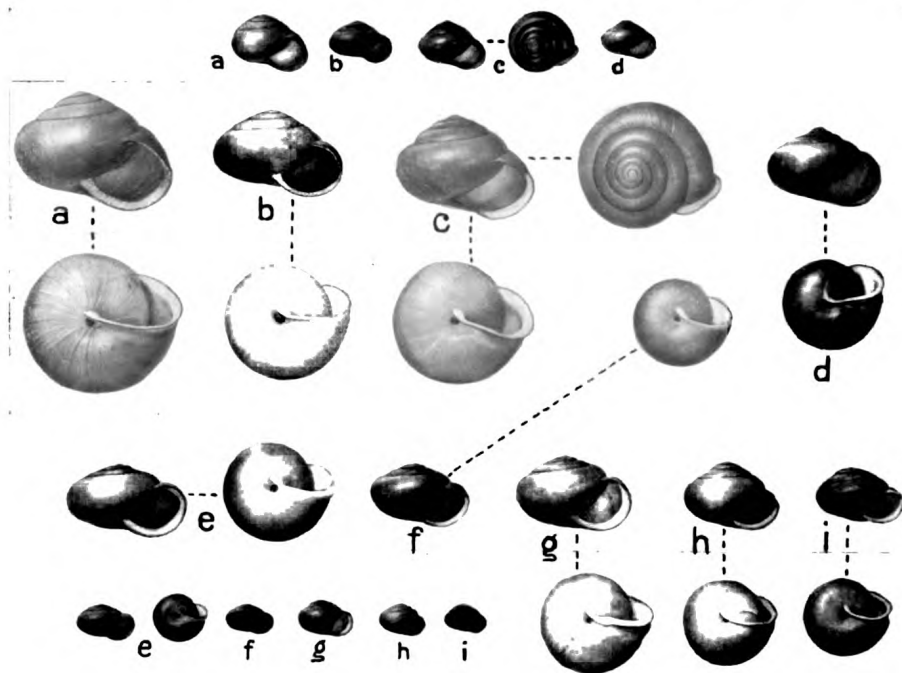


Fig. 429. a, *Praticolella bakeri*, type. b, *Praticolella jejuna* form *clavis*, type, Noname Key. c, *Praticolella mobiliana*, Foley, Ala.; d, Mobile. e, *Praticolella jejuna*, Clearwater; f, Orlando. g, *Praticolella mobiliana floridana*, Type. h, *Praticolella lawae*, Calera, Ala. i, *Praticolella lawae tallulahensis*, type. (Actual size and enlarged.)

lunate. Peristome very slightly expanded at base, not in the outer and upper margins, rather strongly thickened within, white, dilated at the columellar insertion.

Height 4.7 mm., diameter 6.4 mm.;  $4\frac{2}{3}$  whorls. Orlando.

Height 5.4 mm., diameter 8 mm.; 5 whorls. Clearwater.

Height 5.8 mm., diameter 8.6 mm.; 5 whorls. Noname Key.

GEORGIA: Brunswick, Glynn Co. Waynesville, Wayne Co.

FLORIDA: Cow Ford, near Jacksonville, (Say; type locality). Pablo Beach, Duval Co. Imri, Hamilton Co. Gainesville, Alachua Co. Cedar Keys, Levy Co. Blue Creek and Grand Island, Lake Co. Orlando, Orange Co. New Port Richey, Pasco Co. Clearwater and St. Petersburg, Pinellas Co. Ballast Point, Tampa Bay, Hillsborough Co. Chester Shoals Refuge Station and island of Eau Gallie, Brevard Co. (Walker). Palm Beach and Boynton, Palm Beach Co. Pine Island, Lee Co. Dania and Ft. Lauderdale, Broward Co. Lemon City, Miami, Coconut Grove and Homestead, Dade Co. Horr's Island, Monroe Co. Sugar Loaf Key, Noname Key, Little Pine Key and Boca Chica Key.

This little snail is widely distributed throughout peninsular Florida and on the Keys, usually found under stones or wood, both in hammock land and in pine woods. Lewis's unlocalized Alabama record has not been confirmed.

It is readily known by the strongly thickened lip, which is not expanded except at the base, and there is no trace of a contraction or furrow behind it, such as is seen in *P. mobiliana* and *P. bakeri*.

The specimens from the lower keys are partly larger than the typical size of "rather more than one-fifth of an inch" (Say's type representing the small extreme). They are also lighter in color, olive-buff, but also some in the same lots are distinctly brown. This form was called *P. jejuna clavis* Vanatta (Fig. 429 b, Noname Key); but it does not seem sufficiently differentiated for subspecific rank.

At St. Augustine, C. W. Johnson found *jejuna* in sandy scrub oak, under boards and leaves. C. T. Simpson took it in high, dry pine woods near Braidentown. G. W. Webster reports it by hundreds on the tops of weeds and grass to get out of the high water, then a foot deep, near Lake Helen.

(*Jejunus*, insignificant.)

**Praticolella bakeri** Vanatta

Fig. 429 a.

*Praticolella bakeri* Vanatta, 1915, Proc. Acad. Nat. Sci. Phila., p. 196, figs. 7-9.

The shell is perforate, rather thin, depressed-globose with conoid spire; translucent, dilute cinnamon-buff, with an opaque cinnamon streak behind the peristome. Embryonic whorls with widely spaced, irregularly spiral threads, as in *P. jejuna*. Subsequent whorls smoothish, not glossy, with growth lines but weakly developed, and showing in places some microscopic wrinkling, as in *P. jejuna*. The last whorl scarcely descends in front, and is distinctly contracted in a shallow gutter behind the lip. Peristome narrowly expanded, subreflected, thin, with a moderate thickening within.

Height 7.7 mm., diameter 10.5 mm.; 5½ whorls. Type.

Height 7.9 mm., diameter 11 mm.; 5½ whorls.

FLORIDA: Zellwood, Orange County (C. H. Baker), Type 107452 A.N.S.P., Orlando, Orange County (C. H. Baker); Rockledge, Brevard County (E. B. Bartram).

This species is larger than *P. jejuna*, differing by the decidedly though narrowly reflected lip preceded by a furrow; but it agrees with that species in apical sculpture. The prelabral furrow is much shallower than in *P. mobiliana*, which has a smooth apex. In *P. bakeri* the shell is less globose than in *P. berlandieriana pachyloma*.

**Praticolella lawae** (Lewis)

Fig. 429 h.

*Helix (Mesodon) lawii* Lewis, 1874, Proc. Acad. Nat. Sci. Phila., p. 118, text-fig.

*Mesodon lawi* Lewis, Binney, 1878, Terr. Moll., 5: 335, fig. 218.

*Polygyra lawae* Lewis, Clapp, 1912, Nautilus, 25: 132.

*Praticolella lawae* (Lewis), Vanatta, 1915, Proc. Acad. Nat. Sci. Phila., p. 197, fig. 10 (genitalia).—Walker, 1928, Terr. Moll. Alabama, p. 58, fig. 72.

The shell is very narrowly umbilicate, rather thin, depressed-subglobose with conoid spire, dilute cinnamon-buff. Embryonic whorls, after the small smooth tip, with short hyphen-shaped papillae in irregularly spiral and oblique trends, and often visible only in places. Subsequent whorls with indistinct wrinkles of growth and very fine, short hairs arranged in diagonal rows; or when these are lost, minute hair scars in irregularly oblique trends; between them a microscopic wrinkle-granule texture. The last whorl descends slightly in front and is deeply guttered behind the lip, the gutter preceded by a somewhat projecting ridge. The peristome is white, reflected except near the upper insertion, thickened within. Parietal callus very thin, bearing a long, curved, retractively radial parietal tooth.

Height 3.5 mm., diameter 5.9 mm.; nearly 5 whorls. (Lewis.)

Height 4.8 mm., diameter 6.1 mm.; barely 5 whorls. Calera.

NORTH CAROLINA: Hayesville, Clay Co., in a field at the roots of strawberry plants (Annie M. Law<sup>1</sup>).

GEORGIA: Houston, Hall and Habersham counties (Hemphill according to Binney).

TENNESSEE: White Cliff, Monroe Co. (Binney).

ALABAMA: Sand Mt., Fort Payne, Lookout Mt., Valley Head, DeKalb Co. Roanoke, Randolph Co. Horseblock Mt., Talladega Co. Guerne, Calera and Helena, Shelby Co. Woodstock, Bibb Co. Vance, Tuscaloosa Co. Irvington and Mobile, Mobile Co.

MISSISSIPPI: According to Walker.

By its color and the furrow behind the reflected lip this species resembles *P. mobiliana*, but it differs by the presence of a parietal tooth, and the papillose sculpture of both embryonic and later whorls; the latter are also somewhat more coarsely wrinkle-striate in *lawae*. In fresh specimens there are delicate, short hairs, as G. H. Clapp first pointed out.

According to Vanatta, the interior of the penis and the hollow penial gland are longitudinally corrugated, while the convex side of the appendix is thick, and granular on the inner surface. The spermatheca bulb is oval. Fig. 430 b.

***Praticolella lawae tallulahensis* (Pilsbry)**

Fig. 429 i.

*Polygyra lawae tallulahensis* Pilsbry 1897, *Nautilus*, 11: 96, name and locality only; 1898, *ibid.*, 12: 22.

Form and color of shell as in *P. lawae*. There are a few interrupted, widely spaced spiral lines in the subperipheral region. The wrinkles of growth are faint, the scar-like spaced papillae distinct in places, rather irregularly placed, and in perfect, fresh specimens, no doubt there are delicate hairs. The microscopic granulation is distinct. The parietal wall has no trace of a parietal tooth.

Height 3.7 mm., diameter 5.7 mm., 4½ whorls.

GEORGIA: Tallulah Falls, Rabun County (H. Hemphill), type and paratypes 169789 A.N.S.P.

<sup>1</sup> *Nautilus*, 40: 132.

Known only from the type locality, in the northeastern angle of the State, not far from the type locality of *P. lawae*. This is apparently the toothless form mentioned in Manual of American Land Shells, p. 317.

Subgenus FARRAGUTIA Vanatta

*Farragutia* Vanatta, 1915, Proc. Acad. Nat. Sci. Phila., p. 196; type *P. mobiliana*.

The apical whorls are smooth, as in species of Texas and Mexico. The appendage of the penis is in form of a glandular pad adnate throughout (Fig. 430 a).

(Named for Admiral D. G. Farragut, U. S. N., 1801-1870, who captured Mobile Bay in 1864.)

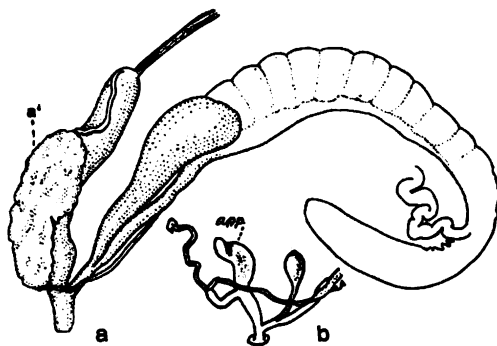


Fig. 430. a, Genitalia of *Praticolella mobiliana*, Mobile; a', glandular penial sac. b, *Praticolella lawae*, Calera, Alabama, after Vanatta.

*Praticolella mobiliana* (Lea)

Fig. 429 e, d.

*Helix mobiliana* Lea, 1841, Proc. Amer. Phil. Soc., 2: 82; 1844, Trans. Amer. Phil. Soc., 9: 17.

*Mesodon mobiliana* Lea, Binney, 1878, Terr. Moll., 5: 336, fig. 219.

*Polygyra mobiliana* Lea, Clapp, 1913, Nautilus, 26: 120.

*Praticolella mobiliana* Lea, Vanatta, 1915, Proc. Acad. Nat. Sci. Phila., p. 195, fig. 3 (genitalia).—Walker, 1928, Terr. Moll. Alabama, p. 59, fig. 73.<sup>1</sup>

The shell is small, perforate, rather thin, depressed-globose with low conoid spire; dilute cinnamon-buff. Embryonic whorls smooth, the rest weakly marked with growth lines, and showing a microscopic wrinkling in some places. Last whorl rounded peripherally, scarcely descending in front, having a deep furrow behind the lip. The aperture is broadly lunate. Peristome thin, brownish, narrowly reflected, but slightly thickened within (or in some lots having a distinct callous rib within); dilated at the columellar insertion.

Height 5.5 mm., diameter 7.6 mm.; 5½ whorls. Mobile.

Height 6.8 mm., diameter 9.1 mm.; 5¾ whorls. Foley.

<sup>1</sup> The full title of this paper is The Terrestrial Shell-bearing Mollusca of Alabama. Issued simultaneously by the University of Michigan as Miscellaneous Publication No. 18 of the Museum of Zoology, and by the University of Alabama as Alabama Museum of Natural History, Museum Paper No. 8.

ALABAMA: Magnolia Springs and Foley, Baldwin County; Mobile, Mobile County, type locality; Homerville, Clinch County; Calvert, Washington County.

GEORGIA: Chester's Island, Okefinokee Swamp.

FLORIDA: Volusia County; Jacksonville, Duval County.

This snail is about equal to *P. jejuna* in size, but it differs by the deep furrow behind the reflected lip, the absence of spiral threads on the embryonic whorls and the absence of a cinnamon or whitish streak behind the lip. The penial appendix is also quite differently developed. Dr. G. H. Clapp found that many specimens from Mobile, collected by H. H. Smith, have a brown band, much darker than the rest of the shell, situated just above the periphery. Mr. Smith found no banded shells of this species except those collected near Mobile.

"Mr. McNeill informs me that he got a great many of this species by 'sweeping' the grass at night with an insect net" (Geo. H. Clapp). They are found in open pine woods.

**Praticolella mobiliana floridana** Vanatta

Fig. 429 g.

*Praticolella mobiliana floridana* Vanatta, 1915, Proc. Acad. Nat. Sci. Phila., p. 196, figs. 4-6.

The face of the lip has a white callous ridge which stops rather abruptly a short distance from the columella and from the upper insertion of the lip; otherwise like *mobiliana*.

Height 5 mm., diameter 7.3 mm.; 5 whorls. Volusia Co.

Height 6.3 mm., diameter 8.6 mm.; 5½ whorls. Jacksonville.

FLORIDA: Volusia County (G. W. Webster), Type 11445 A.N.S.P. Jacksonville (Hebard and Rehn).

Further collections between east Florida and Alabama are needed to determine the validity of this race, but I have not seen the lip structure described in large numbers of *mobiliana* from Alabama.

**MESODON** Rafinesque

*Mesodon* Rafinesque in Férussac, 1821, Tabl. Syst. Fam. Limaçons, p. 33, No. 96 (*Mesodon leucodon* Raf. in synonymy of *Helix thyroidus* Say, and *M. helicinum* Raf. in synonymy of *Helix knorvillina* Fér., a nude name).<sup>1</sup>

*Odomphium* Rafinesque, 1831, Enum. and Acc., etc., p. 3, no species mentioned.—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 324, *Helix thyroidus* Say designated type.

*Odontomphalum* Agassiz, 1846, Index Univ., p. 255. (Emendation of *Odomphium*.)

The shell of medium or large size is umbilicate or closed, in shape from globose with conoid spire to strongly depressed; the aperture with reflected

<sup>1</sup> The identity of *Mesodon* Rafinesque, 1831, Enum. and Acc., etc., p. 3, for *M. maculatum* Raf., is wholly uncertain. *Mesodon* was there defined as "Differ from *Helix* by lower lip with a tooth"; and *M. maculatum*: "Depressed, hardly striated, upper lip reflected, tooth careniform, 5 spires. Fulvous with brown spots."

lip, toothless or with one or two teeth (or in subgenus *Inflectarius*, three teeth).

Genitalia essentially as in *Polygyra*. Penis cylindric or club-shaped, with simple wall and blunt summit, where the retractor muscle and vas deferens are inserted together, or the retractor may attach to the vas deferens very close to its insertion. No penial retentor muscle. The short duct of the spermatheca is always slender.

TYPE: *Helix thyroidus* Say.

*Distribution*.—Eastern United States and Canada, west to eastern Nebraska and Texas.

By the shell alone some species of *Mesodon* are not separable from *Triodopsis* or *Allogona*, but the organs of reproduction show that it is not nearly related to those genera, but groups with *Stenotrema* and *Polygyra*, genera which are much alike anatomically. *Triodopsis*, which in some species is hardly distinguishable from *Mesodon* by the shell, differs conspicuously by the distally tapering shape and the structure of the sheathed penis, the penial retentor muscle and the swollen duct of the spermatheca.

The penis, as in most Polygyridae, frequently shows division into upper and lower chambers, externally often indicated by a slight contraction or bend, and internally by some change in the sculpture of the wall of its cavity. This is only partially shown by the sections I have figured. It calls for further investigation and illustration by slitting the wall and pinning it out flat; the finer structure, not otherwise to be seen, is often highly distinctive. An interesting character of many species, such as *M. thyroidus*, *M. clausus* and others, is the division of the penial cavity at its apex by a short longitudinal partition. I believe that a more extended study of the penes than I have been able to make at this time, will afford valuable clues to specific affinities within the genus.

Binney has shown that there are two types of teeth in *Mesodon*. *M. thyroidus*, *M. clausus* and *M. wheatley* have very long, simple cusps on outer lateral teeth, somewhat shorter on the marginals, and no ectocones on any teeth, except sometimes on outermost marginals. In other species he examined the ectocones are present on outer lateral and marginal teeth, and the mesocones of normal length. Ectocones are weak or wanting on central and inner lateral teeth in all species, thereby differing from most other genera of *Polygyridae*.

While *Mesodon* extends over practically all of the humid Upper Austral Zone, the greatest diversity occurs in the southern Appalachian system, with a secondary center of speciation in the Ozark-Ouachita region. Apparently this group, *Stenotrema* and *Triodopsis*, were evolved in the southeastern United States.



The genus *Mesodon* as now understood is not exactly equivalent to *Mesodon* of former systematic works, as the *inflectus* and *apressus* groups are now included, and the *albolabris* group is excluded.

In *Mesodon* the apical sculpture is somewhat varied, as in most other genera, with the extremes more or less connected by intermediate stages. In some species of *Mesodon* s. str. and *Appalachina* the embryonic whorls are quite smooth; in others there are short radial striae below the suture, or extending half across the whorl or more. This connects with the *apressus* group. In the *M. subpalliatum* group and the *M. inflectus* group the radial striae are more or less broken into long granules.

*Mesodon* is apparently an old genus of eastern North America, where it has been differentiated into at least four rather conspicuously diverse groups here considered to be subgenera. *Triodopsis*, spread over about the same area and occupying the same physiographic regions, has become similarly varied, the shell forms being nearly parallel, as in the following list of subgenera and their type species.

Subgenera of <i>Mesodon</i>	Subgenera of <i>Triodopsis</i> and <i>Allogona</i>
<i>Mesodon</i> s. str. ( <i>thyroidus</i> ).	<i>Neohelix</i> ( <i>albolabris</i> ).
<i>Appalachina</i> ( <i>sayanus</i> ).	<i>Allogona</i> ( <i>profunda</i> ).
<i>Patera</i> ( <i>apressus</i> ).	<i>Xolotrema</i> ( <i>notata</i> ).
<i>Inflectarius</i> ( <i>inflectus</i> ).	<i>Triodopsis</i> s. str. ( <i>tridentata</i> ).

Only in the case of *Mesodon* and *Neohelix* is the resemblance so close that they could not be separated were it not for the anatomic differences; but *Appalachina* (*sayanus*) has always been placed next to *Allogona* (*profunda*), and there is no very tangible conchological diversity which would be thought superspecific. The others are less closely convergent.

#### Subgenera of *Mesodon*

Capacious or depressed shells with the aperture toothless or with a parietal tooth only, the umbilicus narrow or covered. Embryonic whorls smooth to radially striate.

*Mesodon* s. str.

Strongly depressed and openly umbilicate, small parietal and baso-columellar teeth either present or absent . . . . . *Appalachina*

Strongly depressed, imperforate shells, with a lamellar or blade-like, distally truncate rim within the basal lip, and a well-developed parietal tooth. Embryonic whorls radially striate, striae interrupted in some species . . . . . *Patera*

Compact, imperforate or partly covered umbilicate, with the aperture strongly three-toothed, or the lip teeth almost obsolete. Embryonic whorls radially striate, the striae interrupted; later whorls scarcely striate, with a somewhat scaly periostracum.

*Inflectarius*

#### Subgenus MESODON s. str.

This includes rather capacious shells with the aperture toothless or having a parietal tooth, the embryonic whorl smooth or with a band of short radial striae below the suture, or long striae extending nearly across

the whorl; the later whorls striate and usually engraved with spiral lines. In some species the shells are separable from *Triodopses* of the *Neohelix* group only by specific characters.

*Key to Species of Mesodon and Neohelix*

- A. Surface with striae and fine spiral lines.
- B. Shell moderately or strongly elevated, the height usually 60 percent or more of the diameter.
- C. Umbilicus partly covered but not closed by the reflected lip.  
*M. thyroidus, clausus, sanus* and *downieanus*
- CC. Umbilicus wholly closed.
- D. A parietal tooth present.
- E. Basal lip widened by a lamina along the inner edge, which is truncate at junction of outer lip.
- F. Diameter 20 to 27 mm. .... *M. elevatus*
- FF. Diameter 13 to 18 mm. .... *M. clarki*
- EE. Basal lip plain or with a blunt tooth next the columella.
- F. With numerous reddish lines ..... *Triodopsis multilineata*
- FF. Plain colored.  
*M. thyroidus, andrewsae, zaletus; Triodopsis albolabris*
- DD. No parietal tooth present.
- E. Capacious shells, diameter 20 mm. or more
- F. With reddish spiral lines ..... *Triodopsis multilineata*
- FF. Plain colored, or with a single darker band.  
*M. andrewsae, thyroidus, zaletus; Triodopsis albolabris*
- EE. Smaller shells, diameter less than 20 mm.
- F. Baso-columellar margin straightened, with a weak prominence.  
*M. pennsylvanicus*
- FF. Baso-columellar margin concave.
- G. Diameter 15-17 mm. .... *M. mitchellianus*
- GG. Diameter 10-15 mm. .... *M. downieanus*
- BB. Shell depressed, the height usually less than 60 percent of the diameter.
- C. Lip wide and flat; a parietal tooth present.
- D. Glossy, light colored, striation weak; Great Smoky Mt. region.  
*M. ferrissi*
- DD. Rather dull, with very distinct striation; Quebec to South Carolina.  
*Triodopsis dentifera*
- CC. Lip rather narrow; no parietal tooth (except in *M. roemeri*); west of the Mississippi.
- D. Lip reflected to its upper insertion.
- E. Glossy, with fine striae and distinct spiral lines.  
*M. binneyanus, M. indianorum*
- EE. With regular strong striae, the spiral lines subobsolete.  
*Triodopsis divesta*

- DD. Upper part of lip not expanded or reflected.  
 E. Umbilicate; Arkansas, Oklahoma.  
 F. Diameter 19-22 mm. .... *M. clenchi*  
 FF. Diameter 14-16 mm. .... *M. kiowaensis*  
 EE. Umbilicus from half covered to closed; Texas ..... *M. roemeri*
- AA. Surface without spiral lines.  
 B. Surface striate.  
 C. Diameter 8.5 to 10 mm.; parietal tooth large ..... *M. christyn*  
 CC. Diameter 13 to 23 mm.; parietal tooth small ..... *M. wheateleyi*
- BB. Surface silky, minutely papillose; diameter 23 mm. .... *M. ferrissi sericeus*

## MESODON THYROIDUS GROUP

**Mesodon thyroidus** (Say)

Fig. 432 a-e.

- Helix thyroidus* Say, 1816, Nicholson's Encyclopedia, II, art. "Conchology," under *Helix albolabris*; Journ. Acad. Nat. Sci. Phila., 1: 123.—Férussac, 1821, Tabl. Syst. Fam. Limaçons, p. 33, with *Mesodon leucodon* Rafinesque in synonymy.—Say, 1831, Amer. Conch., no. 2, pl. 13.—Binney, 1851, Terr. Moll., 2: 129, pl. 11.—Leidy, 1851, *ibid.*, 1: 257, pl. 11, figs. 7-9 (anatomy).—Pilsbry, 1892, Nautilus, 5: 141 (New Jersey).
- Helix thyroides* Say, Pfeiffer, Monogr. Hel. Viv., 1: 345.—Singley, 1893, Geol. Surv. Texas, 4th. Ann. Rep., p. 304.
- Mesodon leucodon* Rafinesque (in MS. "Conchologia Ohioensis"), Binney & Bland, 1870, Ann. Lyc. Nat. Hist. N. Y., 9: 294, fig. 12.
- Mesodon thyroides* Say, Tryon, 1867, Amer. Journ. Conch., 3: 41.—W. G. Binney, 1878, Terr. Moll., 5: 330, pl. 11, pl. viii, fig. 8 (teeth).—Wetherby, 1895, Nautilus, 9: 94 (reversed).—Sampson, 1894, Ann. Rep. Geol. Surv. Ark. for 1891, 2: 191 (distribution in Arkansas).—Call, 1886, Bull. Washburn Coll. Lab. Nat. Hist., 1: 206.
- Polygyra thyroidus* Say, Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 122, 452; *ibid.*, 1903, p. 201; 1906, *ibid.*, p. 556 (variation west of Mississippi).—Johnson, 1915, Occ. Pap. Boston Soc. Nat. Hist., 7: 197.—R. E. C. Stearns, N. A. Fauna, 7: 278 (Natividad R., Texas).—T. D. Foster, 1936, Amer. Midland Nat., 17: 978 (size of shell).—Van Cleave & Foster, 1937, Nautilus, 51: 50 (life history).—F. T. & F. A. Wolf, 1939, Bull. Torrey Bot. Club, 66: 1, fig. 1 (food).
- Helix thyroides* var. *pulchella* Cockerell, 1892, Journ. Conch., 7: 39 (Toronto, Ont.).
- Polygyra thyroides* Say, Chadwick, 1905, Nautilus, 19: 58 (Milwaukee, Wis.).—Walker, 1906, Ill. Cat. Moll. Mich., 1: 468, fig. 19; 1928, Terr. Moll. Alabama, p. 41, fig. 46 ("over the entire state").—Sampson, 1913, Trans. Acad. Sci. St. Louis, 22: 95 (distribution in Mo.).

The shell is half-covered umbilicate, depressed-globose, rather thin, ivory yellow, with the back of the lip cream buff; the surface somewhat glossy, with fine oblique striae and microscopic spiral lines (sometimes very weak); embryonic  $1\frac{1}{2}$  whorls smooth, or with short striae radiating below the suture. The spire is low conoid, the last whorl descending very little in front. The rotund-lunate aperture is somewhat dished. Peristome rather widely

Fig. 431. A, *Mesodon thyroidus*, Samburg, Tenn., at a', b', sections of penis; B, Philadelphia, Pa. C, *Mesodon clausus*, Wetumpka, Ala. D, *Mesodon zaletus*. E, *Mesodon elevatus*. F, *Mesodon clarki*, Thunderhead Mt. G, *Mesodon pennsylvanicus*; at a', section near apex of penis, p. r., penial retractor; p. c., upper end of penial cavity; v. d', cavity into which the vas deferens (v. d.) enters; b', section of penis below a'; c', section at lower third of penis; t, talon.

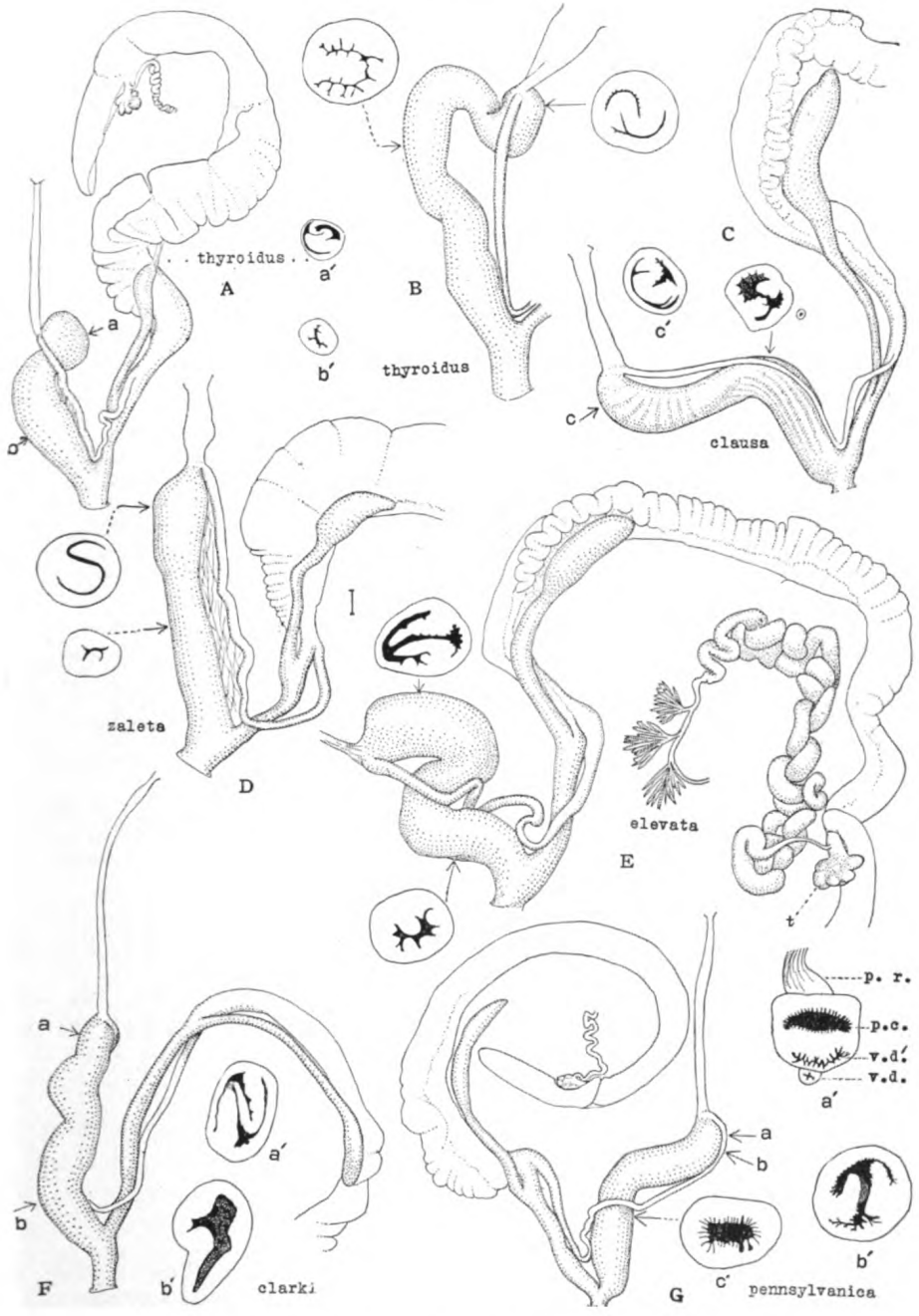


Fig. 431. See bottom of p. 706 for legend.

reflected in its outer and basal margins, dilated about half over the narrow umbilicus. Parietal wall bearing a short, obliquely placed tooth (but this is frequently wanting).

Height 14.7 mm., diameter 20.7 mm.;  $5\frac{1}{2}$  whorls. Neotype.

Height 13.2 mm., diameter 20.7 mm. Topotype.

Height 11.1 mm., diameter 17.0 mm. Topotype.

Height 18.3 mm., diameter 28.3 mm.;  $5\frac{1}{3}$  whorls. Philadelphia.

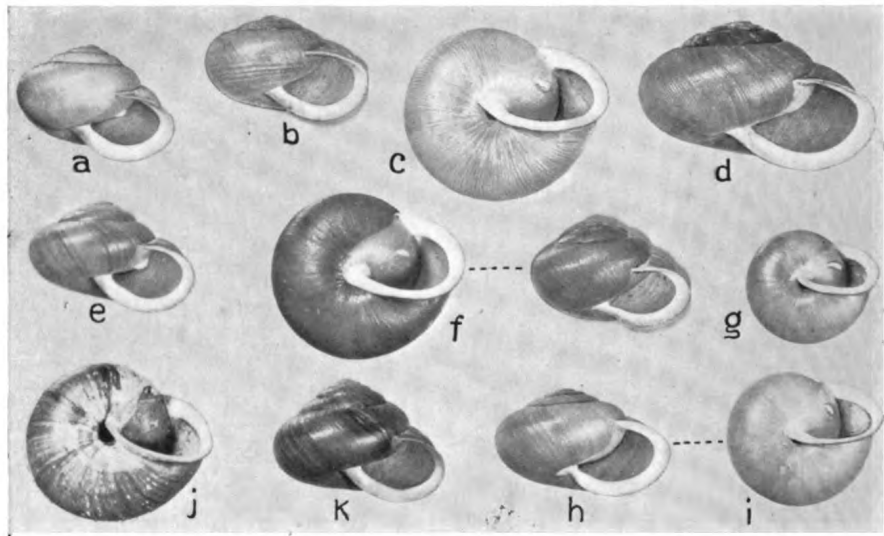


Fig. 432. *Mesodon thyroidus*: a, b, c, Philadelphia, Pa.; d, Lorraine Co., Ohio; e, Smith's I., Cape Fear. f, *Mesodon thyroidus bucculentus*, Wilmington, N.C.; g, specimen from Gould; h, i, Houston, Texas. j, k, *Mesodon thyroidus sanctisimonis*.

*Distribution.*—Massachusetts and Ontario west to Minnesota, eastern Nebraska, Kansas and Oklahoma; south to the Gulf of Mexico and eastern Texas. Some localities in limital states follow:

ONTARIO: Casselman, Russell Co. (Latchford). Near Pottageville, York Co. East of Goderich, Huron Co. (Oughton). Chippewa, Welland Co. (Letson). Paris, Brant Co.; St. Williams, Norfolk Co.; Copenhagen, Elgin Co. (Oughton). Middle Sister I., Lake Erie (Clapp, Goodrich).

MASSACHUSETTS: Cohasset, New Bedford, Westport, Dartmouth, Swansea, Williamstown, Blue Hill, Naushon I., Clarendon Hill (Johnson).

RHODE ISLAND: Tiverton, Cumberland (Johnson).

CONNECTICUT: Greenwich (Johnson).

KANSAS: Neosho Co.; Oswego; Wyandotte (Call).

OKLAHOMA: Wyandotte, Ottawa Co.; Vinita, Craig Co.; Wister, LeFlore Co. (Pilsbry). Antlers, Pushmataha Co. (Ferriss). Fort Gibson, Muskogee Co. (A. D. Brown).

TEXAS: Anderson, Bastrop, Bowie, Brazos, Caldwell, Collin, Dallas, Fort Bend, Gladwell, Gonzales, Grayson, Harrison, Hays, Jefferson, Lee, Nueces, Robertson, San Jacinto, Travis, Victoria, Waller, Washington, Webb and Wharton counties.

Say gave no locality for *Helix thyroïdus*, but it was apparently described from the small form of the gneiss in and around Philadelphia. I have selected one from near mouth of Wissahickon Creek as neotype, (Fig. 432 a). On the river plains adjacent it often grows much larger, as the measurements above show, and the color may be chamois, or even with a pale cinnamon buff tint on the upper surface, all from Fairmount Park specimens. These ecologic forms are continuously connected in this area, and very similar shells occur throughout the vast range of the species. In the trans-Alleghanian states it is often larger: 21.2 x 30 mm. Hamilton County, Tennessee; 19.2 x 31 mm., Lorrain County, Ohio; but these are exceptional. Freshly collected shells often show a pinkish flush, which soon fades in the collection.

The var. *pulchella* Cockerell appears to be the small typical *thyroïdus*. It was thus described: "Max. diameter 20.5 mm.; thin( translucent, rather shiny, transverse grooves regular and distinct, lip well formed but delicate, parietal tooth subobsolete; color pale horn, tinged with vinous, especially near the aperture." Very common at Toronto, Canada.

Much work remains to be done on the details of distribution of this wide-spread species. I have never found it high in the Adirondacks or Catskills, or in the Appalachians, but do not possess material enough to map the areas where it is absent. Its northern limit in Ontario seems to be about the latitude of Ottawa. In Michigan, Walker cites it north to Chippewa County. The northwestern range is undetermined. It was reported by Binney from near Sedan, Chautauqua County, Kansas. The Oklahoma and most Texas localities are within the humid division of the Lower Austral Zone, the Hays, Bastrop, Caldwell and Gonzales County lots probably were taken along rivers or creeks and thus practically in digitations of the humid area. The Webb County record, and those from around Nueces County, are also probably from humid places in a dry country. It occurs in western Florida, but is not known from the peninsula.

From a study of 2003 specimens from White Heath, Illinois, Mr. T. D. Foster concluded that large and small individuals exist in the same locality irrespective of the nature of the habitat; that environmental factors influence the size of *P. thyroïdus* in Illinois, and if depauperization takes place it is individual, not racial. Shell size conforms to a normal distribution curve within which adult shells range from 18.5 to 24.5 mm. in diameter. Variation in size is the same in the dentate as in the non-dentate form. These were found to be practically equal in numbers; in a lot of 845 from White Heath, 429 were non-dentate and 418 dentate.

They were found mating in September and November, and in the field the first eggs were found on May 1st., laying continuing to August 15th. They are usually deposited in shallow holes excavated by the snail in the soil, the clutches of 20 to 70 eggs each. The food of these snails he found to be chiefly woods nettles (*Laportea canadensis*).

“Practically all of the snails that pass one winter as immature young attain full growth, form a reflexed lip on the shell and are recognizable as mature adults by the following fall. Typically, the first breeding season is in the third year. . . . Maturity requires more than one full year. The individuals which attain a lip in the fall of their second growing season produce eggs the following spring

when they have just completed their second year or are entering on their third year. Three or possibly four years seems to be the usual length of life for individuals of this species.”

F. T. and F. A. Wolf (1939) found leaves of lilac (*Syringa vulgaris*) in Durham, North Carolina, infected by the powdery mildew *Microsphaera alni*, and noting peculiar markings on some of them, examined at night, found them to be feeding tracks of *M. thyroidus*. Snails placed in jars were found to consume numerous larger fungi, as well as slime molds and a lichen. All of the species of fungi offered were eaten, in preference to lettuce or other



Fig. 433. Leaf of lilac, with feeding tracks of *Mesodon thyroidus* (after F. T. and F. A. Wolf).

chlorophyll-containing food. *M. thyroidus* thus appears to be decidedly mycophagous in its food preferences (Fig. 433).

*Genitalia*: (Fig. 431 a', Samburg, Tenn., and Fig. 431 B, Philadelphia, Pa.). The penis, in Philadelphia specimens, is in length about equal to the shell's diameter. In the more contracted Tennessee specimen figured it is much shorter. The terminal 1.5 mm. has a partition dividing the blind end of the penial cavity from that into which the vas deferens opens (Figs. 431). Further down there is a very large pilaster and numerous longitudinal ribs (Fig. 431 B). As usual the cavity becomes simpler downward (Fig. 431 b'). The vas deferens is bound to the penis as in Fig. 431 A (binding fibres omitted in Fig. 431 B).

	Philadelphia, Pa.	Samburg, Tenn.
Length of penis .....	20	10
Length of penial retractor .....	4	10
Length of vagina .....	..	4
Length of spermatheca .....	..	7
Diameter of shell .....	19	22.7

*Helix bucculenta* Gould (Fig. 432 f, g, h, i) is typically well enough characterized to be considered a subspecies of *thyroidus*, but there are many lots which may be referred to one of these races about as well as the other. This mainly coastal plain race does not seem to be sharply defined either morphologically or geographically; it is an incipient subspecies. The supposed *bucculenta* of Pennsylvania and other northern states seems to be referable to typical *thyroidus*, so far as seen. As it has often been recognized as a separate subspecies, the references and description are here given separately.

*Helix bucculenta* Gould, 1848, Proc. Boston Soc. Nat. Hist., 3: 40 (Georgia to Texas); 1851, Terr. Moll. 3: 9, pl. 11 A. Cf. W. G. Binney, Terr. Moll. 5: 332, figs. 214, 215, as form of *Mesodon thyroides*, and Tryon, Amer. Journ. Conch., 3: 41.—Singley, 1893, 4th Ann. Rep. Geol. Surv. Texas, p. 304, as var. of *thyroides*.—Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 452.—Frierson, Nautilus, 14: 68.—Price, Nautilus, 14: 75.

"Shell globose-conic, more or less elevated, rather thin, shining, pale yellowish green, surface regularly and delicately furrowed by the striae of growth. Whorls five or a little more, rounded, and separated by a well-impressed suture; base convex; aperture rounded; peritreme forming nearly two-thirds of a circle, rather broadly reflected, white, somewhat flesh colored behind, not completely covering a small umbilical perforation. The palate [parietal wall] sometimes bears a small white tooth at the middle, but oftener not. Diameter three-fifths of an inch; axis from three to five-tenths of an inch." (Gould.)

Wilmington, North Carolina, to Georgia, west to Texas; Arkansas, Oklahoma.

Typical *bucculenta* is small, thin, with the umbilicus narrower than in *thyroidus* or completely closed. In the same colonies the color varies from marguerite yellow to sayal brown. It is found throughout the Austroriparian region, but does not exclusively replace *thyroidus* there. Thus, at Smith's Island, Cape Fear, North Carolina, fine *thyroidus* occurs, varying from typical shape nearly to the form of *M. t. sanctisimonis*, but always toothed; around Wilmington, a few miles inland, only *bucculenta* was found.

The diameter of 15 mm., given by Gould, is surely minimum size. Specimens received from Gould are 16 to 17.5 mm. On the Bayou Bartholomew, Morehead Parish, Louisiana, the size runs from 13 x 18.5 to 15 x 21 mm. At Houston, Texas, from 12 x 18.5 to 13.8 x 21.8 mm. Near Laredo, Texas, 19 to 21.2 mm. diameter. All of these are imperforate, part in each lot



being dentate. Lots from Caldwell County and Corpus Christi, Texas, are apparently *thyroidus*.

**Mesodon thyroidus sanctisimonis** (Pilsbry)

Fig. 432 j, k.

*Polygyra thyroides sanctisimonis* Pilsbry, 1901, *Nautilus*, 15: 8.

The shell is rather solid, naples yellow. The spire is more highly conic than in *thyroidus*, the last whorl more depressed; umbilicus wider (almost 2 mm.). Whorls are more closely coiled, the last narrower, in dorsal view. The aperture is smaller than in *thyroidus*, transversely elliptical-lunate; parietal tooth either present or wanting.

Height 16 mm., diameter 23.5 mm.; 5½ whorls. Type.

Height 15.8 mm., diameter 21.7 mm.

GEORGIA: Saint Simon's Island (T. Bland), Type 11346 A.N.S.P.

While some *thyroidus* have the same h/d index, the proportions of spire and last whorl are quite different. The several lots seen, all traceable to Bland, were collected about 70 years ago, probably by J. Postell.

**Mesodon clausus** (Say)

Fig. 434 a, b.

*Helix clausa* Say, 1821, *Journ. Acad. Nat. Sci. Phila.*, 2: 154; 1832, *Amer. Conch.*, pl. 37, fig. 1.—Binney, 1851, *Terr. Moll.*, 2: 107.—Bland, 1858, *Ann. Lyc. Nat. Hist. N. Y.*, 6: 336.—Shuttleworth (text by Fischer),<sup>1</sup> 1877, *Notitiae Malac.*, 2: 10, pl. 3, fig. 1; with var. *subalbolabris*, pl. 3, fig. 2.

*Mesodon clausa* Say, W. G. Binney, 1878, *Terr. Moll.*, 5: 332.—Sampson, 1894, *Ann. Rep. State Geol. Ark. for 1891*, 2: 192.—Call, 1900, *Indiana Dept. Geol. & Nat. Res.*, 24th Ann. Rep., p. 392.

*Polygyra clausa* Say, Sargent, *Nautilus*, 9: 89.—Pilsbry, 1898, *Nautilus*, 11: 95.—Ferriss, *Nautilus*, 14: 31, 55.—Greger, *Nautilus*, 30: 64.—Sampson, 1913, *Trans. Acad. Sci. St. Louis*, 22: 96; *Nautilus*, 26: 91, 93; 28: 16.—Hanna, *Nautilus*, 23: 82.—Price, *Nautilus*, 14: 75.—Walker, 1906, *Ill. Cat. Moll. Mich.*, p. 469; 1928, *Terr. Moll. Alabama*, p. 42; 1902, *Proc. Acad. Nat. Sci. Phila.*, 427 (Paint Rock, N. C.).—Wheeler, *Nautilus*, 31: 116.

*Helix ingallsiana* Shuttleworth, 1877, *Notitiae Malac.*, 2: 10, pl. 3, fig. 5.

*Helix jugallsiana* Shuttl. Von Martens, 1860, in Albers, *Die Heliceen*, p. 99, nude name.

*Tridopsis thyroidus*, b, *edentula* Beck, 1837, *Index Moll.*, p. 23.

The shell is narrowly umbilicate, the umbilicus half or almost entirely covered; depressed-globose with conoidal spire; marguerite yellow to chamois colored, glossy, finely, closely striate, with microscopic spiral lines. The last whorl descends very little in front, and has a furrow behind the lip. The peristome is typically rather narrow, white, reflected and thickened within. Parietal callus very thin and transparent.

Height 13 mm., diameter 18 mm.; 5½ whorls. Indianapolis.

Height 10 mm., diameter 13.6 mm. Lockland, Ohio.

Height 11.8 mm., diameter 16 mm. St. Louis Co., Mo.

8.6 x 12.5 mm. to 10.6 x 16.2 mm. Gallion, Ala.

<sup>1</sup> Heft II of Shuttleworth's *Notitiae* was a posthumous issue of lithographic plates with names of the species lettered at the foot, which Shuttleworth had prepared, but without text. Dr. Paul Fischer supplied the text, merely the synonymy of species figured, with the general range of each, compiled from the literature. He did not study Shuttleworth's material.

OHIO: Columbus, Franklin Co. Cincinnati and Lockland, Hamilton Co. Lorain Co.

MICHIGAN: Monroe, Monroe Co. Grand Rapids, Kent Co.

INDIANA: Indianapolis. Brookville, Franklin Co. Connersville, Fayette Co. Lawrenceburg, Dearborn Co. "Wabash valley north to Covington" (Call).

ILLINOIS: Utica, LaSalle Co. Joliet, Will Co. Alton, Madison Co. Henry Co. Dubois, Washington Co.

MINNESOTA: Clearwater, Wright Co. (Sargent).

IOWA: Davenport. Iowa City, Johnson Co. Des Moines. Bellevue, Jackson Co.

KANSAS: Douglas Co. (Hanna).

MISSOURI: Affton, St. Louis Co. Chadwick, Christian Co. Dent Co. Springfield, Greene Co. Arcadia, Iron Co. Also the following additional counties reported by Sampson: Barry, Boone, Callaway, Cape Girardeau, Clay, Cooper, Dade, Douglas, Jackson, Jasper, Lawrence, Moniteau, Pettis, Sabine, St. Charles, Stone and Webster.

ARKANSAS: Hardy, Sharp Co. Mammoth Spring, Fulton Co. Recorded by Sampson from Arkadelphia, Clark Co. Carroll, Clark, St. Francis, Washington and Yell counties.

OKLAHOMA: Vinita, Craig Co. Fort Gibson, Muskogee Co.

KENTUCKY: Opposite Indiana (Call). Warren Co. (Sadie F. Price).

TENNESSEE: Valley Forge, Carter Co. Chattanooga. Knoxville. Dove, Marion Co. Marbleton and Limestone Cove, Unicoi Co. Johnson Co. Washington Co. Anderson, Franklin Co. (Clench). Talassee Ford, Monroe Co.

ALABAMA: Clarke Co. Wetumpka, Elmore Co. Boligee, Greene Co. Gallion, Hale Co. Woodville, Jackson Co. Gurley, Madison Co. Uniontown, Perry Co. Prairie, Wilcox Co. Also the following counties reported by Walker: Choctaw, Dallas, Greene, Jefferson, Lauderdale, Macon, Montgomery, Perry and Sumter.

GEORGIA: Starke Clay Landing, Clay Co. (C. B. Moore).

Early authors confused *M. mitchellianus* and *M. pennsylvanicus* with *M. clausus*, but Bland pointed out the distinctions. Though in some allied forms, such as *M. thyroideus bucculentus*, the umbilicus may be either closed or partly open, in *M. clausus* a crevice always remains open.

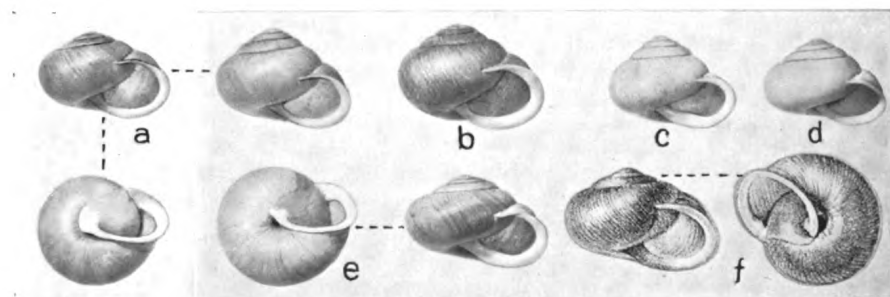


FIG. 434. *Mesodon clausus*: a, Utica, Ill.; b, Lookout Mt., Tenn. c, *Mesodon clausus* form *ingallsianus*, Natchez, Miss.; d, Claiborne, Ala. e, *Mesodon sanus*, paratype. f, *Mesodon clausus subalbolabris*, (after Shuttleworth).

*Helix clausa* var. *subalbolabris* Shuttleworth, figured without description or locality, is rather large, diameter 19.5 mm., with the umbilicus more widely open than usual in *clausus*, and the lip is broader. Shuttleworth's figures are copied, Fig. 434 f. The figures look like *M. sanus*, but without more definite information its identity with that is doubtful.

In some Tennessee localities such as Lookout Mountain (Fig. 434 b) and Chattanooga, the lip is broader than in typical *clausus*, and the umbilicus is usually almost closed, only a narrow, oblique crevice remaining. The color is sometimes darker, dilute tawny olive. The shell figured measures 14.2 x 19 mm.; others from Chattanooga 13.5 x 18 mm. and 11 x 16.4 mm. In the lots seen, the character of the lip varies, as well as the size.

The genitalia (Fig. 431 c, Wetumpka, Ala.) show relationship with *M. thyroïdus*. The upper end of the penis has a short longitudinal partition (Fig. 431 c'), which soon becomes free from one side, voluminous and much folded. It continues forward as a pilaster, seen on the left side in the section. The other pilaster shown in the same section arises at about the upper fourth of the whole length. Besides these ridges the walls of the cavity are strongly ribbed lengthwise, with some weaker transverse ribbing also, in the upper fourth. It is an elaborate and beautiful design. The slender spermathecal duct is unusually long. Hermaphrodite duct large and much knotted. Length of penis 15 mm.; retractor 7.5 mm.; spermatheca 17 mm.; vagina 4 mm.; diameter of shell 18 mm. The animal is light colored, lung plain.

In southern Alabama (Claiborne, Fig. 434 d, 11.2 x 15.8 mm., 5½ whorls) and Mississippi (Natchez, Fig. 434 c, 12.5 x 16.3 mm., 5½ whorls) there is a form with more elevated conoid spire and more depressed last whorl, which Shuttleworth figured as *Helix ingallsiana*. It appears to lie at the southern border of *clausus* territory, and further work on it in Alabama and Mississippi is needed. While the more extreme examples are rather distinct, others in the same museum lots merge into the usual form of *clausus*. No locality or description were given by Shuttleworth, and the shell could not be found in his collection. The example figured from Claiborne, 113522 A.N.S.P., may be considered a neotype of *ingallsiana*.

(*Clausus*, closed.)

**Mesodon sanus** (Clench & Archer)

Fig. 434 e.

*Polygyra (Triodopsis) sana* Clench & Archer, 1933, Nautilus, 46: 88, pl. 7, figs. 4-6.

"Shell umbilicated, depressed globose, thin. Color of yellowish horn with a slightly reddish tone on the body whorl of some specimens. Peristome nearly white. Whorls 5-5¼, quite convex, especially the body whorl. Spire somewhat elevated. Aperture lunate. Peristome expanded, smooth and merging into a short broad columella, widening where it joins the parietal wall. Parietal wall smooth with a very thin callus. Suture impressed. Nuclear whorl smooth, succeeding whorls covered with axial riblets, the later whorls, especially the body whorl, are crossed by fine incised lines. The whole shell possessing a shining appearance. Height 11.9 mm., maj. diameter

19.4 mm., lesser diameter 16.8 mm.; aperture 6 x 8 mm." (Clench & Archer.)

Paratypes measure: 12.9 x 20.6 mm., 12.9 x 19.5 mm., 12.4 x 18.5 mm., 11.3 x 17.5 mm.; h/d index 63. (Clench & Archer.)

ALABAMA: Slopes of Big Cove, Monte Sano, Huntsville, Madison County under leaves at the bases of limestone ledges (Clench & Archer), Type 95089 M. C. Z.; paratypes in M. C. Z., 159817 A. N. S. P. and Archer Collection.

"This species is most nearly allied to *P. clausa* (Say). It is more depressed than *clausa* and the whorls are less rounded. The umbilicus is wider so that some of the upper whorls are visible. The peristome is wider, flatter and more expanded. In sculpture our species differs in having more strongly incised spiral lines and a shinier surface. This species can be compared with *P. thyroidus* (Say) in the following respects: The shell is more depressed; the peristome is narrower, thicker and less sharply edged; the umbilicus is more open; no parietal tooth is present; the axial riblets are more strongly raised, while the spiral lines are less deeply incised." (Clench & Archer.)

It is very similar to wide-lipped forms of *M. clausus*, but more depressed, the striae are perceptibly more widely spaced and the umbilicus wider. *M. clausus* often has entirely similar minute sculpture and gloss. Some Alabama records for *M. clausus* may have been based upon *M. sanus*. See also the dubious *M. clausus subalbolabris* Shuttleworth.

**Mesodon mitchellianus** (Lea)

Fig. 435.

*Helix mitchelliana* Lea, 1839, Trans. Amer. Phil. Soc., 6: 87, p. 23, fig. 71 (Ohio). Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 6: 339.

*Mesodon mitchelliana* Lea, W. G. Binney, 1878, Terr. Moll., 5: 323, pl. viii, fig. H, pl. xi, fig. H (anatomy).—Marshall, 1893, Nautilus, 6: 126.—Call, 1900, Indiana Dept. Geol. etc., 24th Ann. Rep., p. 391.—Letson, 1909, Bull. Buffalo Soc. Nat. Sci., 9: 241.

*Polygyra mitchelliana* Lea, Baker, 1906, Bull. Ill. Lab. Nat. Hist., 7: 117.—Walker, 1906, Ill. Cat. Moll. Mich., p. 460.—Sterki, 1907, Proc. Ohio State Acad. Sci., 4: 376; Nautilus, 22: 52; 24: 92.—Clapp, 1895, Nautilus, 8: 116.—Billups, Nautilus, 16: 51.

The shell is imperforate, depressed-globose, rather thin, translucent colonial buff. Surface glossy, regularly thread striate, with microscopic spiral lines, the apical whorl smooth. Last whorl descending in front,



Fig. 435. *Mesodon mitchellianus*, Columbus, Ohio.

guttered behind the lip. Peristome white, reflected, thickened within, dilated and appressed over the umbilical region; columellar margin concave. Parietal callus thin and transparent.

Height 13 mm., diameter 17.2 mm.; 5 whorls. Columbus, O.

Height 11.7 mm., diameter 15.3 mm. Lawrenceburg, Ind.

ONTARIO: Ft. Erie (Letson).

NEW YORK: Goat Island (Letson). Herkimer Co. at Litchfield (A. Bailey), and colonized by Dr. Lewis about 1873 in a branch of a ravine leading from Ilion to Cedarville (Marshall).

PENNSYLVANIA: Allegheny Co. (Clapp).

OHIO: Cincinnati (J. K. Mitchell, M.D.), Type 106754 U.S.N.M.; Columbus; Harrison and Tuscarawas counties, and Defiance, Defiance Co. (Sterki). Portage Co. (Dean).

MICHIGAN: Armada, Macomb Co. (Walker).

KENTUCKY: Pleasant Valley, Nicholas Co. (Sterki).

INDIANA: Brookville (Call); Lawrenceburg (Billups).

ILLINOIS: Starved Rock, La Salle Co. (F. C. Baker). Mercer Co. (Marsh). Spoon River, Fulton Co. (Strode).

This species resembles *M. clausus* (Say) closely in size, texture and color, but may be known by the somewhat different shape and the closed umbilicus, the columellar termination of the lip being appressed over it, while in *M. clausus* a cleft always remains open. While the difference is not great, it has proved constant in large numbers of the shells examined. Binney found an outer cusp or ectocone on the marginal teeth of *M. mitchellianus*, but in *M. clausus* these teeth have but one cusp, as in *M. thyroidus*. *M. pennsylvanicus* (Green) differs by its straightened baso-columellar lip. Wetherby reported a sinistral specimen (Nautilus 9: 94).

I have not seen the Fort Erie and Goat Island specimens reported by Miss Letson, and do not know whether they are native or imported there. Dr. James Lewis planted it in Herkimer County, where it became abundant. (*Mitchellianus*, of J. K. Mitchell, M.D., who sent it to Dr. Lea).

**Mesodon downieanus** (Bland)

Fig. 436.

*Helix downieana* Bland, 1861, Ann. Lyc. Nat. Hist. N. Y., 7: 420, pl. 4, figs. 23, 24.

*Mesodon downieana* Bld., W. G. Binney, 1878, Terr. Moll., 5: 335, fig. 217, pl. viii, fig. F (teeth).

*Polygyra downieana* (Bld.), Walker, 1928, Terr. Moll. Alabama, p. 44, fig. 52.

"Shell umbilicate, umbilicus nearly covered, subglobose, thin, subpellucid, with obsolete rib-like striae, decussated with crowded microscopic spiral lines, greenish horn-colored; spire short, obtuse; whorls five, convex, the last tumid, anteriorly somewhat gibbous, scarcely descending, constricted; aperture oblique, lunate-oval; peristome white, labiate, reflected, right margin expanded, columellar margin angularly dilated, nearly covering the umbilicus. Diameter maj.  $10\frac{1}{2}$ , min.  $9\frac{1}{2}$ , Alt. 6 mill." (Bland.)

Height 9 mm., diameter 12.2 mm.;  $5\frac{1}{2}$  whorls. Topotype.

Height 10.2 mm., diameter 14.7 mm. Sawyer Spring.

KENTUCKY: Warren Co.

TENNESSEE: Richland Creek, Davison Co. Allardt, Fentress Co. Philadelphia, Loudon Co. University Place, Franklin Co. (Maj. Downie) type locality. Sawyer Spring, Walden Ridge, Hamilton Co. Grassy Cove, Cumberland Co.

ALABAMA: Blount Springs, Blount Co. Cullman, Cullman Co. Top of Sand Mt., 2300 ft., Valley Head and ridges west of Venaga, DeKalb Co. Sand Mt. and Pisgah, Jackson Co. Gallant, St. Clair Co.



Fig. 436. *Mesodon downieanus*: a, Sawyer Spring, Walden's Ridge; b, topotype, University Place; c, Blount Springs; d, Philadelphia; all in Tennessee.

By its color, the spiral lines and the nearly closed umbilicus, this species resembles *M. clausus* in miniature. The marginal teeth differ from those of *M. clausus* by the development of ectocones and bifid mesocones, according to Binney. It ranges from southern middle Kentucky to northeastern Alabama.

The color varies from cinnamon-buff to a darker tint, dilute isabella color. The umbilicus may be half covered by the dilated columellar lip, but usually is wholly covered though not closed, as a minute crevice remains behind the reflected lip. In some shells of a lot collected by Miss Annie E. Law at Philadelphia, Tennessee, the umbilicus is completely closed. This lot shows extremes of shape, two measuring: height 6.6, diameter 10.7 mm. and 7.7, 10.8 mm.; the h/d ratios about 61.68 and 71.39.

**Mesodon andrewsae** W. G. Binney

Fig. 437 g, h.

*Mesodon andrewsi* W. G. Binney, 1879, Ann. N. Y. Acad. Sci., 1: 360, pl. 14, fig. e, f, pl. 15, fig. 1; 1883, Bull. Mus. Comp. Zoöl., 11: 154, pl. 2, fig. 1, pl. 3, fig. e, f, pl. 4, fig. a; 1885, Man. Amer. L. Sh., p. 301, figs. 321, 322.—Wetherby, 1893, Journ. Cincinnati Soc. Nat. Hist., 16: 92.

*Polygyra andrewsae* (W. G. B.), Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., pp. 115, 123.—Walker, 1902, *ibid.*, p. 425.

“Shell imperforate, globose, very thin, with delicate wrinkles of growth and microscopic revolving striae; horn-colored; spire elevated, conic, apex obtuse; whorls six, convex, the last greatly swollen; peristome white, thickened, slightly reflected, ends separated, the columellar one expanded. Greater diameter 25 mm.; lesser 20 mm.; height 14 mm.” (W. G. Binney.)

Height 18.2 mm., diameter 27.3 mm. Roan Mt.

Height 15 mm., diameter 21.2 mm. Roan Mt.

Height 15 mm., diameter 21.2 mm. Roan Mt.

NORTH CAROLINA: Roan Mountain, Mitchell County, from about 3500 to 5000 feet (Mrs. Geo. Andrews, A. G. Wetherby, S. N. Rhoads, H. B.

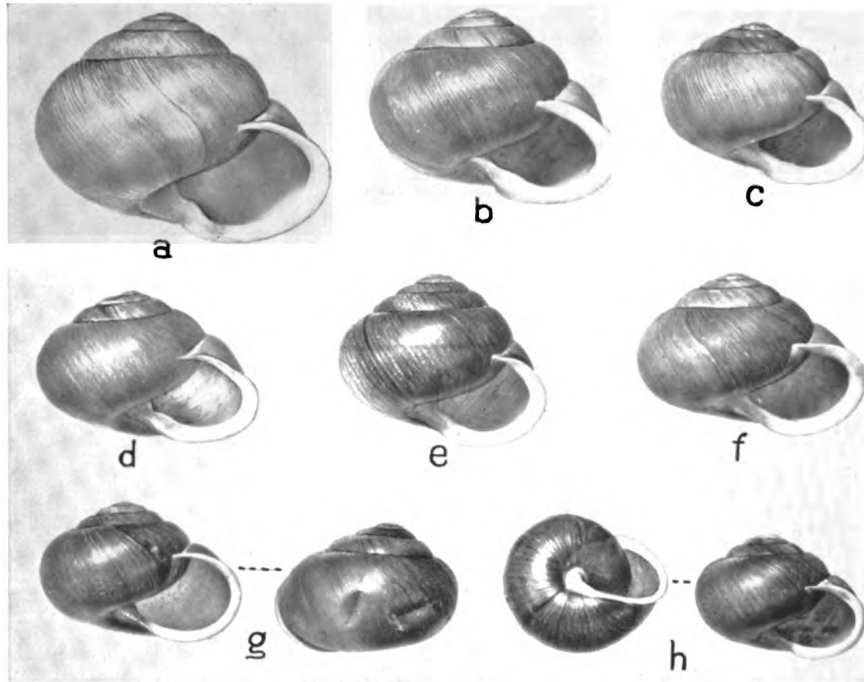


Fig. 437. a, *Mesodon andrewsae normalis*, Lookout Mt., Ala.; b, type, Cade's Cove, Tenn.; c, Mirey Ridge, Great Smoky Mountains. d, *Mesodon andrewsae altivaga*, Bittinger, Md.; e, type, Clingman Dome. f, *Mesodon andrewsae intermedius*, Potato Top, Black Mts., N. C. g, *Mesodon andrewsae*, Mt. Mitchell, N. C.; h, Roan Mt., N. C.

Baker and others). Also on the northern side in Carter County, Tennessee. Clingman Peak and along the ridge to Mt. Mitchell, Yancey County (Walker & Ferriss). Cherokee, Macon County and Jackson, Transylvania County (Archer).

The thin, fragile shell is from ecru olive to buffy olive in color, rarely lighter. The fine striae are unequal, rather low, rounded, about as wide as their intervals; over them there is a minute but strong wrinkling in the same direction, cut by much more widely spaced spiral lines. The apical whorl is smooth. The columellar lip is not toothed, and in typical *andrewsae* there is no parietal tooth.

“The typical form of this fine species was quite abundant all along the ridge from Clingman Peak to Mt. Mitchell. It is partial to the hellebore (*Veratrum viride*) which grows rankly in the open spaces, and was usually found either roosting beneath the large leaves or hidden in the grass around the roots. The shells are exceedingly fragile and were often crushed between the fingers in the slight pressure occasioned by lifting them from their

hiding-places. They are uniformly of a dark olive-green color, with a thin, narrow, concave lip. Of sixty-five specimens the largest was  $27\frac{1}{4}$  mm. in diameter, the smallest  $22\frac{1}{4}$ , average 24.9. Compared with Roan mountain specimens they differ only in size, being on the average slightly larger. Of thirty-nine Roan specimens the smallest was 19, the largest 22.2. The shells from both localities are alike in the extreme fragility, narrow lip and shape. And in both places this form is found only on the highest parts of the mountain." (Walker.)

The shell is so thin that it occasionally becomes dented by a fall or other accident, without any fracture, as in Figure 437 g.

I have not dissected the typical form of *M. andrewsae*. Binney's figure shows the penis strongly contracted near the upper third, the genitalia otherwise about like *M. a. normalis*.

**Mesodon andrewsae intermedius** (Walker)

Fig. 437 f.

*Polygyra andrewsae intermedia* Walker, 1902, Proc. Acad. Nat. Sci. Phila., p. 425.

"Throughout this region [Buncombe and Yancey Counties, N. C.], occupying the higher levels from 3,500 to 5,000 feet, and thus ranging above the var. *normalis*, but below the typical *andrewsae*, was found a well-marked race which cannot be satisfactorily assigned to any of the recognized varieties. It is intermediate between the typical form characteristic of the higher altitudes of Roan and Mitchell and subsp. *altivaga*, which similarly occupies the summits of the Smoky mountains. In texture, sculpture, color and character of the peristome it is nearer to *altivaga*, but in shape is more like the typical *andrewsae*. On the whole, however, it is more nearly related to the former. It may be characterized as typical in shape, but larger, with a stronger, thicker shell, closely and regularly striate, lighter in color being usually with a strong yellowish tinge, frequently pale green, and occasionally tinged with red; the lip is decidedly different from the typical *andrewsae*, being broader and flatly reflected; in many cases the reflected portion is decidedly convex, being rolled back so that the center of the face of the peristome projects beyond the outer edge. Compared with var. *altivaga* it is decidedly less globose, being wider in proportion to its height. The aperture also is proportionately wider than in *altivaga*. Total alt. 22, alt. axis 15.5 mm., diameter 30.5 mm." (Walker.)

Diameter of largest 30.5 mm.; smallest 26.5 mm. Bluff Mt.

Largest  $30 \times 20\frac{1}{4}$ ; smallest  $26\frac{1}{4} \times 20$  mm. Potato Top.

Diameter 25 to  $27\frac{1}{4}$  mm. Craggy Mts.

NORTH CAROLINA: Bluff mountain, from Baker's to the summit (Walker & Ferriss), Type University of Michigan, Museum of Zoology. Also Potato Top, 4000 feet; Vance's branch, north fork Swannanoa River; Bee Tree Creek, Craggy Mountains, 3500 feet; Roan Mountain R. R. station (Walker).

"There is no evidence of any tendency to bands, nor to the development of a parietal tooth so characteristic of *altivaga*, in any of these specimens.



This form extends as far north as Roan mountain. Four specimens from Roan mountain R. R. Station are as heavy as an ordinary *P. albolabris*, with a broad, thick, flattened or convex lip, and of a decided yellow-horn color. They measure  $27\frac{1}{4} \times 23$ ,  $27\frac{1}{4} \times 22$ ,  $26 \times 19\frac{3}{4}$ ,  $27\frac{1}{2} \times 21$  mm., and approach var. *altivaga* very closely." (Walker.)

**Mesodon andrewsae normalis** (Pilsbry)

Fig. 437 a-c.

*Helix albolabris* var. *maxima* Shuttleworth, 1877, Notitiae Malac. 2: 11 (text by Fischer), pl. 8, fig. 3. Not *Helix maxima* Pfr., 1853.

*Mesodon andrewsi* var., W. G. Binney, 1885, Man. Amer. L. Sh., p. 302, fig. 3224.

*Polygyra andrewsae normalis* Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 123.—Walker, 1902, *ibid.*, p. 425; 1928, Terr. Moll. Alabama, p. 40, fig. 45.—Ferriss, Nautilus, 12: 99-101; 14: 54.

*Polygyra normalis* Pils., Clench & Banks, 1932, Nautilus, 46: 58, 59.

The shell is capacious, much larger than *M. andrewsae*, and more solid though rather thin; ecru olive to isabella color, the back of the lip yellow. The white lip is broad, flatly reflected, the columellar margin with a low, wide "tooth" or convexity.

Height 26.1 mm., diameter 32 mm.; 5 $\frac{3}{4}$  whorls. Type.

Height 26.5 mm., diameter 34 mm. Paratype.

TENNESSEE: Roan Mountain R. R. station, 3000 ft., and northern outliers of Roan Mountain in Carter Co. (W. L. Abbott, S. N. Rhoads, H. B. Baker). Indian Gap and The Chimneys, Mt. LeConte, Sevier Co. (Clench & Archer). Cade's Cove, Blount Co., 2000-2500 ft. (Pilsbry), Type 77601 a A.N.S.P. Tellico Gorge, Monroe Co., and Near Pikeville, Bledsoe Co. (H. B. Baker). Also on the Tenn.-N. C. boundary range.

NORTH CAROLINA: Paddy Mountain west of Jefferson, Ashe Co., 3400 ft. (Francis Harper). Ben Creek Experimental Forest, Walnut Cove, Stokes Co. (A. P. Jacot). Cranberry, 3200 ft. (H. B. Baker) and Blowing Rock (Jos. Willcox), Watauga Co. Roan Mountain, deciduous tree belt (S. N. Rhoads); Chalk Mt. (S. G. Gordon), Mitchell Co. Paintrock, Madison Co. (Ferriss). Bluff Mountain, Wilson's and Meadow Coves; Mount Mitchell, Yancey Co. (Walker & Ferriss). Montreat, Buncombe Co. (Maxwell Smith). Great Smoky Mts. at Clingman Dome, 5000-5800 ft.; Andrews Bald; Mirey Ridge, 5000 ft.; Proctor's Knob, 5000 ft., Eagle Creek, Thunderhead, 3500-4000 ft. (Ferriss, Walker, Clapp, Sargent and Pilsbry). Hayesville, Clay Co., and Unaka Mts. near Citico Creek (Ferriss). Blowing Springs, Nantahala Gorge, Cliff Ridge, Swain Co. (Clench, Archer and Rehder). Tryon, Polk Co. (H. A. Green).

SOUTH CAROLINA: Sassafras Mt., Pickens Co. (Bayard Long).

GEORGIA: Tallulah Falls, Rabun Co. (Hemphill). Tray Mt., 4370 ft. (Francis Harper), and Presly (Jess White), Towns Co.  $\frac{3}{4}$  mi. south of Frogtown Gap, Lumpkin Co., 3000 ft. (Francis Harper). Toccoa Falls, Stephens Co. (Hemphill). Macon Co. (W. G. Binney).

ALABAMA: Dugger Mountain, Piedmont, Calhoun Co. Little River Gorge, Lookout Mt., Cherokee Co. Pyriton, Clay Co. Lookout Mt. and Valley Head, DeKalb Co. Burlison, Franklin Co. Woodville, Jackson Co. Bear Creek and Hamilton, Marion Co. Horseblock Mt., Talladega Co. (Walker, mainly from H. H. Smith collections).

*M. andrewsae normalis* is the form of *andrewsae* which has often been mistaken for *Triodopsis albolabris* or *T. a. major*. It is usually thinner, and the last whorl is higher than in *albolabris*. It is thinner than *major*,

lighter colored. It is everywhere a mountain snail, while *major* is most finely developed in low country, on the Coastal Plain. The anatomical distinctions, first pointed out by W. G. Binney, show that these snails are not closely related.

This is the abundant and wide-spread form of the species; from it *andrewsae* proper, *intermedia* and *ultivaga* seem to have been differentiated locally on the cloudy mountain tops. It is most abundant between 2000 and 4500 feet; rarely higher, as on Mirey Ridge and Clingman Dome. In Cade's Cove, at 2000-2500 feet, in a lot of 75 the diameter runs from 29 to 34.5 mm., 75 percent being 31 to 33 mm., none with a parietal tooth. In many places it is larger: Roan Mt., 28 x 36.4 mm.; Mt. Mitchell, N. C., 28 x 37.2 mm.; Lookout Mt., near Valley Head, Ala., 31 x 38.7 mm. Quite rarely a parietal tooth is developed, as in a few shells from Mirey Ridge, where the great majority are toothless. The h/d index varies widely. In a lot of 14 from Cranberry, N. C., the extremes measure 25 x 34 mm. and 29.3 x 36.3 mm., the h/d index from about 73.5 to 80.7.

Shuttleworth's specimens were probably sent him by Dr. Rugel, who was apparently the first to collect this fine snail. A specimen taken by Dr. H. B. Baker on the Walden escarpment two or three miles southwest of Pikeville, Bledsoe Co., Tenn., is scarcely distinguishable from *M. a. intermedia* Wkr. except by its dull chamois color, *intermedia* being ecru-olive. It is thin, toothless and measures 19 x 25.9 mm. This is farthest west for any form of *andrewsae* in Tennessee, and the only locality known from west of the Tennessee River.

Some Roan Mt. shells referred to *M. a. intermedius* by Walker, do not seem to differ materially from *M. a. normalis*.

Genitalia of a specimen from Mirey Ridge, in the Great Smoky range. The length of penis is about two-thirds the diameter of the shell. Within the upper end there is a single high pilaster, folded over in this preparation. At a slight contraction of the penis the internal arrangement changes with one principal and two smaller pilasters. Length of penis 23 mm., retractor 14 mm., vagina 12 mm., spermatheca 18 mm.; diameter shell 36 mm. Mantle over the lung is plain.

(*Normalis*, as it is the widely spread form.)

**Mesodon andrewsae altivaga** (Pilsbry)

Fig. 437 d, e.

*Polygyra andrewsae altivaga* Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 125.—  
Ferriss, Nautilus, 14: 51-56.

The thin shell is smaller and more globose than *M. a. normalis*, isabella color or partly dilute dresden brown (or indistinctly streaked with dilute cinnamon-brown preceding a growth-rest), with or without a weak darker supraperipheral band.<sup>1</sup> The white lip is decidedly wider than in *M. andrewsae*, not so wide as in *M. a. normalis*. Parietal wall typically unarmed (but exceptionally having a small tooth).

<sup>1</sup> The colors described are those of cabinet specimens.

Height 22.4 mm., diameter 27.5 mm.; 5½ whorls. Type.

Height 19.5 mm., diameter 26.2 mm. Paratype.

Height 22.2 mm., diameter 29.1 mm. Paratype.

Height 19 mm., diameter 23.4 mm. Thunderhead.

Height 18.5 mm., diameter 25.1 mm. Mt. LeConte.

TENNESSEE-NORTH CAROLINA: Summits of Great Smoky range, along or near the interstate boundary from Thunderhead to Mt. Guyot. Thunderhead, at margin of the "bald", about 5400 feet; Mirey Ridge; Clingman Dome from 6500 feet, near the summit (Type 77597 *a* A.N.S.P.), to about 5500 feet at the west end; Andrews Bald, south of Clingman, 5800 feet (Ferriss, Clapp, Walker and Pilsbry). Mt. LeConte, Tenn.; Mt. Collins at 5000 feet and Mt. Guyot (Ferriss). Mt. Kephart, Sevier County, Tenn., 6050 feet (Francis Harper).

This most beautiful of the *andrewsae* races fades in the cabinet, though kept in the dark, and the band becomes very faint. When freshly collected the color is most attractive, dark and rich.<sup>1</sup> It might be worth while to try excluding ultraviolet radiation as much as possible from the beginning.

The greatest range in size was found on Andrews Bald, diameter 27 to 32.5 mm. On Thunderhead we found them in or under bunches of moss on the trunks of the dwarfed beech trees bordering the "bald" summit. All were small and light colored. In a few shells the band color extended to the suture, but this is scarcely noticeable in cabinet specimens. Details of local variation may be found in my paper of 1900.

In the genitalia of a specimen from Mt. Kephart, Tenn., the penis does not differ except in size from that of *normalis*. Length penis 20 mm., vagina 4 mm., spermatheca 13 mm.

(*Altivaga*, wanderer on the heights.)

**Mesodon zaletus** (Binney)

Fig. 438 a-d.

*Helix albolabris* Say, var. *unidentata*, Ferrussac, 1822, Hist. Nat. Moll. Terr. et Fluv., pl. 46 A, fig. 6.

*Helix zaleta* Say, MS., Binney, 1837, Boston Journ. Nat. Hist., 1: 492, pl. 20.

*Polygyra zaleta* (Binn.), Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 120.—F. C. Baker, Nautilus, 11: 29.—Sterki, Nautilus, 24: 91, 29: 122.—Goodrich, 1913, Nautilus, 27: 82.—Sampson, Nautilus 26: 91 (St. Louis Co., Mo.).—Daniels, Nautilus 26: 40, pl. 5, fig. 4 (pathologic; Mitchell, Ind.).—Walker, 1906, Ill. Cat. Moll. Michigan, p. 466, fig. 14; 1928, Terr. Moll. Alabama, p. 33.—Wheat, Nautilus, 20: 101.—Billups, Nautilus, 16: 51.—W. Stone, Nautilus, 25: 112.—Allen, Nautilus, 29: 19.—Price, Nautilus, 14: 75.

*Helix exoleta* Binney, 1851, Terr. Moll., 2: 131, pl. 10.—Leidy, *ibid.*, 1: 256, pl. 10, figs. 1-3 (anatomy).

*Mesodon exoleta* Binn., W. G. Binney, 1878, Terr. Moll., 5: 326, pl. 10; pl. viii, fig. A. (teeth).—Wetherby, 1881, Journ. Cincinnati Soc. Nat. Hist., 4: 333.

*Mesodon andrewsi* W. G. B., Sampson, 1892, Nautilus, 6: 90.

<sup>1</sup> I fear that Ferriss was led into some exaggeration when he called *altivaga* "cherry red" (Nautilus, 14: 54); but after about forty years I recall our enthusiasm over the color on finding these lovely shells.

The shell is imperforate, depressed-globose, rather solid; cream colored to deep colonial buff (or sometimes cinnamon-buff); rather glossy. After the smooth tip, the embryonic whorls have striae radiating from the suture, at first short, gradually becoming longer.<sup>1</sup> Later whorls with sculpture of fine oblique striae and microscopic spiral lines, which are typically rather

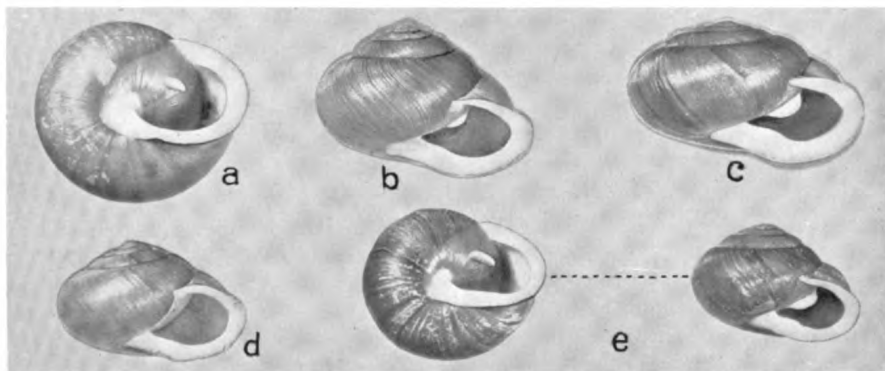


Fig. 438. *Mesodon zaletus*: a, Cincinnati; b, Lawrenceburg, Ind.; c, Woodville, Ala.; d, Oxley, Ontario. e, *Mesodon zaletus ozarkensis*.

weak or subobsolete, but sometimes distinct. The spire is moderately elevated with somewhat convex outlines. Aperture shaped much as in *Triodopsis albolabris*. Lip white, flatly reflected and nearly 3 mm. wide, its baso-columellar margin straightened or weakly toothed. Parietal wall bearing a white oblique tooth (rarely wanting).

Height 19.9 mm., diameter 27.5 mm.,  $5\frac{1}{2}$  whorls. Cincinnati, O.

Height 24.5 mm., diameter 31 mm.;  $5\frac{3}{4}$  whorls. Roan Mt., N. C.

Height 16.9 mm., diameter 24 mm. Oxley, Ontario.

CANADA: Oxley; Middle Sister I. and Green I. (in Lake Erie), Ontario.

NEW YORK: West Falls, Niagara Co. (Letson). Buffalo, Machias, Windom, Erie Co. (Letson). Introduced at Litchfield (A. Bailey); Mohawk (Call) Herkimer Co. E. shore Cayuga Lake, between Ithaca and Portland Point (Wheat) Tompkins Co.

PENNSYLVANIA: Kane, McKean Co. Indiana, Indiana Co. (R. W. Wehrle). Laurel Ridge, Somerset-Fayette Co. (S. Brown). Ellwood City, Beaver Co. (J. B. Clark). Monaca (Ortmann).

MARYLAND: Jennings, Garrett Co. (Witmer Stone).

VIRGINIA: Scott Co. (Clapp). Near Reed Creek, 12 mi. southwest of Pulaski, Wythe Co. (Clench and Archer). Cedar Bluff, Tazewell Co. (Goodrich).

NORTH CAROLINA: Near Waynesville, Haywood Co., and Balsam, Jackson Co. (J. B. Clark). Glen Cove, Unaka Mts., and Paintrock, Madison Co. (Ferriss). Roan Mt., Mitchell Co. (Wetherby).

OHIO: Put-in-Bay Island (J. A. Allen). Ashtabula, Butler, Franklin, Hamilton and Ottawa counties; Cincinnati, here selected as type locality.

MICHIGAN: Huron R. above Ann Arbor, Washtenaw Co. (Clench).

<sup>1</sup> In some specimens, as at Roan Mountain, N. C., the striae of the embryonic whorl extend entirely across the whorl from the beginning.

INDIANA: Mitchell, Lawrence Co. (Daniels). Lawrenceburg, Dearborn Co. (A. C. Billups). Brookville, Franklin Co. (Call).

ILLINOIS: Grand Tower, Jackson Co.; near Alton, Madison Co.

WISCONSIN: (A. D. Brown).

IOWA: Black Hawk Hollow, Ft. Madison, Lee Co. (Van Hyning).

MISSOURI: Fern Glen, St. Louis Co. St. Francois Co. (Sampson). Vineland, Jefferson Co. (Woodruff). Branson, Taney Co. Sequoia State Park, Greene Co. (Archer).

ARKANSAS: Woods west of Arkadelphia, Clark Co. (Wheeler). Chester, Crawford Co.; Hecy Co. (Archer).

KENTUCKY: Edmonson, Harlan, Hopkins, Mason, Pulaski and Warren counties.

TENNESSEE: Oakdale, Morgan Co.; Cade Cove, Blount Co.; Talassee Ford, Caringer, Monroe Co.

ALABAMA: Bibb Co. Blount Springs, Warrior, Blount Co. Tuscombina, Colbert Co. Fort Payne, Valley Head, DeKalb Co. Wetumpka, Elmore Co. Gadsden, Keener, Etowah Co. Burleson, Franklin Co. Johnson Cove; Pisgah; Stevenson; Princeton; Woodville, Jackson Co. Trafford; Squah Shoals, Jefferson Co. Florence, Lauderdale Co. Monte Sano; Huntsville; Gurley, Madison Co. Yellowleaf Creek, Wilsonville, Shelby Co. Gallant, St. Clair Co. Hagler; Holt; University; Tuscaloosa, Tuscaloosa Co. Forks of Warrior, Walker Co.

This shell resembles *Triodopsis albolabris* closely, especially the toothed variety of that snail, but it is higher and less wide, the last whorl being narrower viewed from above, the aperture is less broad and not so oblique, and the parietal tooth is ordinarily larger, though sometimes very small or even wanting in individuals apparently adult. Dr. Clapp (*Nautilus*, 30: 140) has noted the difference in minute sculpture: *T. albolabris* has a dull luster, owing to the minute wrinkling over the striae and intervals, but *M. zaletus* is more polished, the microscope showing very little wrinkling or none. The differences between the two species are conspicuous in the soft parts. The mantle of *M. zaletus* is boldly marked with irregular black spots which are usually more or less confluent, or form a network. In shells not thickened by age this pattern is visible through the shell. In *T. albolabris* the spots are much smaller and gray. There is also a conspicuous difference in the genitalia, the duct of the spermatheca being invariably much swollen in *albolabris*, but in *zaletus* it is slender.

A thin, toothless form of *zaletus* from St. Francois Co., southeastern Missouri, was reported by F. A. Sampson as *Mesodon andrewsi* W. G. B. Though in color, shape and rather narrow lip the specimen he sent is much like some *andrewsae*, it does not have the well developed minute wrinkling of the surface proper to that species, but only the very weak, almost obsolete traces of such wrinkling to be seen in *zaletus*.

*M. zaletus* is generally spread from west of the Alleghenies in Pennsylvania to the Mississippi and a little beyond in Iowa and Missouri, and south to Alabama. In the southern mountains it rarely lives at elevations above 2000 ft. According to Mr. A. Bailey the ancestors of the colony in Herkimer

County, N. Y., were imported by Dr. James Lewis from Ohio, about 1874. A reversed individual was found there; the Academy also possesses one.

Genitalia (Fig. 431 D, Harriman, Tenn.). There are two large pilasters in the somewhat swollen terminal third of the penis. The pilasters do not unite to form a partition above. The smaller one is quite short, about 2 mm. only; the larger pilaster becomes suddenly smaller and extends forward, becoming divided, and two small ridges appear. In another specimen the section 1 mm. from apex shows unequal pilasters. At 2 mm. they become subequal. Length of penis 12 mm., retractor 5 mm., vagina 5.5 mm., spermatheca 10 mm. Diameter of shell 26 mm.

The mantle is marbled with black or dark gray.

(*Zaletus*, thought to be intended for *exoletus*,—past full growth, obsolete.)

**Mesodon zaletus ozarkensis** Pilsbry & Ferriss

Fig. 438 c.

*Mesodon exoleta* Binney var. *minor* Wetherby, 1881, Journ. Cincinnati Soc. Nat. Hist., 4: 333.

*Mesodon exoletus* Binn., Sampson, 1893, Ann. Rep. Geol. Surv. Ark. for 1891, 2: 190.

*Polygyra zaleta ozarkensis* Pilsbry & Ferriss, 1907, Proc. Acad. Nat. Sci. Phila. for 1906, p. 553, pl. 22, figs. 28-29.

The shell averages smaller than *M. zaletus*, often more elevated; whorls more slowly increasing, the last narrower in dorsal view, surface glossy, bright cream color with faintly pink spire. Parietal tooth large; columellar prominence usually well developed.

Height 17 mm.; diameter 23.5 mm.; 5½ whorls. Type.

Height 16 mm., diameter 21.5 mm. Paratype.

Height 17 mm., diameter 25 mm. Petit Jean Mts.

Height 12.5 mm., diameter 18.9 mm. Mammoth Spring.

MISSOURI: Harrisonburg, Boone Co.; and Springfield, Greene Co. (Stuart Weller). Cedar Gap, Wright Co.; and Seligman, Barry Co. (Ferriss).

OKLAHOMA: Wyandotte, Ottawa Co.; Sugarloaf Mt. (Ferriss & Pilsbry), Type 91329 A.N.S.P.

ARKANSAS: Rogers, Benton Co. (Pilsbry). Eureka Springs, Carroll Co. (Sampson). Mammoth Spring, Fulton Co.; Magazine Mt. and Blue Mt. Station, Logan Co.; Little River, Little Rock Co.; Rich Mountain and Mena, Polk Co. (Ferriss & Pilsbry). Mablevale, Pulaski Co. (C. W. Johnson). Poteau Mts., south of Gwynn, Sebastian Co. (Pilsbry). Sulphur City, Washington Co. (A. J. Brown). Petit Jean Mts., Yell Co. (Pilsbry & Ferriss). Walnut Shade, Taney Co. (Archer).

Although the Ozarkian race is distinguishable by its small size and rather different aspect, there is no very definite distinction. The incipient racial differentiation may be worthy of record, but it is not a well characterized subspecies. Measurements from various localities were given in 1907.

*M. zaletus* does not affect specially moist or rocky situations. It lives preferably on slopes leaf-carpeted over a rich humus, and rolls out of the leaves where one is raking for *Omphalina*. On the north side of Magazine Mountain we took them on the leafy slope just below the great rock-talus.

**Mesodon pennsylvanicus** (Green)

Fig. 439.

*Helix pennsylvanicus* Green, 1827, Contrib. Maclurian Lyceum, 1: 8.*Helix pennsylvanica* Green, Binney, 1837, Boston Journ. Nat. Hist., 1: 483, pl. 16; 1851, Terr. Moll., 2: 105, pl. 7.—Bland, 1858, Ann. Lyc. Nat. Hist. N. Y., 6: 299.*Mesodon pennsylvanica* Green, W. G. Binney, 1878, Terr. Moll., 5: 321, pl. viii, fig. e, pl. xv, fig. 6 (anatomy).*Polygyra pennsylvanica* Green, Walker, 1906, Ill. Cat. Moll. Mich., p. 468.—F. C. Baker, 1906, Bull. Ill. State Lab. Nat. Hist., 7: 116.—Sampson, 1913, Trans. St. Louis Acad. Sci., 22: 95; Nautilus 26: 91.

The shell is imperforate, subglobose with convexly conic spire; thin but moderately strong; between deep colonial buff and light yellowish olive, naples yellow behind the lip. The whorls increase slowly, the last rounded at periphery, descending in front, contracted behind the lip. The first half whorl is smooth, next half whorl closely striate below the suture, the striae extending about one-third across the whorl. The surface of later whorls is

Fig. 439. *Mesodon pennsylvanicus*, a, type; b, Joliet, Ill.

slightly glossy, closely, regularly striate, the striae nearly smooth except for rather close, strongly engraved spiral lines. The aperture is somewhat triangular. Peristome white, rather narrowly reflected, thickened within, the outer margin strongly arched above, baso-columellar margin oblique, straightened, with a low prominence on the inner rim.

Height 15 mm., diameter 20 mm.; 6 whorls. Type.

Height 13.4 mm., diameter 19.7 mm. Lawrenceburg, Ind.

Height 13.4 mm., diameter 17.7 mm.;  $5\frac{1}{4}$  whorls. Joliet, Ill.

Height 10.2 mm., diameter 15.5 mm.;  $5\frac{3}{8}$  whorls. Indiana, Pa.

Height 11 mm., diameter 15.2 mm. Indiana, Pa.

PENNSYLVANIA: West of the Allegheny mountains: Indiana, Indiana Co. (Wehrle). Eldwood City, Beaver Co. (J. B. Clark). Near Chartier's Creek, Washington Co. (Green), Type 11298 A.N.S.P. Waynesburg, Greene Co. (S. N. Rhoads).

OHIO: Columbus (T. Bland). Cincinnati (Harper & Wetherby). Adams Co. (Archer).

MICHIGAN: Near Monroe, Monroe Co. (Sister M. Catharine). Bois Blanc I., Detroit River (Walker).

INDIANA: Lawrenceburg (A. C. Billups).

ILLINOIS: Joliet, Wills Co., and La Salle Co. (Ferriss). Dubois, Washington Co., and Jackson Co. (Hinkley). Hamilton, Hancock Co. (Lyon). Fulton Co. (Wolf).

MISSOURI: Fern Glen, St. Louis Co.; Jackson and Cape Girardeau counties; Providence, Boone Co. (Sampson).

*M. pennsylvanicus* is somewhat like *M. clausus* in size and color, but it is imperforate, the whorls are more closely coiled, the aperture of more irregular shape and the basal lip straightened and thickened or obscurely

toothed. The spire is usually high, much as in *M. elevatus*, but this varies. Specimens from Joliet, Illinois, have the h/d index from 65.8 to 83.54.

It does not seem very closely related to any other species, but the sculpture of the embryonic whorls as well as the general form of the shell ally it with *M. elevatus*.

Genitalia (Fig. 431 g, Waynesburg, Pa.). The penis has a longitudinal partition in the upper end of the cavity, extending down about 2 mm. (Fig. 431 g, a'), the cavity v. d', shown below in that figure, being that into which the vas deferens (v.d.) opens, the upper, marked p.c., being the blind end of the penial cavity. Further down this partition breaks down into two fleshy ridges running downward about 1.5 mm. In the middle the penial cavity becomes simple except for the fine corrugation of its walls, which persists throughout (Fig. 431 g, c'). The talon is oblong, with low nodules. Length of penis 7 mm., retractor 6.5 mm., vagina 4 mm., spermatheca 7 mm.; diameter of shell 17.7 mm.

## MESODON ELEVATUS GROUP

**Mesodon elevatus** (Say)

Figs. 440 a, 441.

*Helix elevata* Say, 1821, Journ. Acad. Nat. Sci. Phila., 2: 154; 1832, Amer. Conch., pl. 37, fig. 2.—Binney, 1851, Terr. Moll., 2: 126, pl. 9.—Leidy, 1851, Terr. Moll., 1: 256, pl. 10, figs. 4, 5 (anatomy).—H. Smith, Nautilus, 10: 84.—W. G. Binney, 1857, Proc. Acad. Nat. Sci. Phila., p. 192.

*Mesodon elevata* Say, W. G. Binney, 1878, Terr. Moll., 5: 324, pl. 9; pl. viii, fig. m (teeth).—Sampson, 1883, Kansas City Rev. Sci. and Ind., p. 551; 1885, Bull. Sedalia Nat. Hist. Soc., 1885, p. 19; 1894, Ann. Rep. Geol. Surv. Ark. for 1891, p. 190.—Simpson, 1888, Proc. U. S. Nat. Mus., 450.—Call, 1886, Bull. Washburn Coll. Lab. Nat. Hist., 1: 202; 1899, Indiana Dept. Geol. etc., 24th Ann. Rep., p. 392.—Marshall, 1893, Nautilus, 6: 126 (colonized in Herkimer Co., N. Y.).

*Polygyra elevata* (Say), Pilsbry, 1907, Proc. Acad. Nat. Sci. Phila. for 1906, p. 555, pl. 22, figs. 22-25 (Hardy, Ark.).—Sampson, 1913, Trans. Acad. Sci. St. Louis, 22: 95.—Walker, 1906, Ill. Cat. Moll. Mich., p. 468; 1928, Terr. Moll. Alabama, p. 39.—S. F. Price, Nautilus, 14: 75.—Daniels, 1912, Nautilus, 26: 40, pl. 5, fig. 15 (abnormal).

*Helix tennesseensis* Lea, 1841, Proc. Amer. Phil. Soc., 2: 31; Trans. Amer. Phil. Soc., 9: 1.

*Helix elevata* Say, Shuttleworth 1877, Notitiae Malac., 2: 11, pl. 13, fig. 2.

*Helix knoxvillina* Férussac, 1821, Tabl. Syst. Fam. Limaçons, p. 33, no. 94, nude name (*Mesodon helicinum* Rafinesque cited as a synonym); 1822, Hist. Nat. Moll. Terr. et Fluv., Expl. Pl., p. iii, pl. 49, figs. 5, 6.

The shell is solid, imperforate, globose-conic, with elevated, convexly conic spire of closely coiled whorls, and rounded periphery; primrose yellow to dilute eceru-olive, often with a chamois area behind the lip, and usually having one or more brownish growth-rests (or sometimes there is a slightly cinnamon tint). The embryonic shell after an initial smooth tip, is finely and closely striate radially. Last whorl is finely striate, the striae rather low, cut by close engraved spiral lines, and often showing some scattered malleations. There is little or no contraction behind the lip. The aperture is angularly lunate. Peristome white, broadly reflected, thickened within, nearly flat or often concave along the basal lip, which is a rather wide plate, obliquely truncate at junction of basal and outer margins. Parietal callus bearing a very strong, curved, obliquely entering tooth.



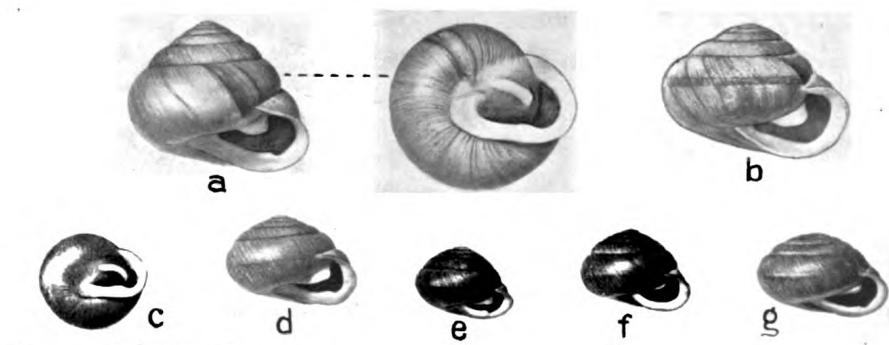


Fig. 440. a, *Mesodon elevatus*, Cincinnati. b, *M. elevatus* form *tennesseensis*, near Blackwater, Lee Co., Va. c, *Mesodon clarki*, Thunderhead; d, Mirey Ridge; e, Clay Co., N. C. f, *M. clarki* (type of *bradleyi* Van.). g, *M. clarki nantahala*.

Height 18 mm., diameter 22 mm.; 6 $\frac{3}{4}$  whorls. Neotype, Cincinnati.

Height 19 mm., diameter 24 mm. Cincinnati.

Height 16.4 mm., diameter 21.2 mm. Cincinnati.

Height 17.5 mm., diameter 25.7 mm. Lee Co., Va.

Height 20.2 mm., diameter 26.3 mm. Lee Co., Va.

Height 14.5 mm., diameter 19.8 mm.; 6 whorls. Jackson Co., Ala.

NEW YORK: Ravine leading from Ilion to Cedarville, Litchfield (A. Bailey); Mohawk (Clapp).

OHIO: Defiance, Defiance Co. (Sterki). Miami Co. (G. D. Lind). Hamilton, Butler Co.; Cincinnati (Wetherby).

MICHIGAN: Niles and Saint Joseph, Berrien Co. Grand Rapids, Kent Co. Near Ann Arbor, fossil only.

INDIANA: Lawrenceburg, Dearborn Co. Lafayette, Tippecanoe Co. Flat Rock River, Bartholomew Co.

ILLINOIS: Vermilion Co. Alton, Madison Co. Spoon River. Fulton Co.

MISSOURI: Providence, Boone Co., fossil. Springfield, Greene Co. Sedalia, Pettis Co. Jefferson City, Cole Co. Also, according to Sampson, Bear Creek, Marion Co.; Barry Co.; Camden Co.; Columbia, Boone Co.; Moniteau Co.; Galena, Stone Co.; Fern Glen, St. Louis Co.; St. Charles Co.; Missouri City, Clay Co.; Lupus, Moniteau Co. Fossil near Mokane, Callaway Co. (Greger).

ARKANSAS: Hardy, Sharp Co. (Ferriss).

VIRGINIA: Newman's Ridge, 4 mi. from Blackwater, Lee Co. Natural Tunnel, a few miles from Gate City, Scott Co.

KENTUCKY: Boone Co., opposite Lawrenceburg. Ind. Trimble Co., opposite Madison, Ind. Warren Co. near Mammoth Cave.

TENNESSEE: Fraley Gap, Skillen Cove, Bledsoe Co. Bellevue, Davison Co. Chattanooga, Hamilton Co. Concord and Knoxville, Knox Co. Clarksville, Montgomery Co. Fullerton Bluff, Prior Cove and Dove, Marion Co. Samburg, Obion Co. Near Byrdstown, Pickett Co. Harriman, Roane Co. Cherry valley east of Watertown, Wilson Co.

SOUTH CAROLINA: Calhoun Falls, Abbeville Co.

ALABAMA: Clarke Co., fossil. Colbert Co. Burleson, Franklin Co. Stevenson, Princeton, Woodville, Jackson Co. Cedar Island, Florence, Lauderdale Co. Gurley, Madison Co. Bass Creek, Marion Co. Marshall Co. Walker Co.

MISSISSIPPI: Natchez bluff, fossil.

*M. elevatus* is a very distinct species by its high spire, compact coil and large parietal tooth. The degree of elevation varies widely; in Cincinnati shells measured the h/d index is from 69.64 to 81.61. Tryon reported a sinistral specimen (Amer. Journ. Conch., 3: 104).

In southwestern Missouri and northern Arkansas the average size is smaller than eastern shells, diameter 19.75 to 21.5 mm. (Springfield, Mo.), and 20 to 22 mm. (Hardy, Ark., Fig. 441). Some care is required to distinguish these shells from *M. zaletus ozarkensis*. Possibly the specimens recorded as *elevatus* from Fort Gibson, Okla., are referable to *ozarkensis*.

Although *M. elevatus* had been reported from New York without definite locality by DeKay and W. G. Binney, the species apparently does not normally occur in the state. It was unknown as a New York snail to Dr.

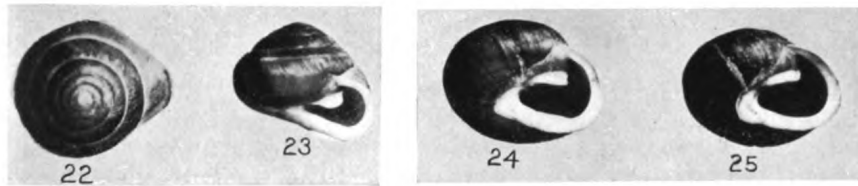


Fig. 441. *Mesodon elevatus*, Hardy, Arkansas.

Lewis as late as 1874 (Lewis, '74, 171). Soon after that time Lewis colonized it, together with several other species from Ohio, in a ravine between Ilion and Cedarville, Herkimer County. Specimens were collected there by Mr. Albert Bailey in 1893 (Marshall, Nautilus, 6: 126).

Genitalia (Figs. 431 E, Samburg, Reelfoot Lake, Tenn.). The stout penis has two high, compressed pilasters arising close to the apex and partly corrugated obliquely, the wall between them being regularly corrugated. Further forward the pilasters become lower and rounded. A long epiphallus is differentiated from the vas deferens by its larger caliber, its end being abrupt but without vestige of flagellum. The talon is large, the expanded end with numerous nodules. The hermaphrodite duct is large. Length of penis 13 + mm., retractor 10 mm., vagina 7 mm., spermatheca 13.5 mm.; diameter of shell 23 mm. The mantle is uniform light colored.

(*Elevatus*, raised.)

In the form *tennesseensis* (Lea), Fig. 439 b, a tawny band about 2 mm. wide encircles the shell above the periphery. This banded *elevata* inhabits a belt extending from Scott and Lee counties, Virginia, southwest to Knox, Bledsoe, Hamilton and Marion counties, Tennessee. The figured specimen is from Newman's Ridge, 4 miles from Blackwater, Lee County, Virginia, 167116 A.N.S.P., collected by A. F. Archer. While feebly characterized, the mutation appears established as a race in this district, but it occurs elsewhere also; W. G. Binney, 1857, stated that "Robert Kennicott collected in

Wisconsin two specimens . . . furnished with a broad revolving brownish band on the body whorl."

Lea described a young shell, but his statement that it has "an indistinct brownish line on the periphery" indicates this form. His locality was "Cumberland mountains, Tennessee (S. M. Edgar)." It is evidently what J. W. Taylor called *Helix elevata* var. *cincta*, without definition or reference; not *Helix cincta* Lewis, 1874. The band is conspicuous in fresh shells but fades with time, sometimes becoming very faint in the collection.

**Mesodon clarki** (Lea)

Fig. 440 c-f.

*Helix clarkii* Lea, 1858, Proc. Acad. Nat. Sci. Phila., p. 41; Journ. Acad. Nat. Sci. Phila., 6: 138, pl. 24, fig. 111.

*Mesodon clarki* Lea, W. G. Binney, 1878, Terr. Moll., 5: 324, fig. 209, pl. viii, fig. 1; pl. xi, fig. c (anatomy); 1885, Man. Amer. L. Sh., pp. 307, 490, fig. 329.

*Polygyra clarki* (Lea), Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 122.—Ferriss, Nautilus, 12: 100; 14: 51, 54.

*Polygyra clarkii bradleyi* Vanatta, 1912, Nautilus, 25: 120; 26: pl. 1, figs. 1, 2.

The shell is imperforate, rather solid, globose-conic, the spire elevated, convexly conic; deep colonial buff to chamois colored, glossy. The whorls are only weakly convex, closely coiled, the last subangular at the periphery in front, the last half turn becoming rounded there, and slightly convex below the periphery; slightly descending to the aperture, contracted behind the lip. The embryonic shell is closely striate, the striae radiating re-tractively from the suture, short at first, gradually lengthening but not reaching to the lower suture until about the first third of the second whorl. The last whorl is finely but regularly striate throughout, the striae rather strong, either slightly sinuated where they pass over the weak peripheral angle, or dislocated there, the ends of the striae of the upper surface alternating with those of the base. The aperture is irregularly lunate. Peristome white, rather widely reflected in the outer and basal margins, a thickening of the inner edge of the basal margin forming a blade-like tooth obliquely truncate at its outer end, where there is a rounded notch at junction of basal and outer margins. The parietal wall bears a long curved tooth.

"Height .51, diameter .37 inch." (Lea.)

Height 8.5 mm., diameter 13 mm.; 6½ whorls. Clay Co., N. C.

Height 10.8 mm., diameter 14.7 mm.; 6 whorls. Thunderhead Mt.

Height 11.9 mm., diameter 17.1 mm.; 6 whorls. Mirey Ridge.

TENNESSEE-NORTH CAROLINA: Great Smoky Mountains, from Thunderhead to Clingman Dome and Andrews Bald, 3700 to about 6500 ft. (Ferriss, Clapp, Walker and Pilsbry). Indian Gap Road, Mt. Le Conte, Sevier Co., Tenn. (Clench and Archer).

NORTH CAROLINA: South of the Little Tennessee on Tuskegee and Cheoah Creeks, in Glen Cove, and at Talassee Ford of the Little Tennessee (Ferriss). Nantahala Mts., and Hayesville, Clay Co. (Hemphill). Beef Market Mt., Balsam, Jackson Co. (J. B. Clark). Tuskee Cove, Cherokee Co. (D. Christy), Type 116278 U.S.N.M. Macon Co. (Archer).

GEORGIA: Tallulah Falls, Rabun Co. (Hemphill). Blood Mt., Union-Lumpkin Co. line, 4440 ft. (Francis Harper). Black Rock Mt., Rabun Co. (J. Chester Bradley).

This species is generally spread in its area but everywhere rather rare. It is much like *M. elevatus* in miniature. The size varies rather widely, as in the measurements above. Ferriss stated that one he has measures 18 mm. diameter. The sculpture also is variable; typically the base has regular striae, but in a few places, such as Mirey Ridge, the striae are much interrupted by fine malleation and transverse indentations. In some specimens the periphery is distinctly angular in front of the aperture. In others the angulation would hardly be noticeable if it were not for the interruption of the sculpture by a smoothish zigzag line where the striae of upper surface and base interdigitate, or by a very slight bend in the individual striae, where these are continuous.

Usually no engraved spiral lines are present, but in a few specimens they are faintly traced on the rib-striae of the last whorl above the periphery.

*Polygyra clarkii bradleyi* Vanatta (Fig. 439 f), based on a single shell from Black Rock Mountain, Rabun County, Georgia, has a malleate base with weak striae, and there is only the faintest indication of the rounded notch in the inner rim at junction of basal and outer margins of the lip, characteristic of the species. If this character is constant, it indicates a well-marked subspecies at that locality, but further material is needed. The single specimen is not fully adult.

Genitalia (Figs. 431 r, Thunderhead Mt., Tenn.) with greatly lengthened ♀ organs. The penis cavity has a longitudinal partition near the apex (Fig. a'), which is soon interrupted to form two longitudinal and gradually lowering ridges. In the middle part a few low additional ridges appear, continuing forward as in Figure b'. The vagina is as long as the penis. Spermatheca and its slender duct are also of about the same length. Length of penis 7.5 mm., retractor 9 mm., vagina 7.5 mm., spermatheca and duct 7.5 mm.; diameter of shell 16.7 mm.

***Mesodon clarki nantahala* (Clench & Banks)**

Fig. 440 g.

*Polygyra nantahala* Clench & Banks, 1932, Nautilus, 46: 17, pl. 2, figs. 1-3, 5.

The shell is larger and more depressed than *M. clarki*, the spire lower, dome-shaped; isabella color, very glossy; the periphery appearing angular where the ends of the striae of the upper surface interlock with those of the base (as in many specimens of *clarki*). 5½ whorls.

Height 11 mm., diameter 17.7 mm. Type.

Paratypes measure: 11.2 x 18.2 mm., 11.6 x 17.8 mm.; 11.1 x 17.2 mm.; 11.6 x 17.7 mm., according to Clench and Banks; 11.3 x 16.7 mm.

NORTH CAROLINA: Blowing Springs, Cliff Ridges, Nantahala Gorge, Swain County (G. Banks 1930, Clench, Archer and Rehder 1931). Type 86429 M.C.Z.; paratypes 153664 A.N.S.P., Univ. Mich., and others.

The specimens collected in the Nantahala Mountains by Hemphill, reported as *M. clarki* by W. G. Binney, may be this race. I have not seen them.

**Mesodon archeri** new species

Fig. 442 a.

The shell is imperforate, depressed globose with convexly conoid spire and rounded periphery; glossy, in color between sudan brown and brussels brown of Ridgway, the apex whitish. Sculpture of, on the embryonic whorl, some short, radial striae below the suture. Last whorl very evenly and deeply striate, the striae smooth, deeply cut, about 4 in one mm. at periphery of last whorl, continuing over the base. No papillae or spiral lines. The last whorl descends very shortly to the aperture, and is rather deeply constricted behind the peristome, which is yellow behind. The aperture is somewhat triangular, rather strongly oblique, not dished. Peristome white (or faintly buff tinted), broadly reflected. The edge somewhat recurved;

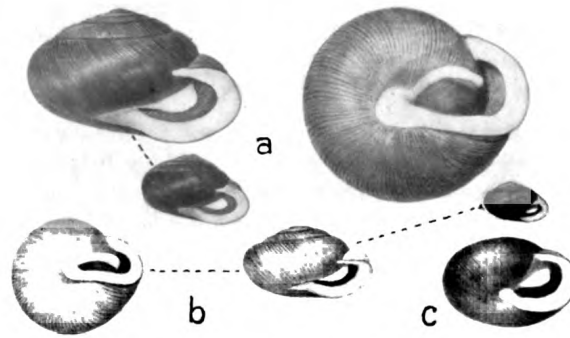


Fig. 442. a, *Mesodon archeri*, type and paratype. b, *Mesodon christyi*, Cade's Cove; c, Gaston Co., N. C. ( $\times 2$  and actual size.)

thickened within, the inner thickened rim with a slight notch at junction of the basal margin and outer arc of the lip. The parietal callus is thin and transparent. The parietal tooth is high and long, curved, set very obliquely, and with a low continuation running to the axial callus.

Height 9 mm., diameter 13.7 mm.;  $5\frac{1}{2}$  whorls. Type.

Height 9.3 mm., diameter 14.6 mm.

TENNESSEE: On Goforth Creek, Cherokee National Forest, Polk County (A. F. Archer).

This species is related to *M. wheatleyi* and *M. clarki*. It differs from the latter by the less closely coiled whorls of the spire, the more depressed, less tumid last whorl, absence of any peripheral angulation, the striae, stronger than is usual in *clarki*, are continuous over the rounded periphery, not interrupted or slightly bent there, as in *clarki*. The parietal tooth is like that of *M. clarki*, but stronger than is usual in that species. The notch where margin of the basal lip passes into outer margin is very slight in *archeri*, usually strongly marked in *clarki*. The latter also seems to have more sculpture on the embryonic shell, but only fully adult *archeri* are at hand, and the apices may be somewhat worn.

*M. wheatleyi* is a somewhat less depressed shell, which never has the parietal tooth so strongly developed as in *M. archeri*.

(Named for Allan F. Archer, ardent investigator of Appalachian snail faunas.)

#### MESODON WHEATLEYI GROUP

The striate surface is not engraved with spiral lines, the structure otherwise as in *Mesodon* generally. The two species grouped here by sculpture are probably not otherwise nearly related.

#### *Mesodon christyi* (Bland)

Fig. 442 b, c.

*Helix christyi* Bland, 1860, Ann. Lyc. Nat. Hist. N. Y., 7: 118, pl. 4, figs. 5, 6.

*Mesodon christyi* Bld., Binney, 1878 Terr. Moll., 5: 325, fig. 210, pl. xvi, fig. E (teeth).

*Polygyra christyi* (Bld.), Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 128.—Walker, 1928, Terr. Moll. Alabama, p. 44.

“Shell imperforate, depressed, rather solid, with numerous oblique rib-like striae, dark horn-colored; spire short, obtuse; whorls  $4\frac{1}{2}$ , rather convex, the last descending at the aperture, slightly angular at the periphery, constricted, above gibbous; base convex, excavated in the middle; aperture depressed, with a strong oblique lamelliform parietal tooth; peristome reflected, with a wide callus within.” (Bland.)

Height 4.5 mm., diameter 10 mm. (Bland.)

Height 5.7 mm., diameter 9.5 mm. Tellico Gorge.

Height 5 mm., diameter 8.7 mm. Tellico Gorge.

**NORTH CAROLINA:** Cherokee Co. (David Christy), type locality. Jackson Co. (Ferriss). Tuskegee Mt., Graham Co. (H. E. Sargent & Ferriss). Rutherford Co. (W. G. Binney). Thunderhead (Mrs. George Andrews) and Clingman Dome (Pilsbry), Great Smoky Mts., on the Tennessee-North Carolina boundary.

**SOUTH CAROLINA:** Gaffrey, Cherokee Co. (Archer).

**TENNESSEE:** Cade Cove (Ferriss). Tellico Gorge, Monroe Co. (H. B. Baker). 3 mi. west of Brevard, Transylvania Co. 3 mi. west of Bat Cove, Henderson Co. (Archer).

**ALABAMA:** (Dr. Jas. Lewis).

The small size, strongly striate glossy surface without spiral lines, and the long parietal tooth, are the more prominent features of this little species. The apical whorl appears smooth except for delicate ripples radiating below the suture. There are some short narrow ridges or impressions running more strongly retractive than the riblets on the penult and last whorls; but they are variable in development, being found with difficulty on some individuals, but rather conspicuous on others.

In Cade Cove, Blount Co., the diameter runs from 8.3 to 8.7 mm. There is no definite locality for it in Alabama.

Genitalia (Figs. 445 H, Tellico Gorge, Tenn.) having the penis swollen and containing two large pilasters at the upper end, as in *elevata*; then contracted, and again somewhat swollen in the anterior half, the cavity with a single pilaster. Penial retractor short. The spermatheca is very

short. Length of penis 5.3 mm., vagina 2.3 mm., spermatheca and duct 2.5 mm.; diameter of shell 8.7 mm.

**Mesodon wheatleyi** (Bland)

Fig. 443 a-d.

*Helix wheatleyi* Bland, 1860, Ann. Lyc. Nat. Hist. N. Y., 7: 119, pl. 4, fig. 7.

*Mesodon wheatleyi* Bld., W. G. Binney, 1878, Terr. Moll., 5: 327, fig. 211, pl. viii, fig. R (teeth); 1883, Bull. Mus. Comp. Zoöl., 11: 155.

*Polygyra wheatleyi* (Bld.), Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., pp. 116, 128.—Walker, 1902, *ibid.*, p. 427; 1928, Terr. Moll. Alabama, p. 43, fig. 49.—Ferriss, 1898, Nautilus, 12: 101; 1900, 14: 55. Clench and Banks, Nautilus, 46: 58, 59.

“Shell imperforate, depressed, conoid-globose, thin, reddish horn-colored, with numerous rib-like striae, and microscopic granulations with very short hairs; spire shortly conoid; suture deeply impressed; whorls  $5\frac{1}{2}$ , rather convex, the last rounded, slightly depressed at the aperture, constricted; base

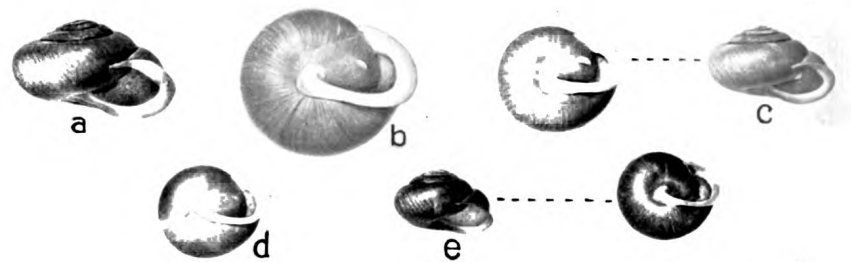


Fig. 443. a, *Mesodon wheatleyi*, Mt. Hayo; b, Stratton Bald; c, Thunderhead; d, North Carolina, from Bland. e, *M. wheatleyi clingmanicus* type and paratype.

convex, excavated in the umbilical region; aperture oblique, lunate, with a small parietal tooth-like tubercle; peristome acute, rose-colored, equally, angularly reflected, appressed at the columella. Diameter maj. 14, min. 12, alt. 7 mill.” (Bland.)

Height 11.4 mm., diameter 16 mm.;  $5\frac{1}{2}$  whorls. Magnetic City.

Height 9.7 mm., diameter 14.5 mm. Top of fir belt, Roan Mt.

Height 11.2 mm., diameter 16.5 mm. Thunderhead Mt.

Height 12 mm., diameter 17.7. Mt. Hayo, 5000 feet.

Height 14.1 mm., diameter 21.4 mm. Mt. Hayo.

Height 15.3 mm., diameter 23.1 mm. Stratton Bald Mt.

TENNESSEE-NORTH CAROLINA: Roan Mt. and Magnetic City, Mitchell Co., N. C., and northern outliers of Roan in Carter Co., Tenn., 3500-5000 ft. Waynesville, Haywood Co., N. C. Linville Falls, Burke Co., N. C. Paintrock, Madison Co., N. C. Mt. LeConte, and Mirey Ridge, Sevier Co., Tenn. Thunderhead, to 5000 ft., and Cade Cove, 2000-2500 ft., Blount Co., Tenn. Talassee Ford of the Little Tennessee, and Cliff Springs, Monroe Co., Tenn. Welch Bald, Swain Co., N. C. Unaka Mts., Graham Co., N. C., at Citico Creek, Mt. Hayo, Stratton Bald and Hangover, about 5000 ft. Frying Pan Gap, Big Pisgah Mt., Macon Co., N. C. Balsams, Jackson Co., N. C. Blowing Springs, Cliff Ridge, Nantahala Gorge, Swain Co. Pinnacle, Black Mts., N. C., 4500 ft. Type loc.: Mountains in Cherokee Co. (D. Christy). Valley River Mts. 5 mi. southeast of Andrews, Cherokee Co., N. C.

GEORGIA: Near Presley, Towns Co.

ALABAMA: Coosa River near mouth of Yellowleaf Creek, Chilton Co. (H. H. Smith, 8348 Clapp Collection).

A generally distributed snail in the mountains along the Tennessee-North Carolina boundary, extending southeast to Towns County, Georgia, and southwest into Alabama. It was reported from that state by Dr. Lewis, without definite locality, and by George H. Clapp from Chilton County, in central Alabama, about 175 miles southwest of any other known record.

The type described by Bland is not the usual form, being small and thin (Fig. 442 d, specimen from Bland, diameter 13.7 mm.). Generally the size is greater, around 16 mm., and the glossy surface is not hairy in adult shells, though under the microscope some dents or transverse wrinkles are seen between the striae, and some post-embryonic whorls show close hair-scars, or a few weak papillae on the last whorl. There are no spiral lines. The color is cinnamon-buff or a shade darker. The apex shows very minute striae radiating from the suture about half way across the whorl; but the summit is generally worn. The strong, close striation is a constant character of *wheatleyi*.

The several series seen are not large enough for definite statistics of the occurrence of a parietal tooth. In the Great Smoky Range it is almost always present in fully adult shells. At Roan Mountain the tooth is exceptional in lots seen. In the region southward from Roan, Walker noted that "three-fourths of the specimens from Mitchell and Cat-tail were edentate, while those from Bluff mountain were all dentate and with the outer margin of the lip dark colored. These varied from 13½ to 16 mm. in diameter, while those from Mitchell and Cat-tail averaged larger, running from 14½ to 16. Ferriss found it also at Paint Rock, Tyson's, Wilson's, Meadow Cove, Great Craggy, Bee Tree Cove and Toe river." In the Unaka region there are very large specimens in some places, such as Stratton Bald and Mt. Hayo (Fig. 443 a, b), all dentate.

The genitalia of the small Cherokee County form described by Bland have not been examined. The somewhat more robust form of the coves in the Great Smoky Mountains (Fig. 445 d. Thunderhead, Tennessee side) show a stout penis, in length somewhat more than half the diameter of the shell, the upper end of the penial cavity separated from the cavity receiving the vas deferens. Lower down there is a single large pilaster. The retractor muscle is short and broad. The vagina is very short. Length of penis 9 mm., retractor 4 mm., vagina 2 mm., spermatheca and duct 7 mm.; diameter of shell 16.4 mm., a small parietal tooth present.

The specimen dissected from Roan Mountain, Carter Co., Tenn. (Fig. 445 A) is so different that another species seems indicated, but I have not found any material difference in the shells. The penis is very long, as in *M. perigrapta*, exceeding 1½ times the diameter of shell. The rather large



cavity has several low longitudinal ridges. The penial retractor is very short. Length of penis 26 mm., vagina 4.5 mm., spermatheca 6.5 mm.; diameter of shell 15.2 mm.

(Named for C. M. Wheatley.)

**Mesodon wheatleyi clingmanicus** (Pilsbry)

Fig. 443 e.

*Polygyra wheatleyi clingmanica* Pilsbry, 1904, *Nautilus*, 18: 90.

Shell small, thin and fragile, somewhat transparent, isabella color. The glossy surface is set throughout (except near the apex) with short delicate hairs, readily removed and often in large part lost from old or cleaned shells. The rib-striae found in *wheatleyi* are much weakened or nearly effaced in *clingmanica*. Lip narrow; no parietal tooth.

Height 9 mm., diameter 13.2 mm.

TENNESSEE-NORTH CAROLINA: Near the summit of Clingman Dome, Great Smoky Mountains (Ferriss, Clapp, Walker, Sargent and the author, 1899), Type and paratypes 77616 A.N.S.P.

This very delicate form was found from about 5500 feet at the west end of Clingman Dome to near the summit, 6680 feet, in coniferous forest. By the obsolescence of striation it seems sufficiently differentiated from the typical form of *wheatleyi* from Cherokee County, and from the more solid form prevalent in the Great Smoky Mountains generally, to require a special name; *wheatleyi* proper having close "rib-like striae"; but it may be an ecologic form rather than a subspecies. In life it is usually quite dirty.

MESODON FERRISSI GROUP

Embryonic whorls are finely striate radially, the striae minutely papillose, later whorls finely striate with microscopic spiral lines or with minute papillae; the shell moderately depressed, imperforate, *Mesodon*-like. The single species resembles *Triodopsis dentifera* superficially. An isolated snail.

**Mesodon ferrissi** (Pilsbry)

Fig. 444 a, b.

*Polygyra ferrissi* Pilsbry, 1897, *Nautilus*, 11: 92; 1900, *Proc. Acad. Nat. Sci. Phila.*, pp. 166, 120.—Ferriss, 1900, *Nautilus*, 14: 53.—Clench, 1937, *Nautilus*, 51: 18.

The imperforate, depressed shell resembles *Triodopsis dentifera* in size and shape. It is thin, light yellowish olive, the last whorl, or part of it, isabella color.<sup>1</sup> Surface glossy, the initial half whorl smoothish or having some radial wrinkles, next whorl papillose in radial lines, radial striae gradually beginning, upon which the papillae stand. There are some papillae scattered as far as the end of the penult whorl. Last whorl with fine, rather low striae and fine engraved spiral lines (which are sometimes very weak). The peripherally rounded last whorl descends very little in front, and is but slightly or not contracted behind the lip. The peristome is broadly, flatly

<sup>1</sup> The color fades in the collection. I described fresh shells as having the "last two whorls of a very bright chestnut color, becoming light green on the earlier whorls". This was before we had Ridgway's "Color Standards".

reflected (often recurved at the edge), thickened at the inner edge, white, shading into gray at the outer edge (but when fresh, shading through pink to a broad purple band at the margin). The transparent parietal callus bears a short, oblique tooth, like that of *Triodopsis dentifera*.

Height 12.3 mm., diameter 21.5 mm.;  $4\frac{1}{2}$  whorls. Type.

Height 12.8 mm., diameter 22.7 mm.; 5 whorls. Paratype.

Diameter 19.7 to 20.6 mm. Mt. Guyot.



Fig. 444. a, *Mesodon ferrissi*, near summit Clingman's Dome; b, Andrews Bald, *M. ferrissi sericeus*, type.

TENNESSEE-NORTH CAROLINA: Clingman Dome at about 6500 feet (Ferriss, Clapp, Walker, Pilsbry), Type and paratypes 72662 A.N.S.P.; down to about 4000 feet on the Tennessee side; Andrews Bald; Mirey Ridge; Welch Bald, on the N. C. side south of Silers Bald, 5000 feet (Ferriss and others). Mt. LeConte (G. W. McClure, Clench, Archer). Mt. Guyot (Ferriss). Mt. Collins and New Found Gap, Swain County, N. C. (Archer).

This species differs from *Triodopsis dentifera* by its glossy surface, lacking the minute crinkling which gives *dentifera* a dull appearance; by the papillose early whorls and the color, which is entirely different in fresh specimens. It is confined to the Great Smoky Range and its outlying spurs in both Tennessee and North Carolina.

North and northwest of the summit of Clingman Dome the slope is steep, frequently precipitous, and covered with a talus of large blocks of rock, deeply carpeted with sphagnum and shaded by great balsam firs (*Abies fraseri*, and some *Picea rubens*). Mossy trunks lie in every direction, making progress slow and difficult. Like the other mountains of this ridge, Clingman is a monocline, the massive conglomerate beds dipping steeply to the south or southeast. This results in a rocky talus on the north or northwest slopes, from disintegration of the faulted or eroded edges of the strata, while the other slope is less rugged. It is on the wet and bare under surfaces of blocks resting free from the ground that Ferriss' *Mesodon* lives. Kneeling or lying at length on the wet moss, and peering or crawling into these dark crevices, we found the snails on the rock roofs of the cavities, but only in small numbers. Candles were occasionally of use. A few specimens were taken among the rank herbage near the summit of the ridge. In some places, as on the western slope of Mirey Ridge, the stone was smaller and

the shells among it were got by "quarrying". On Mt. LeConte and near the base of the "chimneys" Clench and Archer found it "mainly on small moss covered rocks on a steep slope with plenty of seepage water."

It varies but little. The largest and smallest specimens are from Andrews Bald, 19.6 and 24.7 mm. diameter. An albinistic specimen, primrose yellow throughout, was taken on Mirey Ridge (72558 A.N.S.P.).

Mrs. George Andrews gave me a specimen which she had received many years ago from Dr. Rugel, who was therefore the first collector of this beautiful snail.

Genitalia of a specimen from Clingman Dome (Figs. 445 G). The rather large, smooth-walled cavity of penis has one distinct pilaster, a low one opposite, the latter enlarging anteriorly. The vas deferens is enlarged and somewhat glandular before its union with the prostate gland. Talon terminating in an oblong body 1 mm. long, which has numerous weak lobes. Length of penis 27 mm., retractor stout, 4 mm., vagina 8, spermatheca and duct 13 mm.; diameter of shell 21.7 mm.

**Mesodon ferrissi sericeus** (Ferriss)

Fig. 444 c.

*Polygyra ferrissi sericea* Ferriss, 1905, Nautilus, 19: 67.

With the shape and apical characters of *M. ferrissi*, this race differs by the silky, not glossy, luster of the surface; the last whorl being densely, minutely papillose, the papillae in irregular spiral trends in large part, but there are no spiral engraved lines. Color in museum specimens tawny olive (but when fresh, "rich reddish brown with a slight olive tint"). The broad lip is white at the inner rim, the outer part dark, as in *ferrissi*. The parietal denticle is smaller than usual in *ferrissi*.

Height 13 mm., diameter 23.3 mm.; 5½ whorls. Type.

Height 13.3 mm., diameter 22.8 mm.; 5 whorls.

NORTH CAROLINA: "Balsam Mt., Swain Co." (Ferriss) or Plott Balsam, Jackson County, Type and paratype 90527 A.N.S.P.

This shell was collected by Ferriss' and Walker's guide on his return journey from the Mt. Mitchell trip of 1901. Ferriss seems to have been in some confusion as to where it was taken. He assumed that it was from Balsam Mountain, a ridge along the Swain-Haywood county line, branching southward from a ridge which runs east from Mt. Guyot; but his letter also mentioned it as "on a branch of the Southern R. R. running on the southeast side of the Smokies." In that case it would be from Plott Balsam of the Great Smoky Mountain National Park topographic map (1926), in Jackson County, North Carolina. I believe this to be the true locality, but only further collections can settle the question.

MESODON BINNEYANUS GROUP

Imperforate to umbilicate, strongly depressed shells with fine striae and minute spiral lines, the aperture not toothed (except in *M. roemeri*), the lip rather narrowly reflected. Distributed from Arkansas to central Texas.

**Mesodon indianorum** (Pilsbry)

Fig. 446 a-c.

*Polygyra divesta indianorum* Pilsbry, 1899, *Nautilus*, 13: 39.—Ferriss, 1900, *Nautilus*, 14: 28.

*Polygyra indianorum* Pilsbry, 1903, *Proc. Acad. Nat. Sci. Phila.*, p. 200.—Pilsbry & Ferriss, 1907, *ibid.*, for 1906, p. 550, pl. 21, figs. 1-8.

The shell is imperforate, depressed, thin, buffy-citrine to ecru-olive, often with a yellowish or dusky growth-rest streak; glossy. Spire very low. Embryonic whorls with short striae radiating from the suture, and a few low ripples extending across the whorl. The last whorl is equably rounded peripherally, impressed around the axial callus, descending but little in front, and somewhat contracted behind the peristome throughout (or only at the base). The striation is very fine and close, weaker at the base, and crossed by close, distinct, engraved spiral lines. The broadly lunate aperture has a narrow, white peristome, reflected throughout, its face convex, the baso-columellar slope straightened. Parietal callus thin, transparent, unarmed.

Height 14.4 mm., diameter 26.1 mm.; 5½ whorls. Type.

Height 15.5 mm., diameter 28.6 mm.; 5¾ whorls. Topotype.

Height 8.5 mm., diameter 16.4 mm.; 5 whorls. Limestone Gap.

Height 11.4 mm., diameter 22.4 mm.; 5½ whorls. Limestone Gap.

Height 13.7 mm., diameter 25.7 mm. Poteau Mt.

ARKANSAS: Poteau Mountains south of Gwynn, Sebastian County, on steep slopes under stones (Pilsbry and Ferriss). Caddo Gap, Montgomery County (Archer).

OKLAHOMA: Tuskahoma, Pushmataha County, Type 76669 A.N.S.P. Stanley, Pushmataha County, and Poteau, LeFlore County (Ferriss). Limestone Gap, Atoka County (Ferriss and Pilsbry).

This snail has a more glossy, much more finely striate shell than *Triodopsis divesta*; it is closely engraved with spiral lines, and is more impressed in the center of the base. The narrow lip it has in common with *T. divesta* and *M. binneyanus*.

At Limestone Gap, on the line of the M. K. & T. R. R., we found *M. indianorum* the commonest species, though living ones were hard to get. The shells are smaller than at Tuskahoma, rarely over 22 mm. diameter, and about 60 per cent of the whole number taken have the umbilicus more or less open. There is a perfect series of gradations from imperforate to as widely umbilicate as some *M. binneyanus*; only three shells of 110 taken by the author were so open as this, and as they were specially looked for, the actual proportion is probably less than 3 per cent.

These umbilicate shells, taken by themselves, might be considered to be *M. binneyanus* were it not that they connect with imperforate *indianorum* by an unbroken series of intergrades, and moreover even those most like *binneyanus* have the columella more widely dilated at the umbilicus.

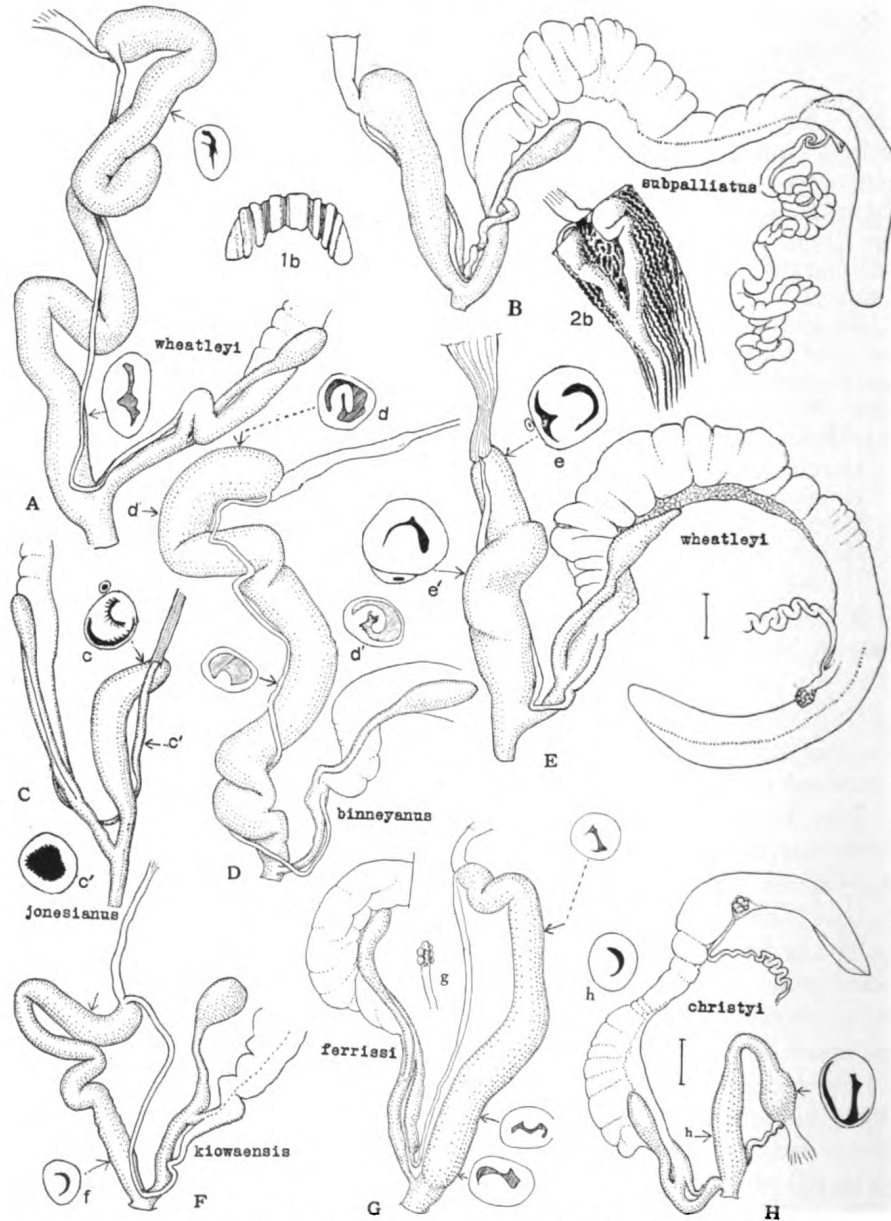


Fig. 445. A, *Mesodon wheatleyi*, Roan Mt., Carter Co., Tenn., with sections of penis. B, *Mesodon subpalliatns*, Magnetic City, with jaw at 1b. C, *Mesodon jonesianus*, topotype, with sections of penis at c and c'. D, *Mesodon binneyanus*, Rocky Cove, Ark., with sections of penis. E, *Mesodon wheatleyi*, Thunderhead. F, *Mesodon kiowaensis*, Limestone Gap, Okla. G, *Mesodon ferrissi*, Clingman Dome, the talon at g. H, *Mesodon christyi*, section of penis at h.

“ It will be seen by the table of measurements in our paper of 1907 that all the specimens (110) from Limestone Gap plotted together would form a curve with two nearly equal, strongly marked modes at the diameters 18 and 21 mm. Separated into three series according to the condition of the umbilicus, it is apparent that the *imperforate* (typical) form is larger than the *perforate*, being from 18 to 22.5 mm. diameter, with the mode at 21 mm., while the *perforate* form is from 16 to 21 mm., with the mode at 18 mm., and the few really *umbilicate* specimens are 16.3 to 16.8 mm. in diameter.” (Pilsbry and Ferriss.)

(*Indianorum*, of the Indians; who formed a large part of the population of “ Indian Territory”, now Oklahoma, when Mr. Ferriss and the author were first there.)

**Mesodon indianorum lioderma** (Pilsbry)

Fig. 446 d.

*Polygyra indianorum lioderma* Pilsbry, 1902, Proc. Acad. Nat. Sci. Phila., p. 511.

The shell is imperforate, somewhat translucent cream-buff, often with an opaque buff, brown-edged growth-rest streak; glossy with much weaker striation than *M. indianorum*; spiral lines weak or partly wanting. Base less impressed around the umbilical callus than *M. indianorum*. 8.9 x 17.7 mm., 4½ whorls; other specimens 16 to 18.5 mm.; diameter, the average of fourteen, 17.2 mm.

OKLAHOMA: Red Fork, Tulsa County (J. H. Ferriss), Type 83281 A.N.S.P.

In the color and surface it is much like *M. roemeri*.

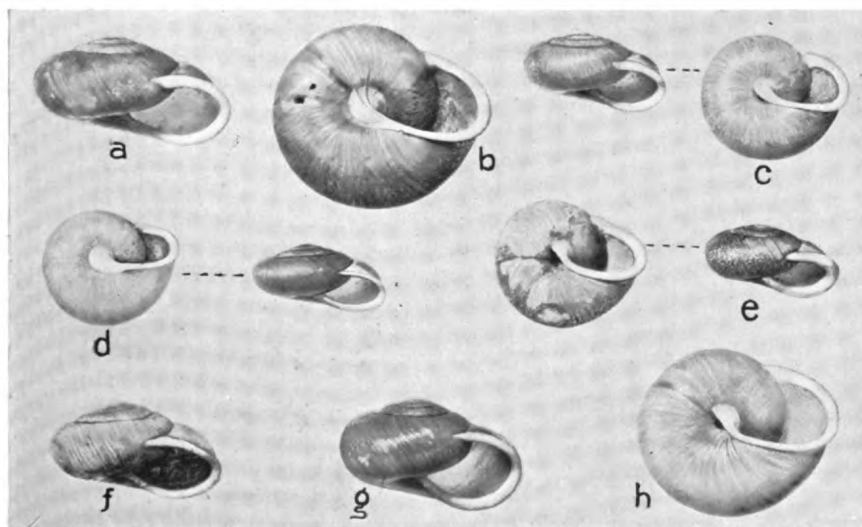


Fig. 446. a, b, *Mesodon indianorum* Tuskahoma, Okla. c, Limestone Gap. d, *M. indianorum lioderma*, Red Fork. e, *Mesodon bimcynus*, Mena, Ark.; f, type; g, Petit Jean Mts.; h, Gilham, Ark.

**Mesodon binneyanus** (Pilsbry)

Fig. 446 e-h.

*Polygyra binneyana* Pilsbry, 1899, *Nautilus*, 13: 38; 1900, *Proc. Acad. Nat. Sci. Phila.*, p. 451; 1903, *ibid.*, p. 201.—Ferriss, 1900, *Nautilus*, 14: 26-28.—Pilsbry & Ferriss, 1907, *Proc. Acad. Nat. Sci. Phila.*, for 1906, p. 548, pl. 21, figs. 9-12.

The shell is narrowly, half-covered umbilicate, depressed, thin, buffy-citrine to ecru-colored, buff behind the lip,<sup>1</sup> (sometimes with a buff growth-rest streak), glossy. Spire very low. Embryonic whorls smooth, with a zone of short striae radiating from the suture. The last whorl is equably rounded at periphery, slightly descending in front, a little contracted behind the lip. The striation is fine and close, as in *P. indianorum*, and it is marked throughout with engraved spiral lines. In some places a microscopic wrinkling may be seen between striae. The broad lunate aperture has a narrow, white peristome reflected throughout, its face convex, the columellar margin dilated half over the umbilicus.

Height 12.8 mm., diameter 22.8 mm.; 5½ whorls. Type.

Height 14 mm., diameter 26.3 mm. Petit Jean Mts.

Height 11.8 mm., diameter 22.5 mm. Petit Jean Mts.

ARKANSAS: Hardy, Sharp County,<sup>2</sup> in drift of the Spring River (Ferriss), Type 104182 A.N.S.P. Magazine Mountain, Logan County; Petit Jean Mountains, Logan-Yell counties (Ferriss and Pilsbry). Mena, Hatton Gap and Rich Mountain, Polk County, and Gilham and Horatio, Sevier County (Ferriss). Caddo Gap, Montgomery County (Archer).

OKLAHOMA: Sugarloaf Mountain and Wister, LeFlore County (Pilsbry and Ferriss). Tuskahoma, Pushmataha County, and Poteau, LeFlore County (Ferriss).

The shell is very similar to *M. indianorum*, but differs by having the umbilicus always partly open, in large numbers seen by Ferriss and myself. The reflection of the peristome extends to the upper insertion, as in *Triodopsis divesta* and *Mesodon indianorum*, and unlike *M. roemeri* and *M. kiowaensis*, in which the lip becomes straight above. It is found mainly on wooded mountains or hill tops, under large stones, rarely under logs; but near Mena, Arkansas, also under stones in creek bottoms. At Tuskahoma it occurred with *M. indianorum*.

The specimens from Oklahoma are much smaller than those from Arkansas, as may be seen from the table of measurements in our paper of 1907, from which the variation curves may readily be plotted. At Sugar Loaf Mountain the mode is at 19.5 mm. and the largest specimen measures 23 mm. in diameter, while in Arkansas the mode is at 24 to 26 mm., and the largest specimen measures 28.2 mm. Curiously enough, at Tuskahoma,

<sup>1</sup> As the type was a dead shell, the color and fine sculpture are described from fresh specimens from Gilham, Sevier Co., Ark.

<sup>2</sup> Hardy, Ark. seems well out of the usual range of this species. Ferriss took the type in the course of a hasty winter trip, and there is just the possibility of mistake in the locality, though this seems unlikely. Cf. Ferriss, *Nautilus* 14: 28.

where the largest *indianorum* were found, *binneyana* was small, about 19.6 mm. in diameter.

Genitalia (Fig. 445 D, Mena, Ark.) characterized by a very long penis, exceeding the diameter of the shell. The large pilaster is folded over in the upper part in the specimen sectioned (fig. d'), becoming simple in the middle and anteriorly. Length of penis 33 mm., retractor 13 mm., vagina 9 mm., spermatheca and duct 11 mm.; diameter of shell 22.8 mm.

(This beautiful snail was named for William G. Binney.)

**Mesodon binneyanus chastatensis** (Pilsbry & Ferriss)

*Polygyra binneyana chastatensis* Pilsbry & Ferriss, 1907, Proc. Acad. Nat. Sci. Phila., for 1906, p. 549.

Form, color and sculpture about as in *M. binneyanus*, but the reflected lip is relatively much wider, 1.7 to 1.8 mm.

Height 10 mm., diameter 19.7 mm.; umbilicus 1.4 mm.; fully 5 whorls.

Height 9 mm., diameter 17.8 mm.; 4 $\frac{1}{4}$  whorls.

Height 9.8 mm., diameter 17.8 mm.; 4 $\frac{3}{4}$  whorls.

ARKANSAS: Chastat Mountains, four miles south of Mena, Polk County (Ferriss), Type and paratypes 78655 A.N.S.P.

This race was mentioned by Ferriss, *Nautilus*, 14: 29. In *M. binneyanus* of 17.5 mm. diameter, the peristome is only 1.1 mm. wide (measured above middle of outer lip).

**Mesodon clenchi** (Rehder)

Fig. 447.

*Polygyra clenchi* Rehder, 1932, *Nautilus*, 45: 129, pl. 10, figs. 1-3.

"Shell rather solid, depressed, upper surface rather flattened; openly umbilicate, the diameter of the umbilicus one-tenth that of the shell. Whorls about five, flattened on top; last whorl rounded at the periphery. The color is dark straw with a dull luster. The sculpture consists of rather low

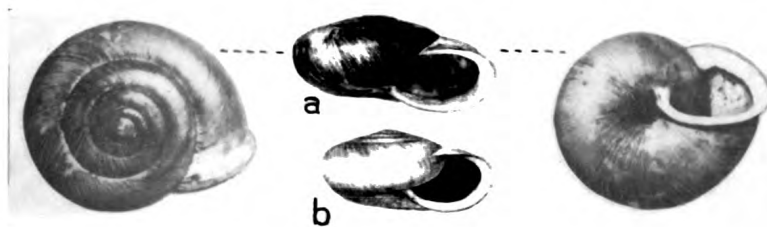


Fig. 447. *Mesodon clenchi*. a, type, after Clench, enlarged; b, paratype, actual size.

irregular striations (not as regular as in *P. indianorum* Pils.) and minute, irregular, impressed, spiral lines; nuclear whorls smooth. Aperture sub-circular, slightly oblique. Peristome white, thickened, the upper part hardly expanded, the lower part expanded but not reflected. A very thin glaze joins the ends of the peristome." (Rehder.)



- Maj. diameter 20.9, min. diameter 17.5, alt. 10 mm.; whorls 5. Type.  
 Maj. diameter 22.2, min. diameter 18.5, alt. 10.5 mm.; whorls 5. Paratype.  
 Maj. diameter 21.2, min. diameter 17.9, alt. 9.5 mm.; whorls 5. Paratype.  
 Maj. diameter 19.8, min. diameter 16.8, alt. 9.0 mm.; whorls 4½. Paratype.

ARKANSAS: At foot of dolomitic bluffs of White River at Calico Rock, IZARD COUNTY (Ernest J. Palmer). Holotype 81347 M.C.Z., paratype in Rehder Collection.

"This species is close to *P. indianorum* Pils. in general shape, and in the minute spiral lines, but differs in being less regularly and distinctly finely striate, and in being widely umbilicate. It seems to lack the gloss seen in *indianorum*. It also differs in having the upper part of the lip not expanded, being in this respect like *P. roemeri* Pfr. The rest of the lip is however more expanded than in *roemeri*, but not as much as in *indianorum*, where the lip is subreflected. This gives the lip a rather broader appearance than the lip of *roemeri* and *indianorum*." (Rehder.)

**Mesodon kiowaensis** (Simpson)

Fig. 448 a, b.

*Helix* (*Mesodon*) *kiowaensis* Simpson, 1888, Proc. U. S. Nat. Mus., 11: 450.—Pilsbry, 1893, Man. Conch., 8: 155, pl. 50, figs. 13, 14, with var. *arkansensis*, p. 156, pl. 50, figs. 11, 12, 15; 1889, Proc. Acad. Nat. Sci. Phila., p. 414, pl. 12, figs. 11, 12 (jaw and teeth).

*Mesodon kiowaensis* Simps., W. G. Binney, 1890, 3rd. Suppl., Bull. Mus. Comp. Zool., 19: 199. (Not the figure, which is *Ashmunella varicifera*).

*Polygyra* (*Mesodon*) *kiowaensis* Simpson, var. *arkansensis* Pilsbry, 1891, Nautilus, 4: 131.

*Mesodon kiowaensis* var. *arkansensis* Pils., Sampson, 1894, Ann. Rep. Geol. Surv. Ark. for 1891, 2: 192.

*Polygyra kiowaensis* (Simpson), Pilsbry & Ferriss, 1907, Proc. Acad. Nat. Sci. Phila., for 1906, p. 547, pl. 21, figs. 17-20.

"Shell umbilicated, orbicularly depressed, solid, dark-brown in color; whorls 5, with numerous rather coarse striae, and fine revolving impressed lines, which are much more conspicuous on the last whorl. Suture deeply impressed, leaving the whorls well rounded; aperture oblique, somewhat

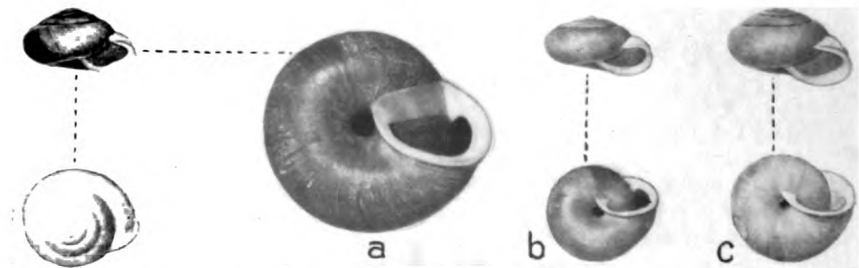


Fig. 448. *Mesodon kiowaensis*. a, type, actual size and  $\times 2$ . b, Limestone Gap, c, Hot Springs, Ark. (form *arkansensis*).

transversely rounded, forming fully three-fourths of a circle; peristome thick and solid, white or purplish, evenly reflected with a slight constriction behind it; umbilicus moderate, deep, exhibiting but little more than one of the whorls. Greater diameter 15, lesser 13 mm.; height 7 mm." (Simpson.)

Height 8.7 mm., diameter 14.5 mm.;  $5\frac{1}{2}$  whorls. Kiowa.

Height 7.6 mm., diameter 15.1 mm.;  $5\frac{1}{2}$  whorls. Limestone Gap.

Height 7.6 mm., diameter 14 mm. Limestone Gap.

Height 9 mm., diameter 15.3 mm.;  $5\frac{1}{2}$  whorls. Magazine Mt.

Height 8.9 mm., diameter 15.6 mm. Magazine Mt.

ARKANSAS: Magazine Mountain, Logan County, on the dry southern slope (Pilsbry and Ferriss). Near Hot Springs, Garland County (Sampson), Types of *arkansaensis*, 61376 A.N.S.P.

OKLAHOMA: Near Eufaula, McIntosh County; Kiowa, Pittsburg County, Type locality (Simpson). Limestone Gap, Atoka County (Simpson, Ferriss and Pilsbry).

A solid, compact shell, with rather narrow, slowly widening whorls, the last very little contracted behind the basal lip. The umbilicus is contained 9 times in the diameter in a paratype, 60057 A.N.S.P. The blunt-edged peristome is well expanded rather than reflected in its outer and basal margins, but not in the upper margin, which is straight, as in *M. roemeri*. It is strongly thickened within. The aperture is decidedly wider than high. None of the shells seen show the embryonic shell perfectly, the first  $1\frac{1}{2}$  whorls appearing smooth, slightly pitted by erosion; if sculpture is present it must be weak. The spiral lines of the last whorl are often faint. There are no papillae.

The form from Hot Springs which I called var. *arkansaensis*, Fig. 448 c, is more robust with somewhat larger aperture and smaller umbilicus. Two measure: 10.7 x 16 mm., umbilicus contained about 12 times in diameter;  $5\frac{1}{2}$  whorls, and 10 x 16 mm. The deviation from *kiowaensis* does not seem sufficient for subspecific segregation.

Genitalia (Figs. 445 f, Limestone Gap, Okla.) with long penis, about equal to the diameter of the shell. Its cavity contains one large and several smaller ridges in the upper part, but only one in the anterior portion (fig. f). Length penis 14 mm., retractor 5 mm., vagina 3 mm., spermatheca and duct 5.5 mm.; diameter of shell 15 mm.

**Mesodon roemeri** (Pfeiffer)

Fig. 448.

*Helix roemeri* Pfeiffer, 1848, Zeitschrift für Malakozoologie, 5: 117.—Roemer, 1849, Texas, p. 455.—Singley, 1893, 4th Ann. Rep. Geol. Surv. Texas, p. 305.—Crandall, Nautilus, 6: 103.

*Mesodon roemeri* Pfr., W. G. Binney, 1878, Terr. Moll., 5: 329, fig. 212; pl. viii, fig. c, and pl. xi, fig. j (anatomy).

*Polygyra roemeri* (Pfr.), Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 316, fig. 7 (genitalia).—Strecker, Nautilus, 22: 65; 24: 4.

“Shell narrowly umbilicate, depressed, thin, closely striatulate, diaphanous, scarcely shining; dull flesh colored; spire scarcely elevated; suture lightly impressed; whorls 5, but slightly convex, the last with periphery subangular. Aperture oblique, lunate; peristome strongly white-lipped, the upper margin straight, the basal reflected, dilated at the columella in a very thin plate half covering the umbilicus. Diameter 10 lines, alt. 5 lines.” (Pfeiffer.)



Fig. 449. *Mesodon roemeri*. a, b, Fort Worth; c, San Antonio.

The color is not far from cinnamon-buff, but varies to chamois. Striation is fine and low with some weak impressed spiral lines on the upper surface, the base smoother. Under the microscope some weak wrinkles parallel to lines of growth, and minute spiral striae may be seen in places. The embryonic whorl is smooth at first, but later has fine radial striae, varying in amount in different specimens. Though Pfeiffer's type was half-covered umbilicate and toothless, others are imperforate and have a parietal tooth, variable in size. The periphery is bluntly angular in front, but becomes rounded behind the lip.

Height 12.8 mm., diameter 24 mm.; fully 5 whorls. Fort Worth.

Height 11.6 mm., diameter 21 mm. Fort Worth.

Height 12.2 mm., diameter 22 mm. San Antonio.

Height 10 mm., diameter 18 mm.;  $4\frac{1}{2}$  whorls. San Antonio.

TEXAS: Fort Worth, Cooke Co. (Sampson, Crandall). 6 mi. northwest of Dallas, Dallas Co. (Cheatum). Tarrant Co. (Askew). Waco, McLennan Co. (Ferriss, Hemp-hill). Belton, Bell Co. (Crandall). Valley of the Saba River (Roemer), Type locality. Falls, Lampasas, Milam and Burnet counties (Singley). 2 mi. east of Mineral Wells, Palo Pinto Co. (Archer). Washington Co. (Bland). Smithville, Bastrop Co. (Ferriss), and near the Travis Co. line (Julia Gardner). Austin, Travis Co. (T. H. Montgomery). New Braunfels, Comal Co., and San Antonio, Bexar Co. (Pilsbry). Hays Co. (Singley).

Pfeiffer gave the locality “Neu Braunfels”, evidently because that was Roemer's headquarters, and the locality of many of his shells. Roemer, who supplied his specimens, gave only “im Thale des San Saba Flusses” in his list of the shells he collected. In my experience the species is rather rare at New Braunfels, and those found there are imperforate.

By the unexpanded upper margin of the lip, this snail differs from *Triodopsis divesta*, *Mesodon binneyanus* and *M. indianorum*.

At Fort Worth, 11 out of 16 have a parietal tooth, all being umbilicate. Of 6 from Dallas, four are toothed, two are umbilicate; diameter from 19.5 to 23 mm. Both imperforate and umbilicate shells occur at Austin, also, though the imperforate predominate. All seen from McLennan, Bell, Bastrop, Washington, Comal and Bexar counties are imperforate.

In a lot of 49, collected under leaves and dead wood in the fringe of woods along the river near San Antonio, 43 are toothed, though in some the tooth is barely perceptible, 6 having none. All are imperforate. It appears that the transition from toothed to plain parietal callus is found almost everywhere, and is very gradual; but the imperforate form, which may be called form *tectus*, is a pure strain in many places.

The spermatheca is scarcely 8 mm. long, about half the length of the penis. The penis contains one large pilaster throughout its length, as shown in the sections. The inner wall is irregularly rugose obliquely. The penial retractor is short, about 3 mm. Vagina 5 mm. long. The specimens dissected were preserved retracted, and had evidently been boiled. All the organs would probably be a little longer in relaxed specimens (Fig. 450).

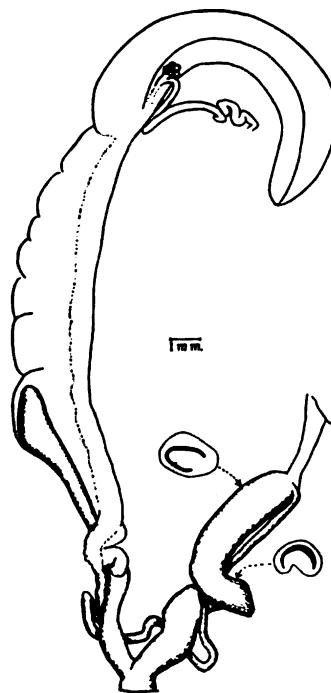


Fig. 450. Genitalia of *Mesodon roemeri*, San Antonio.

(Named for Karl Ferdinand Roemer, 1818-1891, eminent German geologist, who was in Texas in 1845-1847.)

#### Subgenus PATERA Albers

*Patera* Albers, 1850, Die Heliceen, p. 96.—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 326; (*Helix appressa* Say designated type).

*Odotropis* (? Rafinesque, 1819, Journ. Phys., Chim., Hist. Nat., 88: 425), Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 322; (type: *Helix appressa* Say).

? *Odontotropis* Agassiz, 1846, Nomencl. Zool., p. 256 (Emendation of *Odotropis* Raf.).

*Trophodon* Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 322; (type: *Helix appressa* Say). Not *Trophodon* Rafinesque, 1831, Enum. and Acct. Nat. Objects, etc., p. 3.<sup>1</sup>

<sup>1</sup> Under *Mesodon*, which is defined as "differ from *Helix* by lower lip with a tooth", Rafinesque says: "The *G. Trophodon* differ from this by upper lip notched. The *G. Odomphium* by having an ombilic." In 1930 I designated *Helix appressa* Say as type of *Trophodon*, but that species does not agree with Rafinesque's description, and therefore did not conform to the requirements of Opinion 46 of the International Com-

The strongly depressed shell is imperforate, rounded or subangular at periphery, usually with spiral impressed lines or lines of papillae; the apex with fine radial striae (in some species interrupted into granules). The outer lip is toothless, inner margin of basal lip with a somewhat laminar ridge which is obliquely truncate at junction with outer lip. Parietal tooth well developed.

(*Patera*, a saucer.)

The species seem to be well differentiated by the length and form of the penis and the length of vagina, but further examinations of various forms of the *appressa* series are needed. In *M. subpalliatum*, *wetherbyi* and *jonesianus* the apical striae are interrupted into long granules, yet these species appear otherwise related to the *appressus* group.

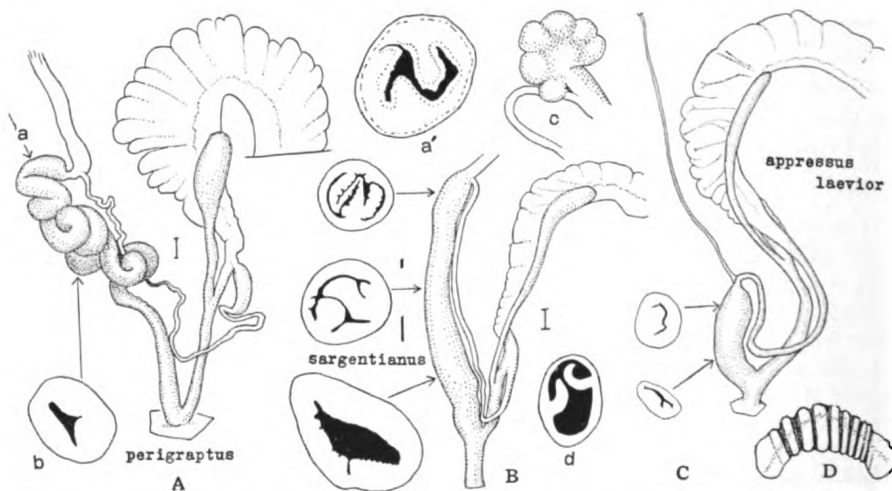


Fig. 451. A. Genitalia of *Mesodon perigraptus*, with sections of penis at a', b, d. and enlarged view of talon at c. B, D. *Mesodon sargentianus*, Woodville, Ala., with three sections of penis and jaw. C. *Mesodon appressus* form *laevior*. (Scale lines = 1 mm.)

#### Key to Species of Subgenus *Patera*

A. Surface having spiral sculpture.

B. Surface with minute papillae, partly arranged in spiral series; height of shell less than half of the diameter.

C. Diameter 12 to 20 mm.; angular or subangular in front.

*M. appressus*

CC. Diameter 22 to 27 mm.; more strongly angular; northern Alabama. .... *M. sargentianus*

mission. This designation cannot stand. I do not know of any *Mesodon*-like species with the "upper lip notched." In *M. appressus* (Say) it is perfectly plain. In 1930 I thought that Rafinesque might have had the "*appressa*" with an upper lip-tooth (= *Triodopsis fosteri*); but a tooth is not a notch. It is idle to waste time over such inadequate work, where one guess is as good as another. Such a demonstration as should be required to justify displacing a clearly established name is not possible with the absurd enigmas loaded on conchology by Rafinesque.

- BB. Surface engraved with clear-cut spiral lines.....*M. perigraptus*  
 AA. No spiral lines or spiral series of papillae; dull, roughened with low points or laminae; height of shell more than half of the diameter.  
 B. Cinnamon-buff; diameter 17.5 to 18.3 mm.; Whitley Co., Ky., Campbell, Morgan and Roane Counties, Tenn.....*M. weltherbyi*  
 BB. Light chestnut-colored; diameter 12.8 to 13.5 mm.; Swain Co., Tenn.  
*M. jonesianus*  
 BBB. Buff to pale yellow; diameter 13.4 to 16.4 mm.; Roan Mt. to Cranberry and Haywood Co., N. C. ....*M. subpalliatius*

**Mesodon appressus** (Say)

Fig. 452 A, a, b, c.

*Helix appressa* Say, 1821, Journ. Acad. Nat. Sci. Phila., 2: 151 (exclusive of "var. a.")

*Triodopsis appressa* Say, Binney, 1878, Terr. Moll., 5: 305, in part.

*Helix linguifera* Férussac, 1821, Tabl. Syst. Fam. Limaçons, p. 33, no. 95. (Les environs de Nogeville, état de Ténese; nude name); Hist. Nat. des Moll., pl. 49A, fig. 3 (date uncertain).

*Helix linguifera* Lamarck, 1822, Anim. sans Vert., 6, pl. 2, p. 90. (Nogeville, état de Ténésé.)

*Polygyra appressa linguifera* (Lam.), Pilsbry & Vanatta, 1924, Nautilus, 38: 4.

*Polygyra appressa sculptior* Chadwick, 1899, Nautilus, 13: 54 (Scott Co., Virginia).

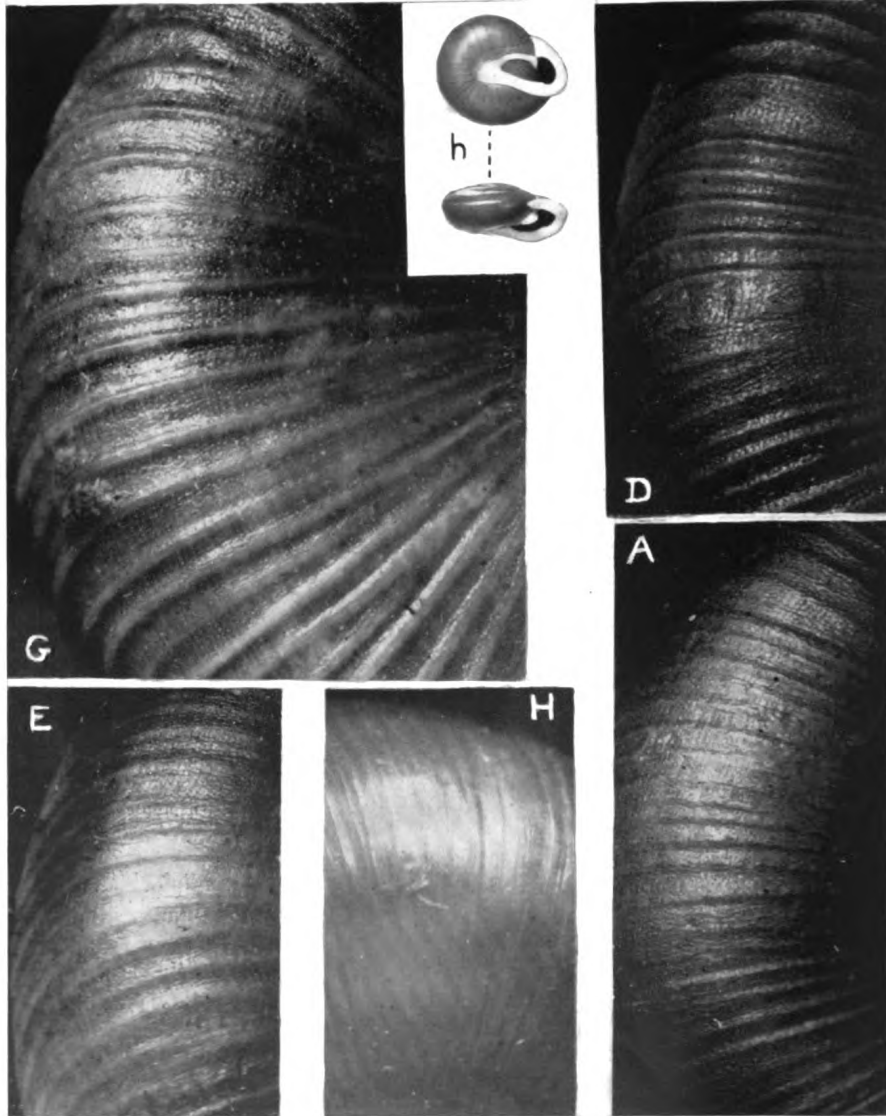
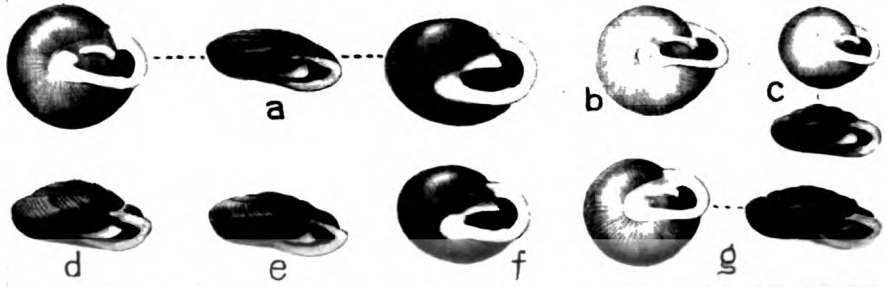
*Helix sancta Georgiensis* Temple Prime, The Bermuda Pocket Almanac, 1853, p. 55 (Bermuda; nude name).—W. G. Lane, Five Essays, etc., The Spiral Snails of Bermuda, p. 2 (no date, but about 1892; nude name).

*Polygyra appressa*, with the synonym *Helix sancta georgiensis*, Verrill, 1902, Trans. Conn. Acad. Sci., 11: 732, text-figs. 75 d, e, f, on p. 730.

*Polygyra appressa extrema* MacMillan, 1940, Nautilus 53: 98.

"Shell depressed, brownish horn color; whorls five, depressed, forming an angle on the external one, more acute near the superior angle of the labrum, with numerous transverse, elevated, equidistant lines, with interstitial grooves; umbilicus covered over with calcareous matter, but concave within; aperture moderate; labrum dilated, reflected, white, margined with brownish; near the base, appressed to the body whorl, and covering the umbilicus; a slight projecting dentiform angle on the inner middle; labrum with a strong, prominent, oblique, compressed, white tooth, which gradually slopes and becomes obsolete towards the umbilicus. Var. a. Labrum with two projecting angles. Breadth, three-fifths of an inch." (Say.)

The somewhat glossy shell is cinnamon-buff above, fading to a paler tint of the same at base. The whorls are rather weakly convex above. The last whorl is decidedly angular at periphery in front, the angle weaker in the latter part; it is contracted close behind the lip, and scarcely descends to the aperture.  $1\frac{1}{2}$  embryonic whorls have fine but not very close striae radiating from the suture. Beginning with the second whorl the striae become coarse, and with their intervals microscopically papillose. On the upper surface of the last whorl part of the papillae are strung into spiral lines, but on the base they are closely scattered, and the striae are much weaker. There are no smooth engraved spirals. The strongly oblique aperture is symmetrically lunate. Peristome broad, flattened, white with tinted edge, strongly thickened within, with a blade-like rim within the basal margin, which is truncate at junction of basal and outer margins. No trace of a tooth within the outer arc of the lip. The dilated columellar end of the lip is concave and appressed over the umbilicus. The parietal wall



bears a rather long, curved, obliquely entering tooth, high at its outer third, sloping down towards, but usually not connected with, the axial callus.

Height 9 mm., diameter 19.5 mm.; 5 whorls. Gallipolis, Ohio.

Height 7 mm., diameter 16.6 mm.; 4 $\frac{3}{4}$  whorls. Gallipolis, Ohio.

Height 7.3 mm., diameter 15.5 mm. Cincinnati.

Height 8.7 mm., diameter 18.6 mm. Cincinnati.

The h/d index is from 41.5 to 46.2 in Gallipolis specimens.

OHIO: Gallipolis, Gallia Co. (Say, Goodrich); type locality; neotype 95288 University of Michigan, Museum of Zoology. Cincinnati (Wetherby, C. R. Judge, Sterki).

INDIANA: Lawrenceburg (Billups).

VIRGINIA: Natural Bridge, Rockbridge Co. (Clench & Archer). 6 mi. west of Wytheville, Wythe Co. (Pilsbry). 19 mi. southwest of Tazewell, Tazewell Co., Cedar Creek, north of Lebanon, Russell Co., and 2 $\frac{1}{2}$  mi. south of Jonesville, Lee Co. (Clench & Archer). Scott Co. (Chadwick, type of *sculptior* Chadw., 76751 A.N.S.P.)

KENTUCKY: Frankfort, Franklin Co. (S. N. Rhoads). Quicksand, Breathitt Co. (W. D. Funkhouser). Mammoth Cave, Edmonson Co. (J. B. Clark). Monticello, Wayne Co. (B. R. Bales). Pine Mt., Harlan Co. (Witmer Stone). Between Cumberland Falls and Eagle Falls, McCreary Co. (Francis Harper).

TENNESSEE: Richland Creek, Davison Co. (S. N. Rhoads). Oakdale, Morgan Co. (Clapp). Jefferson Co. (Rugel). 2 mi. west of Kingston, Roane Co. (Clench). Knoxville, Knox Co. (Pilsbry). Chattanooga, Hamilton Co. (S. N. Rhoads). Ooltewah, James Co. (Clench & Archer).

ALABAMA: Widow's Creek, Jackson Co. (C. B. Moore). Colbert Co. (Archer).<sup>1</sup>

Say stated: "Inhabits banks of the Ohio and Missouri. This species is very common on the banks of the Ohio below Gallipolis; I also found it near Council Bluff." His description evidently was drawn from the Ohio form in which there is no upper lip tooth, while his "Var. *a*, labrum with two projecting angles" is the western form, now called *Triodopsis fosteri*. Since Say did not notice the minute sculpture I have given a supplementary description of topotypes from Gallipolis, Gallia County, Ohio, collected by Mr. Calvin Goodrich, one of them selected as neotype (Fig. 452 A, a).

*M. appressus appressus* (Say), (Fig. 452 A, a, Gallipolis, O.) has rather close striation, about 3 $\frac{1}{2}$  striae in one millimeter (measured above periphery,

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Fig. 452. A, a, *Mesodon appressus*, Gallipolis, Ohio; b, Cincinnati. c, *M. appressus f. sancligeorgiensis*, Bermuda. d, d, *M. appressus f. sculptior*, type. e, e, f, *M. appressus f. linguiferus*, Knoxville. g, g, *M. appressus f. extremus*, Jefferson Co., Tenn. h, h, *M. appressus f. laevior*, Nashville, Tenn. (Figures A, D, E, G, H, portions of base  $\times 10$ .) Illustration on p. 750.

<sup>1</sup> Walker, 1928, recorded typical *appressus* from Cherokee, Jackson, Lauderdale, Madison, Mobile and Shelby counties, Alabama. These may be form *laevior*; I do not know what his ideal of *appressus* was. Archer did not find it in Mobile and Shelby counties, and doubts its occurrence there. Walker recorded *sculptior* from Stevenson and Jackson counties, Ala.

Mr. Vanatta picked up a small dead specimen of *appressus* on the Chester River, opposite Chesterton, Queen Anne Co., Maryland. There is another from Wilmington, N. C., in Swift Collection. Both of these places seem so far out of the range of *appressus* that they require confirmation. Archer has given me the locality Atlanta, Ga., introduced.



a short distance behind the lip). On the upper surface of last whorl the minute papillae are partly arranged along delicate spiral lines, but on the base they are typically scattered irregularly and closely. However, in other lots the striae are more widely spaced, and the spiral lines of papillae continue over the base. This is the case in some Cincinnati lots, but not in others, the shells otherwise the same.

There is also an albinistic form at Cincinnati (Fig. 452 b), mentioned by Wetherby (*Nautilus*, 8: 14). It is sea-foam green throughout, glossy, and under the microscope shows delicate closely strewn papillae both over the striae above and on the smoother basal surface, or in some shells there are some delicate spirals above, and either scattered papillae on the base, or papillae may be almost obsolete there.

Dr. Archer informs me that in Alabama *appressus* is very abundant in urban stone walls and on weedy lots, and is chiefly confined to calcareous soils, while *perigraptus* occurs on non-calcareous soils.

Included in *appressus* are several racial strains having similar sculptural characters but varying so widely in degree of development of the fine sculpture as well as the striation, that extreme forms appear distinct, and have been named. The prevalence of numerous intermediate stages, together with the absence of apparent geographic or ecologic segregation, seems to forbid recognition of several subspecies, which in any case would have nebulous limits; yet the differences cannot be attributed wholly to ecologic conditions. *M. appressus* in the Appalachians and Cumberland plateau calls for further study, with more material than is available to me from Kentucky, Tennessee and neighboring states.

(1). The Knoxville, Tennessee, form *linguiferus* Lamarck, (Figs. 452 e, e, f), has coarser striae than typical *appressus*, about 2.4 in one millimeter, and the peripheral angle is perceptibly more acute. The minute sculpture is the same. Specimens of one lot measure: 8.4 x 18.5 mm.; 7.8 x 15.8 mm.; 7.3 x 16.6 mm. The ordinary Cincinnati form of *appressus* also has the striae as widely spaced, but they are weaker than in Knoxville shells.

(2). In the form *sculptior* Chadwick, from Scott County, Virginia (Figs. 452 d, d), the rib-striae are still coarser, about 2.2 in one mm., the peripheral angle is blunter and the papillae are mostly in spiral lines, even on the base. Diameter 14.9 to 18 mm.

(3). The Bermuda form *sanctageorgiensis* "Prime" Verrill, (Figs. 452 c), is uniformly small, in large numbers seen, diameter 11.8 to 15.8 mm., but mainly from 13 to 14 mm., 4½ whorls. It is rib-striate above, the base nearly free of striae in front of the aperture. Minute sculpture as described for *appressus*. The lip is relatively wider than usual in *appressus*.

Specimens closely similar to those of Bermuda were taken by Dr. H. B. Baker in Carter County, Tennessee, on the eastern outliers of Roan Mt. and at Valley Forge. The small shells about 14 mm. diameter, taken at the

Natural Bridge, Virginia, by Clench, Archer and Rehder, are also similar. Probably the Bermuda colony was accidentally transplanted from somewhere in Virginia, in colonial times.

(4). Form *laevior* new form (Fig. 452 H, h), is somewhat less distinctly angular at periphery but otherwise shaped like *appressus*; glossy; the striation is about as in *M. appressus* but usually weaker, but the minute sculpture is much reduced. The papillae are few, forming thin spiral lines on the upper surface, the base has the striae subobsolete except for a space behind the lip, and there are very weak traces of papillae or none; no spiral lines. Aperture as in *appressus*.

Height 7.8, diameter 17 mm.; or smaller 7.5 x 16 mm. and 7.2 x 15.2 mm.

TENNESSEE: Abundant at Nashville, the type and paratypes, 144676 A.N.S.P., from grounds of the State Capitol (J. B. Clark, July 28, 1927).

KENTUCKY: At Mammoth Cave, 8 x 17.5 to 10.2 x 19.3 mm., and west bluff Kentucky River opposite Frankford (S. N. Rhoads). Bowling Green, Warren Co. (L. E. Daniels). Burnside (J. H. Ferriss).

INDIANA: New Albany, Floyd Co. (J. H. Lemon); some of these very high, 10 x 17.2 mm., but others depressed, 8.3 x 18.5 mm. Jeffersonville, Clark Co.

VIRGINIA: Danville (J. B. Clark).

*Mesodon appressus* form *extremus* MacMillan (Figs. 452 G, g). The shell is more distinctly angular at the periphery than form *sculptior*, with the riblets stronger and more widely spaced, the whole surface closely papillose, papillae partially arranged in spiral lines.

Height 8.3 mm., diameter 17.2 mm. or somewhat smaller, diameter 16 mm.

TENNESSEE: Jefferson County (Dr. Rugel), Type 6467 G. H. Clapp Coll., Carnegie Mus., paratypes 71887 A.N.S.P., all from Mrs. George Andrews who received them from Rugel.

Genitalia of typical *M. appressus* of Gallipolis, Ohio, not examined. In the form *linguiferus* from Knoxville, Tenn., the penis has several unequal fleshy ridges, one of which arises close to the foramen where the vas deferens opens, others lower down. A large, low ridge and a smaller one continue forward. The narrow spermatheca is on a slender duct. Length of penis 4 mm., vagina 3 mm., spermatheca and duct 7 mm.; diameter of shell 16 mm.

A dissection of the form *laevior* (Fig. 451 c, Nashville, Tenn.), is distinguishable from *linguiferus* only by the greater length of the vagina, a rather unimportant difference. The difference in the sections of penis shown in the figures is owing to the collapse of that organ in the specimen of *laevior*. A specimen from Danville, Va., measures: length of penis 4 mm., penial retractor 10 mm., spermatheca 8 mm., vagina 5 mm.

(*Appressus*, pressed in—over the umbilicus.)

**Mesodon sargentianus** (Johnson & Pilsbry)

Fig. 453.

*Helix sargenti* Johnson & Pilsbry, 1892, Nautilus, 6: 8. (Not *Helix sargenti* Bland, 1876.)

*Helix sargentiana* Johnson & Pilsbry, 1892, Nautilus, 6: 48.—Pilsbry, 1892, Man. Conch., 8: 153, pl. 50, figs. 1-5.—Sargent, 1892, Nautilus, 6: 77.

*Polygyra sargentiana* J. & P., Pilsbry, 1897, Nautilus, 11: 95.—Wheeler, 1912, Nautilus, 25: 124.—Walker, 1928, Terr. Moll. Alabama, p. 36, fig. 41.

The shell is imperforate, strongly depressed, lens-shaped, the height usually less than half of the diameter; the spire convex, periphery strongly angular or subcarinate, base convex, but rather deeply impressed in the center; moderately solid. Surface somewhat glossy, the first  $1\frac{1}{2}$  whorls finely and closely striate. Later whorls are rib-striate, the intervals minutely papillose, the papillae in spiral trends in places. There are also some weak minute wrinkles in the direction of growth lines. On the base



Fig. 453. *Mesodon sargentianus*, type (at left) and paratypes.

the striae are much weaker, but the papillae remain well developed. The last whorl descends but little in front, and is subcarinate, the angle weakening near the outer lip. The white peristome is rather broadly reflected, thickened within, the basal margin having a long, blade-like lamina, truncate at its outer end. Parietal callus thin, bearing a large, curved tooth, high near its inner end, not reaching to the umbilical callus.

Height 11.8 mm., diameter 24 mm., 6 whorls. Type.

Height 13 mm., diameter 26.8 mm. Topotype.

Height 10.4 mm., diameter 22.3 mm. Woodville.

ALABAMA: Woodville, Jackson County (H. E. Sargent), Type and paratypes 11265 A.N.S.P. Princeton (H. H. Smith); Keel Mountain, Paint Rock (Clench & Archer). Madison County at Monte Sano (Clench & Archer); near Gurley (H. H. Smith, H. B. Baker); hill two miles east of Gurley (Clench & Archer).

This fine snail is closely similar to *M. appressus* in minute sculpture, but it is always larger with a strongly angular periphery. Young of the same size are more widely umbilicate. In one of 16.2 mm. diameter the umbilicus is 2 mm. wide. In the type lot part of the shells have a dark growth-rest streak on the last whorl, but in most specimens growth seems to have been continuous.

In Gurley specimens the striation is weaker and finer than in those of Jackson County. In a lot collected by Dr. Baker the papillation remains nearly typical, though there is a greater tendency towards arrangement in spiral lines.

In a lot collected at Gurley by H.H. Smith the papillae are well developed on the penult whorl but disappear on the last turn, being replaced by engraved spiral lines, as in *M. perigraptus*. This form may be called form *heterodoxus*, the type 90252 A.N.S.P. The specimens from a hill two miles east of Gurley also belong here.

A. F. Archer informs me that *M. sargentianus* prefers deep hollows under limestone slabs, and seems abundant in the entrances of caves.

Genitalia figured (Figs. 451 B) from a Princeton, Ala., specimen. The penis has two cavities separated by a partition for a short distance at the apex. In the middle there are two main pilasters and several minor ridges; further forward the large ridges disappear. The vagina is shorter and the spermathecal duct longer than in *M. perigraptus*. Length of penis 13 mm., vagina 2 mm., spermatheca 11 mm.; diameter of shell 25 mm. In another specimen from Woodville, Ala., the penis and the spermatheca with duct are 7 mm. long.

**Mesodon perigraptus** Pilsbry

Fig. 454 a-d.

*Helix appressa* Say, in part, Binney, 1851, Terr. Moll., 2: 140, pl. 13, upper and lower figs.—Wetherby in part, 1894, Nautilus, 8: 14.

*Triodopsis appressa* Say, in part, W. G. Binney, 1878, Terr. Moll., 5: 305, description and pl. 13, upper and lower figs.; pl. xi, fig. κ (genitalia).—Sampson, 1894, Ann. Rep. Geol. Surv. Ark. for 1891, 2: 187 (Carroll and Crawford counties only).

*Polygyra appressa perigrapta* Pilsbry, 1894, Nautilus, 7: 140; 1900, Proc. Acad. Nat. Sci. Phila., p. 122; 1903, *ibid.*, p. 201; Walker & Pilsbry, 1902, *ibid.*, p. 424.—Walker, 1928, Terr. Moll. Alabama, p. 38.

*Polygyra appressa tryoniana* Pilsbry, 1904, Nautilus, 18: 89.

The shell is depressed, glossy, chamois colored. Striation very fine and close, weaker on the base in front, the later whorls cut by engraved spiral lines throughout. The broadly reflected lip has no tooth in the outer arc, basal margin with a blade-like thickening within, truncate at its outer end.

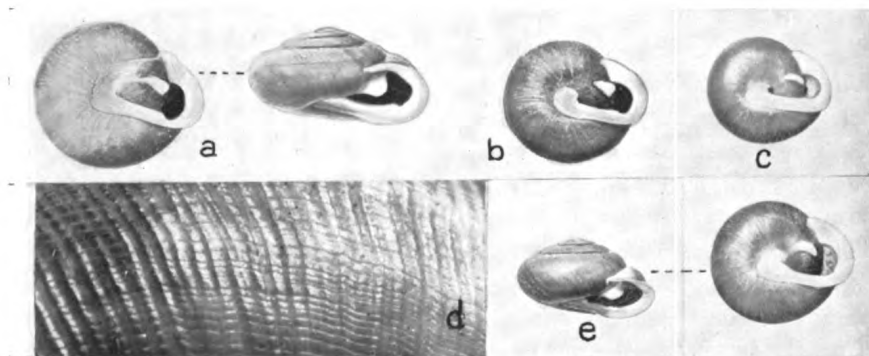


Fig. 454. *Mesodon perigraptus*, a, type and paratype; b, Columbia, Ga.; c, Wilson Cove, Mt. Mitchell, N. C.; d, foot of Bald Mt., Blount Co., Tenn., basal sculpture  $\times 10$ . e, *M. perigraptus tryonianus*, paratype and type.

Parietal tooth short and high, widely separated from the axial callus, but generally a very low callous ridge runs nearly to the latter (but this is often weak or wanting).

Height 12.6 mm., diameter 23.4 mm.; 5 $\frac{1}{4}$  whorls. Type.

Height 11.4 mm., diameter 20.8 mm. Woodville, Ala.

Height 11.9 mm., diameter 23 mm. Thunderhead Mt.

Height 8.5 mm., diameter 15.8 mm. Mt. LeConte.

TENNESSEE: Bledsoe Co. at W. Pikeville and Fraley Gap (H. B. Baker). Cade and Tuckaleechee coves, Thunderhead Mt., Blount Co. (Pilsbry). Walland (Clench). 7 mi. east of Smithville, DeKalb Co. (Pilsbry). Sewanee, Franklin Co. (H. H. Smith). Walden's Ridge, Hamilton Co. (Rhoads); Chattanooga (H. C. Richards). Black Oak Ridge, Knox Co. (H. B. Baker). Kimball, Marion Co. (Clench & Archer); Dove and Kelly Cove, Fullerton Bluff and Prior Cove (H. B. Baker). Tellico Gorge, Monroe Co. Oakdale, Morgan Co. (Clapp). Samburg, Obion Co. (Rhoads). Polk Co. (G. H. Clapp). Harriman, Roane Co. (Rhoads). Mt. LeConte, Sevier Co. (Clench & Archer). Raleigh, Shelby Co. (Rhoads). Limestone Cove, Unicoi Co. (H. B. Baker); Erwin (H. G. Richards).

NORTH CAROLINA: Blowing Springs, Nantahala Mts. (Clench). Balsam, Jackson Co. (J. B. Clark). Cherokee Co. (Bland). Paintrock, Madison Co.; Bluff Mt. and Wilson Cove, Mt. Mitchell (Walker). Transylvania and Macon counties (Archer).

SOUTH CAROLINA: Gaffney, Cherokee Co. (Archer). Abbeville Co. (A. D. Brown). Columbia, Richland Co. (S. N. Rhoads). Dela, McCormick Co. (A. P. Jacot).

GEORGIA: Altamaha Swamp (A. D. Brown). Stone Mountain, DeKalb Co. (J. B. Clark). Presley, Towns Co. (Jess White). Columbus (A. D. Brown). Halfmoon Lake, Baxley (Archer).

FLORIDA: Chipola River near Marianna and at Bailey's Ferry (C. W. Johnson).

ALABAMA: "Generally distributed over the entire state" (Walker<sup>1</sup>). Woodville, Jackson Co. (H. E. Sargent), Type and paratypes 76679 A.N.S.P.

MISSISSIPPI: O'Neil's Landing, Yazoo River, Yazoo Co. (C. B. Moore).

ARKANSAS: Bluffs of White River, Carroll Co. (Sampson). Chester, Crawford Co.; Clinton, Van Buren Co.; Petit Jean, Yell Co.; Little Rock, Pulaski Co. (Ferriss). Washington Springs, Hempstead Co. (S. R. Roberts). Sulphur City, Washington Co. (A. J. Brown). Crittenden Co. opposite Memphis (S. N. Rhoads).

The smooth engraved spirals, usually developed strongly down to the umbilical callus, distinguish this species. It never shows any trace of a superior tooth on the outer arc of the lip in the large number I have seen. The extreme development of the race is seen in specimens having the parietal tooth short and widely separated from the axial callus, such as Figure 454 b.

This is the most common and generally distributed form of the *appressus* group from Tennessee south to the Gulf. West of the Mississippi it apparently occurs over most of Arkansas, though the records are sparsely scattered. In the southern Alleghenies we found it up to about 6000 feet

<sup>1</sup> Walker reported *perigraptus* from 60 places in 39 counties in Alabama, mainly collected by H. H. Smith. There is an old record of *Helix appressa* from Albany, N. Y. The specimen, now in the State Museum, is *M. perigraptus*, but it must have been a stray shell accidentally imported.

(Clingman Dome), as well as in the coves at 2000 and lower. On Mt. LeConte Clench took it from 2000 to 5500 feet. In western Florida and southern Alabama it occurs little above sea level. Dr. Archer informs me that in Alabama it inhabits urban gardens, walls and waste ground in abundance, and in Mobile it is a greenhouse pest.

The size varies independent of the elevation of locality. The smallest are from Mt. LeConte, Tennessee, 8.5 x 15.8 mm.; Wilson Cove, Mt. Mitchell, North Carolina, 16 mm. diameter (Fig. 454 c); Jackson County, North Carolina, 8 x 15.8 mm. At Baily's Ferry, Chipola River, Florida, they run from 17 to 18 mm.

The form called *M. a. tryonianus* Pilsbry (Figs. 454 e), may better be considered a local race subordinate to *perigraptus*. The wide peristome and absence of truncation of the basal lip-callus which characterize it, are rather variable features in *perigraptus*. It has the engraved spirals of *perigraptus*, a rather high spire and distinctly angular periphery. This form I have seen from Tryon, Polk County and Cherokee County, North Carolina. The type, 88769 A.N.S.P., measures 10.5 x 17.4 mm.;  $5\frac{2}{3}$  whorls.

Wetherby gave discursive notes on the *H. appressa* group in 1894 (Nautilus, 8: 14). His treatment was somewhat confused, as *perigraptus* was not distinguished from *appressus*, the anatomic differences being then unknown. He had *perigraptus* from Lookout Mt., Tennessee, 23 mm. in diameter, and from Gasper, Pickens County, Georgia; also four shells from Murphy, Cherokee County, North Carolina in which "the upper tooth is well indicated", but with the short parietal tooth and the spiral incised lines of *perigraptus*; this should be looked into; I have never seen it with an upper tooth, which is the mark of *Triodopsis fosteri*. The species has many local strains which deserve far fuller treatment than my material and space allow.

The genitalia (Fig. 451 A, Woodville, Alabama), are characterized by the great length of the penis, about  $1\frac{1}{2}$  times the diameter of the shell. It lies strongly convoluted. At the apex there are two high pilasters within (Fig. 450 d), farther down three (Fig. 450 a'). These become reduced farther forward (Fig. 450 b), and finally there are numerous small unequal ridges. The vas deferens is strongly swollen prior to its entrance into the prostate gland. The talon (Fig. 450 c) is a rosette of six convex lobes, diameter about 1.2 mm. Length of penis 31 mm.; retractor 6 mm.; vagina 6.5 mm.; spermatheca and duct 8.5 mm.; diameter of shell 19.5 mm.

The lung has a netted-maculate pattern in gray.

(*Perigraptus*, engraved around.)

**Mesodon wetherbyi** (Bland)

Fig. 455 a, b.

*Helix wetherbyi* Bland, 1873, Ann. Lyc. Nat. Hist. N. Y., 10: 361.—Wetherby, 1878, Amer. Nat., 12: 392.

*Mesodon wetherbyi* Bld., W. G. Binney, 1878, Terr. Moll., 5: 330, fig. 213, pl. viii, fig. D (teeth); Man. Amer. L. Sh., p. 313.

*Polygyra wetherbyi* (Bld.), Pilsbry & Rhoads, 1896, Proc. Acad. Nat. Sci. Phila., p. 491.—Clapp, 1899, Nautilus, 13: 70.

“Shell with umbilicus covered, orbicular-depressed, thin, granulately striate, pale horn-colored; epidermis dark, covered with oblique, prostrate hairs; spire somewhat conoidal, suture impressed, apex obtuse; whorls five, slightly convex, gradually increasing, the last suddenly deflected, rather gibbous, constricted, beneath convex, subangulate at the periphery, aperture

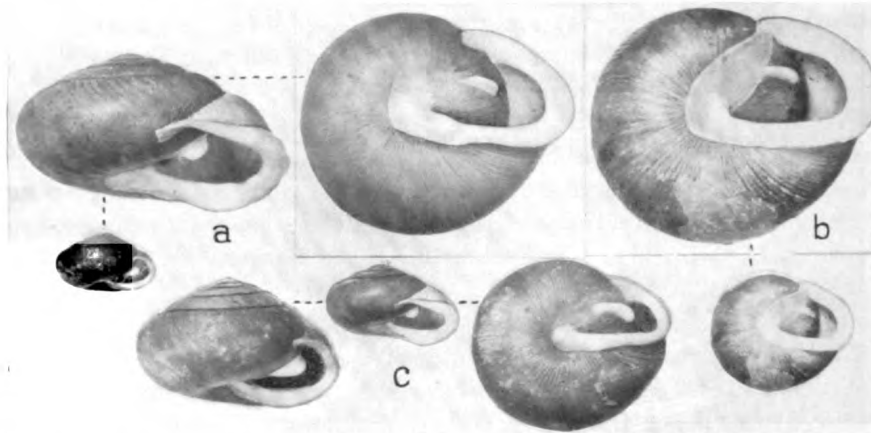


Fig. 455. a, *Mesodon wetherbyi*, Whitley Co., Kentucky; b, Harriman, Tennessee. c, *Mesodon jonesianus*, type. ( $\times 2$  and actual size.)

oblique, roundly lunate, with a white, erect, oblique, tongue-shaped parietal tooth; peristome thickened, angularly reflected, the upper margin expanded, the columella margin dilated, covering the umbilical perforation. Diameter maj. 17, min. 15 mill.; alt. 8 mill.” (Bland.)

Height 10.5 mm., diameter 17.5 mm.;  $5\frac{1}{2}$  whorls. Topotype, orig. lot.  
Height 11.4 mm., diameter 18.3 mm.;  $5\frac{3}{4}$  whorls. Harriman.

**KENTUCKY:** At base of sandstone cliffs, mouth of Laurel River, Whitley County (A. G. Wetherby), Type 39451 U.S.N.M. Burnside, Pulaski County (Ferriss)

**TENNESSEE:** Campbell County (W. G. Binney); bluff along Emory River, Oakdale, Morgan County (G. H. Clapp); wooded rocky banks of Emory River, Harriman, Roane County (S. N. Rhoads).

With the shape, flatly reflected lip and parietal tooth as in *Triodopsis dentifera*, this species differs in sculpture. The first whorl appears to have sculpture much like that of *subpalliata*, but almost worn away in those seen. On the last whorl the striation is rather uneven and not strong; strewn over it there are small prominences which form foci for dark, adnate, narrow periostracal wrinkles, which look like “prostrate hairs” as Bland called

them. There is also some minute wrinkling parallel to striae in some places. No spiral lines anywhere.

In a specimen from Roane County the periostracal appendages are wanting but the roughened surface remains. It is a "dead" shell.

The color is dull cinnamon-buff. At the junction of the basal and outer margins of the peristome there is an inconspicuous notch in the inner rim, sometimes hardly perceptible, but which is significant as it shows the relationship to *subpalliatum* and the *appressus* group.

"This species is distributed, so far as traced, through the carboniferous sand hills of southern Kentucky and northern Tennessee, but occurs only rarely, at the foot of cliffs under leaves, or deeply buried under well-rotted logs. The shell is often coated with a mass of sticky dirt, made up of earth and the mucous secreted by the animal, which it is impossible to remove, unless after thorough soaking, without stripping the epidermis from the shell. The animal is bluish-black and finely granulated; the tentacles are very slender and the foot attenuated and sharply keeled behind." (Wetherby.)

**Mesodon jonesianus** (Archer)

Fig. 455 c.

*Polygyra* (*Mesodon*) *jonesiana* Archer, 1938, *Nautilus*, 51: 135, pl. 9, fig. 9.

"Shell rather small, imperforate, rather solid, subglobose, concave in the umbilical region, dull and faintly hirsute. Color light chestnut; nuclear whorl eroded, dirty white. Parietal lamella white; peristome white, edged with a faint reddish brown. Whorls 5½, gradually increasing, gently convex; nuclear whorl nearly flat. Suture impressed throughout. Body whorl gently bulging behind the peristome; area immediately behind the peristome deeply impressed. Aperture oblique, lunate. Peristome rather narrow except in the basal area, reflected; edge of peristome rather sharp; surface of peristome dished and concave directly above the anal sinus; the rest of the surface convex. Outer denticle present in the form of a slight, rounded boss; basal denticle, a faint curve inwards towards the parietal wall, and nearly continuous with the thickened, undifferentiated rim of the basal peristome. Parietal lamella rather prominent slightly curved, and robust; the proximal portion of the lamella much more elongated than the distal portion. The umbilical region covered by a broad callus, rather impressed. The nuclear whorl and the two succeeding whorls covered with faint, irregular, axial riblets. The fourth whorl and the body whorl covered with rather widely spaced axial riblets which tend to become faint below the periphery in the region just above the parietal callus. From about the third whorl onwards to the groove behind the peristome the shell is covered with spirally disposed longitudinal pits surmounted by cuticular laminae; these laminae in a staggered arrangement. The entire surface of the peristome, parietal lamella, and parietal callus covered with very closely set and very fine beading. Holotype: height 7.5 mm., greater diameter 12.8 mm.; aperture 3 x 5. Paratypes: height 8.5; greater diameter 13-13.5; aperture (of the mature specimen) 3 x 5 mm." (Archer.)



TENNESSEE: Near New Found Gap,  $2\frac{1}{2}$  miles south of Mt. LeConte, Swain County, 4800 feet elevation (A. F. Archer), Type 169583 A.N.S.P., 2 paratypes 169584.

This snail is closely related to *M. wetherbyi* and *M. subpalliatu*s, but differs by the smaller size and the narrower last whorl, viewed from above. There seems also to be some difference in sculpture, but this cannot be fully compared until fresh shells of *wetherbyi* and *jonesianus* with the periostracal development perfect are available. *M. jonesianus* has hyphen-shaped spirally disposed little ridges on the base, which are not apparent in *wetherbyi*. The apical sculpture of *wetherbyi*, *subpalliatu*s and *jonesianus* is practically identical; there are well defined radial striae broken into oblong granules. On parts of the antepenult whorl of *jonesianus*, pustules in forwardly descending series are seen. The aperture is much as in *M. subpalliatu*s. The outer denticle mentioned by Archer is extremely weak; hardly visible in an adult paratype; but it is equally present in some examples of *M. subpalliatu*s.

Dr. Archer writes: "only three specimens of this rare and apparently endemic species are available for diagnosis. I found all three specimens in a very limited area during a field trip in company with H. E. Wheeler." "It inhabits the birch-beech-maple-hemlock forest of the higher elevations. Characteristic trees are *Tsuga canadensis*, *Betula lutea*, *Acer rubrum*, *A. spicata*, *Fagus grandifolia*. *P. jonesiana* does not occur in the talus of massive, moss-covered rocks of the *Polygyra ferrissi* zone, but instead lives in the humus zone. Its habitat is under the top layer of leaves and hemlock spills, or under bark and logs in a cover of fallen limbs and twigs."

Genitalia (Fig. 445 c) having a short partition at apex of penis (c) and a finely corrugated wall with no large ridges in the middle and lower parts of the penis (c').

(Named for Dr. Walter B. Jones of the Alabama Geological Survey.)

**Mesodon subpalliatu**s (Pilsbry)

Fig. 456.

*Polygyra subpalliatu*s Pilsbry, 1893, Nautilus, 7: 7, 140.

*Mesodon wetherbyi* Bld.?, Wetherby, 1881, Journ. Cincinnati Soc. Nat. Hist., 4: 325 (reprinted in Nautilus 7: 6); 1894, Nautilus, 17: 75. Not *H. wetherbyi* Bland.

The shell is imperforate, depressed with low conoid spire and obtuse apex, the last whorl rounded at periphery, descending in front, with a rather deep gutter behind the lip; color deep colonial buff to primrose yellow. Embryonic shell of  $1\frac{1}{2}$  whorls; initial third of a turn smoothish but with some slight radial wrinkles, followed by a radially striate area, the striae more or less dislocated or broken into radially oblong granules, this dense granulation extending to the middle of the second whorl. Later whorls have the striae broken into low oblong granules, which bear erect triangular periostracal processes or sometimes oblique adnate periostracal wrinkles, or



Fig. 456. *Mesodon subpalliatum*, type and paratypes. ( $\times 2$  and actual size.)

in places )-shaped processes; the degree of development of these processes varies widely. In life this sculpture holds a coat of soil. The aperture is lunate. Peristome white, rather widely reflected, the inner rim thickened, especially in the base, where there is a notch in the inner rim at the junction of basal and outer margins. Parietal tooth curved, long and high.

Height 9.6 mm., diameter 15.9 mm.; 5 whorls. Type.

Height 7.3 mm., diameter 13.4 mm.;  $4\frac{1}{2}$  whorls.

Height 9.6 mm., diameter 16.4 mm.

TENNESSEE: Northern outliers of Roan Mountain, Carter County (S. N. Rhoads, H. B. Baker).

NORTH CAROLINA: Roan Mountain, 3500 to 5000 feet (Rhoads). Magnetic City (Wetherby), Type and paratypes 63428 A.N.S.P. Cranberry, Avery County (Jos. Wilcox, H. B. Baker). Mt. Sterling, Haywood County (Archer).

This snail is related to *M. wetherbyi*, but it differs in being smaller, of different color, with a much larger parietal tooth, and with periostracal processes more fully developed. It was considered a variety of *wetherbyi* by Bland and Binney, though I have not seen intermediate forms. Wetherby, who collected both, believed them distinct. In life both are coated with dirt.

Wetherby states that "the station of this species is always *in the dirt* under and beside rotting logs. It is very sluggish and timid, and very rare." "Lives in leaves in damp places during winter and hot, dry weather in summer. During rainy seasons it ascends trees to a great height, being sometimes found on the upper branches."

Genitalia figured from a Magnetic City, N. C. specimen, (Figs. 445 B). The club-shaped penis contains two pilasters in the upper half, converging Y-like to one pilaster anteriorly (Fig. 2 b), the rest of the inner surface being finely zigzag ridged, the ridges plainer anteriorly. The retractor is stout and very short. Spermatheca and duct only about half as long as penis. The hermaphrodite duct was very elaborately knotted. Length of penis 9 mm.; retractor 2 mm., vagina 3 mm., spermatheca 5 mm., diameter of shell 15 mm.

## APPALACHINA new subgenus

The large, depressed shell is openly umbilicate, with either smooth or radially striate embryonic whorls, the later whorls finely striate, and with microscopic spiral lines. The rounded-lunate aperture has small basocolumellar and parietal teeth or none. Penis very long, its length about  $1\frac{1}{2}$  times the diameter of shell.

TYPE: *Mesodon sayanus* (Pilsbry).

The sculpture of embryonic and later whorls is mesodontid, but it differs by the form of the shell and aperture and the very long penis.

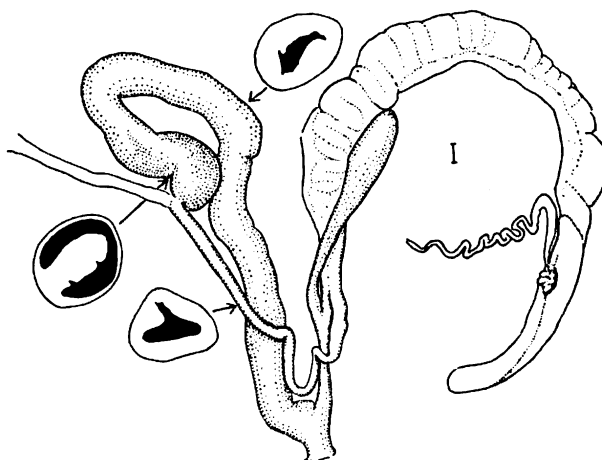


Fig. 457. Genitalia of *Mesodon sayanus*.

**Mesodon sayanus** (Pilsbry)

Fig. 458 a-c.

*Helix diodonta* Say, 1824, Major Long's Second Exped., 2: 257, pl. 15, fig. 4 ("inhabits the state of New York"); (Not *Helix diodonta* Megerle v. Muhlfeld, Férussac, 1822).—Leidy, 1851, Terr. Moll., 1: 256, pl. 11, figs. 1-4 (anatomy).—Wetherby, 1878, American Naturalist, 12: 391; 1881, Journ. Cincinnati Soc. Nat. Hist., 4: 324.

*Helix sayi* Binney, 1840, Boston Journ. Nat. Hist., 3: 379, pl. 16. Not *Helix sayi* Wood, 1828.

*Mesodon sayi* W. G. Binney, 1878, Terr. Moll., 5: 339, pl. 23; pl. viii, fig. v (teeth).—Gratacap, 1901, Bull. Amer. Mus. Nat. Hist., 14: 390.—Lemon, Nautilus, 10: 11 (Ontario).—Morse, 1864, Journ. Portland Soc., 1: 9, fig. 9, pl. 4, fig. 10 (jaw and teeth).

*Polygyra sayii* Binn., Hanham, Nautilus, 11: 100 (Quebec).—Clapp, Nautilus, 14: 63.—Nylander, Nautilus, 8: 126; 10: 100.

*Polygyra sayana* Pilsbry, 1906, Proc. Acad. Nat. Sci. Phila., p. 127.—Walker, 1906, Ill. Cat. Moll. Mich., p. 464, fig. 10.—Johnson, 1915, Fauna of New England, Moll., p. 195.

The shell is umbilicate, umbilicus contained nearly 7 times in diameter; depressed; thin; pale yellow (dilute naples yellow to dilute isabella color); glossy; embryonic  $1\frac{1}{2}$  whorls smooth, the rest finely striate, with microscopic spiral lines. Spire low, convex-conoid. Whorls  $4\frac{1}{2}$  to  $5\frac{1}{2}$ , convex, rather narrow, the last descending slightly in front, rounded at periphery, very

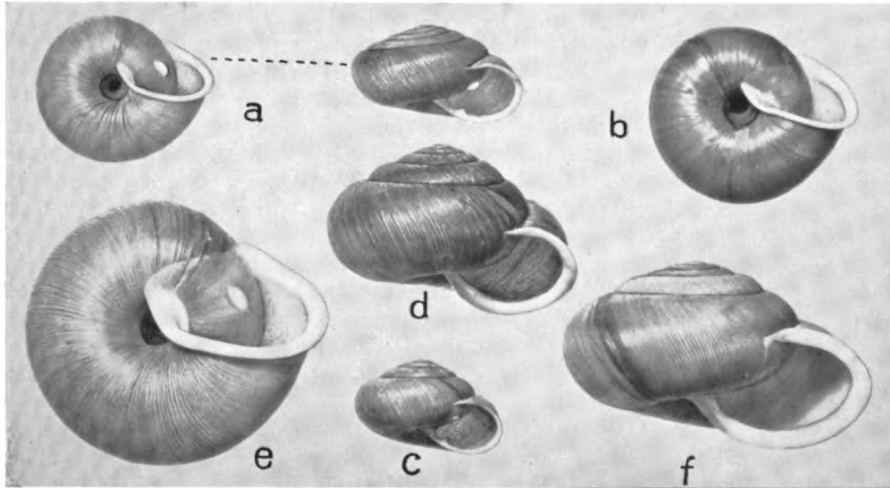


Fig. 458. a, *Mesodon sayanus*, Herkimer Co., N. Y.; b, Burnside, Ky.; c, Knox Co., Me. d, *Mesodon chilhoweensis*, Mirey Ridge; e, Davidson Co., Tenn.; f, Cade's Cove, Tenn.

slightly contracted behind the lip. Aperture rounded-lunate, the lip white, narrow, reflexed throughout, bearing a small, acute tooth on the baso-columellar margin, another small tooth being situated obliquely on the parietal wall.

Height 12.8 mm., diameter 22.7 mm.;  $5\frac{1}{2}$  whorls. Herkimer Co., New York.

Height 15.4 mm., diameter 25 mm. Garrett Co., Maryland.

Height 16 mm., diameter 27 mm. Burnside, Kentucky.

Height 12.5 mm., diameter 19.8 mm. Wise Co., Virginia.

Height 12.4 mm., diameter 19.4 mm. Knox Co., Maine.

QUEBEC: Island of Orleans (Hanham).

ONTARIO: Toronto (Bland); Hamilton (R. Walton).

MAINE: Caribou and Woodland, Aroostook Co. (Nylander). Fairfield, Somerset Co. (A. D. Brown). Bangor, and Capens, Moosehead Lake (C. W. Johnson). Sidney, Kennebec Co. (Bayard Long). Knox Co. (N. W. Lermond). Bethel (Johnson), and Buckfield (J. A. Allen), Oxford Co. Bridgeton, Cumberland Co. (Johnson). Hancock Point, Frenchman's Bay (D. Blaney). North Whitefield, Lincoln Co. (Archer). Kennebunkport (G. H. Clapp).

VERMONT: St. Johnsbury, Mt. Ascutney and Mt. Equinox, near Manchester (Johnson).

MASSACHUSETTS: North Adams (B. Long). Westport and Williamstown (C. W. Johnson).

RHODE ISLAND: Tiverton (Thomson).

NEW YORK: Western Bouquet Mt., Essex Co. (Pilsbry). Racquette Lake, Hamilton Co. (S. N. Rhoads). Rochester (F. C. Baker) and Pittsford (Walton), Monroe Co. Canandaigua Lake, Ontario Co. (Mitchell). Cayuga Lake (Banks), and Ithaca (Van Ingen), Tompkins Co. Watkins Glen, Schuyler Co. (Bayard Long). Onondaga Co.

(Beauchamp). Cazenovia, Madison Co. (J. B. Henderson). Utica, Oneida Co., (Crooke) - Mohawk (Lewis), and Winfield (A. Bailey), Herkimer Co. Sunset Hill and near Oak Creek (Maxwell Smith), and Oneonta (Lewis), Otsego Co. North Creek, Warren Co. (J. B. Henderson). Albany (C. E. Beecher). Slide Mt., Catskills (G. W. Chadwick); Lanesville (Van Ingen); Cairo (Clench); Hunter Mt. (E. A. Mearns), Greene Co. Near Summit, Ulster Co. (Bicknell).

PENNSYLVANIA: Carrolltown, Cambria Co. (Witmer Stone). Round Island, Clinton Co. (S. N. Rhoads). Elk Co. (Bland). Indiana (R. W. Wehrle). Petersburg, Somerset Co. (Stew. Brown).

MARYLAND: Jennings, Garrett Co. (W. Stone).

OHIO: Cincinnati (Shaffer; discredited by Harper and Wetherby, 1876).

MICHIGAN: Saginaw and Alpena Bay (Miles). Douglas Lake, Cheboygan Co. (H. B. Baker). Charlevoix, Emmet, Presque Isle, Huron and Tuscola counties (Walker).

KENTUCKY: Quicksand, Breathitt Co. (W. D. Funkhouser). Burnside, Pulaski Co. (Ferriss). Pine Mountain, Harlan Co. (Witmer Stone). Big Hill, Jackson Co. and Whitley Co. (Bland, in Gratacap).

VIRGINIA: Big Stone Gap, Wise Co. (Clench and Archer). Scott Co. (Archer).

NORTH CAROLINA: Magnetic City and Roan Mt. up to 4500 ft. (Wetherby). Paint-rock, Madison Co., and Wilson's Cove, Mt. Mitchell (Walker and Ferriss).

TENNESSEE: Near Marbleton, Unicoi Co. (H. B. Baker).

The large umbilicus and light color of the thin shell, and the small but constant tooth at base of the columella, are characteristic. The parietal tooth is occasionally lacking, especially in small specimens (Knox Co., Me., Wise Co., Va., and elsewhere), but sometimes in the largest also (27 mm., Burnside, Ky.). The variation in size is probably owing to local ecologic conditions, chiefly the degree of humidity, as it has no geographic relation. The height of the spire varies a good deal. A record from Edgar County, Illinois (Wm. A. Marsh) seems improbable, and is discredited by F. C. Baker.

It lives among leaves on woodland hillsides, also in stone fences and under logs in pastures.

The genitalia (Figs. 456, Aroostook Co., Me.) are characterized by the great length of the penis, as noted by W. G. Binney, about one and a half times the diameter of the shell. Its terminal part (8 mm.) contains a very large pilaster, obliquely grooved on one side. Below that there are only low ridges and a minute vermiculate-granulate texture. The vagina and spermathecal duct are of the usual rather short proportions. Length of penis 31 mm., retractor 10 mm., vagina 5 mm., spermatheca and duct 11 mm.; diameter of shell 21.5 mm. The lung is speckled with gray.

**Mesodon chilhoweensis** (Lewis)

Fig. 458 d-f.

*Helix chilhoweensis* Lewis, 1870, Amer. Journ. Conch., 6: 191, pl. 12, figs. 5, 6, 7; 1875, Proc. Acad. Nat. Sci. Phila., p. 334.—Wetherby, 1878, Amer. Nat., 12: 390.

*Mesodon sayii* Binney, large form (*Mesodon chilhoweensis* on p. 165), W. G. Binney, 1883, Bull. Mus. Comp. Zool., 11: 156, pl. 1, figs. A, B (anatomy), pl. 2, fig. K (shell); 1885, Man. Amer. L. Sh., p. 320, fig. 345.

*Mesodon chilhoweensis* (Lewis), Wetherby, 1894, Journ. Cincinnati Soc. Nat. Hist., 16: 212.

*Polygyra chilhoweensis* (Lewis), Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 118.—Walker, 1902, *ibid.*, p. 424.—Clench, 1937, *Nautilus*, 51: 17.

The shell is depressed with low conoidal spire; umbilicate, the umbilicus contained 8 or 9 times in diameter; rather thin, cream color, usually with one or more narrow olivaceous growth-rest streaks. The convex whorls increase slowly, the last rounded peripherally, not contracted behind the lip. Surface somewhat glossy, the embryonic whorl radially striate, the striae not quite reaching the suture below. Later whorls are covered with close, thread-like striae and close distinctly engraved spiral lines. The white peristome is rather broadly reflected throughout, thickened within, the inner edge of basal margin with a very weak blunt prominence or none at foot of the columella. Parietal callus thin, typically toothless but sometimes bearing a small and low oblique tooth.

Diameter 1.40 inch [= about 35 mm.] (Lewis.)

Height 24 mm., diameter 39.5 mm.;  $6\frac{1}{2}$  whorls. Cade Cove.

Height 23.5 mm., diameter 36.4 mm. Cade Cove.

Height 19 mm., diameter 31.8 mm.;  $6\frac{1}{4}$  whorls. Cade Cove.

TENNESSEE: Chilhowee Mountain, Blount Co. (Annie M. Law), type locality. Sugar and Cade Coves, Blount Co., Mirey Ridge, Proctor's Knob, and "The Balsams", western end of Clingman Dome at about 4800 ft., all on or close to the Tenn.-N. C. boundary (Ferriss, Walker, Pilsbry and Clapp). Mt. LeConte, Sevier Co. (Clench and Archer, G. W. McClure). Coal Creek, Anderson Co. (Mrs. Geo. Andrews). Braden mountain, Campbell Co., and in the Jellico range (A. G. Wetherby). 4 mi. south of Byrdstown, Pickett Co. (W. G. Parris). Alpine, Overton Co. (Paul Adams).

NORTH CAROLINA: Eagle Creek, southeastern slope of Thunderhead, Swain Co. (Ferriss). Paint Rock Creek, Madison Co. (Walker and Ferriss). Yellow Creek, Graham Co., and in Glen Cove, one of the heads of Slick Rock Creek, Unaka mountains (Ferriss). Mt. Sterling, Haywood Co. (Archer).

This magnificent snail differs from *M. sayanus* not only in size but by its more broadly reflected lip, the obsolescence or absence of a baso-columellar tooth and the more distinct and crowded spiral lines. Like *M. sayanus*, it lives in deciduous forest among leaves and brush on the forest floor.

Ferriss reported the extremes of diameter in his collection to be 27.5 and 40 mm. G. H. Clapp gave: height 26.5, diameter 42 mm., as the size of his largest shell, from Bald Mt., Blount County, Tennessee, out of the James Lewis Collection. About 20 percent of the specimens seen have a parietal tooth. None has a distinct tooth at junction of columella and basal margin.

The genitalia do not differ much from *sayanus*, but the ribbing in the lower part of the cavity of penis is more complicated. In a shell of 35.5 mm. diameter the penis was over 55 mm. long. It was much convoluted in the hard alcoholic specimen examined. Vas deferens is strongly bound to penis by fine connective strands.

## INFLECTARIUS new subgenus

[?] *Xolotrema* Rafinesque, 1831, Enum. and Acc., etc., p. 3, for *X. clausa*.—Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila., 82: 323, *X. clausa* Raf. = *Helix inflecta* Say, designated type. Not *Xolotrema* Rafinesque, 1819.

The moderately depressed, compact shell is imperforate (or rarely only partially closed), with rounded periphery. Surface scarcely striate, with a more or less "scaly" periostracum. After the smooth tip the embryonic whorl is radially striate, the striae curved, sometimes not reaching the lower suture. They are often in greater or less degree interrupted in some places into long granules, or appear divaricating, as if crossed by indistinct traces of more strongly oblique striae. Aperture trilobed, the peristome being three-toothed, the basal tooth tuberculiform (or sometimes one or both of the lip teeth are more or less completely obsolete).

TYPE: *M. inflectus* (Say).

Notes on the subgeneric name may be found under *Triodopsis*, subgenus *Xolotrema*.

The blunt summit of the penis, which has no sheath, and the slender duct of the spermatheca, show that these are mesodontid snails, not related to *Triodopsis*, with which they have been associated hitherto.

The genitalia of *M. inflectus* (Fig. 459 A, Magazine Mt., Ark.) show a large and a small pilaster in the upper part (Fig. a'), with numerous unequal longitudinal ridges. Below the middle there is a single large pilaster, with many minor ridges. Retractor muscle is short. The vagina is rather long. The talon is partly imbedded in the albumen gland. Length of penis 7 mm., vagina 3 mm., spermatheca and duct 6 mm.; diameter of shell 10.3 mm.

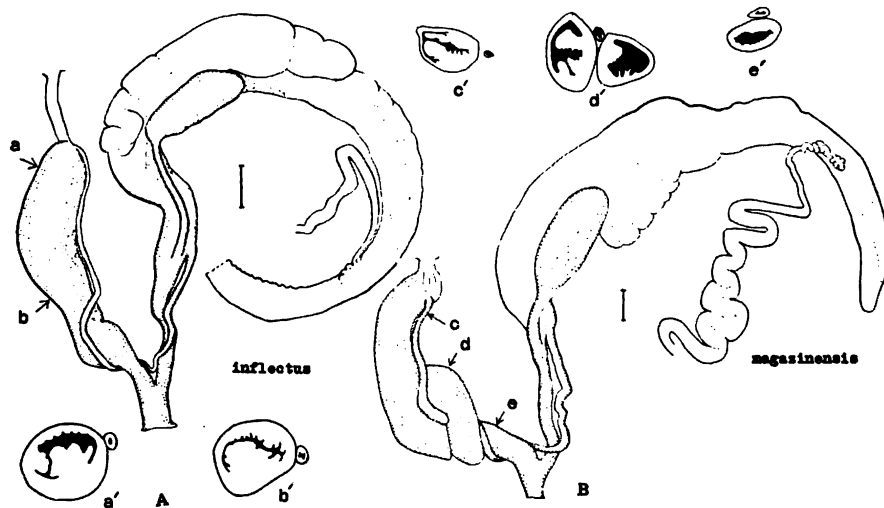


Fig. 459. A, *Mesodon inflectus*, Magazine Mt., Ark.; at a' and b', sections of the penis. B, *Mesodon magazinensis*, paratype; at c', d', e', sections of penis and vas deferens. (Scale lines = 1 mm.)

*Key to Species and Subspecies*

- A. Aperture having three well developed teeth.  
 B. Teeth large, the sinus between the two lip teeth narrow, deeper than wide.  
 C. Tooth in the outer lip blunt, rather deeply receding.....*M. rugeli*  
 CC. Tooth in the outer lip very slightly receding...*M. inflectus approximans*  
 BB. Teeth somewhat smaller, the sinus between them wider.  
 C. Imperforate.....*M. inflectus*  
 CC. Umbilicus partly open; small, depressed.....*M. inflectus mobilensis*  
 AA. Basal lip tooth indistinct or wanting.  
 B. Outer tooth large and blunt, Alabama.....*M. smithi*  
 BB. Outer tooth very small, Arkansas.....*M. magazinensis*  
 AAA. Both lip teeth very small or subobsolete.....*M. inflectus edentatus*

**Mesodon rugeli** (Shuttleworth)

Fig. 460.

*Helix rugeli* Shuttleworth, 1852, Mittheil. Naturforsch. Ges. Bern, no. 248-9, p. 198.  
 —Bland, 1862, Ann. Lyc. Nat. Hist. N. Y., 7: 426.

*Triodopsis rugeli* Shuttl., Binney, 1878, Terr. Moll., 5: 307, fig. 201, pl. vii, fig. κ,  
 pl. xv, fig. E (teeth and genitalia).—Wetherby, 1894, Journ. Cincinnati Soc. Nat.  
 Hist., 16: 212.

*Polygyra rugeli* Shuttl., Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 117.—Walker,  
 1902, *ibid.*, p. 423; 1928, Terr. Moll. Alabama, p. 25.—Clench, Nautilus, 46: 58,  
 59, 91.

“The shell is covered-perforate, orbicular-convex, granulate-striate, sparsely bristly, waxy horn-color; spire short, obtuse;  $5\frac{1}{2}$  slightly convex whorls, the last abruptly deflexed in front, strongly constricted at the aperture. Aperture depressed, narrowed by a strong, curved, tongue-shaped tooth entering on the parietal wall; peristome reflected, calloused within, the right margin with a large, obtuse, deeply immersed tooth, its position marked outside by a pit; basal margin with a smaller, transverse, submarginal tooth. Diameter maj. 13, min.  $11\frac{1}{2}$ , alt.  $6\frac{1}{4}$  mm.” (Shuttleworth).

Height 8.8 mm., diameter 15.3 mm.;  $5\frac{1}{2}$  whorls. Cade's Cove, Tenn.

Height 8.3 mm., diameter 14.0 mm. Cade's Cove, Tenn.

Height 7.3 mm., diameter 12.7 mm. Cade's Cove, Tenn.

Height 8.9 mm., diameter 15.0 mm. Mt. LeConte, Tenn.

Height 6.4 mm., diameter 11.2 mm. Mt. LeConte, Tenn.

Height 9.3 mm., diameter 16.4 mm. Woodville, Ala.

VIRGINIA: Newman's Ridge, Lee Co. (T. R. Brotherton). Near Lebanon, Russell Co.; 11 mi. southwest of Tazewell, Tazewell Co.; Reed Creek, southwest of Pulaski; Wythe Co. (Clench and Archer). Scott Co. (G. H. Clapp).

KENTUCKY: Quicksand, Breathitt Co. (W. D. Funkhouser). Raven Creek, Fayette Co. (R. M. Bailey). Burnside, Pulaski Co. (Ferriss). Bowling Green, Warren Co. (L. E. Daniels).

TENNESSEE: Bledsoe, Blount, Clay, Green, Hamilton, Knox, Monroe, Pickett, Polk, Roane, Sevier and Unicoi counties.

NORTH CAROLINA: Buncombe, Cherokee, Clay, Jackson, Haywood, Macon, Madison, Swain and Transylvania counties.

GEORGIA: Dillard, Rabun Co. (Rehn and Hebard). Near Hiawassee, Towns Co. (Archer). White Sulphur Springs (H. H. Smith).



ALABAMA: Barbour, Bibb, Blount, Calhoun, Clay, Cenech, DeKalb, Etowah, Franklin, Jackson, Jefferson, Lee, Macon, Madison, Marengo, Marion, Montgomery, Mobile, Randolph, Shelby, Talladega and Tuscaloosa counties (H. H. Smith, A. F. Archer *et al.*).

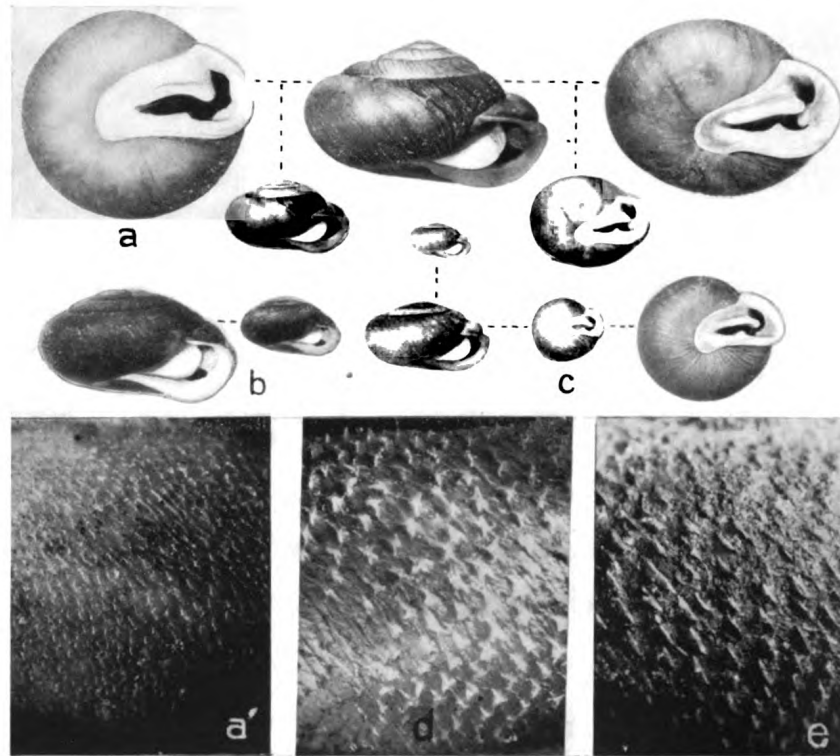


Fig. 460. *Mesodon rugeli*. a, Cade's Cove; b, near Andrews, N. C.; c, Roanoke, Ala.; d, near Blount Springs, Ala.; e, Citico, Monroe Co., Tenn. ( $\times 2$  and natural size; figs. a', d, e, sculpture at last fourth of last whorl about  $\times 10$ .)

*M. rugeli* is distinct from *M. inflectus* by the decidedly more deeply immersed and larger tooth in the outer lip and the more strongly curved parietal tooth. The shell is often larger, but the sizes intergrade.

The form of the Great Smoky Mountains, where it is known that Rugel collected in the western foothills, is taken as typical. This is usually large, diameter 12 to 15 mm., though sometimes uniformly small, 9.7 to 12.4 mm., as at Murphy, Cherokee County, North Carolina. The sculpture is minute, of little periostracal scales along striae, or, in some places, appearing in vertical series (Fig. 460 a'). It generally has a coat of black dirt, almost impossible to remove without destroying much of the sculpture, as in Fig. 460 b. It occurs in the Great Smokies from the coves at the base to over

4000 feet. On Mt. LeConte Clench found it from 2000 to 5500 feet. An outlying locality is Woodville, Alabama, where very large examples were taken by H. E. Sargent in 1892.

The more widely spread form of *M. rugeli* has coarser sculpture, as in Figures 459 c, d, e. It does not attain the large size of the typical form, though often larger than small specimens of the latter. The sculpture, in rare specimens which have never been encrusted, consists of triangular periostracal processes running up in short slender bristles, usually curved forward, as in Figure 460 d (Blount Springs, Ala.). In coated shells, in natural condition or carefully cleaned, the points are largely lost, a scale-like appearance remaining, as in Figure 460 e. The processes are often blunted or lost by wear or by injudicious cleaning; or possibly in some examples they were never well developed. There are specimens somewhat intermediate between the typical, finely sculptured form of the Great Smokies and the more widely spread coarser form; these have influenced me against racial segregation of the latter under a separate name.

Most Virginia specimens seen are rather small, from 4.3 x 8.8 mm., (Tazewell Co.), up to about 10 mm. diameter. A single lot from West Virginia, without definite locality, consists of strongly depressed shells, 5.4 x 10.6 mm.

Most lots seen from Alabama are warm buff or cream color and of small size, 4.8 x 7.8 mm. to 5.6 x 9.2 mm. at Roanoke, Randolph County; diameter 8 to 10 mm. at Calera, and 9 to 10.5 mm. at Pyriton, Clay County.

(Named for Ferdinand Rugel, 1806-1878, a physician and naturalist, who finally settled in east Tennessee, sending shells and plants he collected to Shuttleworth.)

**Mesodon smithi** (Clapp)

Fig. 460.

*Polygyra smithii* G. H. Clapp, 1905, Nautilus, 19: 73, pl. 3, figs. 1-4.—Wheeler, 1912, Nautilus, 25: 124.—Walker, 1928, Terr. Moll. Alabama, p. 28, fig. 33.

“Shell imperforate, depressed, thin, horn-color, densely covered with elevated epidermal processes, giving the shell a scaly appearance, the hairs following the weak growth lines; embryonic whorls sculptured with elongate



Fig. 461. *Mesodon smithi*, Monte Sano. ( $\times 2$  and actual size.)

granules; spire low, convex, rounded, sutures well impressed, whorls about  $5\frac{1}{2}$ ; body-whorl obtusely carinated above the periphery in its first third; rounded, swollen and very deeply constricted back of the peristome, sharply descending in front; upper half of the aperture, viewed from the under side, forming a half circle; below the periphery almost straight, so that the whole effect is like a human ear; lip wide, white, concave above and flat below, at the periphery a wide, flat entering tooth, basal lip straight, slightly thickened on the upper margin; parietal wall bearing a large, high, very slightly curved tooth extending from the lip-tooth to the axis, a thin wash of whitish callus connecting the upper and lower ends of the lip.

"Gr. diameter  $16\frac{1}{2}$ , lesser 14, alt. 10 mm.

"Gr. diameter  $15\frac{1}{2}$ , lesser  $13\frac{1}{2}$ , alt. 9 mm.

"Gr. diameter 15, lesser 13, alt.  $8\frac{1}{2}$  mm.

"Gr. diameter  $14\frac{1}{2}$ , lesser  $12\frac{1}{2}$ , alt.  $8\frac{1}{4}$  mm.

"Gr. diameter  $13\frac{1}{2}$ , lesser  $11\frac{3}{4}$ , alt.  $7\frac{1}{2}$  mm.

"The first and last measurements given are the extremes of a considerable series, the average size being about 15 mm." (Clapp.)

ALABAMA: Near the top of Monte Sano, about 5 miles east of Huntsville, at an altitude of about 1600 feet, under large logs, piles of stones, etc. (H. H. Smith), Type 5388 Clapp Collection, Carnegie Museum; cotypes 90968 A.N.S.P., and in collections of Bryant Walker and T. H. Aldrich. Gurley (H. B. Baker). Smithers Mountain, Madison County (H. H. Smith). Jackson County at Stevenson, Sand Mountain, Fabins, Princeton, and "The Narrows" (H. H. Smith); Keel Mountain, Paint Rock (Clench & Archer).

The extremes in a series of 45 from the type locality measure 13.6 and 17 mm. in diameter, but one in the Clapp Collection from The Narrows measures 18.5 mm. When cleaned of the blackish coating the shell is olive-buff or somewhat lighter.

"While bearing a striking resemblance to an overgrown *P. inflecta*, it is readily separated by the character of the hairs and the absence of the basal lip-tooth; it is also close to *P. subpalliat*a, but is apparently most closely related to *P. inflecta*.

"Animals almost black, very shy in confinement, spending most of their time either half or completely buried in the earth." (Clapp.)

"Almost always it is on the ground or on the lower surface of a stone which rests on the ground. I have never seen the snail crawling abroad, even in wet weather. The shells are invariably covered with a dark deposit, which is removed with some difficulty." (H. H. Smith.)

"It lives on both sandstone and limestone, and is chiefly active after dark," according to Dr. Archer.

**Mesodon inflectus** (Say)

Fig. 462 a-c.

*Helix inflecta* Say, 1821, Journ. Acad. Nat. Sci. Phila., 2: 153.—Binney, 1851, Terr. Moll., 2: 143, pl. 45, figs. 2, 3.—Bland, 1861, Ann. Lyc. Nat. Hist. N. Y., 7: 425.

*Helix (Triodopsis) inflexa* Say, Von Martens, 1860, Die Heliceen, p. 97 (emendation of *inflexa*).

*Triodopsis inflecta* Say, W. G. Binney, 1878, Terr. Moll., 5: 306, fig. 200; pl. vii, fig. s (teeth).—Sampson, 1894, Ann. Rep. Geol. Surv. Ark., for 1891, 2: 187.—Call, 1900, Indiana Dept. Geol. & Nat. Res., 24th Ann. Rep., p. 387, fig. 7.

*Polygyra inflecta* (Say), Pilsbry, 1900, Proc. Acad. Nat. Sci. Phila., p. 450; 1903, *ibid.*, p. 196; 1906, *ibid.*, p. 543.—Walker, 1902, Proc. Acad. Nat. Sci. Phila., p. 423; 1906, Ill. Cat. Moll. Mich., 1: 463, fig. 8; 1928, Terr. Moll. Alabama, p. 26, figs. 30, 31.—Sampson, Nautilus, 26: 91; 1913, Trans. Acad. Sci. St. Louis, 22: 90.—Archer, 1933, Occ. Pap. Mus. Zool. Univ. Mich., no. 276, p. 1-8 (structure, habits, etc.).—Sterki, 1907, Proc. Ohio State Acad. Sci., 4: 376.—F. C. Baker, 1939, Fieldbook Ill. Land Sh., p. 47.

*Helix clausa* Férussac, 1821, Tabl. Syst. Fam. Limaçons, p. 38, no. 104 (nude name; *Triodopsis clausa* Raf. in synonymy).—Deshayes, 1830, Encycl. Méth., 2: 252.

[?] *Xolotrema clausa* Rafinesque, 1831, Enum. and Acc., etc., p. 3.

*Polygyra inflecta* var. *media* Pilsbry, 1903, Proc. Acad. Nat. Sci. Phila., p. 197; 1906, *ibid.*, p. 544, pl. 22, fig. 10.

*Polygyra herberti* Bryant Walker, 1928, Terr. Moll. Alabama, p. 43, fig. 50.—Clench, 1937, Nautilus, 51: 17, pl. 3, figs. 1-3.

The imperforate, depressed shell has a convex or low conoidal spire of rather slowly increasing whorls, the last rounded peripherally, abruptly descending in front, and deeply guttered behind the outer and basal margins of the lip; cream-buff colored. Apical half whorl with few radial wrinkles, the next whorl closely covered with fine, retractively radial striae which are interrupted into long granules. Last whorl lightly striate, and set with

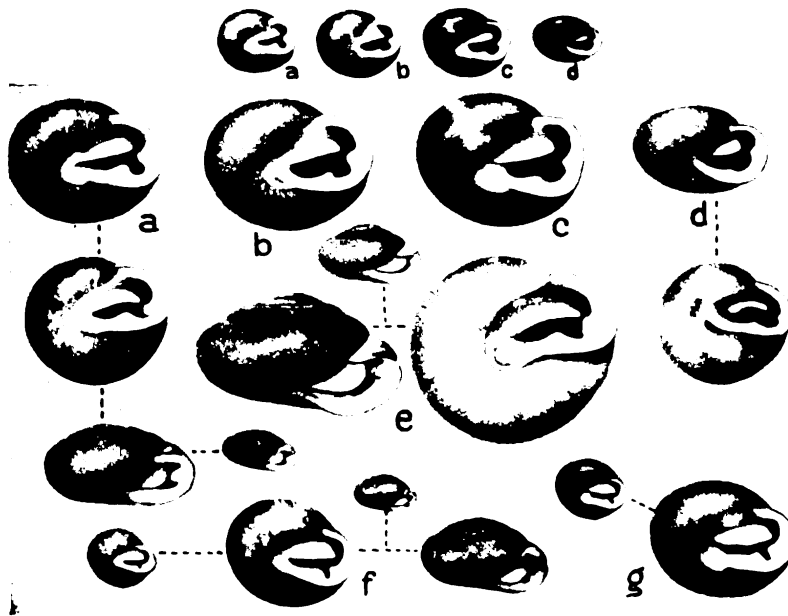


Fig. 462. a-e, *Mesodon inflectus*: a, Chadwick, Mo.; b, type specimen; c, Limestone Gap, Okla.; d, St. Simon's I., Ga.; e, Mt. Mitchell, N. C. f, g, *M. inflectus approximans*: f, Marion, Ala.; g, Harrison, Hale Co., Ala. (Actual size and  $\times 2$ .)

short curved periostracal processes, partly with short projecting points, between them a network of microscopic wrinkles, mainly in the direction of lines of growth; obsolete in the middle of the base. Aperture three-lobed; outer lip reflected, thickened within, bearing a blunt, slightly receding tooth in the outer arc, a narrow, tubercular tooth in the basal lip. Parietal tooth long, somewhat curved.

Height 6 mm., diameter 11.3 mm.; 5 whorls. Type.

Height 6.3 mm., diameter 11.4 mm. Carthage, Mo.

Height 7.4 mm., diameter 11.9 mm.; 5½ whorls. Chadwick, Mo.

Height 5.4 mm., diameter 9.8 mm.; 4½ whorls. Chadwick, Mo.

Height 7.0 mm., diameter 12.7 mm.. Limestone Gap, Okla.

Height 5.9 mm., diameter 9.5 mm. Harrison, Ala.

Height 5.0 mm., diameter 8.3 mm. Harrison, Ala.

Height 8.1 mm., diameter 13.8 mm. Mt. Mitchell, N. C.

OHIO: Adams, Burke, Clark, Delaware, Fairfield, Green, Guernsey, Licking, Miami, Ottawa, Ross, Shelby, Tuscarawas, Warren, and Wyandot counties.

MICHIGAN: Kent, Washtenaw, Wayne and Monroe counties (B. Walker).

INDIANA: Lawrenceburg, Dearborn Co. (A. C. Billups). Delaware Co. Connersville, Fayette Co. (E. A. Enos). Madison and Brookville; common over southern Indiana (Call).

ILLINOIS: Southern, north to Calhoun and Edgar counties (F. C. Baker).

KENTUCKY: Cave City, Barren Co., and Mammoth Cave, Edmonson Co. (J. B. Clark). Frankford, Franklin Co. (S. N. Rhoads). Pine Mountain, Harlan Co. (Witmer Stone). Near Lexington, Nicholas Co. (W. Clay). Burnside, Pulaski Co. and Bowling Green, Warren Co. (Ferriss).

TENNESSEE: Carter, Carroll, Davison, Hamilton, Knox, Marion, Polk, Shelby, Sullivan, Unicoi, Washington and Wilson counties.

NORTH CAROLINA: Cranbury, Avery Co. (Jos. Willcox). Roan Mt., Mitchell Co. (Wetherby, Archer). Paint Rock, Madison Co. (Ferriss and Walker). Tyson's, Black Mts., Graham Co. (Ferriss). Lower slopes of Mt. Mitchell, Yancey Co. (Clench, Rehder and Archer).

SOUTH CAROLINA: Dela Howe State School, McCormick Co. (A. P. Jacot). Columbia, Richland Co. (S. N. Rhoads).

GEORGIA: Macon, Bibb Co., Mableton, Fulton Co. (Archer). Green Co. (A. D. Brown). Frogtown Gap, Lumpkin Co. (Francis Harper). Charlotte, Montgomery Co., and base of Stone Mountain, 15 mi. from Atlanta (J. B. Clark).

FLORIDA: Quincy, Gadsden Co. (Van Hyning). Jackson's Bluff, Ochlochnee R., Leon Co.; Bailey's Ferry, Chipola R. and near Marianna, Jackson Co. (C. W. Johnson). Rock Bluff, Liberty Co. (C. R. Crosby).

ALABAMA: Common and generally distributed. Walker enumerates many localities in 44 counties.

MISSISSIPPI: Vicksburg, in loess (C. W. Johnson; Jas. Greer).

MISSOURI: "Lower Missouri" (Say), Type 11095 A.N.S.P. F. A. Sampson gave the following: Poplar Bluff, Butler Co.; St. François Co.; Marble Hill, Bollinger Co.; Madison Co. Seligman, Barry Co. (Pilsbry and Ferriss). Fern Glen, St. Louis Co. River Bluffs, Moniteau Co. Providence, Boone Co. Boonville, Cooper Co. Camden Co. Morgan Co. Sedalia, Pettis Co. Warsaw, Benton Co. Galena, Stone Co. Carthage, Jasper Co. Macdonald Co. Chadwick, Christian Co. (Pilsbry and Ferriss). Cureall Springs, Howell Co., and Jefferson City, Cole Co. (O. A. Crandall). Ironton,

Iron Co.; Cape Girardeau, Cape Girardeau Co.; Ste. Genevieve, Ste. Genevieve Co.; Callaway Co. (Greger). Stone Co. (U.S.N.M.). Postpliocene at Providence, Boone Co.

ARKANSAS: Menard Landing, Arkansas R., Arkansas Co. Carlock Place and Tebb's Place, Ashley Co.; Purdue Wood Camp, Calhoun Co. (C. B. Moore). Rogers, Benton Co. (Pilsbry). Eureka Springs, Carroll Co. (Sampson). Hot Springs, Garland Co. (A. D. Brown). Richland Landing and Slader's Landing, Jefferson Co. (C. B. Moore). 7 mi. east of Lonoke, Lonoke Co. (Pilsbry). Rocky Comfort, Little River Co. (Ferriss). Magazine Mountain and Petit Jean Mts., Logan Co. (Pilsbry). Caddo Gap, etc., Montgomery Co. (Pilsbry and Harvey). Kent, near Camden, Ouachita Co. (C. B. Moore). Rich Mountain, Hatton Gap and Mena, Polk Co. (Ferriss). Mablevale and Little Rock, Pulaski Co. (C. W. Johnson). Poteau Mt., south of Gwynn, Sebastian Co. (Pilsbry). Horatio, Sevier, and Hardy, Sharp Co. (Ferriss). Clinton, Van Buren Co. (R. Walton). Sulphur City, Washington Co. (A. D. Brown). Petit Jean, Yell Co. (Ferriss). Also, according to Sampson: Crawford, Franklin, Johnson, Conway, Hot Springs, Clark, Jackson, Perry, Independence, Pope, Cross and Fulton counties.

OKLAHOMA: Limestone Gap, Atoka Co. (Simpson). Wister and Sugarloaf Mt., Le Flore Co. (Pilsbry). Ft. Gibson, Muskogee Co. (A. D. Brown). Wyandotte, Ottawa Co., and 6 mi. northeast of Finley, Pushmataha Co. (Pilsbry).

LOUISIANA: Jones, Morehouse Parish, and Dailey Landing, Boeuf R., Franklin Parish (C. B. Moore). Lake Charles, Calcasieu Parish (B. Shimek).

There are two forms of the species, usually, I believe, occurring in separate colonies, though often in the same vicinity. In one form the lip teeth are larger and nearer together, as in Figure 462 a. In the other the teeth are smaller, more separated, as in Figure 462 d. Say's type specimen is somewhat intermediate (Fig. 462 b).

The size varies widely in different colonies, though usually rather constant in single lots.

The color varies from cream-buff to pale brown. In Cat-tail, Tyson's and Wilson's coves around Mt. Mitchell, North Carolina, Bryant Walker found that all of the specimens were albinos (pale chartreuse yellow of Ridgway), and quite large, diameter 13.5 to 14 mm.

Occasionally specimens are found with the umbilicus not wholly covered. Leslie Hubricht found a sinistral specimen in St. Louis County, Missouri.

The form from Seligman, Missouri, which I called var. *media* (Fig. 464 a), has teeth much like the Sulphur City *edentata*. The type of *media* measures height: 6, diameter 11.5 mm., 5 whorls; a paratype: height 5.7, diameter 9.8 mm., 4½ whorls. It is one of the forms connecting *inflectus* and *edentatus*. In another place near Seligman only typical *inflectus* was found.

*Polygyra herberti* Walker was thus described:

"Shell umbilicate, conoid-globose, thin, light yellowish-horn color, surface rather closely, finely and irregularly striate above with irregular, weak, oblique granules between the striae, apical whorls nearly smooth, striae on the base stronger; spire somewhat obtusely elevated; sutures well impressed; whorls five, convex, the last rising as it approaches the aperture and then obliquely descending to the lip, behind which it is deeply con-

stricted; base slightly flattened and excavated around the umbilicus, which is round and deep; aperture oblique, subquadrate, with a heavy, low, wide, curved parietal tooth, extending from near the umbilicus to slightly within the lip; peristome acute, not reflected above, where it is nearly straight and joins the body whorl at nearly right angles, the outer and basal margins obliquely and narrowly expanded, the latter becoming rounded as it approaches the umbilicus, where it is expanded and half covers it. Greater diameter 9.4; lesser 8.7; alt. 6.4 mm." (Walker.)

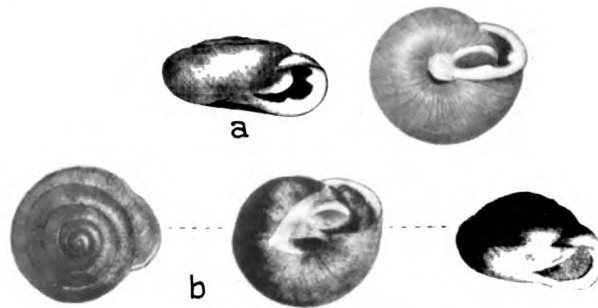


Fig. 463. a, *Mesodon inflectus mobilensis*, topotypes. b, "*Polygyra*" *herberti* (= *Mesodon inflectus*), type, after Clench. (All  $\times 2$ .)

The unique type from Spur of Sand Mountain overlooking Greasy Cove, near Gallant, St. Clair County, Alabama, collected by the late Herbert H. Smith, after whom it was named, is in the collection of the Alabama State Museum. It has been examined by Dr. A. F. Archer, who reports that it is a somewhat abnormal example of *Mesodon inflectus*, having the usual sculpture of that species. The aperture is not fully developed, though the armature is unmistakable; it is perforate, a rather rare condition in the species. *M. inflectus* is common in the whole Greasy Cove area.

***Mesodon inflectus approximans* (Clapp)**

Fig. 462 f, g.

*Polygyra inflecta approximans* G. H. Clapp, 1905, Nautilus, 19: 74, pl. 3, fig. 6.—Walker, 1928, Terr. Moll. Alabama, p. 27, fig. 32.

"Differs from typical *inflecta* in the closely approximated lip teeth, the space between them measuring only about  $\frac{1}{2}$  mm. in width, while in the typical form it measures 1 mm. and over. The aperture is also wider, in proportion to its length, and less rounded in front; body-whorl narrower at the aperture, not swollen back of the lip. In other characters like the type; whorls about  $4\frac{1}{2}$ .

"A considerable proportion of the shells have the umbilicus partly open, and while this can hardly be considered a specific character the proportion is greater than in any lot of *inflecta* I have seen.

"Greater diameter  $7\frac{1}{2}$ , lesser  $6\frac{1}{2}$ , alt.  $4\frac{1}{4}$  mm.

"Greater diameter 8, lesser 7, alt. 5 mm.

"Greater diameter  $8\frac{1}{2}$ , lesser  $7\frac{1}{2}$ , alt.  $4\frac{3}{4}$  mm.

"Greater diameter  $8\frac{3}{4}$ , lesser  $7\frac{3}{4}$ , alt. 5 mm." (Clapp.)

ALABAMA: Marion, Perry County, Type 5389 Clapp Collection, cotypes 105988 A.N.S.P. and in collections of Bryant Walker and T. H. Aldrich. Hamburg, in the same county; Marengo, Marengo County; Hagler, Tuscaloosa County (H. H. Smith). Chimney Mt., Choocolocco Mts., 4 miles east of Jacksonville, Calhoun County, 1400 feet elevation (Clench & Archer). Bibb County and Harrison, Hale County (Archer).

GEORGIA: Chatsworth (C. C. Allen). Taylor County (Dr. Neisler, in Bland).

There are some rather intermediate specimens, such as those from Chimney Mt., and from Chatsworth, Georgia.

**Mesodon inflectus mobilensis** (Clapp)

Figs. 462 d; 463 a.

*Polygyra inflectus mobilensis* G. H. Clapp, 1915, *Nautilus*, 28: 128.

"It differs from the type in being flatter, with the last whorl less swollen beneath, the teeth small and weak, and in always having the umbilicus *partly uncovered*; white to light-horn-color but 'when found the shells are covered with a black, *very* adherent coating'. Five typical shells from Mobile measure:

"Diameter  $10\frac{3}{4}$ , alt.  $6\frac{3}{4}$  mm., whorls 5.

"Diameter  $10\frac{3}{4}$ , alt.  $6\frac{1}{2}$  mm., whorls 5.

"Diameter  $10\frac{1}{2}$ , alt. 6 mm., whorls 5.

"Diameter  $10\frac{1}{2}$ , alt. 6 mm., whorls 5.

"Diameter 10, alt.  $6\frac{1}{4}$  mm., whorls 5." (Clapp.)

ALABAMA: Mobile (L. H. McNeill), Types 7163, collection of G. H. Clapp. Also Dauphine Island, at entrance of Mobile Bay (McNeill).

"On Dauphine Island Mr. McNeill found dead shells of the same form. The majority of the shells have about one half whorl less than the typical form, from Mobile, as shown by measurements below. Six examples, the largest to smallest, measure:

"Diameter  $11\frac{1}{2}$ , alt. 6 mm., whorls 5.

"Diameter  $11\frac{1}{2}$ , alt.  $5\frac{3}{4}$  mm., whorls  $4\frac{1}{2}$ .

"Diameter  $10\frac{3}{4}$ , alt.  $5\frac{1}{2}$  mm., whorls  $4\frac{1}{2}$ .

"Diameter  $10\frac{1}{2}$ , alt. 5 mm., whorls  $4\frac{1}{2}$ .

"Diameter  $10\frac{1}{4}$ , alt. 5 mm., whorls  $4\frac{3}{4}$ .

"Diameter 10, alt.  $5\frac{1}{4}$  mm., whorls  $4\frac{1}{2}$ ." (Clapp.)

The above description and notes are quoted from Clapp. According to Archer, it is entirely urban in distribution. Figured from Mobile topotypes (Fig. 463 a) collected by Mr. H. P. Löding.

Apparently the specimens from western Florida and those from St. Simon's Island, Georgia (Fig. 462 d), would fall under this subspecies.

Frequently the umbilicus is somewhat open in this Florida form, which is reported from Gadsden, Leon, Jackson and Liberty Counties (see Florida paragraph in locality records for *M. inflectus*). The diameter is from 9.5 to 11 mm. It is also sometimes incompletely covered in the little, strongly



depressed race from St. Simon's I. Georgia, measuring 5 x 8.8 mm. (Fig. 462 d). Bland wrote of this race as follows: "From Darien, Ga. (Dr. Wilson), and St. Simon's Island, Ga. (J. Postell), I have a variety in which the epidermis has very little of the usual hirsute character; the aperture is more rounded, and the two lip teeth are small, in fact mere denticles. The parietal tooth is less oblique and more central, not being continued to the lower margin of the little reflected lip."

**Mesodon inflectus edentatus** Sampson

Fig. 464 b-d.

*Triodopsis edentata* Sampson, 1889, Nautilus, 3: 85, reprinted 1894, in Ann. Rep. Geol. Surv. Ark. for 1891, 2: 188, text figs.

*Polygyra edentata* (Sampson), Pilsbry, 1893, Man. Conch., 8: 154, pl. 50, figs. 16-18, 18a; 1903, Proc. Acad. Nat. Sci. Phila., p. 197; 1906, ibid., p. 545, pl. 22, figs. 11, 15, 16.

*Triodopsis edentula* Sampson, W. G. Binney, 1890, 3d. Suppl., Bull. Mus. Comp. Zool., 19: 190 (as "a depauperated form" of *T. inflecta*).

"Shell imperforate, depressed, with granulate striations, thickly covered with hair-like projections; whorls 5, the last strongly contracted at the aperture; suture not much impressed; spire short, obtuse; parietal wall with a long arcuated white tooth; umbilical region impressed; aperture contracted by a deep indentation behind the peristome; on the inner margin of the peristome are two enlargements or obsolete teeth, one near the base, the other midway between it and the right terminus of the peristome. Greater diameter 13½, lesser 12, height 7 mm." (Sampson.)

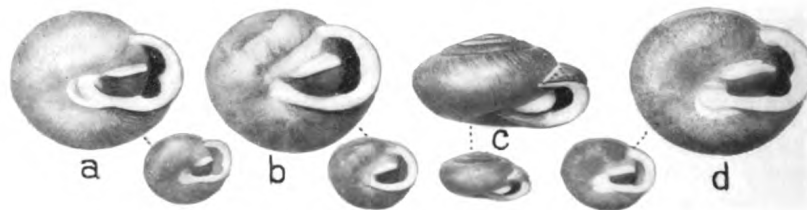


Fig. 464. a, *Mesodon inflectus* form *medius*. b, *Mesodon inflectus edentatus*, type, Winslow; c, Porter; d, Sulphur City. ( $\times 2$  and actual size.)

ARKANSAS: Boston Mountains, Winslow, Washington County<sup>1</sup> (Sampson), Type in Sampson Collection, paratype 170425 A.N.S.P. Sulphur City, Washington County (A. J. Brown). Crawford County at Porter (Sampson), and Chester (Ferriss). Branson, Taney County (Archer).

It is similar to *M. inflectus* except that the lip teeth are reduced to small vestiges. In the lot from Sulphur City (Fig. 464 d), they are slightly more developed than in those from farther south, approaching close to the con-

<sup>1</sup> Mr. Sampson informed me that the type lot was taken near Winslow, in Washington County, not in Crawford County, as at first reported; but subsequently he found it over the Crawford County line at Porter station.

dition found in the form I called *media*, from Seligman, Missouri. The presence of such intermediate forms indicates subspecific rank for *edentatus*.

Elevations of the localities for this race are between 840 feet at Chester, and 1735 feet at Winslow.

**Mesodon magazinensis** (Pilsbry & Ferriss)

Fig. 465.

*Polygyra edentata magazinensis* Pilsbry and Ferriss, 1906, Proc. Acad. Nat. Sci. Phila., p. 545, pl. 22, figs. 12-14, 17, 18.

The shell is similar to *M. inflectus* except that it is more abruptly contracted behind the lip, the crest preceding the contraction, above the periphery, being more prominent. The aperture is bluntly triangular, outer



Fig. 465. *Mesodon magazinensis*, type and paratypes. ( $\times 2$  and actual size.)

lip with a small conic tooth, often subobsolete; and instead of a tooth in the basal lip there is a low swelling nearer the columella. Scale-like periostromal processes are well developed.

Height 7.3 mm., diameter 14.1 mm.; 5 whorls.

Height 7.7 mm., diameter 14.3 mm.

Height 7.0 mm., diameter 13.6 mm.

ARKANSAS: Magazine Mountain, Logan County, in a talus of large rocks under the cliff on the north side of the summit plateau, elevation about 2800 feet (Ferriss and Pilsbry), Type 91314 A.N.S.P. We found a single dead specimen on the south side, near where the road ascends the cliff.

The series of 114 examined shows practically no variation in the apertural characters given above. There is no trace of a basal tooth. The size also is nearly uniform, almost all being between 13 and 14 mm. in diameter, several taken at random measuring 7.4 x 14.2 mm., 7.9 x 14.3 mm., 8 x 13.9 mm., 7.7 x 13.3 mm. An exceptionally small one measures 6.2 x 11.4 mm.,  $4\frac{2}{3}$  whorls, and is bluntly but distinctly angular in front.

The Alabaman *M. smithi* parallels this snail in having the basal tooth obsolete, but it has a strongly developed tooth in the outer lip. In *M. magazinensis* this outer lip tooth is always very small or wanting.

Compared with *M. inflectus* the genitalia (Figs. 458 B, c'-e') differ by the longer penis and extremely short, broad penial retractor. Near the apex

the penis contains two high ridges and numerous unequal small ones (Fig. c'). About the middle, one of the main ridges becomes obsolete, as in Fig. d', a section across two folds of the penis. The large ridges disappear anteriorly (Fig. e), but the smaller ribs continue. Length of penis 15 mm., retractor 1.5 mm., vagina 5 mm., spermatheca 6 mm.

#### TRILOBOPSIS Pilsbry

*Trilobopsis* Pilsbry, 1939, Land Mollusca of North Amer. I, pt. 1, p. xvi.

The small shell is strongly depressed with rounded periphery, usually perforate or umbilicate, the surface with interrupted thread-like or scale-like periostracal processes. Embryonic shell smooth except for some weak radiating striae below the suture. Aperture with a curved parietal tooth and two lip teeth, the peristome reflected.

The stout penis has a simple wall, no external sheath, and no verge. The epiphallus is well differentiated from the vas deferens, and without a flagellum. The spermathecal duct is of the usual short type, and may be either swollen, as in *T. tehamana*, or not noticeably so as in *T. loricata*. The talon has a rather long stalk.

The jaw is thin, with ribs indicated by their edges, not appearing thicker than their intervals.

Teeth few, 10.6.1.6.10 in *T. tehamana*. Centrals and laterals with well developed ectocones. On the marginals the mesocone is bifid and the ectocones vary from one to three, or even four; on the outermost teeth cusps are obsolete as usual (Fig. 466: 6). *T. loricata* has 20.1.20 teeth, according to Binney, formed as in *T. tehamana*.

TYPE: *Helix loricata* Gld.

*Distribution*.—Southwestern Oregon to the San Francisco Bay region, and inland to Mariposa and Fresno Counties, California.

*Affinities*.—I have dissected several species of these little *Triodopsis*-like snails without becoming fully satisfied as to their relations to other genera. The absence of penial sheath and penial retentor muscle, and the large, obtuse posterior end of the penis (at least in *T. tehamana*), indicate the subfamily Polygyrinae. But in some other forms of *Trilobopsis* the penis tapers distally. All have a well differentiated epiphallus; this, with the swollen spermathecal duct of *T. tehamana*, are Triodopsid features. However, there is an epiphallus in *Stenotrema*, belonging to the Polygyrinae; and the spermathecal duct is slender, Polygyrine, in *Trilobopsis loricata*. The smooth embryonic shell is like most Polygyrinae, but it occurs also on the West Coast in *Allogona* and in some species of *Vespericola*, which are Triodopsinae.

On the whole, *Trilobopsis* appears to be an isolated genus of Polygyrinae, with some indistinctly Triodopsid features, but without near relatives either east or west. Its area is rather small for a genus of this family.

*Anatomy.*—In *T. loricata* (Fig. 466: 4) the cavity of the short, stout penis contains two low ridges (Figs. a, b). The epiphallus is rather stout, with vas deferens inserted centrally at the end. Penial retractor inserted at base of epiphallus with some strands to apex of penis. The duct of the spermatheca is not enlarged. The talon has a long duct.

In *T. l. mariposa* (Fig. 466: 2), the penis is longer, ridged within, with the following measurements:

Penis . . . . .	1.7 mm.	Vagina . . . . .	1.5 mm.
Retractor . . . . .	4.0 mm.	Spermatheca . . . . .	2.4 mm.
Epiphallus . . . . .	1.8 mm.	Diameter of Shell . .	7.0 mm.

The genitalia of two topotypes of *T. tehamana* (Figs. 466: 3, 7) differ in several particulars. The penis extends well beyond the insertion of the epiphallus, and is irregularly ribbed within. The duct of the spermatheca is rather strongly swollen, as in *Triodopsis*. Length of penis 3 mm., vagina 1.5 mm., spermatheca and duct 2.4 mm.

The mantle in all species examined is irregularly maculate with black; lung without secondary venation. The collar and foot are pale buff except for pigment in and near the eyes. The foot is uniform whitish. Kidney long-triangular, about three times the length of pericardium and nearly one-third that of the lung.

From the limited materials examined by Dr. Hanna and the author, it appears that the genitalia are considerably varied and may prove of value specifically in the taxonomy of the genus.

(Τρεῖς, λοβός, ὄψις, three-lobed face.)

#### *Key to Species of Trilobopsis*

- A. Umbilicus large, contained about 4½ to 5 times in the diameter of 7 to 8.2 mm.
  - B. Surface with fine hairs; Shasta Co. . . . . *T. roperi*
  - BB. Surface with flattened, rather coarse scales; Sacramento Co. . . . . *T. penitens*
  - BBB. Surface with fine striae, papillose in umbilicus; Tehama Co. . . . . *T. tehamana*
- AA. Umbilicus much smaller or closed.
  - B. Teeth rather strongly developed.
    - C. Umbilicus moderately open.
      - D. Diameter 6 to 7 mm.; San Francisco Bay region. . . . . *T. loricata*
      - DD. Diameter 7 to 8 mm.; Sonoma Co. . . . . *T. l. sonomaensis*
    - CC. Umbilicus very narrow; diameter 8 to 9 mm.; Sonoma Co.
      - T. l. perforata*
  - BB. Teeth quite small.
    - C. Imperforate; diameter 7.4 mm.; Humboldt Co. . . . . *T. trachypepla*
  - CC. Narrowly umbilicate.
    - D. Diameter 6.4 to 7 mm.; Del Norte Co. and southwestern Oregon.
      - T. l. nortensis*
    - DD. Diameter 6.3 mm.; El Dorado Co. . . . . *T. l. lowei*
    - DDD. Diameter 8 mm.; sculpture fine; Fresno and Mariposa Counties.
      - T. l. mariposa*

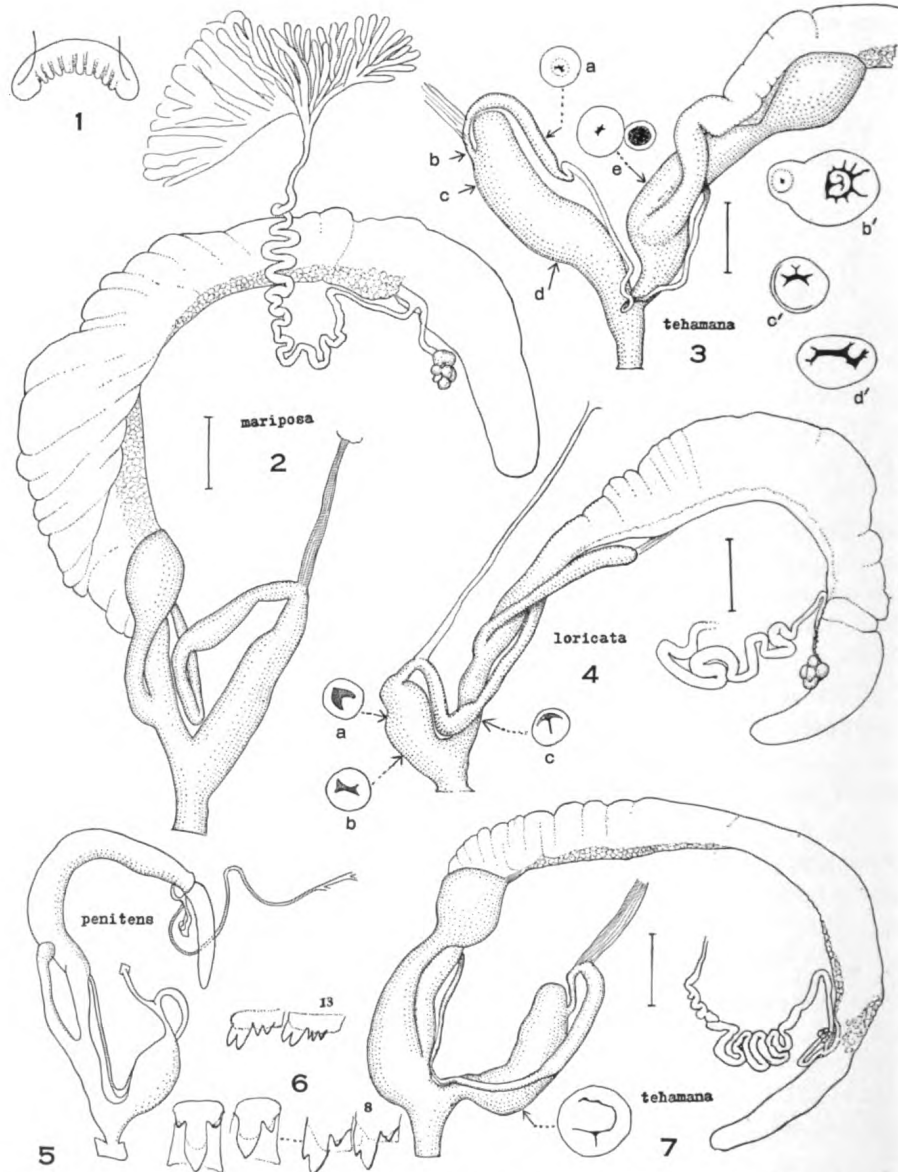


Fig. 466. 1, *Trilobopsis penitens*, jaw (after Hanna). 2, *T. mariposa*, Mariposa Big Trees, Mariposa Co. 3, *T. tehamana*, with a section of epiphallus; b', c', d', sections of penis; e, section of spermathecal duct and free oviduct. 4, *T. loricata*, Berkeley Hills, Alameda Co., with sections of penis at a, b, and section near end of epiphallus at c. 5, *T. penitens* (after Hanna). 6, *T. tehamana*, teeth. 7, *T. tehamana*, with section of penis. (Scale lines = 1 mm.)

## TRILOBOPSIS LORICATA GROUP

**Trilobopsis loricata** (Gould)

Fig. 467 a.

*Helix loricata* Gould, 1846, Proc. Boston Soc. Nat. Hist., 2: 165; 1851, in Binney, Terr. Moll., 2: 145, pl. 29a, fig. 2; 1852, U. S. Expl. Exped., Moll., p. 68, pl. 3, figs. 39a, b, c (near the Sacramento River).

*Triodopsis loricata* Gld., Tryon, 1867, Amer. Journ. Conch., 3: 54.—Binney, 1878, Terr. Moll., 5: 513, pl. 29a, fig. 1, pl. vii, fig. J (teeth).—J. G. Cooper, 1868, Amer. Journ. Conch., 4: 225.

*Helix lecontii* Lea, 1852, Trans. Amer. Phil. Soc., 10: 303, pl. 30, fig. 13; Obs., 5: 59, pl. 30, fig. 13 (San Francisco).

*Polygyra loricata querceti* Pilsbry, 1925, Nautilus, 39: 31 (Oakland).

“Shell small, depressed, spire less convex than the base; thin, of a yellowish green color, having the surface everywhere ornamented with small, crescent-formed scales of the epidermis, in relief, arranged along the lines of growth, and in quincunx. Whorls five and a half, slightly convex, separated by a deeply impressed suture, and forming a low, conical spire; the periphery of the last whorl is slightly angular near its posterior portion. The base is rounded, tending rapidly to a deep, umbilical depression, with a small perforation. Aperture small, crescentic, having a small, acute tooth on the right margin, a transversely oblong one at base, and a prominent, compressed, curved, nearly horizontal one on the columella, thus giving a three-lobed outline to the aperture. Peristome white, slightly reflected, having a very profound constriction of the whorl directly behind it. Diameter one-fourth of an inch; axis three-twentieths of an inch.” (Gould.)

Height 3.6 mm., diameter 6.7 mm.

CALIFORNIA: Near the Sacramento River (Pickering, U.S. Expl. Exped.). San Francisco, Oakland, and the Bay counties. Berkeley Hill, Alameda County, under rocks (H. B. Baker). St. Helena, Napa County (R. C. McGregor).

Gould's type was the roughly sculptured form with rather large teeth which occurs in the Bay counties and up the river. The umbilicus is contained about 8 times in the diameter, but varies somewhat. The synonymous *Helix lecontii* and *P. loricata querceti* were based upon the same coarsely sculptured form. Occurring in the museum lots with them there are sometimes specimens typical in shape, aperture and umbilicus, but deficient in the scale-like processes of the surface.

Shells of the *loricata* type appear widely spread, from Fresno County, California, north to Douglas County, Oregon; but the details of variation and distribution and the differentiation into local races have not been fully worked out, though a few salient forms have been named. It is a problem for Californian conchologists, who no doubt already have much material of the group, and can plot out the regions still to be explored. Probably several of the forms which are still considered to be subspecies of *loricata* will eventually be segregated as species.

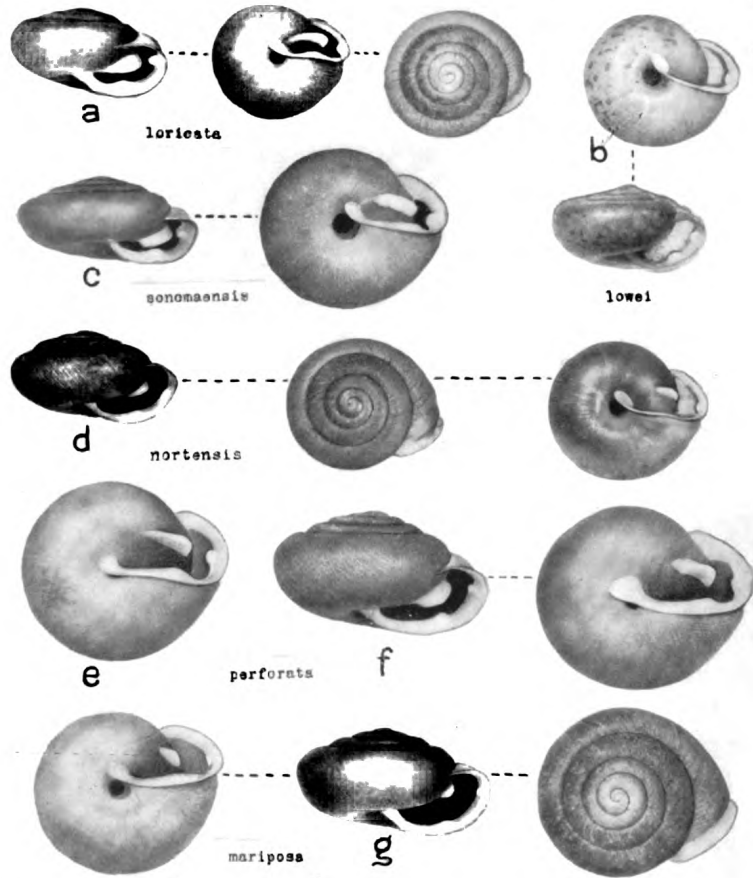


Fig. 467. a, *Trilobopsis loricata*, Oakland. b, *T. loricata lowei*, type. c, *T. loricata sonomaensis*, type and paratype. d, *T. loricata nortensis*, Douglas Co., Ore. e, f, *T. loricata perforata*, type and paratypes. g, *T. loricata mariposa*, type and paratypes. ( $\times 3$ .)

***Trilobopsis loricata mariposa* new subspecies**

Fig. 467 g.

The depressed shell has an umbilicus contained about 8 times in the diameter of shell, about one-fourth covered by the reflected columellar lip. The last whorl is deeply contracted behind the lip, as in typical *loricata*, but the surface is less roughened, the scales being fine and close, in some specimens running into striae. Teeth of the lip smaller than in *loricata*, the parietal tooth quite short.

Height 4.7 mm., diameter 8.1 mm.

CALIFORNIA: Fish Camp, Fresno County (Hemphill); Mariposa County (Bland), Type 170911 A.N.S.P.; Mariposa Grove (J. B. Clark); lodge branch of Big Tree Creek, Mariposa Big Trees under logs in damp meadow

(H. B. Baker). Sequoia Park, edge of forest north of Wawona (H. N. Lowe).

This southern form living at elevations of 6000 to 7000 feet, has smaller teeth and finer sculpture than the typical middle Californian *loricata*. The proportions of the penis also differ (Fig. 466: 2).

**Trilobopsis loricata sonomaensis** (Hemphill)

Fig. 467 c.

*Helix* var. *sonomaensis* Hemphill, 1911, Trans. San Diego Soc. Nat. Hist., 1: 101.—  
Hanna, 1923, Proc. Cal. Acad. Sci., (4), 12: 49.

*P[olygyra] loricata sonomaensis* Hemph., Pilsbry, 1928, Proc. Acad. Nat. Sci. Phila., 80: 184.

"Shell rather small, greatly depressed, umbilicated, of a yellowish or buff color, whorls  $5\frac{1}{2}$ , slowly increasing in size, the last flatly convex beneath, and not excavated around the umbilicus; umbilicus large and deep; suture distinct; aperture rather small, nearly quadrate in form and bearing on its columellar portion a long oblique tooth; peristome slightly reflected, crowding but not covering any portion of the umbilicus, and bearing on its inner side two small denticles, one on the basal, and the other near its upper termination.

"Great diameter 8, height  $2\frac{1}{2}$  mm.

"Great diameter 7, height  $2\frac{1}{2}$  mm."

Height 3.7 mm., diameter 7.5 mm. Paratype.

"The larger size, more depressed form, lighter, and larger umbilicus, will serve to separate this variety from the other known forms of *Helix* (*Trilobopsis*) *loricata* Gld." (Hemphill.)

CALIFORNIA: Near Healdsburg, Sonoma County (Hemphill), Type 8041 C.A.S.

The specimen figured measures: height 3.5 mm., diameter 7.4 mm.;  $5\frac{1}{2}$  whorls. In shape it is more depressed than *T. loricata*, and the umbilicus is wider, contained in the diameter about 8 times. The scales are close, and finer than in *T. loricata*. They are much as in *T. l. mariposa*. The teeth are about as strongly developed as in *T. loricata*, and much larger than in *mariposa*, *nortensis* or *trachypepla*. Dr. Hanna (1923) is inclined to rank it as "a perfectly good species."

**Trilobopsis loricata perforata** new subspecies

Figs. 467 e, f.

The shell is somewhat less depressed than *T. l. sonomaensis*, but similar in the fine sculpture, and in having strongly developed teeth. It differs by the very narrow, almost closed (Fig. 467 e) or half closed (Fig. 467 f) umbilical perforation.

Height 4.8 mm., diameter 8.5 mm.;  $5\frac{1}{2}$  whorls. Type (Fig. 467 e).

Height 5.3 mm., diameter 8.8 mm.

CALIFORNIA: Healdsburg, Sonoma County (H. Hemphill), Type 11146, figured paratypes 11148 A.N.S.P.



Somewhat similar to *T. l. sonomaensis*, and from the same region, but far less depressed. It was sent out separately by Mr. Hemphill. Further collections from that place are required. Do two races really occur there? Or did Hemphill send out extreme forms of a series connecting in the size of umbilicus? The teeth are stronger than in *T. trachypepla*.

***Trilobopsis loricata lowei* (Pilsbry)**

Fig. 467 b.

*Polygyra loricata lowei* Pilsbry, 1925, Nautilus, 39: 31.

The shell has a wider umbilicus than *T. loricata*, about one-fourth covered by the reflected columellar lip; depressed, in figure about like *T. loricata*, but the last whorl is very much less contracted behind the lip. Dilute tawny olive (having irregular black spots when the animal is dried in). Surface slightly glossy, the embryonic  $1\frac{1}{2}$  whorls smooth, following whorl with sculpture of light growth lines, the penult and last whorls showing minute irregular growth striae and very few long granules, the peripheral region and base smooth. Close to and in the contraction behind the lip there are close, short, minute scales far smaller than those of *loricata*. The last two whorls are microscopically striate spirally. Aperture having only a trace of the parietal tooth, the two lip teeth very low.

Height 3.4 mm., diameter 6.3 mm.;  $4\frac{3}{4}$  whorls.

CALIFORNIA: 24 miles east of Placerville, Eldorado County (H. N. Lowe), Type 138510 A.N.S.P.

This is chiefly notable for its smoothish surface, the striations being very minute, and only traces remain of the scaly sculpture of *loricata*. The teeth are only weakly developed. Probably specifically distinct from *loricata*. Cf. *T. nortensis*.

***Trilobopsis loricata nortensis* (Berry)**

Fig. 468.

*Polygyra loricata nortensis* S. S. Berry, 1933. Nautilus, 47: 13, pl. 2, figs. 14, 14a.

"Shell small, depressed, thin, perforate. Whorls  $4\frac{3}{4}$  to  $5\frac{1}{4}$ . Embryonic shell weakly concentrically wrinkled, the wrinkles much broken, soon becoming closer and heavier, and eventually passing into the general sculpture-system of many low, closely placed, crescentic tubercles, trending



Fig. 468. *Trilobopsis loricata nortensis*. (After Berry.) ( $\times 3$ .)

like the growth-lines which are otherwise hard to make out, and overlying the very close and fine spiral striation. Body-whorl tumid, subangulate at the shoulder, weakly descending and abruptly and deeply constricted behind the lip. Aperture ovate, the peristome hardly thickened except for two

small teeth (sometimes not more than whitish thickenings), one basal, the other above it on the outer lip. Parietal tooth a small oblique whitish denticle which may be represented by a mere trace. Umbilicus narrow, nearly straight-walled, partly covered by the peristome. Color of periostracum near tawny-olive of Ridgway. Max. diameter 6.4, min. diameter 5.6, alt. 3.6, diameter of umbilicus 0.5 mm.; whorls 5." (Berry.)

CALIFORNIA: Ternah, near Requa, Del Norte County (Allyn G. Smith), Type 7456 Berry Collection, paratypes 2220 collection of Allyn G. Smith.

"This seems a reasonably well defined race, differing from typical *loricata* of the San Francisco region in being smaller, with a thinner lip, less open umbilicus, and reduced apertural dentition, the parietal tooth often, indeed, no more than a trace. The sculpture is altogether finer, more even, and less crude than the rough, scaly ornamentation of the typical form." (Berry). It is probably a distinct species.

I am temporarily referring the specimens collected by F. H. Andrus in Douglas County, Oregon (Fig. 467 d), to *T. l. nortensis*. They differ from Dr. Berry's account by having the parietal tooth quite well developed, though decidedly shorter than in typical *loricata*. Height 4.1 mm., diameter 6.9 mm. I have not seen authentic specimens of *nortensis*.

***Trilobopsis trachypepla* (Berry)**

Fig. 469.

*Polygyra trachypepla* S. S. Berry, 1933, *Nautilus*, 47: 12, pl. 2, figs. 12, 12a.

"Shell small, depressed, thin, imperforate. Embryonic whorls with first half-turn smooth and vitreous, the second half-turn less transparent and showing a few weak concentric wrinklins together with a gradually developing system of minute papillae which on succeeding whorls become much larger, elongate, then almost confluent, and eventually somewhat crescentic and bearing more or less deciduous scale-like excrescences above; there is evidence of a double arrangement of these in forward-slanting series on the one hand and approximately axial or concentric lines on the other, but it does not proceed quite far enough for the formation of actual ribs; papillae numerous on base of shell as well, but there more minute. In cleaned specimens which have lost the scales, traces of a weak spiral striation may be observed. Whorls 5, narrow, convex, with the suture deeply impressed. Body-whorl subangulate at the shoulder, strongly tumid below, only slightly descending to the aperture, behind which it is abruptly and narrowly constricted. Aperture ovate, the peristome only moderately thickened, flattened below, and bearing two small whitish denticles, one basal and one above it on the outer lip, in addition to the slightly larger, oblique and high-placed parietal denticle. Color of periostracum snuff brown, the lip pale brown to whitish. Max. diameter 7.6, min. diameter 7.4, alt. 4.3 mm." (Berry.)

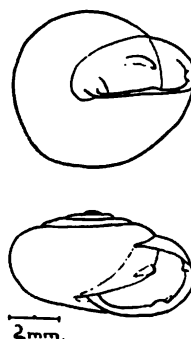


Fig. 469. *T. trachypepla*.  
(After Berry.)  
( $\times 3$ .)

CALIFORNIA: Vicinity of Bridge Creek Lumber Camp, south of Scotia, Humboldt County (James Cunningham), Type 6170 Berry Collection.

"This species somewhat resembles *germana* but the shell is a trifle larger and flatter, imperforate, and the parietal tooth smaller, while the very different periostracal ornamentation suggests an approach toward *loricata*. I know nothing closely like it in our western fauna." (Berry.)

#### TRILOBOPSIS ROPERI GROUP

##### *Trilobopsis roperi* (Pilsbry)

Fig. 470.

*Helix* (*Triodopsis*) *roperi* Pilsbry, 1889, Nautilus, 3: 14, text-figs.; 1893, Man. Conch., 8: 154, pl. 50, figs. 19, 20; 1898, Nautilus, 12: 59.

*Polygyra roperi* Pils., W. G. Binney, 1890, 3d Supl., Bull. Mus. Comp. Zoöl., 19: 212, text-fig.—Pilsbry, 1898, Nautilus, 12: 59.—Hanna & Nicholson, 1930, Nautilus, 44: 17 (distribution).

The shell is rather broadly umbilicate, the umbilicus contained about  $4\frac{1}{2}$  times in the diameter, discoidal, the spire almost flat, of closely coiled whorls, periphery and base rounded; last whorl deeply contracted behind the outer and basal margins of the lip. Buckthorn brown. Embryonic  $1\frac{1}{2}$  whorls smooth; later whorls with sculpture of long granules in the direction of lines of growth, over a microscopic spiral striation, the granules rather ill-defined

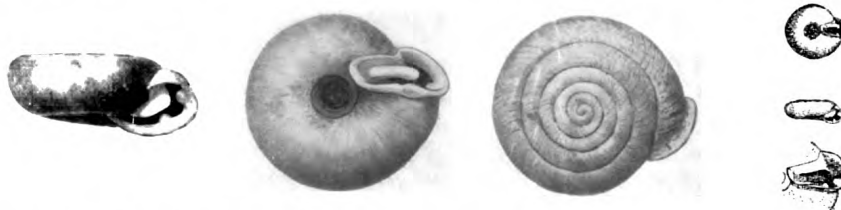


Fig. 470. *Trilobopsis roperi*, type, paratype, and top view of a specimen from Cedar Creek ( $\times 3$ ). At right, the original figures.

on the last whorl, where, in protected places, short, erect hairs in forwardly descending trends, remain. The somewhat triangular aperture has the lip well reflected at outer and basal margins, and is obstructed by three teeth: parietal tooth rather high and long, but not extending to the columellar end of the lip; outer tooth strong, somewhat square-topped; basal tooth strong but rounded at top.

Height 3.3 mm., diameter 8.2 mm.;  $5\frac{3}{4}$  whorls.

CALIFORNIA: Redding, in drift of the Sacramento River, Shasta County (E. W. Roper), Type 60059 A.N.S.P. Redding (R. C. McGregor). 6 miles east of Ingot, Shasta County, in a slide of limestone detritus on the north side of the road between Redding and Alturas, there close beside Cedar Creek on the north side (Hanna & Nicholson).

Distinguished by its nearly flat spire, wide umbilicus and the sculpture of erect hairs, which, however, are mostly lost from the "dead" specimens seen.

Dr. Hanna writes that "it seems almost certain that the species will be found to have a fairly wide distribution among the isolated limestone outcroppings of northern California. The three species *roperi*, *penitens* and *tehamana* form a compact group in the genus and the available information indicates that the three live in similar situations; that is, well drained limestone talus slopes over which there is some protective shade."

**Trilobopsis tehamana** (Pilsbry)

Fig. 471.

*Polygyra tehamana* Pilsbry, 1928, Proc. Acad. Nat. Sci. Phila., 80: 178, fig. 1.

The shell is discoidal, umbilicate, the umbilicus contained about five times in the diameter; cinnamon colored (maculate with black, if the animal is dried in). Surface dull, with the apex pale, smooth, following whorls with some growth wrinkles, the base having microscopic sculpture of very close, somewhat anastomosing radial wrinkles and in places weak spiral lines, the interior of the umbilicus with much coarser papillae. The last whorl is

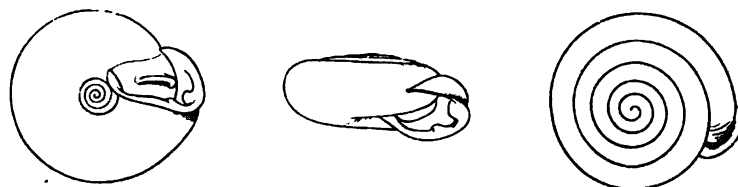


Fig. 471. *Trilobopsis tehamana* ( $\times 3.5$ ).

strongly contracted behind the lip and descends abruptly to the aperture. The aperture is small, oblique, with reflected, pale brown lip; three teeth, an elongate, rather high parietal tooth, a tubercular tooth on the basal lip, and a squarish tooth within the outer lip.

Height 3.2, diameter 7 mm.;  $5\frac{1}{3}$  whorls.

CALIFORNIA: Battle Creek, Tehama County (R. C. McGregor), Type and 3 paratypes, 73549 A.N.S.P.; one paratype in collection of the California Academy of Sciences.

This species differs from *T. loricata* (Gld.) in sculpture, as well as by the large umbilicus, smaller aperture, more closely coiled whorls, and more discoidal shape. *T. roperi* (Pils.) has a larger aperture and different sculpture.

Two of the original lot were dissected (Figs. 466: 3, 7). The penis is stout, continued beyond the entrance of epiphallus, obtuse at end. Over part of the upper half there is a thin sheath, adnate about half way around (Fig. c'), its lower limit visible by a change in surface texture. Internally it has a number of unequal ribs, continued into the blind end above the entrance of epiphallus (Fig. b'). The ribs of the upper part of the penial cavity give place to a different arrangement in the lower part (Fig. 466: 7). The stout epiphallus has the usual thick muscular walls (Fig. a), and where