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POLYGYRA HIPPOCREPIS AND ITS AUTHOR, LOUIS PFEIFFER

By H. E. WHEELER

One hundred years ago a German conchologist described a new Helix from Texas, which, because of its curious aperture, he fittingly named *Helix hippocrepis,* the horseshoe snail. This very rare species, which has no near relative in its family, focuses attention not only on its author, Louis Pfeiffer, but on a contemporary German geologist, Ferdinand Roemer, who was its discoverer. The centennial year of its description, 1948, furnishes an appropriate opportunity to review the species. The biographical notes on these pioneer students of Texas geology and conchology will, it is hoped, clear some misapprehensions as to their researches and travels, for we are better acquainted with their writings than we are with their personal history.

The uniqueness and rarity of *Polygyra hippocrepis* is unquestioned. Though published in 1848 [1] it seems never to have been represented in any American collection, with the exception of one specimen, until its rediscovery by Pilsbry in 1885 and Singley in 1889.

Pfeiffer's description is as follows:

T. anguste umbilicata, depressa, solidula, confertim arcuato-plicata, opaca, fuscula; spira vix elevata; anfr. 5½ angusti, vix convexiusculi, sutura impressa discreti, ultimus superne carinatus, basi convexior, antice solutus, subito deflexus, pone aperturam constrictus et gibboso-inflatus; umbilicus extus latiusculus, angustissime pervius; apertura subhorizontalis, auriformis, ringens; perist. sublabiatum, marginibus callo elevato angulari, superne laminam profunde intrantem, alteramque

[1] Zeitschrift für Malakozoologie 5: 119, 120, 1848. Repeated in Roemer's "Texas," p. 455, 1849; also Conchylien-Cabinet, Helix, Part III, p. 332, pl. 131, figures 4–6, and Monographia Heliceorum Viventium 3: 267, 1853.

minorem prope columellam (ambas profunde ferri equini instar connexas) emittenti junctis, supero breviter expanso, laminam obliquam emittenti, basali calloso-reflexo. Diam. maj. 12, min. 10, alt. 5 mill. (Coll. No. 658½.) Habitat in Texas.

Prope New Braunfels legit Dr. Ferd. Roemer.

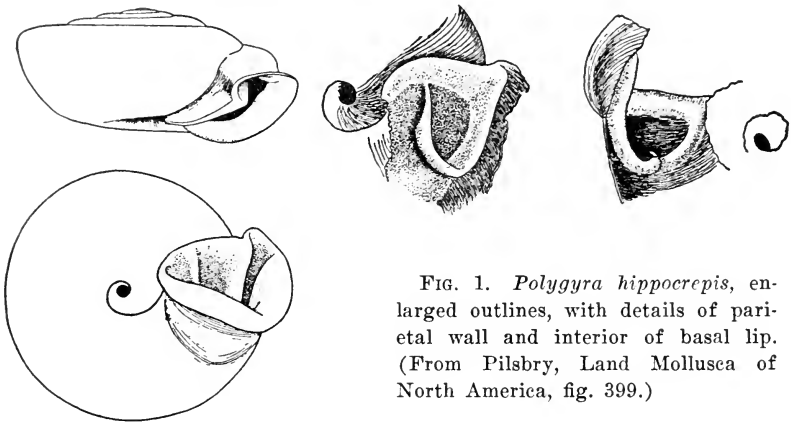


FIG. 1. *Polygyra hippocrepis*, enlarged outlines, with details of parietal wall and interior of basal lip. (From Pilsbry, Land Mollusca of North America, fig. 399.)

Pilsbry remarks that "it is an isolated, highly evolved shell, remotely related to the *Polygyra 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 4.5 × 10.3 mm. with 4½ whorls. The parietal tooth is not V-shaped as in other Polygyras, but U-shaped, hence the name *hippocrepis*—horseshoe."

Pilsbry [2] elsewhere covers the characteristics of the shell, stating that "the structure of the aperture has never been fully described or figured. Besides the parietal tooth there is an internal tubercle on the columella, as in *Polygyra mooreana*. The upper and lower lip-teeth enter and arch toward each other, forming a U-shaped curve which stands close to but a little deeper than that formed by the parietal tooth. Where the two entering teeth join there is a notch and a delicate, slender hook with the point curved toward the adjacent basal wall projecting forward. The immersion of the original lower lip-teeth gives

[2] Proc. Acad. Nat. Sci. Phila., 1906, p. 127; Land Moll. of N. A., 1: 638. 1940.

room for a secondary callous ridge along the basal lip, as shown in figure 1. These structures form in their way a more perfect barrier perhaps than that produced by other means in *P. auriculata* and *uvulifera*. The species stands isolated at present."

Collectors of the New Braunfels fauna have been very few indeed. During the hundred years which have elapsed since Roemer's discovery we are able to name only Singley, Pilsbry, Ferriss, H. B. Baker, Allan F. Archer and the writer. About 1912 Mr. Otto Heilig, the postmaster at New Braunfels, reported the finding of the species under treatment and sent specimens to the writer. In the summer of 1938 Dr. Allan F. Archer and the writer made a survey of the territory extending from El Paso by way of New Braunfels through Texas and most of the counties in western Arkansas, even into Missouri, but we found no other Polygyras that suggested any relation to *hippocrepis*.

Even in its own territory it is apparently restricted to a few spots, all within a sector of 30° whose center is Comal Springs and whose radius is less than six miles. The original habitat was in all probability the hillsides above Comal Springs and along the creek. Pilsbry and Ferriss added the foothills along Guadalupe River, some five or six miles north of the town. Just where Singley collected was not stated. Dr. Archer and the writer recorded a new habitat at the well-known Hueco Falls, three miles northwest of New Braunfels, where shells are less disturbed than they are now on the margin of Landa Park. For other species of mollusks we added the urban area and the road between the village and Landa Park.

New Braunfels lies close to the Balcones Escarpment of the Edwards Plateau in Comal County, Texas. The Guadalupe River flows through a gap in the low-lying mountains to the north and receives the waters of Comal River, having its rise in the springs of that name, before it passes the limits of the town. These springs, the largest in Texas, discharge 190,000 gallons of water daily, and they are the chief feature of the pleasure gardens known as Landa Park. The botanist Lindheimer is supposed to have had his cabin on the creek near the springs. Here Roemer made his headquarters for the better part of a year while he was exploring the geology of Texas. The

town had been founded only three years before Roemer's arrival by German refugees led by Prince Solms. They were attracted to the region by the fertility of the valleys, its abundant waters, and the prospect of an undisturbed home. The colony has prospered greatly and other towns, recruited by similar groups of Germans, have developed an industrious and loyal citizenship.

The writer has visited New Braunfels in spring, summer and early autumn, during the past two years, but has never seen *P. hippocrepis* crawling. The snail is doubtless somewhat nocturnal in habit, hiding during the day under rocks and in debris, but more often in the crevices of rocky ledges. It is generally associated with *Holospira goldfussi* (Menke), *Polygyra mooreana* (W. G. Binney), and *Microceramus texanus* (Pilsbry), the first-named shell being the most abundant. *Euglandina singleyana* (W. G. B.), usually immature or dead, was occasionally found, and commonly *Retinella indentata paucilirata* (Morelet). *Rumina decollata* (L.) is the common garden snail of this inland town, but at the time of Roemer's researches and as late as 1903 it had not been introduced. Few *Bulimuli* were noted in the haunts of the Polygyras but were common enough around dwellings, estivating both on trees and the walls of houses. *Helicina orbiculata tropica* (Pfr.) was found in suitable places, but was not abundant at the type locality of *P. hippocrepis*.

The vegetation noted by Roemer in the vicinity of Comal Springs is apparently unchanged, though some weeds and plants escaped from cultivation, as well as introduced trees, shrubs and flowering plants, were naturally to be expected in and near a public park.

A descendant of a pioneer family whom I met at New Braunfels seemed to be more or less familiar with the local shell fauna, particularly the bivalves of Guadalupe River, and reported that he had found many fine pearls in the larger Unios. But the freshwater shells have not received the attention they deserve.

The river, crossed many times by a winding road, locally known as the River Road, cuts its way through the mountains to the north and flows in a southeastern and southern direction passing on the eastern side of New Braunfels. Comal River, issuing from the springs of the same name, and emptying into

the Guadalupe, hardly deserves that designation. If so, it is the shortest "river" in the United States, or elsewhere for that matter, completing its entire course within the limits of the town. Roemer called it "Comal-Creek," and this name is in general use.

The Land Shells of the New Braunfels Area

The first list of Texas shells was that given by Roemer in the "Naturwissenschaftlicher Anhang" of his volume *Texas,* 1849. It is well to note that this natural history appendix to *Texas* is omitted in the English translation, which did not appear for many years. Few students have access to the very rare original edition. Roemer was careful not only to give complete lists of all natural history material collected but to include the descriptions of new species. He states that Pfeiffer and Philippi identified the species unknown to him, and they supplied the descriptions. He listed 91 mollusks from Texas, of which 28 are land mollusks. The marine species are mostly from Galveston. The New Braunfels entries of his list follow. The names as given by him are in the first column, the present nomenclature, or the corrected identification, in the second. The numbers in parenthesis following some names refer to the notes following the list.

Helix arborea Say	*Zonitoides arboreus* (Say)
Helix avara Say (1)	?
Helix Berlandieriana Moric.	*Praticolella berlandieriana* (Moric.)
Helix chersina Say	*Euconulus chersinus trochulus* (Reinh.)
Helix convexa Raf.	*Stenotrema monodon aliciae* (Pils.)
Helis fallax Say (2)	?
Helix hippocrepis Pfr.	*Polygyra hippocrepis* (Pfr.)
Helix indentata Say	*Retinella indentata paucilirata* (Morelet)
Helix labyrinthica Say	*Strobilops texasiana* Pils. & Ferr.
Helix minuscula Binney (3)	*Hawaiia minuscula* (Binney)
Helix pustula Say (4)	?
Helix Texasiana Moric.	*Polygyra texasiana* (Moric.)
Helix thyroides Say	*Mesodon thyroidus* (Say)

Bulimus n. sp. (5)	*Bulimulus dealbatus mooreanus* (Pfr.)
Bulimus Gossei Pfr. var. b.	*Microceramus texanus* Pils.
Glandina truncata de Kay	*Euglandina singleyana* (W. G. Binney)
Pupa contracta Say	*Gastrocopta contracta* (Say)
Pupa exigua Say	*Carychium exiguum* (Say)
Pupa minuta (Say)	*Gastrocopta procera* (Gld.)
Pupa pellucida Pfr.	*Gastrocopta pellucida hordeacella* (Pils.)
Cylindrella Roemeri Pfr.	*Holospira roemeri* (Pfr.)
Cylindrella Goldfussi Menke	*Holospira goldfussi* (Menke)
Helicina tropica Jan	*Helicina orbiculata tropica* Pfr.

Notes on the above list:

(1) Hard to tell what "*H. avara*" could be. Probably *Polygyra auriformis* (Bld.), which occurs there, and is not otherwise mentioned by Roemer. It had not been described at that time.

(2) This is an enigma, *Triodopsis fallax* (Say) being an eastern species.

(3) "*Helix minuscula*" was doubtless the variety *alachuana* Dall, and probably included *Helicodiscus singleyanus*, a shell of about the same appearance.

(4) "*Helix pustula*" is another enigmatic identification as *Polygyra pustula* (Say) is not known from west of Alabama. Could Roemer's shell be *Polygyra mooreana* (W. G. B.), which had not been described at that time?

(5) Roemer states that his specimens of "*Bulimus*" were "verloren gegangen." Only *Bulimulus dealbatus mooreanus* is known to occur in Comal County.

Few additions to the New Braunfels list of land shells were made until the publication of J. A. Singley's Texas Mollusca (Geol. Surv. Texas, 4th Annual Report for 1892, pp. 299–343. 1893). He reported 36 species from "Comal County," no doubt taken in the vicinity of New Braunfels. Several names reported by Singley are omitted from the revised list below, either because they are known to be synonyms, or because it is evident that they are misidentifications; but he recorded some which no other collector has taken, such as *Vertigo ovata* Say, *V. tridentata* Wolf, and *Pupa syngenes* Pils. As Dr.Sterki identified his Pupillidae, there can be no doubt of these species. *Pupa hordeacea* Gabb, listed by Singley, is a name used by Sterki at that time for *Gastrocopta cristata*. The single specimen of *P. syngenes* was doubtless Pleistocene, and should be compared

with *Pupilla muscorum sinistra* Franzen. The Texas Geological Survey has none of Singley's collections, and could not discover if they were deposited elsewhere.

Pilsbry and Ferriss visited New Braunfels in 1903. Their records of 35 species of land shells published in 1906 (Proc. Acad. Nat. Sci. Phila., pp. 125–161) included also some collected by Pilsbry in 1885. Most of their species had already been recognized by Singley, but several were new records. Their specimens were preserved and are accessible.

The revised list following is based mainly upon the above-mentioned records, with additional species, missing in earlier records, taken by Allan F. Archer and the writer in 1938. In the following New Braunfels list, complete up to this time, the nomenclature of earlier lists has been modernized.

Polygyra auriformis (Bld.)
Polygyra hippocrepis (Pfr.)
Polygyra texasiana (Moric.)
Polygyra mooreana (W. G. B.)
Mesodon roemeri (Pfr.)
Mesodon thyroidus (Say)
Praticolella berlandieriana (Moric.)
Bulimulus dealbatus mooreanus (Pfr.)
Euglandina singleyana (W. G. B.)
Rumina decollata L.
Holospira roemeri (Pfr.)
Holospira goldfussi (Pfr.)
Microceramus texanus Pils.
Helicodiscus eigenmanni Pils.
Helicodiscus singleyanus (Pils.)
Helicodiscus nummus (Vanatta)
Punctum "pygmaeum Drap."[3]
Euconulus chersinus trochulus Reinh.
Retinella indentata paucilirata (Mor.)
Retinella roemeri (Pils. & Ferr.)
Hawaiia minuscula alachuana (Dall)
Striatura meridionalis (Pils. & Ferr.)
Zonitoides arboreus (Say)
Limax maximus L.
Limax flavus L.
Deroceras laeve (Müll.)
Succinea luteola Gld.

[3] No doubt the form intended is *P. minutissimum* (Lea). The species is known from Texas only by Singley's record.

Succinea concordialis Gld.
Gastrocopta armifera (Say)
Gastrocopta contracta (Say)
Gastrocopta holzingeri (Sterki)
Gastrocopta pentodon (Say)
Gastrocopta tappaniana (C. B. Ads.)
Gastrocopta pellucida hordeacella (Pils.)
Gastrocopta procera (Gld.)
Gastrocopta cristata (Pils. & Van.)
Pupilla blandi Morse. Pleistocene
Pupilla syngenes Pils.
Pupoides albilabris (C. B. Ads.)
Vertigo ovata Say
Vertigo tridentata Wolf
Vertigo rugosula Sterki
Vertigo oscariana Sterki
Vertigo milium Gld.
Strobilops texasiana Pils.
Carychium exiguum (Say)
Carychium exile (H. C. Lea)
Helicina orbiculata tropica Pfr.

Probably a few other species will be found. It is curious that no *Vallonia* has turned up.

Hueco Falls. The three habitats visited by Archer and Wheeler in 1938, one of which, Hueco Falls, 3 miles north of New Braunfels, was previously unrecorded, shows some interesting facts as to the number of specimens collected, this particular spot yielding a much larger number of *Polygyra hippocrepis* than the writer collected on several trips to the original habitat near Comal Springs. Fourteen species were collected here, of which the most prolific were: *Polygyra hippocrepis* (Pfr.), 123; *Holospira goldfussi* (Menke), 122; *Helicina orbiculata tropica* (Pfr.), 34; *Retinella indentata paucilirata* (Morelet), 25; *Helicodiscus eigenmanni* Pils., 24.

It was on this trip that two species hitherto unrecorded were found, namely: *Derocerus laeve* (Müll.) and *Limax flavus* L.

Of Pfeiffer's seven species described from New Braunfels we failed to find three, namely: *Mesodon roemeri,*[4] *Gastrocopta pellucida,* and *Holospira roemeri.*

[4] Pfeiffer was in error in giving New Braunfels as type locality of *Helix roemeri.* Roemer states that he found that species in the San Saba River valley. However, it is known to occur near New Braunfels, but it must be rare there; Pilsbry records finding only one.

In 1946 the writer collected at the original habitat of *P. hippocrepis* near Comal Springs the following shells in the order of their abundance: *Polygyra hippocrepis* (Pfr.), *Holospira goldfussi* (Menke), *Microceramus texanus* (Pils.), *Euglandina singleyana* (W. G. Binney), and *Retinella indentata paucilirata* (Morelet). The last three species named were in larger abundance than in any of the other stations discussed. Other species were found sparingly. This is the more remarkable since this area is overrun by visitors to the park, and is separated from it only by the creek that flows from the springs.

Along the road between New Braunfels and Landa Park, nine species were collected, the most prolific being: *Helicina orbiculata tropica* (Pfr.), 83; *Polygyra mooreana* (W. G. Binney), 30; *Polygyra texasiana* (Moricand), 29; *Bulimulus dealbatus mooreanus* (Pfr.), 15; *Praticolella berlandieriana* (Moricand), 14.

The urban area of New Braunfels. Eight species collected, the most prolific being: *Rumina decollata* (L.), 74; this is the first record of *Rumina* from Comal County. *Helicina orbiculata tropica* (Pfr.), 36; *Bulimulus dealbatus mooreanus* (Pfr.), 15.

I am indebted to Dr. Allan F. Archer and Dr. H. A. Pilsbry for checking all these lists and clearing some problems in their synonymy.

[*To be concluded*]

NEW MARINE MOLLUSKS OF FLORIDA AND THE BAHAMAS

By H. A. PILSBRY and T. L. McGINTY

Apodosis, new genus

The shell is small, thick, oblong-conic, spirally striate, with rather narrowly ovate aperture about half as long as the shell, having a single submedian entering fold at junction of columellar and parietal margins; outer lip and columella very thick, plain within. The internal partitions and columellar axis are absorbed above the last whorl, as usual in this family.

The relations of this snail appear to be with a group of genera beginning with *Stolidoma* Deshayes, but that Paleocene and

Eocene genus differs by having a much more lengthened, thin, polished shell, with a median fold as in our snail, but having the columella indistinctly subtruncate at the base, while in *Apodosis* it passes by an even curve into the basal margin.

Turning to genera still represented by living species, we have been strongly inclined to treat *Apodosis* as a subgenus of the antipodal genus *Leuconopsis* Hutton,[1] of New Zealand and eastern Australia, but it differs from that by the much more solid oblong-conic (instead of ovate-conic) shell with non-impressed suture, and the outer lip is strongly thickened within, not thin as in *Leuconopsis*. The same characters and the single submedian fold of the aperture rule out a reference to *Leucophytia*,[2] *Microtralia*,[3] or other groups which have been associated with the name *Leuconia* Gray, and have already been discussed by Watson,[4] Pilsbry and others. When the dentition is examined the affinities of *Apodosis* should be clarified. Unfortunately none of our specimens contains the soft parts.

Apodosis novimundi new species. Plate 1, fig. 1.

The shell is quite solid and strong, imperforate, oblong-conic, pale brown. The outlines of the spire are a little convex, the whorls nearly flat, the suture distinct but scarcely impressed; the first whorl convex, smooth and glossy, later whorls matt, evenly sculptured with very fine spiral striae. The aperture is narrowly ovate, acutely angular posteriorly, rounded in front. The outer and basal margins of the peristome are thick within the sharp edge; columellar margin wide, concave; parietal callus a thin, transparent wash. Slightly below the mid-length of the aperture there is a strong entering fold at the junction of columella and parietal wall; as the fold does not emerge quite to the plane of the aperture it appears weak in a direct face view of an adult shell. It enters about one whorl.

Length 3.4 mm., diameter 1.8 mm. 5½ whorls.

Clifton Bluff, New Providence, Bahamas, type 185474 ANSP., paratypes in McGinty collection. Collected by T. L. and P. L. McGinty, 6–7–1947.

[1] Hutton, F. W., 1884, Trans. N. Z. Inst. 16: 213, type *L. obsoleta* Hutton.

[2] Winckworth, R., 1949, Jour. of Conch. 23: 38, type *L. bidentata* (Montagu).

[3] Dall, Wm. H., 1894, Bull. M. C. Z. 25: 117, type *Auricula?* (*Microtralia*) *minuscula* Dall. Cf. Pilsbry, 1927, Nautilus 40: 125, 126.

[4] Watson, Hugh, 1943, Jour. Conch. 22: 17–20.

The superficial spiral striation is often lost by slight erosion.

CORALLIOPHILA MANSFIELDI (McGinty). Plate 1, figs. 2, 3.

Muricidea mansfieldi McGinty, 1940, Nautilus 53: 83, pl. 10, figs. 5, 5a.

This species was originally described from a male specimen taken in the Pliocene at Clewiston. It has now been found living at the North Inlet of Lake Worth, under stones in shallow water, and elsewhere. We give figures of both sexes from this place, the specimens collected by Virginia (Mrs. J. W.) Donovan. A description of the female follows. The male is a much smaller shell, often more strongly carinate.

The shell is white, solid and strong, biconic, imperforate but having a concave umbilical area bounded by a scaly siphonal fasciole. The nucleus is conic, buff, of three smooth, somewhat convex whorls, sometimes minutely plicate below the suture, the last nuclear half whorl narrow, ending with a very small variceal ridge. (The apex is more or less worn in adult shells seen. It is described from a young shell 10 mm. long.) Later whorls have a median keel and axial sculpture of strong, slightly retractive axial waves, about eight on the last whorl. Spiral sculpture of closely scaly cords of which there are about 7 or 8 above the peripheral keel, which is emphasized by a stronger spiral cord extended in flattened lobes or short triangular spines where it crosses the axial waves. Below the peripheral angle there are about 10 scaly spiral cords and a few smaller ones in the interstices. The aperture is oval, with 8 lirae a short distance within the outer lip. Anterior canal narrow but deep.

Length 30.7 mm., diameter 20 mm., length of aperture and canal 18.4 mm., 7 whorls, the nucleus lost, ♀.

Length 19.6 mm., diameter 15.4 mm. ♂

The operculum is aniline yellow.

This beautiful shell is doubtless a close relative of such Mediterranean coralliophilas as *lamellosa* Jan, *babelis* Requien and other forms which Monterosato assembled as varieties of *C. bracteata* (Brocchi), which should be compared when a sufficient series of that species is available. In America *C. mansfieldi* appears to be related to *C. lintoni* (Verrill and Smith),[5] from off Marthas Vineyard in 70 fathoms, but that species is not

[5] *Trophon lintoni* Verrill & Smith, Trans. Connecticut Acad. 6: 176, pl. 29, fig. 1.

angular and the outer lip is smooth within, not lirate as in this species.

C. mansfieldi occurs in Lake Worth as stated above and has also been taken off Lantana in 100 fathoms, on the Venetian Causeway, Biscayne Bay, and at Destin in 20 fathoms, northwest Florida.

There is considerable variation in the sculpture. In Biscayne Bay specimens the spirals above the shoulder are small with shallow intervals, those of the base high with deep intervals. In some specimens from Lake Worth the spirals above the shoulder are very weak.

Mitra fordi, new species. Plate 1, fig. 4.

The shell is rather stoutly fusiform, the diameter somewhat exceeding one-third of the length; solid, white with a broad girdle of burnt sienna streaks above the periphery, part of them extending to the suture, and a paler, more diffuse band in the subbasal concavity of the whorl; the spire irregularly streaked, summit white. About 6½ whorls remaining in adult specimens are convex, the last somewhat shouldered. The nucelus retained in young shells is very small (diameter of first whorl 0.4 mm.), mamillar, smooth and glossy, of about 1¾ convex whorls, the first globose, but the last half turn is very narrow, Fig. 4a, b. Four crenulated spiral cords then appear, at first as mere traces. The whorls of the spire have four rather coarse rounded spirals, finely crenulated by axial striae which are much more developed in the intervals of the cords (in unworn shells). On the last whorl there are about fourteen spiral cords and about seven much smaller on the siphonal fasciole. The second cord from the suture is more prominent. The aperture is about half the length of the shell, rather narrow. Outer lip straightened in the middle, broadly curved into the basal margin. Columella with four folds. Anterior canal broad and deep.

Length 30.7 mm., diameter 12.3 mm.
Length 30 mm., diameter 11.5 mm.
Length 28 mm., diameter 11.4 mm.

New Providence, Bahamas, type and paratypes 185479 ANSP., other paratypes in the Ford and McGinty collections, all collected by the Rev. Paul D. Ford, in whose honor the species is named. Also taken at Gun Cay, Bimini Is. by T. L. McGinty.

In beach specimens the color markings, which are mahogany red in the darkest examples, fade to orange rufous or a lighter tint.

MITRA FLUVIIMARIS new species. Plate 1, fig. 5.

The shell is fusiform, white with some brown stains under a thin, light brown epidermis; of about 7 rather weakly convex postnuclear whorls. The nucleus is minute, conic, of 4½ smooth, lightly convex whorls, the last narrower than the preceding. Later whorls have sculpture of five blunt spiral cords (or seven, counting those at the suture above and below) on each whorl of the spire. Somewhat crenulated by axial threads which are much more prominent in the intervals of the cords. The last whorl has about 14 to 18 cords, plus about 8 very small ones at the anterior end. The aperture is more than half of the length of shell, narrow, passing into a shallow anterior canal. There are four columellar folds, the anterior one quite weak.

Length 28.8 mm., diameter 9.5 mm., length aperture 15.3 mm. Type.

Length 27.7 mm., diameter 9.3 mm., length aperture 14.5 mm.

Off Palm Beach, Florida, in 100 fathoms, type 185476 ANSP., paratypes in the Donovan and McGinty collections. Also dredged off the Keys by J. B. Henderson (U. S. Nat. Mus.).

This miter, known only from the border of the Gulf Stream in Florida, is peculiar for its long embryonic shell of 4½ smooth whorls, Fig. 5a.

It is probably what has been identified as *M. straminea* A. Adams (Proc. Zool. Soc., 1851, p. 132), an imperfectly described species of unknown locality, which from Sowerby's figure (Thes. Conch. 4, pl. 25, fig. 561) has a relatively wider aperture, and measures 22 mm. long.

THERICIUM BIMINIENSE, new species. Plate 1, fig. 6, 6a, 6b.

The oblong-conic rather solid shell tapers regularly from the last whorl to the apex, the lateral outlines of the spire being about straight. The surface is matt and smoothish in all adult shells seen being slightly corroded, but in immature shells a fine and very weak spiral striation is visible on the somewhat shining surface of the last whorl, and in a middle stage of growth there are very low axial folds, more prominent midway between sutures. On a white ground there are irregularly bent or sometimes branched axial stripes of brownish black, extending from suture to base or interrupted. The aperture is about half the length of shell, broadly oval, acutely angular posteriorly, passing into the short channel anteriorly; within either brownish and showing dark stripes or white. The peristome is edged with brown, dark or light, or it may be entirely white.

Length 11.5 mm., diameter 6.7 mm.; 6½ whorls. Type.
Length 11 mm., diameter 6.8 mm.; 6½ whorls.

Turtle Rocks, Bimini Is., Bahamas, type 185468 ANSP., paratypes in McGinty collection. Also taken in deep tide pools at south end of South Bimini Island. Collected by T. L and P. L. McGinty, 5–22–1947.

The nuclear whorls are lost by erosion in all adults seen. In an immature shell 6.4 mm. long there are 8 whorls, two nuclear whorls being quite convex and apparently smooth.

In size, shape and characters of the aperture this species resembles *T. variabile* (C. B. Adams), but that species has spiral cordons of tubercles with spirally striate intervals, of which *T. biminiense* shows no trace.

Amphithalamus dysbatus, new species. Plate 1, fig. 7.

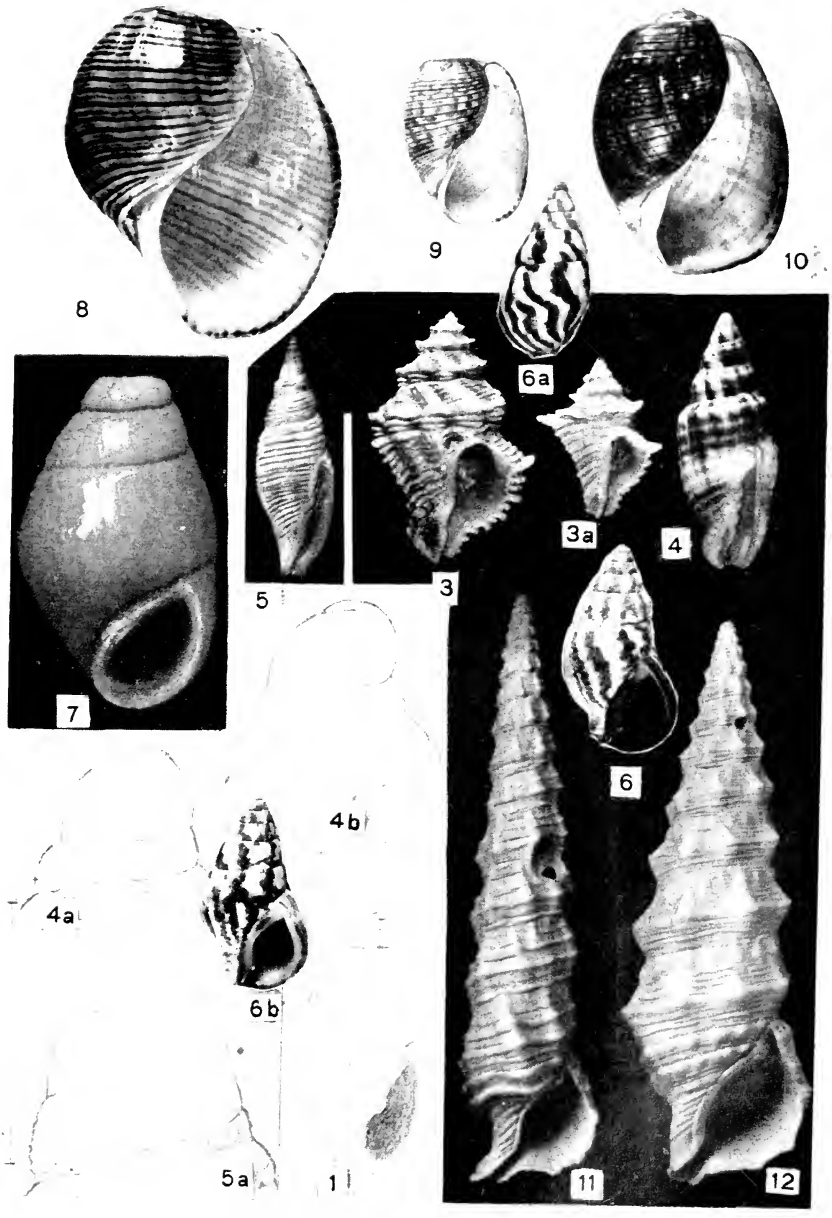
The shell is solid, very narrowly rimate, ovate-conic, but truncate in the adult stage, clove brown in color, somewhat glossy, without sculpture except for occasional faint lines of growth. The spire tapers rapidly, the whorls remaining being only weakly convex, the last whorl being dilated transversely (that is, somewhat flattened between dorsal and ventral sides), only slightly convex above and below the convex peripheral region. The suture is only superficially impressed, and at the end descends steeply to the upper angle of the aperture, somewhat as in the genus *Stenothyra*. The aperture is either vertical or somewhat advanced below, ovate, the parietal side flattened. The peristome is very thick, obtuse, flesh tinted, continued in a thick parietal callus with abrupt edge, not appressed to the preceding whorl, there being a groove between callus and the surface of the whorl.

Length 3.4 mm., diameter 2 mm. Type.
Length 3.3 mm., diameter 1.9 mm. Paratype.

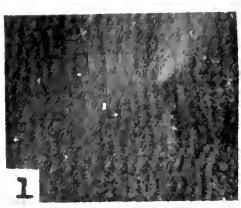
The operculum is very thin, oblong, the columellar margin moderately convex, scar of attachment long and narrow. The nucleus is probably near the base, but no spiral figure could be made out in the specimen mounted.

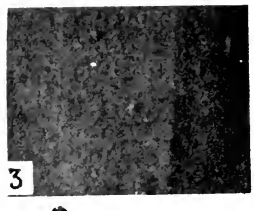
Snake Creek, Plantation Key, in the upper Florida Keys, type 185478 ANSP., paratype in McGinty collection, collected by T. L. McGinty, May, 1945.

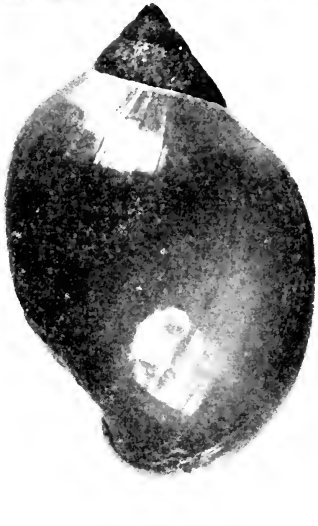
The shell has the appearance of a fresh water snail, but Snake Creek is a purely salt water inlet.



1, *Apodosis novimundi*. 3, 3a, *Coralliophila mansfieldi* ♀ & ♂. 4–4b, *Mitra fordi*. 5, 5a, *Mitra fluviimaris*. 6–6b, *Thericium biminiense*. 7, *Amphithalamus dysbatus*. 8, *Hydatina vesicaria*; 9, small form. 10, *Hydatina verrilli*. 11, *Thericium chara* Pilsbry, length 22.7 mm., Hudson, Fla. 12, *T. lymani* Pils., l. 24 mm., Hudson.







1, *Physa gyrina hildrethiana* Lea. 2–7, *Physa heterostropha* (Say).

The generic place of this little snail is uncertain, awaiting a knowledge of the animal and especially the radula. The shell does not agree fully with *Amphithalamus* or *Scrobs,* and we form for it a new subgenus provisionally referred to *Amphithalamus,* as follows:

Floridiscrobs n. subg. Shell solid, imperforate, ovate-conic, of few whorls (the summit deciduous or lost by erosion in specimens seen), smooth, with a dark cuticle. The suture is linear, scarcely impressed. Last whorl contracting slightly at the aperture, the suture descending steeply there. Peristome continuous, thick, the parietal margin not appressed but separated from the adjoining whorl by a groove.

No living specimens were found, but one contained an operculum.

A WEST INDIAN HYDATINA

By H. A. PILSBRY

Last March, when looking over shells collected in the Antilles by A. Hyatt Verrill, of Lake Worth, Florida, he called my attention to a specimen of *Hydatina* which he obtained at Dominica, B. W. I. With a color design of the *H. physis* pattern, it is a more solid, narrower shell than that, with the spire produced. Description follows:

Hydatina verrilli, new species. Pl. 1, fig. 10.

The shell is more solid than *H. vesicaria* (Sol.) or *H. physis* (L.), oblong, the diameter about 67 per cent of the length. The spire rises shortly above the last whorl, the apex being obtuse but not sunken. There are 4 whorls. The surface is smooth except for rather strong lines of growth. Ground color is warm buff, with four almost equally spaced indefinitely defined spiral bands of vandyke brown, which color also forms streaks along growth lines and little lunate spots in the intervals of about twenty fine black spiral lines. The aperture is white within, showing only weak traces of external bands. Columella white, wider and less concave than in *H. vesicaria,* the base having a crescentic convex fasciole outside of the columella.

Length 34 mm., diameter 23 mm.

Dominica, B. W. I., collected by A. H. Verrill, 1948. Type in Verrill collection but deposited in A.N.S.P.

Hydatina physis (L.) was formerly thought to have a wide range in Indo-Pacific and also West Indian seas but is not known from the tropical American west coast. Lake Worth specimens observed by Mr. John Irons and described by Dr. P. Bartsch were found to differ in coloration of the soft parts from Quoy & Gaimard's figure of *H. physis* from Mauritius, and Dr. Bartsch [1] proposed to separate them specifically under the name *Hydatina vesicaria* (Solander), which was based upon figures of West Indian specimens.

In both the Indo-Pacific and West Indian areas there is great variation in the shell. The typical *H. physis* is subglobular, the diameter about 84 to 89 per cent of the length, while more oblong, usually smaller specimens occur in some of the same localities. This narrower form has been called *Bulla* (*Hydatina*) *staminea* Menke. Menke states that the apex is more sunken than in *H. physis,* and this is the case in part of the specimens seen from Mauritius and Hawaii, but it is variable, so that the racial status is uncertain. I select Mauritius as type locality of *H. p. staminea.* In the West Indies also, a narrow form occurs, some specimens not distinguishable from Indo-Pacific *staminea,* so far as the shells are concerned. Fig. 9.

The small size and thin texture of the narrow Antillean shells, as well as the less produced spire, appear to separate them from *H. verrilli.*

The type figures of *H. vesicaria* (Sol.) in Seba represents specimens of somewhat intermediate shape, but may be from immature shells of the globose form. They are entirely like some of the St. Thomas specimens before me in a lot varying from globose to somewhat oval. Pl. 1, fig. 8 represents a Lake Worth *H. vesicaria.*

It is clear that we know very little about this *H. physis* group, and until new studies are made of the living animals of the several forms, their relations will remain uncertain. Persons collecting them should draw or photograph the extended animals, or make careful notes on the color pattern. They are not diffi-

[1] Proc. Biol. Soc. Washington 53: 92. 1940.

cult to collect in the spring when they come into knee-deep water in protected bays or inlets to oviposit.

MALACOLOGY AND THE OFFICIAL LIST OF GENERIC NAMES

By C. G. AGUAYO [1]

Having been requested to publish a Spanish edition of the International Rules of Zoological Nomenclature as well as of the Summaries of Opinions rendered by the Permanent Commission, I have noticed, not without astonishment, the scant number of generic names of Mollusca in the "Official List of Generic Names." Indeed, only 29 names have been accepted and only 25 Opinions refer to mollusks among the 194 examined by us. This reduced number stands out the more sharply when compared with those accepted in other less numerous zoological groups.

According to Schilder, there are more than 450,000 species of mollusks known (including fossils), with more than 11,000 genera, which shows that only Insects outnumber them from the quantitative point of view. In spite of this, students of various groups of less important animals have given more attention to the fixing of their generic names than malacologists. Thus, mammals are represented by 60 genera in the Official List; birds, by 109; fishes, by 56; crustaceans, by 177, though not one of these groups comes even to 10 per cent of the total number of the species of mollusks.

These data do not mean that systematic malacology is more stabilized than the other branches of zoology; on the contrary, perhaps it is one of the most entangled owing to the brevity of old descriptions, to the extensive literature, and to the ambiguity of many generic names. All this often becomes evident by the large number of genera whose status is very doubtful because of the many homonyms and synonyms, some of which are accepted by malacologists of this or the other school, and

[1] Read at the Fifteenth Annual Meeting of the A.M.U., Miami, Florida, June 17, 1949.

some rejected by those of still other schools. Malacology is an instrument for work both scientific and practical, which should tend chiefly to attain uniformity in nomenclature and also to stabilize names. On tackling the arduous problems of priority, we should bear in mind that in case of disagreement between priority and stability, the latter should have preference. The number of conflicts of this nature is, as we all know, really astounding, and for this very reason it is strange how little interest we malacologists have shown in bringing to the attention of the International Commission the principal cases in which there are doubts about the strict application of the Code, as well as its suspension in favor of the stability of nomenclature.

We shall mention only one example for the sake of brevity: that of the genus *Tritonalia* Fleming, which, according to some, should be applied to those species that have *Murex erinaceus* L. as type, and which, according to others, are included in *Ocenebra*. Some think that the genus *Tritonalia*, being a substitute for *Triton* Montfort (preoccupied by *Triton* L., Crustacea), should take the same genotype: *Murex tritonis* L., and should therefore, be applied to the Giant Triton of tropical seas, better known as *Charonia tritonis* (L.) but which, in our opinion, should now be called *Tritonalia tritonis* (L.). We don't intend to discuss the status of the group mentioned, but merely to call attention to the fact that there are many similar cases in which the clashing of opinions could be cleared up only by the action of the International Commission.

Perhaps the most practical procedure would be that the A.M.U. named a committee composed of curators from the great Institutions which possess rich malacological libraries—such as the U.S.N.M., the M.C.Z., the A.N.S.P.—who would study the cases urgently needing revision that came to their hands, and send them to the International Commission now at London.

It is our opinion that all genera about which there exists a divergence of opinion as to the criteria in determining the type species, should be sent to the said Committee.

Generic Names of Mollusks in the Official List

(Opinions 1–194)

Genera	Genotype	Opinion
Agasoma Gabb, 1869	*Clavella sinuata* Gabb.	121
Anodonta Lam., 1799	*Mytilus cygneus* L.	94
Arca L., 1758	*Arca noae* L.	189
Argonauta L., 1758	*Argonauta argo* L.	94
Buccinum L., 1758	*Buccinum undatum* L.	94
Bulinus Müller, 1781	*Bulinus senegalensis* Müll.	116
Calyptraea Lam., 1799	*Patella chinensis* L.	94
Cerion Röd., 1798	*Turbo uva* L.	119
Clausilia Drap., 1805	*Clausilia rugosa* Drap.	119
Columbella Lam., 1799	*Voluta mercatoria* L.	94
Conulinus v. Mart., 1895	*Buliminus conulus* Rve.	86
Dentalium L., 1758	*Dentalium elephantinum* L.	94
Helix Lin., 1758	*Helix pomatia* L.	94
Leucochila v. Mart., 1860	*Pupa fallax* Say	115
Limax L., 1758	*Limax maximus L.*	94
Lytoceras Suess, 1865	*Ammonites fimbriatus* Sow.	130
Mactra L., 1767	*Mactra stultorum* L.	94
Mya L., 1758	*Mya truncata* L.	94
Mytilus L., 1758	*Mytilus edulis* L.	94
Neritina Lam., 1816	*Nerita pulligera* L.	119
Oleacina Röd., 1798	*Bulla voluta* Gmelin	119
Ostrea L., 1758	*Ostrea edulis* L.	94
Physa Drap., 1801	*Bulla fontinalis* L.	94
Sepia L., 1758	*Sepia officinalis* L.	94
Sphaerium Scop., 1777	*Tellina cornea* L.	94
Succinea Drap., 1801	*Helix putris* L.	94
Teredo L., 1758	*Teredo navalis* L.	94
Tornatellina Pfr., 1842	*Tornatellina clausa* Pfr.	119
Vitrina Drap., 1801	*Helix pellucida* Müller	119

Genera of mollusks rejected by the Commission

Achatinus Montf., 1810, as an emen. of *Achatina* Lam., 1798 Op. 120, 148)

Borus Albers, 1850, as a homonym of *Borus* Agassiz, 1846 (Op. 125, 148)

Leucochilus Boettger, 1881 to avoid confusion with *Leucochila* v. Mart. 1860 (Op. 115)

Opinions of special importance to malacology

3, 20, 21, 39, 51, 79, 86, 94, 96, 100, 115, 116, 119, 120, 121, 123, 124, 125, 126, 148, 166, 185, 182, 184, 166.

PHYSA HETEROSTROPHA (SAY)

By CHARLES B. WURTZ

Introduction.—During the course of some recent field work in southeastern Pennsylvania it became increasingly evident that certain described species of *Physa* were not based upon constant characters. An extensive study of populations of *Physa* contained in the collection of the Academy of Natural Sciences of Philadelphia led to the conclusion that only *Physa heterostropha* (Say) is found in Pennsylvania east of the Allegheny Escarpment, and that *P. integra* Haldeman is the only other known species found in the state with the possible exception of *P. gyrina* Say which may occur in the Lake Erie region. No authentic specimens of *P. gyrina* from this area are at hand. This conclusion is at variance with the views of most recent workers who have named collections of *Physa* for systematic purposes. Determinations by such authors have been made without a critical evaluation of specific characters. Certain "classic" characters are easily observed, and frequently are sufficient to permit recognition of certain facies of certain genetic strains. The fact that these characters are not constant and that they show varying stages of intergradation is evidenced by the presence of many lots in collections which are simply labelled "*Physa* sp." No extensive critical work on *Physa* has been done since that of F. C. Baker (1928). Although the knowledge of fresh water Mollusca has been tremendously increased by the various works of Dr. Baker it must be borne in mind that he was a "splitter" in his later years. This is obviously true to any who have referred to various works of his that were published in his later years. However, he was unquestionably the authority on fresh water forms and most recent determinations are based upon his later publications.

The *Physa* of southeastern Pennsylvania are the common pond or tadpole snails which are abiquitous in nearly all fresh waters of the state. The shell, less than an inch long, is a sinistral spiral; thin; with or without impressed spiral lines; usually shining; either long or short spired; and with a sharp outer lip. The animal, also sinistral, has a narrow foot which is pointed posteriorly; two filiform tentacles with sessile eyes at

their inner base; and with the mantle edge variously lobed and reflected over the shell.

HISTORY.—Say (1816) described the first Pennsylvania *Physa* (from the Delaware River at Philadelphia) as *Lymnaea heterostropha*. Today the range of the species (of authors) is known to include all of the northeastern states and Canada westward to Michigan and Indiana. It is not known to extend south of the Ohio River in the western part of its range. Say (1821) says of it, "very common in ponds of the Missouri as far as Council Bluff," but these Missouri River forms have since been ascribed to another species.

P. ancillaria Say (1825) was described by the same author from the Delaware River at Easton, Northampton County, Pa. Its range has been extended by subsequent collecting to include the same range as *P. heterostropha*, "but it is not so plentiful in the extreme east, and may extend a little further west, but does not cross the Mississippi River" (Crandall, 1901).

The only other species with a type locality in Pennsylvania is *Physa lata* Tryon. The type locality is the Juniata River at Hollidaysburg, Blair County, Pa. The holotype (the only specimen in the Academy collection) is well within the range of the individual variation of *P. heterostropha* of which it must be considered a synonym.

Three other species have commonly been listed as a part of the Pennsylvania fauna. These are *Physa sayii* Tappan, *P. gyrina* and *P. integra*.

P. sayii was described from Lake Pepin, Portage Co., Ohio (Lake Erie Drainage Basin). The range was subsequently extended to include the northern United States from Maine to Nebraska. *P. gyrina* was described from Bowyer Creek, Council Bluffs, Pottawattamie County, Iowa. The range is now recognized as extending from the Arctic to Alabama and Texas and from the Allegheny Mountains to the Rocky Mountains. It is especially characteristic of the Mississippi Valley. *P. integra* was described from Indiana. Its range is now known to include the Great Lakes Region from New York westward and south to New Orleans and Texas.

As a result of incorrect determination many records of distribution that have been published are erroneous.

There have been very few comprehensive works concerning *Physa*. The first was Haldeman's (1842, Jan. 1843 on cover) Monograph of the Freshwater Univalve Mollusca, Number 6. W. G. Binney (1865) listed the known species in his Land and Freshwater Shells of North America. Tryon (1870) dealt fully with the genus as understood at that time in his continuation of Haldeman's monograph. The best analysis of eastern North American *Physa* to date is that of Crandall (1901). He studied the subject thoroughly and reduced to synonymy or to varietal level many of the then current names. Baker (1928) described several new species and subspecies, and erected to specific level many forms Crandall had relegated to synonymy. This was contrary to his earlier opinion (1900) where he said that there were probably only ten or fifteen valid species of *Physa* in the United States, only six or seven of which were to be found in the northern part east of the Rockies. Clench (1930) has discussed the subgeneric names in *Physa* and designated those which are valid. This series of treatises and their contained discussions eliminates the need of further discussion of taxonomic history in this paper.

Physa heterostropha is excessively plastic and the shell reflects the immediate influence of ecological factors. Thus, with each habitat, the species may respond in a way peculiar to that habitat. Since the 1928 work of Baker is generally used as the authoritative work for determination of species of this genus it is necessary to point out that Dr. Baker had a penchant for naming each of the above peculiarities. Once a variation was observed he apparently was not satisfied until the extreme form of that variation was found and named. For example, *Physa rinosa* Gould was the name given to an ovate-globose form from Michipicoten, Lake Superior. Crandall (1901), recognizing the variation of species, considered Gould's species to be a subspecies of *P. ancillaria*. Baker, having collected an extreme form of this facies from the Bayfield Peninsula, Lake Superior, restored it to specific rank and said (1928), "the specimens from Bayfield seem to indicate that it should be accorded specific rank." Although Baker recognized the intergradation of many species and subspecies, even taking cognizance of it in his publication, he still persisted in attaching taxonomic terms to

these forms. As he was actively working with these organisms it was undoubtedly a convenience for him to have a "handle" for each variation, but the result is confusion rather than clarification as the nomenclature was not based on sound biological premises. He apparently looked upon each facies and each intergrade as a static expression rather than as a variable.

Scope.—The present work does not include critical studies of *P. gyrina* and *P. integra*. These are considered to be valid species although the characters distinguishing *P. gyrina* from *P. heterostropha* are the same as those used to separate the various facies of *P. heterostropha* and which allowed these various facies to receive specific names. A critical study of *P. gyrina* is needed. *P. integra* is a distinct species evidenced by the structural divergence of the anatomy of the soft parts from other species of *Physa*.

This work presents a critical analysis of specific characters demonstrating that the present concept of certain "species" of *Physa* is not tenable. Thus *Physa heterostropha* (Say) properly includes in its synonymy *P. ancillaria* Say and *P. sayii* Tappan. This is a sweeping statement. It brings under the consideration of one species a series of complexes that have resulted in twenty-three taxonomic entities at one time or another. Many of these have long since been placed in synonymy while others cannot be considered as synonyms as material was not available to allow of their consideration in this study. The inferences drawn from this work would, however, include some of these in the synonymy of *P. heterostropha*. This work, though based on a limited amount of material and therefore restricted in its scope, contains information pertaining to the genus as a whole.

Characters.—The "classic" characters referred to above are those features of a shell which usually reflect differences that are constant between species and subspecies. These features are either sculptural or structural. Among the *Physa* the shell is simple and most species of the genus have shells at best but weakly differentiated from other species. Aside from the shell the specific characters of snails are found in the radula and the anatomy of the soft parts of the animal. Here again, however, *Physa* fails to show striking differences. Many differences in

the shell, radula and genitalia of *Physa* have been delineated in the literature, but the differences are woefully small when critically studied.

1. *Genitalia.*—Baker (1928, fig. 190) presents a series of six drawings of the male organ of each of six species (*P. elliptica* Lea, *P. warreniana* Lea, *P. sayii* Tappan, *P. gyrina hildrethiana* (Lea), *P. chetekensis* (Baker) and *P. obrussoides* (Baker)). Actually the variations shown in these drawings are well within the limits of individual variation. They simply reflect the degree of retraction within the haemocoele. The same figure shows the male organs of *P. integra* Say and *P. walkeri* Crandall. These two drawings do show a fundamental difference from the preceding six in the relative position of the gland on the praeputium.

2. *Radula.*—Baker (1898) said, "The writer has recently tried Crosse and Fischer's suggestion in regard to specific characters in the form of the teeth on the radula, but thus far with a decidedly negative result." Later (1928) he emphasized the radula as the best criterion for species determination in *Physa.* His earlier beliefs were much closer to the observations made for this study. 58 radulae from ten localities in southeastern Pennsylvania were prepared and studied in this work. Baker (1928) used the number of cusps, number of denticles between the cusps, and the distribution of the latter as specific characters. He treated these as constant. The number of teeth in a transverse row, i.e., the radular formula, was also considered by him to be of specific value. In this study every phase of tooth variation, and range of radular formula, was found within *P. heterostropha* that Baker used as specific characters in separating the species here discussed (excepting *P. heterostropha* which he did not examine). In brief, the radular characters designated as specific by Baker are within the range of individual variation of *P. heterostropha* (including the radular characters of several species discussed by him but not considered here). Thus the radula, of so much value in many groups of snails, cannot be considered a valid character for separating the various complexes of the *Physa* studied here.

3. *Sculpture.*—Sculptural characters of the shell include growth lines and impressed spiral striae. The original descrip-

tion of *P. heterostropha* made no mention of sculptural features and the species has always been considered to be a smooth shell. Baker (1900) made the first reference to the sculpture of impressed spiral lines on the shells of some species of *Physa*. During a visit to the Academy of Natural Sciences of Philadelphia Pilsbry pointed out to him the smooth shell of *P. heterostropha* as opposed to the spirally striate shell of other species. As a result Baker (1900) considered *P. heterostropha* to be smooth while *P. sayii, gyrina* and *integra* were spirally striate. The only species to which Crandall (1901) attributed spiral sculpture was *P. gyrina*. Baker (1928) modified his earlier view of *P. heterostropha* and said of it, "spiral sculpture subobsolete, faintly visible with a hand lens." Spiral sculpture occurs in *Physa heterostropha* (of authors), *P. ancillaria* (of authors) and *P. sayii* (of authors) as well as in *P. gyrina*.

This sculpture of impressed spiral lines is modified by three variables. First, its distribution on the shell, i.e., whether restricted to the spire, shoulders of the body whorl, etc.; second, its frequency, i.e., the number of such lines per unit of measurement; third, its intensity, i.e., the degree to which the spiral lines are impressed. *P. gyrina hildrethiana* has the highest rating in all three of these variables. This species is figured in Fig. 1, Pl. 2. The specimen figured is from Davenport, Iowa, ANSP 123729, approximately × 30. A comparable phase is found in *P. sayii* (of authors) (Fig. 2, Pl. 2, approximately × 30, Conestoga Creek, Lancaster County, Pa.). *P. heterostropha* (of authors) is figured in Fig. 3, Pl. 2, approximately × 30, Pennypack Creek, Philadelphia County, Pa. Intergrades are found between all phases of each of these three variables from the highest rating observed to a complete absence of the character. These intergrades can be found in the same population. As a result this spiral sculpture cannot be used as a criterion for specific determination.

These impressed spiral lines have not been found to be correlated with any ecological factor. They are presumed to be a phenotypic expression of a genotype that occurs throughout the range of *P. heterostropha*. In all the populations of the species examined this character is either present on nearly all the individuals or absent on nearly all the individuals. That

is, nearly all individuals of any population are of the same genetic structure as regards this character. Two features have some correlation with this genotype. The first of these is size. Apparently the presence of spiral lines is linked with a genetic structure which results in large individuals. In effect, therefore, there is a greater chance of finding spiral lines in populations of large individuals and, conversely, a greater chance of finding smooth shells in populations of small individuals. Size itself, however, is a feature that responds readily to ecological influences. Favorable habitats result in larger individuals. The influence of ecological factors over a genetic structure regulating size, and *vice versa*, is unknown. The second feature correlated with this genotype is geographical distribution. The genotype, or genetic structure, which results in the presence of spiral lines is found predominantly in the northern and western reaches of the species range, while the genotype, or genetic structure, allowing development of smooth shells is found predominantly in the southern and eastern reaches of the species range. However there is a very broad overlap with both phases found throughout the entire range. This observation already exists in the literature in statements regarding the distribution of *P. heterostropha* (of authors), *P. sayii* (of authors) and *P. ancillaria* (of authors).

Growth lines demarcate increments of shell material added to the margin of the lip during growth. Growth itself is so much influenced by ecological factors that growth lines cannot be considered a valid character for systematic work. Crandall (1901) refers to the appearance of growth lines as texture. He considered it a character for specific determination. *P. heterostropha,* for example, was considered by him to grow by the addition of frequent and small increments resulting in fine growth lines producing a smooth and shining surface. However the activity of the snail and its physiological response to ecological factors results in excessive variation of this shell feature. Although growth lines are a sculptural character their rate of occurrence is correlated with size, and in this respect are probably, in part, a product of genetic structure. Like size the rate of occurrence of these incremental lines of growth is masked by ecological influences.

A sculptural phenomenon of not uncommon occurrence in *Physa* is malleation. It is, however, so variable, and so sporadic in occurrence, that it is assumed to be an individual physiological response (perhaps pathologic) to ecological influences and not a product of genetic structure. This feature is also found in the family Lymnaeidae where, according to Baker (1911), it is associated with stagnant water. Such a correlation has not been developed for *Physa*. Malleation, as such, has no taxonomic value, but it may in time prove to be ecologically significant. (Figs. 4 and 5, Pl. 2, show some malleation.)

4. *Structure.*—Structural characters of the shell include all the features of a shell excepting surface features considered as sculpture. Size, discussed above, is one of these. In *Physa* other structural characters considered are height of the spire, degree of convexity of the spire whorls, which is frequently spoken of as the degree of sutural impression, degree of inflation if present, degree of shouldering of the body whorl if present, number of whorls, columellar features, the index derived from the diameter of the shell divided by the length of the shell, and the index derived from the length of the aperture divided by the length of the shell.

P. heterostropha has long been recognized as dimorphic as regards spire length. Both long and short spired forms occur, and frequently they occur side by side in the same population. Populations do occur in which all individuals are either long or short spired. Fig. 4, Pl. 2 is a long spired shell from Cresheim Creek, Philadelphia, Pa. (ANSP 104378) while Fig. 5, Pl. 2 is a short spired form from the same population. (Both figures approximately $\times 4$.) The same two figures demonstrate the dimorphism of the degree of spire whorl convexity and the degree of inflation of the body whorl. Intergrades also occur between these latter features as they do between the long and short spired phases. The degree of inflation, or, more properly, campanulation, dictates the spire structure. Usually the term inflation is applied only to the body whorl. In point of fact it begins well above this whorl. This is evident in Fig. 5 where the penultimate whorl is obviously more inflated than the corresponding whorl in Fig. 4. Shells with a low degree of spire

whorl convexity (i.e., sutural impression) and an obtuse spire are those shells with a high degree of campanulation. Fig. 6, Pl. 2, a specimen from Perkiomen Creek, Philadelphia, Pa. (ANSP 123700), shows the typical obtuse spire associated with campanulation and a shouldered whorl. This specimen is the *P. ancillaria* of authors. The shoulder of the shell is recognized as variable in its dinstinctness within the same population. It may not be present in some individuals while quite prominent in others. It is well pronounced in Fig. 6, but scarcely evident in Fig. 7, Pl. 2, which is from the same population. (Figures 6 and 7 approximately $\times$ 4.) The greatest obtuseness of the spire and the smallest degree of spire whorl convexity or sutural impression is associated with the greatest degree of campanulation combined with a well pronounced shoulder.

Among the complexes under consideration here the number of whorls, and the differences in columellar features, have never been considered to be of diagnostic value. They are not, therefore, discussed in this work.

The indices of shell diameter divided by shell length, i.e., D/L, and length of aperture divided by shell length, i.e., La/L, are most useful in dealing with populations of snails. Such indices are easily adapted to mathematical treatment. With a view toward finding differences between populations these indices were calculated, and curves prepared, for several populations of *P. heterostropha* and *P. ancillaria* (of authors). (Text fig. 1.) These curves are based on a secondary grouping (the data of each individual being considered a primary grouping since the measurements are those of a continuous variate) with a class interval of three percent. The percentage figures represent midpoints. The populations are indicated by the letters A to H in the figure. The source of each population is as follows:

A, Lititz Spring Run, Lititz, Lancaster County, Pa. 1948 ANSP State Stream Survey, Station 105A. B, Tacony Creek near Ashbourne, Montgomery County, Pa. ANSP 71412. C, Near Valley Forge, Chester County, Pa. ANSP 174018. D, Tullytown Creek, Tullytown, Bucks County, Pa. ANSP 110566.

E, Schulykill River, above Columbia Ave., Philadelphia, Pa. ANSP 61348. F, Delaware River, west end of Burlington, Burlington County, N. J. ANSP 98527. G, Delaware River, above Bridesburg, Philadelphia, Pa. ANSP 72774. H, Delaware River, above Delanco, Burlington County, N. J. ANSP 91869.

Populations C, D and E are *P. ancillaria* (of authors).

The curves as arranged in the figure from top to bottom pass from a mode for D/L of 58% to a mode for D/L of 70% Similarly the mode for La/L passes from 70% to 82%. It is interesting to note that the populations with the highest modes are associated with the largest bodies of water. However eight populations are not enough data to justify presumptions as regards this matter. Although curves D (Tullytown Creek) and E (Schuylkill River) could be transposed in their relative positions in the figure it must be borne in mind that Tullytown Creek (called "Common Creek" on the U.S.G.S. Burlington Quadrangle, edition of 1906) at Tullytown is fundamentally a backwash from the Delaware River, and would be expected to maintain a population comparable to the river population. (The mean of D/L for population E, 67%, is the basis for position in the figure since the modes are the same.) As this work is limited to the study of shell characters *per se* the possible ecological significance of this observation cannot be discussed. Certainly the need for further work along these lines is indicated.

Since absolute size is, in a large measure, responsive to ecological influences the indices used here are more valid as a systematic character. To compare properly several populations it is necessary to use a measure of variation. This is done in this work by the use of the coefficient of variation represented by V. The symbols used in the following data are as follows:

N, number of individuals (observations). M, mean. σ, standard deviation. 6σ, real range. R, observed range. V, coefficient of variation.

The value of N in each of the eight populations studied was 50.

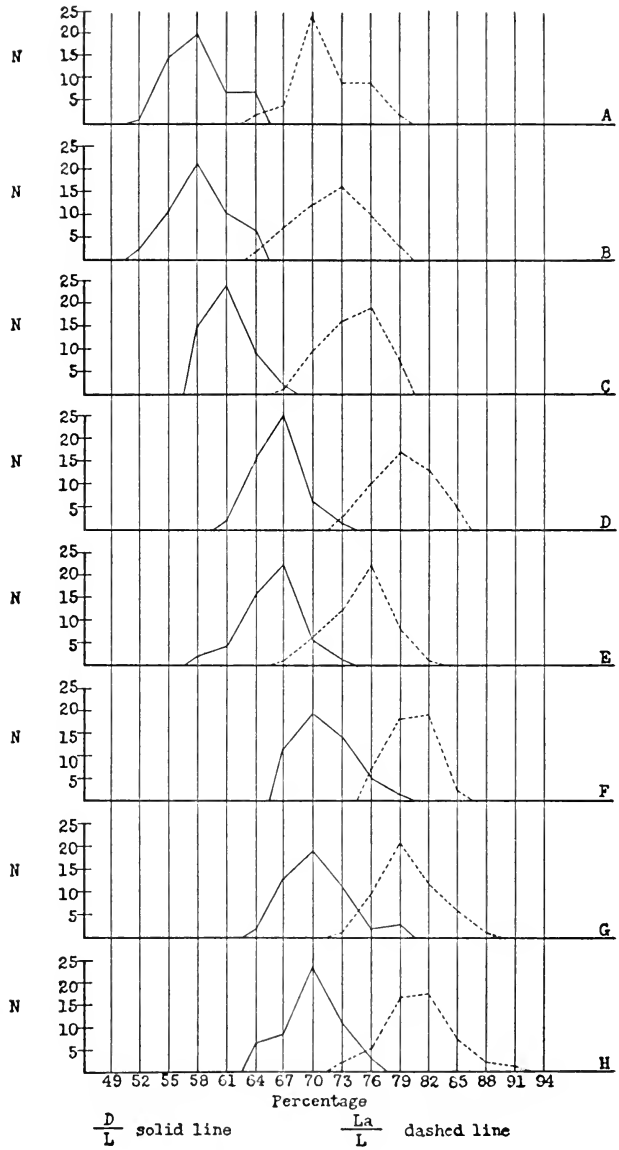


FIG. 1. D/L indices.

The values derived for D/L and La/L are as follows:

		M	σ	6σ	R	V
A	D/L	57 ± .305	2.163 ± .216	12.978	12	3.798 ± .379
	La/L	70 ± .359	2.545 ± .254	15.310	15	3.635 ± .363
B	D/L	57 ± .279	1.975 ± .197	11.850	12	3.464 ± .346
	La/L	71 ± .343	2.429 ± .242	14.574	14	3.421 ± .342
C	D/L	60 ± .248	1.755 ± .175	10.530	10	2.825 ± .282
	La/L	74 ± .269	1.908 ± .190	11.448	12	2.578 ± .257
D	D/L	66 ± .316	2.240 ± .224	13.440	13	3.393 ± .339
	La/L	79 ± .269	1.907 ± .190	11.442	12	2.413 ± .241
E	D/L	67 ± .368	2.608 ± .260	15.648	14	3.892 ± .389
	La/L	76 ± .307	2.276 ± .227	13.656	13	2.994 ± .299
F	D/L	70 ± .305	2.163 ± .216	12.978	12	3.090 ± .309
	La/L	79 ± .184	1.304 ± .130	7.824	9	1.650 ± .165
G	D/L	70 ± .412	2.915 ± .291	17.490	16	4.164 ± .416
	La/L	80 ± .303	2.148 ± .214	12.888	13	2.685 ± .268
H	D/L	70 ± .334	2.366 ± .236	14.196	14	3.380 ± .338
	La/L	80 ± .436	3.085 ± .308	18.510	16	3.856 ± .385

Inherent differences in variability of the several populations are reflected by the different values of V derived for most of the populations. The differences are moderate, but they do exist. This is more likely to be a response to genetic structure than a product of ecological influences, but it is not necessarily so. The low values derived for V indicate that the use of the indices as taxonomic characters is justified. The moderate differences between some populations and the absence of this difference between others as regards V indicates that all the populations are of one species. This is in accord with the data of the previously discussed curves which form a gradient of the indices from a D/L mode of 58% and a La/L mode of 70% in population A to D/L mode of 70% and a La/L mode of 82% in population H. No decided break is evident in this gradient and the various populations are presumed to be members of the same species. Certainly *P. ancillaria* is not a recognizable entity distinct from *P. heterostropha* on the basis of these data. Yet the D/L index (expressed verbally) has been the chief diagnostic character of *P. ancillaria*. (*P. sayii* was separated from *P. heterostropha* primarily on sculptural characters. The D/L index has not been considered to be appreciably different.)

Conclusion.—*P. heterostropha* is a complex of populations in which various genetic strains, or genotypes, are present, and in which, if isolation were to become absolute, speciation would

occur. *P. ancillaria* and *P. sayii* are two such genotypes and are not, therefore, species distinct from *P. heterostropha* and must be considered synonyms of the latter. Geographic isolation of populations of *Physa* composing the *P. heterostropha* complex has never lasted long enough to allow the development of sexual isolation with its resultant speciation. Geographic isolation of freshwater habitats is one of the most transient types of physical isolation. The effects of stream capture, reversal of flow due to glaciation, formation and disappearance of lakes and ponds, etc., are all measurable in magnitudes of 10,000 to 100,000 years. In a group as old as *Physa* (Cretaceous according to Henderson, 1935) such units of time are not enough to allow for speciation. Speciation could not have occurred since the Pleistocene. Yet species have been described that are restricted to bodies of water that could only be a product of the Wisconsin Ice. Actually such species are, in all probability, isolated genotypes which may, given enough time, form distinct species. At present, however, the characters of such entities scarcely justify subspecific recognition. This is all the more evident from this study which shows *Physa heterostropha* to be a polymorphic species which is excessively plastic and which readily responds to ecological influences. A comprehensive study of each genotype in relation to ecological factors is the next step toward an understanding of this species.

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CHARLES MONTAGUE COOKE JR.

Dr. Charles Montague Cooke Jr. passed away on the afternoon of October 29, 1948, at the age of 73, after nearly four months' illness. His last illness was caused by a fall upon the laboratory floor at the Bernice Pauahi Bishop Museum on July 1, 1948. This accident was the result of a weakened condition caused by injuries sustained in January when he tripped over a rope that was strung across the deck of an inter-island steamer on which he was a passenger.

He devoted forty-six years to the Bernice Pauhai Bishop Museum and about sixty to malacology, having collected land shells since he was a youngster. He was born in Honolulu on December 20, 1874. His father was a brilliant leader in the financial development of Hawaii. His grandfather, Amos Starr Cooke, a missionary, founded the Royal School for the children of the chiefs in Honolulu. Princess Pauahi, whose name is commemorated in the museum established by her husband Charles R. Bishop, was a student in the Royal School when Dr. Cooke was a child. The Princess spent much time caring for him. As a boy he was continually asking questions, and in his youth he had always wanted to work in the Bishop Museum.

Dr. Cooke graduated from Yale University in 1897 and received his doctorate in 1901. During his senior year he applied for a position in the Museum, but then decided to do graduate work under the great zoologist A. E. Verrill. It was on an expedition to Bermuda with Verrill that he met the future Mrs. Cooke, Elizabeth (Lila) Lefferts of Brooklyn. They were mar-

ried in 1901. In 1902, while they were on their honeymoon in Europe, Dr. Cooke received a cablegram notifying him of his appointment to the staff of the Bishop Museum as a general assistant. His greatest desire was satisfied when he took up his duties in October, after a month spent in Dr. Pilsbry's laboratory in Philadelphia. The Bishop Museum was then in its formative years, under the guidance of William T. Brigham. One of the new assistant's duties was to act as a guide for visitors. In those early days the Museum had no department of mollusks. It did, however, have Andrew Garrett's fine collection of Polynesia land and marine shells. The marine species had been studied and their taxonomy revised by Dr. W. H. Dall. Dr. Cooke at once began the museum collection of Hawaiian land shells, making numerous expeditions on Oahu and to the other islands, paying attention to the minute shells as well as the large. These trips were usually in company with other staff members such as J. F. Stokes and C. N. Forbes, but also with nonprofessional conchologists and friends. Good roads and automobiles did not exist in Hawaii in those early days, and collectors depended largely on their feet for transportation. They thought nothing of tramping twenty or thirty miles to their collecting grounds in the mountains with camping and collecting gear.

In building up a collection Cooke was hampered by the lack of adequate literature and accurately named specimens for comparison. In 1906 he made a trip to European and American museums in order to study the widely scattered types of Hawaiian land shells. To fill the gaps in the Bishop Museum shell literature he copied the unobtainable material in longhand at the Academy of Natural Sciences of Philadelphia. Here he worked again with Dr. Pilsbry, and a lifelong friendship grew up between them.

Following his return from this trip Dr. Cooke was appointed Curator of Pulmonate Mollusca, a position he held with distinction for 41 years. Later he was appointed to the Board of Trustees of the Museum and was president of the Board at the time of his death.

Time and again Dr. Cooke insisted that his contribution to malacology was mainly in building a collection of Pacific Island land shells of sufficient scope that any malacologist interested

in the pulmonates of this area would find most of them accessible under one roof. Of course this was a characteristically modest estimate of his work. However, toward this end he not only collected the Hawaiian islands most thoroughly but took part in, led, or directed from Honolulu, at least 16 major collecting trips to Polynesia and Micronesia. The longest and most complete was the Mangarevan Expedition of 1934, in which he led a party of scientists in a converted tuna sampan on a six months' exploratory expedition into eastern Polynesia, thus bringing to life a dream he had had for many years.

The total number of shells in the collection he left amounts to approximately three million, comprising most of the known and many unnamed species of the Pacific archipelagos. To round out the collection he instituted a system of open exchanges with the American Museum of Natural History, Academy of Natural Sciences of Philadelphia, The U. S. National Museum, Museum of Comparative Zoology, Rijksmuseum of Stockholm and others. Thus many species, otherwise unobtainable, have found their way to the Bishop Museum.

The beauty of the collection is that most of the species are represented by both the shell and the preserved animal. This has been greatly appreciated by anatomists such as Dr. H. B. Baker, who studied the zonitids in this collection.

In the process of amassing this vast collection Dr. Cooke became familiar with the literature of the subject. It is no exaggeration to say that he knew Pacific land shells as no one else in the world. It is a great loss to science that more of his investigations were not put on permanent record. He published authoritative papers on *Carelia,* new *Amastridae* and many other groups; on new species of *Partula* jointly with Professor Crampton; and he collaborated with Pilsbry in four volumes of the Manual of Conchology, on *Achatinellidae, Amastridae, Tornatellinidae* and Pacific *Pupillidae.*

Two other malacologists should be mentioned in connection with Dr. Cooke, namely, Henry E. Crampton of Columbia University, and William J. Clench of the Museum of Comparative Zoology. Together with Pilsbry and Baker, these names will always be associated with Cooke, as each of them, with Cooke's cooperation, has contributed much to the study of land shells of this area.

Scientific men visiting the Islands found the Doctor and Lila Cooke the soul of hospitality. Nothing that would forward a visitor's objectives was too much trouble. Many scientists in Europe and America recall with keen pleasure the hours spent under the generous roof of Kualii in lovely Manoa Valley.

Dr. Cooke is survived by Mrs. Cooke, a son Charles and daughter Caroline.—Yoshio Kondo.

NOTES AND NEWS

Dates of The Nautilus.—Volume 62, no. 1, pp. 1–36, pl. 1 (11), was mailed July 22, 1948. No. 2, pp. 37–72, pls. 2–4, December 8, 1948. No. 3, pp. 73–108, pls. 5 and 6, March 18, 1949. No. 4, pp. 109–145, I–vii, pls. 7 and 8, June 8, 1949.—H. B. B.

Errata.—In the last number of Nautilus, p. 120, first line of fifth paragraph, for "Phenacolepididae" read Patellidae. Page 141, last paragraph, *Haliotis "asinea"* is a printer's or other error for *H. asinina* L.

Murex argo Clench and Farfante.—While on a recent collecting trip through the Lesser Antilles, I collected a magnificent living specimen of this extremely rare shell. Only one other specimen is known, that being the holotype in the Liverpool Museum taken at Grenada in deep water. The specimen which I obtained is absolutely perfect and measures 3¾ inches in length. The color is deep cinnamon-brown, nucleus flesh pink, interior of aperture bluish white. In life the shell was covered with a very thin, dull black epidermis. Animal dull olive-green, striped and blotched with purplish brown.

This specimen was taken in a fish trap at a depth of between 30 and 50 fathoms off La Bime Point, Dominica, B.W.I.—A. Hyatt Verrill.

Two overlooked synonyms.—If you want to learn how much you can overlook or forget, just write a book. I have found two names for American land snails omitted from my book on that subject, as follows: *Vertigo minuscula* Sterki, 1897, a synonym of *V. parvula* Sterki; cf. MacMillan, Nautilus 57: 127. *Helix minima* True, 1857, a synonym of *Punctum minutissimum* (Lea); cf. Nautilus 57: 132 and 58: 31.—H. A. Pilsbry.

Druck v. Th. Fischer

Lith. v. W. Pfaff.

Dr. L. Pfeiffer. 1856.

THE NAUTILUS

Vol. 63 OCTOBER, 1949 No. 2

LAND MOLLUSKS OF CAYMAN BRAC

By H. A. Pilsbry

The first land snails to be reported from Cayman Brac were collected by the ornithologist C. J. Maynard, who published new species of *Strophia* (= *Cerion*) in 1889.[1] Mr. James Bond, who was there in 1930 investigating birds, brought in a single *Chondropoma,* described as *C. caymanbracense.* In May, 1938, Mr. C. Bernard Lewis visited the island briefly as a member of the Oxford University Cayman Islands Biological Expedition. He was not after mollusks especially, but picked up four species, recorded in Nautilus for July, 1942; one, *Alcadia lewisi,* was described as new. In 1940 Mr. Lewis, who had become Curator of the Museum in Kingston, spent one week (March 30 to April 6) on Cayman Brac enroute to the Pedro and Morant Cays on behalf of the Jamaica Government. The land mollusks were one of several groups to which he gave special attention and the collection resulting has given occasion for this paper.

Mr. Lewis writes "I stayed at Stake Bay. Collecting was done particularly in that vicinity and along the trail crossing the island at that point. The weather had been very dry for some weeks and, with the exception of *Cerion,* live shells were scarce. Dead shells were abundant in the pits and pockets of the limestone."

Geological and other descriptive information on the Cayman Islands has been given by Chapman Grant, in Bulletin of the Institute of Jamaica, Science Series No. 3, 1940. "The Cayman Islands, satellites of the Greater Antilles, political dependencies of Jamaica, are perhaps the most isolated spots in the Caribbean Sea. Cayman Brac lies 125 miles northwest of Jamaica and about 120 miles from the nearest point of Cuba. . . . The sub-

[1] Maynard, Charles J., Monograph of the genus *Strophia,* in Contributions to Science, I.

marine slopes around the islands are steep. The hundred fathom line is only a few hundred yards from the shore of Cayman Brac. . . . Cayman Brac is the most easterly of the group. Little Cayman is 5 miles to the west. These islands are each about 13 miles long by 1¼ wide. Grand Cayman lies 60 miles west-south-west of Little Cayman."

The Bluff Limestone, said to be of Oligocene and Miocene age, forms the higher parts of the islands. The Ironshore formation is a Pleistocene formation of coral and coral sand, forming the low coastal platform. A low hardwood forest covers the island. There are some brackish wells near the north coast, but no other fresh water. Fruit and vegetables are abundant. Somewhat over 1000 inhabitants live on the north shore.

One of the three Cayman islands, Little Cayman, seems to have been worked for *Cerion* only. A *Chondropoma* and a *Dialeuca* have been found there, but no other land snails, I believe. Doubtless, further species are to be found there.

In my paper of 1930, an estimate was made of the affinities of Cayman faunas. Evidence afforded by the considerable additions to the list of species confirms the results then reached that the main affinity of the fuuna is with Jamaica. About 50 species now known fall into the following categories;

1. Culture snails, some or all of which are usually to be found wherever there is settlement and cultivation in the American tropics. They are probably carried about on banana plants and the like. This includes the species of *Subulina, "Opeas," Gastrocopta,* and probably the single species of *Karolus* and *Veronicella* are to be added to this category, both described from Jamaica. These eight species may be ignored in any inquiry into the origin of the indigenous faunas.

2. Species belonging to groups generally spread in the West Indies and Central America. *Chondropoma, Helicina, Brachypodella, Microceramus* and *Cerion,* and the freshwater snails *Tropicorbis* and *Drepanotrema.* The genera *Chondropoma* (3 species) and *Brachypodella* (2 species) belong to little groups special to the Caymans and Swan Island, their closest relatives elsewhere being uncertain. *Microceramus* is nearest to the Central American *M. concisus. Cerion* has relatives in the islands from Cuba to Porto Rico, and is the only one of these genera

not found in Jamaica. *Strobilops* may belong to this group. Its affinities are with species of the Mexican mainland.

3. Species most nearly related to those of Jamaica, many belonging to specially Jamaican genera or subgenera. This includes all the species of *Poteria, Colobostylus, Lucidella, Stoastoma, Geomelania, Dialeuca, Lacteoluna, Stauroglypta, Proserpinula, Varicella* (but not *Melaniella*), *Spiraxis & Succinea,* in all 25 species.

Exclusive of the culture snails, all of which are widely spread species, it is remarkable that all but one or two species are endemic in the Caymans. Most of them must date back to Pliocene time, as from the records we have elsewhere, it is obvious that very few snails have been differentiated specifically during the Pleistocene. In Miocene times the islands had not emerged. If the fauna is a wind-borne or drift one, it is rather remarkable that there are not more species identical with those of the source islands.

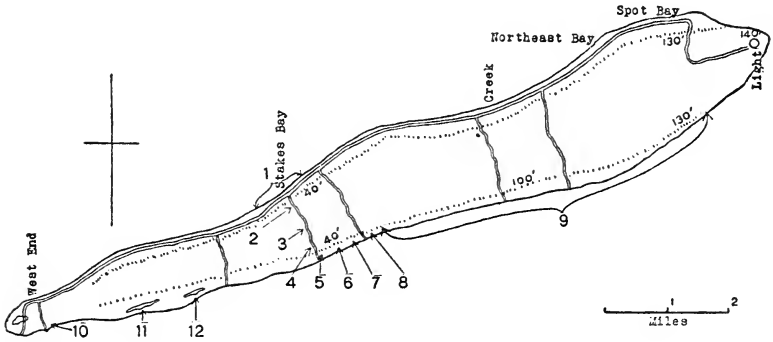


FIG. 1. Cayman Brac, showing collecting localities, road and trails. Perpendicular limestone cliffs indicated by dotted lines, the elevation in feet marked at intervals.

Eleven species of land mollusks are now known from Cayman Brac. The fauna is closely related to that of Grand Cayman, but there are two genera *Alcadia* and *Proserpinula,* not found as yet on the larger island, and the cerions are apparently of different genesis, not directly related to *C. martinianum* of Grand Cayman.

List of collecting localities: 1, Stake Bay below the bluff. 2, North end of Stake Bay, south side of road. 3, Midway across, on path south of Stake Bay. 4, South end of same bluff road from Stake Bay. 5, South side below bluff. 6, South side ¼ mile east of locality 5. 7, South side ½ mile east of locality 5. 8, South side ¾ mile east of locality 5. (Thatch Palm grove). 9, South side from locality 8 to about 1 mile from east end. 10, West end, south side. 11, South of salt water pond at west end of south coast. 12, South of the most easterly of the south east bay ponds at west end of south coast.

HELICINA FASCIATA CAYMANENSIS new subsp. Fig. 7.

Localities 1 to 4.

The shell is depressed-globose, rather strong, white with a band of irregular spots of terra-cotta color below the periphery, another on the upper surface. The moderately low spire is convexly conic. The 4½ whorls are weakly convex, the last rather broadly rounded at the periphery. Aperture strongly oblique. Peristome white, reflected and heavily thickened on the face. Axial callus rather heavy, white.

Height 6.2 mm., diameter 8.2 mm. Type.
Height 7 mm., diameter 9.2 mm.

In a previous paper I referred Helicinas from Grand Cayman to *H. fasciata substriata* Gray, described from Barbados. The original locality of *H. fasciata* was Porto Rico. However, the periphery is more narrowly rounded, almost angular, in those shells, while in the Cayman Brac specimens it is rather broadly rounded, as may be seen from the photographic figures. It seems best therefore to give this island form a separate name.

ALCADIA LEWISI Pilsbry.

Alcadia lewisi Pilsbry, 1942, NAUTILUS 56: 4.

Locality 2, 5. The specimens from locality 2 are mostly larger than the original lot, from 4.5 to 5 mm., diameter, 4½ whorls. None were collected alive, but the freshest specimens are light yellow.

CHONDROPOMA CAYMANBRACENSE Pilsbry.

Chondropoma caymanbracense Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila. 82: 352, pl. 30, fig. 1; 1942; Nautilus 56: 3 (Cayman Brac).

Chondropoma parvicaymanense Pilsbry, 1930, Proc. Acad. Nat. Sci. Phila. 82: 352, pl. 30, fig. 5; 1942: Nautilus 56: 3 (Little Cayman).

Localities 1 to 6. This species is rather variable in details of sculpture. In some lots, as that from station 8, the size is rather small and the axial threads coarser than in the type. In some specimens the intersections of axial and spiral threads are far more conspicuously beaded than in others. Several specimens measure:

Length 13 mm., diameter 8 mm.; 3½ whorls.
Length 12.5 mm., diameter 7.7 mm.; 3½ whorls.
Length 11.4 mm., diameter 7.2 mm. Locality 8.

From an examination of the series collected by Mr. Lewis I am inclined to believe that the forms from Little Cayman and Cayman Brac, which I described from single specimens, are extremes of one variable species. I have seen only one specimen from Little Cayman, received from Thomas Bland many years ago, the collector unknown.

Dialeuca caymanensis ("Maynard" Pilsbry).

Helix caymanensis Maynard, Pilsbry, 1893, Man. Conch. (2) 8: 241, pl. 56, figs. 10–12 (Little Cayman I).
Cepolis (Hemitrochus) caymanensis "Maynard" Pilsbry, Pilsbry, 1942, Nautilus 56: 5, pl. 1, figs. 10, 10a, 11, 11a.

Localities 1 to 4. This species was described from specimens taken by C. J. Maynard on Little Cayman Island. It is essentially three-banded, but in the type specimen the upper band is split on the last whorl, so that it was described as with four bands. In the type the bands are cut into many narrow spots, and some from Locality 3 are similarly variegated, but the bands are continuous in most Cayman Brac examples having color (most of those collected being bleached). The size and the degree of elevation of the spire are variable.

Height 9.4 mm., diameter 13.4 mm.; 4½ whorls (Type).[2]
Height 10.6 mm., diameter 13.8 mm.; 4½ whorls Locality 1.

[2] The type is the first measurement given in my description of 1893. In this work of more than fifty years ago I did not make caliper measurements, and those made by holding the shell against a flat scale were sometimes rather wide of the mark.

Height 9 mm., diameter 11 mm.; 4⅓ whorls Locality 4.
Height 8.3 mm., diameter 11 mm.; 4¼ whorls Locality 4.

In former papers (1930, 1942), I treated the Cayman species as members of the genus *Cepolis* subgenus *Hemitrochus*. On further study it became clear that they belong to the Jamaican genus *Dialeuca*, type *Helix gossei* C. B. Adams, (cf. H. B. Baker, Nautilus 56: 82) where I had placed them in 1895, Man. Conch. 9: 183.

Lacteoluna caymanbracensis, new species. Fig. 1.

Locality 2. The shell is umbilicate, strongly depressed, the very low spire with nearly straight outlines. Embryonic 1½ whorls are convex and smooth; following whorls are convex, increase slowly, and have sculpture of rather coarse but low, irregular growth-wrinkles. The last whorl has a narrowly rounded periphery, above the middle of the whorl. The base is rather weakly convex except where it curves into the umbilicus. Umbilicus (measured to insertion of columellar lip) contained 3.7 times in the diameter. The aperture is strongly oblique. Peristome thin, its columellar insertion carried rather far forward.

Height 2 mm., diameter 5 mm.; 4 whorls.

In shape this snail is much like the far larger *Lacteoluna ptychodes* (Pfr.) of Jamaica. It is not nearly related to the species described from Grand Cayman, *L. summa, L. caymanensis* and *L. steveni* (Proc. A. N. S. Phila. 82: 331–333); these belonging to the subgenus *Stauroglypta* H. B. Baker (Nautilus 48: 136), a Jamaican group.

Proserpinula lewisi, new species. Fig. 2.

Localities 1, 2, 3, 4 and 5.

The imperforate shell is moderately depressed, with a low, convexly conoidal spire; translucent whitish; polished, but showing faint growth-lines. The whorls are weakly convex and increase slowly, the last evenly rounded peripherally; the base is only a little impressed around the center. The aperture is oblique, rather deeply lunate, with no internal teeth or lamellae. Peristome thin and simple, the columella short, oblique and thick, a small callus covering the umbilical region.

Height 3.5 mm., diameter 5.4 mm.; 4¾ whorls.
Height 3.2 mm., diameter 4.6 mm.; 4½ whorls.

This species appears to be abundant. It differs from the Jamaican species by its greater height, contained about one and a half times in the diameter, while the Jamaican snails are more depressed, the height being contained about twice in the diameter. They have the spire lower and the base more deeply impressed around the axis than in *P. lewisi*. In a broken specimen there is seen to be a small umbilicus at a very young stage.

The relations of the several species can be shown best by the following

KEY TO SPECIES OF PROSERPINELLA [3]

A. Shell strongly depressed, the height contained about twice in the diameter.
  B. A thread revolves within the base, terminating in a thin tooth within the basal lip.....*P. infortunate* Bland
  BB. No revolving thread or tooth.
    C. Diameter 5 to 7 mm.....*P. discoidea* C. B. Adams
    CC. Diameter less than 4 mm.
      P. margaritella Pilsbry & Brown.
AA. Shell less depressed, the height contained about 1½ times in the diameter; no tooth.....*P. lewisi* Pilsbry.

PROSERPINULA INFORTUNATA (Bland).

Helix opalina C. B. Adams, Jan. 1845, Proc. Boston Soc. N. H., p. 16. Not *Helix opalina* Sowerby, 1840.
Helix margarita Pfeiffer, June, 1845, Zeits. f. Malak, p. 83; Monogr. 1: 13; and in Küster's Conchyl. Cab., Helix, pl. 100, figs. 24–27. Not *Helix margarita* Montagu, 1808.
Odentostoma apalinum C. B. Ad., Pfeiffer, 1848, Monogr. 1:12.
"*Helix hyalina* C. B. Adams" (in MS. list) Pfeiffer, 1848, Monogr. Hel. Viv. 1: 13, as a synonym of *Odontostoma opalinum* C. A. Ad. Not *Helix hyalina* Le Guillou, 1842.
Prosperina opalina C. B. Ad., Pfeiffer, 1848, Monogr. 3:292.
Helix infortunata Bland, 1854, Ann. Lyc. N. H. of N. Y., 6:78.
Proserpinula infortunata (Bland), Pilsbry & Brown, 1910, Proc. A. N. S. Phila. p. 316, fig. 2 (teeth of radula).—H. B. Baker, 1935, Nautilus 49:53 (distribution).

PROSERPINULA DISCOIDEA (C. B. Adams.)

Proserpina discoidea C. B. Adams, 1850, Contrib. to Conch. p. 81.
Helix prosperinula Pfeiffer, 1851, Zeits. f. Malak. p. 128; Monogr. 3:35; 4:15.
Proserpinula discoidea (C. B. Ad.) H. B. Baker, 1935, Nautilus 49:53.

[3] The synonymy of the two older species was correctly given by the clear-thinking Bland about 95 years ago, but as Tryon (Man. Conch. 2:201) did not follow his decisions it may be convenient to give the references here.

PROSERPINULA MARGARITELLA Pilsbry & Brown.

Proserpinula margaritella Pilsbry & Brown, 1910, Proc. A. N. S. Phila. p. 526, fig. 6.

BRACHYPODELLA CAYMANENSIS Pilsbry. Figs. 3, 4.

Location 2. The ribs are a trifle more widely spaced than in the Grand Cayman type lot, and the free neck is a little longer (fig. 4); but in one specimen (fig. 3) the ribs and neck are about as in the type, so that judging by only seven specimens of the Cayman Brac form collected, no racial difference seems indicated.

MICROCERAMUS CAYMANENSIS Pilsbry.

Location 4. Known before from Grand Cayman, the type locality. The single specimen agrees closely with the type. It is nearly related to *M. concisus* (Morelet) which is known from Swan and Little Swan Islands, Utila, and the mainland of Guatemala and Yucatan.

In this connection I may mention that Dr. Axel A. Olsson collected *Microceramus bonairensis* (E. A. Smith) on the mainland at Rancheria, a place northeast of Magdalena, in northeastern Colombia. It was known before only from the Dutch Leeward Islands. The Rancheria specimens reach a larger size (length 9 to 11 mm., with 10⅓ to 11½ whorls), than any seen from the islands. They are a little wider and the sutural papillae are more generally developed, though still more minute than in *M. gossei* or *M. concisus*. This mainland form might be rated as another weakly characterized subspecies of *M. bonairensis*, nearest to *M. b. arubanus* H. B. Baker; but the individual variation is considerable, so that these subspecies rest upon average characters of the populations.

CERIONIDAE

"Living *Cerion* was found to be abundant at most places where they occurred at all. Sometimes they would be completely absent. Coconut trees were wiped out through the ravages of bud-rot and storms between 1920–33 so that Maynard's reference to the 'coconut grove' has little significance today.

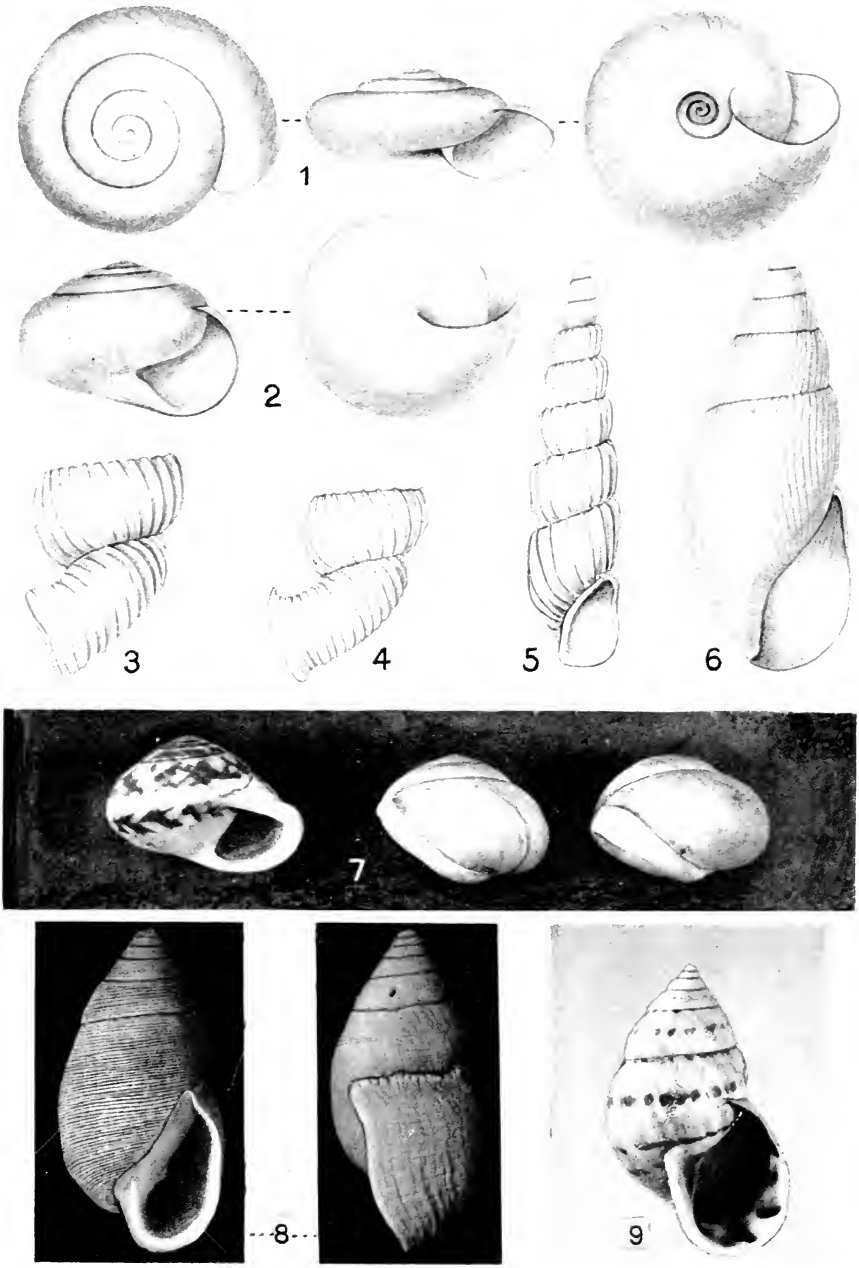
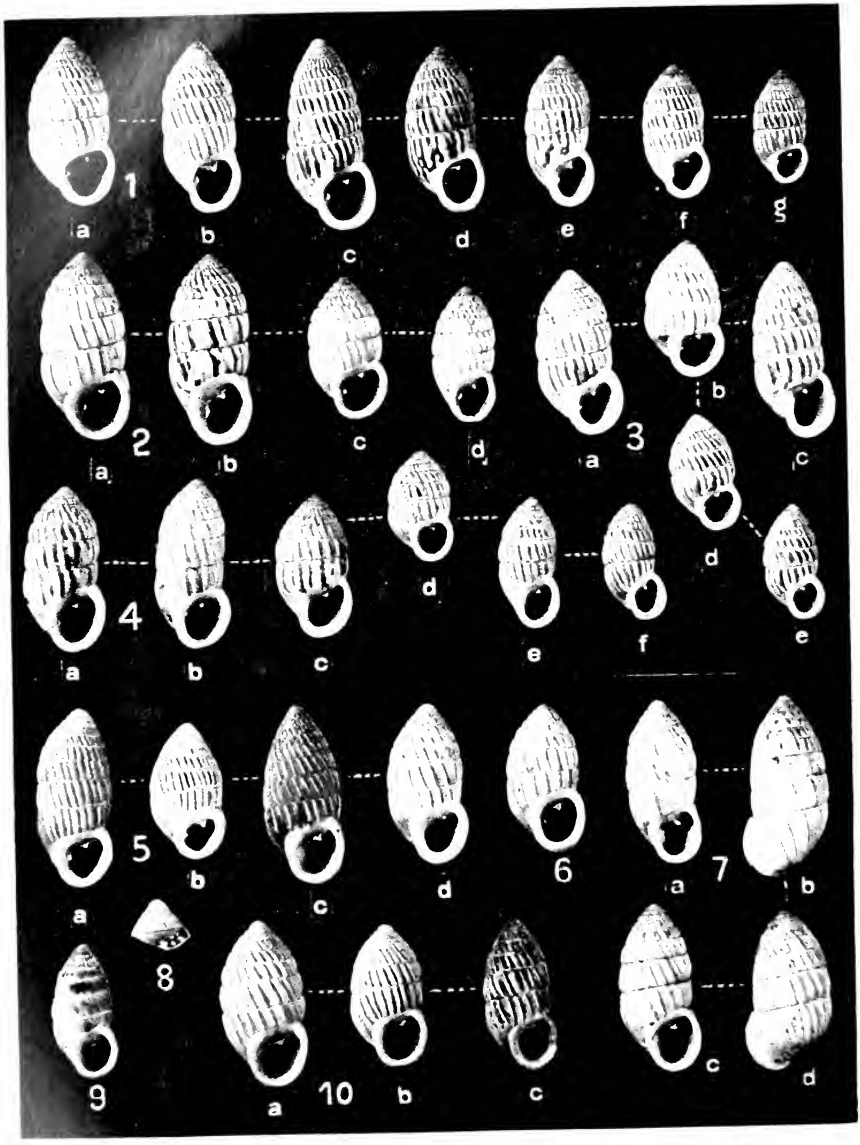


FIG. 1, *Lactcoluna lewisi*, type. 2, *Proserpinula lewisi*, type. 3, 4. *Brachypodella caymanensis*. 5, *Varicella (Melaniella) caymanbracensis*, type. 6, *Varicella lewisi*, type. 7, *Helicina fasciata caymanensis*, type and two paratypes. 8, *Apodosis novi-mundi* P. & M. (p. 10). All figures enlarged. 9, *Neopetraeus cremnobates* Pilsbry, Hydroelectric plant, R. Santa, Peru, n. sp.



FIGS. 1–10. *Orion copium* and varieties. 1 a–g, Point at West end. 2 a–d, locality 10, 3 a–c, loc. 5, 4a–f, loc. 7, 5 a–d, loc. 2. 6, "*Strophia*" *incrassata*, specimen from Maynard. 7 a–d, "*Strophia*" *perplexa*, from Maynard, 66283, 60030, 129005 ANSP. 8, young *C. copium*, loc. 2. 9, "*Strophia glabra*, from Maynard, 60078 ANSP. 10 a–c, loc. 4.

We merely know that it was located toward the western end of the south side.

"I made special effort to take unselected, random samples in any given area. I would take a space of two or three square yards and pick up every individual. Specimens obtained at localities 2, 3, and 4 on the 'bluff' were all dead shells and out of habitat. Some or all may have been taken inland by hermit crabs which abound" (Lewis).

CERION COPIUM (Maynard). Plate 4.

Formerly (Manual of Conchology 14: 186) I considered this to be a race subordinate to *C. pannosum* of Little Cayman, and that view is probably correct; but as the typical form of *pannosum* is not found on Cayman Brac it may be more convenient to allow *copium* specific standing until the Little Cayman forms shall be fully studied.

Mr. Maynard (Contributions to Science I, 1889) recognized six "Species" on Cayman Brac, named and located as follows. Brief comments are added.

Strophia copia. Widely distributed in western and southern parts of the island, especially abundant in the "coconut grove."

S. lineota. South side, coconut grove near the boat landing, with *S. copia*, which it resembles except by having brownish purple intervals of the ribs. There are 25 to 27 ribs on the penult whorl. Also occurs on Little Cayman.

S. intermedia. South side as far east as the "coconut grove" extends. It has scattered, unequally spaced ribs, and is rather small, 20 to 23 mm. long. Many specimens are indistinguishable from *S. perplexa,* but some *perplexa* have the ribs more reduced and fewer.

S. perplexa. From "a barren, rocky section about two miles from the west end of the key and one-fourth mile from the south shore." Ribs are very weak and irregularly, widely spaced on the last two whorls, but their number and size vary widely. It is about the size of *S. copium* and intergrades fully with *S. intermedia.* Figs. 7a-d represent specimens from Maynard. Not obtained by Mr. Lewis.

S. parva. "Near northern termination of a path that crosses the key near the western end" in "a strip of quite high shrubbery," also scattered at intervals into the large colony of Common Strophia [*S. copia*] in the coconut grove on the south side. This is a small edition of *C. copium,* less than 18 mm. long.

S. glaber. From "near the area inhabited by *S. parva.*" This is a form of *parva,* differing from that by having the ribs very weak on the last three whorls. Maynard found only 16 specimens, one of which is shown in fig. 9.

It is well known that in many land shells having color markings, there are populations in which part of the individuals, or sometimes all of them, have lost the color markings leaving them plain. The genes carrying color in inheritance have been dropped out. The same applies in some degree to characters of the whole organism. There are probably few species uniform in all characters. It is likely that all are more or less heterogeneous, though the varying qualities may not be those affecting the shell, and so may be overlooked.

Maynard's *S. copia* and *S. lineota* are such varying members of a single species. *S. intermedia* and *S. perplexa* are forms of *copia* in which variation is expressed in dropping out some of the ribs; but this is different in every specimen, and they occur in the *C. copium* territory, sporadically. *S. glaber* (why masculine I do not know) is a similar modification of *S. parva.* In Cuba and elsewhere species occur which vary from ribbed to nearly without ribs (Man. Conch. 14: 204).

S. parva is fully connected with *C. copium* by specimens of intermediate size, and might perhaps be regarded as a little race which had been evolved in isolation and subsequently mingled with *C. copium,* with production of hybrids.

Mr. Lewis's specimens are as follows:

C. copium is typically uniform white, but specimens with dark interstices or some mottling (which Maynard called *S. lineota*) occur with the white shells in all lots I have seen from the localities 1, 5, 6, 8, 9, 10, 11, 12 (see map). In some places, such as localities 1 and 10, white shells predominate; in some other localities shells with dark intercostal intervals are equally prevalent, or form a majority, or even, as at locality 12, all seen are dark. Such variation in color is common in *Cerion,* as explained above. The size varies, the length 24 to 26 mm. or in some lots the average is somewhat smaller. Frequently there are some much shorter shells among those of normal populations (figs. 2e, 4d).

Perfectly typical specimens of form *parva* occur with normal *C. copium* in localities 5 and 11. The size diminishes from copium measuring: Length 22, diameter 10.3 mm., 10 whorls, 26 ribs on penult whorl, and length 23.5, diameter 9.3 mm., 10½ whorls, 22 ribs on penult whorl, through intermediate sizes to *parva* measuring: length 15, diameter 7.3 mm., 9⅓ whorls, 21 ribs on the penult whorl. A series is shown in fig. 1a-g.

Locality no. 7, on the south coast, furnished small shells, 15 to 22 mm. long, mostly less than 20 mm. Some individuals agree wholly with Maynard's *S. parva*, but most of them are decidedly stouter than that form. A series is figured, fig. 4a-f.

Localities 2, 3, and 4 are situated on the bluff, higher than any of the preceding. Only dead shells which had lost most or all of the color they may have had, were gathered. In locality 2, at the north end of Stake Bay, south of the road, figs. 5a-d, the ribs are narrower than in *copium* of the lower areas, and more numerous, up to 32 on the penult whorl in fig. 5a. Evidently Maynard did not collect this form or he would have made another "species." In the same lot there are also some shells which approach form *intermedia*, with about 18 spaced ribs (fig. 5d).

At locality 3, midway across the island, south of Stake Bay, there are also rather narrow, close riblets, 28 on the penult whorl in a shell 25 mm. long. In this lot there are shells down to 15 mm. long, and one "*intermedia*" with narrow, unevenly spaced riblets.

Locality 4, at the south end of the bluff path, has shells like the larger ones at locality 3 (fig. 10a-c).

Varicella lewisi, new species. Fig. 6.

Localities 1, 2, 3, and 4.

The shell is white, polished, fusiform, the diameter contained about 2.6 times in the length. The apex is obtuse; first 2½ whorls are smooth, the following whorls weakly convex but joined by a deep suture, and with sculpture of axial grooves, separated by somewhat unequal intervals of the same or somewhat greater width, the grooves becoming a little weaker at the base. The aperture is less than half of the total length, long-piriform; the outer lip is broadly arched forward. Columella evenly concave, obliquely truncate at the base.

Length 7.6 mm., diameter 3 mm., length aperture 3.5 mm.; 5⅓ whorls. Type.

Length 9 mm., diameter 3.6 mm.

This Varicella belongs to the same group as *V. caymanensis* of Grand Cayman, and may perhaps be a subspecies of that; but it differs by the broader form. Both are allied to *V. pinchoti*, which is larger and longer, with the columella much less concave.

Varicella (Melaniella) caymanbracensis new species. Fig. 5.

Locality 4.

This very slender or subulate shell belongs to the group of *V.* (*M.*) *gracilliama* (Pfr.). The length is four times the greatest breadth. The pointed apex is shaped as in *V. gracillima;* first 2½ whorls are smooth. There are thin, widely spaced axial ribs on following whorls, 14 on the last whorl. Intercostal intervals have about four fine striae. The whorls are strongly convex below the deep suture, elsewhere only weakly convex. The aperture is piriform, somewhat oblique. Peristome is continued in a raised cord across the parietal wall, and the outer lip is not "bent inward and produced forward at its upper third" as described for *V. gracillima,* being but slightly compressed at that place.

Length 6 mm., diameter 1.5 mm.; 8½ whorls.

A single specimen was taken. It is evidently related to *V. gracillima* of Cuba (with subspecies in Florida and the Bahamas), but the Cayman race differs in details of form and sculpture.

POLYGYRA HIPPOCREPIS AND ITS AUTHOR, LOUIS PFEIFFER—II

By H. E. WHEELER

In the last Nautilus we dealt with Pfeiffer and Roemer as pioneers in Texas science, of their discoveries and the scene of their labors. Not less interesting are the lives and family background of these men. We begin with Dr. Louis Pfeiffer (1804–1877).

A book compiled by his nephew, August L. Pfeiffer, in 1886, a copy of which is in the library of Kassel, traces the family back to the early 16th century. It contains genealogical tables of the different branches of the family and short biographical

sketches of its best-known members, among them of Louis Pfeiffer. The earliest known Pfeiffer lived as a peasant at Körle, a small village near Kassel, which was at the time the capital of the Landgraftentum Hessen. Here the family lived for nearly two centuries, but at the beginning of the 18th century Hans Jacob Pfeiffer, one of the eleven children of Nicolaus Pfeiffer, burgomaster of Körle, moved to Kassel. One of his grandsons was Johann Jakob Pfeiffer who lived from 1740 to 1791. This man qualified as Professor of Theology at the University of Marburg and later was tutor to the Crown Prince of Hessen, and recognized as an outstanding and influential citizen. One of his ten children, Carl Jonas, founded the leading private bank in Kassel, and another, Buchard Wilhelm, became counsellor of the high court of Justice of Hessen.

Carl Jonas was the first member of the family to show an interest in the study of mollusks, and in his later years wrote the first pretentious monograph on German land and freshwater shells. This was published between 1821 and 1828 figuring all the German species then known. The fine drawings and accurate coloring of the plates were notable for that time.

Burchard was the father of Louis whose full Christian name was Karl Georg Louis. He was born July 4, 1804. He was a clever boy and an exemplary student, graduating from the gymnasium when only sixteen years old. He then matriculated in the University of Göttingen in medicine, but later at the University of Marburg, receiving the degree of M.D. on his twentieth birthday, July 4, 1825. Postgraduate work at Paris and Berlin followed, but he returned to Kassel in the autumn of 1826 and entered upon the practice of his profession.

In 1831 he accepted a call from German physicians to go to Poland, which was then at war with Russia, and worked as staff physician at Lozienka, Pomonsk, and the great Alexander hospital in Warsaw. His special assignment was ministering to the wounded and in the treatment of the victims of the cholera epidemic which was raging at that time. When Warsaw capitulated on September 8, 1831 he received a flattering offer from the Russian government to enter their service, but in sympathy with the unhappy Poles he indignantly declined and returned to Kassel. His experiences with cholera prompted the publica-

tion of a short paper in 1831 in which he contended that the disease was not contagious.

On May 19, 1833, Pfeiffer married Louise Philippine Nathusius and soon after gave up the practice of medicine in order to devote himself exclusively to more congenial studies in natural science, especially botany and malacology. His first work on the cacti appeared in 1837 and immediately gave him high rating as a scientist. Henceforth he was known as Kactus-Pfeiffer. His first marital relations were not congenial, and after the death of his three children he secured a divorce. His wife seems to have had means and her endowment made him independent. In 1842 he married again, his union with Wilhelmina Frederika Wagner, of Wetzlar, being very happy and blessed with five sons and a daughter. His eldest son became a merchant in Spain; his second son was an architect; the third a Justice of the Peace; the fourth a Prussian officer; and his only daughter married one of the directors of the state bank, called the Landeskredithasse, in Kassel.

As early as 1833 Pfeiffer began making extensive excursions through all parts of Germany and the low countries for which his physical strength and endurance well fitted him. It is said that on one occasion he walked from Marburg to Kassel, a distance of 55 miles, in a single day. He was blessed with a robust constitution up to the time of the death of his youngest son on the field of honor in the Franco-Prussian war in 1870, after which by reason of depression his health was much impaired.

In 1838 Pfeiffer made his historic trip to Cuba, and this was to have a significant bearing on his future work. The original objective of the expedition was the collection and study of living cacti. Cuba, however, is not a prolific habitat for this family, so he turned his attention to the collection of mollusks.

Sailing from Hamburg on a small vessel in October, 1838, he reached Havana after a stormy voyage of seventy days on January 5, 1839, remaining until some time in March. Pfeiffer wrote an account of this voyage, which, in manuscript form, was presented to the Museo Poey, Havana, by his grandnephew, Dr. Karl Pfeiffer, but it could not be located while this paper was being written. It appears from Ramsden's sketch of Dr.

Johannes Gundlach that Mr. Charles Booth, who had an estate in Mantanzas Province, had invited Dr. Gundlach, Dr. Edward Otto, and Dr. Pfeiffer to be his guests, which invitation was accepted. Pfeiffer spent a large part of his sojourn in Cuba in this hospitable home. It seems that the brigantine on which these fellow-travelers embarked was forced by contrary winds, as it approached Cape Maisi at the eastern end of the island, to turn southward and proceed along the southern coast, thus delaying their arrival in Havana until the fourth of January, and they did not reach Matanzas until the thirteenth of the month.

Otto was soon on his way to Surinam and to Caracas, Venezuela, and Gundlach turned back for a time, hearing of the death of a friend in Germany, but his decision had been made for a life-long devotion to the natural history of Cuba. Otto and Pfeiffer had already collaborated on a paper, dated 1838, and published in 1839,[1] which was Otto's first appearance in print, with the exception of his thesis for a doctorate published the year previous. This was followed by another paper [2] also published in 1839.

Pfeiffer's first papers on Cuban shells were: Bericht über die Ergebnisse einer Reise nach Cuba im Winter 1838–1839, in Archiv für Naturgeschichte 50 (1), 348–358, 1939, and Übersicht der im Januar, Februar und März 1839 auf Cuba gesammelten Mollusken, Archiv f. Naturg. 6 (1), 250–261, 1840. In 1840 he also published his Kritisches Register zu Martini und Chemnitz' Systematisches Conchylien-Cabinet.

The many species of marine, freshwater and land shells described in the Cuban papers were collected for the most part in the vicinity of Havana and Mantanzas. The total number of his contributions on Cuban malacology is not less than eighty. Species described after his return to Germany were collected by Gundlach, Poey, and other correspondents. These studies claimed his attention to the very last year of his life and were

[1] Auszug aus einem Bericht über die zoologischen Beobachtungen während der Reise von Hamburg nach Havannah. In a yearly report of an unlocated Society, III. pp. 9–12.

[2] Zur Molluskenfauna der Insel Cuba. Malak. Blätter VII, pp. 9–32.

published more or less regularly in monographs and papers for more than forty years.[3]

Eduard Otto is known to have continued his researches on botany in the Antilles and parts of South America, but Gundlach remained until his death in 1896 a resident of Cuba and a prolific writer on Cuban ornithology, botany, conchology, and other zoological subjects. An important sketch of his life,[4] written by Carlos T. Ramsden, contains notes on these fellow-travelers. Otto at a later period collaborated with Pfeiffer in his monumental work on cacti, at least in the first volume, published in 1850, but the second volume, which concludes Pfeiffer's work on that family, was published in 1858, and was his work alone. It was then, and has been ever since, applauded for its exact and elegant execution.

It remains to be noted that these trips of Roemer and Pfeiffer are now fully cleared. Pfeiffer was never in Texas; Roemer was never in Cuba. Pfeiffer's voyage preceded that of Roemer by seven years. The expedition of Pfeiffer was within a compass of seven months including the sea voyage; Roemer's residence in Texas was a matter of eighteen months. Roemer made voluminous collections while in the field, but Pfeiffer had no Texas material to work on until Roemer submitted it to him after his return to Germany.

It seems that Pfeiffer made frequent trips to Paris and London to consult literature not accessible in Kassel and to study the collections brought to Europe by the great French voyages and especially by Hugh Cuming. After his death his own books

[3] The principal works of Louis Pfeiffer, omitting his voluminous treatises on the flora of Europe and his monumental works on the cacti, include:

Symbolae ad Historiam Heliceorum. Kassel, 1841–1846.

Monographia Heliceorum Viventium. Eight volumes, Leipsig, 1847–1877.

Monographia Pneumonopomorum Viventium. 3 parts, Kassel, 1852–1876.

Monographia Auriculaceorum Viventium. Kassel, 1856.

Novitates Conchologicae. 5 Volumes, Kassel, 1854–1877.

Zeitschrift für Malakozoologie. 10 volumes, Kassel, 1846–1853 (Herausgegeben zusammen mit Dr. Karl Theodor Menke). Continued as Malakozoologische Blätter. 24 volumes, Kassel, 1854–1877 (the first eight volumes in collaboration with Menke, all the others edited by Pfeiffer alone).

[4] Vida y Exploraciones Zoologicas del Dr. Juan Gundlach in Cuba, in Memorias de la Sociedad Cubana de Historia Natural, 1918, pp. 146–168, with two portraits.

and all of his collections were sold to Dr. H. Dohrn who bequeathed them to the Museum in Stettin, his native city, where, if they have escaped the ravages of war, they may still be. Stettin is now under the control of Poland. The Museum at Kassel was never an important institution and was bombed out of existence during the last world war.

Many letters of Pfeiffer in his own handwriting are preserved in the Senckenberg Museum at Frankfurt a/Main but only one was left in the hands of Dr. Karl L. Pfeiffer who entrusted it to the writer. It contains a statement that the writer declared that he had been and would remain a pure "schalen (concha) Konchyliolog" in opposition to Adolf Schmidt, whom he calls an "anatomizer." Pfeiffer had been sending him shells for dissection in alcohol. To whom this letter was addressed is not stated. References to collections made by Frivalsky and by Rossmässler, collecting in Spain, indicate that one of them was the correspondent, probably Frivalsky.

Pfeiffer was undoubtedly a Protestant Christian, though no specific records of his religious convictions have been located. All of his children were baptized in the Christian faith.

In 1874 Pfeiffer, in spite of ill health, made a two months' visit to one of his sons who was then living in Catalonia, Spain. He had been prostrated by the death of his youngest son who was killed on the field of battle in the Franco-Prussian war, and his health had been greatly impaired. Two years before his death, on the 50th anniversary of his career as a physician and scientist, he was honored by the degree of Doctor of Philosophy. On this occasion many friends joined in the celebration, or sent their congratulations, and he was made a member of many learned societies, though he had already received recognitions of this kind. On October 2, 1877, at the age of 72, he passed away in his native city, Kassel, and he is buried there.

As to the value of Pfeiffer's work, and especially his *Monographia Heliceorum,* Dr. Pilsbry informs me that even today it is indispensable and in frequent use by those working on the taxonomy of land mollusks, all over the world. In the United States the field was covered in Pfeiffer's time by Lea, Gould, the Binneys and Bland, so that his work was far less extensive here than in regions then without resident conchologists, such

as tropical and South America and the Orient. The judicious and conservative spirit of Pfeiffer's writings had a deep and salutary influence upon land mollusk students of his time throughout the world.

Ferdinand Roemer

It would be ungracious not to review the life and work of Roemer in relation to that of Pfeiffer, for it presents a material interest all too briefly presented in this sketch.

Ferdinand Roemer [5] was born in Hildesheim, Hannover, on January 5, 1818. He died at Breslau on December 14, 1891, being nearly 74 years old. An elder brother, born in 1809, was a geologist and was, at the time Ferdinand made his trip to America, Professor of Mineralogy and Geology at Clausthal, but seventeen years later was elected Director of the School of Mines. He is distinguished as the author of three elaborate works on the Cretaceous and Jurassic strata of Germany. The father of these brilliant sons was a lawyer and counsellor of the High Court of Justice. Ferdinand was indebted to his brother for his interest in geology, though he was persuaded by him to take up the study of law. University training at Göttingen and a semester at Heidelberg prepared him for his examinations, but on account of political objections, he declined to try for advanced courses, and his inclination for a scientific career asserted itself.

Two years of study in Berlin won him the degree of Doctor of Philosophy, his thesis being on a paleontological subject. After several years of geological researches in the Rhenish Mountains he published the results at Bonn in 1844.[6] The next year his first contribution to the Neues Jahrbuch für Mineralogie, Geologie und Paleontologie appeared, and "thereafter for more than forty years his name was familiar to the readers of that journal."

The year 1845 dates his expedition to Texas, funds being provided by the Berliner Akademie der Wissenschaften, and he received the endorsement and possible financial aid of Alexander

[5] My attention has been called to the fact that there is no "von" in his name as has been sometimes stated. (Dr. S. W. Geiser.)

[6] Das Rheinische Übergangsgebirge.

von Humboldt. At this time little was known of Texas, certainly nothing of its geology, but in the year and a half of his sojourn, with headquarters for a considerable part of the time at New Braunfels, he covered the greater part of southern Texas and completed an immense amount of investigation. He frequently shared the humble hut of Lindheimer, the botanist, which was in proximity to Comal Springs, finding him a very congenial spirit and a helpful field companion. All his collections were left in the care of his friend until they were packed for shipment overseas.[7]

Roemer's preliminary papers on Texas appeared in the American Journal of Science and Arts in 1846 and 1849, but in the latter year, after his return to Germany, he published at Bonn his great work on the State.[8] In 1852 appeared an even more pretentious volume,[9] which was also published in Bonn, and which won him the title, "Father of Texas Geology." Simonds,[10] who covers Roemer's life in splendid fashion, adds: "That Roemer should have been able to accomplish so much during his brief sojourn in the State is remarkable considering the limited means of transportation and the serious danger from wandering bands of Indians when conducting scientific work outside of the immediate vicinity of the settlements. Under such circumstances that his results should have been so accurate is a little short of phenomenal."

But if we depended on Simonds, or several other biographical sketches, we would never have surmised that Roemer ever had any contact with Pfeiffer nor that the geologist ever made the collection of shells which engaged so heartily the attention of the malacologist.

Roemer had other opportunities to treat of geological matters in America, and his latest contribution, published only three years before his death in 1891, had to do with Texas.[11]

[7] Notes on Lindheimer will be found in Geiser's splendid volume, Naturalists of the Frontier, 1937.

[8] Texas. Mit besonderer Rücksicht auf deusche Auswanderung und die physischen Verhältnisse des Landes nach eigener Beobachtung geschildert.

[9] Die Kreidebildungen von Texas und ihre organischen Einschlusse.

[10] American Geologist, XXIX, March 1903, p. 133.

[11] Über eine durch die Häufigkeit Hippuriten-artiger Chamiden ausgezeichnete Faune der oberturonem Kreide von Texas. Paleont. Abh. Bd. IV. Berlin, 1888.

On Roemer's return to Germany he made extensive journeys to all parts of Europe. He was actively engaged as a lecturer in geology, paleontology and mineralogy. He made a magnificent collection of minerals which was later housed in a great museum planned largely according to his wishes and located near his home in Breslau.

Roemer never had any children of his own but was very devoted to his wife's nieces, whom he raised as his own daughters. Though some of his conclusions have found a different explanation, yet withal his work was done with great care, and his map of Texas deserves the greatest praise for its fidelity to detail and accuracy of delineation. He died at Breslau on December 14, 1891, in his seventy-fourth year, being spared the infirmities of old age as he earnestly desired.

Conclusion

There is an incidental, but quite intriguing parallelism in the life history of these distinguished scientists.

Their active years in research and authorship cover nearly the same decades. They prepared themselves for different careers, one in law, the other in medicine, abandoning them for the more congenial appeals of science. Each was a contributor to two or more different subjects not in the same field, Roemer in mineralogy and paleontology, but principally in geology; Pfeiffer in the translation of medical works, in botany, and malacology. Roemer was at home in Latin and Greek, and spoke English, French, and probably Spanish; Pfeiffer was proficient in the classical languages, besides having a fluent use of French, English, Spanish, and a working knowledge of Polish. Each of them had a comprehensive knowledge of history and belles-lettres. Roemer was talented as a lecturer, drawing many listeners to his discussions even though they were not students of the subjects, for they were fascinated by his charming style and comprehensive knowledge. Pfeiffer was unusually proficient as an artist making many sketches of subjects in his travels and drawing the illustrations for his books. He was also an accomplished musician on the flute. He sang with fine expression the baritone parts of the operas of the composer, Spohr, who was his brother-in-law. The story is told that when the baritone

soloist left the choral society Pfeiffer surprised the group by volunteering to take his place and he sang at sight the parts to the delight of all and interpreted the songs of Spohr to the satisfaction of the composer.

Both were devoted to children: Roemer to his wife's neices whom he raised as his own daughters; Pfeiffer to his dutiful children. The travels of both were confined to the continent of Europe, but each had one significant trip to America, Roemer to Texas, Pfeiffer to Cuba. Both are distinguished by the accuracy of their observations and the precision of their records. They refused flattering opportunities in other fields of education and service that they might render a better account in their chosen subjects. On each of them were conferred degrees both earned and honorary, and they were elected members of many scientific societies. Both were characterized by the simplicity of their lives, their sincerity of character, their integrity and unselfishness, and by their amazing energy. They were prolific writers and their works won the highest recognition not only in their own homeland but throughout the world.

We wish that we knew more of their field experiences and their personal interests and habits. None of us would turn down an opportunity to accompany such men as these, and others like Von Möllendorff, Doherty, Arango, Poey, Gundlach, and Herbert Smith—past masters these in the exploration of unknown fields of malacological interest. These early pioneers were too modest and too busy to make records of their methods of work, their hardships, their means of getting to places now easily accessible to the present-day naturalist, and it never occurred to them how much their successors would be enriched by their unpublished diaries.

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The author's grateful acknowledgments are due to: Dr. S. W. Geiser, Southern Methodist University, Dallas, Texas, for citations from his books. Dr. Karl L. Pfeiffer, Kassel, Germany, for invaluable records and assistance, for papers of Louis Pfeiffer, and transcriptions of biographical material in German. Dr. C. G. Aguayo, Museo Poey, Havana, Cuba, for information concerning Pfeiffer's work in Cuba, and for Ramsden's sketch of Dr. Juan Gundlach. Dr. H. A. Pilsbry for critical studies of Pfeiffer's species, biographical data, and a portrait of Louis Pfeiffer. Dr. Allan F. Archer for the identification of species collected in New Braunfels. Mr. Charles Long, Witte Museum, San Antonio, for photographing the type locality of *Polygyra hippocrepis* and Comal Springs. Mr. Q. B. Schenk, Birmingham, Alabama, for photographing *Polygyra hippocrepis,* and photostats of Roemer's map of Texas, and a letter of Louis Pfeiffer. Mr. Albert Wingfield, Birmingham, Alabama, for the translation of German biographical excerpts and letters. The Public Library of San Antonio, Texas, for the loan of Roemer's Texas, original German edition. The Library of Congress for research service and photostats of original German biographical excerpts and papers. Dr. John T. Lonsdale, Director of the Bureau of Economic Geology, University of Texas, Austin, Texas, for transcript of Singley's paper on Texas Mollusca, 1892. The Senckenberg Museum, Frankfurt a/Main, Germany, for letters of Louis Pfeiffer, with permission to copy.

SEXUAL DIMORPHISM IN INDO-PACIFIC STROMBUS *

By R. TUCKER ABBOTT

Assistant Curator, Division of Mollusks, U. S. National Museum

Sexual dimorphism in shell characters is not uncommon among the dioecious gastropods, although in many species it is expressed only as a size difference between males and females. No dis-

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tinctive sexual dimorphism has been demonstrated in the family Strombidae, although it is common knowledge among a few Florida collectors that males of *Strombus raninus* Gmelin and *S. pugilis alatus* Gmelin are often smaller than females. Colton (1905) attempted to show that the columellar angle, and hence the relative width, in *S. pugilis alatus* Gmelin is greater in females than in males. There is some question as to the validity of his results because of the small number of specimens employed (28) and the small degree of difference noted (3°).

In 1945, I collected several hundred specimens of small *Strombus* at the north end of Agana Bay, Guam Island, Marianas. The shallow, protected waters and the sand-mud bottom of this area are ideal for large, mixed colonies of *S. gibberulus* Linné and *S. flammeus* Link, 1807 (= *floridus* Lamarck, 1822). In the process of cleaning the shells, females were separated from males. The latter are easily recognized by the long, slender penis which is attached to the right side of the body.

Additional observations were made on a colony of *Strombus gibberulus* Linné collected June 5, 1946 by Dr. J. P. E. Morrison on the southwest side of Igurin Island, Eniwetok Atoll, Marshall Islands. Since these specimens were preserved in alcohol, it was possible to separate the sexes.

The shell length of the males and females in each sample population was measured, and the results found in the two Guam colonies have been presented in the graphs shown below. It will be seen in the growth curves of *Strombus flammeus* Link in fig. B that the males are, on the average, smaller than the females. The distinct separation of the peaks of the growth curves is lost when the shell length of both females and males is plotted, as shown by the dotted line. The extent and overlapping of the range in size of the two sexes is such that the character of shell length cannot be used as an indication of sex.

Figure A, which is a graph of the males and females of *Strombus gibberulus* Linné from Guam, shows that sexual dimorphism is present to a very small degree. The Eniwetok colony of 297 specimens of *S. gibberulus,* which is not figured here, showed growth curves very similar to those shown in the Guam specimens (fig. A). The differences between the sizes of the two sexes were more pronounced, and suggest that the degree

of sexual dimorphism, as expressed by size, may differ from one locality to another. Ecological studies would be necessary to determine if these geographical differences are genetically founded or are products of the environment.

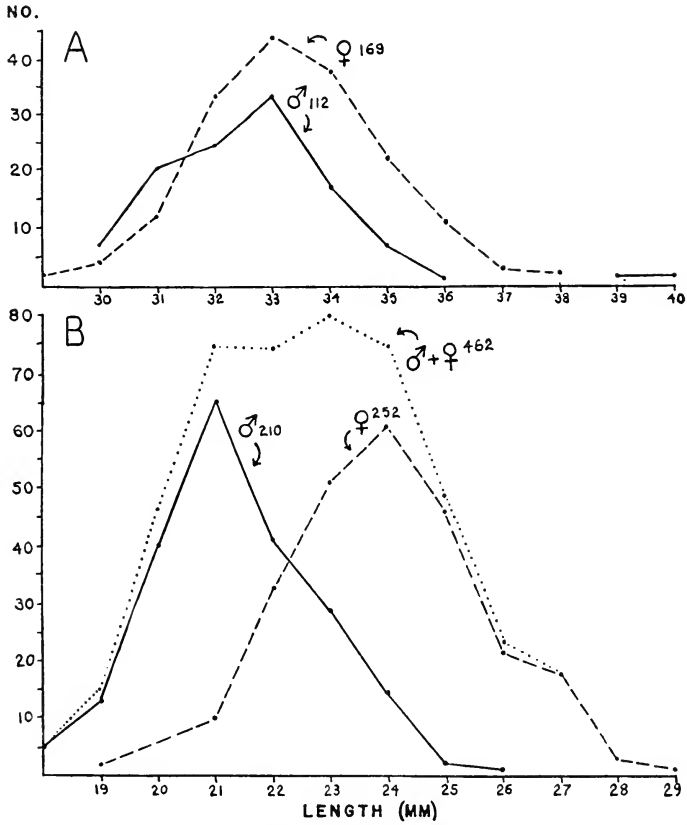

FIG. 1. Growth curves based on total shell length of male and female *Strombus* from Agana Bay, Guam Island. A: *S. gibberulus* Linné; B: *S. flammeus* Link.

It was noticed that in each of the three colonies there are fewer males than females. The percentage of males present in each sampling were 40% (*gibberulus*, Guam), 43% (*gibberulus*, Eniwetok) and 40% (*flammeus*, Guam).

There are two general color phases in *Strombus gibberulus:* (1) the *light* phase, in which the aperture is white or rarely with

yellowish markings and in which the markings on the outside of the shell are light yellow or nearly absent. (2) the *dark* phase, in which the columella and interior of the aperture are variously splotched with deep or light purple and in which the markings on the outer shell are light to dark brown. No correlation was found between sex and color phase. At Eniwetok, 38 males and 51 females were dark, 92 males and 119 females light. At Guam, 36 males and 30 females were dark, 76 males and 136 females light. In both these colonies there were roughly twice as many light as dark phase individuals. At Tutuila Island, Samoa, however, a colony possessed, in contrast, only 280 light phase to 452 dark phase individuals. These color phases are probably genetically controlled, since individuals of each type are found in the same immediate habitat, and since individuals do not change from one phase to the other during their life span. Whether or not the predominance of one phase over the other follows a geographical gradient can be determined only when large series from many localities are available for study.

Goodrich (1944) made an extensive series of measurements of shell length of *Strombus pugilis alatus* Gmelin from Sanibel Island. Rather than measure 1100 specimens, he arbitrarily chose the 10 largest and 10 smallest specimens of each group of 100 specimens. No growth curve can be constructed from his raw data to determine whether or not the population curve is bimodal as in the case of our graph B of *S. flammeus* Link. It may be noted in Goodrich's material, however, that the relative width of the 110 largest specimens is exactly the same as that in the 110 smallest specimens. Were Colton's assumption correct that females are relatively wider, and if females on the average are larger, we would expect to find a difference in relative width of small and large specimens. Further study on sexual dimorphism in *Strombus* by some Florida student is needed.

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AN INDIAN SPECIES OF CLENCHIELLA

By R. TUCKER ABBOTT

Since the publication of the diagnosis of the genus *Clenchiella* (Nautilus, vol. 61, no. 3, pp. 75–80, 1948), the description of a species from Port Canning, India, has been found in the literature which in all likelihood is referable to this genus. It was described by G. Nevill in 1877 as *Valvata* (?) *microscopica* (Cat. Moll. Indian Mus., fasc. E., p. 21). Its small size, shape, sculpturing, coloring, operculum and brackish water habitat seem to indicate that it is congeneric with *C. victoriae* Abbott of the Philippines. Probably this genus is widespread throughout the East Indies and the Indian Ocean, but has escaped notice because of the small size of the shells. *Clenchiella microscopica* does not appear to have been collected since Nevill's day. The original description reads:

"Shell exceedingly minute, orbicular, moderately thin, depressed, and discoidal; four whorls, moderate, convex, with distinct suture, the last whorl increasing rapidly; the shell, both above and below, rugosely and distinctly spirally striated, deeply umbilicated, with rounded and proportionately rather large aperture; the specimens were coated with some thick black deposit; when cleaned the shell presents a brownish-red appearance; the operculum examined under the microscope is horny and circular, of comparatively rather thick substance; it appears to be multi-spiral, but we were not able to make out the structure quite satisfactorily. Diam. 1½ mil."

Nevill collected 30 specimens in a brackish water pond about a quarter of a mile from the river. He stated that "it is very doubtful if it can remain in the Valvatidae; probably it will prove to be a new section of the genus *Hydrobia,* or even possibly a tropical *Skenea.*"

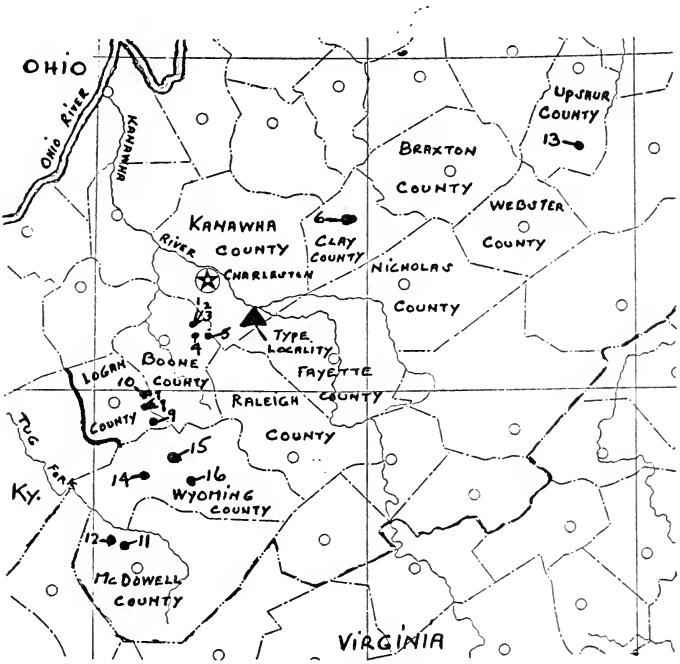
I am uncertain whether or not Nevill's species is the same as *C. victoriae,* and only examination of the types of *C. microscopica* would solve this point. Correspondence with and a careful search by the authorities of the Zoological Survey of India failed to bring the types to light. In 1942, when danger of invasion seemed imminent, the mollusk collection was moved to Kaiser Castle, Cantt, India. The collections have now been returned to Calcutta. I am told that no molluscan worker is at present located in this part of India.

ADDITIONAL RECORDS OF GASTRODONTA FONTICULA WURTZ IN WEST VIRGINIA

By GORDON K. MacMILLAN

Carnegie Museum

Charles B. Wurtz described a new land snail from West Virginia as *Gastrodonta fonticula* in The Nautilus, vol. 61, 1948, p. 86, pl. 6, fig. 3. Upon a reexamination of the specimens of *Gastrodonta interna* (Say) in the collections of the Section of Invertebrates at the Carnegie Museum from that State made by Neil D. Richmond, Charles B. Wurtz, and myself in 1937 and 1938, *G. fonticula* can be reported from the following localities. The number after each locality refers to its location on the accompanying map. The distribution of *G. fonticula* has thus been plotted, in order that a better perspective of its occurrence throughout the state can be obtained.



Boone County: cliffs and hillside ½ mile east of Peytona, 1. Tiger Rock, along Sandy Creek near Peytona, 2. Dry ravine, Draudy Mt. 5 miles southwest of Peytona, 3. Wooded hillside, Lens Creek Mt. 3 miles north of Racine, 4. Steep ravine, 1 mile southeast of Seth, 5.

Clay County: Elk River and Camp Creek Valleys 1½ miles south of Clay, 6.

Logan County: Damp ravine, Blair Mt. 1 mile southwest of Blair, 7. Cliffs and hillside 2 miles southeast of Blair, 8. Hillside along Huff Creek 2 miles east of Davin, 9. Hillside and bottoms along Spruce Fork, 1 mile east of Sharples, 10.

McDowell County: Wooded hillside 3 miles north of Iaeger, 11. Steep hillside 2 miles south of Panther, 12.

Upshur County: Woods, farm of Maurice Brooks 1½ miles south of French Creek, 13.

Wyoming County: Steep, open hillside 1½ miles southwest of Pineville, 16.

As with the observations made by Wurtz, no specimens of *G. interna* were found associated with *G. fonticula* at any of the above localities.

Wurtz reported that the type and paratypes of *G. fonticula* are housed in the collections of the Academy of Natural Sciences of Philadelphia and two paratypes in his own collection. The Section of Invertebrates of the Carnegie Museum contains one specimen of *G. fonticula* from Hudnall, Kanawha County, West Virginia, presented by Charles Wurtz to the Section in December, 1937. This specimen has been designated as a Topotype by me upon the assumption that it came from the type locality.

All the specimens of *G. fonticula* had been obtained from localities within the drainage system of the Ohio River. The ancestral specimens presumably entered West Virginia by way of Tug Fork of the Big Sandy, the Guyandot, and the Kanawha Rivers. French Creek falls within the Monongahela system, but the ancestral specimens of *G. fonticula* from that area did not enter West Virginia along the Monongahela River as no specimens of it occur north of that locality. The French Creek specimens presumably migrated, with other species along the Kanawha Valley, the snails moving from the Kanawha drainage

system to the Monongahela system. The source of Laurel Fork of French Creek is very close to the source of a small branch of the Little Kanawha River. The distance between these two sources is not more than one-eighth of a mile, and both originate on the same ridge but on opposite sides.

G. fonticula might have been in existence in the area within French Creek while still present in the Kanawha system. Its occurrence in the drainage of French Creek might be explained by stream capture of a part of the Little Kanawha system by Laurel Fork of French Creek. However, there is no definite proof as yet that this actually took place, and this supposition is only a conjecture on my part.

G. fonticula seems to prefer a habitat consisting of dense woods on a more or less steep gradient. In this type of situation there is a predominance of limestone, but it will also inhabit sandstone areas. This is the same type of habitat in which *G. interna* is found. With this in view, the development of *G. fonticula* as a distinct species from *G. interna,* or from an ancestral form common to both, cannot be attributed to ecological differences in habitats, but to some other isolating factor. *G. fonticula* and *G. interna* are at present isolated geographically as, stated above, these two species do not occur together in the same locality.

These new locality records are also mentioned in "The Land Snails of West Virginia," MacMillan, Annals of the Carnegie Museum, vol. 31, 1949, p. 179, but not as fully as in this paper.

NEW CERITHIIDAE FROM FLORIDA

By H. A. PILSBRY

THERICIUM CHARA new species. Pl. 1, Fig. 11.

The shell is long and very slender, the greatest diameter nearly one fourth of the length, buff with some minute speckles of brown on the spirals or scattered, chiefly on the back of the last whorl. The nucleus is lost, the early whorls remaining being white in one specimen, black in others, with two spiral ridges. Later whorls have strong axial ribs narrower than their intervals, about 7 on each whorl. Spiral sculpture of threads, on

the spire about three being distinctly larger. On the last whorl there are four principal spirals, the lower two being strong cords, the base below them concave with fine spirals. The aperture is oval. The anterior canal long and recurved. Parietal callus rather strong, with an angular tubercle defining a posterior commissure.

Length 22.7 mm., diameter 5.4 mm.; 15 whorls.

About seven miles off Hudson, Florida in 3 fms. (Frank Lyman). Type and paratypes 185477 ANSP.

T. chara is remarkable for its slender shape and numerous whorls. By the shape of the aperture, the rather strong basal cord and the speckled coloration, this species and the next resemble *T. muscarum* (Say), apparently being off-shore representatives of that group. Some of the small slender forms referred by Kobelt (Icon. schalentrag. europ. Meeresconch. 4: 93) to *Cerithium vulgatum gracile* Philippi, such as *C. vulgatum* var. *longissima* B. D. & D. and var. *repanda* Monts. (Moll. du Roussillon, I, pl. 22), resemble our Florida shells rather closely, but these forms from the Gulf of Gabès, on sponges, do not appear to be directly related to our species.

Thericium lymani new species. Pl. 1, Fig. 12.

The shell is rather slender, the greatest diameter about one-third of the length. Color buff, irregularly and sparsely sprinkled with chocolate dots or short dashes. Nucleus lost, the earliest whorl remaining either black or white. Later whorls are angular, with a submedian series of axially lengthened somewhat pointed tubercles, about 8 on the penult whorl. Spiral sculpture of fine nearly even striae, and on the last whorl two somewhat nodulose cords above the concavity of the base. The aperture is oval, with a short anterior canal which is straight or but little recurved. An entering ridge defines a posterior commissure.

Length 22 mm., diameter 8.3 mm.; 13 whorls.

Off Hudson, Florida. Type and paratypes 185475 ANSP.

This is evidently related to the preceding species but it is a less slender shell with a series of strong tubercles below the middle of each whorl. There is often a series of small subsutural tubercles. The anterior canal is shorter, less recurved. Named for Mr. Frank Lyman, of Lantana, who collected the specimens of both species.

THE AMERICAN MALACOLOGICAL UNION FIFTEENTH ANNUAL MEETING

By MARGARET C. TESKEY

The fifteenth annual meeting of the A.M.U. was held in Miami, or to be specific, in Coral Gables, Florida, June 16th to 18th, 1949. The University of Miami flung open its modernistic doors to 44 registered members, who began to gather on the afternoon and evening of June 15th.

Thursday forenoon was devoted to registration in the beautiful Students' Club on the main campus. Old friends and new drifted in, until by noon the gathering was nearly complete. The Faculty dining room was assigned for the use of the group, and after lunch all repaired to the meeting room in the Memorial Classroom Building in still another part of the campus. The University of Miami is anything but a crowded group of buildings. The campus is a series of wide-open spaces, and strolling from dormitories to cafeteria and to meeting room, afforded time for plenty of discussion.

President Elmer G. Berry formally opened the first session at 2:00 P.M., introducing Dean Charles Tharp of the College of Liberal Arts, who made a gracious welcoming address. Dr. Berry in reply said that one of the charms of the A.M.U. is its informality, and that he spoke for the Union in voicing gratitude for the privilege of meeting in such delightful surroundings.

The following papers were then presented, each bringing forth much instructive discussion: "Malacology and Nomenclature," by Dr. Carlos G. Aguayo, "Synopsis of the Cuban *Macroceramus* and *Microceramus,*" by Dr. Paul Bartsch, "Some Kodachromes of Live *Achatina fulica,*" by William J. Clench, "Molluscacidal Experiments in Brownsville, Texas," by Dr. Elmer G. Berry, "The Occurrence of *Hendersonia occulta* in Pennsylvania," by Gordan K. MacMillan, and "A Biographical Sketch of Dr. C. Montague Cooke, Jr.," prepared by Yoshio Kondo and read by Dr. H. B. Baker. The Clench and MacMillan papers were illustrated by slides.

It was during this initial session that the reports of the Secretary and the Treasurer were read by Margaret Teskey, acting

for Imogene C. and Harold R. Robertson, who were unable to be present. Reports accepted as read.

The annual dinner was held at 6:30 in the Faculty dining room, followed by a short address by Dr. Bartsch paying tribute to Dr. Henry A. Pilsbry, to which Dr. Pilsbry replied briefly.

Then still another room of this amazing "College of Tomorrow" was thrown open, and in the Upper Den of the Students' Club, movies of underwater scenes and of the activities of the Marine Biological Laboratories of the University of Miami were shown, accompanied by the running comment of Dr. Charles E. Lane, who is in charge of this department. Afterward the assemblage remained to chat for another hour, while the Council meeting was being conducted in an adjoining room.

The program began Friday with the report of the Council after which nominations were read and officers for the coming year were elected as follows: President, Dr. Fritz Haas; Vice-president, Dr. Joseph P. E. Morrison; 2nd Vice-president, John Q. Burch (President A.M.U.P.); Secretary, Imogene C. Robertson; Treasurer, Harold R. Robertson; Executive Councillors, Dr. C. G. Aguayo, Dr. Jos. Bequaert, Dr. G. D. Hanna, Dr. Jeanne Schwengel.

It was announced that no decision had been reached on the time or place of the 1950 meeting, and that these would be decided and announced later.

Another matter discussed by the Council and brought before the members was the question of the NAUTILUS Index, a project on which Dr. Aurele LaRocque and his colleagues at the University of Michigan have labored long and exhaustively, and which is now ready for the printer, needing only financial backing for completion. It was the consensus of opinion that this comprehensive index will be of great value to everyone concerned, and that it deserves the support of every member.

The program of this morning session was as follows: an unscheduled but much appreciated showing of slides by Mrs. Lillian Cockerill, illustrating a part of her collection of shells. "The Reproduction in the Cuban Land Snail, *Caracolus sagemon*," prepared by Dr. Luis Howell Rivero and read by William Clench; the dissections described were exhibited. "Another Technique for the Preparation of Radulae," by Dr. Henry Van

der Schalie. Dr. Van der Schalie asked that anyone observing in *Succinea* an abnormal swollen and banded tentacle, send that specimen to him for study by one of his students.

Noon-time afforded opportunity for some hurried collecting in the scrub area near the cafeteria, and when someone discovered that the lily pool harbored a variety of aquatic species, some frantic "dipping" ensued until the signal was given to re-convene.

These papers were read at the afternoon session: "Notes on the Florida Species of *Bursa*," prepared by Dr. J. P. E. Morrison and read by Paul L. McGinty. "Collecting Boards for *Teredo* Studies," by Mr. Clench, who asked that those in a geographical position to do so, prepare these boards according to the two plans illustrated, and so aid in the very important program of ship-worm control now being carried on. Dr. Robert H. Williams of the staff of the Marine Biological Laboratory spoke of the organization and program of that unit of the University of Miami. Dr. Isabel P. Farfante read "An Exhibition of marine mollusks from the Argentine," and passed about a collection of these shells. "Recent Investigations in Medical Malacology," by Dr. Berry, completed the afternoon session.

The University kindly furnished a bus for transportation downtown, and the entire company gathered in the Pan-American Room of the Columbia Hotel to enjoy Dr. Jeanne Schwengel's lavish hospitality at a cocktail party and buffet supper. These parties, which of late years have become almost a tradition, liven up the A.M.U. meetings at which she is present, providing the "frosting on the cake," so to speak, and the gracious hostess is to be congratulated on her contribution to the program.

Following this much appreciated event, Mr. Ted Dranga issued an invitation to all to visit his near-by shop, and for an hour the attractive store, offering shells and shell products, was jammed with an enthusiastic throng who, at a late hour and in a driving rain, straggled back to the campus dormitories, to rest after a long, long day.

Saturday was devoted to field trips. Here the University again came gallantly to the fore; two busses were provided, stocked with all the gear which might be needed for the diving

trip aboard the Laboratory boat, which transported 15 persons to a submerged reef off Elliott Key, and for the 22 who preferred to keep two feet, albeit wet feet, on terra firma. These latter were taken to a sponge and coral-studded shoal at Key Largo, with Donald Moore and Herbert Voss acting as guides. It will long be a matter of controversy whether the delights of seeing finny and shelly population at home, through a diving helmet, equal or surpass the joy of tipping up a slab of coral rock and capturing the mollusks dwelling thereunder. And another argument: which is worse, sea-sickness or ferocious mosquitoes? On one thing agreement was unanimous: it was a never-to-be-forgotten day.

So ended another annual get-together of the A.M.U. The few who did not go on either field trip, left Miami during the day. There was a general exodus on Saturday evening; only a few met for breakfast on Sunday morning before saying goodbye. May we all meet again, soon!

NOTES AND NEWS

An overlooked Chinese unionid.—The species to which the title of this note refers is contained in the following book: Dabry de Thiersant, C.P., La pisciculture et la pêche en Chine. 4°. Paris, 1872, 195 pp., pls. 1–35, 35bis, 36–50.

The text and plates 1–35 are dealing with fishery and its methods, the plates showing the corresponding implements used in China. The plates 36–50 and their explanations show the various kinds of Chinese fishes, and on plate 35bis, there is excellently represented, in natural size, a fresh water shell to which, at the bottom, the following name is given: *Symphonota lhuysii* J. L. Soubeiran and Dabry. No mention of this shell or its figure can be found in the text.

Since the picture in question is fully recognizable in all details, so that it constitutes a description without words, since a binominary name is given to it, and since its provenance as Chinese cannot be doubted, *Symphonota lhuysii* seems to be satisfactorily described and cannot be regarded a *nomen nudum*.

However, since the shell thus described and depicted represents undoubtedly one of the phases of the highly variable *Cristaria plicata plicata* (Leach), it does not add to our knowledge of the Chinese unionid fauna, but adds only to the synonymy of *Cristaria plicata plicata*.—Dr. F. Haas, Chicago.

The mollusk fauna of glasshouses in the Netherlands.—In Basteria, 13: 1–44, June, 1949, A. D. J. Meeuse and B. Hubert have given a list with copious notes of the mollusks of greenhouses in Amsterdam, Utrecht and other Dutch cities. The following species native to the United States were found: *Helicodiscus parallelus* (Say), *Hawaiia minuscula* (Binn.), *Pseudosuccinea columella* (Say) and *Gyraulus parvus* (Say). There are several tropical American species, an unexpected one being *Varicella clappi* Pils., of Jamaica. In all 41 species from various countries were found.—H. A. P.

Gastrodonta fonticula Wurtz.—In Mr. MacMillan's article concerning this species in this number of The Nautilus he designates as a topotype a specimen of *G. fonticula* from Hudnall, W. Va., which was collected by me. This specimen is unquestionably a part of that collection which represents the type material of the species. The two paratypes which Mr. MacMillan mentions as being in my collection have since been deposited (one each) in the U. S. National Museum and the Museum of Comparative Zoology at Harvard.—Charles B. Wurtz.

The Phil L. Marsh collection has been acquired on loan by the University Museum of Zoology at Ann Arbor, Michigan. It contains thousands of prepared and cataloged shells, maps of shell distribution, and other valuable material, and is partially the result of special expeditions made by Dr. Marsh while he was affiliated with the Museum of Zoology. After a five-year period, and upon agreement of Dr. Marsh, the collection will become a permanent part of the Museum. There are approximately 20,000 lots of shells in the collection. About one-third of them are marine species collected by Dr. Marsh while he was a resident of California. The larger portion of the collection contains land

and fresh-water species taken mostly from Michigan and adjoining states.

LIGUUS ENLARGES ITS MENU.—In a letter from my friend Nancy F. (Mrs. Richard R.) Quigley, of Lock Haven, Pa., she mentions a new comestible on the *Liguus* bill-of-fare. As I believe that others have had difficulty in finding anything those fastidious snails will eat in captivity, I send you the following quotation from her letter. "After we left Sanibel this Spring, we went to Marathon on the Keys for a week. I obtained some *Liguus* from Key Largo, not knowing they were 'restricted' [Wildlife is 'protected' in The Everglades National Park—J. S.] As a matter of fact, they were given to me, but it wasn't until I reached home and looked them up in Dr. Pilsbry's book, that I realized I shouldn't have them!

"Then what to do! We kept them in a box with plenty of fresh lettuce and frequent sprinklings of water on the way home. They were alive and fine when we arrived. After reading that they ate only 'a minute fungus' I was desperate. We tried all kinds of protein, thinking they would possibly eat that, or the mold or fungus that develops on cheese. Carnation Malted Milk did the trick. They love it!

"I spray a strong solution of malted milk on the sides of the glass aquarium every day. Every other day I clean the bowl thoroughly and put fresh lettuce in the bottom. The lettuce was originally put in to break their fall and hold moisture, but now they are eating the lettuce. I have had them almost four months, and they have grown new shell, which is much more vividly colored than that which had developed with their normal diet. It said in Dr. Pilsbry's book that they were nocturnal. Anytime that I spray them with water they emerge and start hunting for food. Apparently the heavy dew at night on the Keys is necessary for their moving about.

"Maybe this is all known to you. If it is, please excuse an amateur's ravings. But I had to write some one and find out if *Liguus* had ever been raised on Carnation Milk before."—JEANNE S. SCHWENGEL.

THE NAUTILUS

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SOME PRELIMINARY NOTES ON THE DISTRIBUTION OF MOLLUSCA IN THE LAKES OF THE WESTERN STATES

By JOSHUA L. BAILY, JR.

The exploration of inland lakes has always fascinated me. Perhaps this interest dates from the reading of Oliver Optic's stories for boys long before I became addicted to the study of malacology, and perhaps to the fact that there were no large lakes in the vicinity of where I was born and raised may also have been a factor. Consequently, when the wedding of a nephew in Denver, the Goethe bicentennial celebration in Aspen, and the opportunity to ride some of the few remaining narrow gauge railroads which radiate from Durango coincided to demand the presence of Ruth Ingersoll Baily and myself in the Rocky Mountain area, we decided to take advantage of the opportunity to visit the relict lakes in the Bonneville and Lahontan basins, to gather some of the remarkable species of *Carinifex*, *Parapholyx*, and *Pyrgulopsis* for which they are so justly celebrated.

We had, of course, heard rumors of the peculiar distribution of these genera, but even so we were not prepared for what we found —that not only did each lake tend to have its own peculiar fauna but also that each lake seems divided into local areas whose faunas differ from each other just as the stars differ among themselves in glory. For instance, the west shore of Bear Lake is a mud beach, whose fauna is characterized by the same genera that one expects to find anywhere—*Physa, Lymnaea*, and *Helisoma*. But at the north and south ends of the lake there are sand beaches whose vegetation is somewhat suggestive of that of marine sand dunes. The resemblance is accentuated by the occurrence of a *Sphaerium* with a large heavy shell that looks as if it would feel more at home in the ocean than in an inland lake.

In addition there is a *Carinifex* which is so abundant that it is hardly possible to walk on the beach without crushing quantities of them. To us who had never collected this species before this seemed a sacrilege.

At the Idaho end of the lake *Carinifex* grows to be half as large again as at the Utah end. At both localities it has a thick heavy texture, like that of *Physa* in the Salton basin, and quite unlike that of living *Carinifex* in Klamath Lake. We saw no living specimens, and as those on the beach were either bleached white or of a dark blue-black color like the shells of *Busycon* and *Pecten* from the Pleistocene mud banks of New Jersey which one occasionally encounters on the beach after storms, we concluded that they were fossils. Whether *Carinifex* still lives in the depths of Bear Lake is a question to be solved by dredging.

On both sand beaches occurs one species each of *Fluminicola* and *Amnicola* and two of *Valvata*. At the north end two additional species of *Valvata*, making four in all, occur, and the young of an *Oreohelix* was found in the drift.

We were surprised to find shells on the beach of the Great Salt Lake, for in nearly everything that has ever been published about this strange inland sea it is stated that the only metazoan inhabiting its saline waters is the brine shrimp. Yet in the beach drift *Physa* and *Lymnaea* are plentiful, and *Gyraulus* and *Amnicola* somewhat less so. That other collectors before us had found some of these same species is evidenced by their occurrence in the collection of the Museum of Natural History in San Diego. They can be found not only in the drift along the upper beach level but also embedded in the salt crust which binds the sand at the water's edge. They may be fossils, but they do not look like fossils. Neither does it seem likely that they may have drifted into the lake from a fresh water stream, for there is no fresh water entering the lake nearby. Their occurrence on the Great Salt Lake beach is likely to remain a mystery until some future malacologist whose search for living specimens in their home has been crowned with success exclaims in the words of Brigham Young, "This is the place."

In Utah Lake one finds the same species of *Carinifex*, *Fluminicola*, and *Sphaerium* as at Bear Lake, and in addition a *Ferrissia* and an *Amnicola*, the latter apparently a different species. All

these can be found on the sand beach near the boat landing at Provo, as well as at Saratoga on the opposite shore, together with land shells of the Zonitidae, Succineidae, and Pupillidae. None of these are found at Geneva, where the outstanding species is a large *Physa,* apparently not found elsewhere. None of these were seen alive. The surface of the lake is covered with a filthy scum discharged by the steel plant at Geneva. Unless Uncle Sam steps in and calls a halt it is likely that the next generation will see the complete extermination of all aquatic life in this interesting body of water.

So much for Lake Bonneville. To the west lies the valley of Lake Lahontan, which differs in its physiographic features from Lake Bonneville chiefly in that about half of its total area was occupied by a mountainous island, so that its water surface had the form of a comparatively narrow ring, which today is completely dry except in its lowest levels, which are occupied by Pyramid and Humboldt Lakes. This ring-shaped valley had three extensions, one to the southward which included Carson Lake, now dry, and Walker Lake, which is still a sizable body of water though it is rapidly drying up; one to the northwest which includes the dry bed of Honey Lake; and one that penetrated the interior island which was formerly occupied by Winnemucca Lake.

Pyramid Lake is to us the most interesting of all. Certainly it is the most surprising. One strives in vain to recapture the emotions of the first pathfinder who after days of interminable hardships while crossing the alkali plain suddenly beheld the sapphire waters of this lake, and watched its amethyst waves tipped with white like the breasts of its own pelicans, as they briefly caressed the margin of the sage brush desert before sinking into its sands to disappear one at a time. The fact that this lake is on an Indian Reservation explains why it is possible to drive for many miles along its shore without seeing either a beer can or a paper drinking cup, or any hot dog stand such as those which disfigure Lake Tahoe. Its primitive beauty is unspoiled, and in that respect unique.

Conchologically its outstanding feature is the genus *Pyrgulopsis* of which there are two species, one of which appears to be nondescript and not found elsewhere. The other also occurs in

the dry bed of Winnemucca Lake and on the beach of Walker Lake, but is not plentiful there. One must search diligently to find it at all, and that is quite a chore when the thermometer reads 97 in the shade, or would do so if there were any shade.

Carinifex is found in Walker Lake but not in Winnemucca or Humboldt Lakes, where its place seems to be taken by *Paraplolyx*. Both genera occur in Pyramid Lake, but *Carinifex* is quite scarce, several hours search resulting in a single specimen. Perhaps these two genera illustrate Gause's law, that when two species occupy the same niche in the environment one of them must disappear.

Near the northern limit of Lake Lahontan is the locality where Carl and Laura Hubbs found *Goniobasis interioris* about eight years ago. With the help of very explicit instructions from these two explorers we found the exact locality from which they obtained their material but we did not find *Goniobasis*. Agricultural developments have necessitated the diversion of all surface water and that additional artesian wells be drilled. There are no dead shells in the dried up water courses, and none at all in the water above the diversion dams. If Dr. and Mrs. Hubbs had not made their find when they did the existence of this interesting pleuroceratid would never have been suspected.

Single species of *Anodonta* inhabits Pyramid and Walker Lakes, and occurs in a semifossil condition in Carson Lake, but the large *Sphaerium* of Lake Bonneville seems to be absent from the Lahontan basin. The same species of *Fluminicola* occurs in both, but it is interesting to note that the *Fluminicola* and *Valvata* from Humboldt Lake appear to be not conspecific with the representatives of these genera found elsewhere in the two basins. The complete absence of any shells at all in Smoke Creek Desert is remarkable, for in its appearance it does not differ conspicuously from Winnemucca Lake.

The greater part of Honey Lake is also devoid of any evidence of molluscan habitation, but after an all day search a limited area was discovered late in the afternoon where one species each of *Gyraulus, Helisoma,* and *Physa* were taken, and two of *Lymnaea,* one of which we did not see anywhere else in either basin.

The question naturally arises. Why are all these lakes drying

up? The answer is simple. Too much water is being diverted from the streams which feed them, to be impounded behind dams for irrigation. The evaporation of the Pleistocene lakes was a slow process which required long periods of geological time, but today the turbulent current which Lake Tahoe pours into the Truckee River becomes an invisible trickle where it flows into Pyramid Lake, and the surface level of Walker Lake has been dropping about a foot each year for the past quarter century, according to the testimony of an Indian who lives nearby.

Lake Tahoe, of course, was never part of Lake Lahontan, but it belongs to the same drainage system. Unlike the relict lakes which are relatively shallow, Lake Tahoe is deep enough to have a true abyssal fauna, but it is doubtful whether its molluscan life extends to its greatest depths. Along its beaches shells are neither plentiful nor conspicuous, and in one day's driving around it we found only four specimens—all of them *Carinifex*. The shells were paper thin, quite unlike those from the relict lakes generally considered conspecific.

The patient reader who has perused this narrative thus far has doubtless noticed the absence of specific names. Specific identifications in the Great Basin genera are attended with much greater difficulty than in the days when Israel Cook Russell wrote his monumental treatise nearly three quarters of a century ago. Although this is still the leading work on the subject the chapter dealing with the Mollusca is quite inadequate to meet present day needs, largely because modern research has brought about the dismemberment of the old nineteenth century species to make half a dozen new ones of each. This necessary result has so increased the difficulty of making specific determinations that we do not feel justified in undertaking such a task at present.

Further, Russell did not realize how limited and discontinuous was the distribution of many species. He merely recorded what species had been taken in Lake Lahontan, but what we need to know is *exactly* where each one is found. It is also necessary that the horizons in the different valleys that make up the bed of the ancient lake be correlated and that the horizon from which each sample of shells was obtained be recorded.

On the west side of Pyramid Lake the highway intersects the

ancient beach level of Lake Lahontan. Shells from this region are essentially the same as those from the waters edge, except that there are no blue-black specimens from the upper terrace. (Incidentally, we saw no blue-black shells in Winnemucca Lake.) Except for this detail the resemblance between the two faunas is so great as to justify the conclusion that the one gave rise to the other. But the species in the Lahontan terrace do not occur in Honey Lake, and those in Honey Lake do not occur in the Lahontan terrace. Whether or not this fact should be interpreted to mean that the Honey Lake fauna was introduced at some time after the water level had begun to recede is one whose solution must be held in abeyance until a more detailed conchological survey of the two basins has been made, that will require the cooperation of many workers.

In the preparation of this report we would like to express our gratitude to our cousins, Fisher C. and Margaret F. Baily, of Reno, Nevada, who accompanied us to Lake Tahoe and to Honey Lake, and without whose persistent encouragement the site of the Honey Lake fauna would have eluded us.

GONIOBASIS PROXIMA (SAY)

By CALVIN GOODRICH

It is practise to call the single *Goniobasis* of mountainous North Carolina *G. proxima* (Say) whether it is in the Tennessee River basin or the more direct drainage to the Atlantic. So far as shell characters offer any clue there is no difference between the forms of one basin and the other. These are of very simple terms, and it might be difficult to imagine further subtraction of features. Yet since as a rule differentiation is marked as between goniobases of southern river systems, and indeed, sometimes within the same system—take the genus in the Coosa, Cahaba and Black Warrior rivers for example—one is pursued by the suspicion that *G. proxima* of the western French Broad and the east-flowing Broad is not identical anatomically.

Support for the suspicion is lent by a consideration of biological relationships. Going down the French Broad, *G. clavaeformis* (Lea) is met with in side streams and after that *G. sim-*

plex (Say), the three species surely relatives. But the *G. proxima* of streams of the eastern escarpment does not lead to *G. simplex,* but through *G. symmetrica* (Haldeman) to *G. virginica* (Gmelin). This is toward the northeast. The Broad River flowing southeast through South Carolina becomes the Santee. Far down in the Santee is an area occupied by *G. catenaria* (Say), a notably plicate species. Related to this shell is the less plicate *G. dislocata* (Ravenel), a race of which has been found in tributaries of the Broad just about where the true uplands leave off and the Piedmont, so-called, begins. All of which appears to argue that "*G. proxima*" is an end-product of three distinct groups.

It sometimes seems that *G. proxima,* meaning here both eastern and western forms, is merely hanging on, and that the next freshet will carry it away altogether. On the other hand, an occasional colony is made up of innumerable members, two or three in the Catawba of McDowell County, North Carolina, for instance. In a mere field rivulet I have seen individuals so packed together that the bed of the rill was black with them. Returning to the locality after a year, I could see none. While it is odd to think that migration occurred, there were no dead shells present to suggest destruction. Colonies almost as large occupy springs along the French Broad River. The main stream is polluted first by wastes of a tannin factory and then by domestic sewage. In only one place below the factory were the shells come upon, and this was where water of a brook entered and for a few square feet acted as a shield against contamination. No doubt the whole river once had populations of gastropods as, within recent years at least, the shells were abundant at the mouth.

Long ago it was observed that *G. aterina* Lea of the type locality, Cumberland Gap, was a mountain climber. Until the spring it inhabited was to put to use as a community water source, the species covered the rocks of a steep slope five or six hundred feet high. It lived in miniature falls, in spray, often merely on wet stones. The same habit is to be seen in *G. proxima.* It climbs far up in torrents that virtually have no quiet waters. It sometimes goes, in fact, as far up as there is water to let it. Lately, the shell was discovered in the meager flow

from a dripping hillside spring. Connection with the mother stream was cut off by road work except by seepage. The mollusks had lived and reproduced in two or three inches of water for a number of years, and they will disappear if and when an especially dry season comes along, all chance of restoration as a colony having passed. Flood and silt have done for shells in many of the occupied valleys, and of course the mania for building power dams (at government expense) is increasing the speed of annihilation. It may be that in time the shells remaining will be those individuals that have taken to mountain climbing.

The peristome or outer lip of *G. proxima* is very nearly straight except where a shell now and then succeeds in reaching old age. This is what may be expected of mollusks forced to live in a rush of water. The foot of the animal has to cling to the rocks. A crevice such as that formed by an incurved lip would serve as a spot for an entering wedge, as the phrase goes. Now it is a general habit in the genus for juveniles and adolescents to keep to the faster currents, for adults to seek the quieter stations, eddies or the lee of boulders or muddy banks. It is in such spots that old specimens of *G. proxima* are to be found, and that an incurved peristome can, as it were, be afforded.

A note may be added of the *G. catenaria dislocata* aforementioned. Specimens of it came to Lea that he named *G. spartenburgensis*. This was for the town or county of Spartanburg, South Carolina, drained by the Broad River. Search has been made for the shell, but for a hundred years the area has been given over to cotton growing, and no land washes worse than a cotton field. Streams of Iowa look no more evil than do those of the Piedmont. For the clean-living *Goniobasis* existence is denied.

TWO PACIFIC SPECIES OF PHOS

By JEANNE S. SCHWENGEL

Phos lannumi new species. Pl. 5, fig. 3.

Shell small, of 9½ whorls, over two and one-half times as long as wide. The apex of two and one-quarter embryonic whorls is blunt, smooth and glassy, slightly tipped. The following three whorls are straight-sided, with the last four whorls slightly and

increasingly rounded. The suture is distinct. The entire shell is nodulously, longitudinally ribbed, with spaces between the ribs not quite equal to the width of the ribs. The first four post-nuclear whorls have three nodules to a rib and between most nodules a heavy continuous line, some of which thicken into nodules, half the thickness of the primary three, so that on the sixth whorl there are five spiral rows of nodules and on the seventh or body whorl, there are fourteen nodules on fifteen longitudinal ribs, the last rib forming a varix behind the outer lip of the aperture. The color is light buff with the nodules irregularly cinnamon colored. On the first five whorls the first and second spiral row of nodules are mostly cinnamon. The third and fourth rows are completely white. On the sixth whorl, the first three spiral rows have cinnamon nodules with the next three rows white. The two rows above the suture are again cinnamon. The first three rows of the body whorl are cinnamon, the next two heavy and three light rows are white, the next two rows are cinnamon, the next two heavy and two light rows are white and the following three or four rows are mostly cinnamon. The last four or five spiral ridges are white and not noduled. The anterior canal is white. This alternation of white and cinnamon rows gives a semblance of banding to the shell.

The aperture is long and narrow, a lamellar ridge on the parietal wall and opposite on the outer lip, forms a distinct posterior sinus. The columellar callus is slightly raised from the center down, forming a sharp inner lip, which smoothes down toward the base. There are seven heavy ridges on the inner side of the outer lip, flattening out before they reach the lip, which incurves to form a definite, narrow anterior canal.

Length 17 mm.; breadth 7 mm.; length of aperture 8½ mm.

Length 13½ mm.; breadth 5½ mm.; length of aperture 6½ mm.

Type No. 186176 ANSP., paratype in my collection.

This shell was collected in 1947 by Mr. Dan Langford and Mr. D. D. Thaanum, at Guam Island, in the Pacific. It has been named for the two collectors by a combination of the two names.

This *Phos* is much the same size and shape as *Phos amoenus*, but is coarser and heavier looking, and the coloration forms pale but definite bands, whereas the maculations on *Phos amoenus*. are scattered without pattern.

PHOS AMOENUS new species. Pl. 5, figs. 4.

A small shell of eight whorls, over two and one-half times as long as wide. Apex blunt, about two embryonic whorls, glassy smooth, turned in at the tip. The following six whorls are

rounded, suture distinct. The first whorl has eight longitudinal, rounded ribs, nine on the second, ten on the third, twelve on the fourth and fifth and thirteen ribs on the body whorl, with a heavy varix preceding an unribbed area of about one mm. to the thin unevenly crenulated lip. The first, second, third and fourth whorls are moderately shouldered, with the fifth and body whorl rounded and sloping.

The entire shell is covered with heavy, spiral ribs, continuous over the longitudinal ribs. Four spiral ribs on the first, five on the second, six on the third and fourth, eight on the fifth, and sixteen on the sixth or body whorl. Between each of these heavier spiral ribs are three fine raised lines, and over the ribs and intervals are blunt axial striae.

The color is pinkish-buff, with small mikado-brown maculations sparsely scattered over the shell. The aperture is long, narrow, with sub-parallel sides. A lamellar ridge on both lip and columella, adjoining, form a small, but well-defined anal notch.

The broad columellar callus is raised from the center down, forming a sharp inner lip. There are seven thickened folds on the columella, and beginning near the edge of the outer lip, numerous, uneven lirae, giving it a crenulated appearance. The columella bears a heavy basal fold below which is a short canal. A heavy fold at the base of the outer lip, sharply defines the anterior canal.

Length 15 mm.; breadth 6½ mm.; length of aperture, 6½ mm.

Length 13½ mm.; breadth 6½ mm.; length of aperture 6½ mm.

Locality, Mbega Island, Fiji, collected in 1940 by Mr. D. Thaanum.

Type No. 186177 ANSP., paratype in my collection.

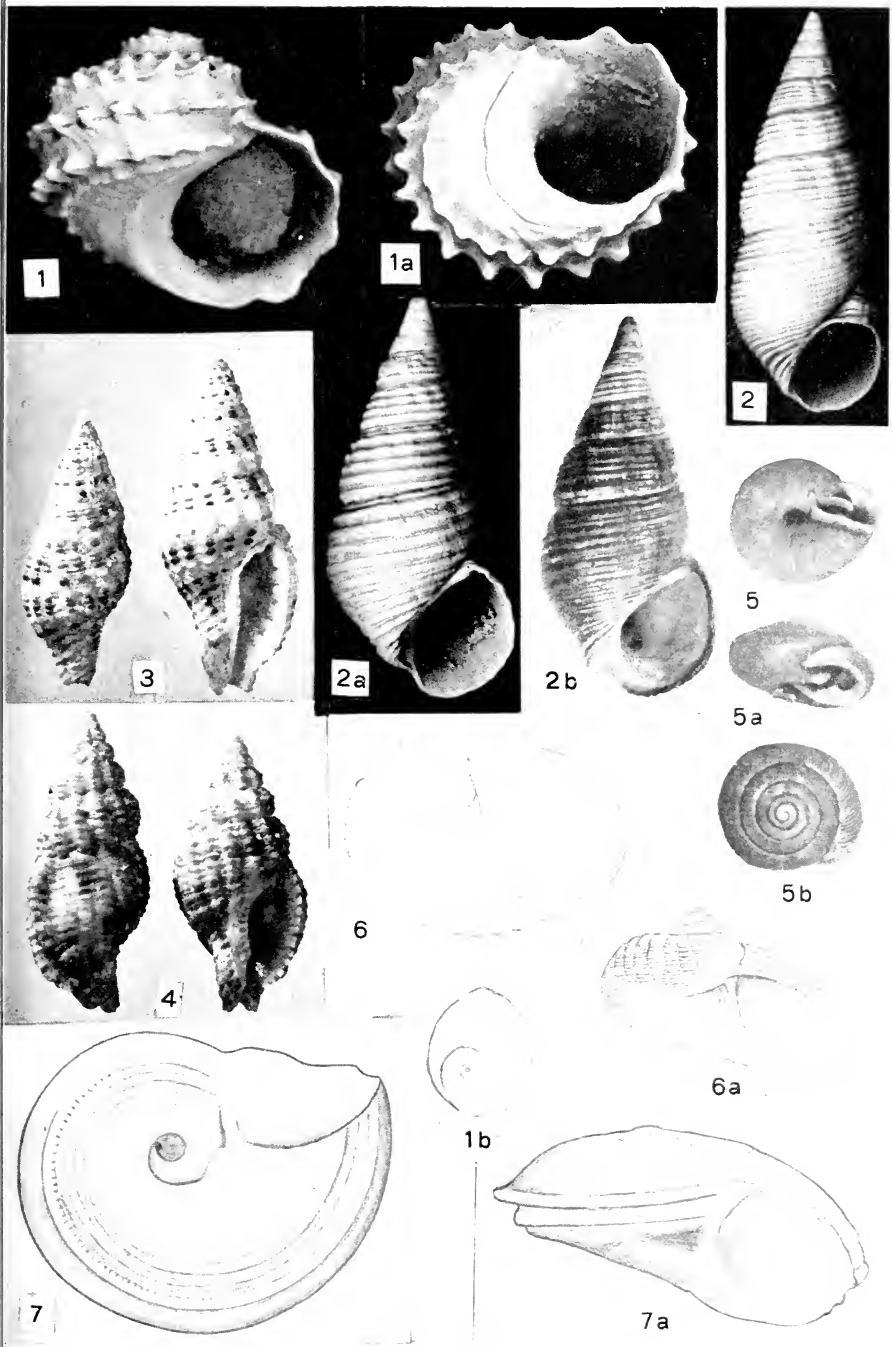
At first glance, this shell could be confused with *Phos lannumi,* but upon closer observation, it will be noticed that the colorations do not form bands as in *P. lannumi* and the lirae between the spiral ridges give it a finer and more delicate appearance.

FRESH WATER MOLLUSKS FROM COLOMBIA AND GUATEMALA

By HENRY A. PILSBRY

Lithococcus venustus new species. Pl. 5, figs. 1, 1a, 1b.

The somewhat depressed-globose shell is solid, imperforate, with low conic spire. The apex is eroded in all specimens seen,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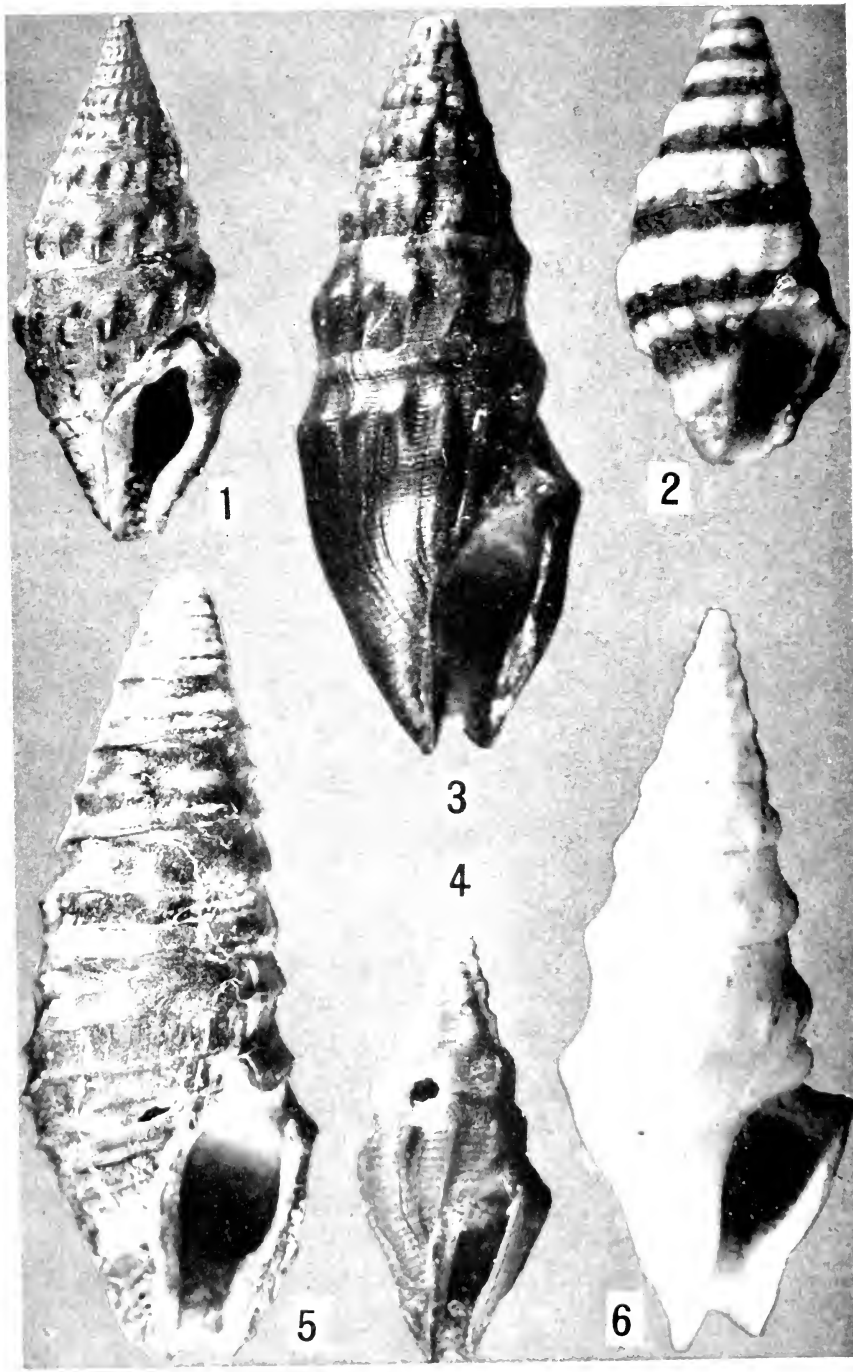
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adults having about three whorls remaining. Younger shells have a single strong, smooth carina. In the adult stage there are five spiral ridges all armed with conic tubercles, the anterior ridge smaller, often incomplete. The penultimate whorl shows three tuberculate spirals. Fine lines of growth are rather distinct. Color olive or buffy-olive on the back, becoming lighter, isabella color to honey yellow, on the spire and the front of last whorl. The large aperture is quite oblique, nearly circular but with an angle above, dull blackish plumbeous within, the basal and columellar margins heavily thickened by a white callus.

Height 8.3 mm., diameter 9.3 mm.

The thin, light yellow operculum (fig. 1b) is very shortly oval, the nucleus a little above the lower third of the length and well removed from the columellar margin. There are about three rapidly widening turns, the last with an extension downward past the inner spiral suture. The surface has fine wrinkles of growth.

Between Boca de Napi and Suarez, Dept. of Narino, western Colombia. Type 186145, paratypes 182273 ANSP., collected by A. A. Olsson, Dec. 19, 20, 1935. Dr. Olsson writes:

"Guapi in the Dept. Narino, Colombia, is an important village with sawmills and stores. It is situated on the river of the same name, and is reached by small launches and boats from Tumaco and other points. Upstream travel is possible for small launches to and possibly beyond the mouth of the Rio Napi, the trip requiring, under normal conditions of water, about two hours. To ascend the Rio Napi, change is made to dug-out canoes which are poled upstream, the current in the river being swift and clear. The head of canoe travel is the village of Belen, at which point giant blocks of agglomerate and other hard rocks are encountered in great profusion.

"Fresh water mollusks were found in the stretch of river about midway between Boca de Napi and a place called Suarez. The river in this zone has a good current, and high rock cliffs line both banks at frequent intervals. A species of *Mytilopsis* is common along these cliff banks, living in circular, deep holes, probably of its own making. Rather uncommon is a dark-colored *Neritina*. Commonest of all shells is *Lithococcus* which was found clinging to rocks. It was not noticed above Suarez."

The shells have a black incrustation, easily removed by oxalic acid.

This is the second species of the genus. It differs from *L. multicarinatus* (Miller) of the Rio Cayapan, Ecuador, by the more elaborate sculpture, that species have usually two more prominent tuberculate spirals, the tubercles on them much lower than in *L. venustus,* and blunt, not pointed as they are in *L. venustus;* the additional spirals are smooth or nearly so, and also, *L. multicarinatus* is a somewhat larger shell and often perforate or rimate.

PACHYCHEILUS OLSSONI new species. Pl. 5, figs. 2, 2a, 2b.

The shell is long-conic, the spire with nearly straight lateral outlines, of about 8 or 9 weakly convex whorls (the apex eroded in specimens seen). Sculpture of strong spiral cords, typically eleven on the last whorl, five on the preceding whorls, but in many specimens some smaller interstitial spirals are developed, so that the count may be about 15 spirals on last whorl. Some specimens show very faint traces of axial folds on the spire. Under the lens a fine axial striation is seen in many specimens, but it is often worn or obsolete at the summits of the spirals. The color is blackish olive, but sometimes light olivaceous with small blackish spots sparsely scattered on the spiral cords. The aperture is ovate, blackish brown or bluish within, the peristome dark brown, the upper half of the outer lip retracted a little. Columella concave, thickened by a white callus which extends also over the parietal wall, and is thickened near the posterior angle.

Height 34 mm., diameter 15.5 mm.
Height 32.3 mm., diameter 15 mm.
Height 34 mm., diameter 13 mm.
Height 36.5 mm., diameter 15 mm.
Height 26 mm., diameter 12 mm.

Rio de la Pasion, between P. Sabal and Sayaxche, Peten, northern Guatemala, from a small brook arising from a limestone spring and depositing much calcareous sinter with which most of the shells are thickly coated. Collected May, 1945, by Axel A. Olsson, for whom it is named. Type 186101 ANSP., paratypes 185947 ANSP.

In some specimens the last whorl is somewhat contracted, as in fig. 2. Otherwise the principal variation is in the development of interstitial spirals and in the color. Most of the apparently adult specimens taken are about 26 to 30 mm. long.

No closely related species has been noted, though several Pachycheili, such as *P. pluristriatus* (Say), have well-developed spiral sculpture.

VITRINELLIDAE OF FLORIDA: PART 5

By H. A. PILSBRY and T. L. McGINTY

Solariorbis euzonus new species. Pl. 5, figs. 7, 7a.

The shell is biconvex, carinate, umbilicate, the umbilicus narrow within, very rapidly widening in the last half turn to more than a fifth of the shell diameter. The spire of about 3½ whorls is low dome-shaped, the first whorl smooth, convex, the last whorl very wide, excavated above the peripheral keel, with a group of fine spiral striae above the excavation; the peripheral keel is strong, rounded, two strong spiral cords and several fine spiral striae below it; the rest of the base is smooth to the umbilicus, which is contracted by a strong, rather sharp ridge. The aperture is quite oblique, ovate, the peristome blunt, the columellar margin thickened and running forward into the thick, short parietal callus.

Height 0.9 mm., diameter 1.75 mm.

Sebastian, Indian River Co., Florida. Type 185808 ANSP., paratype in McGinty collection (no. 43); collected by T. L. McGinty, also North Inlet, Lake Worth. Also found by Charles R. Locklin in the Shell Creek and Saint Petersburg Pliocene.

Macromphalina palmalitoris new species. Pl. 5, figs. 6, 6a.

The thin fragile, white shell is strongly depressed, with rounded periphery. The nuclear shell is conic, erect, of two smooth, convex whorls. One whorl and two-thirds following are rounded at periphery and base, and have sculpture of retractively curved, well spaced riblets and fine but distinct spiral striae. In the concavity of the base the riblets are thin and crowded. The very oblique aperture is oval, the columellar margin only weakly curved. The contact of peristome with preceding whorl is extremely short.

Height 0.95 mm., oblique diameter 1.95 mm.

Off Palm Beach, Florida, in 400–500 feet. Dredged by T. L. McGinty. Type 185813 ANSP., presented by C. R. Locklin.

This is a much depressed species, also distinguished by its erect nuclear shell.

PARVITURBOIDES new genus

The shell is depressed globose with conic spire of few (about 4) convex whorls, the apex minute, initial 2¼ whorls smooth, abruptly giving place on the rest to a sculpture of spiral cords and very fine threads in the direction of lines of growth. Umbilicus very narrow bounded by a spiral cord. Aperture subcircular but angular above. Columellar margin thickened.

Operculum thin, multispiral.

The living animal has a narrow foot auriculate in front, bilobed or emarginate posteriorly and showing a median longitudinal line. The tentacles terminate in ciliated globules and show very minute eyes near their outer bases.

There are no epipodial cirri. The radula is taenioglossate.

Practically the only superspecific difference in the shells between this group and *Parviturbo* (type *P. rehderi*) is that slightly over two nuclear whorls of *P. interruptus sanibelensis* are smooth, while *P. rehderi* has only about one nuclear whorl, smooth and convex, the surface after it being dull with a ridge beginning rather gradually at about the middle of the second whorl. The change from smooth nuclear surface to ribbed later growth is not so abrupt as in *Parviturboides,* but well indicated by the dull instead of glossy luster.

While this group is apparently near *Vitrinella,* it differs by the bifid foot. The narrowly umbilicate or closed axis, more globose shape and coarse sculpture give the shells a different appearance, and probably it will be considered generically distinct.

The type of *Parviturboides* is *"Cyclostrema" sanibelensis* Pilsbry. This, together with *C. zacalles* Mazyck, is probably a slight variety or synonym of *Vitrinella interrupta* C. B. Ad. The species now referred to *Parviturboides* are as follows.

P. interruptus (C. B. Adams) (*Vitrinella*). Jamaica.

P. i. zacalles (Mazyck) (*Cyclostrema*). South Carolina.

P. i. sanibelensis (Pilsbry) (*Cyclostrema*). Florida.

P. copiosus (Pilsbry & Olsson) (*Parviturbo*). Ecuador to Panama.

P. decussatus clausus (Pilsbry & Olsson) (*Parviturbo*). Ecuador to Colombia.

Parviturbo weberi (Nautilus 59:55) was said to have two nuclear whorls, but this was a mistake of observation due to imperfect preservation. The examination of several fresh, immature specimens shows that there are not over one and one-fourth embryonic whorls.

In introducing *Parviturbo* (Nautilus 59:54) we alluded to the possibility that it would prove to be identical with *Pseudorbis* Monterosato, based upon the Sicilian *Fossarus granulum* Brugnone. It is equally likely that *Pseudorbis* is identical with *Parviturboides*. Until the nuclear whorls or the dentition of *P. granulum* (Brugnone) can be examined, the nomenclature of our genera will remain unsettled.

NEW WEST AMERICAN TURRIDS

By PAUL BARTSCH

In the preparation of the monograph of the Recent and Fossil East Pacific Turrids it became desirable to study the collections made by Mr. H. N. Lowe which are in the Academy of Natural Sciences of Philadelphia. Thanks to the good offices of the Academy and Dr. Pilsbry especially, these were placed in my hands for study. A comparison of this material with the collections in the U. S. National Museum makes it necessary to give nomenclatorial status to a number of species from that collection which are here described.

Adanaclava adana new genus and species. Plate 6, figure 4.

Shell small, elongate-ovate, bright chestnut brown. The last of the remaining nuclear whorls is carinated. The postnuclear whorls have a weak cord at the summit followed by a concave sinal area which extends over about two-fifths of the turns and is marked by 4 spiral threads which are rendered feebly nodulose by the incremental lines. Anterior to the sinal area, the whorls are marked by protractively curved axial ribs which on the last whorl extend to the columella. These ribs are separated by spaces about twice as wide as the ribs, and the intercostal spaces are marked by 8 spiral threads separated by incised lines about half as wide as the threads. Base rather long, well rounded, with the intercostal spaces marked by 10 spiral threads equaling those on the spire in strength and spacing. These spiral threads

cross the axial ribs and render them feebly nodulose. The columella is stout, slightly twisted with a rather strong basal fasciole, posterior to which are 2 additional spiral threads equaling those of the spire, while anterior to it the columella is rather irregular and rough. Aperture elongate-ovate. Posterior sinus only moderately deep and rather broad and outward reflected at the edge. Anterior to the posterior sinus the outer lip is protracted and bears a weak stromboid notch a little posterior to its anterior limit. A strong varix is present a little distance behind the edge of the outer lip. The anterior canal is moderately long and rather narrow. The inner lip is reflected over and appressed to the base. The parietal wall is covered with a thick callus which forms a low hump at the posterior angle.

The type, Acad. Nat. Sci. Philadelphia No. 158582, was collected by Lowe at Manzanillo, Mexico. It has 8 whorls remaining and measures: Height, 12.2 mm.; greater diameter, 5.3 mm.; length of aperture, 6 mm.

Imaclava pilsbryi new species. Plate 6, figure 6.

Shell small for the genus, white with chestnut maculations; one row at the anterior end of the axial ribs, another at the suture. There is also an interrupted band of chestnut on the base, and the varix is of the same color. The nucleus consists of almost 2 well rounded, smooth turns. The postnuclear whorls are appressed at the summit and slope to the concave sinal area which covers the posterior half of the turns. The anterior half is marked by protractively slanting axial ribs which pass weakly over the base of the last whorl. Of these ribs, 9 including the varix are present on the last whorl. The axial ribs are about half as wide as the spaces that separate them. Base moderately long and moderately rounded. The spiral sculpture consists of very feeble incised lines in the sinal area and mere indications of incised lines in the intercostal spaces. On the base the spiral markings are represented by very poorly defined incised lines which, however, are more or less equally spaced. The columella is moderately long, moderately stout, and bears a fasciole about midway between its insertion and tip. Aperture elongate pear-shaped. Posterior sinus deep with the edge outward reflected. Posterior to the posterior sinus, the outer lip joins the heavy lump on the parietal wall at the posterior angle of the aperture. Anterior to the sinus it is protracted and bears a moderately thick stromboid notch a little posterior to its anterior margin; it also has a heavy varix at some distance behind its edge. The anterior canal is moderately long and moderately broad, and the

inner lip is reflected over and appressed to the columella. The parietal wall is covered by a thick callus which forms a conspicuous hump at the posterior angle of the aperture.

The type and 3 immature specimens, Acad. Nat. Sci. Philadelphia No. 164446, were collected by Dr. Pilsbry at Punta Penasco, Sonora, Mexico. The type has 9.5 whorls remaining and measures: Height, 20.2 mm.; greater diameter, 7.8 mm.; length of aperture, 8.1 mm.

This is the smallest of the three species here recognized. In ribbing it most nearly resembles *I. unimaculata,* but differs from this in its much smaller size and much weaker spiral sculpture.

Zonulispira new genus

Shell varying from small to medium sized, varying in shape from elongate-ovate to ovate-conic, usually dark colored. The nuclear whorls consist of 1.5–2 small, round smooth turns which are followed by 1–1.5 whorls which are axially ribbed. The postnuclear whorls bear a moderately strong spiral cord a little anterior to the summit, which is followed anteriorly by a slightly concave, broad sinal area. The latter is bounded by an interrupted spiral series of nodules that have their long axis parallel with the spiral sculpture. These nodules may be simple or consist of 2 or 3 subnodules. Base rather long, moderately rounded, and marked by a varying number of spiral cords which, like the subsinal cord, bear elongated nodules. The columella is rather short and also bears strong spiral cords which grow finer near the tip. Between the nodulose cords, even on the narrow area at the summit, are lesser spiral threads which vary in strength and number in the different species. The nodules on the spiral threads are usually also arranged in axial series. The left outline of the base and columella is concave. Suture moderately impressed. Aperture irregularly pear-shaped. Outer lip with a deep round sinus which communicates with the edge through a slit about half the width of the sinus. Posterior to this sinus the shell is much thickened to form a hump. Anterior to the sinus the outer lip is protracted and rendered sinuous by the external sculpture; the inner lip is reflected over the short stout columella and usually shows a slight umbilical chink at the base. The parietal wall is covered with a heavy callus which joins the knob at the posterior angle. Operculum irregularly ovate, thin, with apical nucleus, marked by concentric lines of growth on the outside. Radula with marginals only, which have the two parts of the Y fused to form a hollow tube.

The type: *Zonulispira zonulata* Reeve (= *Pleurotoma zonulata* Reeve).

This genus ranges from the Gulf of California to Ecuador and Galapagos.

ZONULISPIRA REIGENI new species. Plate 6, figure 5.

Shell rather large, elongate-conic, blackish brown with the subsinal cord of the early whorls white, and the nodules on the later turns a little paler than the background. The nuclear whorls are decollated. The postnuclear whorls are not high between summit and suture and are marked by a strong spiral cord a little below the summit followed by a rather broad concave sinal area. Anterior to this, the median whorls bear an interrupted spiral series of nodules of which 8 are present on the antepenultimate whorl. On the last whorl this cord is narrow and scarcely distinguished from the basal cord with quite feeble nodules. Base rather long and moderately rounded and marked by 4 narrow spiral cords which are almost equally spaced. The columella is short, stout, and marked by 9 narrow spiral threads. In addition to this, fine incremental lines, which are a little stronger on the base than on the spire, mark the whorls and exceedingly fine spiral striations are present in the spaces between the spiral cords of spire and base. Suture slightly constricted. Aperture oval. Posterior sinus deep and rounded at base. Posterior to the posterior sinus, the outer lip is thickened into a lump-like element that connects with the parietal wall. Anterior to the posterior sinus, the outer lip is protracted and rendered slightly sinuous by the external sculpture. There is a strong varix at a little distance behind the edge of the outer lip. The anterior canal is short and broad; the inner lip is reflected over and appressed to the columella and extends over the parietal wall as a rather heavy callus.

The type and a paratype, Acad. Nat. Sci. Philadelphia No. 156406, were collected by Lowe at Mazatlan. The type has 7 whorls remaining and measures: Height, 21.7 mm.; greater diameter, 8.2 mm.; length of aperture, 9.4 mm.

This species recalls *Z. castanea,* but differs from it in having the spiral lirations of the sinus area exceedingly weak.

PILSBRYSPIRA new genus

Shell oval, bicolor with spiral zones of dark chestnut brown and yellowish white. One of the brown zones extends over the posterior half of the whorls; another is at the posterior termina-

tion of the base; another on the middle of the base, and another at the tip of the columella. The nuclear whorls are decollated in the unique type. The postnuclear whorls are marked with a slender spiral cord a little anterior to the summit; anterior to this is a moderately broad sinal area, while the anterior half of the whorls is marked by heavy, broad, low, rounded axial ribs separated by spaces less wide and crossed by 5 spiral cords which render the axial ribs of the spire slightly nodulose. The base is short, well rounded, and marked by 4 strong spiral cords which are slightly nodulose. The columella is short, stout, and bears spiral threads which decrease in size from the posterior anteriorly. In addition to that, numerous, hairlike incremental lines are present and fine, very closely spaced spiral lirations, which are very regular in size and spacing on the brown zone at the summit and coarser and less regular on the anterior half of the whorls and on the base. The aperture is oval. Posterior sinus deep and well rounded at base. Posterior to the posterior sinus, the outer lip is much thickened and joins the knob on the parietal wall. Anterior to the posterior sinus, the outer lip is protracted and bears a heavy varix immediately behind the edge of the outer lip. The anterior canal is moderately long and broad. The inner lip is reflected over and appressed to the columella.

Type: *Pilsbryspira pilsbryi* new species.

The presence of 5 slender spiral elongated nodules anterior to the sinal area distinguishes this genus from all the other members of the subfamily.

PILSBRYSPIRA PILSBRYI new species. Plate 6, figure 2.

Shell small, oval with a broad brown band which extends from the summit over the sinal area. There are 2 brown bands on the base separated by a light zone. The anterior tip of the columella is pale brown. The rest is yellowish white with a faint orange flush. Nuclear whorls decollated. The postnuclear whorls are moderately rounded. They bear a slender spiral thread at about one-sixth of the distance between summit and suture anterior to the summit. Anterior to this is a slightly concave sinal area which occupies about one-fourth of a turn. Anterior to the sinal area the whorls are marked by low, broad, rounded axial ribs which are separated by spaces much less wide than the ribs. These ribs extend over the base to the columella. Of these 12 are present on the last whorl. Between the sinal area and the suture the ribs are marked by 6 spiral cords. Base short, well rounded, and marked by 2 rather strong spiral cords on the posterior dark band, of which the first limits the dark zone, while the second is at some little distance posterior to its

anterior limit. The second dark zone is also marked by a strong, somewhat nodulose, spiral cord, while the white zone between the two bears a stronger, almost median, spiral cord. In addition to this, the entire surface of the whorls is marked by fine hairlike incremental lines and fine, closely spaced, spiral striations which are very regular and fine in the sinal area and posterior to the sub-summit cord, but heavier in the ribbed portion of the whorls and on the base, and in the stronger reaches they are somewhat variable in size. The columella is short, stout, and marked with 9 spiral cords which decrease in size from the posterior anteriorly. Suture moderately impressed. The posterior sinus is moderately deep and rounded at base. Posterior to the posterior sinus, the outer lip is thickened and joins the knob at the posterior angle of the aperture on the parietal wall. Anterior to the posterior sinus, the outer lip is protracted. It bears a very broad heavy varix a little distance behind the edge of the outer lip. Anterior canal short and broad. The inner lip is reflected over and appressed to the columella. The parietal wall is covered by a moderately thick callus.

The type, Acad. Nat. Sci. Philadelphia No. 153869, was collected by Dr. Pilsbry on Taboga Island, Panama. It has 7 whorls remaining and measures: Height, 12.3 mm.; greater diameter, 6.2 mm.; length of aperture, 6.4 mm.

Dallspira new genus

Shell rather small, elongate-ovate, varying in color from unicolor yellowish white to blackish brown, or banded. The nucleus consists of 2 small, smooth turns followed by a whorl bearing protractively curved axial ribs. The postnuclear whorls may have a feeble cord at the summit or this usually is absent. The sinal area is moderately broad and moderately concave. Anterior to the sinal area, the whorls may be marked by axial ribs or mere nodules which sometimes almost become spinose. The base, which is moderately long and rounded, bears nodulose spiral cords. Aperture oval. Posterior sinus usually deep and well rounded at base, sometimes narrowed toward the edge of the lip. Posterior to the posterior sinus the outer lip is thickened and joins the parietal knob. Anterior to the posterior sinus the outer lip is protracted and rendered sinuous by the external sculpture. It bears a rather heavy varix a little behind the edge of the outer lip. The inside of the outer lip may or may not have spiral lirations, depending upon the species in question. The anterior canal is short and moderately broad. The inner lip is reflected over and appressed to the columella,

usually leaving an umbilical chink. The parietal wall is covered by a thick callus which terminates in a heavy knob at the posterior angle. Operculum elongate-ovate with apical nucleus, marked on the outside by concentric lines of growth. The radula bears marginals only, in which the Y basal portion is not equal, the lesser one being attached to the larger.

Type: *Dallspira dalli* new species.

This genus extends from the Gulf of California to Panama.

DALLSPIRA DALLI new species

Shell moderately large, ovate, blackish brown with a little paler zone on the posterior portion of the base and a narrow band at the insertion of the columella, while the nodules on the base are yellowish white. Nuclear whorls decollated. The postnuclear whorls are appressed at the summit and have the merest indication of a slender spiral thread a little anterior to this. This thread is stronger on the early whorls, but fades out towards the last. The sinal area is narrow, occupying about a quarter of the whorls. This is marked by fine striations. Anterior to the sinal area the whorls are marked by very strong axial ribs which almost disappear at the suture but are indicated by the nodules on the base. These ribs are heaviest at their posterior termination and taper gently toward the suture. They are much narrower than the spaces that separate them. Of these 12 are present on the last whorl. The intercostal spaces are marked by slender, rather closely spaced, spiral lirations. Base moderately long, well rounded and marked by 3 series of nodules which are placed upon the axial ribs. The intercostal spaces between these nodules indicate a broad feeble spiral thread. The nodules themselves are very prominent and pearl-like. In addition to this, the base is marked by spiral lirations of about the same spacing as those between the ribs on the spire, but much less strongly impressed. The columella is short, stout, and marked by 15 spiral threads which grow consecutively stronger from the posterior anteriorly. Suture moderately impressed. Aperture elongate-ovate. Posterior sinus very deep, rounded at base, and narrowed at the edge of the aperture with the edge outward reflected. Posterior to the posterior sinus, the outer lip is thickened and joins the heavy hump at the parietal wall. Anterior to the posterior sinus, the outer lip is protracted and rendered decidedly sinuous by the external sculpture. The outer lip bears a moderately strong varix at a little distance behind its edge. Anterior canal short and broad. The inner lip is reflected over and appressed to the columella. The parietal wall bears a thick callus which develops into the strong hump

at the posterior angle. Operculum elongate-ovate with apical nucleus and marked on the outside by concentric lines of growth. The radula bears marginals only in which the Y basal portion is decidedly asymmetrical, one part being much smaller than the other and attached to the other.

The type, U. S. N. M. No. 484896, was collected by Miss Robson at Bella Vista, Panama. It has 8 whorls remaining and measures: Height, 16.7 mm.; greater diameter, 7 mm.; length of aperture, 7.2 mm. A topotype is in Miss Robson's collection.

This species most nearly resembles *D. lowei* from which it can readily be distinguished by its decidedly oblique ribs and much finer spiral striations.

DALLSPIRA LOWEI new species. Plate 6, figure 1.

Shell moderately large, ovate, blackish brown. Nuclear whorls decollated. The early postnuclear whorls bear a strong nodulose cord at the summit which rapidly fades and disappears on the later turns, leaving the merest indication of a spiral thread at some little distance below the suture, stronger than the appressed suture itself. This entire area, as well as the shallow, rather broad sinal area, is crossed by about a dozen rather strong spiral threads. Anterior to the sinal area the whorls bear short, slightly protractively slanting axial ribs which appear as elongated nodules, and which are not quite as wide as the spaces that separate them. Of these, 12 are present on the last whorl. The intercostal spaces are marked by 7 spiral threads which are separated by mere impressed lines. Base moderately long and marked by 3 series of rounded nodules corresponding in disposition with the axial ribs. They are connected by feebly indicated axial ribs. In addition to this, the entire surface of the base bears fine, closely spaced, low, spiral threads separated by mere impressed lines. The columella is short, stout, and marked by 13 spiral threads. Suture moderately constricted. Aperture elongate-ovate. The posterior sinus is deep, thickened and reflected. The outer lip posterior to the posterior sinus is thickened and joins the heavy knob of the parietal wall. Anterior to it it is protracted. It bears a heavy varix a little behind its edge. Anterior canal short and moderately broad. The inner lip is reflected over and appressed to the columella. The parietal wall is covered by a heavy callus which develops into a strong knob at the posterior angle.

The type, Acad. Nat. Sci. Philadelphia No. 155045, was collected by Lowe at San Juan del Sur, Nicaragua. It has 10

whorls and measures: Height, 14.7 mm.; greater diameter, 6.2 mm.; length of aperture, 6.2 mm.

The more slender form, less oblique ribs and much stronger spiral sculpture will readily distinguish this from *D. dalli*.

Striospira new genus

Shell ranging from small to medium size; in shape from ovate to elongate-ovate. The surface bears a thin dark periostracum. The nucleus consists of about 3 turns of which the first 2 are small and smooth, while the rest bears protractively curved axial riblets. The postnuclear whorls bear a spiral cord a little below the summit which may be smooth or nodulose. Anterior to this is a broad sinal area, and anterior to the sinal area are axial ribs which may extend over the base or vanish before reaching this, depending upon the species. The posterior termination of these ribs frequently forms slight nodules, while on the basal portion there is no indication of nodulation. In addition to this the entire surface is marked by incremental lines and numerous spiral lirations which vary materially in strength in the different species. The base is well rounded, and the columella is usually short and stubby. Suture not conspicuous. Aperture irregularly oval. Posterior sinus well rounded, usually narrowed at the edge of the aperture. Posterior to the posterior sinus the outer lip is thickened into a knob which extends over the parietal wall. Anterior to the posterior sinus the outer lip is protracted and usually rendered denticulated by the external markings. Anterior canal short and moderately broad. The inner lip is reflected over and appressed to the base, in some of the forms leaving an umbilical chink anteriorly. The parietal wall is covered by a moderately thick callus which joins the lump at the posterior angle. Operculum elongate-ovate with apical nucleus showing concentric lines of growth on the outside. The radula bears marginals only in which the basal Y is approximated and fused.

Type: *Striospira lucasensis* new species.

This genus ranges from the Gulf of California to Ecuador.

Striospira lucasensis new species

Shell of medium size, elongate-ovate, chestnut brown. The nucleus consists of 2 small, smooth turns followed by a whorl having protractively slanting, heavy axial ribs which are as wide as the spaces that separate them. The postnuclear whorls have a feeble thread about one-fifth of the distance between the summit and suture anterior to the summit. This is followed by

the sinal area which covers about two-fifths of the turn. Anterior to this the whorls are marked by protractively slanting axial ribs. Of these 10 occur on the last whorl. These ribs evanesce on the base. The columella is short, stout, and rather straight. The spiral sculpture consists of fine microscopic lirations posterior to the heavy thread below the summit and 4 feeble threads in the sinal area, while in the intercostal spaces moderately deeply incised spiral lines separate 6 low, flat, rounded threads, while on the base the spiral sculpture consists of 14 threads a little narrower than those on the spire. The columella bears 28 spiral threads which vary materially in size and spacing. Operculum elongate-ovate with apical nucleus marked on the outside by concentric lines of growth. The radula bears marginals only, of which the Y portion is fused to practically form a single element.

The type, U. S. N. M. No. 267916, was collected by Bartsch at Cape San Lucas. It has 10.5 whorls and measures: Height, 17.2 mm.; greater diameter, 6.8 mm.; length of aperture, 8 mm. U. S. N. M. No. 266213 contains 3 topotypes from the same source. U. S. N. M. No. 566514 contains 2 specimens collected by Bartsch with a boat dredge at Mulege Bay, Gulf of California. U. S. N. M. No. 554252 contains 2 specimens collected by R. Hawkins, Jr., on gravelly bottom at Cerros Island. U. S. N. M. No. 566517 contains 2 specimens dredged by Hawkins in 12–18 ft. on fine black sand on the northwest side of Santa Inez Bay, about 2 miles west of Point Inez. U. S. N. M. No. 566518 contains 1 specimen dredged in 5 fms. about three-quarters of a mile off shore, 2½ miles southwest of Point Inez, Santa Inez Bay, on gray sand bottom. U. S. N. M. No. 566519 contains 1 specimen dredged about one-half mile off shore in coarse gray sand in 4.5 fms., 2 miles west of Inez Point, Santa Inez Bay. U. S. N. M. No. 558211 contains 1 specimen collected by Hawkins in 3–4 fms. in La Paz Bay. U. S. N. M. No. 56217 contains 1 specimen collected by Rich at Mazatlan.

This species is most nearly related to *S. luctuosa* but its larger size will readily differentiate it from that.

Striospira tabogaensis new species. Plate 6, figure 3.

Shell rather large, elongate-turreted, blackish brown. Interior of the aperture livid, brown at the edge. Nuclear whorls decollated. The postnuclear whorls show a feeble thread a little

below the summit scarcely differentiated from the rest of the spiral sculpture. The sinal area covers about one-fourth of the turns between this thread and the nodulose axial ribs. Anterior to the sinus the moderately strongly developed, axial ribs are present, which are slightly nodulose at the summit. These ribs, of which 13 are present on the last whorl, evanesce before reaching the middle of the base on this whorl. Base long, gently rounded. The columella is long and stout. The spiral sculpture consists of 7 low, slender, weak threads in the sinal area. Anterior to the sinal area, 8 low, flattened spiral threads are present, while on the base 15 similar threads occur. The anterior members of the base are considerably more elevated, in which respect they approach those of the columella. The columella bears 17 spiral threads. In addition to this, the whorls are marked by moderately strong incremental lines. Aperture oval. The posterior sinus is moderately deep and rounded. Posterior to the posterior sinus the outer lip is developed into a heavy lump which extends strongly over the parietal wall. Anterior to the posterior sinus, the outer lip is protracted and bears a rather strong, broad, stromboid notch a little posterior to its anterior termination. There is a heavy varix a little behind the edge of the outer lip. The anterior canal is short and moderately broad. The inner lip is thick, reflected over and appressed to the columella. The parietal wall is covered by a heavy callus.

The type, Acad. Nat. Sci. Philadelphia No. 153867, was collected by Dr. Pilsbry on Taboga Island. It has 7 whorls remaining and measures: Height, 20.2 mm.; greater diameter, 7.5 mm.; length of aperture, 9.1 mm. U. S. N. M. No. 219643 contains 2 worn specimens collected by Zetek at Pena Prieta Beach, Panama City.

SOME SHELLS OF CLEAR LAKE, NORTHERN MODOC COUNTY, CALIFORNIA

By G. D. HANNA

A very large lake in northern Modoc County, California, is called "Clear Lake" on many maps and "Clear Lake Reservoir" on others. It has been variously modified from time to time, ostensibly for "reclamation" purposes, and at the southern end there is a large sign inscribed: "Clear Lake Bird Reserve U. S.

Biological Survey." During the few hours Mr. Charles Chesterman and I were there on September 5, 1949, however, we saw only about a dozen gulls and two killdeers.

Possibly other parts of the lake would be more interesting than that which we saw at the southern end. Near the northeast "Mammoth Springs" are indicated on some maps. Barren "sage" brush desert surrounds the southern portion with here and there a lone, stunted juniper. Scattered lava blocks and mud flats form a zone up to 100 yards wide out to the water edge which is devoid of vegetation. No tules or cat-tails or other water vegetation was visible as far as we could see from our point of observation. Two or three springs of true water plants had drifted on shore but there were no windrows of drifted debris such as may be seen bordering most lakes of large size.

On the mud flats there were large numbers of *Anodonta californiensis* Lea varying in size from half an inch long up to three inches. They were fairly free of corrosion and beautifully colored with green and brown.

A large *Helisoma* was present but only dead shells were found. Any one of a dozen names might be applied to this but it is about the size and shape of *H. trivolvis* Say of the east, and, indeed, it might be this.

Two *Gyraulus* shells, both dead, were found during our stay. They are presumably *G. parvus* Say. Screening the mud and fine sand produced no *Pisidium*.

Undoubtedly this cursory examination which was merely a side issue in connection with nearby geological work is insufficient to give a real indication of the molluscan fauna. The northern portion should be examined and a boat is needed for some dredging operations. However, the subject is brought up at this time because of a confusion of names.

Several species of fresh water shells have been described from "Clear Lake, California" with no indication of the County. It has always been presumed that the lake involved was the large one in Lake County, about 130 miles north of San Francisco. Dr. A. B. Leonard, working on *Valvata*, brought the matter up recently, and it was thought that any investigation, cursory though it be, would be worthwhile.

It so happens that there are three "Clear" lakes in California. The one in Lake County is the best known. There are actually two in Modoc County, one being that which is indicated above and the other is a small one in the upper part of Pit River drainage in the Warner Mountains.

Clear Lake in Lake County contains relicts, forms which have lived through from the great system of western Pliocene lakes. Such genera as *Carinifex* and *Parapholyx* have survived in certain lakes while many others did not. If more than one "Clear Lake" contained these relicts the matter would be very confusing. However, it appears from this brief examination that the northern Modoc one is not involved. It is also very unlikely that the one in the Warner Mountains is, because it is not well known to travelers, and apparently none of the early geographical survey parties came close to it.

A LIST OF THE LAND MOLLUSCA OF CLAIBORNE COUNTY, TENNESSEE, WITH DESCRIPTION OF A NEW SUBSPECIES OF TRIODOPSIS

By LOUIS LUTZ

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Introduction: The purpose of this paper is to present a preliminary list of the molluscan fauna of Claiborne County. Up to the present time no compilation of this county has been published. All species listed in this paper are for the first time recorded for this county. Because the literature pertaining to the mollusca of Tennessee has been rather limited, few regions have been shown to have many species. This list is based primarily upon the author's collection.

Investigation of past and recent literature on terrestrial snails shows deficiency in comprehensive collecting. Many collections made show indications of sampling of a random rather than of a systematic nature. This weakness was forcibly brought to my attention during the collecting of my material in the county.

Although mollusca are fairly abundant, the state of Tennessee has at the present time only about 165 species and varieties of

terrestrial snails recorded in the literature. It is highly probable that more species await discovery and that many more ranges will be extended. This can be brought about by more systematic methods of field work.

In order to acquire a fairly broad geographical representation, the county was subdivided into major areas to be searched in turn. It is hoped that other counties can be similarly covered in the future.

In the early 1900s great contributions to knowledge of Tennessee mollusks were made by Pilsbry, Ferriss, Clapp and their co-workers, and in later years mainly by H. B. Baker. Some of these references may be found in the bibliography.

The system of classification followed in this paper is that used by Pilsbry in his Monographs, "Land Mollusca of North America" (1940, 1946, 1948). The species are listed in systematic order. The localities in Tennessee where the various species have been recorded are listed with the name of the collector in parenthesis. Claiborne County locality records under each species are the result of the writer's recent studies. In all 19 species or subspecies, 10 genera and 7 families and subfamilies of terrestrial mollusca are represented.

At the end of the paper is found a brief list of references that will serve as an introduction to the terrestrial snails in this state.

I wish to express my gratitude to the many people that have made this paper possible. First, I wish to thank the various members of the Division of Mollusks at the United States National Museum: Harold A. Rehder, curator, J. P. E. Morrison, associate curator, and R. T. Abbott, assistant curator. Credit for identification of specimens is due to H. A. Pilsbry and C. Wurtz of the Academy of the Natural Sciences of Philadelphia, and J. P. E. Morrison of the United States National Museum. I wish to thank Dr. A. O. Weese, University of Oklahoma, for his helpful suggestions.

Description of Claiborne County: *Location*—Claiborne County is in the extreme northeastern part of the East Tennessee Valley, adjoining Kentucky and Virginia on the north, and includes parts of both the East Tennessee Valley area and the Cumberland Plateau.

Topography—Variable. Rolling to level valley lands are

separated by numerous ridges. The northeastern part of the county is mountainous, being part of the Cumberland Plateau which extends in a northeast to a southwest direction. The larger part of the county slopes southwesterly and drains into the Powell and Clinch Rivers, tributaries of the Tennessee River; the northwestern part of the county, however, drains to the northeast into the Little Yellow River, a tributary of the Cumberland River.

Climate—Mild and humid. Mean temperature from July to August averages about 76 degrees Fahrenheit; during months of December, January and February the mean temperature averages about 38 degrees Fahrenheit. The average annual precipitation is around 48.6 inches. The greatest monthly precipitation occurs during July and the smallest occurs in October. The total average snowfall is around 14 inches, but the ground is rarely covered for more than a few days. Claiborne County, being located partly on the Cumberland Plateau, experiences some variation in climate, chiefly temperature, due to differences in elevation. The summer temperature on the Cumberland Plateau is approximately five degrees Fahrenheit lower than in the valley but there is less difference during the winter.

Soils—The soils of Claiborne County are variable, being derived from Knox dolomite, cherty limestone, weathered sandstone, siltstone, and shale materials. The soils in general are deeply leached, acid in reaction, contain little organic matter, are low in plant nutrients, and are severely eroded.

FAMILY POLYGYRIDAE

GENUS Polygyra Say

Polygyra plicata (Say), 1821

Tennessee Records: Cowan, Franklin Co. (Archer). Marion Co. At Dove and near Jasper (H. B. Baker); South Pittsburgh (H. H. Smith); Seucachie Valley (Bishop Elliot). W. Pikeville, Bledsoe Co. (H. B. Baker). Roane Co. at Harriman (S. N. Rhoads), and 2 miles west of Kingston (Clench and Archer). Citico, Monroe Co. (A. G. Wetherby).

Claiborne County Records: Arthur. *Ecology:* Found among rocky rubble (canyon near Arthur).

GENUS Stenotrema Rafinesque

Stenotrema stenotrema (Pfeiffer), 1842

Tennessee Records: Eastern two-thirds of the state (Pilsbry).

Claiborne County Records: Harrogate, Forge Ridge, bluff 8 miles south of Tazewell, on the bank of the Clinch River. *Ecology:* Red and Black Oak communities (Harrogate); rocky rubble (bluff overlooking the Clinch River).

Stenotrema spinosum (Lea), 1830

Tennessee Records: Pikeville, Bledsoe Co. Cowan, Dewanee, 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. (Pilsbry).

Claiborne County Records: Harrogate and Arthur. *Ecology:* Hilly terrain of Red and Black Oak communities, Harrogate.

GENUS Mesodon Rafinesque

Mesodon inflectus (Say), 1821

Tennessee Records: Carter, Carroll, Davison, Hamilton, Knox, Marion, Polk, Shelby, Unicoi, Washington, and Wilson counties (Pilsbry).

Claiborne County Records: Harrogate, Arthur, Tiprell and Speedwell. *Ecology:* Hardwood forests.

Mesodon clausus (Say), 1821

Tennessee Records: Valley Forge, Carter Co. Chattanooga. Knoxville. Dove, Marion Co. Marbleton and Limestone Cove, Unicoi Co. Johnson Co. Washington Co. Anderson, Franklin Co. (Clinch). Tallassee Ford, Monroe Co. (Pilsbry).

Claiborne County Records: Harrogate. *Ecology:* Foothills of Cumberland Mts. in Red and Black Oak forests.

Mesodon appressus (Say), 1821

Tennessee Records: Richland Creek, Davison Co. (S. N. Rhoades). Oakdale, Morgan Co. (Clapp). Jefferson Co. (Rugel). 2 miles west of Kingston, Roane Co. (Clinch). Knox-

ville, Knox Co. (Pilsbry). Chattanooga, Hamilton Co. (S. N. Rhoades). Coltewah, James Co. (Clinch and Archer).

Claiborne County Records: Harrogate, Tiprell, Cumberland Gap, Arthur, Canyon near Arthur, Tazewell, Goin, bluff 8 miles south of Tazewell, Speedwell, Forge Ridge, Fork Ridge, and Pruden. *Ecology:* Foothills of hardwood forests, rocky rubble and under old logs.

Mesodon thyroides (Say), 1816

Tennessee Records: South to the Gulf of Mexico. Samburg, Tenn. (Pilsbry).

Claiborne County Records: Tiprell, Arthur and bluff 8 miles south of Tazewell on the bank of the Clinch River. *Ecology:* Woody slopes of hardwood forests (Tiprell). Bluff 8 miles south of Tazewell on the bank of the Clinch River.

GENUS Triodopsis Rafinesque

Triodopsis fraudulenta vulgata Pilsbry, 1940

Tennessee Records: Knoxville; near Dove, near Jasper, etc., 4000–5000 ft.; sink holes 2 miles west of Johnson City, Carter Co.; Limestone Cove and near Marbleton, Unicoi Co. (H. B. Baker). Monroe Co. (Anne M. Law). Samburg, Obion Co.; Richland Creek, Davison Co.; banks of Emory River, Harriman, Roane Co., and William's Island 3 miles west of Chattanooga (S. N. Rhoads).

Claiborne County Records: Harrogate. *Ecology:* Hills of Red and Black Oak forests.

Triodopsis fallax (Say), 1825

Tennessee Records: Citico, Monroe Co. (Wetherby). Lookout Mt. near Chattanooga (J. H. Ferriss). Holstein Valley (W. G. Binney).

Claiborne County Records: Harrogate, Goin, Tazewell, Forge Ridge, and Canyon near Arthur. *Ecology:* Forests of hardwood.

Triodopsis albolabris (Say), 1816

Tennessee Records: In east Tennessee large, solid specimens of 32 to 36 mm. have sometimes been taken for *T. albolabris major* (Pilsbry).

Claiborne County Records: Arthur and Harrogate. *Ecology:* Hills of hardwood forests, found among leaf mold.

Triodopsis tridentata (Say), 1816

Tennessee Records: Bledsoe, Blount, Carter, Cumberland, DeKalb, Fentress, Franklin, Green, Hamilton, Polk, Sevier, Sullivan, Unicoi, and Washington counties (Pilsbry).

Claiborne County Records: Harrogate, Tazewell(?), immature forms. *Ecology:* Hilly terrain of Red and Black Oak forests.

FAMILY ZONITIDAE

GENUS Mesomphix Rafinesque

Mesomphix cupreus (Rafinesque), 1831

Tennessee Records: Blount, Carter, Hamblen, Knox, Marion, Obion, Roane, and Unicoi counties (Pilsbry).

Claiborne County Records: Harrogate. *Ecology:* Red Oak-Black Oak communities.

GENUS Ventridens W. G. B.

Ventridens ligera (Say), 1821

Tennessee Records: Chattanooga, Hamilton Co. (Pilsbry).

Claiborne County Records: Harrogate, Speedwell, and Forge Ridge. *Ecology:* Hardwood forests on sloping terrain (Harrogate).

Ventridens collisella (Pilsbry), 1896

Tennessee Records: Elizabethan and Valley Forge, Carter Co.; Johnson City, Washington Co.; Citico, Monroe Co. (Pilsbry).

Claiborne County Records: Arthur, bluff 8 miles south of Tazewell on the bank of the Clinch River, (?) immature forms. *Ecology:* Hilly terrain of hardwood.

FAMILY HAPLOTREMATIDAE

GENUS Haplotrema Ancey

Haplotrema concavum (Say), 1821

Tennessee Records: South to non-peninsular Florida. Humid division of eastern North America (Pilsbry).

Claiborne County Records: Harrogate, Arthur, Canyon near Arthur and Forge Ridge. *Ecology:* Rolling hills of hardwood forests.

FAMILY LIMACIDAE

GENUS Limax Linnaeus

Limax maximus Linnaeus, 1758

Tennessee Records: Introduced into North America from Europe. No specific Tennessee records published that the author knows of.

Claiborne County Records: Harrogate, Pruden, Tazewell, Arthur and Cumberland Gap. *Ecology:* Found in gardens, around damp places in the above localities.

GENUS Deroceras Rafinesque

Deroceras laeve (Müller), 1774

Tennessee Records: North America, generally from the Arctic to middle Florida and Central America, the southern limit not determined (Pilsbry).

Claiborne County Records: Harrogate. *Ecology:* Red Oak-Black Oak communities.

FAMILY PUPILLIDAE

GENUS Gastrocopta Wollaston

Gastrocopta armifera (Say), 1821

Tennessee Records: Eastern United States and Canada: Quebec to northern Florida (Pilsbry).

Claiborne County Records: Harrogate. *Ecology:* Foothills of the Cumberland Mountains, hardwood forests.

Gastrocopta rupicola (Say), 1821

Tennessee Records: South Carolina to the keys of Florida.

Claiborne County Records: Harrogate. *Ecology:* Foothills of Cumberland Mts., in Red Oak-Black Oak communities. If this identification is correct, this extends the range of this species in an entirely new range. *G. rupicola* is supposed to be a coastal species.

(To be continued)

NOTES AND NEWS

Mesodon andrewsae normalis (Pils.) in Kentucky.—During a recent collecting trip I collected a single living shell of this species below the Natural Arch, 2 miles west of Parkers Lake, McCreary Co., Kentucky. Not only is this the first time that the species has been reported from this State but the altitude (1100 ft.) is about a thousand feet lower than previous recorded. The shell measured: diameter 35 mm., height 26.5 mm. A specimen of *Triodopsis albolabris* (Say) found with it measured: diam. 27.5 mm., ht. 18 mm.—Leslie Hubricht.

Notes on Pallifera.—*Pallifera wetherbyi* W. G. B. Collected at night after a rain at Cumberland Falls State Park, and near the mouth of Laurel River, Whitley Co., Kentucky, on trunks of trees, fallen logs, and cliffs, apparently preferring vertical surfaces. Living specimens fully extended were about four inches long.

Pallifera hemphilli (W. G. B.) Found abundantly in the fir zones on the mountain tops crawling about during the day on the needle-covered ground, and rarely at lower elevations buried in the leaves in the beech woods. Strictly terrestrial. Not a single specimen was seen on the trunks of trees. Living specimens fully extended were about two inches long.

New localities.—6300 ft., Roan High Knob, Roan Mtn., Carter Co., Tennessee; 5000 ft., Grandfather Mtn., Avery Co., North Carolina; 5400 ft., Beech Mtn., north of Banner Elk, Avery Co., North Carolina; 5700 ft., Mt. Rogers, Grayson Co., Virginia; 5500 ft., Whitetop Mtn., Smyth Co., Virginia.—Leslie Hubricht.

Slug Behavior, *Ariolimax* vs. *Philomycus*.—Since we seem not to know why philomycids have not been found in the northwest with such snails as *Allogona*, the following note may be pertinent. Nov. 25, 1941, a rich-yellow, adult-sized *Ariolimax columbianus stramineus* Hemphill (unverified genitalially because the slug escaped), collected Oct. 29, 1941 by Ernest N. Wilcox at Salmon Falls Creek Canyon, Monterey Co., California, was noted to commence eating a piece of lettuce. Just ahead lay a slice of carrot which was mostly covered by an adult *Philo-*

mycus carolinianus (Bosc). The *Ariolimax* consumed all of the lettuce and then crawled forward and brushed against the side of the carrot-eating *Philomycus*. Very deliberately the *Ariolimax* began to gnaw upon the side of the mantle of the other slug. The *Philomycus* squirmed its mantle at this point and the *Ariolimax* continued its attack, also moving forward, but allowed the *Philomycus* to draw away. The *Ariolimax* then began chewing on a fragment of shell from a chicken egg. By its aggressiveness and seeming greater crawling speed, would *Ariolimax* prevent the two genera from coexisting in an area? I have not noted *Philomycus* to be aggressive toward other snails even in crowded cages.—Glenn R. Webb, Ohio, Illinois.

Shell-Spinules as Defense Structures.—After a juvenile *Stenotrema spinosum* (Lea), progeny of adults collected Sept. 2, 1941, on S. bank of Mulberry Fork, Black Warrior River, near Garden City, on route U. S. 31, Cullman Co., Alabama, was added to a cage containing other young snails (*Helix nemoralis; Helminthoglypta dupetithouarsi,* collected by Emery P. Chace in an open pine grove near Point Pinos, Monterey Co., California; *Helm. umbilicata;* and *Polygyra septemvolva*), the following incident was noted. The *dupetithouarsi* was observed crawling over the spire of the slightly smaller *S. spinosum* which was twitching its shell from side to side. As the *dupetithouarsi* sought to slide off onto the substratum, several times it was noticed to suddenly retract its tentacles as if in alarm or pain. The cause of its discomforture was evident,—each time it affixed its forepart to the substratum, the movement of the shell of the *spinosum* caused the spinules of the peripheral keel to scratch against the anchored body of the other snail. After ultimately freeing itself as I continued to watch, the *dupetithouarsi* again happened to encounter the *spinosum*. As its tentacles swept over but seemed not to touch the now unmoving periphery, the *dupetithouarsi* made an extreme avoidance reaction. Inasmuch as the *Stenotrema spinosum* had just been put into the cage, the *dupetithouarsi* had apparently learned to identify something about the *spinosum* as being noxious after one brief discomforture. Later, however, the *dupetithouarsi* was noted gnawing on the spines of the other snail.—Glenn R. Webb, Ohio, Illinois.

CHONDROPOMA (S. S.) SCHALIEI, **new species.**—*C. swifti* (Sh.), H. B. B., 1941, Notulae Naturae 88: 4; also Schalie, 1948, Misc. Publ. Mus. Zool. Univ. Mich. 70: 35, exclusive of synonymy, pl. 2, fig. 10. Not *Cyclostoma swiftii* Shuttleworth, Mitth. Naturf. Ges. Bern, 1854: 91; Cf. *Chondropoma* (*Chondropomium*) *swiftii swiftii,* Bartsch, 1946, Bull. U. S. Nat. Mus. 192: 28, pl. 4, fig. 2. Type of *C. schaliei,* ANSP. 186175, from Cerro Capron, semidesert hills east of entrance to Guanica Harbor, a female, quite similar to cited figure; it measures: length 10.7 mm., major diameter 7.0, minor 5.6, with 3⅝ whorls remaining. Tan unicolor, with central wall of plugged whorl orange. Last 1/10 of body whorl solute. Parietal angle of peristome reflection produced (apparently more than in closely related Haitian species) to form narrowly rounded crest. Males average smaller; one measures: length 8.2 mm., maj. diam 5.8, minor 4.7, with 3⅜ whorls retained. (Tallaboa shells more whitish; males about size of Guanica females.)

Through some lapsus menti, I evidently employed *C. swifti* without a careful check of its original description. Full blame is taken for Dr. van der Schalie's (1948) repetition of my misuse, and the new species is named after him. My attention was called to the error by Dr. Bartsch's (1946) fine figure of Shuttleworth's type. Also, ANSP. 13867 is a set of the true *C. swiftii,* from the Swift Collection, labeled as from Ponce, Puerto Rico. Robert Swift was usually careful of his localities, but he also collected on the island of Haiti (Hispanola).—H. BURRINGTON BAKER.

CERION INCANUM.—Last June, after the A. M. U. meetings, some of the smaller snails, collected on Key Largo, were aired out under a palmetto, just inland from the Tides Hotel, Redington Beach, St. Petersburg, Florida. A few specimens of *C. incanum* seemed to be missing. Any future collector, who may discover a colony in the vicinity, will please not blame any other birds.—H. B. B. & B. B. B.

DR. PILSBRY, the week after his 87th birthday, left by airplane for a visit to his daughters and son-in-law in Buenos Aires, Argentina. He hopes to do some collecting, and will return in the spring. His permanent address remains unchanged, and manuscripts sent to it will reach THE NAUTILUS.

THE NAUTILUS

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A NEW VERTICORDIA FROM THE PACIFIC COAST [1]

By ARTHUR D. HOWARD

In going over the bottom samples collected by the *Velero III,* some verticordiae we noted are quite different from the series of *V. ornata* (D'Orbigny) (1846) that have been taken. These consisted of one right valve and a broken shell from Angel de La Guardia Island, Gulf of California, March 21, 1937, 90 fathoms and another broken right valve from near Catalina Island, Aug. 2, 1941, 105 fathoms.

The condition of the shells would indicate that they are recent although, until living specimens are collected, that question will be in doubt. I would not attempt to record this new species with so little material but for the fact that it seems comparatively rare and more material may be found if attention is called to it.

VERTICORDIA AEQUACOSTATA **new species.** Pl. 7, figs.

Shell, small, thin, subquadrate to suborbicular inflated with prosocoelous subcentral beaks; anterior extremity evenly rounded; posterior dorsal margin evenly arcuate and joining arcuate ventral margin with slight angle; surface sculptured with about twenty-two or twenty-three rounded ribs with rounded interspaces which give an evenly dentate margin to the shell. The seventh and ninth ribs are shorter as plainly interpolated in the growth of the shell. The whole surface is minutely granulose, the granules appearing to be arranged in lines in a photograph. Interior with brilliant pearly nacre. Hinge has a prominent cardinal tooth in the right valve with apparently a lateral tooth in the left valve with corresponding receptive groove in the right. Adductor scars: anterior plain, impressed; posterior faint. Pallial line faint. Length 4; height 4; diam. 2 mm. (one valve).

[1] Contribution from the Allan Hancock Foundation, University of Southern California, Los Angeles, California.

Holotype and paratype, Allan Hancock Foundation no. 4.371; from north of Angel La Guardia Island, 90 fathoms. Another paratype, A.H.F. no. 4.411 (numbers tentative); from off Whites Cove, Santa Catalina Island, 105 fathoms.

Of the various species of *Verticordia* listed by Dall, *Verticordia* (*Haliris*) *jamaicensis* seems to be close to this species, in size, sculpture, and markings of the surface. The number of the ribs, twenty-seven in *V. jamaicensis* is probably not within variability limits (23) of this species. *V. fisheriana* (Dall, 1885–6, Pl. II, fig. 4a, 4b), the type of subgenus *Haliris,* is considerably larger.

According to Dall, there are several genera and subgenera of the *Verticordia* group. *Verticordia cardiiformis* of Searles V. Wood (1844) has been accepted as the generic type. "The curious history of the genera of this family and of the many conflicting views of their extent and relationships is ably given by Heilprin." (1881).

The two figures on plate 7 are from photographs by Daniel H. Chapman. The upper one shows the exterior, and the lower the interior of the holotype right valve.

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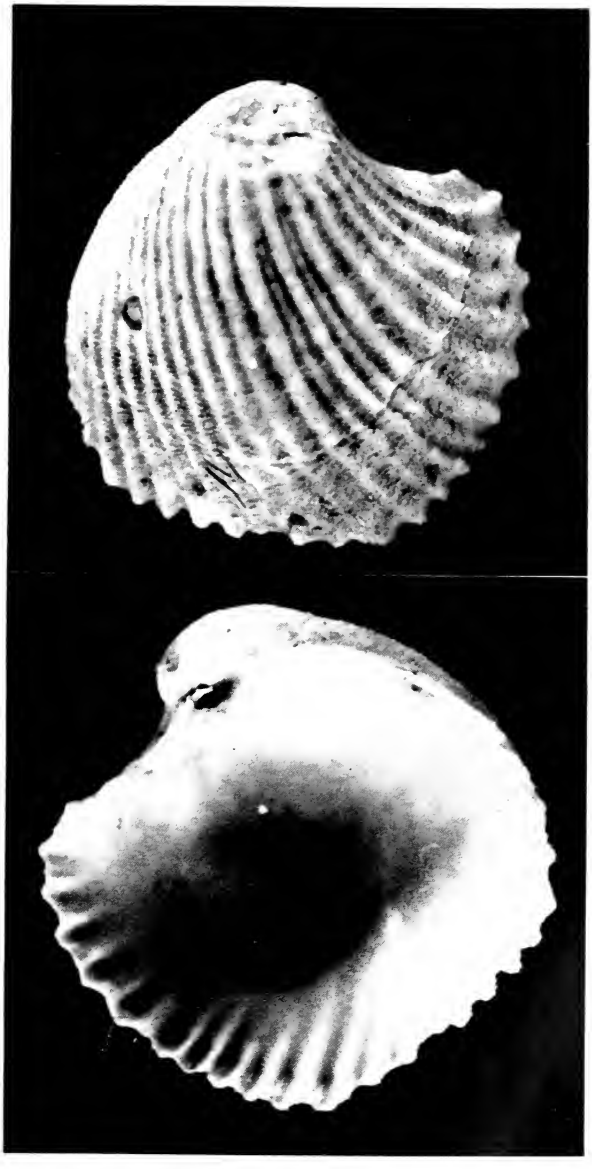
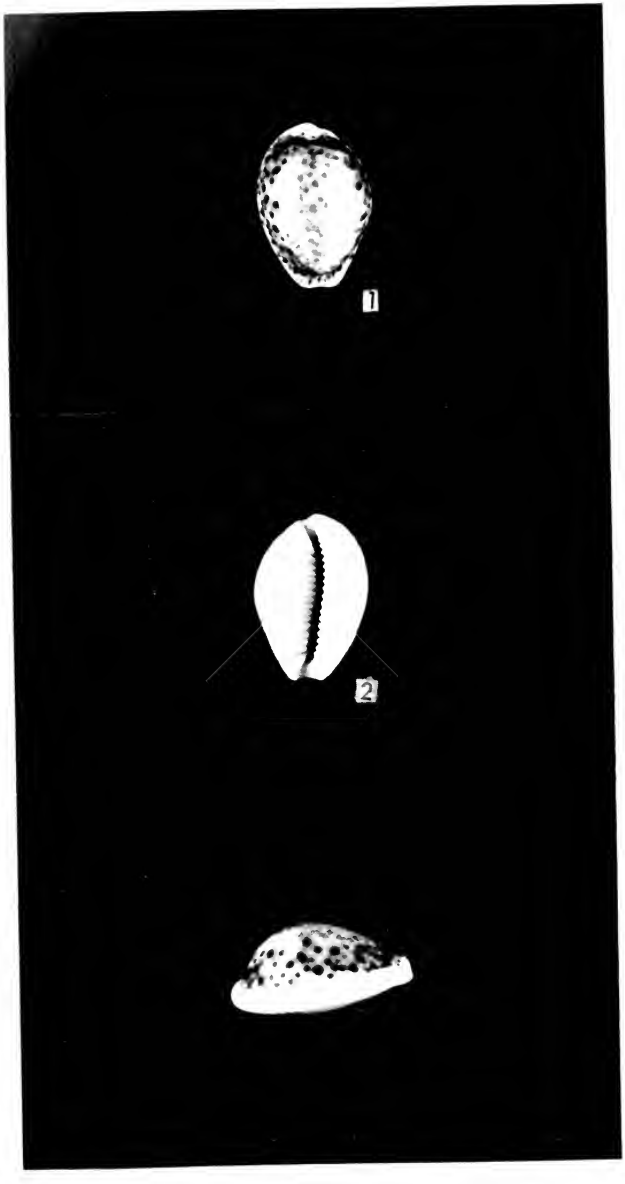


Verticordia acquacostata Howard



Cypraea allani Ostergaard

A NEW SPECIES OF CYPRAEA FROM HAWAII

By J. M. OSTERGAARD

As one of the rewards for his keen interests and energetic efforts to increase our knowledge of the molluscan fauna of Hawaii, Mr. Charles A. Allen, former President of the Malacological Society of Hawaii, secured a specimen of what appears to be a new species of *Cypraea*.

Mr. Allen dredged the mollusk in a living state from a depth of about 80 feet, one mile from Nawiliwili Bay, and 1500 yards off the leeward shore of the Island of Kauai, Hawaiian Islands, on April 25, 1949.

The shell was turned over to the author for study; and, after a careful diagnosis and comparison with related species, he has arrived at the conclusion that it is new and is therefore naming it for the discoverer, Mr. Allen.

CYPRAEA ALLENI **new species.** Pl. 8, 3 figs.

Shell ovate, depressed, sides thickened and margined, pitted throughout the length of the outer margin and above anterior canal as well as at anterior and posterior ends of inner margin. Spire depressed and concealed, slightly umbilicated. A light-brown zone with numerous rounded dark-brown dots of varying sizes extends from the margins about half way to the mid-dorsal region. The dorsal region lying between the marginal zones is of a cream yellow evenly sprinkled with minute white dots, inconspicuous on their light background; while faint brown ocelli with large eccentric white pupils occur fairly evenly among the white dots. Dorsal line indicated by transverse striations of the white "pupils" of the ocelli. Base, teeth, interstices, as well as columella, white. Aperture straight, narrow; teeth fine, numbering on outer lip 21, on inner lip 17. Length of shell 22 mm., width 16 mm.

This species is probably most closely related to *Cypraea ostergaardi* Dall, which it resembles in form, teeth and aperture, but departs radically from it in its markings. In markings and general coloration, it shows some resemblance to *Cypraea spurca* Linnaeus; but, unlike that species, the aperture in *Cypraea alleni* is straight and of equal width and the teeth are finer.

The number of teeth present has been stated, since it might prove of some value; but, as is a known fact, the fluctuation in the number of these structures in *Cypraea* is great within the species, even considerable among individuals from the same colony.

The solitary specimen, being the holotype, is in Mr. Allen's collection.

LOCOMOTION IN LIMA

By JOSHUA L. BAILY, JR.

"The Lima . . . darts through the water like a scallop, but in a contrary posture. The hinder end instead of the ventral end is in front, so that the mode of its progression may be compared to that of a fish swimming tail foremost." So wrote Gwyn Jeffreys [1] in 1863, and his statement has been accepted uncritically and repeated by Tryon.[2] The present writer vaguely recalls having seen the same statement in Dall's writing, but cannot now find the bibliographic reference.

Authorities are by no means agreed on this matter, since ten years before Jeffreys, Forbes, and Hanley [3] had stated that "The rounded extremity is that which is in front and the beaks behind, when the animal moves."

In 1860, Reeve,[4] quoting from Landsborough,[5] stated "Its mode of swimming is the same as that of the scallop." And Sowerby [6] made the astonishing observation that "The animal makes use of the valves of his shell for swimming, working them like fins or paddles. . . ."

Recently the present writer has been privileged to examine three specimens of the local species, now known as *Lima hemphilli* Hertlein and Strong,[7] but which generally has been referred

[1] British Conchology, vol. 2, p. 77, 1863.

[2] Structural and Systematic Conchology, vol. 3, p. 286, 1884.

[3] British Mollusca, vol. 2, p. 267, 1853.

[4] Elements of Conchology, vol. 2, p. 60, 1860.

[5] Excursions to Arran, p. 319.

[6] Conch. Manual, p. 183, 4th ed., 1852.

[7] Zoölogica, vol. 31, pt. 2, p. 66, 1946.

to *Lima orientalis* Adams and Reeve [8] and *Lima dehiscens* Conrad.[9] These were taken in False Bay, San Diego, California, by Mr. Robert Menzies and Mr. Roy L. Morrison. In each case, while swimming they were observed to carry the hinge behind, in the manner of *Pecten*.

Of course, some species of *Lima* possibly may swim one way and others differently, but this seems unlikely. Further observations on other species of this family are desirable.

WEST INDIAN MARINE MOLLUSKS FROM SOUTHERN BRAZIL

By WALTER J. EYERDAM

In a recent exchange of shells with Dr. H. de Souza Lopes of Inst. Oswaldo Cruz, Rio de Janeiro, Brazil, I received 80 species of marine shells which were collected in the vicinity of Bahia and Rio de Janeiro. On account of the similarity of many of these shells with our Florida and West Indian faunule, I compared each species with other specimens in my collection and looked up the geographical ranges in both Charles Johnson's and Maxwell Smith's western Atlantic Coast marine shells. A few other species, that have already been treated in Wm. J. Clench's monographs of the Atlantic coast shells, were also compared for geographical ranges. As was quite a surprise to me, no less than 47 species in this casual exchange of shells from southern Brazil were not recorded south of the West Indies.

Maxwell Smith's book on the Atlantic Coast shells is practically a duplication of the work of Johnson, as far as ranges are concerned. When an important work of this nature is undertaken, there should be an effort made to get a more comprehensive idea of gathering fuller data on geographical ranges, which is becoming a more necessary detail for determining ecological factors and studying the vagaries of ocean currents, especially at or near the limits of ranges.

As also seems somewhat surprising to note, the southward limit of most of our Gulf of Mexico and Caribbean Sea mollusks

[8] Zoöl. Voy. Samarang, p. 75, pl. 21, fig. 7, 1850.

[9] Journ. Acad. Nat. Sci. Philadelphia, vol. 7, p. 247, pl. 19, fig. 7, 1837.

reaches no further south than the West Indies, with never a mention of the vast country Brazil. I am sure that there must be still plenty of shells from Brazil in the great museums of Europe, U. S. A., and in Brazil, that are also found in the West Indies.

As I have collected shells along the coast from Uruguay to Porto Gallegos in Patagonia, and along the Strait of Magellan to Punto Arenas I have a good knowledge of the littoral marine shells of the Magellanic region. Besides the shells I personally collected from this region for my cabinets, I have made many extensive exchanges to supplement the list. Very few of the W. I. shells extend as far as Uruguay, and south of the mouth of the Rio de la Plata, there is almost an entirely different shell fauna, discounting a few species of wide range or near cosmopolitan scope.

The following list of extended geographical ranges, southward from the West Indies or Gulf of Mexico to Brazil, were collected by Dr. H. de Souza Lopes.

Barnea costata Linné. Aracaju, Sergipe State.
Cardium muricatum Linné. Guiba Is. Est. do Rio.
Chama macrophylla Gmelin. Itagipe.
Chama congregata Conrad. Bahia.
Dosinia discus Reeve. Bahia.
Glycimeris americana Defrance. Rio de Janeiro.
Glycimeris pennaceus Lamarck. Guiba Is.—Est. do Rio.
Laevicardium serratum Linné. Guiba Is.—Est. do Rio.
Lucina jamaicensis Lamarck. Zumbi Id.—Rio de Janeiro.
Martesia striata Linné. Boa Viages Id.—Rio de Janeiro.
Mytilus exustus Linné. Mangaratiba.
Ostrea frons Linné. Rio de Janeiro.
Ostrea virginica Gmelin. Mangaratiba.
Pinctada radiata Leach. Gragoata (Est. do Rio) Niteroi.
Plicatula gibbosa Lamarck. Ipagipe, Bahia.
Tagelus gibbus Spengler. Bahia.
Semele proficua Pulteney. Gragoata, Niteroi.
Saxicava arctica Linné. Guaiba Is.
Venus mercenaria notata Say. Guiaba Is.
Dentalium callithrix Dall. Bahia.
Astraea longispina longispina Lamarck. Bahia.
Anachis avara Say. Niteroi Est. de Rio.
Bulla occidentalis C. B. Adams. Juruguba, Niteroi.
Calliostoma jujubinum Gmelin. Bahia.
Cantharus auritula Born. Bahia.
Cerithium atratum Born. Juruguba, Niteroi.

Colus obesus Verrill. Rio de Janeiro.
Columbella mercatoria Linné. Bahia.
Crepidula aculeata Gmelin. Mangaratiba.
Crepidula plana Say. Gragoata, Niteroi.
Cypraea exanthema exanthema Linné. Bahia.
Cypraea cinerea Gmelin. Bahia.
Cypraeacassis testiculus Linné. Bahia.
Diodora cayenensis Lamarck. Bahia.
Fasciolaria gigantea Kiener. Paqueta, Rio de Janeiro.
Littorina angulifera Lamarck. Piscina da Urca, Rio de Janeiro.
Littorina ziczac Linné. Niteroi, Est. do Rio.
Morum oniscus Linné. Itaparica, Bahia.
Nassa ambigua Montagu. Jurujuba, Niteroi.
Natica livida Pfeiffer. Bahia.
Oliva sayana Ravenel. Cabo Frio.
Olivella jaspidea Gmelin. Madre Deus, Bahia.
Semicassis inflata granulosa Bruguière. Bahia.
Strombus pugilis Linné. Bahia.
Strombus pugilis alatus Gmelin. Bahia.
Sinum perspectivum Say. Guaiba Is.
Siphonaria pectinata Linné. Niteroi, Est. del Rio.

SOME WRONG IDENTIFICATIONS OF SPHAERIIDAE

By H. B. HERRINGTON
Newburgh, Ont.

It is pretty well recognized that the family Sphaeriidae (finger nail clams) is in a bad state of confusion. Not only are there cases of many names for the same species but there is also confusion in the identification of species. This paper is presented as a contribution toward the correction of the latter cause of confusion.

I wish to express my gratitude to Wm. J. Clench of the Museum of Comparative Zoölogy, Cambridge, Mass., for the help he gave me in person and by correspondence; to Gordon K. MacMillan of Carnegie Museum, Pittsburgh, Penna., for searching the early records for references to *Cyclas similis* Say and *Sphaerium sulcatum* Lamarck; and to John Oughton of the Ontario Agricultural College, Guelph, Ont., for help in preparing this paper for the press.

In June, 1948, the writer visited the Museum of Comparative Zoölogy, through the kindness of the Royal Ontario Museum of Zoölogy, Toronto, for the purpose of studying the Sphaeriidae. The type specimen of *Sphaerium nobile* Gould was found to be quite unlike the specimens in that collection marked *nobile*. The latter appeared to be a form of *S. primeanum* Clessin of small diameter. The following information is submitted.

Gould's description fits the type specimen in the M. C. Z. [This is likely one of the specimens of which Prime says (Mon. Amer. Corb., 1865, p. 42) "were kindly presented to me by Dr. Gould."] But his description does not fit the specimens that have been travelling as *S. nobile*. The description says, "Has a general resemblance to what is usually regarded as *C. similis* [*S. sulcatum* Lamarck] . . . epidermis delicate, light brown . . . interior white." Who would think of comparing the specimens that pass for *nobile* with *sulcatum?* The "epidermis" of such adults as I have examined range from dark brown to almost black, the younger specimens being rather grayish, and the nacre is quite blue.

S. primeanum Clessin is a western species, and part of the confusion in the case of *S. nobile* started at least as far back as Gould himself. In his original statement (Boston Proc., V, 1855, p. 229) he gives the type locality as "near San Pedro, California." But, as Dr. Wendell O. Gregg has pointed out (Minutes Conchological Club, So. Calif., 69, May, 1947, p. 7) "The locality as given by Gould is definitely incorrect. It is ironical that the genus *Sphaerium* is absent from Recent molluscan fauna of Southern California."

The records show that Dr. Webb, who sent the specimens to Gould, collected in the mid-southwestern States as well as in Southern California. The specimens in question may have been collected in the former area but by the time Gould came to deal with them apparently they had been put with material from near San Pedro. In any case, Dr. Gregg points out, no *Sphaerium* is found in southern California and, besides, the type specimen in the M. C. Z. has affinity with sphaeria from the mid-southwestern States.

The specimens in the Royal Ontario Museum of Zoölogy, Toronto, Ont., that bear the name *S. nobile,* are *S. primeanum* Cles-

sin. The same state of affairs may exist in other museums. For a long time, Dr. Victor Sterki also thought these thin *primeanum* were *nobile*. But, by the spring of 1927, he had discovered that what passed for *nobile* were really *primeanum*. In a letter to Mr. Walter J. Eyerdam, dated April 6, 1927, accompanying specimens returned to Eyerdam, Sterki wrote, "I took for *nobile* Gld.—cf. *primeanum* Clessin. The latter is appary. not specify. distinct from the former; in his monograph, Clessin described *primeanum* but does not even mention *nobile* of Gould; and they are much alike." Evidently Sterki had thought that the clam Gould had in mind was what passed as *S. nobile* Gould. And now, by the time he is writing to Eyerdam, he has made the discovery that these are only a form of *primeanum*, so he concludes that *nobile* should be reduced to a synonym of *primeanum*. Mr. Eyerdam very kindly loaned me both this letter and the specimens. These clams proved to be the same form of *primeanum*.

Whether Gould's *nobile* is properly recognized in some localities or is given some other name I am not sufficiently familiar with Southern sphaeria to be able to say. The specimen in the M. C. Z. has some resemblance to *S. sulcatum* Lamarck but it struck me, at the time I examined it, as being a different species from *sulcatum*.

CYCLAS SIMILIS Say vs. SPHAERIUM SULCATUM Lamarck. [*Cyclas similis* Say (Nicholson's Encyclo., 1st edition, 1816).]

"Shell suborbicular convex, base a little flattened; with nearly equidistant, raised, concentric lines, giving a sulcated appearance to the surface, and generally a more conspicuous elevated darker wave, marking the former year's growth of the shell. Epidermis brown or ferruginous; beak nearer central and obtuse; hinge with minute very oblique teeth, lateral ones very distinct, elongated, and considerably resembling those of the next species. Length, seven-twentieths of an inch; breadth, two-fifths." (The "next species" was *C. dubia*.)

This is not a description of the *Sphaerium* that passes for *S. simile* (Say) today and which is otherwise known as *S. sulcatum* Lamarck.

(1) The measurements do not fit *S. sulcatum*. Length 7/20 and breadth 2/5 of an inch (= L. 9; breadth 10 mm.). If

"breadth" meant height the specimen described had a greater height than length; on the other hand if "breadth" meant diameter (as A. A. Gould used the term when dealing with *C. similis* Say in Report on the Invertebrata of Massachusetts, 1841) then the diameter was greater than the length. But *sulcatum* is elongated, besides a specimen but 9 mm. in length would be only a juvenile. Compare with the following measurements:

2489. Latchford's collection, *S. crassum* Sterki (which I take to be a form of *sulcatum*) L. 9; h. 7; d. 5 mm.

S–253 (my own) Napanee River, Newburgh, the usual run of *sulcatum*. L. 9; h. 6.5; d. 4.5 mm. L. 16.5; h. 12; d. 9.5 mm., an adult of usual size.

(2) I cannot see why anyone would call these "suborbicular convex." And certainly the base of *sulcatum* of the length given in the description is not "a little flattened."

(3) Surely Gould would not say of the cardinals of *sulcatum* "very oblique teeth." The cardinals of *sulcatum* are placed parallel, or nearly so, with the hinge-plate.

(4) The darker bands of sulcatum are sunken not "elevated."

That A. A. Gould in recording *C. similis* Say, and F. C. Baker and others in recording *S. simile* (Say), did not give measurements similar to those given by Say but measurements agreeing with *S. sulcatum* Lamarck also goes to show that the identification of *sulcatum* with *simile* is an error.

It is true that *S. simile* (Say) was described in 1816 and *S. sulcatum* Lamarck not until 1818, but I do not know what species Say was describing—certainly not what is known as *S. sulcatum* Lamarck. The fact that at a later time Gould, or someone else, noted that among the types was a specimen that "measured in length nearly three-fifths of an inch" does not alter what is here set down (see below under *P. ultramontanum* Prime). Therefore, I see no justification for discarding the name *S. sulcatum* for that of *S. simile*.

Pisidium ultramontanum Prime.

Mistaken identification has arisen on occasion because some person did not succeed in keeping all the other species from among the type specimens.

Take, for example, *P. ultramontanum* Prime. The eight type specimens at the Museum of Comparative Zoölogy had four of another species mixed with them. A comparison of these with Prime's description (Mon. Amer. Corb., 1865, p. 76) showed that he was describing the eight specimens. He says, "remarkable for its spherical and flattened appearance." The other four specimens, I take to be a short, high form of *P. abditum* Haldeman, much like *P. casertanum* (Poli) var. *humeriforme* Stelfox. [As will be borne in mind, *P. abditum* Haldeman is the North American name for the species that in Europe is called *P. casertanum* (Poli) or *P. cinereum* Alder.]

Seemingly not the eight specimens Prime described, but the other four, are taken currently to be *P. ultramontanum* Prime, for all the other five lots at the M. C. Z. marked *ultramontanum* consisted of specimens like the four that I have called a form of *abditum*.

Summary

(1) Apparently, a form of *Sphaerium primeanum* Clessin is passing currently as *S. nobile* Gould; *S. nobile* likely being a species from the mid-southwestern States.

(2) *Sphaerium simile* (Say) and *S. sulcatum* Lamarck are not synonymous. This large *Sphaerium* should be called *S. sulcatum* Lamarck.

(3) *Pisidium ultramontanum* Prime is almost round in outline and of very small diameter, and is perhaps confused in some collections with *P. abditum* Haldeman.

LAND SNAILS FROM GRANT COUNTY, INDIANA

By CLINTON J. BUSHEY

During the last two or three years, collecting land snails in and around the community of Upland, Indiana, where Taylor University is located, has been interesting. Although I have done some collecting other than local, the following list is confined to Grant County. In looking over previous Indiana snail records, there apparently has been no systematic collecting of snails in the state with the exception of a few specific localities, such as Turkey Run. Thus the field is wide open for a complete check list of Indiana land mollusks.

With this in mind, I feel that the following list of snails collected in Grant county may add to total knowledge, and possibly as time goes on other material from the county, as well as from other counties, can be added until a fairly good picture of the whole may be obtained. This is not a complete list. A few small species have not been checked yet, and there may be species which I have already identified. There may be some confusion of names but I have attempted to avoid this by using the nomenclature adopted by Dr. Pilsbry in his recent Monograph of the Land Snails of North America. Dr. Pilsbry has identified some of my specimens for me. Dr. van der Schalie and his assistants have also helped out some. Consequently, I feel quite confident that our identifications are correct, and put out this list hoping it will accomplish good in the field of conchology.

*Allogona profunda**
*Anguispira alternata**
*A. a. carinata**
*A. kochi**
Carychium exiguum
*C. exile**
*Cionella lubrica**
Columella edentula
*Deroceras gracile**
D. reticulatum
Discus cronkhitei anthonyi o
*D. patulus**
Euconulus chersinus o
E. fulvus
*Gastrocopta armifera**
*G. a. abbreviata**
*G. a. affinis**
*G. a. similis**
G. contracta
G. corticaria
G. pentodon *
G. procera o
*Haplotrema concavum**
*Hawaiia minuscula**
*Helicodiscus parallelus**
H. singleyanus inermis
*Mesodon clausus**
*M. elevatus**
M. inflectus
M. pennsylvanicus
*M. thyroides**
M. zaletus
*Mesomphix cupreus**
*M. friabilis**
Pallifera dorsalis
Paravitrea capsella
*Philomycus carolinianus**
Polygyra stenotrema
Pupoides albilabris
P. modicus
*Retinella electrina**
*R. indentata**
R. wheatleyi
*Stenotrema fraterum**
*S. hirsutum**
Strobilops labyrinthica o
Succinea avara
S. concordialis
*S. ovalis**
*Triodopsis albolabris**
*T. fraudulenta**
*T. multilineata**

* Means abundant; o = common.

T. notata
T. tridentata o
Vallonia costata
V. excentrica
V. pulchella *
Ventridens demissus
*V. ligerus**
V. intertextus
Vertigo tridentata
*Zonitoides arboreus**
Z. limatulus
Z. nitidus

A LIST OF THE LAND MOLLUSCA OF CLAIBORNE COUNTY, TENNESSEE, WITH DESCRIPTION OF A NEW SUBSPECIES OF TRIODOPSIS

By LOUIS LUTZ

(Continued from January number)

The following new subspecies was found in considerable numbers in the foothills of the Cumberland Mountains, at Harrogate, Tennessee. The forest cover in this area consists mainly of Red and Black Oak, with Chestnut Oak, White Oak, Silver Maple, White Hickory, Black Locust, Sourwood, seedlings of Persimmon, and Red Cedar in lesser abundance. The soil in this area is derived from an underlying dolomitic limestone formation.

Triodopsis hopetonensis claibornensis new subspecies. Pl. 5, figs. 5–5b.

Description. The adult shell of this subspecies is scarcely distinguishable from that of *hopetonensis.* In most of the specimens of *claibornensis* the upper margin of the lip flares forward, less upward than in the typical form. The genitalia, however, are strikingly different. The spermatheca is almost twice as long proportionately as that in *hopetonensis.* Another structural difference is evident in a cross-section of the penis, for there is only one pilaster in *claibornensis* (text fig. 1), and two in *hopetonensis.*

Measurements. Height 6 mm., maximum diameter 12 mm., minimum diameter 10.3 mm., aperture width 6.3 mm., aperture height 3.9 mm. Holotype.

Height 7.1 mm., diameter 12.2 mm., whorls 5.1. Paratype.
Height 6.3 mm., diameter 11.2 mm., whorls 5.1. Paratype.
Height 5.5 mm., diameter 10.0 mm., whorls 4.4. Paratype.
Height 6.17 mm., diameter 11.23 mm., whorls 5.03. Average of 20 specimens.

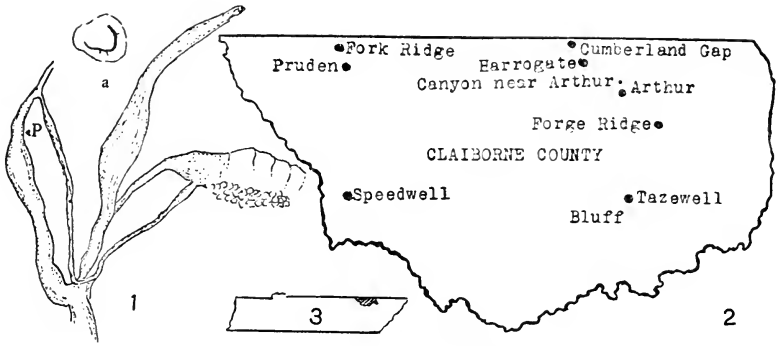


FIG. 1, *Triodopsis hopetonensis claibornensis,* Harrogate, Tennessee; genitalia; at a, cross-section of penis. FIG. 2, Claiborne County, showing areas where collections were made. FIG. 3, outline of the state of Tennessee to show location of Claiborne County.

Types.—The holotype is deposited in U.S.N.M. No. 599444. Paratypes are in U.S.N.M. No. 599445, the Academy of Natural Sciences of Philadelphia No. 186179, the Museum of Comparative Zoology, and the personal collection of the author. *Type locality:* Foothills of the Cumberland Mountains, near the Grace Nettleton Home for Girls, Harrogate, Claiborne County, Tennessee. L. Lutz, collector; Spring, 1948.

Remarks.—Dr. Allan F. Archer kindly pointed out the peculiar nature of this form when I had sent him a number of mollusks for identification. His remarks were limited to the shell characters. Since then, upon his suggestion, I have made a detailed study of the genitalia. It is interesting to note that typical *hopetonensis* is a lowland form distributed from the Carolinas south to Florida, and also recorded in Alabama by Archer. The subspecies *claibornensis,* as far as is known, is limited to the highlands of Tennessee.

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SOME MOLLUSKS NEAR ST. PETERSBURG, FLORIDA

By BERNADINE BARKER BAKER

Following the A. M. U. meetings at Miami in June, 1949, my husband and I spent ten days at the Tides Hotel, Redington Beach, about 7 miles north of St. Petersburg, Florida, directly on the Gulf of Mexico. We averaged four hours a day, combing the beach and collecting in Boca Ciega Bay, across the narrow island. The collecting grounds were within a mile radius of the hotel, in both localities.

The nearest places where shells could be swept from the Bay to the Gulf were at Clearwater, 10 miles to the north, or at John's Pass, 3 miles to the south. Most of the beach material was dead, but most of the Bay mollusks were living or in a fresh condition. The collectors had nothing but bare hands and sharp eyes with which to work. Because of the muddy bottom and the quantities of *Batillaria minimum* in the Bay, they bought shoes for wading. But all other equipment was lacking. The beach was sandy and clean; the Bay had some sand, but for the most part was muddy, dirty from sewage, and had mangrove and sea "grasses" in some quantity. Just off the Bay was a sand flat, which was covered at high tide.

Of course, the following list is by no means exhaustive, but it is published with the thought that amateurs (like me), who have done little or no collecting, will be encouraged to know the wide range of shells that may be had for the taking, and in the hope that residents and visitors to the St. Petersburg area will go to the beach and double the number of species herein listed.

All shells were found dead on the beach, unless otherwise noted.

Ischnochiton papillosa C. B. Adams*
Arca transversa Say
A. secticostata Reeve
A. occidentalis Phil.
A. umbonata Lam.
Noetia ponderosa Say*
Glycymeris pectinata Gmelin*
Atrina rigida Dillwyn*
Pteria colymbus Roeding
Ostrea virginica Gmelin*
Plicatula gibbosa Lam.
Pecten ziczac L.
P. gibbus L.
P. exasperatus Swby.
P. irradians Lam.*
Anomia simplex Orb.*
Mytilus recurvus Raf.*
Modiolus tulipus L.
M. arborescens Dill.*
M. opifex Say [1]
Polymesoda floridana Conr.*
Cardita floridana Conr.*
Chama congregata Conr.
Pseudochama radians variegata Rve.
Echinochama arcinella L.
Lucina pennsylvanica L.
L. nassula Conr.*
Codakia orbicularis L.*
Loripinus chrysostoma Phil.
L. schrammi Crosse
Cardium isocardia L.
C. muricatum L.
C. robustum app. vanhyningi Cl. & S.
Papyridea spinosum Meuschen
Trigoniocardia medium L.
Laevicardium serratum L.
L. mortoni Conr.*
Dosinia elegans Conr.
Transenella stimpsoni Dall*
Macrocallista nimbosa Sol.
M. maculata L.
Chione cancellata L.*
C. grus Holmes
Venus mercenaria notata Say*
V. campechiensis Gmel.*
Tellina lineata Turton*
T. magna Spengler
T. alternata Say
Macoma constricta Brug.*
M. tenta Say*
Apolymetis intastriata Say
Semele proficua Pult.
Abra aequalis Say*
Donax variabilis Say [1]
Tagelus divisus Spengler*
Mactra fragilis Gmel.
Spissula solidissima similis Say
Anatina lineata Say
A. canaliculata Say
Barnea costata L.
Diadora cayenensis Lam.
Turbo castaneus Gmel.
Natica canrena L.
Polinices duplicata Say
Crepidula fornicata L.*
C. plana Say*
C. aculeata Gmel.
Littorina irrorata Say*
L. angulifera Lam.*
Vermicularia spirata Phil. [2, 3]
Modulus modulus L.
Batillaria minimum Gmel.*
Cerithium muscarum Say*
Cerithidea scalariformis Say*
Strombus pugilis L.
Eupleura caudata sulcidentata Dall*

* Boca Ciega Bay; Alive or very fresh.

[1] Beach, living.

[2] Dead, in great numbers, Boca Ciega Bay.

[3] Juvenile live specimens in Boca Ciega Bay.

Murex cellulosa Conr.*
Urosalpinx tampaensis Conr.*
Nassarius vibex Say*
Busycon contrarium Conr.*
B. pyrum Dill.
Melongena corona Gmel.*
Fasciolaria gigantea Kiener
F. tulipa L.*
F. distans Lam.[3]
Marginella apicina Menke*
M. veliei Pils.*
Oliva sayana Ravenel
Olivella pusilla Marrat*
Terebra dislocata Say
T. protexta Conr.*
Conus floridanus Gabb.
C. stearnsi Conr.*
Cerodrillia thea Dall*
Monilispira leucocyma Dall*
Bulla striata Brug.
Melampus coffeus L.*

ON THE SELECTION OF LECTOTYPES

By RICHARD I. JOHNSON

In 1902, when E. von Martens described *Pseudodon resupinatus* he did not figure it, nor did he select a type. In 1948 (Naut. **62**, p. 50), I selected and figured a lectotype for this species, drawn from a series of cotypes in the Museum of Comparative Zoölogy, Cambridge, Massachusetts, which compared (perhaps by chance) exactly with the measurements given in the original description. Later Dr. Jaeckel of the Berlin Museum wrote and told me that the "type" was in that institution and requested that I publish to that effect.

Dr. Jaeckel has brought to light one of the most unfortunate problems with which the present day worker is forced to deal, namely the subsequent selection of a lectotype in those cases where the original author has neither figured the species, nor chosen a holotype, nor (as in this particular case) indicated the location of the main lot. Often we are not certain where the main lot of a species is located, if indeed it exists; therefore I believe that in keeping with modern procedure the first reviser has the right, indeed, the duty, to select a lectotype if he has type material before him. Only by this method can many otherwise "doubtful" species be fixed.

Therefore, though an injustice of the sort Dr. Jaeckel refers to may occur from time to time, I feel that in the long run our science will be forwarded by these selections which fix the identity of a species once and for all.

NEW MARINE MOLLUSKS FROM DOMINICA, B. W. I.

By A. H. VERRILL

Murex maculatus **new species.** Plate 9, fig. 3.

Whorls compressed, swollen, the last whorl almost globular; each whorl with three low varices bearing slender, upcurved, sharp spines, three spines on each varix of last whorl, the spine nearest shoulder twice as long as that next below; one spine on each varix of other whorls. Canal straight, tapering, broad at aperture and blunt at extremity. Varices extending to tip of canal and with numerous short spines. Surface of shell with fine concentric raised ridges with faint indications of five or six low longitudinal ribs between the varices. Color creamy or ochreous-white marked with pale orange or chestnut-brown squarish spots arranged in vertical lines on each whorl. Length 47 mm., diameter 19 mm. Longest spine 14 mm. Taken in 40 to 50 fathoms off Dominica, B. W. I. Two living specimens; the type in my collection.

Cymatium rehderi **new species.** Plate 9, figs. 1, 1a.

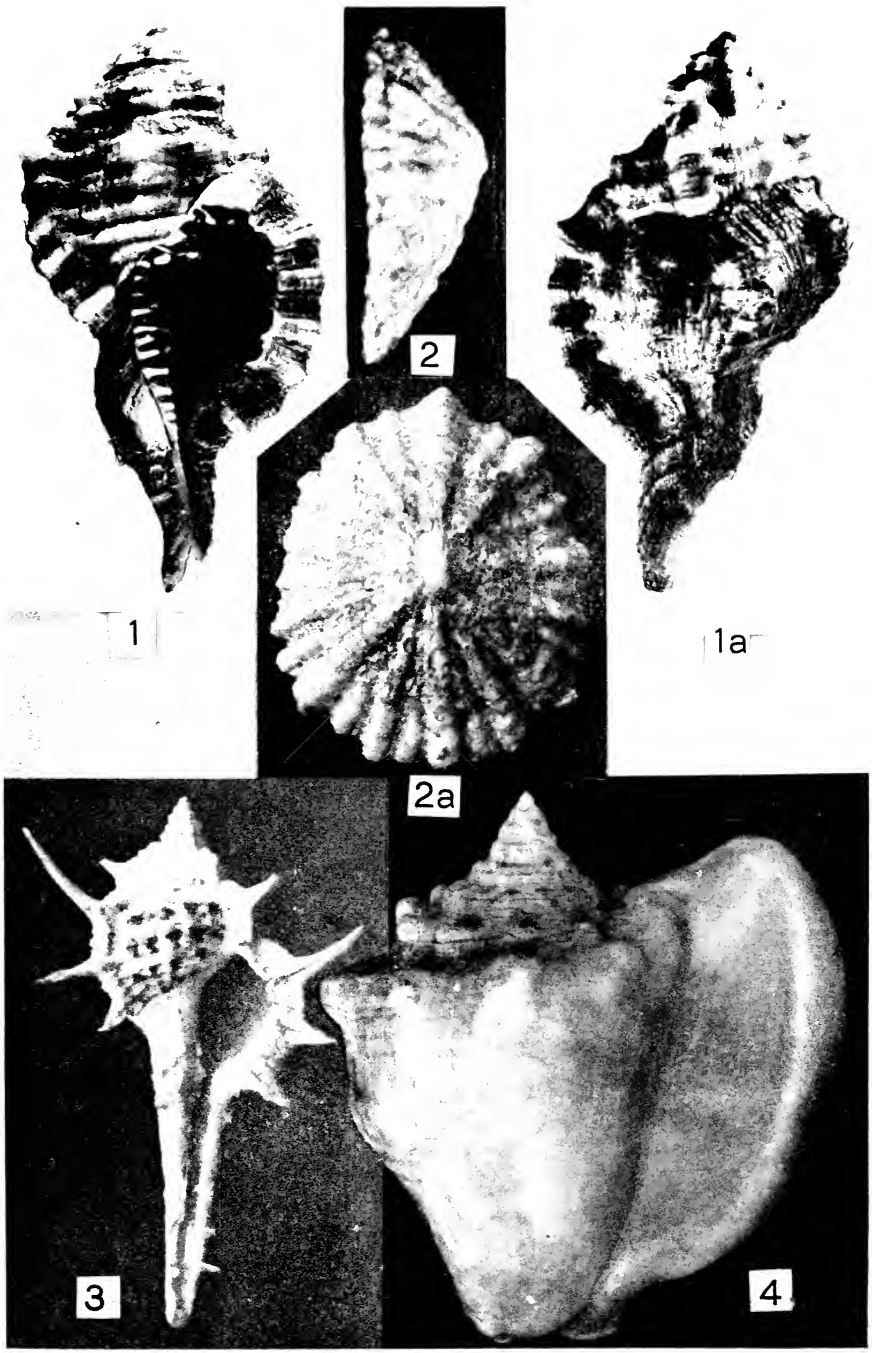
Shell with from six to seven wide, rounded, strong concentric ribs on last whorl, three to four on other whorls. Sutures distinct. Shoulders with six to seven nodules. Three large, strong varices. Sides of spire whorls straight. Aperture elliptical. Lip toothed. Columella with 14 to 16 strong teeth. Canal broad, swollen from about midway of aperture to lower end of aperture and curved to left near tip giving effect of a twisted "tail." Color of shell pale brown indistinctly longitudinally striped with darker brown. Ribs on varices alternately whitish, brown and rich orange. Columella dull orange. Epidermis horn color, silky. Length of holotype 75 mm., width 41 mm. Four living specimens. Taken in 25 to 40 fathoms off Dominica, B. W. I.

Named in honor of Dr. Harald A. Rehder. Type in U. S. N. M.

Hemitoma rubida **new species.** Plate 9, figs. 2, 2a.

Shell moderately pyramidal with apex about one-third of distance between extremities. Strongly and conspicuously sculptured with high rounded ridges with shorter lower ridges alternating. Irregular concentric ribs quite prominent near margin. Margins strongly imbricated. Color dull-purple. Interior violet with an indistinct whitish zone near margin.

Animal brilliant vivid magenta. This limpet differs from *Hemitoma octoradiata* Gmel. in its lower form and straight


1
2
1a
2a
3
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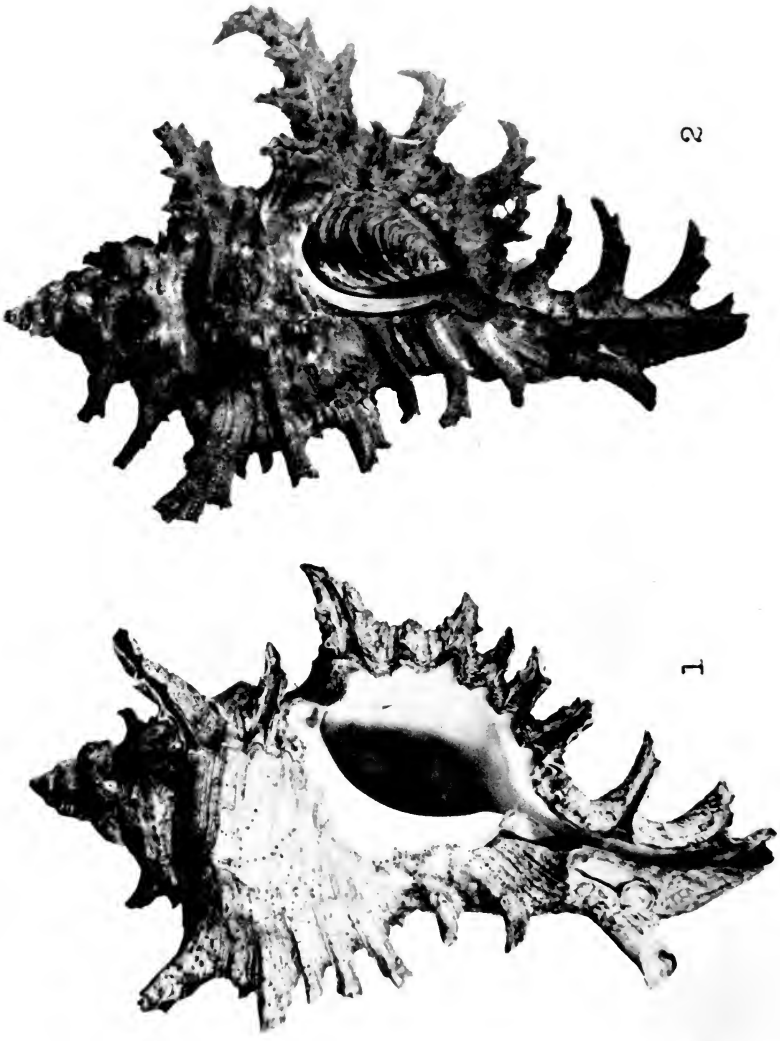

1, *Murex brevifrons* Lamarck. 2, *Murex argo* Clench & Farfante.

rather than curved slopes, in its more numerous, larger and stronger ribs, in the position of the apex, in the strongly fluted or imbricated margin, in the color of the shell and in the color of the animal. Size of holotype: Length 40 mm., breadth 32 mm., height 13 mm. Reefs at Canefield Point, Dominica, B. W. I. Five specimens. Type in the author's collection.

STROMBUS COSTATUS SPECTABILIS **new subspecies.** Plate 9, fig. 4.

The shells resemble *Strombus costatus,* but are shorter and chunkier. Whorls with from ten to twelve strong spines, which on last whorl extend completely around the shell to aperture. Sutures very distinct, each suture covering the bases of the spines on the whorl above, those of spire almost completely hidden by the upward extension of shoulders. Shoulders broad, flattened, concave. Canal bent very sharply to the right. Immature specimens have exceedingly broad, flattened spines and wide, flat shoulders. Color of adult shells whitish, longitudinally streaked with fine stripes of horn-color to brown, the spire often rose-pink with brown blotches. Columellar area and inner lip delicate rose-pink or madder, sometimes violaceous. Immature shells are white heavily blotched and spotted with rich reddish-chestnut. Interior of lip lilac. Size of adult: length 6 inches, diameter 5½ inches.

Collected in fish traps at from 30 to 40 fathoms off Dominica, B. W. I. Type in the author's collection.

MUREX ARGO Clench and Farfante. Plate 10, fig. 2.

Since the validity of *Murex argo* C. & F. (*M. imbricatus* Higgins and Marryat) has been questioned and because Mr. Clench has expressed the opinion that "*Murex argo* is merely a form of *Murex brevifrons,*" I feel that the accompanying photographs are of great importance as convincing evidence that the two shells are not the same. Both specimens are from Soufrière Bay, Dominica, British West Indies, and are of the same size. The differences between them are obvious. *M. argo* (fig. 2) is a much slenderer shell than *M. brevifrons* (fig. 1). The number of spines on the edge of the lip is not the same and the sculpture on the whorls differs. The aperture of *argo* is much smaller than that of *brevifrons,* and is placed differently in relation to the axis of the shell. In *argo,* the interior of the aperture is lilac or pale purple, while in *brevifrons* it is white or yellow. *M. argo* is deep red or reddish brown, with black con-

centric bands, with jet-black spines, and with a scarlet nucleus; whereas *brevifrons* is a light colored shell without bands and with the spines only slightly darker colored.

Dr. Harald A. Rehder of the U. S. National Museum states: "Your photographs of *argo* and *brevifrons* certainly show that these are distinct species."

Plate 10, fig. 1, shows *Murex brevifrons* Lamarck, from 20 to 25 fathoms; fig. 2, *M. argo* Clench and Farfante, from 75 fathoms. Both figures are natural size.

SCIENCE AND LEGALITY

By H. BURRINGTON BAKER

Taxonomy, even in its name, includes two very divergent aspects: the science of systematics (taxinomy) and the legal procedures [1] of nomenclature (taxionymy?). Although inseparable in practice, their aims and methods often are in diametrical opposition, so that most taxonomic problems involve a compromise between them.

From the scientific viewpoint of systematics, the legal concept of type is utter nonsense.[2] A species, for example, usually consists of complex, intergrading, spacious series of populations, and should be based on an adequate sample of one of them; this is approximated more or less in a type lot ("cotypes"). Almost the only reason for type designation in species is the unscientific, but intelligible practice of museums, which of course desire to keep the selected type shell ("holotype") and to distribute some of the other examples ("paratypes") from the original sample. But, in the case of species, the rules allow that systematic science has some rights; and nowhere does the code require (cf. Art. 25, c, 3) type selection prior to the division of a species (Art. 31), although original designation is legalized (cf. Art. 29) and actually recommended (Appendix). How-

[1] International rules (or code) of zoölogical nomenclature. Articles (Art.) and appendix cited are from these.

[2] See "Systematics and the origin of species," etc., by Ernst Mayr, who attacks the legal "type," but confuses it with the old biologic usage (cf. mode).

ever, subsequent selection of type ("lectotype") for a species has no justification, *until* its original description is proved to be based on a composite of more than one species or subspecies (e.g., many of those of the early compilers, like Linné).[3] Even then, designation of a type locality,[3] to restrict typical material ("topotypes") to one population, would be better scientifically.

On the other hand, in groups larger than species (e.g.,genera), the limits or sizes, which mainly are determined by convention or convenience,[4] have fluctuated to a much greater degree. Realizing this difficulty, the rules have decided in favor of nomenclature; thus a type species ("genotype") is now a legal requirement for each new genus (Art. 25, c, 3); otherwise it is ruled a "nomen nudum," without status in nomenclature. But, even for genera, hasty subsequent designations of type, although legal (Art. 30, II), often have caused irreparable damage to nomenclature, and I have made several that I deeply regret.

Now please return to the species level. Those who indulge in subsequent type selection for undivided species should understand that, under the present rules, such designation is futile; it puts no obligation on anybody else. Also, if the strictly generic rule (Art. 30, II) be applied, any selection should be limited to material which the author of the original description unquestionably included in it (Art. 30, e). For example, can anyone prove that the "lectotype" of *Pseudodon resupinatus*[5] was identified by the author of this species?[6] Apparently this may not be the case with the "lectotype" or *P. walpolei*.[5] Dealers and collectors, for obvious reasons, often send a few shells from a large lot to a student or a museum for identification or description. These few shells constitute the true type lot, in any real sense of the term. As illustration, in Hawaii were two "type lots" of "*Philonesia indefinita* (Ancey)": (1) the type shell from Ancey and (2) a large lot from Baldwin, the original collector. The first lot was *P. indefinita,* but the

[3] See 1941, Johnsonia, vol. 1, number 1, p. 6, for an excellent example of a careful study on one of these difficult problems.

[4] This is not true of contents or relationships, which are the natural concerns of systematic science.

[5] 1948, Nautilus, vol. 62, pp. 50, 51.

[6] Some Berlin museum may have the original label in Martens' handwriting, or at least a record that names him as the donor.

second consisted almost entirely of *P. perlucens* (Ancey), which also was based on the few shells, selected by Baldwin from his big set and sent to Ancey. Should any man, unless he accepts liability, be held responsible for the labels on shells which he never has seen?

A still more futile practice is the designation of a so-called "neotype." For example, under the generic rule, W. J. Clench's[7] "neoholotype" of Guppy's *Purpura trinitatensis* is clearly illegal. Even the botanical rules, which, unlike ours, apparently admit the relevancy of museum specimens, allow that, if the actual type be lost,[8] the original description (including any figure) becomes the type. Under our rules, it defines the type lot.

The printed page always continues to read the same, when even authentic type lots, because of the various hands that relabel and rearrange them, become less trustworthy with the lapse of time. So, especially years afterwards, the identity of an originally dubious species ("nomen dubium") cannot be "fixed." At least, *Cyclostrema cancellatum* Marryat[9] does not replace Dall's carefully described species, which apparently is less than half the size and has a sunken spire (instead of a slightly raised one?) and a markedly toothed suture (in place of one that appears fairly smooth on account of the weaker growth ribs on the earlier whorls?), just because "We" decided to "designate it as the neoholotype." The gravest danger of type selections, in fact of all legal procedures, is their tendency to replace careful study, because they seem to offer a quick and easy escape. Actually this appearance is purely illusory, to which many tedious irenics, like this one, bear witness.

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[7] 1947, Johnsonia, vol. 2, p. 70.

[8] Because conchology takes advantage of one rule (Art. 27, a), the greater portion of most molluscan types, sometimes the more essential part to systematics, is lost irretrievably.

[9] 1950, Johnsonia, vol. 2, pp. 196, 197.

NEW RECORDS OF LAND SNAILS FROM WISCONSIN

By LORNA R. LEVI and HERBERT W. LEVI

University of Wisconsin Extension Center, Wausau, Wisconsin

The invertebrates of Wisconsin are not at all well known, the land snails not excepted. Only few papers have appeared dealing with the distribution of these snails in the state, the most recent by J. P. E. Morrison (1929) who collected in Dane County. G. H. Chadwick (1906) listed the snails of his collection and of earlier workers, but these were mainly snails of eastern Wisconsin. The rest of the state remained nearly unexplored for land snails up to now.

Due to the help and encouragement of Professors L. E. Noland and N. C. Fassett, of the University of Wisconsin, the authors were able to make several trips throughout the State during the summer of 1949, primarily for the purpose of collecting spiders. The snail shells listed below were mainly a by-product of the expedition. As the authors are partial to deep woods, mouldy logs and large handsome shells, other habitats and smaller shells might have been slighted.

For identification, Pilsbry's monograph, F. C. Baker's "Fieldbook of Illinois Land Snails," and Oughton's list of Ontario snails were used. Credit should be given to Mr. C. B. Wurtz of the Academy of Natural Sciences of Philadelphia for identification of the more difficult shells.

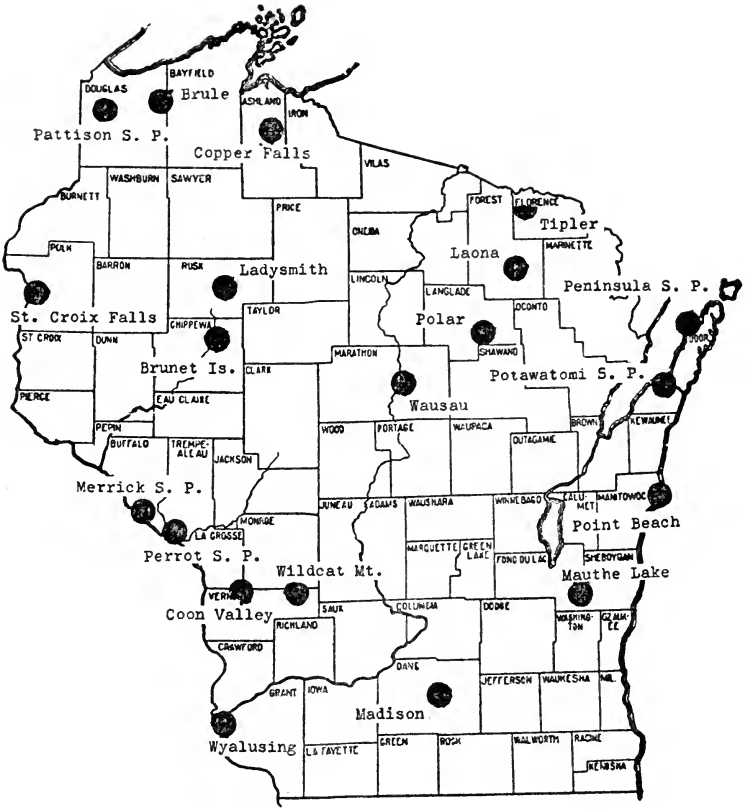
Since all determinations were made from the shells only, there may be some inaccuracies, especially in the families Succineidae and Zonitidae.

To make this list more useful to those unacquainted with the geography of Wisconsin, a map is included.

All the Polygyridae except *Triodopsis multilineata* were found in climax forests with limestone.

Stenotrema hirsutum (Say) 1817. Grant County: Wyalusing. Juneau County: Necedah.

[1] Supported in part by the Research Committee of the Graduate School of the University of Wisconsin from funds supplied by the Wisconsin Alumni Research Foundation.



Stenotrema fraternum (Say) 1824. Chippewa County: Brunet Island. Clark County: near Stanley. Door County: Peninsula State Park, Potawatomi State Park. Grant County: Wyalusing State Park. Kewanee County: Kewanee. Langlade County: Polar. Marathon County: Halder. Pierce County: Maiden Rock. Polk County: St. Croix Falls. Vernon County: Coon Valley, Wildcat Mt.

Stenotrema monodon (Rackett) 1821. Dane County: Madison. Door County: Peninsula State Park. Kenosha County: Kenosha.

Mesodon thyroidus (Say) 1816. Clark County: near Stanley. Monroe County: Coon Valley. Vernon County: Coon Valley.

Triodopsis albolabris (Say) 1816. Clark County: near Stanley Door County: Peninsula State Park, Potawatomi State Park. Fond du Lac County: Mauthe Lake. Manitowoc County: Point Beach. Marathon County: Halder. Monroe County: Coon Valley. Oconto County: Machickanee Forest. Price County: Memorial Grove. Shawano County: Neopit. Trempealeau County: Perrot State Park. Vernon County: Coon Valley.

Triodopsis multilineata (Say) 1821. Dane County: Madison. Grant County: Wyalusing. Rock County: Edgerton (A. D. Hasler!) These shells were found near water except for several immature animals from Wyalusing which were found on limestone outcrops far above the Wisconsin River.

Allogona profunda (Say) 1821. Door County:Potawatomi State Park. Florence County: Tipler. Grant County: Wyalusing State Park. Jefferson County: Lake Mills. Kewanee County: Kewanee. Monroe County: Coon Valley. Ozaukee County: Saukville. Sauk County: Baxter's Hollow. Shawano County: Neopit. Taylor County: Chequamegon National Forest. Vernon County: Coon Valley, Wildcat Mountain. The Wyalusing shells vary in color and include an albino.

Haplotrema concavum (Say) 1821. Grant County: Wyalusing State Park. These snails were found mating in a stump after several days of heavy rain. (June 15, 1949.)

Zonitoides arboreus (Say) 1816. Adams County: Wisconsin Dells, Roche a Cri. Ashland County: Copper Falls State Park. Buffalo County: Merrick State Park. Chippewa County: Brunet Island. Clark County: Owen. Dane County: Madison. Door County: Peninsula State Park, Potawatomi State Park. Douglas County: Brule, Pattison State Park. Florence County: Tipler. Fond du Lac County: Mauthe Lake. Forest County: Alvin. Grant County: Wyalusing State Park, Fenimore. Iowa County: Tower Hill State Park; Spring Green. Jackson County: Castle Rock. Juneau County: Necedah, Rocky Arbor. Kenosha County: Salem. Kewanee County: Kewanee. Langlade County: Polar. Lincoln County: Merrill, Corning. Manitowoc County: Point Beach. Marathon County: Wausau, Halder. Marquette County: Westfield. Monroe County: Coon Valley. Oconto County: Machickanee Forest. Oneida County: Lake Tomahawk. Ozaukee County: Saukville. Pierce County: Maiden

Rock. Polk County: St. Croix Falls. Price County: Memorial Grove. Richland County: Rockbridge. Rusk County: Ladysmith. Sauk County: Baxter's Hollow. Taylor County: Chequamegon. Trempealeau County: Perrot State Park. Vernon County: Wildcat Mountain, Coon Valley. Vilas County: Nicolet National Forest. Walworth County: Kettle Moraine. Waukesha County: Palmyra. Wood County: Marshfield. This snail was found in almost every habitat visited.

Zonitoides limatulus (Binney) 1840. Door County: Peninsula State Park. Monroe County: Coon Valley. Vernon County: Coon Valley, Wildcat Mountain. These are all limestone areas.

Retinella indentata (Say) 1823. Door County: Potawatomi State Park. Douglas County: Pattison State Park. Fond du Lac County: Mauthe Lake. Monroe County: Coon Valley. Vernon County: Wildcat Mountain. These shells were taken in limestone areas with climax forest.

Retinella binneyana (Morse) 1864. Ashland County: Copper Falls State Park. Clark County: Owen. Door County: Peninsula State Park. Douglas County: Brule. Juneau County: Necedah. Oneida County: Lake Tomahawk. Taylor County: Chequamegon National Forest. Vernon County: Timber Coulee. Walworth County: Kettle Moraine State Park. As this species was distinguished from the following one by shell characteristics only, errors in determination may have been made.

Retinella electrina (Gould) 1841. Dane County: Madison. Langlade County: Polar.

Euconulus chersinus (Say) 1821. Dane County: Madison. Douglas County: Brule. Florence County: Tipler. Fond du Lac County: Mauthe Lake. Grant County: Wyalusing. Kewanee County: Kewanee. Langlade County: Polar. Marathon County: Halder. Oconto County: Machickanee Forest. Vernon County: Wildcat Mountain, Coon Valley.

Euconulus fulvus (Müller) 1774. Ashland County: Copper Falls. Dane County: Madison. Door County: Peninsula State Park. Douglas County: Brule, Pattison State Park. Florence County: Tipler. Manitowoc County: Point Beach. Marquette County: Westfield. Price County: Memorial Grove.

Hawaiia minuscula (Binney) 1840. Dane County: Madison. Vernon County: Wildcat Mountain.

Striatura milium (Morse) 1859. Douglas County: Brule, Pattison State Park.

Striatura exigua (Stimpson) 1847. Douglas County: Brule.

Striatura ferrea Morse 1865. Rusk County: Ladysmith.

Paravitrea multidentata (Binney) 1840. Door County: Potawatomi State Park, Peninsula State Park.

Anguispira alternata (Say) 1774. Adams County: Wisconsin Dells. Chippewa County: Brunet Island. Dane County: Madison. Door County: Peninsula State Park. Dogalas County: Pattison State Park. Florence County: Tipler. Fond du Lac County: Mauthe Lake. Grant County: Wyalusing. Iowa County: Tower Hill State Park. Jefferson County: Lake Mills. Juneau County: Rocky Arbor. Kewanee County: Kewanee. Langlade County: Polar. Manitowoc County: Point Beach. Marathon County: Wausau. Monroe County: Coon Valley. Oconto County: Machickanee Forest. Oneida County: Lake Tomahawk. Ozaukee County: Saukville. Pierce County: Maiden Rock. Polk County: St. Croix Falls. Price County: Memorial Grove. Sauk County: Baraboo, Baxter's Hollow; Trempealeau County: Perrot State Park. Vernon County: Coon Valley, Wildcat Mountain. Walworth County: Kettle Moraine State Park.

Punctum minutissimum (Lea) 1841. Adams County: Roche a Cri.

Helicodiscus parallelus (Say) 1817. Chippewa County: Brunet Island. Clark County: Owen. Door County: Peninsula State Park, Potawatomi State Park. Douglas County: Brule. Grant County: Wyalusing. Jackson County: Castle Rock. Marathon County: Wausau. Monroe County: Coon Valley. Oneida County: Lake Tomahawk. Ozaukee County: Saukville. Price County: Memorial Grove. Rusk County: Ladysmith. Wood County: Marshfield.

Discus patulus (Deshayes) 1817. Monroe County: Coon Valley. Sauk County: Baxter's Hollow. Vernon County: Coon Valley, Wildcat Mountain. This species was collected only in climax forest on limestone.

Discus cronkhitei (Newcomb) 1865. Clark County: Owen. Dane County: Madison. Juneau County: Necedah.

Discus cronkhitei catskillensis (Pilsbry) 1898. Adams County: Roche a Cri. Ashland County: Copper Falls. Chip-

pewa County: Brunet Island. Door County: Potawatomi State Park, Peninsula State Park. Douglas County: Pattison State Park. Florence County: Tipler. Fond du Lac County: Mauthe Lake. Kewanee County: Kewanee. Langlade County: Polar. Polk County: St. Croix Falls. Price County: Memorial Grove. Rusk County: Ladysmith. Shawano County: Keshena.

Succinea ovalis (Say) 1817. Clark County: Owen, near Stanley. Dane County: Madison. Door County: Peninsula State Park. Douglas County: Pattison State Park. Grant County: Wyalusing. Iowa County: Arena, Spring Green. Langlade County: Polar. Vernon County: Coon Valley. These were found in moist woods or near water.

Succinea avara Say 1824. Buffalo County: Merrick State Park. Dane County: near Sauk City. Door County: Peninsula State Park. Grant County: Wyalusing. The Dane County shell was found on top of a dry sandstone bluff. The others were found near water.

Oxyloma retusa (Lea) 1834. Buffalo County: Merrick State Park. Dane County: Madison. Fond du Lac County: Mauthe Lake.

Strobilops aenea Pilsbry 1893. Door County: Peninsula State Park. Grant County: Wyalusing State Park.

Strobilops affinis Pilsbry 1893. Fond du Lac County: Mauthe Lake.

Strobilops labyrinthica (Say) 1817. Adams County: Wisconsin Dells, Roche a Cri. Ashland County: Copper Falls. Door County: Potawatomi State Park, Peninsula State Park. Douglas County: Brule, Pattison State Park. Fond du Lac County: Mauthe Lake. Forest County: Laona. Grant County: Wyalusing. Juneau County: Rocky Arbor. Kewanee County: Kewanee. Langlade County: Polar. Lincoln County: Corning. Manitowoc County: Point Beach. Monroe County: Coon Valley. Oconty County: Machichanee. Oneida County: Lake Tomahawk. Pierce County: Maiden Rock. Polk County: St. Croix Falls. Price County: Memorial Grove. Rusk County: Ladysmith. Shawano County: Keshena, Neopit. Vernon County: Coon Valley. Walworth County: La Grange.

Columella edentula (Draparnaud) 1805. Ashland County: Copper Falls. Clark County: near Stanley. Door County: Pen-

insula State Park. Douglas County: Brule. Forest County: Laona. Rusk County: Ladysmith. Taylor County: Chequamegon National Forest. Vernon County: Wildcat Mountain.

Vertigo ovata Say 1822. Ashland County: Copper Falls. Douglas County: Brule. Florence County: Tipler. Sheboygan County: Sheboygan Falls.

Vertigo ventricosa (Morse) 1865. Taylor County: Chequamegon National Forest.

Vertigo nylanderi Sterki 1909. Door County: Peninsula State Park.

Vertigo gouldi (Binney) 1843. Douglas County: Pattison State Park.

Gastrocopta contracta (Say) 1822. Ashland County: Copper Falls. Door County: Peninsula State Park. Douglas County: Pattison State Park. Fond du Lac County: Mauthe Lake. Grant County: Wyalusing. Monroe County: Coon Valley. Pierce County: Maiden Rock. Sauk County: Baxter's Hollow.

Gastrocopta armifera (Say) 1821. Dane County: Madison. Marquette County: Westfield.

Gastrocopta tappaniana (C. B. Adams) 1842. Dane County: Madison.

Vallonia pulchella (Müller) 1774. Dane County: Madison. Langlade County: Polar. Marathon County: Wausau. Sheboygan County: Sheboygan Falls.

Vallonia costata (Müller) 1774. Dane County: Madison. Marathon County: Wausau.

The two species of Valloniidae listed are usually found near human dwellings, a habitat which the authors did not frequently collect.

Cionella lubrica (Müller) 1774. Ashland County: Copper Falls State Park. Clark County: Owen. Dane County: Madison. Door County: Peninsula State Park. Douglas County: Brule. The shells collected were from fields or relatively open places, a habitat not well covered on the collecting trip.

Carychium exiguum (Say) 1822. Dane County: Madison. Kenosha County: Kenosha.

Carychium exile canadense Clapp 1906. Douglas County: Brule, under strips of bark in a cedar bog.

Hendersonia occulta (Say) 1831. Door County: Potawatomi State Park. Kewanee County: Kewanee. Monroe County: Coon Valley. Vernon County: Coon Valley, Wildcat Mountain, Timber Coule. These were found in limestone areas, usually on rocks.

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HIATELLA DAUDIN VERSUS SAXICAVA BELLEVUE

By HENRY DODGE

The name *Saxicava* Fleuriau de Bellevue (1802) is almost universally used for the genus of burrowing bivalves, of which the best-known species and subjective type [1] is *Saxicava arctica* Linné, the *Mya arctica* of the "Systema Naturae." The date of *Saxicava* is well established. It was validly proposed in two different journals—the "Journal de Physique," volume 54, pages 345–355, and the Bulletin 62 of the "Societe Philomathique de Paris," pages 105–109. The volumes of both journals bear the date "1802" on their title-pages.[2] Moreover both serials mentioned the date on which the paper had already been read before

[1] *Saxicava* was proposed with a single species, *S. striata,* which is identical with *Mya arctica* Linné. The latter, therefore, becomes the subjective genotype, by monotypy. Children in 1823 and Gray in 1847 designated *Saxicava rugosa* (Linné) 1767 (*Mytilus rugosus* Linné) as type, but these designations are invalid, since the last name was not upon the original list of *Saxicava.* But the question of validity is academic.

[2] In the "Journal de Physique" the title-page reads "An 10 de la Republique (1802. v.st.)" [vieux style]. In the other journal, it reads simply "1802." Although the use of the Republican calendar was compulsory and was officially in use until 1805, it was more honored in the breach than in the observance during its last years.

the Institut National, in one case "le 26 Ventose, An 10" (March 17, 1802), and in the other "le 6 Ventose, An 10 (February 25, 1802).

From time to time, particularly in the first half of the nineteenth century, the name *Hiatella* Daudin appears in the literature as the generic name for this group, but for the last hundred years or so its use has almost died out because of the dispute as to its priority, the date of its publication being unknown to modern writers. Possibly the early commentators who used the name were aware of the basis for its use, but this basis was never stated.[3] In recent years, the practice has been to use *Saxicava* and to query the validity of *Hiatella* by giving its date as "?1801" or "?1802."

The problem exists because the work in which the name was proposed, the "Histoire Naturelle des coquilles," a five-volume work by L. A. G. Bosc, which was integrated into the "new" Castel's edition of Buffon's Natural History, as a part, has upon the title-page of each of its volumes only the date "An 10," according to the Republican calendar. That "year" began on September 23, 1801 and ended on September 22, 1802. Thus there is no internal evidence of the exact date of publication. According to our calendar, it might have been in either of the two years.

[3] The name *Hiatella* was used by Lamarck (1819), Blainville (1825), Sowerby (1839), Reeve (1841), Hanley (1841 and 1855) and Gray (1847), among others. The most recent use of the name as a good genus was by Cotton and Godfrey (1938, p. 284), who cite it as of Daudin 1801 and add: "Genotype H. *arctica* Linné. *Saxicava* Bellevue 1802 is a synonym." They state no grounds for the priority of *Hiatella*. Bucquoy, Dautzenberg and Dollfus (April, 1896, pp. 589–590) use *Saxicava* as a valid name, but, strangely enough, in citing one of Daudin's species, *Hiatella monoperta*, in the synonymy of *S. arctica* Linné, give it the date 1801. The family name Hiatellidae is also used by Cotton and Godfrey (*loc. cit.*), and has been used by Maxwell Smith (1940, p. 120). Between the middle of the nineteenth century and the Cotton and Godfrey paper I have been able to find no author who cites *Hiatella* as a good genus. Indeed Lamy (1915, p. 249) said: "In fact . . . this *Mya arctica* . . . is a *Saxicava*, and the genus *Hiatella* should be abandoned.", and later (1921, p. 361) he definitely cites the genus as of Daudin 1802.

(*To be continued*)

NOTES AND NEWS

The American Malacological Union will hold its 16th annual meeting in Chicago, Illinois, June 14, 15, 16, 1950. The meetings will be held in the Chicago Natural History Museum, where Dr. Fritz Haas, the president of the Union, is in charge of the conchological collections. Announcement of hotel accommodations and other details will be made later.

Pacific Division, 3rd annual meeting. Mr. John Q. Burch (Chairman) reports: "We have finally agreed and made all arrangements for the 1950 meetings of the Pacific Division. We are to meet April 7, 8 and 9, at the Barbara Hotel, Santa Barbara, California. There are many advantages to this because we will have an amply large meeting room on the main floor of the hotel, and also in the same hotel there is a very good dining room, also a coffee shop. So we will meet, sleep, eat, and have our annual banquet all under the same roof." Any of our eastern members will be cordially welcomed at this meeting. From "News bulletin and annual report, 1949," Mrs. Harold R. Robertson, Secretary, 136 Buffum Street, Buffalo 10, New York.

Some snails in the city parks.—New York City seems an unusual place to hunt mollusks, but I had some small success. In Central Park Lake, there were twenty-five *Vivipara contectoides*, although only half were live shells. Further search revealed no other forms of mollusks, but this park was the only one in which *V. contectoides* was found. The Bronx River, in the south end of Bronx Park, had *Physa heterostropha* in quantity, at the water's edge. There is a little stream running through the Brooklyn Botanic Gardens, and following its length gave me several species. *Vivipara chinensis*, plentiful, but all smaller than those found later in Forest Park. *Helisoma trivolis, Stagnicola palustris elodes, Anguispira alternata, Physa heterostropha.* Prospect Park, in a small pond near the boat-house, contained many *Helisoma trivolis*, some white, some horn-color. A little further from the heart of the city, in Forest Park, Queens County, many *Vivipara chinensis* live in the mud under the leaves of the small yellow pond lilies. These were large, many two, to two and one-quarter inches. The tips are often eroded, but the shells and

operculum are very pleasing when cleaned. On the stems and leaves of the lilies were many *Physa heterostropha*.—Dorothy D. Freas, 8935 86th Street, Woodhaven 21, New York.

Texas snails.—Dr. Pilsbry may be interested in learning of the occurrence of *Otala lactea* (Müll.) in the southwestern section of Houston, Texas. I found a portion of a fresh shell several years ago, and last month I accidently came across a colony in the same area. I noticed thirty or forty living specimens in grass and on garden plants over an area of two city blocks. I picked up four or five dozen fresh shells in a large vacant lot. According to the owner of a small greenhouse, they have been a considerable annoyance for about four years. I moved to Bellaire, a community on the southwestern edge of Houston, about six weeks ago, and was surprised to find *Praticolella griseola* (Pfr.) very abundant in my yard, and in nearby lots. This appears to be considerably beyond the reported range, at least according to the literature available to me.—Jack H. McLellan. (from letter.)

Attempted defense by Haplotrema concavum and mode of eating.—Having frequently observed *Haplotrema concavum* (Say) in captivity and in the field, I have found that it rarely eats its own kind. The following observation on captive specimens from Marion County, Indiana, indicates a possible reason for its general abstinence from cannibalism. On the occasion noted, a young snail of moderate size was seen adhering to and gnawing at a corroded area on the shell of an adult. Apparently the young snail was merely eating shell material. Since the habit of shell-eating is very common among land snails (involving the eating of empty or of living shells) I merely removed the young snail. While doing so, however, I was surprised to discover a hole in the eroded area, and to see that the victim was gnawing outwardly through this perforation. The adult was seen to be retracted unusually far into the body whorl, and the head was free of the usual envelopment by the mantle, which was yet further retracted. Seemingly the adult was deliberately defending itself from the attacking snail. That the victim had found the exact locus of the attack, and had been able to bring

its own mouth and radula into apposition to that of the assailant, indicates either random luck, or a well coordinated defense behavior. Unfortunately, careful observations on the possible recovery of the victim were not made; it was found dead about a week later in the can-cage into which it had been isolated.

In contrast to the foregoing wherein cannibalism was attempted by a perforation of the shell, the following instances of successful snail eating but not shell eating were effected by attacks through the aperture of the prey without harming the shell in the least. The victims were living specimens of *Stenotrema hirsutum* (Say) and of *Mesodon inflectus* (Say), and both attacks occurred in collecting bags. Seemingly the apertural armatures of these two species occasionally are ineffective against the insertion of the feeding organs of *Haplotrema concavum*.—Glenn R. Webb, Ohio, Illinois.

Feeding of the beetle, Calosoma on snails.—The following observations on the feeding of the carabid beetle, *Calosoma* sp. on snails were made on the Edmund Niles Huyck Preserve, Rensselaerville, Albany County, New York during the summer of 1948.

In the field in beech-hemlock stands *Calosoma* beetles were found in leaf mold beside fallen logs in wet-rot decay feeding on *Triodopsis albolabris* (Say) on seven occasions. One beetle was brought into the laboratory to observe its feeding habits at first hand and was kept in a jar terrarium. The terrarium bottom was covered with damp soil and beech leaves were added. The following species of land snails were proferred the beetle over a period of six weeks: *Triodopsis albolabris* (Say), *Triodopsis tridentata* (Say), *Stenotrema fraternum* (Say), and *Ventridens intertextus* (Binney). Of these common snails of the Huyck Preserve only *Triodopsis albolabris* and *Ventridens intertextus* were fed upon.

Observations were made when the beetle began its attack and consequent feeding on two mature *Triodopsis albolabris* and on one immature shell without a lip. In each instance when feeding began, the snails were retracted with the aperture toward the substratum. The shells were turned over by the beetle through the use of its legs and mandibles so that the aperture was turned

upward before feeding commenced. With mature shells with a fully formed lip, the beetle tore off parts of the snails foot bit by bit; the beetle made no attempt to reach the soft parts of the snail that were in the whorls of the spire. When feeding on the individual with an immature and consequently more fragile shell the beetle broke away and discarded the body whorl of the shell, and thus managed to devour completely all the soft parts.

The feeding behavior of the beetle may be leisurely, with the beetle pulling pieces of flesh from the snail, then walking away for a number of seconds only to return again to continue tearing flesh from the body of the snail piece by piece. When the beetle was feeding it was comparatively difficult to disturb it; shaking the jar terrarium and striking it on a table and placing it exposed to the sun did not deter the insect from its feeding activities.—William Marcus Ingram.

Carlos de la Torre.—With feelings of sorrow and loss, our readers will learn of the death of Dr. de la Torre, Feb. 19, at his home in Havana, Cuba, aged 91. Of course he continues to live, in the minds and hearts of all who have known him, either scientifically or personally. More details will follow.

PUBLICATIONS RECEIVED

Einführung in die zoologische Nomenklatur durch Erläuterung der internationalen Regeln. By *Rudolf Richter*. 2nd ed., 252 pp. Waldemar Kramer, Frankfurt am Main, 8.50 marks.—This excellent introduction to zoölogical nomenclature, by a member of the international commission, is both an explanation of the international rules, article by article, and a plea for a more tolerant attitude towards their application. Especially valuable are the discussions of the more pertinent opinions under each rule; these are much more instructive than their formal results. In general, Dr. Richter keeps his treatments remarkably objective, although occasionally (cf. pp. 37 and 149 with 208) subjective opinions do creep in. The official list of generic names and a bibliography are included.—H. B. B.

COWRIES (C. MONETA AND ANNALUS). By *George W. Briggs.* The Review of Religion, vol. 10(3), pp. 227–253, 1946.—Attention of conchologists is called to this article on cowries published under the above title, with *Cypraea annulus* Linnaeus misspelled "annalus"; this spelling is repeated through the text. The article deals with the uses of cowries throughout the world and tells of the folklore that has been built around them. Professor Briggs could have made his article even more valuable if he had referred to specific species on occasion when his allusions to cowries could well point to species other than *Cypraea moneta* Linnaeus and *Cypraea annulus* Linnaeus. The paper is well referenced, there being some 164 footnote citations to literature that might well be obscure to the conchologist as might the journal in which this paper has appeared. Briggs is Professor of History of Religions (retired), Drew University.—WILLIAM MARCUS INGRAM.

THE POETRY OF SHELLS. By *Josiah Keep.* The Eucalyptus Press, Mills College, California. $3.50. October, 1949, pp. 1–25. —This beautifully written and printed volume by the late Professor Josiah Keep of Mills College has just come into my hands. This writer believes that opportunity should be taken here to call it to the attention of conchologists. The manuscript from which this small book was printed between boards was presented before the Berkeley Club in 1899. The author's daughter, Professor Emeritus of Typography of Mills College, Miss Rosalind A. Keep, but recently discovered the existence of this manuscript and dutifully, with artistic touch, has caused it to be published. Miss Keep, an artist of typography, has set the type by hand in Centaur on Worthy Hand and Arrow paper and has struck an edition of but 225 copies. The booklet is illustrated by cuts that were made five or six decades ago from the original pen and ink drawings of Laura M. Mellen for the early editions of Professor Josiah Keep's "West Coast Shells." Dr. Joshua L. Baily, Jr., of San Diego has written an extremely fine and altogether suitable foreword for it.—WILLIAM MARCUS INGRAM, Mills College, California.

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THE NAUTILUS

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EDITORS AND PUBLISHERS
HENRY A. PILSBRY, Curator of the Department of Mollusca,
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