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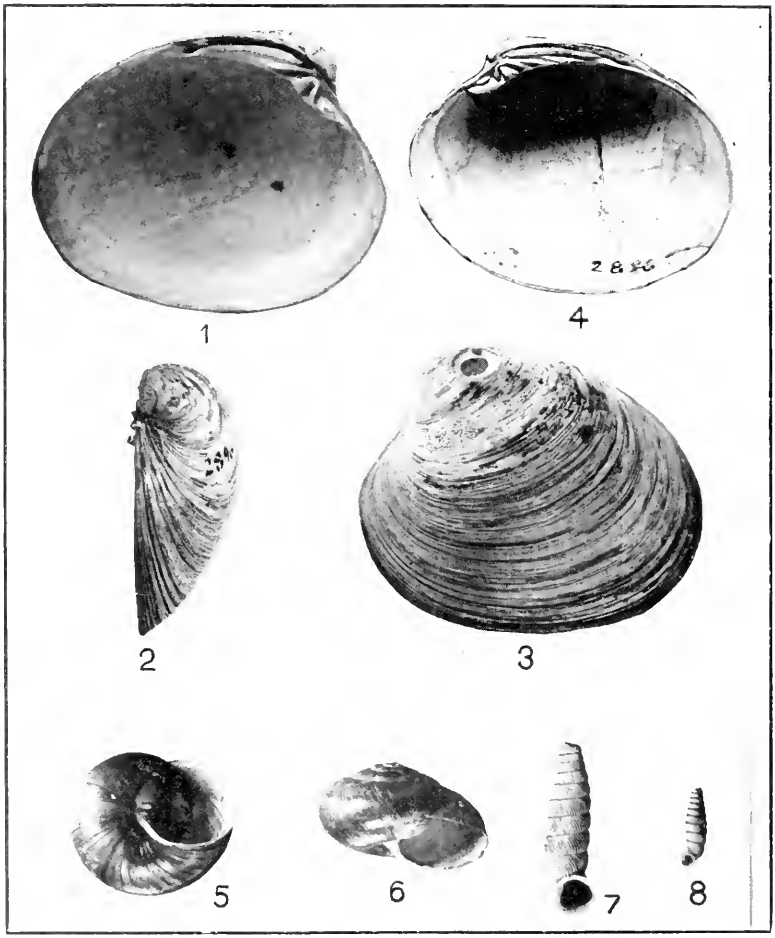

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THE NAUTILUS.

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NOTES ON MICROSCOPIC SHELLS FROM NEWPORT BAY, CALIFORNIA

BY A. M. STRONG

Newport Bay has long been a favorite collecting ground for southern California collectors. Containing over ten miles of tidal channels navigable for small boats, extensive areas of mud flats, some sand beaches and a few rocky areas, conditions favorable to nearly all the species living in the bays can be found. A search for the microscopic species, so numerous in the tide pools and shallow dredging outside, has only resulted so far in locating the habitat of a few.

In many places along the sides of the channels at and below low tide line there is a luxuriant growth of the bay eel-grass, *Zostera marina* L. In certain places in the bay, but not everywhere, *Barleeia subtenuis* Cpr. has been found in abundance on the stems and blades of this grass, and in all stages of growth. The species seems to be confined to this particular species of grass, which is replaced in the tide pools outside by *Phyllospadix terreyi* Wats. on which *Barleeia haliotiphila* Cpr. is found. *Cypraeolina pyriformis*

Cpr. is also found on the bay eel-grass, and seems to be more widely distributed over the bay. This species is not so particular as to its food, as it is found on both species of eel-grass, and is reported as ranging from Alaska to Mazatlan.

The most satisfactory way to collect these shells that we have found is to wash them off the grass under water and over a fine screen resting on the bottom. In this way a large amount of grass can be washed in a short time and the shells which have settled on the screen picked out at home. For this work we have found that a screen of at least twenty meshes to the inch is required to retain the smaller shells.

Above the edge of the eel-grass at many places the fine trails of *Acteocina inculta* Gld. are found in clear spots of sandy mud. The shell itself can seldom be seen on the surface, but if the mud is scooped up and washed through the fine screen they will be found to be present in great numbers, varying all the way from ivory white to dark brown in color, and in sizes up to 5 mm. in length. This is one of the most numerous and widely distributed mollusks in the bay but its habitat is confined to sandy mud between tides.

Associated with the Acteocina and at only one point in this bay as yet located, *Epitonium subcoronatum* Cpr. has been collected in large numbers. There is nothing to indicate the presence of this species tho it lives just under the surface of the mud, and my largest specimen of 9 whorls measures 11 mm. in length. Dead shells or stray specimens are seldom seen, and a colony can only be located by systematic search or by accident.

Along the bay shores back of the mud flats at extreme high tide line the salt-grass is covered in places by a windrow of drift. The moist ground under this is the home of the little shining brown *Syncera translucens* Cpr., where they are to be found in great numbers. The dead shell of this little air breather is hard to distinguish from that of

Barleeia subtenuis Cpr. but tho living so close together, the habitat is very different.

Every pile, rock, or other solid object which has been in place in the bay for any length of time is covered with *Ostrea lurida* Cpr. Living on these is the only Odostomia known to live in the bay, *Odostomia fetella* D. & B. These little shells, the adult only 4 to 5 mm. in length, are rather hard to see until one learns just where to look for them. They are always on the living oysters in the clumps and in spots clear of mud coating, be that spot ever so small. Beyond this there seems to be no fixed position. While this species is commensal with *Ostrea lurida* Cpr. it has not been reported from the northern end of the range of that species. Upwards of a hundred specimens collected in a single afternoon not long ago shows that it is not to be considered as a rare species.

Associated with the oysters there is a sponge-like growth for which I have not been able to find a name. It grows in clusters of finger-like projections two or three inches long and is of a yellowish or yellowish-green color. In the folds and around the base of the fingers of this sponge are two species of Cerithiopsis, living either singly, or in clusters or family groups. They are attached to the surface of the sponge by means of mucous threads and are not imbedded in it. The two species live together and look much alike but are easily separable with a good hand lens. The adult specimens reach a length of 8 mm. but the majority of the specimens found are smaller. They have been identified as *Cerithiopsis carpenteri* Bartsch and *Cerithiopsis pedroana* Bartsch.

Extreme low tide exposes a considerable portion of the inner entrance bar which is formed of clear sand. Many strays from deep water have been picked up here, and a couple of years ago an area of about an acre was found to be the home of *Acteocina magdalenensis* Dall. For several months the shells were present in large numbers but they gradually disappeared, hardly entirely due to the activities

of the collectors, and have not been seen again. This is the shell that was listed by the early collectors as *Acteocina infrequens* C. B. Adams, a shell that is now considered to be a distinct Panama species. This seems to be the only time that they have ever been collected in any numbers. At about the same time *Turbonilla tridentata* Cpr. was found plentifully in the sand along the edge of the bar at extreme low tide line, some fine specimens 15 mm. in length being secured. These also disappeared in a short time, but stray specimens found in other parts of the bay indicate that they are at least periodic visitors.

Stray specimens and dead shells of several other species of small shells have been found in the bay, and indicate that it is their habitat or that they are periodic visitors. The exact locality for these is yet to be found, but when they are located they will probably be found to be present in as large numbers as are those which we now know.

PITARIA IDA, A NEW RECENT SPECIES FROM SITKA, ALASKA

BY NELLIE MAY TEGLAND

Museum of Paleontology, University of California

Type: No. 31526, Mus. Pal., Univ. of Calif.

Left valve: Shell thin, chalky, surface finely striated and roughened by growth lines and bearing remnants of a thin brown epidermis; outline regularly ovate, beak small, anterior and sharply recurved; lunule comparatively large, not depressed, clearly outlined by incised line. Hinge plate normal, with low sharp lamella close to posterior dorsal margin, two well developed cardinal teeth joined in an arch

beneath the beak, posterior tooth heavy, anterior thin; anterior lateral narrow, pointed, high, slightly excavate ventrally, placed close to ventral margin of plate. Pallial sinus triangular, reaching forward toward the center of the valve. Length 47.5 mm., height 39.2 mm.

Paratype: No. 31527, Mus. Pal., Univ. of Calif.

Right valve: Shell smaller and a little more elongate than type, with practically all of the epidermis remaining, otherwise with general description the same. Hinge with long bifid posterior cardinal tooth, middle cardinal free and faintly grooved; anterior cardinal short, thin and connecting by an arch with the posterior cardinal; anterior socket narrow and deep to receive anterior lateral of left valve. Length 43.4 mm., height 33.6 mm.

Named in honor of Ida Shepard Oldroyd to whom we are greatly indebted for her work in West Coast conchology.

The two valves described do not belong to the same individual and are the only known examples of the species, but the similarity of the shells and the accurate complementing of the hinge structures leave no doubt as to their identity.

These valves are in the invertebrate collection of the Museum of Paleontology with a Harriman Expedition label giving the locality as Sitka, Alaska. The shell was originally identified as *Marcia oregonensis* but this determination is precluded by the presence of the anterior lateral tooth in the left valve. Because *Pitaria* has not hitherto been recorded from any West Coast station so far north the validity of the association of specimens and label has been questioned but, as is pointed out by Dr. Paul Bartsch in a letter, the texture of the shell seems to indicate a northern habitat.

I have not been able to find this *Pitaria* described or figured in available literature and the shells examined by Dr. Bartsch were found to be unlike any material in the United States National Museum. My reason for believing this to be a valid species from the West Coast is the fact

that it belongs to the same subgenus as certain fossil forms in Oligocene and Miocene deposits of Washington and this subgenus is peculiar to that region.

A REVIEW OF CERTAIN SPECIES OF THE OLIVIDAE

BY CHARLES W. JOHNSON

The following notes are by way of a review of a recent paper by Ph. Dautzenberg.[1] This paper is a very interesting and useful contribution toward our knowledge of the Olividae. The synonomy is very full, going back to the old pre-Linnean works of Lister, Gaultieri, Klein and others, the illustrations of which are often referred to by subsequent authors, and on these illustrations we really have to depend in determining many of the species. The paper contains many changes in nomenclature from those proposed by the writer[2] and E. G. Vanatta.[3]

The changes suggested by Dautzenberg are due (1) to the adoption of the names of Meuschen 1787 in place of those of Gmelin 1790 and Bolton 1798, (2) to considering many of Bolten's names as representing composite species, and selecting recognizable figures to represent Lamarck's species, leaving the others to stand for Bolten's species, and (3) to individual opinion as to the specific and varietal value of certain forms.

[1] Olividés de la Nouvelle Calédonie et de ses dépendances, Jour. de Conch., vol. 61, no. 1, p. 1-72, Nov., 1927, and no. 2, p. 103-147, Feb., 1928.

[2] Some notes on the Olividae. THE NAUTILUS, vol. 24, p. 49-51, 64-68 and 121-124, 1910-11; vol. 28, p. 97-103 and 114-116, 1915.

[3] Notes on Oliva. THE NAUTILUS, vol. 29, p. 67-72, 1915.

To study a variable and widely distributed species from specimens coming from one section only, would tend to emphasize the distinctness of the more local forms, whereas, when these are studied as a whole, they would show intermediate forms that would make it impossible to consider them distinct. It is much more interesting and instructive to show to what extent species may vary throughout a given region, than to arbitrarily divide these into a number of questionable species.

My studies on this family in 1910 and 1915 were based on the collection of the late John Ford, now in the Academy of Natural Sciences, Philadelphia. In this collection is a series of over 250 specimens of the widely distributed and extremely variable species which will now have to bear the name of *Oliva erythrostoma* Meuschen, instead of *O. sericea* Bolten. Dautzenberg considers *O. textilina* Lam. (*sericea* Bolt.) and *O. tremulina* Lam. distinct species, notwithstanding the difficulties experienced by most conchologists in separating them.

The range of this species is from southern Japan to northern Australia throughout Polynesia and west to Mauritius. Coming from widely separted localities we find many local variations which, in themselves seem quite distinct, the true value of which however can only be shown by a comparison with specimens from all parts of the Indo-Pacific.

Adopting Meuschen's names and recognizing the new varieties proposed by Dautzenberg I have revised the grouping of some of the forms, with notes and references to type figures.

OLIVA ERYTHROSTOMA Meuschen.

(*O. miniacea* Bolt. *O. erythrostoma* Lam.)

Group ERYTHROSTOMA. Aperture bright red.

Var. *efasciata* Dautz. Duclos (in part) Illustr. Conch.,

pl. 15, f. 10, 11. Tryon, Man. Conch., V, pl. 26, f. 53 (only). This is what is referred in part to *porphyritica* Marr. In my paper I restricted the latter to those with bands of bright purple spots, the prevailing form of the Caroline Islands (see THE NAUTILUS, vol. 28, p. 99, 1915).

Var. *saturata* Dautz. Reeve, Conch. Icon., VI, pl. 5, f. 7c. This form has dark longitudinal lines and prominent bands giving it a sombre appearance. It represents a parallel variation to that of *fumosa* Marr. with a whitish aperture.

Var. *johnsoni* Higgins (NAUTILUS, vol. 33, p. 58, 1919). Marrat, Thes. Conch., vol. 4, pl. 7, f. 110. Dark brown with large white markings, a parallel variation to *pica* Lam.

Var. *marrati* Johns. (NAUTILUS, vol. 24, p. 51, 1910.) Marrat, Thes. Conch., vol. 4, pl. 7, f. 109. Shell entirely dark brown.

Var. *sylvia* Duclos. Illustr. Conch., pl. 14, f. 12 (only). Orange yellow with irregular lines and two bands of brown, usually smaller than the other forms.

Group TREMULINA. Aperture whitish, varying from a deep flesh color to bluish white.

Var. *sericea* (Bolten) Röding (*textilina* Lam.), Martini, Conch. Cab. II, tab. 51, f. 559. Both Bolten and Lamarck refer to the same figure here quoted. Even if Bolten refers to two figures, one representing a different species, the first reviser in the case of a composite species has the right to designate the type. This has already been done and the species again figured by Marrat in 1870 (Thes. Conch., IV, pl. 10, f. 130-132). Therefore I do not see how we can use Lamarck's name.

Var. *granitella* Lam. Differs from the typical *sericea* in lacking the two bands.

Var. *albina* Melvill & Standen. Journ. Conch., vol. 8, p. 404, 1897. An ivory white form.

Var. *tremulina* Lam. This differs from *erythrostoma* only in the color of the aperture, and in a large series it is impossible to draw a well defined line separating the two.

There are also parallel variations in both, which, aside from the color of the aperture cannot be separated, another strong indication that we are dealing with only one variable species.

O. concinna Marrat seems to be based on the young of two well marked varieties *tenebrosa* Marr. and *pica* Lam.

Var. *chrysoides* Dautz. Reeve, Conch. Icon., VI, pl. 6, f. 8d. Marrat, Thes. Conch., IV, pl. 9, f. 128. This is what most authors consider as *irisans* Lam. Orange yellow with a whitish aperture it forms a parallel variation to *sylvia* with a red aperture.

OLIVA OLIVA Linné.

The following additional varieties are recognized by Dautzenberg.

Var. *aurata* (Bolten) Röding (not Link). Duclos, Illustr. Conch. pl. 25, f. 10: Marrat Thes. Conch. IV, pl. 10, f. 134. The uniform orange yellow form.

Var. *cinnamonea* Menke, Martini, Conch. Cab. II, pl. 47, f. 501. This variety is cinnamon brown with longitudinal stripes of darker brown.

Var. *cincta* Dautz. Duclos, Illustr. Conch., pl. 25, f. 8. Tryon, Man. Conch., V, pl. 23, f. 23. Yellow with numerous narrow revolving lines of brown.

Var. *rumphi* Dautz. Reeve, Conch. Icon., VI, p. 7, fig. 10c (only). Tryon Man. Conch., pl. 23, f. 22. Dautzenberg says:—"This variety corresponds to the description and figure of Rumph." It is yellowish ornamented with lines and spots of brownish black.

Var. *albofasciata* Dautz. Duclos, Illustr. Conch., pl. 25, f. 4. Greyish, with two broad white bands bearing very irregular markings of black.

OLIVA EMICATOR Meuschen.

(*O. amethystina* Bolten. *O. guttata* Lam.)

There is one improvement in adopting Meuschen's name and this is, to have the species represented by the typical form of this beautiful shell, instead of an abnormality.

Var. *annulata* Gmel. Martini, Conch. Cab., II, tab. 50, f. 564. Whitish, with an elevated ridge near the periphery —a malformation.

Var. *carnicolor* Dautz. A flesh colored form without spots.

Var. *nebulosa* Dautz. Duclos, Illustr. Conch., pl. 16, f. 3. Reeve Conch. Icon., VI, pl. 14, f. 30d. Yellow or light brown, with large sports of dark brown.

Var. *alba* Sowerby. Küster, Conch. Cab., 2 ed., pl. 6, f. 9. Shell entirely white.

Var. *intricata* Dautz. Duclos, Illustr. Conch., pl. 16, f. 4, 17, 18. Marrat, Thes. Conch., IV, pl. 5, f. 57. With irregular lines of reddish purple and spots of very dark brown.

Var. *mantichora* Duclos, Illustr. Conch., pl. 16, f. 7, 8. Color similar to intricata with a more or less prominent ridge or angle near the periphery as in annulata.

OLIVA EPISCOPALIS Lamarck.

In making *O. episcopalis* Lam. a synonym of *O. caerulea* Bolten, I was following Marrat. The only figure of any value referred to by Bolten is that by Martini (Conch. Cab., II. tab. 48, f. 518), and that, in the absence of a description, seems very doubtful. I am therefore inclined to adopt Lamarck's name of which there is no doubt, for he says:—"remarkable for its beautiful violet interior."

Var. *lugubris* Lam. Duclos, Illustr. Conch., pl. 11, f. 5 and 6. Reeve, Conch. Icon., VI, pl. 13, f. 24 a, b. A small dark bluish form marked with white, with irregular longitudinal lines of brown, often with a dark subsutural band.

Var. *emeliodina* Duclos. Illustr. Conch., pl. 21, f. 19, 20. A small ash gray form, reticulated with five brown lines, with brown markings forming an interrupted subsutural and median band.

OLIVA RETICULATA (Bolten).

(*O. sanguinolenta* Lamarck.)

While there may be some doubt as to *O. variegata* Bolten being the same as *O. sanguinolenta* Lam., there is no doubt about *O. reticulata* and *O. sanguinolenta,* as both Bolten and Lamarck refer to the same figures by Martini (Conch. Cab., II, tab. 48, figs. 5-12, 5-13). I have therefore adopted Bolten's name.

Var. *azona* Dautz. Differs from the typical form in the absence of transverse bands.

Var. *pallida* Dautz. Duclos, Illustr. Conch., pl. 22, f. 14, 15. Whitish, reticulated with fine pale brown lines.

Var. *evania* Duclos, Illustr. Conch., pl. 22, f. 3, 4. White reticulate with pale brown lines, with a subsutural and median band of dark brown markings.

Var. *zigzag* Perry, Conch., pl. 41, f. 4. White, with clearly defined zigzag lines. The drawing seems greatly conventionalized.

OLIVA ISPIDULA Linné.

The following additional varieties are noted.

Var. *longispira* Bridgman, Proc. Malac. Soc. of London, VII, p. 195, fig. —, 1906. Luzon and Cebu, Philippines. A variety from the nearby island of Samar which I call *samarensis* in 1915 is the same. According to Dautzenburg this variety differs from the typical *O. ispidula* in having a very high spire.

Var. *oriola* Lam. The var. *gratiosa* Vanatta, 1915, is the same.

Var. *lactanea* Dautz. Marrat, Thes. Conch., VI, pl. 16, f. 253. Entirely white with a dark brown aperture.

Var. *martini* Dautz. Martini, Conch. Cab., pl. 49, f. 535. White or flesh color with a subsutural band of orange.

Var. *jayana* Ducros. Reeve, Conch. Icon., VI, p. 17, f. 34c. Spire short, white or flesh colored, with fine longitudinal lines of brown, and two more or less prominent bands of irregular markings.

OLIVA SIDELIA Duclos.

The typical form is not clearly defined as to color, and the original figures (Illustr. Conch., pl. 21, figs. 1, 2), have been copied by both Marrat and Tryon.

Var. *lepida* Ducl. Illustr. Conch., pl. 27, f. 15-21. A number of color forms are included under this variety.

Var. *todosina* Ducl. Illustr. Conch., pl. 27, f. 9, 10. Reticulated with lines of brown, and with a dark brown median band.

Var. *volvariodes* Ducl. Illustr. Conch., pl. 27, f. 11, 12. Brown with very fine darker brown lines.

OLIVA ATHENIA Duclos.

This is considered a good species by Dautzenberg, although Tryon considered it a synonym of *O. sidelia*. I have not material enough to decide.

OLIVA CARNEOLA Gmelin.

The figure cited by Gmelin (Martini, Conch. Cat. II, tab. 46, f. 495) is poor, but indicates a violet colored band below the suture. The following new varieties are proposed by Dautzenberg.

Var. *coccinata* Dautz. Duclos, Illustr. Conch., pl. 28, f. 8. The body whorl dark orange.

Var. *candidula* Dautz. Duclos, Illustr. Conch., pl. 28, f. 12, 16. Light flesh color with sometimes a white median band.

Var. *bizonalis* Dautz. Duclos, Illustr. Conch., pl. 28, f. 13. Orange with two narrow white median bands.

Var. *unizonalis* Dautz. Duclos, Illustr. Conch., pl. 28, f.

6, 14. Orange with one broad white median band.

Var. *trichroma* Dautz. Duclos, Illustr. Conch., pl. 28, f. 10, 11. A subsutural band of dark violet, a broad band of white, and a basal band of orange.

Var. *adspersa* Dautz. With small white triangular spots, more or less apparent.

Olivancillaria gibbosa Born.

This species seems to connect the genus Olivancillaria and Agaronia. Tryon placed it in the latter, as the suture is distinct on the spire and not covered by a callous.

Var. *flavescens* Melvill, Proc. Malac. Soc. London, VI, p. 65, 1904. This is what I called var. *aurantia,* (Nautilus, vol. 28, p. 103, 1915).

Var. *fulgurans* Melvill. Reeve, Conch. Icon., VI, pl. 8, f. 12b. Yellow, with longitudinal zigzag lines of brown.

Var. *candicans* Melvill. Marrat, Thes. Conch., IV, pl. 19, f. 308. This form is entirely white.

Var. *cingulata* Sowerby. Chemnitz, Conch. Cab. X, pl. 147, f. 1369, 1370. Var. *mediocincta* Melvill. This is bluish gray form, with a wide white band, bearing markings of dark brown. A rare variety or an anomaly.

NEW RECORDS OF WESTERN CANADIAN MOLLUSCA

BY ALAN MOZLEY
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The mollusks mentioned in this note were collected in various parts of Western Canada during the course of an investigation of the molluscan fauna of that region. In

view of the vast area of this territory (over a million square miles) it is obviously desirable to have as many records from specific localities as possible, in order to gain some knowledge of the local distribution of these forms. It will be seen that some species have been collected much more often than others; this is to some extent the result of imperfect collecting, but is also due in part to the fact that some species are much more abundant and widely distributed than others.

From the information so far collected it seems that in Manitoba, the region of the Precambrian Shield and the adjacent drift-covered areas (collectively, the Boreal or Canadian Zone), have a mollusk fauna which is distinct from that of the Forest-Grassland Transition, and Plains areas situated to the west. The mountain region in Alberta also seems to have its characteristic species. Brief descriptions of these regions have been given in previous papers (NAUTILUS XXXIX, p. 121; XL, p. 53, 56) so that a discussion of the specific facts of distribution and the conditions controling these will be discussed in a later paper, after additional information has been collected.

Family HELICIDAE

Vallonia costata (Müller). MANITOBA: Morris; Stony Mountain; Victoria Beach; Portage la Prairie; Delta; Snake Island, Lake Winnipegosis; near Clearwater (Atikameg) Lake, Hudson Bay Railroad. SASKATCHEWAN: Yonker.

Family PUPILLIDAE

Gastrocopta holzingeri Sterki? MAN.: Portage la Prairie.
Strobilops affinis Pilsbry. MAN.: Victoria Beach.
Columella edentula (Draparnaud). MAN.: Delta.

Family COCHLICOPIDAE

Cochlicopa lubrica (Müller). ONTARIO: Malachi. MAN.: Whiteshell River District, near Lake Nora, and also near Whiteshell Lake. Morris; Stonewall; Victoria Beach; Berens River, near the Englishman's Rapid; Portage la Prairie; Delta; Sifton.

Family ZONITIDAE

Vitrina limpida Gould. MAN.: Morris; Winnipeg; Westbourne; Ninette.

Polita hammonis (Strom). MAN.: Morris; Stonewall; Victoria Beach; Portage la Prairie; Delta; Dauphin; Snake Island, Lake Winnipegosis.

Euconulus chersinus polygyratus Pilsbry. MAN.: Morris; Berens River, near the Englishman's Rapid; Portage la Prairie; Sifton. SASK.: Yonker. BRITISH COLUMBIA: Lucerne?

Zonitoides arborea (Say). MAN.: Morris; Portage la Prairie; Berens River, near the Englishman's Rapid.

Family ENDODONTIDAE

Gonyodiscus cronkhitei anthonyi Pilsbry. MAN.: Whiteshell River District, near Lake Nora; Victoria Beach; Stonewall; Berens River, near the Englishman's Rapid; Delta; Westbourne; Dauphin; Sifton; Snake Island, Lake Winnipegosis; near Clearwater Lake, Hudson Bay Railroad. B. C.: Lucerne?

Family SUCCINEIDAE

Succinea retusa Lea. MAN.: Indian Bay Station; Morris; St. Norbert; Jackfish Creek near Jacflfish Lake (Township 18, Range 8, east of the Principal Meridian) ; Grand Beach; Beulah.

Succinea ovalis Say. MAN.: Whiteshell River District, island in Whiteshell Lake; Morris; Dauphin. SASK.: Yonker.

Succinea grosvenori Lea. MAN.: Baldur, near Cobbs Lake.

Succinea avara Say. MAN.: Beulah; Dauphin. SASK.: Yonker, Eyehill Creek.

Family LYMNAEIDAE

Lymnaea stagnalis appressa (Say). MAN.: Whiteshell River District, Little Whiteshell Lake (*Typha-Zizania*), Crow Duck Lake (protected marshy shores), with *L. megasoma* above Jessica Lake. Molson; Beausejour; Portage la Prairie; Macdonald; Delta; Ninette, Bone Lake; Basswood, Long Lake; Clear Lake, Riding Mountains; Dauphin; Lake Winnipegosis, marsh near the Meadow Portage. SASK.: Kuroki, Fishing Lake; Humbolt, Burton Lake; Yonker, Eyehill Creek.

Lymnaea stagnalis lillianae Baker. MAN.: Indian Bay Station. This is apparently the first record of this variety from the Hudson Bay Drainage.

Lymnaea megasoma (Say). MAN.: Whiteshell River District, shore of Whiteshell River below unnamed lake ten miles below Jessica Lake, quite common among aquatic plants and on the muddy bottom among the willows in protected situations near shore, also found in a quiet bay below third rapid below Betula Lake, and near the eight rapid below Betula Lake.

Lymnaea lanceata (Gould). MAN.: Whiteshell River District, Cross Lake; Mallard Lake; large *Zizania* marsh below the Whiteshell Lakes; Little Whiteshell Lake (*Typha-Zizania*).

Lymnaea palustris (Müller). MAN.: Cartier; Stony Mountain; Portage la Prairie; Macdonald; Dauphin; Sifton.

Lymnaea vahlii ("Beck" Moller). MAN.: Molson; Delta?; Portage la Prairie.

Lymnaea emarginata (Say). MAN.: Lake Winnipegosis.

Lymnaea emarginata var. MAN.: Clear Lake, Riding Mountains; Clearwater Lake, Hudson Bay Railroad.

Lymnaea caperata (Say). MAN.: Molson; Navin; Sifton; Lake Winnipegosis, marsh near the Meadow Portage.

Lymnaea obrussa exigua (Lea). ONT.: Onion Lake near Minaki. MAN.: Clandeboye, Muckle Creek.

Lymnaea obrussa decampi (Streng). MAN.: Clearwater Lake, Hudson Bay Railroad.

Family PLANORBIDAE

Planorbis antrosus striatus Baker. MAN.: Winnipegosis, Mossy River. Lake Winnipegosis.

Planorbis antrosus var. MAN.: Clear Lake, Riding Mountains.

Planorbis campanulatus davisi Winslow. MAN.: Douglas Lake, near Onah. This is the first record of this variety of *campanulatus* from the Hudson Bay drainage.

Planorbis exacuous Say. MAN.: Whiteshell River District, Whiteshell Lake; Little Whiteshell Lake (*Typha-Zizania*); *Zizania* marsh below the Whiteshell Lakes; Whiteshell River below the Mallard Lake Portage; small lake on portage between Whiteshell and Crow Duck Lakes. Macdonald; Lake Winnipegosis, marsh near the Meadow Portage, and on the bottom in about five feet of water near Snake Island; Clearwater Lake, Hudson Bay Railroad.

Planorbis deflectus Say. MAN.: Clearwater Lake, Hudson Bay Railroad.

Planorbis hirsutus Gould? MAN.: Whiteshell River District, Whiteshell River below the Mallard Lake Portage. Clearwater Lake, Hudson Bay Railroad.

Planorbis corpulentus Say. MAN.: Indian Bay Station, Falcon Bay.

Planorbula christyi Dall. SASK.: Wadena.

Family PHYSIDAE

Aplexa hypnorum (Linne). MAN.: Whiteshell River

District, with *Lymnaea megasoma* in Whiteshell River above Jessica Lake; Mallard Lake; Little Whiteshell Lake; *Zizania* marsh below the Whiteshell Lakes. Near the Seven Sisters Falls, Winnipeg River; Indian Bay Station; Molson; Stony Mountain; Victoria Beach; Treesbank; Steep Rock; Sifton. SASK.: Yonker, Eyehill Creek.

Family ANCYLIDAE

Ferrissia parallela (Haldeman). MAN.: Whiteshell River District, Whiteshell River, on leaves of *Nymphaea advena.*

Family VIVIPARIDAE

Campeloma decisum (Say). MAN.: Whiteshell River District, Whiteshell River near first portage below White Lake; between fifth and sixth rapids below Betula Lake. Berens River, several miles above the point of junction of the Etomami River, at a depth of about forty-five feet. These records considerably extend the known distribution of this species.

Family VALVATIDAE

Valvata tricarinata (Say). ONT.: Malachi, Malachi Lake. MAN.: Whiteshell River District, Betula Lake (*Zizania*) ; between sixth and seventh rapids below Betula Lake. Morris, Morris River; Delta; Ninette, Bone Lake; Clearwater Lake, Hudson Bay Railroad. SASK.: Yonker, Manitou Lake. A single broken shell, apparently several years old, was the only mollusc found in this lake during a short stay in the vicinity.

Family AMNICOLIDAE

Amnicola walkeri Pilsbry. MAN.: Victoria Beach. This is the first record of this species from the Hudson Bay Drainage.

Amnicola limosa porata Say. MAN.: Victoria Beach.

NOTE ON SOME FRESH WATER MOLLUSCA INHABITING TEMPORARY PONDS IN WESTERN CANADA

BY ALAN MOZLEY
University of Manitoba
Biological Board of Canada, Prairie Lakes Investigations

In the course of malacological investigations in western Canada a number of temporary ponds have been visited. One of these has been examined in some detail, systematic observations on it having been made over a period of three years. An account of the plants and animals of this pond will be given in a later paper. Since there are few records relating to the occurrence of gastropods in these interesting habitats it has been considered that a list of the species found in these situations in western Canada would be of interest.

In most parts of western Canada spring often comes rather suddenly, with the result that temporary ponds form from the melting snows and spring rains in the numerous slight depressions over the prairie and sparsely wooded country. In these ponds a large number of plants and animals flourish for a short time each year, usually from April to June. Perhaps the most characteristic of these are *Eubranchipus gelidus* and *Lepidurus couesii.* In a pond of this kind in the Municipality of St. Vital, Manitoba, the following mollusks have been found on many occasions, and are undoubtedly permanent residents of the pool.

Lymnaea palustris (Müller)
Lymnaea caperata (Say)
Planorbis exacuous Say
Planorbis umbilicatellus Cockerell
Planorbula christyi Dall
Aplexa hypnorum (Linné)

It is interesting to find that so many species are able to withstand the rigorous conditions of existence in this situa-

tion, in which, following the drying of the pond, the organisms are "baked" for two months and subsequently "frozen" for several more. With the first signs of spring they are active, for on the first day the ponds have water in them many snails are to be seen. A number of other temporary ponds in the vicinity of Winnipeg have been examined, and it appears that the list given above includes the species usually found in these situations in this region. *Planorbula christyi* Dall has been found in large numbers in ponds nears Wadena, Sask., by Mr. Alexander Bajkov.

LAND SHELLS OF ALACHUA CO., NORTHEASTERN FLORIDA

BY E. G. VANATTA

The following species of land shells were picked from leafmould collected at "The Devil's Mill Hopper" and "Buzzards Roost" near Gainesville, Alachua County, Florida by Mr. James B. Clark.

Helicina (*Oligyra*) *orbiculata* Say.
Polygyra pustula Fér.
Polygyra hopetonensis Shuttl.
Drymaeus dormani W. G. B.
Euglandina rosea Fér.
Retinella dalliana 'Simps.' Pils.
Glyphyalinia indentata Say.
Euconulus chersinus Say
Guppya sterkii Dall.
Zonitoides arborea Say.
Helicodiscus parallelus Say.
Succinea campestris unicolor Tryon.
Gastrocopta rupicola Say.
Gastrocopta corticaria Say.
Gastrocopta armifera Say.
Gastrocopta contracta peninsularis Pils.
Gastrocopta pentodon Say.
Gastrocopta pentodon tappaniana Ad.
Gastrocopta pentodon floridana Dall.

Pseudovitrea minuscula Binn.
Pseudovitrea minuscula alachuana Dall.
Pseudovitrea singleyana Pils.
Striatura milium Mse.
Agriolimax campestris Binn. (shells).
Vertigo ovata Say.
Vertigo oscariana Sterki.
Vertigo milium Gld.
Pupisoma dioscoricola Ad.
Pupisoma minus Pils.
Strobilops aenea Pils.
Strobilops floridana Pils.
Strobilops hubbardi Brown.
Carychium exile Lea.

STROPHOCHEILUS (BORUS) GLOBOSUS MARTENS

BY WILLIAM B. MARSHALL
U. S. National Museum

Strophocheilus (*Borus*) *globosus* MARTENS, Novit. Conch., V, No. 877, p. 24, pl. 140, f. 2, 3, 1877; quoted in PFEIFFER, Mon. Helic., VIII, p. 17, 1877. PILSBRY, Proc. Acad. Nat. Sci., Philadelphia, p. 391, 1900. PILSBRY, Man. Conch., X, p. 37, pl. 2, figs. 2, 3, 1895-96; XIV, p. 124, 1901-2.

E. von Martens described this shell from a single specimen of which the locality was unknown. It must have been a "living" specimen as he described the cuticle. Pilsbry (Proc. Acad. Nat. Sci. Philadelphia, p. 391, 1900) recorded it as occurring subfossil at Montevideo, Uruguay, and suggested that it would probably be found living in the same region. So far as known, no living specimens have yet been found in the immediate vicinity of Montevideo, but the U. S. National Museum recently has received a living specimen from Dr. Florentino Felippone, which was collected in the Department of Salto, Uruguay. This

department is far to the north of Montevideo and is on the Rio Uruguay, being the next to the northernmost department of the country. Martens' description and figure give a very good idea of the species and leave but little to add. He says nothing of the suture being margined with colors different from that of the periostracum. In our specimen each whorl has a very narrow violaceous or lavender stripe along the upper edge of the succeeding whorl for about 2½ whorls. There the edging becomes white and the violaceous stripe is just below it. It gradually becomes fainter until at the middle of the body whorl it dies out altogether. The narrow white edging continues to the aperture. The interior is lavender color. This specimen measures: Length, 39mm.; greater diameter, 29 mm.; lesser diameter, 26 mm.; length of aperture, 25 mm.; width of aperture, 15 mm. Its catalogue number is 368257.

In subfossil condition the shell is not uncommon, but until 1904 the museum contained no specimens. Since that time, 12 specimens have been received as follows, the first two coming from Mr. S. Olea, and the other ten from Dr. Felippone:

Cat. No. 180776, 2 specimens, South coast of Montevideo, Uruguay.
Cat. No. 185373, 5 specimens, Punta Carreta, Montevideo, Uruguay.
Cat. No. 270881, 1 specimen, Uruguay.
Cat. No. 322366, 1 specimen, Punta Carreta, Montevideo, Uruguay.
Cat. No. 331333, 2 specimens, Uruguay.
Cat. No. 335778, 1 specimen, Vera, Dept. Soriano, Uruguay.

In these the thickening behind the aperture varies in width from a mere edging to 6 mm.

SPHAERIIDAE, PALEARCTIC AND NEARCTIC—II

BY V. STERKI[1]

Since my former article was written, some new evidence has come to light. Among additional materials was my "old collection" of land and fresh-water mollusks, left in Switzerland in 1883, and given up as lost. It has been found lately, and sent over here by the kindness of a niece. It was a beginner's collection, made in 1880-'83, and about a hundred lots of European Sphaeriidae, some of which are of interest in regard to the subject under consideration formed part of it.

Pisidium, I, p. 26

P. supinum A. Schmidt. Some specimens were seen recently, from Michigan and Illinois, confirming the identity and extending the distribution.

P. henslowanum Sheppard: see notes after *lilljeborgii*.

P. subtruncatum Malm. A number of good specimens have been collected in the headwaters of the Taquamenon River, Luce co., Michigan (Upper Peninsula), and sent by Miss Mina L. Winslow; they are in the collection of the museum of the Univ. of Michigan, and part no. 11,517 C. M. They are just like examples from the Rhine Valley on the border of Switzerland and Baden, Germany (C. M. No. 11,117) and like others from various parts of Europe.

P. roseum Scholtz. I had a chance to examine a lot of Pisidium, about a hundred specimens, from Kamchatka, Siberia, in a pond on the Gulf of Kronotzki, collected by Mr. Walter J. Eyerdam, in July 1925; some of them kept are C. M. No. 11,050. They were recognizable at a glance

[1] Continued from the paper published in THE NAUTILUS XL, pp. 26-30 (July, 1926), here referred to as I.—"Nearctic", on p. 28, line 1, should be Nearctia.

as roseum, identical with specimens from Siberia, Europe, and also exactly like those from New England, e. g. a lot from a ditch in Perham tp., Aroostook co., Maine, collected by Olof O. Nylander, in 1898, C. M. No. 2485; if mixed, they could not be separated. This is the only example of such distribution actually known now. The species should be expected, then, to inhabit also our Northwest, and possibly go across the continent.

Clessin and Westerlund have acknowledged *roseum* as a species. B. Woodward, in "British Pisidia", p. 32, has made it a synonym of *P. casertanum* Poli (cf. I. p. 27), with a host of others, on account of the similarity of their hinges. But, as stated before, the hinges of numbers of manifestly distinct species are very similar, on the one hand, and on the other, different forms of one species may show marked differences in the formation of their hinges. Even A. Baudon, in "Essai", 1857, p. 17, stated that the form of the hinges is a character for discerning groups rather than species.

P. punctatum St. (1895). In the "old collection" there are a few specimens of this, "var." *simplex*, from the Rhine, and the Wuttach, a small tributary, on the border of Switzerland, and Baden, Germany, collected in about 1881. At that time they were just "?"; minute mussels about 1.5 mm. long. In 1891 I found the same typical form in the Tuscarawas River, Ohio, and described the species in THE NAUTILUS of Jan. 1895, with figures. It is widely distributed and fairly common in eastern North America, and some years ago a few were collected in western Washington by Prof. Carl C. Engberg.

Whether the species has been rediscovered in Europe, and described, I do not know. It seems worth noting that a European malacologist, on receiving a few *P. p. simplex*, somewhat smaller than the typical and without ridges on the beaks, wrote me that it is not *punctatum* but a distinct species, and also that *P. compressum confertum* St. is not *compressum* but of "some unknown sp." The same man,

of the B. B. Woodward school, told me at about the same time that most of the species described by me, are not valid, and that their number should be reduced to about one fourth, but did not say which.—

P. lilljeborgii Clessin (scutellatum St.) When the latter was described, in 1896, and long afterward, I did not know what *lilljeborgii* was. Recently, some specimens in the collection of Dr. Bryant Walker, apparently immature and of a small form, put me on the track. Then came to notice a lot of good examples from the Lake of Constance (Untersee), and some from a small lake near Berne, Switzerland, which had been in the "old collection", several years before Clessin described the species, in 1886. *P. lilljeborgii* appears to be rather scarce in Europe, or to have been overlooked, or mistaken: among thousands of Pisidia received from various countries, it was not represented. The two are conspecific. *P. scutellatum*, in North Am., is one of the commonest species in the Great Lakes region, and quite variable in several respects; some "vars." have been named, and some others should be. It is also frequent in some places of western Washington, a form markedly different from the eastern, collected by Prof. Carl C. Engberg. There are about 150 entries in the C. M. collection, with thousands of specimens.

Form: *cristatum* St. Some specimens have a short ridge (or "lamella", or "appendicle") on each beak, from vestigial to lamellar, somewhat different in position from the ridges of *P. compressum, supinum, kirklandi, fallax, punctatum.* When first noticed this suggested a distinct species, especially in the young. It is just a form, not a (regional) subspecies, as there are only a few specimens here and there among the many "normal" ones. A few such specimens have also been found among Europeans (*lilljeborgii*).

As to nomenclature, it must be sufficient for the present to have stated the fact that *scutellatum* is not specifically distinct from *lilljeborgii,* and that the species is holarctic.

The former name is so frequent in collections, faunal lists, etc., that it is difficult to change all the labels and entries at once. Besides, there are a number of forms (varieties) named and described, and the names would be cumbersome; also we know hardly anything about the varieties of *lilljeborgii* (s. str.) in Europe, and how far they are conform, or do not, with those in America. Some way may be found for concise naming in such cases. (cf. I, p. 28).

It is in place here to note that *P. henslowanum* Sheppard is manifestly related to *lilljeborgii* and the two make up a group, possibly with one or a few others. Their outlines are similar, markedly oblique and inequipartite, and their unbonal ridges are equal, homologous, and inconstant in both.

P. alpicola Clessin (*marci* St.) *P. alpicola* was described in 1889; the originals were from the Berglises, a small lake in the Alps of Switzerland, at alt. 7,546 feet. The C. M. has a few specimens from that place, topotypes, No. 11,093, received in 1881. Probably it has been found since at other places in Europe.—*P. marci* St. (THE NAUTILUS XXIII, p. 42, 1909): The originals were from Mt. Leidy, Utah, at alt. 10,000 ft., collected by Marcus H. Dall, in 1905; types in the U. S. N. M., No. 187,491; paratype C. M. No. 6,096. Latter, the same were found to be frequent to abundant at a number of places in Colorado, collected by Prof. Junius Henderson, e. g. in a lake near Coronado, Boulder co., at alt. 11,400 ft., C. M. No. 9,616.—Later it was found that the two are remarkably alike, and so far as I can see, identical, not merely similar habitational forms, tho it must be added that a number of strongly marked rest-lines of both are due to climatic conditions. There is hardly a doubt that the species will be found at similar places of both continents, and probably in the Arctic regions.

P. loveni Clessin (*hannai* St.) *P. loveni* is said to be another name for *alpicola* Clessin—why? I had no chance to look over the literature. But the following notes appear

to be of interest. The C. M. collection has three specimens of *loveni* from arctic Norway, No. 883, received from Clessin in 1899, in good condition. Of *P. hannai* (1916, Proc. U. S. N. M.) there were quite a number collected by G. Dallas Hanna on St. Paul Id., Pribilof Is., and they are like those *loveni* cited,—apparently identical.

B. B. Woodward, l. c. pp. 111, 116, regards *alpicola* and *loveni* as synonyms, and both as synonyms of *lilljeborgii* Clessin. The two former, so far as the specimens show, are somewhat similar in shape, but certainly not identical and can easily be discriminated. If, in the future, more materials show them to be conspecific, they still will have to be acknowledged as forms, varieties, and have their significance, and the geographical data demand consideration.

From what has been seen of *lilljeborgii* from Europe and the many thousands of *"scutellatum"* from North America, with we may say a multitude of different forms, none could be mistaken for *alpicola* (+*marci*), nor for *loveni* (+*hannai*). However, this is not the main question here: *quod erat demonstrandum* is the fact that each of these Pisidia is represented on both continents.

MUSCULIUM Link.

The notes in I, p. 29, on *M. lacustre* Müller need a rectification. What has been listed under that name, from the Great Lakes region, western Washington and British Columbia, are not *lacustre* but *steinii* A. Schmidt. *M. lacustre* has not been found in North America, or possibly not yet; like some others, it may be in Canada. In Europe, *steinii* has been regarded as a variety of *lacustre;* but the two are markedly different and apparently distinct, i. e. without intermediate connecting forms, even at habitats in close proximity. In North America *steinii* is quite variable—as most Musculia are—but with no forms anyway approaching *lacustre.*

THE GROUP OF GONIOBASIS CATENARIA

BY CALVIN GOODRICH

Goniobasis catenaria (Say) and its close relatives are a source of solace to anyone who has turned to them after floundering about in the morass of the *Pleuroceridae*. Certain shell characters tend to be persistent throughout the group, even though sometimes they are dimmed. The operculum is distinctive, serving as a clue or to dissipate doubts. For the most part, there is little of the erratic variation which in other groups of the family is likely to be found in quite small colonies of a given species. Yet the group, for all this, has its own burden of synonyms, its share of confused history and its questions. Perhaps otherwise it might seem hardly to belong among the Pleurocerids.

Carinae are present and are strong at least upon the upper whorls. There are usually folds on the base. This is to say that even in a lot in which most whorls of the shells are smooth, as in some distributions of *G. porrecta* and *comalensis*, an individual or two will be found to have revolving ribs on the base. Color bands appear to be absent. The operculum is of the kind that has been called paleomelanian, the spiral lines being loosely coiled and well marked.

Melania catenaria Say (non *M. catenaria* Lea, 1840) was described in 1822 from small shells taken in "limestone springs, St. John's Berkley", South Carolina. Mr. William G. Mazyck has called my attention to an error of Tryon in making the locality a specific "Limestone Springs", and has sent me material from Eutaw Springs of the same region. These specimens, though larger than were Say's, agree very well with the description. The adults are not as carinate as are the familiar Florida forms, but the char-

acter is well developed in the young. Sculpture and operculum are the same.

Pilsbry (footnote THE NAUTILUS, IV, 1891, p. 124) makes the following synonymous with *catenaria*:

M. sublirata Conrad, 1850.
M. floridensis Reeve, 1860.
M. etowahensis "Lea" Reeve, 1861.

He provisionally adds:
M. boykiniana Lea, 1840.
G. hallenbecki Lea, 1862.
M. papillosa Anthony, 1861.
G. downieana, Lea, 1862.
G. bentonensis Lea, 1862.
G. couperii Lea, 1862.

To the first names can be added *G. abbevillensis* Lea, 1862, the types of which I have examined, *canbyi* Lea, 1862, and with definiteness *couperii*. Lea's figures of *canbyi, couperii* and *downieana* look as if the shells had been selected from the same lot. The specimens came to Lea from J. Postell of St. Simon's Island, close to the mouth of the Altamaha, who received them from "Mr. Couper, son of James Hamilton Couper, Esq., of Hopeton, near Darien," which, as in the case of St. Simon's Island, is in southeastern Georgia, and not near the Etowah River of North Georgia, to which the three species are credited. The mollusks are of the form that might be expected to occur in southern Georgia, near the Florida colonies, rather than in the north. It is possible that in Postell's time there was another Etowah River in the state, that kind of duplication of names being then far from uncommon.

Melania cancellata Say, 1829, may be a synonym of *catenaria* also. It came from St. John's River, Florida, and has not been taken by any recent collector, so far as I know. Say thought it was distinct because it was "of a much more elongated and attenuated form." It would seem that he had only one specimen. *M. postelli* Lea, 1858, is under similar suspicion, but as the types came from the Altamaha River and this stream contains the astonishing *Elliptio spinosus* Lea, it would appear probable that a Pleurocerid as distinctive in its own way might have evolved in the same environment. *M. curvicostata* "An-

thony" Reeve, 1861, if it is a good species which is doubtful, will stand upon having longitudinal ribs that are not crossed by revolving striae. The place of *densicostata* Reeve, 1861, is in the synonymy of *curvicostata*, as Tryon made it.

Shortly before his death, Dr. Ortmann sent me for examination some shells that he had taken in Greenville County, Va., in 1926. There were young as well as old specimens in the material, and I was able to recognize them as the juveniles of *M. dislocata* Ravenal, 1834, which had been known previously, I think, only by adult mollusks. They indicated plainly that *dislocata* is an outlier of the *catenaria* group, being both its most eastern and its most northern representative. *Goniobasis inclinans* Lea, 1862, is a narrow form of *catenaria* that appears to be constant, and deserving of recognition as a subspecies. The most definitely named locality for it that I have seen is Skywater Mineral Springs, Albany, Ga.; and it may be that the variety is confined to springs. That it occurs also at Tuscumbia, Ala., as Lea thought, is to be doubted. A third local race that is seemingly derived directly from *catenaria* is *G. vanhyningiana* Goodrich, 1921. It occurs in a creek below Seminole Springs, Lake County, Florida.

The "provisional" synonyms of *catenaria* of which Pilsbry speaks, *M. boykiniana* Lea, *G. hallenbeckii* Lea and *G. bentonensis* Lea, are members of a sub-group, it seems to me, and probably of later development than the rest, to judge by their extreme variability and the modified opercula of some of them. *Hallenbecki*, as Pilsbry notes, is only another name for *boykiniana*, and this name also supercedes *M. catenoides* Lea, 1842. All three occur in the Chattahoochee River at Columbus, Ga. I am not sure whether or not *bentonensis* ought to be discarded as well. Certain specimens so named that I have seen are smaller, less carinate and less granulate than *boykiniana*. Other species that belong to this sub-group are *G. albanyensis*

Lea, 1864; *gesneri* Lea, 1868, and perhaps *clenchi* Goodrich, 1924.

Retaining the essential characters of the *catenaria* species of the Coastal Plain are four species of East Tennessee, the leading term of which is *G. arachnoidea* Anthony, 1854. It occurs in great numbers in five or six counties, confining itself to creeks and springs. Mr. W. J. Clench of the Museum of Comparative Zoology, which has the Anthony collection, writes me that *M. intertexta* Anthony, 1860, is "the absolute synonym of *G. arachnoidea*. The type label reads 'Louden, Tenn.' " This is the place whence *arachnoidea* came. *M. strigosa* Lea, 1841, is a nearly smooth, attenuate species of apparently the same stock and more restricted distribution, the only locality for it that I know being a creek in Knox County. In *M. troostiana* Lea, 1841, the revolving striae upon the shell are intensified, the longitudinal folds are absent. The species occurs plentifully in Mossy Creek, Jefferson County, and in at least one spring in Monroe County. It is approached in the matter of obsolete folds by a form of *arachnoidea* living in a reservoir near Cleveland, Bradley County, which has discharges both to the Tennessee and the Alabama systems. I believe that *M. striatula* Lea, 1842, which replaced *M. striata* Lea, 1841, preoccupied, is only the young of *troostiana*. Looking in the U. S. National Museum for the "single specimen" from which *M. sulcosa* Lea was described, I failed to observe it, but did see three young *troostiana* that were so named by Lea. If they are truly *sulcosa*, then *sulcosa*, having been described two months earlier, will replace *troostiana*. Less obviously a member of the catenaria group is *G. porrecta*, Lea, 1863. It is possibly an offshoot of *arachnoidea*, modified by life in waters usually rather swift and probably colder than the average stream of East Tennessee. It was first taken by Captain S. S. Lyon in Gap Creek and spring at Cumberland Gap. I found it sparingly in the waters of the Gap spring as they come tumbling down the mountainside, but

in Gap Creek at Tyrell, three or four miles below, specimens could be gathered by the fistful. A synonym of *porrecta* is *G. vittatella* Lea, 1863.

Suggesting the *catenaria* of the Florida springs in miniature is the little *G. crenatella* Lea, 1863, of the Coosa River, Ala. It was described as from Uniontown, Ala., which was merely the home of the original collector, Dr. E. R. Schowalter. The species occurs in the middle reaches of the Coosa from Ten-Island Shoals, St. Clair County, to Higgin's Ferry, Chilton County, and in a letter to Dr. Walker, Herbert H. Smith once spoke of finding it in Big Will's Creek, Etowah County. The small *G. nassula* Conrad, 1834, of the Limestone Spring at Tuscumbia, Ala., also belongs to this group. Many specimens greatly resemble the common Florida forms. In the same spring at Tuscumbia are specimens of *nassula* that are wanting or nearly wanting in spiral sculpture. They were given the name of *G. thorntonii* by Lea. It should be in the synonymy. *G. edgariana* (Lea), which Tryon made synonymous with *nassula*, belongs to the group of *G. laqueata* (Say). Another Alabama locality for *nassula* is the big spring at Huntsville.

The oddest species of the group, from the geographical standpoint, is *Goniobasis comalensis* Pilsbry, 1890, of the eastern Texas streams. Between it and any other Pleurocerid, a great area intervenes. Perhaps it must be considered a relict species, going back to the age in which the Appalachian Plateau extended continuously into the southwest, the Pleuroceridae were much more widespread over North America, and the rain fell generously upon the country of the Great Plains and the Great Basin. A form of the springs of Comal County, Texas, was given the subspecific name of *fontinalis* by Pilsbry and Ferriss in 1906.

WILLIAM D. AVERELL

William D. Averell, founder and editor of *The Conchologist's Exchange*, died at his home in Chestnut Hill, Philadelphia, May 8, at the age of 75 years. Mr. Averell was born in Philadelphia and resided here all his life. He was deeply interested in Conchology, but made no permanent collection. He was chiefly known as a dealer in shells and in connection with his little journal, which proved to be highly useful for bringing together the conchologists and collectors of the late '80s. For the last twenty years of his life Mr. Averell was an invalid. He is survived by his wife and daughter.

—H. A. P.

FRED L. BUTTON

The sudden death of Mr. Fred L. Button which occurred October 2, 1927, was a great shock to his many friends. Mr. Button was born in Pontiac, Michigan, March 10, 1856, his parents moving to California in 1863. He was educated in the high school of Oakland and the University of California, graduating in 1876. After serving as instructor in the University he took up the study of law and was admitted to the bar in 1879. For many years he resided in Oakland.

Mr. Button's long interest in the study of Mollusca and the extensive correspondence required in building up his large collection made him one of the outstanding collectors of the old school. From a leaflet which he published on his collection we glean the following: The collection is a general one covering the marine, terrestrial, and fluviatile species of the world. It was commenced by Mr. Button's father in 1868. Since that time Mr. Button has made many collecting trips along the Pacific coast from Southern California to Alaska.

The collection, which we understand is for sale, contains over 12,500 species and named varieties, represented by

about 50,000 specimens. With the exception of the Unionidae, which are packed, the collection is arranged in eleven cabinets of 130 drawers with 50 trays set in. The land shells are represented by over 4,000 and the marine univalves by over 5,700 species. Mr. Button specialized on the Cypraeidae and this family is largely represented both in species and in number of specimens. He published a number of notes on the rarer species of *Cypraea* and *Trivia* in THE NAUTILUS, vols. 19, 21 and 22.

Mr. Button was interested in music and a member of several orchestras. He was also active in Masonic circles. He is survived by a widow and three daughters.—C. W. J.

THE BOSTON MALACOLOGICAL CLUB

The Boston Malacological Club has held its regular meetings during the past season, on the evening of the first Tuesday of the month, from October to May inclusive, at the Library of the Boston Society of Natural History.

The membership list continues at about forty, a few resignations having been offset by the acquisition of new members.

The speakers have, with one exception, been members of the Club. Two papers were given by Mr. William J. Clench, the president, one dealing with collecting fresh water forms in Kentucky, the other with a recent trip to Cuba, richly rewarded, as the land forms are so abundant there.

Mr. Arthur F. Gray, the Club's former president, described collecting both recent and fossil shells in Bermuda, Mr. Charles W. Johnson spoke on distribution and variation with a paper on New England limpets, and from Dr. Joseph C. Bequaert, the Club heard an account of the recent Harvard Expedition to western and central Africa.

Other meetings were devoted to the study of various families of marine shells, and one evening was given to a

talk by a non-member, Dr. Hubert L. Clark, who spoke on reef collecting on the little known Island of Tobago, West Indies.

The season's activities were brought to a close with the Annual Field Meeting, held on May 30th at Scituate, Mass., a small but enthusiastic band gathering at the life-saving station, to spend the afternoon on the stony beach, and the tract of marshland adjacent to it.

Fifteen species of living mollusks were observed, among the more interesting being *Petricola pholadiformis*, and *Zirphaea crispata*, which were dug out of the banks of an old marsh now nearly covered with a deposit of stones. Unusually large specimens of *Ilyanassa obsoleta*, the latter being present in enormous numbers in the marshy pools were also collected.

The gulls and sandpipers, a fine surf, and charming views to the landward added to the enjoyment of the trip. —THEODORA WILLARD, *Secretary*.

NOTES

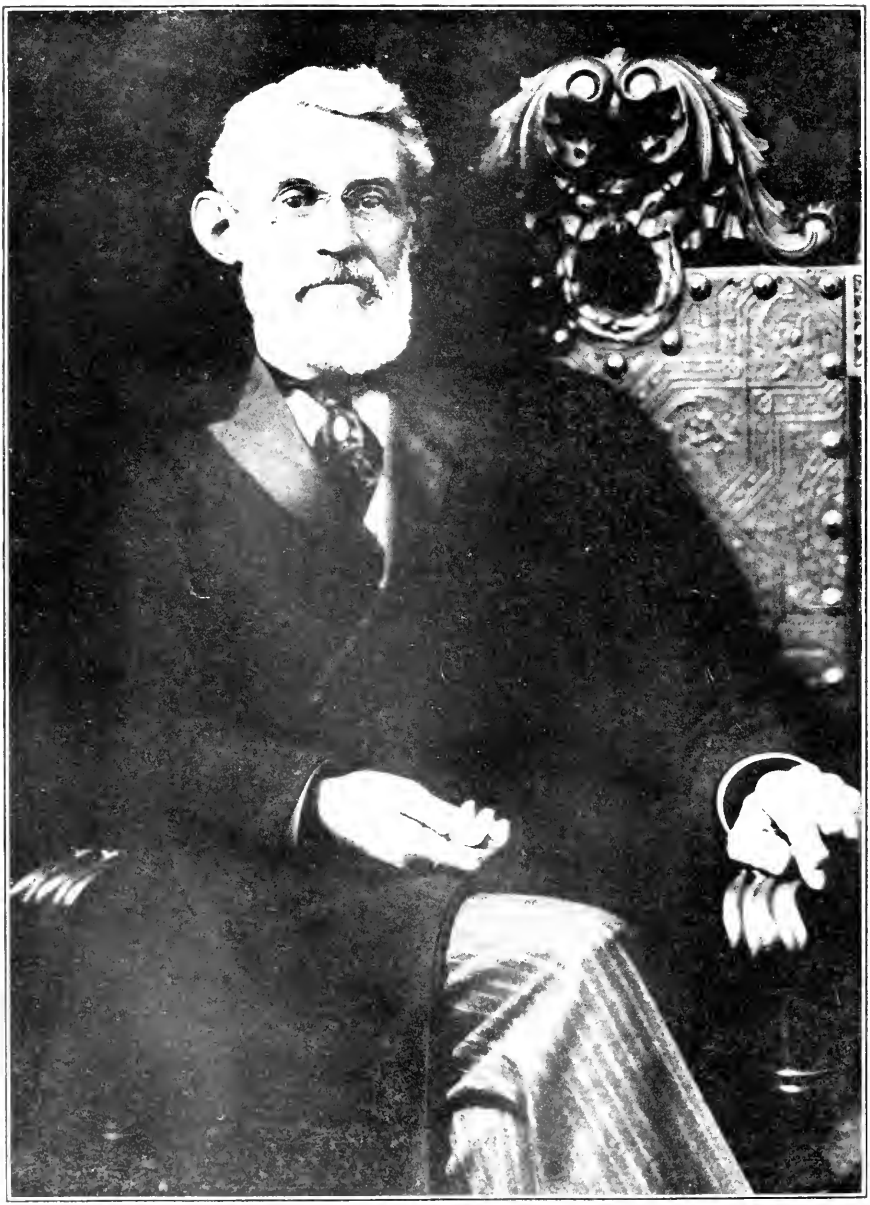
A PREDATORY POLYGYRA.—An adult *Polygyra multilineata* demonstrated the fact that in snails "herbivorous dentition" does not preclude carnivorous habits, which may even take a canibalistic turn. This snail was found under dead leaves in February, 1925, near Ann Arbor, Michigan, and placed in a terrarium in which several adult *Polygyra albolabris*, *P. monodon* and *Succinea* (sp.?) had been living amicably for some four months on a diet of leaf lettuce. Since no fatalities had been observed prior to the introduction of the *P. multilineata* my curiosity was aroused when I found fresh, empty *Succinea* shells lying in full view on top of the soil. Finally, I happened to look into the terrarium just after a victim had been seized. The

Polygyra multilineata turned the *Succinea* onto its back, then oriented it to the desired position, devoured the animal and "licked the shell clean" within a few minutes. Later, this individual laid viable eggs and appeared not to have suffered in any way from its unusual diet. Dr. P. O. Okkelberg kindly identified the snails for me.—ED. D. CRABB.

IO FLUVIALIS TURRITA Anthony.—An example of this species from Little River, 2 miles above Little River Station (M. C. Z. no. 45664; M. D. Barber, collector), seems worthy of record. This is a young specimen spinose on all six whorls. This condition was believed by Adams[1] to exist for this subspecies, but not known to occur, as at the time of his studies young examples were not available. This is the only subspecies of *Io* definitely known to occur spinose on the very early whorls. In addition, this is the first reported locality for any subspecies of this genus occurring in a small stream other than the headwaters of the main confluents of the Tennessee system. Eight collections were made on the Little River (Clench-Remington, 1924) between 6 to 11 miles upstream from this locality (10 to 15 miles from the mouth) without finding any *Io*.—W. J. CLENCH.

GENOTYPE OF SCHASICHEILA.—In a recent discussion of Mexican Helicinidae (1928, Oc. P. Mus. Zool. Univ. Mich. no. 193, p. 36), *Atoyac* is proposed as a new subgenus with the type *Schasicheila alata* (Menke). Since then, I have learned that Kobelt (1880, Ill. Conch., p. 202) has designated this species as the type of *Schasicheila*, so that my *Atoyac* is an absolute synonym of the typical subgenus. The new subgenus *Misantla* is now proposed for my *Schasicheila* s. s. (l. c.), with *S. misantlensis* F. & C., from Necaxa, Mexico (1928, p. 44) as genotype. *Misantla* has the inner marginals of the radula bicuspid and develops the principal spirals of the shell sculpture into cuticular ridges, which are almost continuous.—H. BURRINGTON BAKER.

[1] C. C. ADAMS. *Mem. Nat. Acad. Sci.* 12 (2): 14, 1915.



S. RAYMOND ROBERTS

THE NAUTILUS.

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NOTES ON SOME PACIFIC COAST ACTEOCINAS, WITH DESCRIPTION OF ONE NEW SUBSPECIES

BY G. WILLETT

For many years the two large, striated *Acteocinas* of the Pacific coast of North America, *culcitella* and *eximia*, have been treated as separate species. *Eximia*, the northern race, was said to differ from *culcitella* in shape of spire and absence of columellar fold. A large series of specimens from California and Alaska in the collections of the Los Angeles County Museum and the writer seem to demonstrate complete intergradation between the two forms. Also, an intermediate form, very easily differentiable in most instances, seems worth of a name.

In view of the above facts, the writer proposes the following arrangement of the species.

Acteocina culcitella culcitella Gould. The common California low tide form. Distinguished from the following by its long, pointed spire and heavy fold on the columella. *Acteocina cerealis* Gould appears to be the young of *culcitella*.

Acteocina culcitella eximia Baird. A northern shell dis-

tinguished by lack of heavy fold on the columella and short spire, excavated near the apex.

Acteocina culcitella intermedia, new sub species. Description: Shell cylindrical, with short spire, the latter, however, not excavated at the apex. Columellar fold wanting or only slightly indicated. Lip and aperture as in *A. c. eximia*. Type number 1015 collection of Los Angeles County Museum, dredged by G. Willett in 30 fathoms at Catalina Island, California, August 11, 1928. Measurements of type in millimeters: Alt. 14, Diam. 5.7, Alt. of spire 1.65. Paratypes in collections of A. M. Strong and the writer.

Intermedia is easily separated from typical *culcitella* by much shorter spire and absence of heavy columellar fold; it differs from *eximia* in more pointed and *unexcavated* spire. All of the specimens of *intermedia* seen by the writer have been dredged in from twenty to forty fathoms off the southern California coast. A few specimens of apparent intergrades between *intermedia* and *eximia* were dredged in twenty-five fathoms near Craig, Prince of Wales Island, Alaska, while at Forrester Island, fifty miles to the southeast, only *eximia* was found.

Los Angeles County Museum,
Los Angeles, California.

ACMAEA TESTUDINALIS MÜLL. IN CABSCOOK BAY, EASTPORT, MAINE

BY OLOF O. NYLANDER

During the summer of 1906 I spent a month—from the middle of June to the middle of July, collecting fossils in

region about Eastport. Nearly all the fossiliferous rocks are best exposed in the tidal area and while collecting I sometimes came upon large colonies of living mollusks. On July 5, at Denbow Point, Cobscook Bay, six miles west of Eastport, the rocks at low tide were literally covered with limpets of all sizes; they extended a foot or more above low-water mark. In the water just below the rocks *Buccinum undatum* and *Colus stimpsoni* were also obtained. Most of my limpets have been distributed among collectors and only 28 specimens remain in my collection. The color markings vary considerable and two are plain gray; the following measurements, including the largest and smallest from the locality show to what extent the specimens vary.

Length	Width	Height
43 mm.	33 mm.	12 mm.
42½ mm.	32½ mm.	13 mm.
41½ mm.	31 mm.	12½ mm.
41 mm.	32 mm.	14 mm.
41 mm.	32 mm.	11 mm.
35 mm.	27 mm.	10 mm.
31½ mm.	25 mm.	10 mm.
25 mm.	19 mm.	9 mm.
20½ mm.	15 mm.	6 mm.
14½ mm.	11 mm.	4 mm.

Any one interested in the study of *Acmaea testudinalis* and other northern mollusks should consult the following paper: "Northern and Arctic Invertebrates in the collection of the Swedish State Museum (Riksmuseum) by Dr. Nils Odhner (Kungl. Svenska Vetenskapsakadem. Handlingar, Band 48, no. 1, 1912). This paper is in English and gives the geographical and bathymetrical distribution, color variation, etc. Dr. Nils Odhner is a very active worker in the Riksmuseum, Stockholm, and has published many papers of interest to all workers on New England mollusca.

ON ENGINA ZONATA OF GRAY AND OF REEVE

BY J. R. le B. TOMLIN

Engina zonata Gray has been generally overlooked, as it was published without a figure. The genus *Engina* was first published in the "Zoology of Capt. Beechey's Voyage," p. 112, 1839, and two new species, *zonata* and *elegans*, are assigned to it on p. 113. In Proc. Zool. Soc. 1847, p. 133 Gray alters the spelling to *Enzina* and selects the first species, *zonata* as type.

In the British Museum we still have portions of Gray's collection, mounted on the thin oak tablets which he always used, and I find one of these labelled "*Enzina zonata* Gray, B. V. 113," with 2 examples of a shell which is more usually known as *Engina leucozona* (Phil.),=*Bucc. leucozonum* Phil., Zeit. f. Malak. I. 111, 30 July, 1844. It is a rare Mediterranean species, recorded from Sicily, the Adriatic and the Aegean Seas, and Weinkauff complained that it has never been figured. Tryon and Kobelt have attempted to remedy this, but have both figured another species.

Reeve, Conch. Icon. III, *Ricinula* pl. 5, f. 33, Sept. 1846, describes a *R. zonata* in the Mus. Cuming which is likewise an *Engina* and which I propose to rechristen *Engina melanozona*.

Reeve gives the locality as Charles Is., Galapagos (Cuming), which is almost certainly erroneous. It is common in the New Caladonian region and occurred by hundreds in the Hadfields' Lifu collections.

ODOSTOMIA (IVIDELLA) MARIAE, new species

BY PAUL BARTSCH
Curator of Mollusks, U. S. National Museum

Shell very minute, cream yellow. The nuclear whorls are deeply immersed in the first postnuclear turn, the tilted edge of the last volution only projecting. The first postnuclear whorl bears a strong cord above the channeled suture at its beginning, and later develops the axial riblets characteristic of the succeeding turns. The rest of the postnuclear whorls are strongly, tabulatedly shouldered at the summit, and marked by 14 very strong, slightly retractively slanting, distantly spaced, sublamellar axial ribs which form slight cusps at the outer edge of the shoulder at the summit and which, on the last turn, pass over the posterior portion of the rather long, well rounded base, evanescing before reaching its middle. The spiral sculpture consists of a strong cord a little above the periphery which leaves a deep channeled suture anterior to it, and by 5 additional equally strong and almost equally spaced cords on the base, the anterior one of which is backed by the inner lip. Aperture oval; posterior angle obtuse; outer lip moderately thin; inner lip strongly curved, reflected over and appressed to the base for almost its entire length, and provided with a rather strong fold at its inception. Parietal wall covered by a moderately thick callus.

The type and only specimen, U. S. National Museum Catalogue Number 369001, was collected by Miss Marie Stadnichenko in Well No. 2136 of the International Oil Company, at a depth of 80 feet, probably in a Quaternary formation. The locality is close to the coast, near the town of Vichayal in the northwestern corner of Peru, about 17 miles north of Paita, 17 miles southeast of Negritos, about

Lat. 5° S.; Long. 82° W. It measures—length, 1.5 mm.; greater diameter, 0.7 mm.

I take pleasure in naming this for Miss Stadnichenko. It will be figured in the next number of NAUTILUS, plate 1, fig. 1.

HELIX NEMORALIS L. IN ONTARIO

BY H. A. PILSBRY

Sometime ago Mr. Harry W. Trudell handed me a young snail from Owen Sound, Ontario, given him by Mr. W. R. McColl of that place, which was evidently either *Helix (Cepaea) nemoralis* or *hortensis*. On applying to Mr. McColl he sent a series of 19 specimens of *H. nemoralis*. So far as I know, this is the first Canadian record of this handsome snail. All are five-banded, 12345, or one specimen 12(345), three bands united on the last fourth of the whorl. The ground is pale pink to very pale yellow. Of their occurrence Mr. McColl writes as follows:

"In reply to your request of June 1st I sent you a few days ago a few specimens of snails, *Helix nemoralis*.

"You intimate that this snail has not been known from this part of Canada. Will you kindly say if it is known from any other part of Canada; as I have not come across it anywhere but here. It was very scarce indeed 38 years ago when I first came here.

"My nephew sent one from France during the war, about 1917, a specimen apparently identical with those found here, also two other shades with yellow predominating; also a pinky specimen very similar to ours.

"This snail has what appears to me to be a peculiarity,

that is its habit of climbing trees just prior to or during rain storms. I have repeatedly seen them as high as fifteen feet up, and each specimen I sent you I picked off maple shade trees. At times I have seen them on fence posts and fence boards, but cannot recall seeing them on telegraph or telephone posts. For years they were found only near the Marine Hospital on the west side of the city. After years they spread along the bank for perhaps half a mile; after which they crossed the valley and intervening river Sydenham, and are now found on the east side, over an area of perhaps one quarter mile wide.

"A favorite 'roost' for them in damp weather is the round Equisetum or scouring rush stalks, where I have seen them from the size of a pea with soft-edged shells (undeveloped) up to mature specimens."

NORTH AMERICAN VERONICELLIDAE

BY H. BURRINGTON BAKER

In a recent paper, "On some North American Vaginulidae" (1927, Proc. Acad. Nat. Sci. Philadelphia 79, pp. 209-221), Dr. Hans Hoffmann criticizes strongly and, I must confess, quite justly, his impression of my attitude (1925, P. A. N. S. P. 77, pp. 157-184) towards his monograph, "Die Vaginuliden" (1925, Zeitschr. Naturw. Jena 61, pp. 1-374). I do not think that anyone realizes better than myself just how much every student of slugs is indebted to the truly epoch-making labors of Dr. Grimpe and Hoffmann on this group. From a previous chaos of misleading, conflicting and worthless descriptions, they have developed a

complete and logical system. Such a feat is very impressive, and I now realize that I did utilize somewhat the method of the old berserkers in order to fortify my courage for an attack on even minor details of its organization. I am sorry that I permitted myself the crudeness of some of those criticisms, but Drs. Grimpe and Hoffmann must realize that my vehemence is actually a compliment to the formidable strength of their own contributions.

However, the fact remains that I still believe that their exceedingly helpful (in fact indispensable) monographs are slightly marred by a disregard for priority and by a tendency to underestimate the value of other characters, than those of the verge, in the separation of species. I appreciate thoroughly their enormous contribution to our knowledge of the Veronicellidae, but I do think it was an error to add (to the 29+ earlier group-names) eight new terms, where only one (*Semperula*) was actually necessary.

In view of Dr. Hoffmann's additional contribution to the subject, I may perhaps be excused the following review of my own present opinions:

Veronicella laevis Blainville, and var. *schivelyae* (Pilsbry).

As Dr. Hoffmann and myself differ so widely in the identification of *Onchidium sloanii* Cuvier, it seems best to regard it as a nomen dubium and to drop it entirely from nomenclature. However, I must plead for the retention of *Veronicella laevis*, which name, at any rate, has never been identified with any other species than the one for which Dr. Cockerell and myself gave the first detailed descriptions and which Dr. Hoffmann now agrees is a valid and distinct one. Although I realize that such careless and erroneous work as that of Blainville does not deserve even the slight honor of the acceptance of his *Veronicella*, I still think that it is more practical to use his name than to reject it, although it is my own *Leidyula* that suffers by such recognition. Besides, the malacologists of England and America have commonly used *Veronicella* to the exclusion

of *Vaginulus*, while the Germans and French have usually reversed the process; why not compromise and retain both of them as long as they do not conflict with each other?

Veronicella moreleti (Crosse et Fischer) (+ *floridana* Hffmn.)

Originally, I thought that the ridges on the verge of adult specimens of this species were simply the result of pressure against the edge of its sheath. As a result, I drew the verge of a specimen in which they were not very highly developed and carelessly neglected to add another figure to show their extreme development. Fortunately, Dr. Hoffmann has rectified this omission; in my opinion, his figure 4 (1927, p. 216) is an excellent representation of this phase. Comparison of this figure of the verge of his "*Leidyula floridana*" with my figure of that of *V. moreleti* (1925, pl. 4, fig. 10) will show a substantial agreement in the *arrangement* of the ridges despite considerable difference in their prominence. For this reason, I feel certain that what he calls *L. floridana* is actually *V. moreleti.*

The most important difference between *V. moreleti* and the true *V. floridana* is the ovoviviparity of the former and the oviparity of the latter species. *V. moreleti* is still the only one known from Mexico or Central America.

Veronicella floridana (Leidy).

The prominence of the ridges of the verge also varies considerably in this species, although I believe this is partly due to differences in maturity. Here again, my figure (1915, pl. 4, fig. 13) represents a verge in which the ridges are weakly developed. However, their *arrangement* is quite constant and does differ markedly from that in *V. moreleti;* as I pointed out in my key, they "separate gradually without confluence and extend beyond apical 1/2 (i. e., to near base) of organ". Their extreme development, as seen especially in Cuban specimens, does approach closely the condition shown in Semper's figure of the verge of what he identified as *Vaginula sloanei.* The retractors of the

verge are variable in the large Cuban series examined by me; the more median fibers may separate from the rest of the muscle so as to form two diverging bundles. A slighter degree of this same splitting of the vergic retractor has also been observed in some specimens of *V. laevis* (Cf. H. B. B.: 1925, p. 165, pl. 3, fig. 5).

For these reasons, I am still inclined to believe that my *V. floridana* and Semper's *V. sloanei* are the same species. If "*Belocaulus sloanei*" does completely lack the vaginal pouch, it would be a species that I had never seen, while, at the same time, I would be compelled to believe that Dr. Hoffmann, in turn, had never examined an adult specimen of the true *V. floridana*. The approximation of so many of our locality records makes this seem rather improbable.

Veronicella kraussii (Férussac)?

Dr. Hoffmann believes that this species, for which I have tentatively retained Férussac's name, is a synonym of his "*Leidyula floridana*" (=*V. moreleti*). It probably is closer to *V. moreleti* than to *V. floridana*.

Vaginulus occidentalis (Guilding).

The principal divergence between Dr. Hoffmann's classification and my own is due to his almost complete dependence on the characters of the verge; as he writes himself: "Of the interior organs only the verge may be of use for this purpose" (exact and sufficient characterization of a species). On the other hand, I am firmly convinced that, in our American species, at least, the terminations of the female genitalia are of prime systematic importance, although the difficulties in their dissection have resulted in many conflicting statements about their structure. Partly on this account, I still must consider *Vaginulus* (*Latipes*) *occidentalis* as much more closely related to *Vaginulus* and *Phyllocaulis* than to the group which I call *Veronicella*.

Since my 1925 paper, Dr. Stewart has called to my attention an earlier choice of genotype for *Vaginulus*, that of Chenu (1858, Encycl. d'hist. natur.; Crust., Moll. &

Zoophytes, p. 133), who also designated *V. taunaisii* Fér. (although he misspelled it *tannaisii*).

Dr. Hoffmann's indignant comments have also called to my attention the fact that I neglected to define my method of measurements. In my tables, the length of the slug is taken as the length of its notum along the long axis of the straightened animal, which, of course, is the sum of the distances between the female opening and the two ends of the notum (measured along the same axis). Dr. Hoffmann measures the length of the animal around its dorsum, while he determines the position of the female opening along its venter. In badly contracted and curled animals, these two sets of measurements differ considerably, so I took the sum of his distances between the female opening and the ends of the notum as the nearest equivalent to my own determination of length.

Attention is also called to two group-names in the Veronicellidae which I missed in my earlier list (1925, Naut. 39, p. 13):

Leonardia Tapparone-Canefri (1889, Ann. Mus. Civ. Genova 27, p. 331), monotype *L. nevilliana* T.-C. (1889, p. 332), from Burma. [Canefri separates this "genus" from "*Vaginula*" on a supposed difference in position of the female opening, although he confesses he could not find it! He seems also to have lost the connection between the prostate and the hermaphroditic duct and fails to describe the verge. Otherwise, there is nothing to keep *L. nevilliana* out of the synonymy of *Vaginulus birmanicus* Theobald (1864, J. A. S. Bengal 33, p. 243). However, it would be a shame to change the name of Grimpe and Hoffmann's *Semperula* on the basis of such a dubious description.]

Valiguna Grimpe & Hoffmann (1925, Nova Cal. Zool. 5, p. 391), authors' type *Va. schneideri* Simroth (1894, S.B. Naturf. Ges. Leipzig, 19-20, p. 7), from east Sumatra. [This is a subdivision of *Semperula* G. & H.]

THE MOLLUSCA OF CHAUTAUQUA LAKE, NEW YORK, WITH DESCRIPTIONS OF A NEW VARIETY OF PTYCHOBRANCHUS AND OF HELISOMA*

BY FRANK COLLINS BAKER

Chautauqua Lake is one of the most interesting physiographic localities in New York State and seems to have been studied the least from a biological standpoint. Only three references occur which give any sort of comprehensive list of the species of Mollusca present, and but one of these (Ortmann) pays particular attention to the lacustrine character of the species. During the early part of August, 1927, a week was spent at the Chautauqua Assembly grounds and a small collection was made of those species that could be obtained from the shore. As no plans had been made for studying the lake, equipment necessary for such work was totally lacking. The success of this incidental shore work indicates that a rich harvest of interesting forms awaits the student who will make modern investigations of this lake fauna in comparison with that found in the outlet, Conewango Creek.

Chautauqua Lake is situated in Chautauqua County in the extreme southwestern part of the state. It is about 22 miles long and some three miles wide at its maximum extension, but is less than a quarter of a mile in one place. While the greatest part of the lake is relatively shallow, there are several places where the water is 60 and 80 feet in depth, the latter between Chautauqua and Long points. The northern part of the lake is shallow, not exceeding 20 feet in depth. The altitude of the lake is 1,338 feet above sea level and more than 700 feet above Lake Erie. It lies at the

* Contribution from the Museum of Natural History, University of Illinois, No. 45.

edge of the southwestern plateau province overlooking the Lake Erie plain. A narrow place at the middle of the lake suggests the presence of a preglacial divide which Dr. Tarr suggests (Physical Geography of New York State, p. 205) may indicate that the "lake is made up of parts of two valleys, one north-sloping, the other south sloping, and each dammed by heavy morainic accumulations".

The drainage is into the Allegheny River and hence the species belong to the Ohio River drainage and not to the St. Lawrence River, as is the case with the Finger Lakes and other large and small lakes in New York State. A study of the mollusk fauna suggests that the species migrated up the Allegheny River into the lake following the Wisconsin stage of glaciation and there became modified into characteristic lake varieties, in much the same manner as did the faunae now occupying the many lakes in Wisconsin and Michigan. Nearly all species show lake environmental influences, some forms to a greater extent than others. The two varieties believed to be new are doubtless lake variants of normal river types. A study of this lake such as was made of Oneida Lake for the State College of Forestry at Syracuse University by the writer would result in much addition to our knowledge concerning distribution and variation among aquatic species.

The lake is filled with vegetation (*Scirpus, Myriophyllum, Potamogeton, Elodea, Ceratophyllum,* etc.) which should support a large fauna of mollusks and insects. What may be found in the deeper parts of the lake can only be surmised. In passing, one wonders why the Chautauqua Institution has not instituted some lake studies along with the courses in nature study yearly given. The lake is admirably adapted for limnological studies and the Institution might render a real service to science by conducting lake work in biology.

Mention should be made of the excellent collection made many years ago by Miss Carlotta J. Maury. The species

were identified before much of our knowledge concerning the variation of species coincident with environment was available. Through the kindness of Dr. P. R. Needham, of Cornell University, the writer has been enabled to examine the collection of mollusks made by Miss Maury in Chautaqua Lake, and deposited in the Museum at Cornell. This is an excellent example of the importance of and great necessity for preserving material upon which papers have been based so that subsequent investigators may reëxamine it when additional studies may be made, as in the present instance. Several doubtful references of species to this lake fauna have in this way been cleared up.

In the course of work upon the collection personally made assistance has been received from Dr. V. Sterki, who identified Sphaeriidae, and Dr. Bryant Walker, who identified the Ferrissia. Mr. W. E. Burnett, of Bradford, Penn., also supplied certain species from the lake. My thanks are due each of these persons for their assistance.

In the following annotated list the species cited by Maury, Evermann, and Ortmann are included, thus bringing down to date all that is at present known concerning the mollusk fauna of the lake.

ELLIPTIO DILATATUS STERKII Grier.

Bemus Point and Celeron (Ortmann); Chautauqua Lake (Evermann, Maury); Celeron (Burnett); Chautauqua Assembly (Baker).

The *dilatatus* of the lake appear to be referable to *sterkii* rather than to the typical form. Of these Ortmann says, "This is a form distinctly inclining towards *sterkii*. It is rather small (longest 79 mm.) is also slightly more swollen than the true *dilatatus*, and has the beaks a little more anterior; but with regard to color, the Chautauqua form does not differ from *dilatatus*" (1919, p. 102). The color of the specimens personally collected varies from the river form to the lake Erie form. Measurements are:

L. 73; H. 37; D. 20 mm. Chautauqua Lake.
L. 72; H. 35; D. 20 mm. Chautauqua Lake.
L. 68; H. 32; D. 20 mm. Chautauqua Lake.
L. 87; H. 46; D. 28 mm. Grier's measurements of *sterkii.*
L. 59; H. 31; D. 18 mm. Grier's measurements of *sterkii.*

Much the same form occurs in Lake Winnebago, Wisconsin, and it would appear that all of these small forms should be referred to *sterkii* as a distinct lake race, varying more or less in color, but agreeing in form. They are all ecological responses to changes of environment from river to lake. The nacre of the Chautauqua Lake form varies from almost white to dark purple.

ANODONTA GRANDIS FOOTIANA Lea.

Anondonta grandis, var. *footiana,* and var. *decora* of Maury's list.

Bemus Point, Griffith Landing, Celeron (Ortmann); Celeron (Burnett); Chautauqua Lake (Evermann, Maury); Chautauqua Assembly (Baker).

Call, in 1885 (p. 11) correctly referred the Chautauqua Lake Anodonta to *footiana.* Ortmann (p. 144) refers it to *grandis,* stating in a footnote, however, that it represents a peculiar local race greatly resembling *benedictensis,* but not *footiana.* The lake form is, however, exactly like the *footiana* from the type locality, Lake Winnebago, Wisconsin, although the shell is not quite as thick as in that locality.

STROPHITUS RUGOSUS (Swains).

Chautauqua Lake (Maury); Chautauqua Assembly (Baker).

The Chautauqua Lake *rugosus* is a small form varying toward the race called *rhombicus* by Anthony, but differing from that form in many respects. Only two specimens were collected and these are without beak markings, hence its relationship with other lake varieties is not possible. It most nearly resembles the creek form, which should be

known as *Strophitus rugosus pavonius* (Lea). It is not *undulatus* as thought by Evermann. This is not recorded by Ortmann but is mentioned by Evermann and Maury.

PTYCHOBRANCHUS FASCIOLARIS LACUSTRIS var. nov.

Remus Point, Griffith Landing, Celeron (Ortmann); Chautauqua Assembly Grounds (Baker); Celeron (Burnett); Chautauqua Lake (Maury).

Shell differing from typical *fasciolaris* of the Allegheny and Ohio Rivers in being smaller, relatively higher and shorter, the young not as pointed posteriorly and becoming humped when quite small; female shell with a deeper central marsupial sulcus; growth lines more crowded and regular, the green spots in many specimens being on the impressed growth line, with a bare brown space below, marking the shell into regular zones.

L. 77; H. 46; D. 25 mm. Male. Type.
L. 72; H. 43; D. 23 mm. Male. Paratype.
L. 74; H. 41; D. 22.5 mm. Female. Paratype.
L. 68; H. 38; D. 27 mm. Female. Paratype.

Types: Museum Natural History, Univ. Ill., No. Z23779. *Paratypes:* Acad. Nat. Sci. Phil., No. 144807.

Ortmann (p. 210) calls attention to the peculiar form of *Ptychobranchus* found in Chautauqua Lake but does not consider it of enough importance for a varietal name. However, it appears quite as important as the forms of other naiades which have become different from the river forms through inhabiting a lake environment. Some specimens greatly resemble forms living in Green River, Kentucky. This naiad is not mentioned by Evermann, though it is the most abundant species in the lake, as far as personal observation is concerned.

LAMPSILIS SILIQUOIDEA ROSACEA (DeKay).

Chautauqua Lake, various localities (Ortmann); Chautauqua Assembly (Baker); Chautauqua Lake (Maury).

The small form of *siliquoidea* in this lake is referable to the race *rosacea*, although Ortmann referred them to *luteola* (*siliquoidea*), remarking that they varied toward *rosacea* in size, but that other characters were normal (p. 290). The form as a whole is undoubtedly related to *rosacea*, and should be so referred. It is like many forms of this race common in Wisconsin and Michigan. The nacre is dull white with a few specimens showing a pinkish tint. The largest specimen measures: L. 3; H. 45; D. 27 mm. The epidermis is brownish or yellowish green with rather distinct rays in many specimens.

LAMPSILIS VENTRICOSA LURIDA Simpson.

Lake Chautauqua (Ortmann); Chautauqua Assembly (Baker).

Only a few odd valves of a Lampsilis referable to this race were collected. These agree with specimens from Wisconsin and Michigan. It can not be referred to typical *ventricosa* of the rivers. *Lurida* is not the same as *canadensis* Lea, that race being a small, peculiarly angled form common in the great lakes. *Lurida* was well characterized by Simpson for the abundant form of *ventricosa* found in all the northern lakes and differing markedly from any form of the river *ventricosa*. Ortmann considered the Chautauqua Lake form typical *ventricosa* (p. 305) but it differs from this in the same characteristics as do the lake forms found in Michigan and Wisconsin.

SPHAERIUM FALLAX Sterki.

Sphaerium simile; S. striatinum, var. Chautauqua Lake (Maury); *S. sulcatum* and *striatinum;* Chautauqua Lake (Evermann); Chautauqua Assembly (Baker).

This new species of Sphaerium is very abundant in the lake and has been recorded as both *simile* (*sulcatum*) and *striatinum*. Dr. Sterki states that it may also be found in other places in the Great Lakes region, especially in Michigan and Wisconsin. The Chautauqua Lake form is smaller than the average from more northern places.

SPHAERIUM RHOMBOIDEUM (Say).

Chautauqua Lake (Evermann); Chautauqua Assembly (Baker).

Common and uniform in shape. The shore may be fairly strewn with the empty valves of this species after a storm.

MUSCULIUM ROSACEUM (Prime).

Chautauqua Assembly (Baker). One broken valve apparently referable to this species was found in beach material. Dr. Sterki states that there is a single specimen of this specimen in the Carnegie Museum from Chautauqua Lake.

PISIDIUM INDIANENSE Sterki.

A single large fine specimen of this species occurred with other beach debris from the Chautauqua Assembly grounds. Apparently the first record from an eastern locality.

PISIDIUM SCUTELLATUM Sterki.

Chautauqua Lake (Maury). No examples of the small species of this genus were found by the writer. Such doubtless exist, and many species should be found by careful collecting.

VALVATA TRICARINATA (Say).

Chautauqua Lake (Evermann, Maury); Chautauqua Assembly (Baker).

All typical, with three distinct carinae. One specimen occurred in which the central carina was rather faint, indicating a variation toward the variety *perconfusa*.

VALVATA SINCERA NYLANDERI Dall.

Shore of Chautauqua Lake at Assembly grounds on rocks in shallow water. This Valvata appears to be the regularly ribbed form of *sincera* called *nylanderi* by Dall. It is large (H. 3.5; D. 4.5 mm.), the umbilicus is round and deep, and the spire as in the variety from the north. The spire varies considerably in height.

CAMPELOMA DECISUM (Say)

Chautauqua Lake (Evermann, Maury); Chautauqua Assembly (Baker).

Common on the shore in beach debris. The species appears referable to *decisum* having the normal form of embryonic shell characteristic of that species. The apex is entire in most specimens.

AMNICOLA LIMOSA (Say).

Amnicola pallida of Maury's list.

Mouth of Goose Creek (Maury). The set in the Cornell University collection shows some variation, mostly a widening toward the lake variety *porata*.

AMNICOLA LIMOSA PORATA (Say).

Amnicola limosa of Maury's list. Lakeland, Chautauqua Lake (Maury); Chautauqua Assembly, common on rocks near shore in shallow water (Baker).

The lake form is typical *porata*, showing the same sex dimorphism as noted in the variety as found in Wisconsin and Michigan.

AMNICOLA PILSBRYI Walker.

Amnicola granum of Maury's list. Lakewood (Maury); Chautauqua Assembly, on rocks near shore in shallow water (Baker).

PYRGULOPSIS *cf.* LETSONI (Walker).

Bythinella nickliniana and *attenuata* of Maury's list. Burtis Bay and Sherman Bay (Maury, 31164, 31165, Cornell Univ. Museum).

Seven specimens, two of which appear mature, are in the Cornell collection, which appear to be a form of *letsoni*. They resemble the form as found in the original locality (Goat Island) but differ somewhat from the form found in La Plaisance Bay, Lake Erie, Mich., and in the fossil deposits near Chicago. The Michigan specimens are narrower with lower whorls and deeper sutures and are longer. Not

enough material is at hand to settle this point, but it is probable that some of the forms should be separated to form either species or races of *letsoni*. The largest specimen, from Sherman Bay, measures L. 3.4; D. 1.5 mm.

STAGNICOLA EMARGINATA CANADENSSIS (Sowb.).

Limnaea palustris (Evermann). *Limnaea emarginata* and *catascopium* of Maury's list. Lakewood and White's Bay (Maury); Chautauqua Assembly (Baker); Celeron (Burnett).

The large Lymnaeid of Chautauqua Lake appears to be referable to the race called *canadensis* by Sowerby. It is less elongated than the typical form of the race from Michigan but is otherwise similar. All of the lake forms of this type of shell in New York appear to stand about midway between typical *emarginata* as found in Maine, and *canadensis* as it occurs in the northern lakes. The specimens referred to *catascopium* by Miss Maury are immature *canadensis*, the stage before the lip is thickened and the inner lip spread over the columella and forming the emargination. Perhaps the New York lake form should constitute a distinct race representing a response to a large lake environment. It is very abundant in Chautauqua Lake. A few young animals with shells 8 mm. long, were found on rocks near shore in shallow water.

FOSSARIA MODICELLA (Say).

On rocks in shallow water near shore and on wet ground just above the water line, Assembly grounds. Very abundant.

HELISOMA ANTROSA (Conrad).

Planorbis bicarinatus (Evermann and Maury).

Chautauqua Lake (Evermann, Maury); Chautauqua Assembly (Baker); Sherman's Bay and near Outlet (Maury, Cornell coll.).

Abundant along shore on rocks in shallow water. The

antrosa of the lake are not typical of the species as found in the rivers of the south, in which the spire whorls are sunken below the body whorl and the umbilicus is wide and deep. The majority of specimens have a very low axial height combined with great diameter, the spire is almost flat and only the apical whorls are, as a rule, sunken below the general level. The form is very variable, from ecarinate to strongly bicarinate. Many are similar to the *bicarinata* of Lea from the Delaware River near Philadelphia. All are apparently referable to *antrosa*, though a few resemble an unnamed variety found abundantly in northern Wisconsin. This form probably shows the effect of a lake environment on a river species.

HELISOMA CAMPANULATA (Say).

Chautauqua Lake (Evermann, Maury); Prendergast Bay and near Outlet (Maury, Cornell coll.); Chautauqua Assembly (Baker).

The *campanulata* of the lake vary toward the race called *wisconsinensis* by Winslow, having the raised spire so characteristic of that form. One or two specimens from Prendergast Bay (Cornell coll., 31120) have a large axial height. The specimens observed are all rather small. Living individuals were found bordering the shore of the Assembly grounds in shallow water, on rocks and the bottom.

HELISOMA TRIVOLVIS CHAUTAUQUENSIS var. nov.

Chautauqua Lake (Evermann, Maury); Cheney's Point (Maury, Cornell coll.); Chautauqua Assembly (Baker).

Shell smaller than typical *trivolvis*, with 3½ whorls, sculpture of coarse, more or less equidistant ribs; spire flattened, whorls in same plane or the coil of the last whorl raised somewhat above the general plane, subangulated at the shoulder; base with narrow but deep umbilicus, showing 2½ whorls, the inner ones slightly subangulated; body whorl sharply angled above at the shoulder; aperture long-

ovate, wider below, angled above, the outer lip slightly effuse; color of shell brownish horn.

H. 10; D. 16.5; Ap. H. 9.7; D. 6.0 mm. Type.
H. 10; D. 15.8; Ap. H. 9.8; D. 6.0 mm. Paratype.
H. 10.1; D. 16.0; Ap. H. 9.9; D. 6.0 mm. Paratype.
H. 10.0; D. 16.2; Ap. H. 9.9; D. 5.9 mm. Paratype.

Types: Museum Natural History, Univ. Ill., No. Z23780. *Paratypes:* Acad. Nat. Sci. Phil., No. 144806.

The small size and less number of whorls, the narrow aperture, deeply excavated base and flattened spire distinguish this form of Helisoma from *trivolvis*. It somewhat resembles variety *winslowi* from the northern lakes of Wisconsin, having the same number of whorls; but in that race the body whorl is sharply angulated above and below and the shell has a much greater axial height. Nothing exactly like the Chautauqua Lake form has been seen from any lake and it appears to be a *trivolvis* modified by lake conditions. It is very abundant along the shore of the Assembly grounds, the young and immature living on the flat rocks bordering the shore in shallow water.

GYRAULUS DEFLECTUS (Say)

Planorbis deflectus and *hirsutus* of Maury's list. Lakewood, Sherman's Bay, Fluvanna (Maury, Cornell coll.); Chautauqua Assembly (Baker).

On rocks bordering the shore in shallow water. The form varies from a sharply keeled condition of the periphery to subangulated ,the latter approaching variety *obliquus* of Dekay. The *hirsutus* listed by Maury are fine adult examples of *deflectus* with the hair-like epidermis well preserved.

GYRAULUS PARVUS (Say).

Lakewood, on stones bordering the shore (Maury, Cornell coll.). Apparently quite typical; compared with specimens from near Philadelphia.

MENETUS EXACUOUS (Say).

Prendergast Bay (Maury, Cornell coll.). Quite typical.

FERRISSIA TARDA (Say).

Ancylus rivularis of Maury's list.

White's Bay (Maury, Cornell coll.); Chautauqua Assembly (Baker).

Common on rocks along shore in shallow water. Dr. Bryant Walker, who kindly examined the specimens, refers the specimens to the eastern form of the species which is not quite typical.

PHYSELLA ANCILLARIA (Say).

Physa ancillaria and *P. heterostropha* of Maury's list.

Chautauqua Lake (Maury, Evermann); Lakewood (Maury, Cornell coll.); Chautauqua Assembly (Baker).

The *Physella* of the lake is somewhat different from the typical form as found in rivers. It is smaller and the spire is more regularly dome-shaped and the peculiar shouldered appearance of the typical form is wanting in the majority of specimens. These were identified as *heterostropha* in Maury's list. The presence of a few large shells which are undoubted *ancillaria* seems to indicate that the species should be referred to typical *ancillaria* It is very common in the lake.

SUCCINEA RETUSA Lea.

SUCCINEA AVARA Say.

ZONITOIDES NITIDA (Müller).

The three species of land mollusks listed above occurred more or less abundantly along the shore of the Assembly grounds, near the edge of the water.

POLITA DRAPARNALDI (Beck).

A single specimen of this species was found among beach debris north of the wharf of the Assembly grounds. Where it came from is not known.

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SHERWOOD RAYMOND ROBERTS
1845-1928

S. Raymond Roberts was born in Philadelphia on August 30, 1845. He was the son of Spencer and Louisa J. Roberts, prominent members of the Society of Friends.

Early in life Mr. Roberts became interested in natural history, and at the age of about twenty-one, he was one of the group of members of the Academy of Natural Sciences of Philadelphia who associated themselves for the study of Mollusca as a Conchological Section (founded December 26, 1866). Mr. Roberts was made Recorder, a position he held for many years.

His first scientific paper was published in 1868, "De-

scription of a New Species of Cypraea" (American Journal of Conchology IV). Although he built up a general collection of some size, his main interest was always in the Cypraeidae. In 1885 his monograph of this family was published in Tryon's Manual of Conchology, Vol. VII. This was his longest contribution to science. His last paper was an excellent and well illustrated account of some new Japanese Cypraeidae (Nautilus, January, 1913). His collection of Cypraeidae was left to the Academy of Natural Sciences.

In 1888, upon the death of Mr. Tryon, who had been his closest friend for many years, Mr. Roberts assumed the office of Treasurer of the Conchological Section, and when this was merged in the Department of Mollusca of the Academy he was continued as treasurer of the Manual of Conchology until his death. Although the office demanded a considerable amount of work, it was honorary so far as emolument was concerned, and for many years, until he retired from active business affairs, this was the work of evenings and other hours usually devoted to recreation.

In 1889 he removed from Germantown, Philadelphia, to Glen Ridge, New Jersey, and some time thereafter acquired a summer home on Marthas Vineyard, Massachusetts.

Mr. Roberts took an active interest in the local affairs of the communities where he lived. He was a charter member of the Pennsylvania Society of New York, and a life member of the Pennsylvania Horticultural Society. He died at his summer home in Vineyard Haven on August 19, 1928.

Personally Mr. Roberts was a well built, handsome man of fine presence. Up to an advanced age he gave the impression of abounding vitality. Optimistic, a good friend and a wise counsellor, his death leaves a place which cannot be filled in the lives of his old associates. He is survived by a widow, one son and two daughters.

H. A. PILSBRY.

HENRY CLIFDEN BURNUP

Born April 21, 1852, Died April 23, 1928

With the passing of Henry Clifden Burnup, Maritzburg lost a citizen of distinction, who during his long residence earned the respect of the entire community and the strong affection of the circle of friends who were privileged to know him most intimately.

Henry Burnup arrived in Natal in 1874, in the days when the steamer *Anglian,* on which he was a passenger, was the largest vessel of the old Union Line. For a number of years he followed his profession of accountant in Maritzburg, and after relinquishing his occupation he devoted himself wholly to what he regarded as his life's work, the pursuit and study of conchology.

The Burnup Collection in the Natal Museum—which is pre-eminently the finest collection of shells in South Africa —is the result of years of unceasing toil and patient research. This was entirely a labour of love, and the educative value of the collection is inestimable. The collection is a gift to the Museum of which he was one of the Trustees since its foundation in 1903. It will never be known to the many what the Burnup Collection represents in long and arduous days on foot, in all weathers, by mountain, stream and shore, and late nights of unceasing work. Mr. Burnup's correspondence was world-wide. His contributions to scientific periodicals show a deep knowledge of the science whose secrets he sought, and there are many hitherto unknown specimens in the Natural History Museum at South Kensington bearing his name. His scientific papers are models for their clarity and excellent illustration from his own drawings. He cleared up many doubtful points in South African conchology, and described many interesting new forms.

Early in the year it was apparent that some grave dis-

order was steadily reducing his strength. When its nature was made known to him he at once set himself the task of completing a work the extent of which was astonishing. Day after day, with rapidly failing strength, he was taken to his work at the Natal Museum, till, completely exhausted, he was able to look back with the satisfaction of knowing that he had reached a point from which others could complete the final stages.

Mr. Burnup was removed to the sanatorium where, after a few days of care and devoted attention from the staff and his closer friends, he passed away barely three days after his 76th birthday. As he lived his life so he faced the end —calm, undaunted and serenely cheerful.

RUTH MEANWELL.

DR. ANTONI J. WAGNER

The death of Dr. Antoni J. Wagner, Director of the Zoological Museum of Poland, has been announced. He was born in Ustron, Poland, in 1860, and died June 11th of this year. Dr. Wagner is the author of many useful papers on the mollusks of Austria and surrounding countries and of an important monograph on Helicinidae. The classification of this group was largely remodeled by his work, which emphasized characters of the operculum. Other less extensive monographic works dealt with Daudebardia and Pomatias. He was an eminent authority on European Clausiliidae, and had ably reviewed several groups of this family, at first in the Rossmaessler-Kobelt Iconographie, but after the war and the suspension of this work on Kobelt's death, in a series of separate papers. It is a great loss to conchology that he did not live to finish his work on this intricate family. H. A. P.

CORRESPONDENCE

In Camp at Yakima, Wash., July 22, 1928.

Dear Dr. Pilsbry:

We are getting some good "record" material in Washington. Collected nearly across the state from south to north through the eastern tier of townships. Probably the most interesting finds are *Polygyra* and *Oreohelix*. The former, (several species) was found sparingly at almost every favorable-looking place we examined—usually rock slides. At one station in Oregon, just north of Pendleton, we found them in very great abundance, active under shrubbery along a nearly dry channel in a hot, dry valley.

Oreohelix we have found only in rock slides, rather scarce at most stations from northeastern Oregon northward to Colville, Wash. The slides are mostly lava, but one or two are granite and quartzite. At Blue Lake, in Grand Coulee, all the lava slides protected by shrubbery at the base shelter flourishing colonies, one small slide along the lake shore was swarming with active snails of a small form after an evening storm. Yesterday, 15 miles north of Ellensburg, we found a few much weathered shells and two live ones, one adult, after a long search, in a big lava slide near the canyon rim. The valley is hot and dry, all vegetation dried up, and the temperature at the time 100° above zero in the shade at a nearby gasoline station. This lacks only about 15 miles of being as far west as the most westerly known *Oreohelix* locality—Hemphill's station at Celilo, Oregon.

We have found no *Goniobasis* whatever in Idaho, eastern Oregon or in Washington east of the Cascade Mountains. This increases the puzzle about the reported occurrence of *G. silicula* in southwestern Montana. It would be interesting to see some of the Montana material and ascertain whether it is the same as the true *silicula* of the moist

coastal region. *Margaritana* [I have forgotten what generic name should now be used] *margaritifera falcata,* the Pacific Coast form of this circumpolar species, is also reported from southwestern Montana, and we have it from Weiser, Idaho, Spokane and Vantages Ferry, Washington, at the latter locality only kitchen midden specimens.

JUNIUS HENDERSON

NOTES

PROFESSOR AND MRS. T. D. A. COCKERELL have returned home to Boulder, Colorado, after a trip of about a year around the world.

THE MOLLUSKS OF CUBA have had a hard summer. Dr. PAUL BARTSCH spent several months collecting in western and middle Cuba. Dr. PILSBRY and Mr. D'ALTE A. WELCH put in two months chiefly in Camaguey and Oriente Provinces. Mr. H. N. LOWE has been collecting in various parts of the island all summer, and DR. WM. J. CLENCH sailed about the end of August for a fall campaign in the Cienfuegos-Trinidad district. Last but by no means least, Dr. CARLOS de la TORRE and his able assistants AGUAYO and BERMUDEZ have not been idle. Fortunately for the snails, Mr. Ramsden has been in the United States.

WILLIAM J. MCGINTY of Philadelphia, died on July 24. Mr. McGinty was interested in conchology and for some years made a specialty of Marginellidae. In late years, however, he had dropped out of the ranks as an active collector.

SOLEN NOVACULARIS, A NAME FOR AN EOCENE FOSSIL FROM CALIFORNIA: In our work on the fauna of the type Tejon Eocene of Kern County, California (Occ. Pprs. Calif. Acad. Sci. No. 11, 1925, p. 147, pl. 6, fig. 9) we named a supposedly new species *Solen novacula.* This name having

previously been used by Montagu (Test. Brit. 1803, p. 47) for a different form we hereby designate the California fossil *Solen novacularis*.—F. M. ANDERSON AND G. DALLAS HANNA.

PSEUDAVICULA SIMPSON PREOCCUPIED.—Simpson founded this genus of Unionidae in 1900 (Proc. U. S. Nat. Mus., XXII, p. 860) for *Unio johnstoni* Smith, a remarkable species from Lake Mweru or Moero in Central Africa. The name had, however, been previously used by R. Etheridge Jr. in 1892; see Jack & Etheridge's Geol. Palaeont. New Guinea, p. 449. I suggest the name *Prisodontopsis* to take the place of *Pseudavicula* Simpson.—J. R. leB. TOMLIN.

SHELLS FROM LIVE OAK CO., TEXAS, collected by Dr. Julia Gardner.—A small box of drift collected on June 5th, 1928, on the bank of Atascosa River, between Taut City and the mouth of San Cristobal Creek, Live Oak County, Texas, contained the following species of shells:

Helicina orbiculata tropica 'Jan.' Pfr.
Praticolella berlandieriana Moric.
Polygyra texasiana Moric.
Thysanophora horni Gabb
Bulimulus dealbatus liquabilis Rve.
Bulimulus alternatus mariae Alb.
Glyphyalinia indentata Say.
Euconulus chersinus trochulus Reinh.
Zonitoides arborea Say.
Pseudovitrea minuscula Bn.
Pseudovitrea singleyana Pils.
Pupoides marginatus Say.
Gastrocopta contracta Say.
Gastrocopta pentodon Say.
Gastrocopta hordeacella Pils.
Gastrocopta procera Gld.
Pupisoma dioscoricola insigne Pils.
Planorbula obstructa Morel.
Musculium transversum Say.

E. G. VANATTA.

ARCA IDIODON Pils. & Johns., Proc. A. N. S. Phila. 1917, p. 191; 1921, p. 408, pl. 42, figs. 3, 10, appears to be the unnamed *Arca* sp. *a* of Kellum, U. S. Geol. Surv. Professional Paper 143, 1926, p. 16, pl. 1, figs. 13, 14, of the Jackson

Eocene of Wilmington, N. C.—PILSBRY.

TYPES OF LAMPROCYSTIS AND PSEUDHELICARION.—So far as I know no type has been selected for *Lamprocystis*, and the only type designation for *Pseudhelicarion* is not valid.

Lamprocystis Pfeffer, Abhandl. Nat. Verein von Hamburg-Altona, VII, 1883, p. 20. *L. excrescens* (*Helix excrescens*) Mouss. here designated type.

Pseudhelicarion Moellendorff, Nachrbl, D. Malak. Ges. June, 1894, p. 86. *Macrochlamys* (*Pseudhelicarion*) *virescens* Q. and Mildff, here selected as type. The nomination of *M. ceratodes* (Pfr.) as genotype by von Moellendorff, in Semper's Reisen im Archip. Phil., VIII, 1899, p. 70, is not valid because this species was not mentioned in the article where *Pseudhelicarion* was originally introduced. It is believed that *M. virescens* is closely related to *ceratodes*.—PILSBRY.

GONIOBASIS UNDULATA.—After my article in the July number was written I found that I had overlooked *Goniobasis undulata* Tryon (Amer. Journ. Conchol., II, 1866, p. 5, pl. 2, fig. 4). Tryon compares the shell with *etowahensis*, *inclinans*, *papillosa* and *postellii*, saying that "it differs from all of them by its crisp, rigid appearance". It seems to be close to the Florida form of *catenaria*. The locality is given as Georgia. The species is probably from the southern coastal plain of the state.—CALVIN GOODRICH.

PODODESMUS MACROSCHISMA Deshayes.—Three specimens of this species taken with a dredge in Puget Sound, show an odd false-ribbing that seems worthy of notice. The specimens were fastened to dead shells of *Cardium corbis* Martyn and grew with a rib-like fluting of both valves counterfeiting perfectly the underlying ribs of the larger shell. Inasmuch as the valves are typically smooth, this variation seems of interest.—DON L. FRIZZELL, Seattle, Wash.

THE N. W. LERMOND COLLECTION of mollusks, comprising over 11,000 lots, has been acquired by the Museum of

Comparative Zoölogy at Cambridge, Mass. This collection besides being very rich in Maine species, has many foreign species obtained through years of exchanging.—W. J. C.

UROSALPINX CINEREA SAY IN ENGLAND.—In *Nature* for August 18, 1928, there is an interesting account of the injury to young oysters by this species. It was introduced into England on American oysters in the same way and probably about the same time as *Crepidula fornicata*. "In 1924 50 per cent of an experimental spat fall was destroyed by what we now know is *Urosalpinx*. During the last twenty or thirty years or possibly less, *Urosalpinx* has become an effective addition to the enemies of the oyster cultivators." —C. W. J.

CHOANOPOMA CAYMANICOLA, n. sp.—The shell is openly umbilicate, turbinate the spire with straight lateral outlines, vinaceous brown showing through a thin whitish outer layer. Four strongly convex whorls remain. Sculpture of close, fine and even axial riblets much narrower than their intervals and coarser, low spiral sculpture which is more strongly developed in the umbilicus. On the first 1½ whorls following the truncation the axial riblets stand slightly wider apart, and spirals are not present. The aperture is slightly longer than wide, dark brown within. Peristome white, rather broadly reflected. Length 16, diam. 12.7 mm. Grand Cayman Island, collected by Chas. B. Taylor, April, 1896; received through George H. Clapp. Type 145014 ANSP. This species has a general resemblance to the Jamaican *C. lima* C. B. A., but the spire is more straightly conic, the lip is narrower and the color different.—H. A. PILSBRY.

CYCLOTUS MASBATENSIS new species.—The shell is similar to *C. variegatus* Swainson as defined and figured by Kobelt[1] except in the outer lip, which is much broader,

[1] Whether this is actually what Swainson refers to seems somewhat doubtful; the figure in Sowerby's Genera, by which Swainson defined his species, does not show the wing of the lip.

strongly expanding, the posterior wing ascending on the preceding whorl. The upper part of the last whorl is closely marked with zigzag chestnut brown stripes on a yellowish ground; at the periphery there is a light band, below it a band of sagittiform spots, or in one specimen a continuous dark band, then irregular flammules, and towards the umbilicus uniform light color.

Height 12 mm., diam. 23.8 mm.; 5 whorls. Type

Height 12. 5 mm., diam. 26 mm.; 5 whorls.

Height 9.5 mm., diam. 22 mm.

Aroroy, Masbate, Philippines, collected by Gilbert S. Perez. Type and two paratypes No. 145595 ANSP.—PILSBRY.

PUBLICATIONS RECEIVED

WEST AMERICAN MOLLUSCA OF THE GENUS PHASIANELLA. By A. M. Strong. (Proc. Calif. Acad. Sci., vol. 17, pp. 187-203, pl. 10, 1928.) A history of the work on this genus, is followed by descriptions and full synonomy of the eleven species.

SOME PYRAMIDELLIDAE FROM THE GULF OF CALIFORNIA. By Fred Baker, G. Dallas Hanna and A. M. Strong. (Proc. Calif. Acad. Sci., vol. 17, pp. 205-246, pls. 11, 12. 1928.) A valuable contribution to our knowledge of the Mollusca of this region. Some of the material studied was collected by the late Captain George D. Porter, who with his companion John Johnson was ambushed and killed in 1896 on Tiburon Island, by the Seri Indians. The paper records 53 species, of which 23 are described as new.—C. W. J.

THE TERTIARY MOLLUSCA OF CHATHAM ISLAND, INCLUDING A GENERIC REVISION OF THE NEW ZEALAND PECTINIDAE. By J. Marwick. (Trans. & Proc. New Zealand Inst., vol. 58, pp. 432-506, 48 figs., issued Mar. 19,

1928.) The fossiliferous beds are divided into two groups. The very low percentage of recent forms indicates early or middle Tertiary: Upper Oligocene or Lower Miocene. 88 new species and a number of new genera are described.—C. W. J.

LAND SNAILS FROM HAWAII, CHRISTMAS ISLAND AND SAMOA. Bernice P. Bishop Museum Bulletin 47, 1928. *Georissa, a land snail genus new to the Hawaiian Islands,* by H. A. Pilsbry. Three minute species collected by Marie C. Neal on Kauai are described and figured.

Food habits of Partula zebrina Gld., by C. Montague Cooke. Stomachs of about 200 specimens were examined. Besides vegetable matter, 17 per cent of adult and 50 per cent of young contained shells—*Elasmias, Sturanya, Aphanoconia, Nesopupa, Subulina, Opeas* and *Omphalotropis.* The fluids of the stomach apparently attack the calcareous material, leaving the animal matter practically intact, at least for some time after the shell is completely dissolved. It is presumed that the shells are swallowed solely to supply lime. The greater number found in young than in adult Partulae is thought to be due to the greater needs of the growing shell.

Three Endodonta from Oahu. By C. Montague Cooke. The three Oahuan species of Endodonta s. str. are identified and defined. The long-lost and often misidentified *E. lamellosa* Fér. is recognized in specimens from Mt. Konahuanui. *E. marsupialis* Pils. & Van. has been located on Mt. Tantalus, while *E. frickii* Pfr. is the Waianae range species sometimes mistaken for *E. lamellosa.* The anatomy of all is figured.

Distribution and Anatomy of Pupoidopsis hawaiiensis Pils. & Cooke. By C. Montague Cooke. This species was known as a Pleistocene fossil from the main islands of the Hawaian group, and curiously enough has been found by Mr. T. T. Dranga living on Christmas Island, more than 1,200 miles distant. It possesses inferior tentacles. The

penis has an appendix, but the penial retractor is simple. The majority of specimens lack male terminal organs.

Anatomical studies of Achatinellidae. By Marie C. Neal. One to four species of all sections of all the genera were examined. "The overlapping of variations shows that anatomically *Achatinella* and *Partulina* cannot be differentiated, except in the section *Perdicella* and the genus *Newcombia*. The consistent differences of the three *Perdicella* from other Achatinellidae suggest that the section should be raised to generic rank. The decision that *Newcombia* should have generic value is confirmed."

In the second part of this interesting paper Miss Neal describes the development of the genitalia of *Achatinella viridans*, with numerous figures.—H. A. P.

CEPHALOPOD ADAPTATIONS—THE RECORD AND ITS INTERPRETATION. By Edward W. Berry. (Quart. Review Biol., III, pp. 92-108, pls. 1-6, March, 1928.) A most interesting paper to those who are trying to work out the phylogeny of this fascinating group. The author states that—"The present paper is highly speculative in character. Not that the author has much faith in such a method of attacking a problem, but, as will appear in the sequal, because this is the only method of approaching in any consideration of the probable structure of the soft parts or habits of life of the extinct representatives of this very important class of the Mollusca."

"The Cephalopod, whose ancient line extends over at least a hundred million years from the oldest known forms of the Cambrian period to the present, and which easily comprises upwards of 10,000 known extinct species of great variety of form and presumably of habits, is represented in existing seas by a single restricted genus with an external shell,—the familiar pearly Nautilus; by the less known monotypic genus *Spirula*, with an internal shell; by the variety of active squids and cuttles, with an internal highly modified vestige of a shell; and by the less active

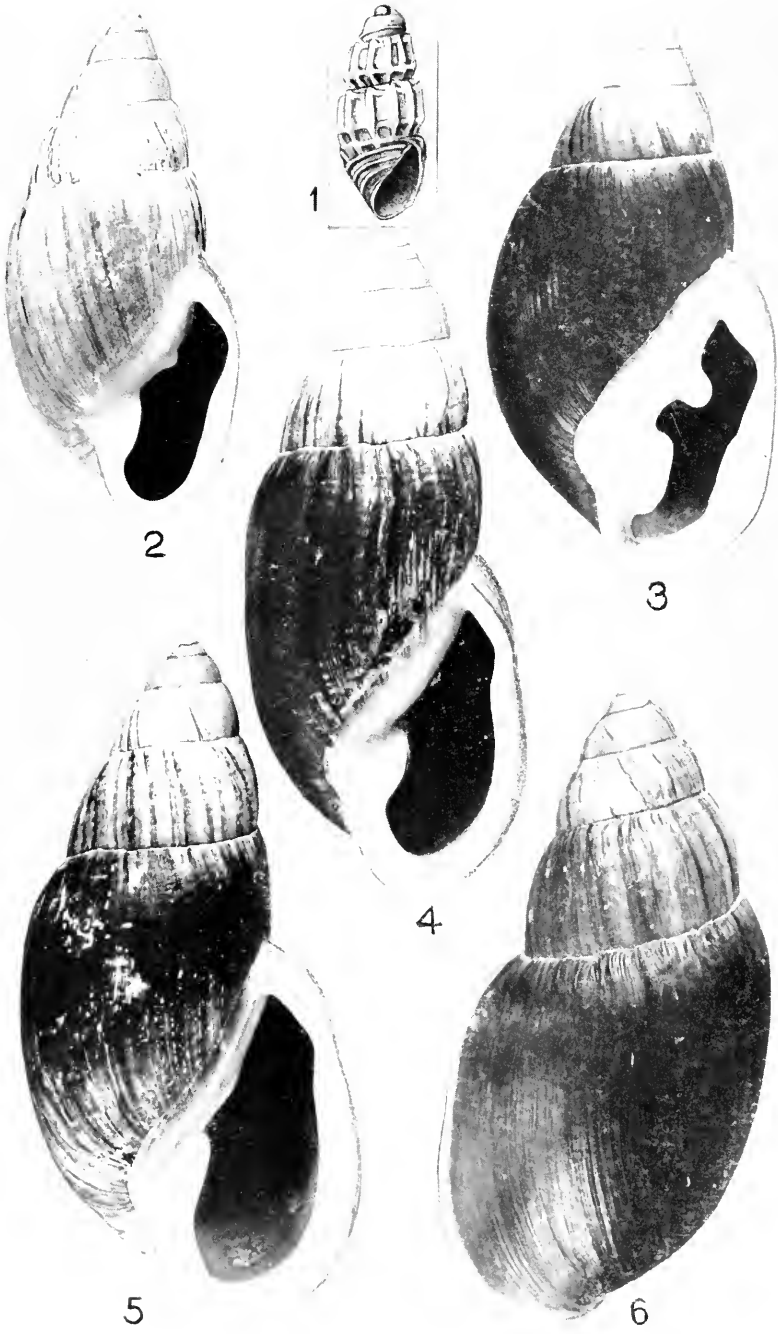
octopus tribe, without any trace of a shell."

Several diagrams illustrate the phylogenetic relationships of the various Cephalopod types and the adaptional modifications of those with external shells. A very full bibliography is given.—C. W. J.

SEASHORE ANIMALS OF THE PACIFIC COAST. By Johnson and Snook, MacMillan and Co., New York. With an apparent waning of interest in conchology throughout the country, anything which will revive this interest is worth while. The work covers all groups of marine invertebrates, but of 576 pages devoted to descriptions of species, 171 are on Mollusca. There are eleven beautifully colored plates and about 700 plain figures, either in the text or in plates placed close to the species described. Of these, three colored plates and 312 plain figures illustrate the commoner species of mollusks of this coast. The plain figures are mostly fine photo-reproductions, though line drawings also are used.

The introduction takes up in plain language the simpler principles of systematic classification and describes collecting grounds in such a way that the amateur would be able to find material in any of the groups. There is a full glossary, a short supplement on the preservation of animals and a quite extensive bibliography. The work is strictly scientific and up to date in nomenclature; in fact it is a most simple, though comprehensive introduction to the study of zoology, with a very large section devoted to conchology in which Dr. Johnson has done extensive work. Withal, it is written so plainly and in so popular a style as to interest those who have no interest in the technical side.

Now that Keep's useful works are out of print and hard to get, it seems to me that this is the best work to recommend to beginning conchologists with the added advantage of giving acquaintance with other lines, the lack of which has been felt by most of us as we have tramped the beaches in search of our particular prey.—FRED BAKER.



COCKERELL: THE GENUS PLACOSTYLUS

Fig. 1. Odostomia mariae Bartsch, p. 41

THE NAUTILUS.

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THE GENUS PLACOSTYLUS IN NEW CALEDONIA

BY T. D. A. COCKERELL

The large snails of the genus *Placostylus* abound all round the coast of New Caledonia. The more typical forms do not go inland, or to any elevation in the mountains, but the peculiar *P. bavayi* (Crosse and Marie) was found on the summit of Mt. Mou, which has an elevation of 1219 meters. People in New Caledonia eat *Placostylus*, and good specimens in considerable numbers may often be obtained in back gardens where the cooks have thrown them out after extracting the soft parts.

The number of species and varieties described is very great, but the genus is still in some confusion. As one follows the coast, local races and species appear, and sometimes the contrast is very great. We went up the west coast to Mueo, which is at the end of the automobile road. At Mueo a very characteristic form, short, broad and thick, with contracted aperture, was common. The epidermis varies from rich reddish brown to rather pale olive brown, without spiral bands. The heavy lip is always white, and the aperture within may be red or white. This is *P. poyensis* Kobelt (pl. 2, fig. 3), the type locality of which is not far away. Most of the shells have the aperture more as in var. *goyettensis* Crosse, but this is only an individual variation.

Going south from Mueo, the next convenient stopping place is Bourail. Here the *Placostylus* are entirely differ-

ent; of the type of *P. fibratus*. The thick shell is much more elongate than *P. poyensis*, the aperture wider, especially below; the parietal tooth rudimentary or absent. The columellar thickening never very large, sometimes hardly evident, gradually sloping to the lower end; the thick lip always white, but the aperture red within, the surface of the shell rich red brown or rather more olivaceous, without bands, but with distinct spiral malleation. This I call *P. fibratus bourailensis* subsp. n. (pl. 2, figs. 4, 5, 6). There is some resemblance to *P. neckliaensis* Kobelt, but that is a west coast form, with much narrower aperture and larger parietal lamella. *P. kanalensis* (Crosse) has been recorded from Bourail, but I think in error. It comes from Canala, on the west coast nearly opposite Bourail, but separted from it by high mountains. Compared with *bourailensis*, *P. kanalensis* has the spire broader below, more conical, much less cylindrical. The peristome is also often colored.

A characteristic *P. f. bourailensis* is 90 mm. long, spire 41 mm., aperture 37 mm., maximum width of shell about 41 mm. On the sea coast near Bourail the shells are larger, about 108 mm. long, spire 49 mm., length of aperture 46 mm. I do not include this in *bourailensis* but consider it a variation of *P. fibratus* (Martyn).

At Noumea, still on the west coast, but far to the south, we found no living *Placostylus*, but in a superficial deposit on the top of a grassy hill we obtained a series of subfossil shells, including a large thick *Placostylus*, distinctly flattened dorsoventrally, with very wide aperture, and no parietal tooth or columellar callus. The shell is only 92 mm. long, spire 37 mm., aperture 45, but I refer it to *P. souvillei* (Morelet), a characteristic species of southern New Caledonia. As I have only one complete shell, I cannot say whether a distinct (extinct) race existed. The locality is on the opposite side of the town from Artillery Point where subfossil *P. corpulentus* (Gassies) is reported to have been found by Layard. *P. savesi* Crosse, also subfossil at Artillery Point, is only 56 mm. long.

Crossing the bay from Noumea, in the "petroletto", we reach Ile Nou, long famous as a convict settlement, from which no less than 22 species of snails have been recorded. Several species of *Placostylus* are reported to live in this small area, but those we found, all dead and probably subfossil, certainly belong to a single variable species. It is small, 57 to 68 mm. long, solid, broad-fusiform, parietal tooth usually well developed but conical, sometimes practically absent, columellar callus distinct. This is the endemic *P. duplex* (Gassies), but it seems better to call it *P. porphyrostomus duplex*. A short distance east of Noumea, at the foot of Mt. Dore, is Plum Farm, a very attractive resort conducted by M. and Mdme. P. Bloc. The name Plum (or Ploum) is from a native language, and has nothing to do with our word plum. *Placostylus* are scarce here, and I failed to find them; but Miss Bloc, the daughter of our host, knew their habitats and brought in four specimens. The species is *P. guestieri* (Gassies), I think the most beautiful of all the forms. It is fusiform, comparatively thin, olive brown, with more or less indistinct spiral dark lines; the aperture and lip in good specimens are a rich red, rather redder than apricot color. The parietal tooth is rudimentary, and the columellar callus is long and weak. In the living animals, the foot is very wide, pale coffee brown; region of head dark brown; sole and mantle pale yellowish or greyish. Plum Farm is on the coast, in a region of serpentine rocks, with red soil. There is little or no lime, except along the coast, where there has been sufficient elevation to expose portions of old reefs with decaying marine shells of living species. This *P. guestieri* is quite distinct from *P. fibratus*, and shows I think a distinct tendency toward the *P. bavayi* alliance. Still further west along this coast is Ngo Bay, where I found an extremely variable lot of *Placostylus*, of large size. All were dead, but one shows the small dark brown epidermis, quite without banding. I thought at first that I had more than one species, but all must be referred to *P. fibratus* (Martyn). One of them is very similar to fig. 16, pl. 25, of the Manual

of Conchology, which I believe is not true *guestieri*. Three islands off the southern coast were examined for *Placostylus*, and all produced slightly divergent races of *P. porphyrostomus* (Pfeiffer). These shells, as Pilsbry notes, lose the epidermis when adult; specimens from Bailly Island and Dge, which I considered dead, unexpectedly came to life and crawled about. A Bailly Island one is still living. The animal is gray, a different shade of color from *P. guestieri*. At Dge, on the southwest corner of Ile Ouen (or Uen), *P. porphyrostomus* was decidedly uncommon, and I brought away only three specimens. On the small Charron Island it was common and variable. From Charron Island, my wife and I rowed across to Bailly Island, but were met by such swarms of mosquitoes that we had to retreat. Leaving my wife in the boat, I hastily ran about under the trees, and picked up six specimens. On comparing the lots from these different places, they appear all to belong to one species, though the diversity in the Charron Island lot is certainly remarkable. The Bailly Island ones have the spire distinctly more pointed or acute than the others, and constitute a weak race, not requiring a special name. (Pl. 2, fig. 2.)

The existence of *P. porphyrostomus* on the small islands, and the larger *P. fibratus, souvillei* and *guestieri* on the mainland, is noteworthy. This may throw doubt on Ile Amère as the type locality for *P. fibratus*. Could it have come from the Isle of Pines, which is a large island known to possess various *P. fibratus* varieties? Was it not on the Isle of Pines that Cook's party found the remarkable tree called *Araucaria cookii* R. Br.? It has been related that the naturalists (Banks and Solander) thought that they were columns of basalt from a distance, but the keen eyes of the sailors detected trees.[1]

One difficulty in the way of correctly interpreting species of *Placostylus* arises from the fact that in certain species,

[1] Schinz and Guillaumin treat *A. cookii* as a synonym of *A. columnaris* (Forster), but Forster's tree seems to have been described from New South Wales.

after the shell has reached full size, the lip thickens enormously and becomes as it were double, while the parietal and columellar lamellae grow and thicken. Hence a subadult shell looks very different from an old individual. This certainly accounts for a good deal of the difference seen in the Charron Island *P. porphyrostomus*. Aside from this, the individual variation is so great that it is easy to pick out specimens which seem to represent valid species in the cabinet. This has been done in a number of instances, and is in part the explanation of the apparent concentration of species in certain localities. It may also be possible to set up so-called species, from analogous variations of several different races. The true condition of affairs will not be known until someone travels all round the coast (as may be done in a launch, mostly with the protection of the reef) and collects the snails in large series at all points. The number of distinct races is undoubtedly large, and so far as I could observe, only one exists at any one place. The reputed occurrence of the same race at remote points may be due to errors of identification, or perhaps to the snails having been carried about by the natives. Critical studies on the ground are especially to be desired on the Isle of Pines (from which many forms have been reported) and the Loyalty Islands *P. guestieri* is said to occur at Mt. Dore (or Mont-Dor) and in the Loyalty Islands. I will designate Mt. Dore as the type locality, as it seems to have been left uncertain. The variety *gatopensis* Crosse, found no great distance from Mt. Dore, probably has no standing. What actually occurs at Ouvea (Loyalty Islands) remains to be seen.

The nearest relatives of the New Caledonia—Loyalty Islands *Placostylus* are no doubt in Lord Howe Island, which is a remnant of a much larger land area. I am indebted to Mr. Iredale for a specimen of *P. bivaricosus* (Gaskoin) from Lord Howe Island.

In studying *Placostylus* I was very fortunate in having access to the splendid collection in the Australian Museum, Sydney.

EXPLANATION OF PLATE 2

Fig. 1. *Odostomia* (*Ividella*) *mariae* Bartsch. Page 41.
Fig. 2. *Placostylus porphyrostoma* (Pfr.), var. from Bailly Island. 146881 ANSP.
Fig. 3. *Placostylus poyensis* Kob. 146888.
Figs. 4, 6. *Placostylus fibratus bourailensis* n. subsp., paratypes. 146884.
Fig. 5. *Placostylus fibratus bourailensis* n. subsp., type. 146883.

NEW CUBAN SPECIES OF CARACOLUS

BY H. A. PILSBRY

PLEURODONTE (CARACOLUS) LOWEI, new species. Plate 4, figs. 4, 5, 6.

Cuesta de Paulo, between Sabana and Cape Maisi, Oriente, Cuba. Type No. 147372 ANSP., collected by Herbert N. Lowe, September, 1928.

The shell is dome-shaped, the height about three-fourths of the diameter, with the periphery rounded; imperforate; solid; cinnamon-brown, with a narrow chestnut brown band a short distance above the suture, and immediately below the periphery of the last whorl; the base dull chamois with curved brown radial streaks and a narrow brown band a short distance below the subperipheral band. The surface is semi-matt, with a sculpture of fine ripples of growth. The whorls are very slightly convex, slowly increasing, the suture not impressed until the last whorl, which is more convex, the base weakly convex, impressed in the center; anteriorly it descends slowly, with no gibbosity behind the upper lip. The aperture approaches a horizontal position. The thick, white peristome is narrowly reflected. Parietal callus moderately heavy.

Height 24 mm., diam. 32.2 mm.; 6½ whorls.

This fine species appears entirely distinct from other described forms; in fact, if all other Cuban Caracoli are ranked as forms of *P. sagemon*, this should still be con-

sidered distinct by reason of its more numerous closely coiled whorls as well as the form and other characters described above. The anatomy will be figured in another place, in connection with that of other Cuban forms.

Named in honor of Mr. H. N. Lowe. It is one of the prizes which rewarded him for days in the saddle over poor trails in his long trip from Baracoa around Cape Maisi to Jauco on the south coast.

PLEURODONTE (CARACOLUS) WELCHI, new species. Plate 4, figs. 1-3.

Summit of the Sierra Maestra where crossed by the "new road" from Ensenada de Mora to the foothills back of Media Luna, Oriente. Type and paratypes No. 147373 ANSP., collected by H. A. Pilsbry and d'Alte A. Welch, Aug. 6, 1928.

The shell is very solid, convexly low-conic above, convex below, the periphery acutely carinate throughout; umbilicate, the umbilicus well-like, scarcely contracting within, contained about 7½ times in the diameter of the shell, somewhat less than half covered by the reflected columellar lip. The first 1½ whorls are whitish, then shading into cinnamon, which darkens on the antepenult whorl into claret brown with a black band at the lower third of each whorl, the last whorl nearly all black above and below. The somewhat glossy surface has weak, irregular growth wrinkles. The whorls are very slightly convex, the last strongly swollen near the aperture, then subvertically descending and flattened. The aperture is subhorizontal, somewhat triangular. The peristome is white, narrowly reflected, thick, the basal margin very wide; there is a blunt angulation at the union of upper and outer margins. The parietal callus is thick and white.

Height 22 mm., diam. 45.3 mm.; 5½ whorls. Type.

Height 24 mm., diam. 46.5 mm.; 5½ whorls. Paratype.

This large species is distinguished by its size, open umbilicus and dark color, the broad, straight basal margin of the lip, the rather triangular aperture and the strong swell-

ing behind the deep descent of the last whorl to the aperture. It was found in company with a very different *Caracolus* which will be discussed in another paper. It is certainly unlike any of the numerous forms of the *sagemon* group which I have seen.

This shell occurred at the top of the ridge west of the "New Road", and also in the ravine east of the road, several hundred feet lower. It was always found at the foot of the trees, while the banded form occurring with it was usually roosting higher up. It is not uncommon.

Named for my companion in the Cuban trip of July and August, 1928, in memory of many exciting days in the field when the luck was good, and cold rides in the rain and mud when we were not so fortunate.

To complete Plate 5 a few Cuban shells collected by Mr. d'Alte A. Welch and the writer in northwestern Camaguey are figured.

Fig. 2. *Choanopoma inquisita* Pils., × 2. Ridge north of Florencia, Camaguey.

Fig. 8. *Urocoptis delectabilis* Pils. East of Chambas River, about 2 miles east of Florencia, Camaguey.

Fig. 9. *Urocoptis delectabilis florentiana* Pils. Ridge north of Florencia.

Fig. 10. *Urocoptis torrei* Pils. Cliff facing north, summit of ridge north of Florencia.

Fig. 11. *Urocoptis chambasensis* Pils. Hill east of Chambas River, about 2 miles east of Florencia.

Figs. 8–11 are natural size. All are new species.

SOME NEW FORMS OF NON-MARINE MOLLUSCA FROM OREGON AND WASHINGTON

BY JUNIUS HENDERSON

MONADENIA SEMIALBA, new species (or subspecies).

Mr. Elven C. Nelson, my field assistant during the summer of 1928, picked up at Rosario State Park, Fidalgo

Island, Washington, a single specimen of *Monadenia*. Supposing it to be *M. fidelis*, which is generally distributed in that region, it was dropped into the bag without examination and no search was made for additional examples. Upon reaching the laboratory it was discovered that the basal coloration is entirely different. In *fidelis* the base is uniformly dark chestnut, dark brown or nearly or quite black. The Rosario specimen, which I call *semialba*, has all the characters of *fidelis* except that the base, from the periphery nearly to the umbilicus, is creamy white, sharply bounded above by the dark peripheral band of *fidelis*, and bounded below not quite so sharply by a broad dark brown band encircling the umbilicus. Width of type specimen (University of Colorado Museum, Mollusk Catalogue No. 16042) 29 mm., height 18 mm. Additional material may in the future show that this form intergrades with *M. fidelis* and thus reduce it to a subspecies or variety, but that is not at all indicated by the unique specimen.

PARAPHOLYX EFFUSA COSTATA ("Hemphill" Stearns).

Call (U. S. Geol. Surv., Bull. 11, p. 19, 1884) under *Pompholyx effusa* Lea, mentions "*P. costata* Hemphill Ms." as a variety from The Dalles, Oregon, but does not describe it. On p. 27 he mentions the "abundance of costate forms in the earlier beds and their comparative paucity among recent shells". Stearns (Proc. U. S. Natl. Museum, XXIV, 291, 1901), after describing *Physa costata* Newcomb as having "ten to fourteen regularly occurring rounded undulations or ribs", adds: "Hemphill's *Pompholyx costata*, from near the Dalles of the Columbia River, has the same sculpture." Sixteen of Hemphill's specimens from The Dalles are before me (Univ. Colo. Mus. No. 13023). I have selected one of them, designated No.13023-a, as the type. It is of light brown color, and bears 15 sharp, rather than rounded, transverse ribs, about equally spaced, parallel with the growth lines. In some specimens the ribs are few, and one is quite devoid of them, thus showing intergradation with *effusa*. Width of type, 5 mm. The others are

about the same size. We have found this costate form common at Algoma, on the east shore of Upper Klamath Lake, Oregon, where it reaches a diameter of 11 mm. or more, and is of dark brown color, though some non-costate specimens from the same locality are larger and a few of them very light greenish. A few specimens from Deschutes River at Bend, Oregon, exhibit similar sculpture less distinctly, but it is accentuated on eroded examples.

PARAPHOLYX EFFUSA DIAGONALIS, new variety.

Mr. E. C. Nelson found a fine lot of *Parapholyx* in Crater Lake, Oregon, about half of the specimens of which bear blunt, irregular spiral ribs, varying in number, which pass over the last whorl somewhat diagonally downward to the aperture, crossing the growth lines at approximately right angle. Though this form grades completely into the smooth form of *effusa*, many well-marked examples are so distinct as to deserve a name by which to designate them. The type specimen, Univ. Colo. Mus., No. 15940-a, bears 9 of the diagonal ribs and is 8 mm. in diameter. This form occurs also in the Deschutes River at Bend, Oregon, associated with the smooth form and Hemphill's *costata*.

ARE CERTAIN MARINE PELECYPODS BECOMING LOCALLY EXTINCT?

BY CHARLES W. JOHNSON

When years have passed without finding a living example or even the shell of a species formerly recorded from a given place, one naturally wonders if the species has not been locally exterminated. Many of the species in question, however, are those that burrow deep into the mud and can only be obtained by unusually deep dredging or after severe storms, when tides and changes in currents have greatly disturbed the bottom of the more shallow parts of the coast. It is therefore quite evident that by ordinary dredging we fail to obtain the true status of these mollusks,

and that they may still be living in some favorable situation. The dredging of harbors in the past was the source of some remarkable discoveries, but these dredgings are now usually confined to keeping old channels clear, while harbor pollution, is undoubtedly destroying many of the uncommon mollusks formerly inhabiting the region. This pollution is also affecting the hardy clam and oyster, and has thus become a serious matter from an economic standpoint.

A most interesting shell for New England is the *Barnea costata* Linn. formerly known as *Pholas costata* and popularly called the "Angel-wing." In 1841 Gould says: "This well known species is admitted into our catalogue from the fact that Professor Adams has lately discovered an extensive bed of dead shells at New Bedford. It probably is not to be found in a living state in our waters." In the Gould and Binney edition (1870) we find the following: "With no little surprise I received (Nov. 26, 1845) from Thomas A. Greene of New Bedford a jar containing three living specimens each of *P. costata* and *P. truncata,* which were brought up by the mud-machine at the end of the Long Wharf in that place. From the number obtained in a short time he supposes they must be plentiful. He thinks they burrow two or three feet below the surface."

Verrill (1873) reported dead shells at Woods Hole, and Sumner (1913) reported large fragments on the south shore of Marthas Vineyard, just outside of Great Pond, Tisbury. Thus to my knowledge living specimens have not been taken in southern New England since 1845.

Arca ponderosa was not reported by Gould although valves are frequently found on the southern shores of Massachusetts. Verrill (1873) says: "This species occurs on the beach at Edgartown, Marthas Vineyard. The valves are apparently tolerably fresh though worn." Sumner (1913) says: "Dr. Dall informs us however that the National Museum contains a fresh valve retaining the epidermis." At Chatham, Mass., in 1904 I collected upwards of twenty single valves along the beach toward Monomoy.

Several were scarcely worn and had portions of the periostracum between the ribs and part of the ligament still in place. They could not have been dead for any great length of time, and to find so many at this northern limit of its distribution was surprising.

Having added to the label of *A. ponderosa* the following: "This species has not been found alive on the New England coast", I was surprised one day by a young man who was looking over the collection, suggesting that I change the label, as he had found a living specimen near Woods Hole. I told him that I should like very much to see the specimen, which he promised to bring to the museum, but from that day to this, I have seen neither the man nor a living specimen from New England. I have, however, little doubt that living specimens do exist.

It is interesting to note that *Arca limula* Conr. common in the Miocene and Pliocene of the southern states, and considered the progenitor of *A. ponderosa* has been recorded from the Pleistocene of Sankaty Head, Nantucket, Mass., by Cushman, 1906, and from Long Island, N. Y., by Gratacap, 1914.

Tagelus divisus Spengl. This species was recorded by Gould as common about Rhode Island. Verrill says: Vineyard Sound and Buzzard's Bay, not common". Carpenter was unable to find it in Rhode Island and it is not recorded by Sumner from the Woods Hole region. There is one specimen with valves intact in the Museum of Comparative Zoology collected by the late Rev. H. Winkley at Woods Hole. Specimens marked "Mass.", Miss Pratt collection, are in the Museum,—Boston Society of Natural History.

The shells of *Tagelus gibbus* Spengl. are more common throughout Vineyard Sound and Buzzard's Bay, but living specimens are quite scarce. Sumner records a living specimen taken near Weepecket Isl. in 6¾ to 7½ fathoms and Mr. F. N. Balch obtained a living specimen from Monomoy, Mass.

With only these records before us both species must be considered rare in this region. Their burrowing habits,

however, make it impossible for one to say what is the real status of the species.

Divaricella quadrisulcata d'Orb. (*Lucina divaricata* and *L. dentata* of authors). There is a record for this shell at Nahant, Mass., but south of Cape Cod single valves are found in some numbers on the various beaches. Verrill says: rarely obtained alive in Vineyard Sound in 6-14 fathoms.

All of the above shells have their metropolis on the shores of the more southern states, Massachusetts being the extreme northern limit of their range. Living thus under conditions less favorable for their existence one would naturally expect to find only struggling colonies easily exterminated under adverse circumstances. The presence of these shells in numbers so far north, would evidently indicate much warmer conditions in the past and also that we are now dealing with only remnants of what were probably once flourishing colonies of the various species.

Panopea bitruncata Conr. In 1904 I described and figured a fine specimen of this species found in the harbor of Saint Augustine, Fla., about 1883. The animal had only recently been removed and both valves were intact. The specimen is now in the John B. Henderson collection in the National Museum. The species was common in the Pliocene, but even single valves of recent specimens seem to be very rare. The type is a single valve from Fort Macon, N. C. As the animal burrows deeply into the mud or sand, probably far below low water mark, the only possible way to secure a living specimen would be to watch carefully extensive dredgings which might occur along the southern coast. It would be interesting to know if any one has ever found a living specimen.

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NEW SOUTHERN APPALACHIAN LAND SNAILS

BY H. BURRINGTON BAKER

These new forms were obtained during July and August, 1928, in eastern Tennessee, while on a search for anatomical material of some of the peculiar pulmonates from the southern Cumberlands and the mountains along the North Carolina boundary.

HELICODISCUS (HEBETODISCUS) SINGLEYANUS INERMIS, new subgenus and subspecies.

Shell (pl. 3, figs. 1-3): minute, broadly umbilicate, depressed, thin, translucent and with a dull sheen; texture as in genus. Color: yellowish corneous, with darker varicoid lines. Whorls: 4½, quite gradually increasing in diameter and well rounded; last whorl slightly descending; suture distinctly impressed. Sculpture: growth-lines weak except a few varicoid ones on the last whorl (as in *H. parallelus*); surface weakly punctate under high magnification but without trace of spiral ornamentation of any sort. Umbilicus: 2.8 times in major diameter. Aperture: subcircular and almost vertical. Peristome: sharp, but very narrowly ex-

panded; continued on parietal wall by a thin but distinctly margined callus.

Altitude 1.24 mm., maj. diam. 178 (2.21 mm.), min. diam. 161 (1.99), alt. apert. 69 (.86), diam. apert. 95 (.82); whorls 4½.

Type locality: leaf humus near base of limestone ledges, at Dove (Martin Spring), Marion County, Tennessee; only one specimen found (Acad. Nat. Sci. Philadelphia, no. 147186).

Jaw: quite heavy and plaited (stegognath), consisting of 15 oblong plates which slightly overlap from center out. Radular formula: 11-1-11, with about 85 transverse rows. Forms of teeth: practically the same as those in *H. parallelus*, as figured by Watson (1920, Proc. Malac. Soc. London 14, fig. 4e).

This description of a subspecies is long and detailed because, at the time it was prepared and offered for publication, I labored under the delusion that I was describing a brand new species. Unfortunately, the copious Texan material of typical *Zonites singleyanus* Pils. (1889, Proc. Acad. N. S. Philadelphia 51, p. 84; 1888, pl. 17, figs. 6-8), consists of shells from stream drift. However, one lot from Riverton, New Jersey (ANSP. 105779), identified by Dr. Pilsbry himself, consists of fresh specimens which closely resemble *inermis*, but show traces of spiral lines that approach those of typical *singleyanus*. A radula, recently soaked from one of these shells, is like that described for the type specimen of *inermis*. For this reason, I have reduced *H. singleyanus inermis* to a subspecies. All of the material examined from east of the Mississippi agrees with this form in the somewhat higher spire, smaller size and more evident growth-lines and varices, although most specimens show some weak traces of spiral sculpture. *Hebetodiscus*, type *Helicodiscus inermis*, has a radula and jaw very similar to that of *Helicodiscus* s. s., but the absence of distinct spiral ridgelets from the shell is reason enough for the foundation of a new subgenus.

PARAVITREA (PARAVITREOPS) MULTIDENTATA LAMELLATA, new variety.

Vitrea multidentata, "accelerated individuals" Pilsbry (1903, Proc. Acad. Nat. Sci. Philadelphia 55, p. 209). *P. lamellidens* H. B. B. (1928, P. A. N. S. P. 80, p. 31, pl. 4, figs. 9, 10), anatomy; not *Gastrodonta lamellidens* Pils. (1898, Naut. 11, p. 134).

Shell: apparently identical with, but not attaining maximum size of typical *P. multidentata.* Internal armature: consisting of curved, obliquely radial barriers. Umbilicus: 7.5 times in major diameter.

Altitude 1.32 mm., maj. diam. 189 (2.49 mm.), min. diam. 174 (2.30), alt. apert. 82 (1.08), diam. apert. 122 (1.32); 6 whorls.

Type locality: valley of Blue Ridge in Rockbridge County, near Snowden, Virginia (ANSP. 137443), but known to occur from Cheboygan County, Michigan, east to Maine and south to the Roan Mountain Region between Tennessee and North Carolina. (It is always much less abundant than the typical form, but is more frequent in the southern part of its range.)

Dr. Pilsbry (l. c.) has already carefully differentiated between this form of *P. multidentata* and the similarly armed *P. lamellidens* from the Great Smokies; in addition, the latter has a considerably larger apical whorl, more slowly expanded later whorls and a greater maximum size (slightly larger than that attained by typical *multidentata*). Although I agree with him that *P. multidentata lamellata* is little more than a sporadic tendency towards an incipient race, it is not known to intergrade with the typical form and the single paratype dissected differs slightly in anatomy.

PARAVITREA (PARAVITREOPS) WALKERI DENTATA, new variety.

Shell: similar to *P. walkeri,* but with weaker and less continuous growth-wrinkles, so that apical side of last whorl, under high light, appears to be decorated with min-

ute points, which are arranged in both spiral and incremental series. Internal armature: similar to typical *P. multidentata,* but with individual teeth of each obliquely radial row even higher and more distinct. Umbilicus: 4.5 times in major diameter.

Altitude 1.65 mm., maj. diam. 215 (3.55 mm.), min. diam. 197 (3.26), alt. apert. 79 (1.31), diam. apert. 114 (1.19); 6½ whorls.

Type locality: in leaf humus at base of slate ledges in gorge of Tellico River, just above mouth of Laurel Creek and about 1½ miles east of Tellico Plains, Monroe County, Tennessee (ANSP. 147187).

Although the armature of this form is more different from typical *walkeri* than typical *multidentata* is from form *lamellata;* a lot of 22 specimens, collected at and near the type locality of *dentata,* contains three individuals with the smooth internal barriers of typical *walkeri!*

PARAVITREA (PARAVITREOPS) VARIABILIS, new species.

Shell (pl. 3, figs. 12-14): similar to *P. walkeri,* but more polished. Color: apex almost colorless; remainder corneous with light chestnut tinge and with a narrow, dark chestnut line just below suture. Whorls: 6½, similar to *P. walkeri,* but forming slightly higher spire. Sculpture: apical whorl almost smooth; second whorl with impressed growth-lines at quite regular intervals; later whorls with closely but somewhat irregularly spaced, impressed growth-lines, which are weaker on base, and with microscopic, closely spaced, spiral, impressed lines, which are almost as prominent on basal as on apical side. Umbilicus: 4.6 times in major diameter. Aperture and peristome: much as in *P. walkeri.* Internal armature; lacking in adults; half-grown shells with 1 to 3, low lamellae, which are almost vertical and about ½ length of periphery of whorl, and which usually exhibit weak and irregular subdivision into 5 or 6 points (pl. 3, fig. 11).

Altitude: 1.81 mm., maj. diam. 197 (3.57 mm.), min.

diam. 175 (3.17), alt. apert. 75 (1.36), diam apert. 112 (1.52); whorls 6½.

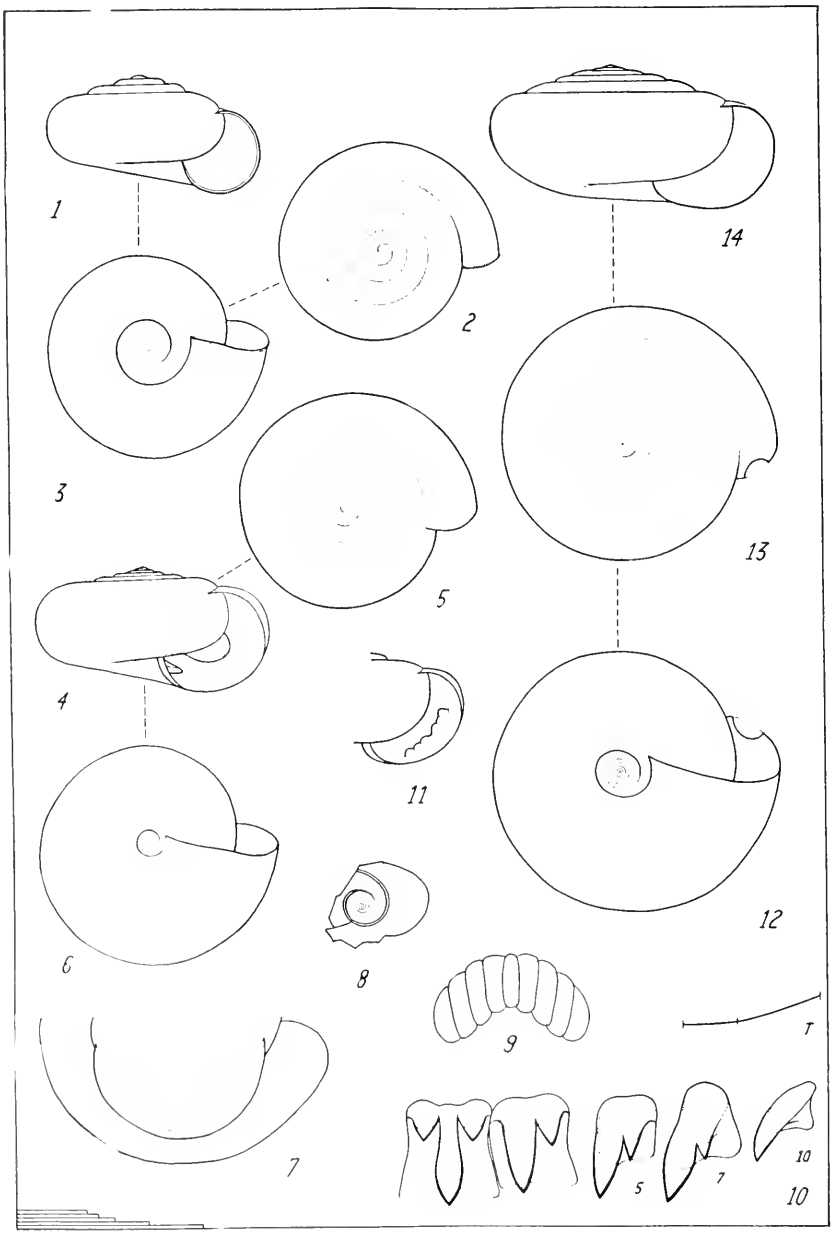
Type locality: leaf humus among sandstone rocks in a valley of the Cumberland escarpment, about 2 miles northwest of Pikeville, Bledsoe County, Tennessee (ANSP. 147190); also found on slopes of Walden Ridge east of Pikeville and on the Cumberland escarpment near Let and near Cannon Creek in Bledsoe County; also at Dove (Martin Spring), Marion County. (Underlying rocks are limestone at Dove, but sandstone at the other localities.)

As indicated above, this species is most like *P. walkeri*, but the surface of the shell in *P. variabilis* is without distinct, raised growth-wrinkles (i. e., the interspaces between growth-lines are almost flat), the impressed growth-lines are more widely and irregularly spaced and the spiral striae are sharper and more nearly continuous. In addition, the internal armature (of young shells) is almost intermediate in structure between that in typical *walkeri* and that in var. *dentata*, although each bar is shorter and more nearly vertical than in either *P. walkeri* or *P. multidentata*. *P. variabilis* is the only small *Paravitrea* that I found in the Sequatchie Valley (or in the southern Cumberlands), but it is superficially similar to, and has probably been confused with *P. multidentata* and var. *lamellata*.

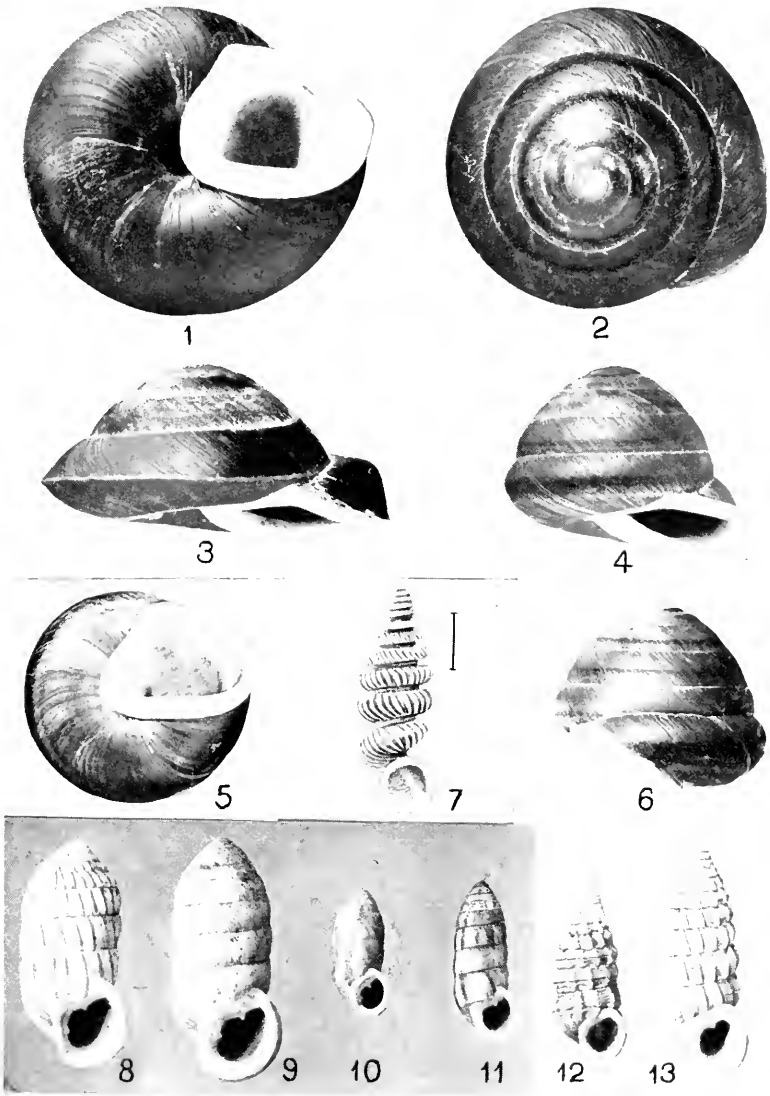
GASTRODONTA (CLAPPIELLA) ALDRICHIANA (Clapp), new subgenus.

Vitrea aldrichiana Clapp (1907, Naut, 20, p. 109, pl. 5, figs. 8-11), Jackson County, Alabama.

This new subgenus is founded on a single specimen taken from the aperture of a shell of *Gastrodonta gularis*, which was collected at the base of limestone ledges on the south side of Prior Cove, near Jasper, Marion County, Tennessee (ANSP. 147188). Although smaller than the dimensions given by Clapp, it agrees so closely with his description in every other character that it can scarcely be anything else. Also, *Glyphyalinia cumberlandiana* (Clapp) and *Paravitrea pilsbryana* (Clapp) occur at this same



H. B. BAKER: NEW SOUTHERN APPALACHIAN LAND SHELLS



1–3. PLEURODONTE WELCHII, Pils. 4–6. P. LOWEI, Pils. 7. UROCOPTIS ALLENI, Torre, Pena Blanca, Sierra Anafe. 8, 9. CERION PAUCICOSTATUM, Torre, Cape Maisi. 10, 11. C. ALLENI, Torre, Antilla. 12, 13. C. VICTOR, Torre, Caleta de Ovando, Oriente.

place. As my shell contained a dried animal, I can describe the jaw and radula.

The jaw (pl. 3, fig. 9) is of the plaited type and consists of 9 plates, which are firmly soldered together and which overlap each other slightly from the center out. It is quite heavy and the free outer edges of the plates give almost the appearance of ribs. The radular formula (pl. 3, fig. 10) is 13-1-13. The central is the largest tooth, bears three cusps and has a squarish base. The inner 4 teeth (laterals) are bicuspid but also have squarish bases. The 5th tooth begins to elongate into the marginal form but the bicuspid condition is retained out to the 9th and sometimes even to the 10th tooth. The 11th and 12th teeth appear to be always unicuspid, while the 13th is vestigial. Thus, all of the principal marginals are bicuspid.

The jaw of this species appears to be closest to that described by W. G. Binney (1885, Bull. U. S. Nat. Mus. no. 28, p. 90, fig. 56A) for *Anceyia* (+*Pristiloma*) *lansingi* (Bland) from Oregon. The radula is distinctive, but its extreme extension of the bicuspid condition out into the marginal field is only approached, among American Zonitidae, by the Gastrodontinae. The internal armature of the shell is fundamentally similar to that in *Gastrodonta interna* (Say), although the two reoccurrent teeth of that species are almost completely coalesced in *G. aldrichiana*. In color and texture, the shell is very similar to that in the Gastrodontae with continuously formed (and reabsorbed) lamellae (e. g., *G. gularis*). These peculiarities authorize the foundation of a new monotypic subgenus.

PILSBRYNA AUREA, new genus and species.

Shell (pl. 3, figs. 4-6): minute, umbilicate, thin, translucent and with a bronze sheen; epidermis relatively heavy. Color: golden corneous, somewhat similar to *Z. arboreus*. Whorls: 5 (type shell has 4½), quite gradually increasing in diameter, well rounded but flattened above; suture distinct but shallow, appearing narrowly margined due to transparency of shell. Sculpture: incremental lines well

impressed, quite closely and regularly spaced (so as to give somewhat the appearance of *Glyphyalinia sculptilis*) ; spiral lines sharply impressed, closely and regularly spaced, but exceedingly fine (nearest those of *Z. arboreus*). Umbilicus: about 8 times in major diameter. Aperture: broadly crescentic and nearly vertical. Peristome: sharp, continued on parietal wall by thin callus. Internal armature (figs. 7, 8) : consisting of two, heavy, crescentic lamellae, one mid-columellar and the other mid-parietal in position; both begin just behind level of peristome and are dished so as to jut out obliquely, outward and slightly downward; columellar one about ⅓ whorl in length and attaining a breadth almost equal to its base; parietal one ½ whorl in length and with a maximum breadth of about ½ of last whorl.

Type: alt. .96 mm., maj. diam. 187 (1.79) mm., min. diam. 172 (1.65), alt. apert. 82 (.79), diam. apert. 102 (.81) ; 4½ whorls. Larger, broken shell (figs. 7, 8) : maj. diam. 2.17, min. diam. 1.98 mm.; 5 whorls.

Foot: with pedal grooves; sole undivided.

Type locality: Limestone Cove, between Unaka and Stone Mountains, about 7 miles east of Unicoi, Unicoi County, Tennessee (ANSP. 147189) ; 5 specimens obtained in 2 days collecting.

Judging from the structure of its foot, *Pilsbryna aurea* probably belongs in either the Ariophantinae or the Gastrodontinae, but presents, in its internal armature, such a startling departure from any known American Zonitid that its systematic position still remains extremely dubious. However, I have two animals in alcohol and so hope to allocate it in the near future. Superficially, its shell looks much like the young specimens of *Paravitrea capsella* which were collected with it. In texture and spiral sculpture, *Pilsbryna aurea* more closely approaches *Zonitoides arboreus.* In any case, its peculiar lamellae, especially the parietal position of the larger, warrant its separation as a distinct new genus, on shell characters alone.

EXPLANATION OF PLATE 3

All figures are drawn with aid of camera lucida. Scales for those of shells represent one millimeter; those of jaw and radular transverse row (10T) 50 microns (.05 mm.), that of radular teeth 20 microns; uppermost scale is for fig. 9, next for figs. 10T and 12 to 14, third for figs. 1 to 3, fourth for figs. 4 to 8 and lowest for fig. 10.

Figs. 1–3. *Helicodiscus* (*Hebetodiscus*) *inermis*. Type shell.
Figs. 4–6. *Pilsbryna aurea*. Type shell.
Fig. 7. *P. aurea*. Half of basal view of larger shell, with base (accidentally) broken away to as to expose parietal lamella.
Fig. 8. *P. aurea*. Basal view of columella, broken out of same shell as in Fig 7, to show columellar lamella.
Fig. 9. *Gastrodonta* (*Clappiella*) *aldrichiana*. Jaw.
Fig. 10. *G. aldrichiana*. Radula: central and 1st lateral in natural relations; also 5th, 7th and 10th teeth. 10T shows shape of right half of a transverse row, with positions of central axis, outer edge of 4th tooth and edge of ribbon indicated.
Fig. 11. *Paravitrea* (*Paravitreops*) *variabilis*. Aperture of a half-grown shell from Walden Ridge, with one of the radial barriers.
Figs. 12–14. *P. variabilis*. Type shell.

FOSSIL FRESH WATER SHELLS FROM WINONA, COCONINO COUNTY, ARIZONA

HAROLD S. COLTON
University of Pennsylvania

Walnut Creek drains a large area south of the San Francisco Mountains in northern Arizona. After passing through a deep limestone canyon, famous for its cliff dwellings, it enters a shallow valley among black cinder cones near the railway station of Winona. This valley, about four miles long, is blocked in the middle by a low recent

volcanic cone perfect in outline. Walnut Creek shows some evidence of having been dammed by this eruption—a lake existing for a brief interval, until the stream cut its way around the east base of the cone.

The chief evidence for the presence of this lake lies in the molluscan fresh water fauna which the writer discovered in the sands and gravels exposed in the east wall of the arroyo about halfway between the highway bridge and the railway bridge west of the railway station of Winona. Below the cinder cone—for two miles the arroyo walls were explored—although land forms were encountered, no fresh water shells were found.

The shells, which were kindly identified by Dr. H. A. Pilsbry, are as follows

Valvata sp. An imperfect shell, with rounded whorls.

Physa sp. The mature shells were in fragments and the young were too small for identification.

Ferrissia parallela Say.

Planorbis parvus Say.

Pisidium sp., near *huachucanum* Pils.

Euconulus fulvus (Drap.)

Zonitoides minusculus (Binn.)

Vallonia gracilicosta Reinh.

Succinea grosvenori Lea.

The four land shells last listed seemed to have been washed from upper layers on the bank and were apparently not buried in the gravel.

This fresh water fauna is notable because it indicates that in geologically recent time Walnut Creek contained permanent water. During the last twenty years a few heavy floods have passed down the valley but whole years have gone by without any water flowing. The presence of this fauna is another crumb of evidence supporting the hypothesis that in the recent past northern Arizona enjoyed a heavier rainfall than it does at the present day.

MOLLUSCA FROM VERMILION AND PELICAN LAKES, MINNESOTA, WITH THE DESCRIPTION OF A NEW VARIETY OF HELISOMA CORPULENTA

BY FRANK COLLINS BAKER[1]

The mollusk fauna of Minnesota is comparatively little known and additions are to be welcomed. A desire to study the anatomy of *Helisoma corpulenta*, reported by Grant from Vermilion Lake, St. Louis Co., prompted the writer to spend his vacation at this place. The result has been very gratifying, as the following catalogue of species obtained may show. A review of the literature indicates that less than a dozen papers have been written relating wholly to the Minnesota fauna. As this state, like Wisconsin and Michigan, contains a multitude of lakes, large and small, it is obvious that a careful study of these, and of the land area, would yield a large and varied mollusk fauna.

In 1887 (Geol. & Nat. Hist. Survey Minn., p. 481), Dr. U. S. Grant published a paper entitled "Notes on the Molluscan Fauna of Minnesota". This paper deals largely with the mollusks of St. Louis County, and particularly with the species found near Tower, Lake Vermilion. The writer spent two weeks in August, 1928, on Lake Vermilion, his headquarters being Birch Point, from which detailed examination was made of Big Bay and Daisy Bay, lying on either side of the peninsula. Observations were also made as far west as Niles Bay. From this limited examination it is apparent that the region of the lake offers an almost virgin field for future work, not only as it relates to the Mollusca, but also in other fields of the aquatic invertebrates. Leaches, crustacea, bryozoa, and other forms were observed to be very abundant. In Grant's list, 20 species are listed, of which eight were not found by the writer. Thirty-one species were personally collected, of which 19 are not recorded in Grant's list. The combined lists number 39 species of land and fresh water mollusks. It is prob-

[1] Contribution from the Museum of Natural History, University of Illinois, No. 51.

able that this could be quite largely extended with additional collecting. In the following catalog Grant's records are incorporated with the author's. The Sphaeriidae were determined by Dr. V. Sterki.

The collection from Crow Wing County was in the collection of Dr. W. A, Nason (deceased), of Algonquin, Illinois, whose large collection of land and fresh water mollusks was given to the University of Illinois by the heirs of Dr. Nason. Though small, the records add somewhat to the distribution of Minnesota species. The material from Lake Vermilion, collected by the writer, is also in the Museum of the University of Illinois. The list follows:

PELECYPODA

Anodonta grandis footina Lea. Not common. The few specimens are like those from Winnebago Lake, Wis.

Anodonta kennicotti Lea. One specimen from Oak Narrows, near Niles Bay, is referred to this species. It has the characteristic quadrate form and rough sculpture of this northern species.

Lampsilis siliquoidea rosacea (De Kay). This is the common mussel of the lake, occurring on sandy or rocky shores in shallow water. None are as abundant as in lakes farther south. Many individuals are smaller and rounder than the *rosacea* of New York, and more nearly approach specimens from northern Michigan and Wisconsin. In some specimens there is a slightly rosy tinge to the nacre.

Sphaerium crassum Sterki. Shore debris on Birch Point, Daisy Bay. Not common.

Sphaerium rhomboideum (Say). Shore debris, Daisy Bay.

Musculium truncatum (Linsley). Swamp behind beach, Birch Point, Big Bay. Common. Not typical but a form of this species (Sterki).

Sphaerium occidentale (Prime). Swampy brook behind beach, Daisy Bay. Abundant and typical.

Pisidium subrotundum Sterki. Swampy brook behind beach. "Like the types from Ohio" (Sterki). Swamp be-

hind beach, Birch Point, Big Bay. Like Daisy Bay specimens.

Pisidium adamsi (Prime). Daisy Bay. In shallow water, near shore. "A small form" (Sterki).

GASTROPODA

Fresh Water Species

Amnicola limosa porata (Say). On Potamogeton in eight feet of water, Daisy Bay. Not common and observed only in this location. The sex dimorphism in the shape of the shell, recorded from the lakes of Wisconsin, was also noted among the Amnicola of this lake. The absence of Campeloma, Valvata, or any other genus of the group is noteworthy. No ctenobranchiate is listed in Grant's paper.

Lymnaea stagnalis lillianae F. C. Baker. Shore of Birch Point, Big Bay, in shallow water, on shingle or cobble bottom. Fairly abundant. The shells are like those of the race from the type locality, Tomahawk Lake, Wisconsin, and the same color dimorphism of the animal, black or yellow, was noted. Grant records *Lymnaea stagnalis*, from Tower, but whether this is the true *stagnalis* from pond-like areas near Tower, or the lake race, is not known.

Stagnicola lanceata (Gould). Swamp behind beach, Birch Point, Big Bay. Only immature individuals were found and these were fairly abundant.

Buliminea megasoma (Say). Recorded from Vermilion Lake by Grant. None seen by the writer.

Acella haldemani ('Desh.' Binn.). Recorded as *gracilis* Jay from Vermilion Lake by Grant. None seen by the writer.

Helisoma antrosa jordanensis (Winslow). Shores of Big and Daisy Bays, Birch Point, in debris. Not common. The *antrosa* of this lake appear to be referable to this recently-described race, having the flat spire and sides, and angulated whorls of the Michigan form. Recorded by Grant as *Helisoma bicarinata*.

(*To be concluded*)

SOME OPERCULATE SNAILS FROM NORTHWESTERN CAMAGUEY, CUBA

BY D'ALTE A. WELCH

One of the main objects of the trip which Dr. Pilsbry and I made to Cuba was to collect at places in Oriente Province which I had superficially gone over in 1927. But upon consultation with Professor de la Torre in Havana we decided to stop a week at Gundlach's old locality near Punta Alegre in the northwestern corner of Camaguey. The Editors of THE NAUTILUS have kindly allowed me space to show a few of our finds to those interested in Cuban shells. More detailed descriptions will follow.

CHOANOPOMA PILSBRYI, n. sp. Pl. 5, fig. 1. A species related to *C. uncinatum* Arango, but having the umbilicus closed; 17.5 x 9.5 mm.

OPISTHOSIPHON TORREI, n. sp. Pl. 5, fig. 3. Intermediate between *O. lamellicostatum* and *O. andrewsi;* 32 narrow ribs on the last whorl. 11.4 x 7 mm.

OPISTHOSIPHON CUNAGUAE, n. sp. Pl. 5, fig. 4, 5. Very finely striate, like *O. judasense*, but the deflection of the peristome backward is very slight. It is usually black, but sometimes buff with streaks and spots. 12.7 x 7.8 mm.

OPISTHOSIPHON ANDREWSI, n. sp. Pl. 5, fig. 6. Related to *O. lamellicostatum* T. & H., but with open umbilicus and fewer ribs, 18 on the last whorl. Named for Professor E. A. Andrews of Johns Hopkins University, to whom I am indebted for most of what I know about zoology.

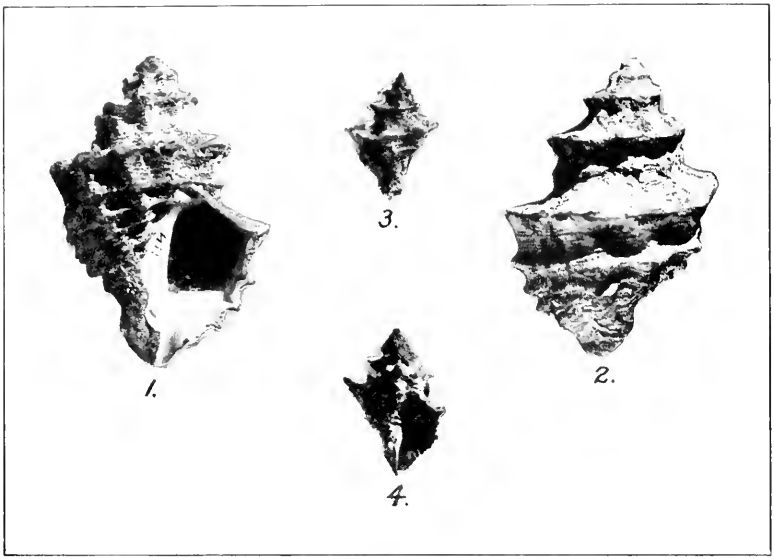
CHOANOPOMA UNCINATUM INDIVISUM, n. subsp. Pl. 5, fig. 7. In this race the last whorl does not become free as in *uncinatum*.

DESCRIPTION OF A NEW CORALLIOPHILA

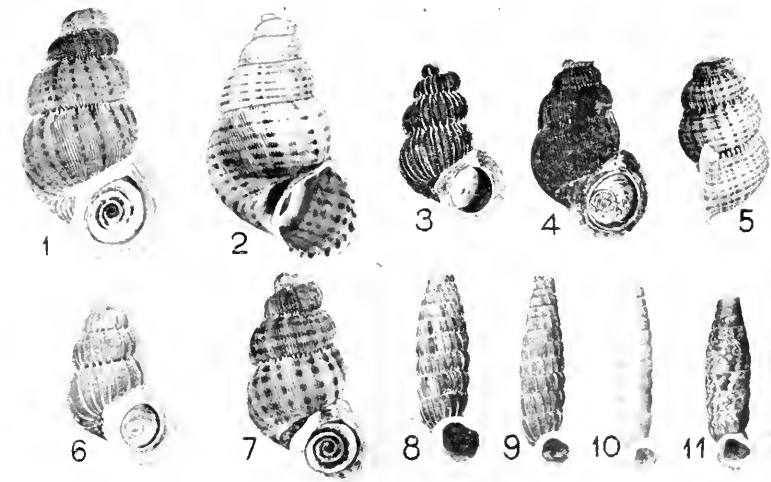
BY IDA S. OLDROYD

CORALLIOPHILA OLDROYDI, n. sp. Plate 5, figs. 1, 2, 3, 4.

Shell large, heavy, aperture one half the length of shell,



1–4 CORALLIOPHILA OLDROYDI



1. CHOANOPOMA PILSBRYI, Welch. 2. C. INQUISITA, Pilsbry. 3. OPISTHOSIPHON TORREI, Welch 4, 5. O. CUNAGUAE, Welch. 6. O. ANDREWSI, Welch. 7. O. UNCINATA INDIVISUM, Welch. 8. UROCOPTIS DELECTABILIS, Pilsbry 9. U. D. FLORENCIANA, Pils. 10. U. TORREANA, Pils. 11. U. CHAMBASENSIS, Pils.

1, 3, 8, 11, from ridge east of Chambas River. 2, 6, 7, 9, 10, ridge north of Florencia. 4, 5, Cunagua hill; all in northern Canaguey.

Figs. 1–7 ×2; 8–11 ×1.

with a row of horizontal scales on the shoulder, and four heavy spiral ridges below the shoulder on the body whorl. There are fine spiral ridges on all the whorls. Aperture of a greenish white, canal short. It differs from *C. hindsii* Carpenter, in having the shoulders nearly straight, and only a faint trace of scales where the body-whorl joins the next one. The shoulders in *C. hindsii* are very sloping. Length of adult shell 47 mm.

Type in Stanford University Collection No. 411. Type locality: Bird Rock off Isthmus, Catalina Island. Range: known only from type locality, and one small specimen from Galapagos Islands (fig. 4).

Named in honor of T. S. Oldroyd who collected it some 34 years ago. It has gone under the name of *Coralliophila hindsii* Carpenter. Carpenter's type was about 17 mm. in length.

A NEW SNAIL FROM CATALINA ISLAND, CALIFORNIA

BY T. D. A. COCKERELL

On the grassy slope above Avalon, Catalina Island, several years ago I collected nine specimens of an elegant little snail of the genus *Micrarionta*. On returning home I found similar examples in the University of Colorado Museum, labelled *Epiphragmophora catalinae* Dall (Proc. Phila. Acad., 1900, p. 103.). However, on looking up the literature, it became evident that the real *Micrarionta catalinae* (Dall) was a different shell, of which we fortunately possessed a specimen, collected by Mrs. M. G. Odell at the Isthmus, Catalina Island. My snail may therefore be called:

Micrarionta beatula n. sp.

Diameter, max. 9.6, min. 8, alt. 5.5 mm.; diameter of aperture 4 mm.; depressed subglobose, with 5¼ whorls; reddish horn color, rather dull with peripheral brown band broadly bordered on each side with whitish; surface with

fine indistinct revolving striae; spire very obtuse; umbilicus entirely covered by the reflexed peristome; peristome white, extremely heavy, strongly reflexed. Type A. N. S. Phila.

M. catalinae (Dall) is much larger, with much wider aperture, peristome not so heavy in proportion to size of shell, umbilicus exposed. Apparently nearer to *M. ruficincta* (Newc.) than to *M. beatula*.

M. gabbi (Newc.), from Santa Barbara I., is larger and more globose with reddened peristome.

MUSSEL POISONING IN CALIFORNIA

BY K. F. MEYER

(From *California Fish and Game*, Vol. 14, July 1928)

During the month of July, 1927, 102 people were seriously poisoned and 6 died following the consumption of the large mussel *Mytilus californianus* Conrad, which had been freshly gathered at 14 different beds on the open shore line of the Pacific coast in the vicinity of San Francisco (see text, figure 1). Although the origin of the poison is not definitely established since the investigations are still in progress it is known that (1) the toxic properties of the mollusks are due to a poison, probably a quaternary amine, which is heat stabile in acid solutions and which causes motor nerve paralysis. The concentration of the poison as determined by laboratory test may vary in different mussels and different beds. (2) the poison is not formed by bacteria nor due to copper salts from the rocks nor due to the little crab, *Pinnotheres pisum*, which lives in the mantle cavity nor is it induced by parasites such as sponges and starfish. (3) The poisonous mussels were neither located in stagnant and polluted basins nor exposed to the sun for long periods at low tide, but they were subjected to the ebb and flow of the tides; the poison is therefore not due to asphyxiation or post-mortem changes. (4) It is prob-

ably the result of a metabolism disease influenced by the food and spawning condition of the shellfish. (5) Poisonous mussels can not be distinguished from sound mollusks neither by appearance nor behavior on cooking; occasionally a pungent odor may be noted; the "liver" is always large and dark. (6) The shellfish may become poisonous within a few days and may remain so for several weeks. No assurance can be given that the mussels may not acquire the poisonous properties overnight. (7) During the winter months December-March the poison disappeared only to reappear late in March; however, the amount of poison which may be present early in spring is not sufficiently concentrated to cause symptoms on indigestion in an empty stomach. (8) Since it is impossible to examine all the mussel beds along the California shore line it is impossible to establish by laboratory test the absence of poisonous mussels in certain beds and during certain months of the year. From the experiences thus far collected it is quite apparent that the use of mussels on the California coast during the summer months is always connected with some danger. Near Santa Cruz poisoning cases have occurred in two successive years. No assurance can be given that this condition may not repeat itself. People who notice a tingling or numbness around the lips and prickly feeling in the finger tips and toes 30 minutes or longer after they have eaten mussels should empty the stomach by an emetic, purge the intestinal tube by brisk laxatives and call for a physician immediately.

MANLY D. BARBER

It is with sincere regret that we report the death on August 18, 1928, of Manly D. Barber. He was born at DeKalb, Illinois, May 21, 1852. His early education was received at DeKalb, and he later attended a business school at Quincy, Illinois. He evidenced an early interest in nat-

ural history, studying the botany of Illinois and later devoted his entire time to mollusks and invertebrate fossils. In 1903, he moved to Knoxville, Tennessee, which remained his home until his death. He was a carpenter by trade, devoting his spare time to collecting. He exchanged his material with collectors both in this country and abroad and built up a modest collection in this way. His chief interest was the *Pleuroceridae* and *Unionidae*, two groups well developed in the Knoxville region.

His endeavors were those of a field collector, preferring that others should publish on his finds. A few notes only appeared by him in THE NAUTILUS. The major part of his collection was sold to the Museum of Comparative Zoölogy a year before his death. Several small collections were made and deposited by him in schools, both in Tennessee and Illinois. A few species of freshwater mollusks have been named after Mr. Barber.—W. J. CLENCH.

NOTES

HELIX HORTENSIS IN THE PROVINCE OF QUEBEC.—*Helix hortensis* Müll, is very common here in Rimouski, on the hills one or two miles from the shore of the St. Lawrence River. I have also found it at Percé on the Gulf of St. Lawrence at an elevation of 1200 feet.—REV. A. A. DECHAMPLAIN.

VENUS MERCENARIA AT MT. DESERT, MAINE.—In looking over some old maps of Mt. Desert Island in 1921 I noticed the name Quahog Bay given to one of the places on the west side of the Island, and, thinking that it might have acquired the name from the fact that quahogs were found there, I searched, but did not find any, nor did I find them in any of the coves up the west side of the Island until I reached the most northwest one at a place called Clarks Cove where I took one in 1927. In the field work of the

Biological Survey of the Mount Desert Region we took another in August 1928, a very large one (125 mm.) and later I took a pair of dead valves. The records show that part of this cove was at one time called Sand Beach, and, on digging down one finds that there has been a sand beach, which has gradually become silted over with mud. This probably accounts for the fact that only large individuals were found, and no indication of young.—WILLIAM PROCTER.

ACMAEA TESTUDINALIS (Müll.).—A most interesting series of *A. testudinalis* was obtained at the "Narrows" Mt. Desert, Maine, by Mr. William Proctor. 55 specimens were taken on eel-grass and 25 from a rock surrounded by eel-grass. Of those from the rock the largest of which, varying from 11 to 17 mm. in length, are typical *testudinalis*, while the 12 smaller ones, varying from 5 to 10 mm. in length, approach the form *alveus*. Among those from the eel-grass the 5 largest are typical *testudinalis*, the largest measuring 11 mm. in width and 15 mm. in length. About 20 would be considered the form *alveus*, the largest having a width of 77 and a length of 12 mm. 30 were intermediate, completely bridging the two forms.—C. W. JOHNSON.

FOSSARIA PERPLEXA F. C. Baker and Junius Henderson.—Shell small, rather solid; periostracum dark brownish horn; surface shining, lines of growth very fine; no spiral lines present; whorls about five, well rounded, slightly shouldered just below the sutures in many specimens; spire somewhat longer than the aperture, acute; sutures well impressed; aperture roundly elliptical, brownish inside; outer lip thin at edge with a varix just within the edge on the inside; inner lip wide, folded back over the umbilical region, leaving a large, open umbilical chink; there is a thin wash of parietal callus connecting the extremes of the lips.

L. 4.5; D. 2.5; Ap. L. 2.0; D. 1.0 mm. Type.
L. 4.6; D. 2.6; Ap. L. 2.0; D. 1.0 mm. Paratype.
L. 5.0; D. 2.7; Ap. L. 2.1; D. 1.0 mm. Paratype.

Type locality: West end Park Lake, Grand Coulee, Washington.

This new species resembles both *parva* and *dalli*. It appears to stand midway between these species, being larger than *dalli* and smaller than *parva*. Its brown color of shell and aperture, deep sutures, fine, regular lines of growth without spiral lines, and its flattened and wide inner lip will distinguish it from related species.—BAKER AND HENDERSON.

ARION ATER ATER (Linné) IN MAINE.—Mr. N. W. Lermond collected near Basin Falls, 4 miles east of Carver's Harbor, Knox Co., Maine, (Aug. 1928) the black form of this common European species. To date, this seems to be the third record for this species from North America. Walker (Occ. pap. No. 58, Mus. Zoöl., Univ. of Mich. 1918) records the red form (var. *rufa L.*) from Detroit. Vanatta (NAUTILUS 38, 1925, p. 93) noted the common occurrence of *A. ater* around Bay Bulls, Newfoundland, taken by the botanist Bayard Long. At the Maine locality several crushed specimens that had been killed by autos were noticed on the state highways.—W. J. CLENCH.

PLANORBIS TRUNCATUS MIGHELS IN NEW YORK. Mr. Eugene H. Schmeck of Niagara Falls, N. Y., has recently sent to me a set of this species, which he collected in the Niagara River at that place. They are quite typical in size, form and sculpture, but differ from the typical form in being quite thin and translucent. I believe that this is the first record for this species east of Michigan.—BRYANT WALKER.

GYRAULUS VERMICULARIS HENDERSONI n. v. In general appearance similar to the typical form, but smaller and with a varix or callus deposit inside of the lip. Dark reddish brown. Major diam. 3.5, minor diam. 3 mm.

Types No. 89534 Coll. Walker. Paratypes in the collection of Junius Henderson.

Type locality: Ditch at Phoenix, Ore. Also Loon Lake, 38 miles N. of Spokane, Wash.; Lagoon 14 miles S. W. of Spokane, Wash.

This form bears the same relation to typical *vermicularis* that var. *walkeri* does to *G. parvus*.—BRYANT WALKER.

THE BRACHIOPOD CALLED MIMULUS. In 1879 Barrande, in his account of the Silurian of Bohemia, proposed a genus *Mimulus* for *M. perversus* Barrande, closely allied to *Triplesia* Hall, 1859. But in 1860 Stimpson had given the name *Mimulus* to a now well-known genus of Crustacea (Irachidae). The Brachiopod may be called *Brachymimulus* n. n., type *Brachymimulus perversus* (Barrande). Bohemia and Arkansas. Three other species which have been referred here should according to N. L. Thomas (Jn. Sci. Lab. Denison Univ., 1928) stand as *Triplesia waldronensis* (Miller and Dyer), *T. moera* (Barrande) and *T. contraria* (Barrande).*—T. D. A. COCKERELL.

THE SCIENTIFIC LIBRARY of the late Dr. Arnold Ortmann has been purchased by the Carnegie Museum, Pittsburgh.

PUBLICATIONS RECEIVED

CATALOGUE OF THE SHELL-BEARING MOLLUSCA OF AMANI-OSHIMA (OSHIMA, OSUMI). By Tokubei Kuroda. This catalogue of 1148 species is the first publication we have had which gives an adequate idea of the mollusk fauna of any part of the Loo Choo arc. The numbers of species of the classes stand: Pelecypoda 207; Scaphopoda 4; Amphineura 2; Gastropoda 933, of which 61 are Pulmonata, 2 Cephalopoda. Several new species are named but not described. Great care has evidently been taken to bring the nomenclature up to date. It is an interesting and valuable work.

THE AFFINITIES OF CECILIOIDES AND FERUSSACIA, ILLUSTRATING ADAPTIVE EVOLUTION. By Hugh Watson, M. A. (Journal of Conchology, August, 1928). In this important work on long known but very imperfectly understood

*Thomas writes *Triplecia contraria*; but *Triplesia* was Hall's original name, changed to *Triplecia* by Hall and Clarke, 1892.

snails, Mr. Watson concludes that "while *Cecilioides* and *Ferussacia* differ in several rather important respects, yet they undoubtedly belong to the same family." "Most of the differences can be explained if we suppose that, in the course of evolution, the genus *Cecilioides* has become specially adapted to an underground habitat." These genera are shown to have a specially modified sigmurethrous kidney, thus differing widely from the orthurethrous *Cochlicopa*. While related to the Achatinidae, Mr. Watson considers them distinct enough to be referred to a separate family, Ferussaciidae.

INFLUENCE OF A CHANGED ENVIRONMENT IN THE FORMATION OF NEW SPECIES AND VARIETIES. By Frank C. Baker, (Ecology, July, 1928). Certain streams in Wisconsin dammed sixty years ago, forming lakes, have served for this interesting study of the effects of lacustrine conditions imposed upon a molluscan fauna of streams.—H. A. P.

THE AMERICAN BITHYNIA NOT WHOLLY AN INTRODUCED SPECIES. By Frank C. Baker (Trans. Ill. State Acad. Sci. XX, March, 1928). The finding of this species in Chicago deposits 9-25 ft. below street level, 5-15 ft. below the level of Lake Michigan, raises the question whether the species was present in America before its introduction into the eastern Great Lake region. The fossils are said to have been found in undisturbed strata, "probably the Toleston stage of Glacier Lake Chicago".

MOLLUSKS OF IMPORTANCE IN HUMAN AND VETERINARY MEDICINE. By J. Bequaert. (Amer. Journ. Tropical Medicine, 1928). A valuable review of the mollusks serving as intermediary hosts for the parasitic trematodes infesting man and domestic animals. While the number of molluscan species involved does not exceed 60, they belong partly to the most widely spread and commonest genera, such as *Lymnaea*, *Planorbis* and *Bulinus*. The proper identification of the incriminated species has become a matter of the first importance in dealing with the diseases caused by the various blood flukes.

THE AQUATIC MOLLUSKS OF THE BELGIAN CONGO, with a Geographical and Ecological Account of the Congo Malacology. By H. A. Pilsbry and J. Bequaert. (Bulletin American Mus. Nat. Hist., Vol. 53, art. 2, pp. 69-602, 1927.) A complete and comprehensive geographical monograph of the freshwater mollusks of west Central Africa. This work is the most exhaustive and critical study that has ever been made for any region the size covered by this work. It is complete geographically as it includes all known species of the region or reference to them if the shells were not examined by the authors. It is monographic in its thorough bibliographic references, its anatomical notes, descriptions, synonomies and ecological considerations.

In the main, the work is based upon an extensive collection made by Lang and Chapin supplemented by material collected by Bequaert and from the Congo Museum at Tervueren, Belgium. A feature of considerable importance and one worthy of copy in all such works is that of "tying in" localities by latitude and longitude. African village sites are apt to change their locations many times in a few years—the common practice to retain the same name—hence the localization of a species based upon the name and locality of a village would mean but little if that village should change its position some forty or fifty miles from where the specimens were collected.

Very complete zoögeographical considerations are given to faunal areas with lists of species and discussions of their probable origin. A chapter is devoted to molluskan parasites with their respective hosts with general statements concerning this subject in Africa and elsewhere.

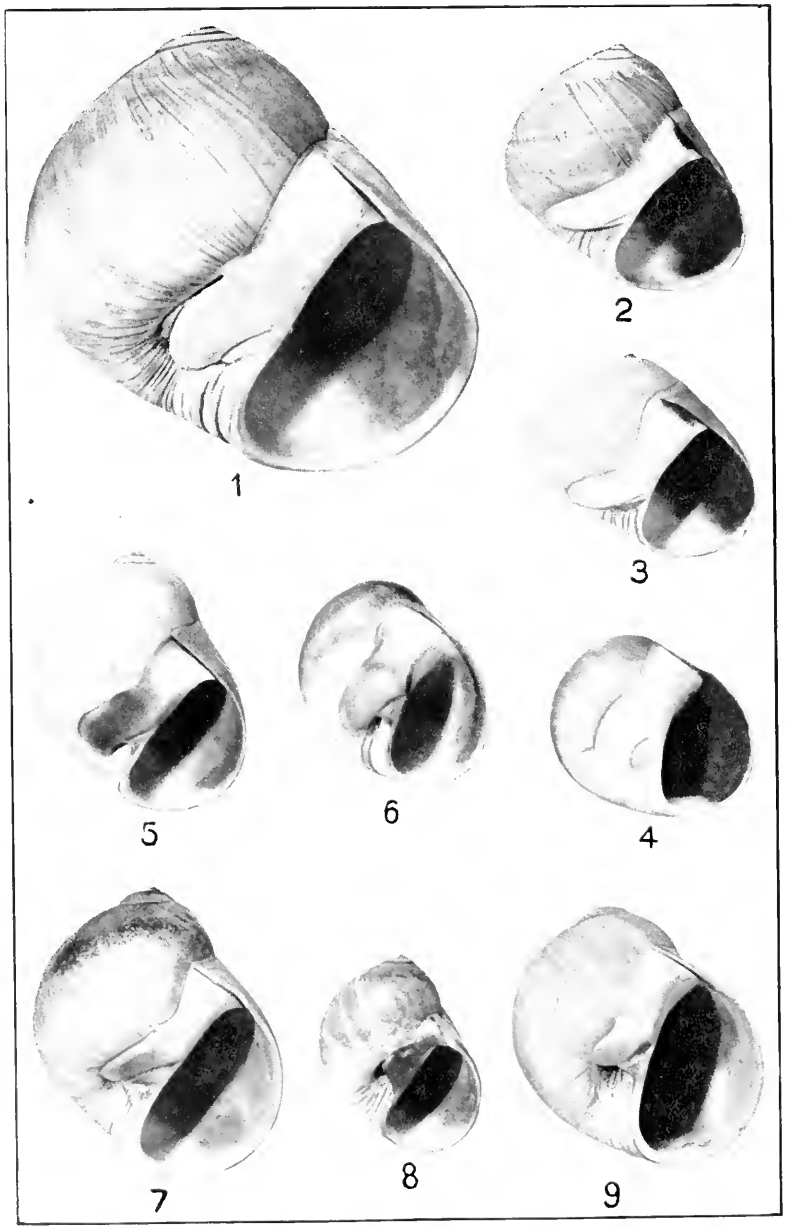
Two genera and one subgenus with sixty-two species, subspecies and mutations are described as new. Three new names are given for names of preoccupied species. Sixty-seven plates with excellent figures depict the new species with several plates devoted to photographs of definite ecological areas.—W. J. CLENCH.

CONTRIBUTION A L'ÉTUDE DES NUDIBRANCHES NEO-CALÉDONIENS. Par Jean Risbec (Faune des Colonies Françaises, Tome 2, Fasc. 1, 328 pp. 12 pls. 1928). This work is based on researches in New Caledonia in 1925, 1926 and part of 1927. It is a valuable addition to our knowledge of this interesting group of Mollusca. Some fifty pages are devoted to their biology, classification, etc. 70 new species are described and the following new genera are proposed:—*Guyonia, Noumea, Gruvelia, Spahria Analogium, Joubiniopsis* and *Vayssierea*.. On the 12 plates are 121 beautiful colored figures of the species, while their anatomy is shown by 98 figures in the text and four plates.—C. W. J.

NEW FOSSIL PEARLY FRESH-WATER MUSSELS FROM DEPOSITS ON THE UPPER AMAZON OF PERU. By W. B. Marshall. (Proc. U. S. Nat. Mus., Vol. 74, Art. 3, pp. 1-7, pl. 1, 1928). *Prodiplodon* and *Eodiplodon* two new genera, and five new species are described and figured. The geological horizon from which these shells were obtained has not been definitely settled.

NEW FRESH-WATER AND MARINE BIVALVE SHELLS FROM BRAZIL AND URUGUAY. By W. B. Marshall. (Proc. U. S. Nat. Mus., Vol. 74, art. 17, pp. 1-7, pls. 1-4, 1928). Eight new species are described and figured.

NATURAL HISTORY OF SHIPWORM, TEREDO NAVALIS, AT WOODS HOLE, MASSACHUSETTS. By B. H. Grave. (Biol. Bull., Vol. 55, pp. 260-282, 1828). An exhaustive study of an interesting mollusk. The following notes are from the summary: "The breeding season extends from about May 10 to October 10. Spawning begins in the spring when the water reaches a temperature between 11° and 12° C. The time required for a fertilized egg to complete larval development to metamorphosis is approximately five weeks. About half of this time is passed in the brood pouch and half as a free swimming veliger. *T. navalis* reaches sexual maturity in six weeks or two months after metamorphosis when it measures four or five centimeters in length. It reaches adult size in one year and dies during the second year."



1, Neverita reclusiana 2-4. N. r. imperforata. 5-9, N. alta.

THE NAUTILUS.

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NEVERITA RECLUSIANA (DESH.) AND ITS ALLIES

BY H. A. PILSBRY

This large Californian naticid snail was described and very well figured by Deshayes in Guerin's *Magasin de Zoologie* for 1841, plate 37. He called it "Natica de Recluz, *N. Reclusiana.*" The same orthography was used on the plate, evidently because Z was considered out of place in classical Latin, appearing only in words transliterated from Greek. The spelling "recluziana" by modern authors is an unauthorized alteration of what Deshayes intended, and should be discarded.

The original type measured 85 mm. long, 65 wide. This is about the maximum size, I would suppose, being larger than any specimen I have seen. The usual size is shown in plate 6, fig. 1, a specimen from San Pedro. The umbilicus is always partly open, and the callus is white or sometimes faintly tinged with brown outwardly. The callus varies in shape as shown in the figures in Chenu's Illustrations Conchyliologiques; it leaves part of the umbilicus open.

The range of typical *reclusiana* is given by Dall as from Crescent City in northern California to the Tres Marias Islands, Mexico, and Chile (on the authority of Phillipi). The series of *N. reclusiana* before me is deficient in specimens of the typical form south of San Pedro. I have not seen any from Lower California or western Mexico. The record of *reclusiana* from Chile appears very dubious.

In 1909 Dall briefly defined two varieties: *Neverita re-*

cluziana var. *alta* and *N.r.* var. *imperforata* Stearns. The former had been noticed by Arnold in 1903. Var. *imperforata* seems to have been taken from a collection label. As these forms have never been fully defined or figured some consideration of them may not be superfluous.

Besides the specimens in the collection here I have received a long series from Mr. H. N. Lowe, who writes as follows: "In January, 1928, I secured a nice lot of live specimens of variety *alta* in Newport Bay. I think they had come in to spawn, for this form seems to live most of the time in deeper water. I also include a lot of dead specimens from Alamitos Bay (washed ashore) and examples from Ensenada, San Diego and Morro Bay. In looking these over I have never found any specimens which intergrade with the typical form, or are at all doubtful. The callus at the base in var. *alta* seems to be always brown. Do you not think this form worthy of specific rank?"

NEVERITA ALTA ('Dall' Arnold). Pl. 6, figs. 5-9.

[*Polynices* (*Neverita*) *recluziana*] var. *alta* Dall, Arnold, Paleontology and Stratigraphy of the Marine Pliocene and Pleistocene of San Pedro, California, in Mem. Cal. Acad. Sci. III, 1903, p. 315.

[*Neverita recluziana*] var. *alta* Dall, Miocene of Astoria and Coos Bay, Oregon, U.S.G.S. Prof. Pap. 59, 1909, p. 88.

Polinices recluziana alta Dall, Oldroyd, Mar. Shells W. Coast N. A., II, pt. 3, 1927, p. 130.

It ranges from Monterey, according to Dall, to San Diego (Lowe).

Arnold originally described this form as "a variety with an elevated spire" from the "Upper San Pedro" Pleistocene of San Pedro. Dall's definition is "with small narrow shell and exceptionally elevated spire", no type locality mentioned. Both definitions are inadequate.

By the kindness of Dr. W. P. Woodring of the California Institute of Technology, Pasadena, I have been able to examine series of the Pleistocene Neveritae from Pacific and Oliver Streets, San Pedro, and from Upper Potrero Canyon, one-fourth mile south of Pacific Palisades P. O. There

are two forms, corresponding to Arnold's var. *alta* and to the var. *imperforata,* which Arnold described and figured as *P. recluziana.* The former agrees fully with living specimens except in the loss of color, and I have selected one of the lot from the "Upper San Pedro" at Pacific and Oliver Streets as a neotype, length 27 mm., diam. 25 mm. *N. reclusiana* proper is not known from these beds.

In the recent specimens the umbilicus varies in size but is always partially open and deep. *The umbilical callus is brown* (rarely partly white). The callus in some specimens, such as those figured from Newport Bay, pl. 6, figs. 5, 6, is long and tongue-shaped at the end. In others, pl. 6, figs. 7, 8, 9, Alamitos Bay, it has the usual shape in *N. reclusiana.* Such variations are seen also in our Eastern *N. duplicata.* The groove on the callus is very variable, and is rarely obsolete, as in pl. 6, fig. 8.

Length 39 mm., width 34 mm. Fig. 7.
Length 37 mm., width 33 mm. Fig. 9.
Length 35 mm., width 30 mm. Fig. 8.
Length 26.5 mm., width 23 mm. Fig. 5.

The question of whether this is to be considered a distinct species or a form of *N. reclusiana* requires consideration. If it occurs with the large typical form I would think it specifically different. If the two occupy distinct ecologic stations, however, that might possibly be thought to account for the differences in the shells, though I would not expect to find them differing in the same way in many localities if the difference was due to station. Those having the opportunity to collect them should publish their observations on the special localities and habitats of both forms. I do not think there is much doubt that *alta* should be given specific rank.

Those who do not use the double author citation will call this form *Neverita alta* (Arnold).

NEVERITA RECLUSIANA IMPERFORATA 'Stearns' Dall. Pl. 6, figs. 2, 3, 4.

Polynices (*Neverita*) *recluziana* Petit, Ralph Arnold,

Paleont. and Stratig. Mar. Pliocene and Pleistocene of San Pedro, Cal., Mem. Cal. Acad. Sci. III, 1903, p. 314, pl. 10, fig. 12.

[*Neverita recluziana*] variety *imperforata* Stearns, Dall, U.S.G.S. Prof. Pap. 59, 1909, p. 88.

Polinices recluziana imperforata Stearns, Oldroyd, Mar. Shells W. Coast N. A., II, pt. 3, 1927, p. 129.

This form appears to have been noticed first by Dr. Stearns, who apparently applied the name *imperforata* to specimens in his collection, but did not mention it in his published work so far as I know. It was first figured by Arnold, who called it *recluziana*.

In shape the shell is smaller and generally more depressed than *reclusiana*, but it varies to forms equally high. The parietal and umbilical callus is white, or there may be a faint brown tint towards the outer margin; old ones have a brown streak on the callus contiguous to the posterior part of the outer lip. The callus covers the umbilicus typically, as in fig. 4, but in some samples the closure is not complete, a small shallow or deep pit being left open. The shell is smaller than *reclusiana*, the diameter usually 30-40 mm., but sometimes it reaches a larger size. Some apparently adult shells are much smaller, down to about 20 mm. diameter.

Length 50 mm., width 44 mm.
Length 36 mm., width 40 mm.
Length 54 mm., width 53 mm.
Length 35 mm., width 34 mm.
Length 19 mm., width 22 mm.
Length 25 mm., width 27 mm.

The specimens figured are from Newport Bay, collected by H. N. Lowe. The Pleistocene specimen figured by Arnold and those sent by Woodring from Pacific and Oliver Sts., San Pedro, are small and agree with the living shells from Newport Bay.

As in the case of *alta*, the status of this form is rather uncertain. Typically it seems to be very distinct, but specimens with the umbilicus not completely closed are somewhat transitional. The comparison of long series is needed;

also observations on the ecologic station, and whether it is associated in life with *reclusiana*.

Neveritae having a grooved umbilical callus are found nearly all around the Pacific, from Japan to Australia on the western side as well as on our shores. It might be well to segregate them as a new section, GLOSSAULAX, with *N. reclusiana* as type.

It is hoped that Californian naturalists who have opportunity to collect the several forms discussed above will send in the results of their observations.

PLATE 6

Fig. 1. Neverita reclusiana (Dh.). Typical. San Pedro.
Figs. 2–4. Neverita r. imperforata 'St.' Dall. Newport Bay. Fig. 3 is the neotype. 147436.
Figs. 5–6. Neverita alta ('Dall' Arnold), Newport Bay.
Figs. 7–9. Neverita alta ('Dall' Arnold), Alamitos Bay.

CYPHOXIS RAFINESQUE, A CRETACEOUS TAXODONT IDENTICAL WITH IDONEARCA CONRAD

BY HENRY A. PILSBRY

In his "Prodrome de 70 nouveaux Genres, Etats-Unis d'Amérique", published in Journal de Physique, de Chimie, d'Histoire Naturelle, vol. 88, June, 1919, Refinesque defined the 52d genus thus:

"CYPHOXIS. (Biv. foss.) Different du genre *Arca* par valves très bombées, les sommets basilaires bossus, recourbés, séparés par un grand intervalle; un sillon oblique, courbé, extérieur, latéral et postérieur.—Plusieurs espèces, telles que *C. venerina, cardites, pulla, lunula* etc. Dans les couches de grès, de marne, etc."

Herrmannsen referred *Cyphoxis* to *Arca*, a course fol-

lowed by E. Lamy,[1] but without indicating what group of arks it was thought to pertain to.

Rafinesque's four species were not defined, so that *Cyphoxis* has to be treated as a genus without species. There is no fossil ark of the region covered by Rafinesque which meets the requirements of the diagnosis, but it applies in every respect to the *casts* of *Cucullaea* of the subgenus *Idonearca* Conrad, found abundantly in the Cretaceous marls of New Jersey. At the time Rafinesque wrote, none of the species had been described; but some years later S. G. Morton described *Cucullaea vulgaris* and *C. antrosa*.[2] The first of these *C. vulgaris* Morton, is now designated type of *Cyphoxis*. If a name based upon a cast is acceptable, *Cyphoxis* will replace *Idonearca* Conrad.

Rafinesque probably picked up these casts, which are common objects in the marl pits, in the course of his rambles in search of plants and shells while he was living in Philadelphia. He appears to have been the first naturalist to notice any Cretaceous shell in the New Jersey marls. The characteristically careless omission of the locality of his fossils caused the find to be overlooked by Morton, Conrad and others who worked on the fauna later.

THE NOMENCLATURE OF ECOLOGICAL VARIETIES

CALVIN GOODRICH

Mr. Frank Collins Baker, in his introduction to Part I of his "Fresh Water Mollusca of Wisconsin", takes issue with those—specified by him as geneticists—who question the power of environment to determine the evolution of species. He says ". . . field zoologists who have observed the multitude of living things in their diverse environ-

[1] Journ. de Conchyl., vol. 55, 1907, p. 1.

[2] Synopsis of the Organic Remains of the Cretaceous Group of the United States, 1834, pp. 64, 65. Good figures have been given by Whitfield, Brachiopoda and Lamellibranchiata of the Raritan Clays and Greensand Marls of New Jersey, pl. 13. 1886.

ments cannot but believe that the environment has played a large part in the production of this infinite variety of living organisms. The geneticists who confine their studies to laboratory experiments on a few animals, usually under abnormal conditions, are not in as good position to judge of the effect of environmental changes as are the students who have spent years in field observations."

Mr. Baker himself has supplied in another place the most telling kind of demonstration of the domination that environment has over the forms of the shells of freshwater mollusca.[1] This came of a study that he made in Barron County, Wis., in 1921. About sixty years ago a dam was built for lumbering purposes in the region which impounded parts of the waters of three large creeks. A series of artificial lakes was created, one of them as large as seven miles long and a mile wide. Six species and varieties of mollusks were found in 1921 to be modified by the alterations in the character of habitat. The creek *Anodonta grandis plana* Lea was supplanted by the relatively shorter and wider *A. grandis footiana* Lea. The compressed and high lake form of *Lampsilis siliquoidea* Barnes that approaches the variety *rosacea* succeeded the elongated and cylindrical river form. Most of the specimens of *Amnicola limosa* Say that Mr. Baker collected in the lakes were the variety *porata,* a more globose shell than the stream form. Similar changes were wrought in the shape of *Lymnaea catascopium* Say. *Planorbis antrosus* Conrad apparently reverted in the lakes from the creek form called *P. antrosus unicarinata* Hald. to the typical specific characters. In the streams of the county, *Planorbis trivolvis* Say was typical; in the sixty-year old ponds it was of greater axial height and the whorls were more rounded. In addition to the forms recited, *Planorbis campanulatus wisconsinensis* Winslow, unknown in the creeks, has made its appearance in the waters above the dam.

[1] "Influence of a changed Environment in the Formation of New Species and Varieties," F. C. Baker, Ecology, IX, July, 1928, pp. 271-283.

Three similar instances that have come to my knowledge may be mentioned. Mr. William J. Clench collected *Goniabasis carinifera* Lam. in the Country Club Lake near Dalton, Ga., that was larger than any taken in the streams of the vicinity and I suspect a good deal larger than any specimens in the average museum collections. The lake is artificial. Mr. Herbert H. Smith was so fortunate as to be present when one of the locks of the Black Warrior River was emptied for repairs and he there came upon Naiades excessively large and freer than usual of the common erosion. In the natural pool below Crawfish Springs at Chickamauga, Ga., is a very slender, scarcely carinated form of *Pleurocera planogyrum* (Anth.). In the comparatively new pond just below the pool, *planogyrum* is heavier, longer, wider and exceedingly carinate.

Planorbis magnificus Pilsbry, too, would appear to have acquired its surprising development under conditions brought about by man.

Now all this, it seems to me, has a significant bearing on molluscan nomenclature. A scientific name tends to have the authority of a pronouncement from the bench. We think of it as setting metes and bounds as definite as a title deed. We are trained that way and, indeed, names thus conferred would be worthless the moment they were published if our respect was not enlisted on their side at their very beginning. Taxanomy is a mere amorphous mass if its nomenclatorial skeleton cannot hold it up. The demonstration that species may be modified in a relatively short time by an alteration in the environment is a demonstration also that freshwater forms lack the permanence that is implied by the erection of subspecific names. Surely a species or a subspecies ought to be conceived as much too fixed a thing to change, short of a great many generations, simply by reason of the establishment of a log dam across a creek or by an invasion on the part of organisms from a wave-swept area into a protected bay just around the corner. If I have counted them correctly, there are thirteen new subspecific names for freshwater gastropods in Mr.

Baker's latest work, his new specific names being ignored. In making these additions, Mr. Baker, one is compelled to believe, has failed to read the illuminating lessons of his own discoveries.

It may almost be said that for life in a freshwater stream nothing is fixed and certain, and not greatly more so for the life of a freshwater lake—contrasting with the commoner conditions of the sea as, say, a mountain torrent with a mill pond. Depths vary. The force of currents varies. The density of water varies between such extremes as do not fall to the experience of the marine forms of an average locality. Floods, laden heavily with silt, may be followed in a few weeks by droughts during which the temperature rises greatly and micro-organisms, benign or evil, multiply enormously. Where a gravel bar has given opportunity for gravel-inhabiting mollusks to flourish for a few seasons may appear a mud bank or a sand bar or a huddle of grinding boulders. Slack water may be the successor of swift water and frequently the clean, open bed of a stream becomes an ox-bow, left to one side to be choked with rotting vegetation. The variation of the hydrogen ion concentration of a body of water, as we are coming to know, can spell the difference between livable conditions and death,[2] and nowhere is this variation so much as in a creek or a river. The battle for existence is less strenuous in the lakes than in the streams, but it is present there also. In the lifetime of people now living in Michigan, many lakes of the state have been conquered by sphagnum and Decodon, and during that invasion the mollusks have succumbed. The reaction to variation in the habitat has been variation in the forms of life. Only in shallow bays, brackish sea marshes and the mouths of streams are there sets of marine conditions paralleling those of inland waters, and it is of interest to note in this connection that here the marine forms of mollusks display confusing variation. I am informed that in such situations there occur wide variations among the fishes.

[2] See "Life in Inland Waters", Kathleen E. Carpenter, 1928, p. 68.

Probably one reason for the present nomenclatorial Babel is that our illustrious predecessors approached the study of freshwater forms from the sea, which is to say that they were familiar first with the inhabitants of salt water and carried a habit of mind, brought about by earlier discoveries, over into their new labors. This antecedent has had a possibly unperceived influence upon us, such an influence as a solemn judiciary decision of the last generation has upon the interpretation of human law today. The result is a custom of considering a freshwater form that varies slightly from some previously known form as of far more importance than it actually is, of blinding us to the fact that plasticity is the inevitable concomitant of a varying habitat and, in the endeavor to point out in freshwater shells such border lines as may be defined among the marines, writing descriptions that are scarcely more than vague and misleading words.

Mr. Baker's findings in Wisconsin have served to crystalize in me a conviction that just as students of the mollusca were once too prone to multiply species they are too ready at this time to heap up subspecies and varieties. It is impossible to give an air of fixity to something that is not fixed in nature, however industriously and ingeniously we attempt it. The enterprise, indeed, can take on the mien of an intentional absurdity. Consider, for example, the instance of differentiating two river mussels by subspecific designation because one of them, from headwaters to the middle reaches of a stream, has a calculated obesity of 47 per cent or less and the other, occurring farther down, has an obesity in excess of 47 per cent. Is a man with a waist line of forty-eight inches any less a member of his species than a man whose midriff measures forty-two inches?

See "Variations in Fresh-Water Mussels", G. H. Ball, Ecology, III, 1922, p. 93.

SOME FOSSIL FRESH-WATER MOLLUSCA FROM WASHINGTON AND OREGON

By Junius Henderson

About a year ago I reported some fossil fresh-water Mollusca from Quaternary deposits between Soap and Alkali Lakes, in Grand Coulee, Washington.[1] At that time I was not aware of the geological history of the Grand Coulee. I have since learned that geologists who have studied the region believe that the Coulee was carved by the Columbia River when it was forced from its channel by glacial ice during the Pleistocene Glacial Epoch, the river having resumed its course around the Great Bend after the retreat of the glaciers, leaving the wide, deep, valley with no perennial stream, but partly occupied by a series of disconnected lakes. Because of the lack of outlets and the loss of water by evaporation in the semi-arid climate, leaving in the water the salts brought in by annual run-off, the water of some of these lakes is too saline to support molluscan life. I am not sure whether the fossils from Soap Lake district represent mollusks that lived there while the river flowed through the Coulee, or lived in a large lake after the abandonment of the Coulee by the river but before the lakes had shrunken to their present dimensions. Certainly Soap Lake was once larger and deeper than now. I have not been able to re-examine the region in the light of my present idea of the history of the Coulee.

In crossing the Coulee farther north in the summer of 1928, accompanied by Mr. Elven Clifford Nelson, we found a very interesting fossiliferous river deposit, undoubtedly of Pleistocene age, in the bluff on the south side of Park Lake, a short distance below Dry Falls, which has recently been set aside as a State Park, where the waters of the river are believed to have once tumbled over a great precipice. There are two distinct deposits of fossils, both at about the same level, many feet above the present level of

[1] Henderson, The Nautilus, XLI, 118-120, 1928.

the valley. The one nearest the upper end of the lake is a well consolidated bed a foot or more thick, exposed in an excavation made in obtaining road material. This bed consists mostly of the shells of *Anodonta californiensis* Lea, which is still found living in the states west of the Rocky Mountains. The mussels were evidently buried alive, as the valves in all cases are together and closed. This is likely the deposit that Curator T. A. Bonser, of the Spokane Municipal Museum, had mentioned to us a couple of weeks before. Several hundred yards south of the first exposure is another thick, loosely consolidated, calcareous bed composed almost entirely of plant fragments, apparently *Chara,* and shells, as follows: *Planorbis antrosus* Conrad, *P. vermicularis* Gould, *P. trivolvis* Say, *Parapholyx effusa effusa* (Lea), *Valvata humeralis californica* Pilsbry, *Physa* related to *P. humerosa* Gould, *Lymnaea stagnalis wasatchensis* "Hemphill" Baker, *Stagnicola couleensis* Baker (new species), *Pisidium compressum* Prime, *Pisidium* sp. It may be noticed that all the species of this fauna are still living somewhere except *S. couleensis* and possibly the *Physa* and *Pisidium* sp.

On the slope of the latter deposit were some shells of *Oreohelix strigosa* (Gould), but they are probably more recent and rolled down from the shrubbery up the hill, as we found none actually embedded in the deposit. This species now lives in abundance in the lava rock slides of the vicinity. We found no mollusks living in the lake, but found along the shore at various points many bleached shells of some of the species, sometimes with a little of the calcareous matrix attached, all probably washed from the fossiliferous deposit. We found *Succinea* living at several places along the shore, and in the tiny outlet by which the lake drains into Blue Lake we found several species of freshwater mollusks living. Dr. Pilsbry[2] long ago reported a number of species as having been found at Blue Lake by Professor Snodgrass.

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[2] Pilsbry, THE NAUTILUS, XVII, p. 84, 1903.

At Silver Lake, southwest of Spokane, Washington, the water is now 30 feet or more below its former level. Tufa deposits many feet above the water contain numerous very small *Physa* shells. We found no other shells actually in the tufa, but on the surface about the tufa knobs large *Physa* shells were common and *Valvata humeralis californica* Pilsbry and detached valves of *Pisidium compressum* (Prime) abundant, the abundance of *Valvata* extending up the slope nearly or quite to the former high water mark. The shells in the tufa are surely fossil, and our failure to find any living mollusks in the lake leads to the belief that the others are also, especially the *Valvata*.

Harney Lake, southeast of central Oregon, has no outlet, hence for a very long period has been a concentrated salt solution, containing no mollusks and subject to considerable fluctuation in size. It, together with the neighboring Malheur Lake, which drains into it, are said to have shrunken rapidly for the past two years. At the present time the high sand dunes are a long distance from the shore line of Harney Lake. On the dunes are large quantities of mollusks of the following species: *Planorbis vermicularis* Gould, *P. trivolvis* Say (very large), *Parapholyx effusa effusa* (Lea), *Carinifex ponsonbyi* Smith, *Lymnaea stagnalis wasatchensis* Hemphill, *L.* (*Stagnicola*) *leai* Baker, *Valvata humeralis californica* Pilsbry, *Paludestrina longinqua* (Gould), *Anodonta* fragments, apparently *A. californiensis* Lea. We considered these surely fossil, representing the period when the climate was more moist and the lake consequently non-saline. Malheur Lake, having no outlet, is comparatively fresh, and probably contains living mollusks. The dense tule growth along its margins prevented us from getting to the water at its present low stage, in a search of several miles along the shore, but the outlet, at Narrows, yielded living *Lymnaea stagnalis wasatchensis* Hemphill, *L.* (*Stagnicola*) *palustris nuttalliana* Lea, *L.* (*Fossaria*) *obrussa obrussa* Say (?), *Planorbis trivolvis* Say (large), *P. vermicularis* Gould and *Valvata humeralis californica* Pilsbry.

The vast, semi-arid, interior portions of Oregon and Washington are dotted with many lakes, varying from fresh-water to saturated salt solutions. A study of their waters and shore deposits would be very interesting and well repay the effort. Most of them can now be reached by auto over passable roads. Where no mollusks are now living in the lakes because of saline conditions, the adjacent lacustrine deposits will usually yield fossils representing the more moist Pleistocene time, when the lake basins were full and overflowing and the water consequently fresh.

The following description was prepared by Dr. Frank C. Baker and the figures of the paratypes were drawn by my assistant, Miss Elberta L. Craig:

STAGNICOLA COULEENSIS F. C. Baker, new species.

Shell elongate-ovate, turreted; surface with distinct spiral striae; whorls 5½, flatly rounded, the body whorl rather obese, rapidly increasing in diameter; sutures well marked; spire acutely conic; aperture ovate or elliptical, half as long as the shell and equal to or longer than the spire; outer lip convex, without varical thickening; inner lip narrow at base of aperture, but becoming wider near the body whorl where it is tightly oppressed and somewhat twisted, forming a distinct, ascending plait; there is a small umbilical chink and the parietal wall is covered with a thin wash of callus.

L. 18.5; D. 10.5; Ap. L. 10.5; D. 6.0 mm. Holotype.
L. 17.6; D. 11.1; Ap. L. 11.1; D. 6.6 mm. Paratype.
L. 14.8; D. 8.1; Ap. L. 8.6; D. 5.7 mm. Paratype.

Type Locality: From Bluffs on south side of Park Lake, Grand Coulee, Washington

Types: Museum Natural History, Univ. Ill., No. Z28049; paratypes: Univ. Colo. Museum, No. 17024.

This is apparently an extinct species characterized by its acute spire, wide and somewhat globose shell, and distinct columellar plait. It somewhat resembles some forms of *Stagnicola binneyi* (Tryon) but differs in its sharper, more

turreted spire and twisted, plait-like columella. It bears the greatest resemblance to Currier's *intertexta,* which has been considered a synonym of *Stagnicola catascopium.* A somewhat similar form, believed to be ancestral to *intertexta,* has recently been found in Pleistocene deposits in Wisconsin. The fossils from Grand Coulee appear to be of an extinct species, although it may yet be found living in the northern part of British America.

NOTES OF THE MOLLUSCA OF SOUTHEASTERN UTAH

By Ralph V. Chamberlin and Elmer Berry

The mollusca listed in the present paper were for the most part taken by the authors and associate members of a field expedition from the University of Utah during April, 1928. While most of the collecting, which was carried on in connection with other work, was done in San Juan County, some material was secured in adjacent parts as indicated under the separate forms below. The region covered is largely desert in character and so unfavorable for the group. Mr. Berry deserves credit for the material obtained.

Pisidium variabile Prime. Moab, Grand Co., three specimens occurring with *P. abditum* Hald.; Fruita, Wayne Co., a number of very small specimens.

Pisidium abditum Haldeman. Torrey, San Juan Co., one specimen; Moab, Grand Co., several mature specimens; south of Colorado River, near Moab, three specimens taken with *P. variabile* Prime.

Vallonia pulchella (Müller). Moab, Grand Co.

Vallonia albula Sterki. Verdure San Juan Co.; Torrey, Wayne Co., one specimen.

Vallonia gracilicosta Reinhardt. Verdure, San Juan Co.; Fruita, Wayne Co.

Oreohelix depressa (Cockerell). LaSal Mts., San Juan Co.,

at 10,000 ft. (V. M. Tanner Coll.) on Mt. Tukuhnikivatz. In these specimens the spire is rather low. Two reddish bands of variable width on periphery.

Oreohelix sp. Near Bluff, San Juan Co. One specimen lacking spire and with keeled periphery. Probably washed down from higher level.

Microphysula ingersolli (Bland). Mt. Tukuhnikivatz, LaSal Mts., San Juan Co. One specimen (U. of U. Zool. Mus. No. 1481) collected by V. M. Tanner.

Pupilla hebes (Ancey). San Juan Co., (Pilsbry, 1921).

Pupilla syngenes dextroversa (Pilsbry and Vanatta). Verdure, San Juan Co.; Torrey and Fruita, Wayne Co.

Vertigo coloradensis (Cockerell). Between Blanding and Verdure, San Juan Co. One specimen apparently weathered and with palatal folds undeveloped, length 1½ mm.; Verdure, San Juan Co., also weathered and with only columellar and parietal teeth showing.

Cochlicopa lubrica (Müller). Verdure, San Juan Co.; and between Verdure and Blanding, San Juan Co.

Vitrina alaskana Dall. Verdure, San Juan Co.; between Verdure and Blanding, San Juan Co.; Fruita, Wayne Co.

Vitrea indentata (Say). Verdure, San Juan Co.; and between Verdure and Blanding, San Juan Co.

Euconulus fulvus alaskensis (Pilsbry). Eight miles north of Monticello, San Juan Co., in very dry leaves; Verdure, San Juan Co.; between Blanding and Verdure, San Juan Co.; Fruita, Wayne Co.

Zonitoides arborea (Say). Verdure, San Juan Co.; between Verdure and Blanding, San Juan Co.; Bluff, San Juan Co.; Mt. Tukuhnikivatz, LaSal Mts., San Juan Co. (V. M. Tanner); Moab, Grand Co.; Fruita, Wayne Co.

Agriolimax agrestis (Linnaeus). Verdure, San Juan Co.; north of Blanding, San Juan Co.; Moab, Grand Co.; Fruita, Wayne Co.

Agriolimax campestris (Binney). Price, Carbon Co.

Gonyodiscus cronkhitei (Newcomb). Verdure, San Juan Co.; Fruita, Wayne Co.

Gonyodiscus cronkhitei anthonyi (Pilsbry). Verdure, San Juan Co.

Gonyodiscus shimeki cockerelli (Pilsbry). Mt. Tukuhnikivatz, LaSal Mts., San Juan Co. (V. M. Tanner Coll.). Several fine specimens (U. of U. Zool. Mus. No. 1482).

Helicodiscus eigenmanni Pilsbry. Between Blanding and Verdure, San Juan Co., one shell, immature, pale yellow in color, diameter slightly over 3 mm.; Verdure, San Juan Co., two shells, weathered and immature.

Succinea grosvenori Lea. Blanding, San Juan Co.; between Blanding and Verdure, San Juan Co.; Moab, Grand Co.

Succinea avara Say. Moab, Grand Co.; Fruita, Wayne Co.; Salina, Sevier Co.

Stagnicola (*Hinkleyia*) *caperata* Say. Moab, Grand Co.; Torrey, Wayne Co.

Fossaria parva (Lea). Moab, Grand Co.

Fossaria modicella (Say). Torrey, Wayne Co.

Gyraulus vermicularis (Gould). Price, Carbon Co.

Physella ampullacea (Gould). Moab, Grand Co.

Physella virgata (Gould). Bluff, San Juan Co.; Moab, Grand Co.; Price, Carbon Co.

EGG LAYING AND BIRTH OF YOUNG IN THREE SPECIES OF VIVIPARIDAE

By Edward D. Crabb
Department of Zoology, University of Pennsylvania

Recent observations of Frömming (Arch. f. Molluskenkunde 60:283-4, 1928) on birth in *Viviparus viviparus* led me to offer my observations on this phenomenon in other species of so-called viviparous snails for publication. Three large *Viviparus contectoides* were collected in a pond near the Zoology Building (3-26-28) and were placed in a fingerbowl of water in my laboratory. At 8.30 the next morning there were three eggs without any trace of a

vitellus, one young within the egg membrane (which emerged within three hours) and one crawling young. At 2.15 another had emerged and at 4.30 I found four unhatched young in the water. These four eggs were observed under a binocular microscope until the young emerged. The membrane of three of these eggs has fully distended, while that of the fourth was flaccid and appeared as if about one-fourth of its contents had been removed. In each case the young snails tried vainly to tear the egg membrane off by extending the foot as far caudad as possible. These attempts greatly distorted the egg, but the membrane was not ruptured until the movements of the foot were assisted by attempts to grasp it with the mouth. After about an hour of more or less constant "kicking" and biting, the membrane parted across the anterior region; then the new-born snail filled its branchial chamber with water and rested motionless for several minutes before crawling away with the membrane still clinging to its shell like a caul.

When the uterus is opened those eggs which are ready to be laid are transparent while those higher up in the tract are successively more and more nearly opaque, especially if the animal has been preserved. Since the newly laid eggs and those ready to be laid are quite transparent, one may be led to conclude that in these the albumen has been consumed and its place taken by water. However, if freshly land turgid eggs, or uterine eggs which are ready to be laid, are placed in water under a dissecting microscope and opened one can observe currents created by the fluid contents of the egg escaping into the water, very much as Frömming describes. If such eggs are placed in alcohol and quickly opened the escaping fluid is coagulated, thus suggesting that it probably contains an appreciable amount of albuminous material even at the time the young emerges.

After a number of attempts to observe the activities of unhatched uterine young, I finally succeeded in orienting a translucent egg under the binocular in such a way that the contained young was lying with its oral side up. This

youngster obligingly remained in this position so that I was able to observe it take up a mouthful of the milky fluid, "chew" a few moments, spew the remainder out and then repeat the performance again and again. Twenty-two hours later the albumen in this egg was clear, which indicated that the vegetative processes within had advanced to the stage at which the egg probably would have been laid.

The meager data at hand indicates that temperature affects the laying processes, for two large females, collected in a pond near the Zoology Building late in March, appear to have retained their eggs all winter and became active after being brought into higher temperatures of the laboratory. One of these produced 16 young four days later and two more on the fifth day. On this date she was opened and 81 eggs, 79 of which appeared ready for laying, were removed. The other individual was opened two days after having been brought into the laboratory and 129 eggs removed. Of these 122 were apparently ready for laying, 5 contained no vitelli and only two were opaque. Of the 122 eggs 89 were put in a Petri dish of water and 90 minutes later over half of them had hatched and the young were clinging to the side of the dish next to the window. The remaining 33, in a small tin dissecting tray, did not show positive phototropism definitely, however, three were crawling suspended from the surface film.

An individual collected in the same pond November 2, 1927, contained 130 eggs, 4 of which were without vitelli, 76 transparent, or nearly so, and 50 opaque. The total numbers and the proportion of transparent to opaque eggs in spring collected individuals (201:4) and in those collected in the fall (76:50) indicate that oviposition is probably discontinued during the cold months and that developmental processes are perhaps retarded but not entirely discontinued.

This appears to be the case in *V. malleatus*, for of a number collected September 22, 1928, in the old canal in Fairmount Park, the condition of uterine eggs in seven were as follows: In individual a) there were 3 transparent, no

translucent and 9 opaque eggs; b) 6, 0 and 83; c) 0, 3 and 58; d) 3, 5 and 51; e) 0, 0 and 9; f) 14, 0 and 102; g) 0, 0 and 44; h) (coll. 11-27-27) 11, 0 and 0. This gives a total of 371 eggs contained by eight snails of which approximately 89 per cent were opaque and contained very young embryos. I recall that very few opaque eggs were found in snails collected in May and June, however, I have only one record of eggs in all three stages of development. This individual was collected May 29, 1927, at the same place as the others, and all of its eggs (11) were transparent.

In *Viviparus malleatus* and *Campeloma decisum* it appears that the egg membrane is ruptured either by the young snail before being extruded or by the process of extrusion. This membrane is so delicate that one must open the fresh uterus under water to prevent all the eggs that are nearly ready to be extruded, as well as more than half of those containing very small embryos, from rupturing. The membrane of such eggs ruptures within a few minutes after the eggs have been placed in water, due, apparently, to a rapid imbibition of water by the egg. In order to prevent the egg from swelling, uteri were emptied into tap water containing, by guess, about 0.5 per cent of table salt and about 1 per cent of ethel alcohol. This anesthetized the young snails (Campeloma) and permitted me to make camera lucida outlines of them. After being transferred to fresh tap water they recovered and emerged during the night.

In one instance seven *C. decisum* uteri were emptied into a bowl of tap water and within twenty minutes 58 young were crawling up the sides of the vessel. No attempt was made to rear these young snails. However, I have frequently kept young *V. malleatus* growing in aquaria for several weeks after they had been removed from the mother. In one instance I transferred 31 young from a female to an aquarium containing tap water and only two died the first week. About ten of these were not more than two-thirds the average size of the others, which indicates the ability of this snail to live although born prematurely.

I have succeeded in keeping individuals that had been removed from the female growing in isolation eight to eleven months, but not to adult size.

My observations and experiments lead me to believe that *Viviparus contectoides* habitually extrudes its young enclosed in an egg membrane containing more or less albuminous fluid, and that it requires from a few minutes to three hours for the young snail to actually hatch after the egg has been extruded; that this membrane does not normally envelop the young of *Campeloma decisum* and *V. malleatus* at birth, and that the young of this last species probably is free of the egg membrane some time before it is extruded.

I am indebted to Dr. H. A. Pilsbry for having identified my material of *Campeloma decisum* and to Mr. E. G. Vanatta for having identified my *Viviparus contectoides* and *V. malleatus* for me.

FRESHWATER SNAILS IN BRACKISH WATER

BY HORACE G. RICHARDS
Zoological Laboratory University of Pennsylvania

On a collecting trip to Bay Head on Barnegat Bay, New Jersey, on April 10, 1928, to collect marine snails, the freshwater snail *Physa heterostropha* was observed. The locality was near the mouth of the Metedeconk River, where the water is almost fresh. The specific gravity of the water at this point at another time was 1.001.

An interesting problem presented itself. Just how far into brackish water can these freshwater snails migrate? With this in view some preliminary and rather crude experiments were attempted in the summer of 1928.

The salinity of the water was gradually increased in an attempt to see if the snails could become adjusted to the salt water, and to see just how far they would go. Three species were used: *Physa heterostropha, Lymnaea stagnalis appressa* and *Lymnaea palustris* (the latter two from Michi-

gan). All snails were taken from the culture jars in the Vivarium of the University of Pennsylvania and transferred to finger bowls at Cape May Point, New Jersey. Here they were placed in tap water for one week to adjust themselves to any possible change. After that time some were placed in sea water diluted to 5 percent concentration, and after various intervals in sea water of higher concentrations.

Because of the small number of snails used the results of this experiment can not be considered as very significant. However additional and more accurate experiments now being conducted at the University of Pennsylvania seem to give the same results in the majority of cases, and therefore this preliminary note is published.

All three species could live normally in 5 percent or 10 percent sea water, but the Physa used in the summer died when the water reached the specific gravity of 1.002. This race was probably weak, as snails of the same species taken from the streams near Philadelphia have since been kept alive and normally active in water of at least 25 percent (1.006).

The other two species used in the summer were active until the water was 25 percent of normal sea water (1.005). They had lived in this strength for about a week when they died.

Further experiments show that *Physa* and *Lymnaea palustris* behave normally in water to at least the strength of 25 percent sea water; above this strength they may live, but show few signs of activity, the body of the snail usually being projected far out of the shell. Perhaps the snails may become adjusted to higher strengths if left for a considerable period of time.

MOLLUSCA FROM VERMILION AND PELICAN LAKES, MINNESOTA, WITH THE DESCRIPTION OF A NEW VARIETY OF HELISOMA CORPULENTA

BY FRANK COLLINS BAKER[1]

(*Continued from page 97*)

Helisoma corpulenta (Say). Since Thomas Say described this species in 1824 it has been generally misunderstood by the majority of students, owing principally to its rarity. In 1900 (NAUTILUS, XIII, p. 133) Walker redescribed and figured the species, thus placing it as a distinct member of the American fauna. Probably no more distinct species of the Planorbis group is known. In Grant's list it is included as a distinct species with the note "This shell seems to be quite distinct from *H. trivolvis* Say."

The typical form has the whorls carinated above and rounded or sub-carinated below and the axial height is not noticeably great. Say's specimens came from Winnipeck River, Winnipeck Lake, Lake of the Woods, and Rainy Lake, all in Ontario, Canada. Three specimens from Rainy Lake are figured in the writer's Monograph of Wisconsin Fresh Water Mollusca, pl. xix, received from Judge F. R. Latchford. Dr. A. R. Cahn, of the Department of Zoology, University of Illinois, also found the typical form in Fall Lake, near Winton, St. Louis Co., Minn., and in Trout Lake and Kawnipi Lake, Ontario. All of these conform to the diagnosis of Say and are like the specimens from one of the type localities, Rainy Lake. The Lake Vermilion form appears to be a variation from this typical form and is distinct enough to constitute a recognizable variety or race. It may be characterized as follows.

HELISOMA CORPULENTA VERMILIONENSIS nov. var.

Walker, Nautilus, XIX, p. 136 (part), pl. iii, figs. 3-7, 1900. Grant, 16th. An. Rep. Geol. & Nat. Hist. Surv. Minn., p. 484, 1887.

Shell differing from typical *corpulenta* in having the whorls at the shoulder and base encircled by a sharp, cord-

like carina which persists to the aperture both above and below, the spire is much flatter, the umbilicus much flatter and relatively deeper with the penultimate whorl sunk below the last whorl to a greater extent than in the typical form; the axial height is greater and the aperture is longer and narrower and peculiarly effuse and expanded below; the body whorl is much more flat-sided in the variety, hence profoundly modifying the aperture in form.

L. 15.0; D. 21.5; Ap. L. 16.0; D. 12.0 mm. Type.
L. 14.0; D. 22.0; Ap. L. 15.5; D. 12.0 mm. Paratype.
L. 13.5; D. 17.5; Ap. L. 13.0; D. 9.5 mm. Paratype.
L. 12.0; D. 13.5; Ap. L. 11.0; D. 9.0 mm. Paratype.
L. 13.0; D. 13.5; Ap. L. 11.7; D. 7.0 mm. Paratype.
L. 8.0; D. 10.0; Ap. L. 7.9; D. 5.5 mm. Paratype.
L. 6.5; D. 7.0; Ap. L. 6.5; D. 4.0 mm. Paratype.

Type locality: Birch Point, Big Bay, Vermilion Lake, St. Louis Co., Minn.

Types: Baker Coll., No. 2040. *Paratypes:* Acad. Nat. Sci. Phil., No. 147370.

This variety of *corpulenta* occurs abundantly in Lake Vermilion on more or less exposed shores, in shallow water, on shingle or cobble bottom. In many places the bottom is fairly peppered with the shells. In the aquarium the animal crawls about with a rapid, gliding motion, examining objects with its long, filiform tentacles. The pseudobranch is very large and protrudes as a rounded lobe from the left side of the body. The genitalia of both the typical form (Fall Lake specimens, collected by Dr. Cahn) and of the variety indicate that the species groups with *Helisoma truncata*, the praeputium placed on the gland sac near the lower part of this sac. (A paper on the genitalia and radula will be published in the Trans. Amer. Micr. Soc.) Grant records *corpulenta* as found in Vermilion Lake and all over St. Louis and Lake counties. It was personally found in all parts of Vermilion Lake, but whether the form found in other lakes is the typical species or the variety *vermilionensis* cannot be determined without an examina-

tion of specimens. Cahn's records from Fall Lake, Minn., and Trout Lake, Ontario, are based on the typical form. As it has not been found in Wisconsin as far as known it would appear to be a species of the Hudson Bay drainage. Walker's Michigan reference needs confirmation by the discovery of authentic material from the Upper Peninsula. Apparently wherever this species is found it is abundant and seems to replace the larger species in the lakes in which it lives.

Helisoma campanulata wisconsinensis (Winslow). Shore debris on Birch Point, Big Bay and Daisy Bay. Immature individuals were found in Daisy Bay on Potamogeton. The *campanulata* of the lake are small but appear to be referable to *wisconsinensis* rather than to *davisi*. Similar specimens occur with the large form in Tomahawk Lake, Wisconsin. Recorded by Grant as *Planorbella campanulata*.

Planorbula crassilabris (Walker). Daisy Bay, on rocks in shallow water, near shore. Not abundant. Recorded by Grant as *Segmentina armigera* Say.

Menetus exacuous (Say). Recorded by Grant from Vermilion Lake. This might have been the race *megas* Dall, which is a northern form.

Gyraulus deflectus (Say). Recorded by Grant from all of the lakes of St. Louis, Lake and Cook counties. Not found by the writer.

Gyraulus circumstriatus (Tryon). A single specimen of this little-known species occurred in a marsh behind beach, Birch Point, Big Bay. The spiral striation mentioned by Tryon is very distinct. See Baker, Mon. Wis. Moll., I, p. 378, for a discussion of the status of this distinct species.

Gyraulus umbilicatellus (Ckll.). Swamp, behind beach, Birch Point, Daisy and Big Bays. Rather common, but smaller than specimens from Wisconsin.

Ferrissia parallela (Say). Daisy Bay, on Potamogeton, water 8 feet deep. Typical and common.

Ferrissia tarda (Say). Along shore of Birch Point on both the Daisy Bay and Big Bay sides. Always found on

rocks, usually small boulders or large pebbles, in shallow water, associated with *Helisoma corpulenta, Planorbula crassilabris, Ferrissia tarda,* and *Physella sayii.*

Physella sayii (Tappan). Daisy and Big Bays, on rocks near shore, in shallow water. Also found on Potamogeton in Daisy Bay, water eight feet deep. Recorded by Grant as *Physa gyrina* Say. All specimens collected were immature and mostly very narrow; no adults were observed in shore debris. This form was at first thought to be a northern variety, but an examination of radula shows that it is immature *sayii,* the teeth being exactly like those of undoubted *sayii* from Lake Winnebago, Wis. Examination of the radula with higher powers than previously available (900 diameters) shows that the figure in the Monograph of Wisconsin Mollusca, I, p. 432 is slightly inaccurate. The first lateral has very small intermediate cusps between the three inner large cusps, and the second to sixth lateral has these small intermediate cusps between the four inner larger cusps. Otherwise the published figure is correct. In the Lake Vermilion specimens there are 120-1-120 teeth in a row. It is evident that to satisfactorily identify Physae the radula teeth must be examined, for the shell has an exasperating way of resembling other totally distinct species. The genitalia (comparative length of male organ) will also help.

Aplexa hypnorum (Linn.). In swampy area behind beaches on Birch Point, on both Daisy Bay and Big Bay sides. Recorded by Grant.

Carychium exile canadense Clapp. Under logs and wet leaves, Birch Point. Not common. Grant lists *Carychium exiguum* (Say), but his specimens may have been *canadense.* No *exiguum* were found by the writer.

Land Species

Land mollusks were abundant in wooded areas all over Birch Point under logs, leaves, branches, and every sort of debris. Singularly enough, none of the larger species, such as Polygyra and Anguispira, were found, although diligent

search was carried on for them. The smaller species were so abundant that as many as 50 specimens of five or six species were often found under one log. Grant records *Anguispira alternata* (as Patula) from Tower, and it certainly should be found somewhere about the lake.

Vallonia gracilicosta Reinh. Probably the *V. pulchella* recorded by Grant. The fine, crowded ribs are differently arranged from those of *costata.*

Cochlicopa lubrica (Müller). Recorded by Grant as *Ferussacia subcylindracea.* Not found by the writer.

Vertigo gouldii (Binney). Not common. Only seven specimens found during two weeks collecting. The specimens are rather smaller than those from Maine and other places, the largest being 1.6 mm. long.

Strobilops virgo (Pilsbry). Very abundant and typical. Probably the *labyrinthica* recorded by Grant from Tower. *Virgo* is as a rule a more northern species than *labyrinthica.*

Acanthinula harpa (Say). Recorded by Grant from Tower. Not found by the writer.

Succinea retusa Lea. Common near shore of Daisy Bay.

Helicodiscus parallelus (Say). Apparently rare. Recorded by Grant from Tower.

Gonyodiscus anthonyi (Pilsbry). Abundant. Listed as *striatella* by Grant from Tower.

Anguispira alternata (Say). Listed from Tower by Grant.

Agriolimax campestris (Say). Common under logs.

Zonitoides arborea (Say). Abundant.

Euconulus fulvus (Müller). Common. Recorded from Tower by Grant.

Retinella hammonis (Strom.). Common. Recorded by Grant from Tower.

Vitrina limpida Gould. Listed from Tower by Grant. Not found by the writer.

Fresh Water Mollusca from Pelican Lake, Crow Wing Co.

The material from Pelican Lake is contained in the W. A. Nason collection and was collected by Mrs. Edward Morton many years ago. The collection is small but seems

worthy of record, particularly as it contains an additional record of a recently described race of Stagnicola.

Anodonta grandis footiana Lea. The abundant species of small lakes. The majority are like those from the type locality in Lake Winnebago, Wis., but a few have a white epidermis.

Lampsilis siliquoidea rosacea (De Kay). The common *siliquoidea* of lakes, but on the whole more elongated than usual.

Sphaerium rhomboideum (Say). Rare.

Campeloma milesii (Lea). Apparently abundant in the lake. *Milesii* has thus far proven to be a lake form of Campeloma.

Amnicola limosa porata (Say). Apparently rare.

Stagnicola emarginata vilasensis F. C. Baker. An abundant species in this lake as in the northern lakes of Wisconsin. See NAUTILUS, XL, p. 82, for description of this race. Also Mon. Wis. Moll., I, p. 243, pl. xvi, figs. 21-26.

Stagnicola exilis (Lea). Common. The whorls are somewhat more rounded than is usual in this species.

Acella haldemanni ('Desh.' Binn.). One large specimen only in the collection.

Helisoma trivolvis (Say). Common and typical.

Helisoma campanulata (Say). Apparently rare.

Planorbula armigera (Say). Not common.

Gyraulus deflectus (Say). Form with bluntly angulated periphery. This has been confused with *obliquus* DeKay, but the blunt periphery merges into the acutely keeled periphery in any large series. *Obliquus* has the faint angulation below the center of the whorl, while in *deflectus* it is usually about at the periphery.

NOMENCLATURE IN THE GENUS VITRINA

BY H. BURRINGTON BAKER

P. Hesse (1923, Arch. Moll. 55, pp. 1-25, 81-115, 130-145) has presented a thorough revision of the Vitrininae of Europe and the neighboring regions on an anatomical basis. However, perhaps on account of inadequate library facilities, his nomenclature is not entirely correct. In an attempt to ascertain the proper generic and subgeneric names for the American *Vitrina limpida* Gould, I have necessarily reviewed the literature and believe that my results may be of general interest.

The following group-names need to be taken into account:

Vitrina Draparnaud (July 14, 1801, Tabl., pp. 33, 98); monotype: *V. pellucida*, with *Helix pellucida* Müll. (1774, Verm. II, p. 15) in synonymy, but description, at least in Hist. (1805, p. 119, pl. 8, figs. 34-37), was subsequently used as the foundation for *Helicolimax major* Fér. (1807, Ess., p. 47). Type subsequently designated by Fleming (1822, Encycl. Brit., Suppl. to 4th, 5th & 6th ed., vol. 5, p. 573): *Helix pellucida* Müller. [Emended to *Vitrinus* by Montfort (1810, Conch. Syst. II, p. 238), with *V. pellucidus* as type by original designation, but without separation of the two confused species.]

Helico-limax Fér. (Nov. 6, 1801, Mém. Soc. Méd. d'emul. Paris 4, p. 390); monotype (only species mentioned by name): *Helix pellucida* Müll. [Emended to *Helico-Limax* in 1807 and to *Helicolimax* in 1821.]

Cobresia Hübner (1810, Mon. Test. Baier. Landschn. Cobresien); type subsequently designated by Gray (1847, P. Z. S., p. 170), in syn. *Vitrina: V. pellucida.* Type now designated: *Cobresia vitrea*= *H. pellucida* Müller. [Hübner's terms limacoides and helicoides are shown by the text to be simply descriptive words.]

Hyalina Studer (1820, Syst. Verz., p. 11), not Schumacher (1817).

Limacina Hartmann (1821, N. Alp. I, p. 207), not Cuvier (1817).

Semilimax Agassiz (1846, Nomen. Zool.), nude name. *Semilimax* "Férussac" Gray (1847, p. 170); type by original designation: *Vitrina elongata* Drap. (1805, Hist., p. 120)= *Helix semilimax* Férussac (1802, Naturf. 29, p. 236). *Semilimax* Stabile (1859, Rev. & Mag. Zool. ser. 2, v. 11, p. 422); type subsequently designated by Fischer in Paulucci (1878, Mat. serv. et. faun. mal. t. f. Ital., p. 24): *Vitrina elongata* Drap.

Pagana Gistel (1848, Naturg., p. 168); substitute for *Vitrina* "Der Autoren"; type: *Helix pellucida* Müll.

Phenacolimax Stabile (1859, p. 422); type subsequently designated by P. Fischer (1878, p. 24): *Vitrina major* (Fér.).

Oligolimax P. Fischer in Paulucci (1878, pp. 1, 23); type by original designation (p. 24): *Vitrina paulucciae* Fischer (l. c.).

Gallandia Bourguignat (Aug., 1880, Desc. Nouv. gen. Gallandia); type by original designation: *Vitrina conoidea* Mart. (1874, in Fedtschenko's Put. Turkestan, vol. 2, pt. 1, p. 8), but from Mt. Olympe in Bithynia.

Trochovitrina "Schacko" O. Boettger (Oct., 1880, Jahrb. Mal. Ges. 7, p. 379); includes *Vitrina subcarinata* Bttg. (l. c.) and *Lampadia lederi* Bttg. (1878, Nach. D. Mal. Ges. 5, p. 121).

Vitrinopugio von Ihering (1892, Zeitschr. wiss. Zool. 54, p. 401); type subsequently designated by Hesse (1923, Arch. Moll. 55, p. 103): *V. elongatus* (Drap.)=*Vitrina semilimax* (Fér.).

Semilimacella Soós (1917, A. M. N. H. Budapest 15, pp. 94, 154); monotype: *Vitrina velebitica* Soós (l. c.).

Insulivitrina Hesse (1923, p. 131); type subsequently designated by Hesse (1924, Arch. Moll. 56, p. 226): *Vitrina lamarcki* (Fér)=*Helicolimax lamarckii* Fér. (1821, Tabl. Lim., p. 25).

Tozzettia Hesse (1924, p. 226); type by substitution for *Targionia* Hesse (1923, p. 82), not Lindinger (1870), which has type by original designation: *V. bonellii*=*Vitrina*

bonelli Targioni-Tozzetti (1873, At. Soc. It. sc. nat. Milano 15, p. 322).

Eucobresia, new name for *Semilimax* Hesse (1923, p. 86); type: *Vitrina diaphana* Drap. (1805, Hist., p. 120), from France.

From the above data, if Hesse's genera are considered as subgenera and his subgenera as sections, the following classification results. For easy reference, I have added, after each group-name, its synonyms and the proper specific name of its type.

Genus *Vitrina* Draparnaud.
- Subgenus *Vitrina* s. s.
  - Section *Vitrina* s. s. (+*Helicolimax*+*Cobresia*+*Pagana*). *V. pellucida* (Müll.).
  - Section *Eucobresia,* n. n. *V. diaphana* Drap.
  - Section *Oligolimax* P. Fischer. *V. paulucciae* P. Fisch.
  - Section *Gallandia* Bgt. (+*Trochovitrina*). *V. conoidea* Mart.
- Subgenus *Phenacolimax* Stabile. *V. major* (Férussac).
- Subgenus *Semilimax* Gray.
  - Section *Semilimax* s. s. (+*Vitrinopugio*+*Semilimacella*). *V. semilimax* (Fér.).
  - Section *Tozzettia* Hesse. *V. bonelli* Targioni-Tozzetti.
- Subgenus *Insulivitrina* Hesse. *V. lamarckii* (Férussac).

NOTES AND NEWS

Poisonous Mussels.—In his interesting and highly important article on "Mussel Poisoning in California, Dr. K. F. Meyer notes, among other facts, that the poison is believed to be due to a metabolic disturbance influenced by the food and low tone attendant upon spawning. Furthermore, these diseased mussels were subjected to the ebb and

flow of the tide, and were not exposed to the sun for a long period at low tide. It should be noted, however, that this last statement is relative. Seasoned fishermen, operating from Monterey, declare that mussels collected at water level or lower, during slack water with a zero or minus tide, are innocuous at any time of the year.

This statement is strengthened by the fact that mussel bakes, given by the students of the Hopkins Marine Station during practically every summer since 1892, have never produced a case of poisoning. The mussels involved were invariably collected at the time of minus tides. It is also important to note that several years ago there were at least three separate cases of mussel poisoning near Monterey where the mussels were known to have been collected at high levels. We need to know therefore whether it is indeed true that mussels are at all times healthy below the zero tide level on the California coast; or whether this is true only where the temperature is sufficiently low or other favoring conditions prevail. It is to be hoped that Dr. Meyer, at the conclusion of his valuable work, will be able to give an answer to these and other problems which he has set out to solve.—HAROLD HEATH.

SNAILS AS FOOD.—Explorations in Algeria north of the Sahara Desert, show that the prehistoric natives, living 15,000 to 25,000 years ago, subsisted very largely on snails. Mounds 300 feet in diameter and from 5 to 12 feet deep were discovered.—(*Science News-Letter*, Jan. 19, 1929.)

AN ASSOCIATION OF FRESH WATER SHELLS from Dunlap's Creek, Alleghany County, Virginia.—In the summer of 1928 the following collection of shells was made on the bank of Dunlap's Creek, Alleghany County, Virginia, near Sweet Chalybeate Springs, which Dr. Bryant Walker has kindly identified:

Anguispira alternata (Say).
Physa gyrina Say.
Anculosa carinata (Brug.)
Polygyra albolabris (Say).

Planorbis antrosus Con.
Lampsilis constricta (Con.).

The shells were especially abundant in the flood pools near the stream. All were collected from one locality. Most numerous were the species of *Anculosa*.

This group of shells was collected very hastily, and no doubt with more time others could be added to the association. This I hope to do perhaps next season.—WINNIE MCGLAMERY.

UROCOPTIS ALLENI Torre (Nautilus, Jan., 1929, pl. 4, fig. 7).—This extraordinary little species proves to have teeth very similar to those of *U. plicata* (Poey), the type of the section *Tetrentodon*, and *U. scalarina* (Shuttl.), species which also appear nearly related by characters of the shell. The tooth formula is 6, 2, 1, 2, 6.—PILSBRY.

THE TYPE OF LAMPROCYSTIS.—On page 67 the type was said to be "*L. excrescens* (*Helix excrescens*) Mouss." Dr. C. M. Cooke has called my attention to the fact that Mousson's species was called *Nanina excrescens* (Journ. de Conch., 1870, 115). The reference to *Helix* was made by Pfeiffer (Monogr. VII).—H. A. PILSBRY.

BOLTEN'S SPECIES OF LIGUUS.—In the Bolten Catalogue three species of this genus are mentioned: No. 1358, *Helix hepatica;* 1359, *H. testa-ovi;* and 1360-1364, *H. fasciata.* All of them are defined by a reference to Gmelin, *Bulla fasciata* sp. 25. Gmelin cites Müller's description and many figures. Of the two figures cited by Müller for his typical form, I select Seba, Mus., pl. 39, fig. 74 as the type figure for *fasciatus.* This is also one of Gmelin's references. The same figure will become the type of *H. hepatica* and *H. testa-ovi* "Bolten", which will thus fall as absolute synonyms of *Liguus fasciatus* (Müller).—PILSBRY.

VIVIPARUS MALLEATUS IN PHILADELPHIA, PA.—This species, which is native to Japan, has been introduced into various sections of the United States. Hannibal (NAUTILUS,

Vol. 25, p. 31, 1911) reports that it was introduced into the Sacramento and San Joaquin Valleys, and between Aladema and Centerville in California, to supply the markets of San Francisco, since the snail is frequently eaten by Orientals. It has also been reported (as Paludina japonica) from the Chinese markets of Victoria, British Columbia (NAUTILUS, Vol. 7, p. 144, 1894), and from other places along the Pacific Coast.

In 1915 C. W. Johnson (NAUTILUS, Vol. 29, p. 35) reported its presence in Muddy River, Brookline, Massachusetts, where it was probably introduced with gold fish. It has also been reported from Worcester, Massachusetts, Arlington, New Jersey, and from other sections of the East.

V. malleatus has been known to be present in Fairmount Park, Philadelphia, for some time, but no record of its presence has appeared in the literature. It was probably introduced into the pond near Horticultural Hall with some gold fish. It seems to have migrated down the little stream that leads from this pond to the Schuylkill River, and is now quite common in the river near the mouth of this stream. This snail has been observed as far down the river as the Fairmount Dam, two miles below. In 1925 specimens were collected and given to the Academy of Natural Sciences of Philadelphia and the United States National Museum in Washington, D. C. As far as is known, these are the first records of the presence of this species in Fairmount Park, although it had undoubtedly been there for some time previous.—HORACE G. RICHARDS and JOSEPH W. ADAMS.

RANGE OF DONAX VARIABILIS.—This species has been collected by the writer at Beaufort, N. C., and Long Island, N. Y., and compared with specimens from Florida. Throughout its range it retains its specific characters but varies widely in size which becomes gradually reduced northward until at Long Id. it is so much smaller than the Floridian specimens as to appear distinct, being smaller than *D. fossor*. Its shape remains constant. It is furthermore

characteristic of sandy ocean beaches while *D. fossor* prefers the more protected, muddier substratum of the sounds and bays. Long Island specimens may be consulted in the local collection of the American Museum.—A. P. JACOT.

MR. WM. J. CLENCH has just returned from Florida where he collected *Liguus* along the Tamiami Trail in company with Messrs. Allen and Lermond.

MR. H. N. LOWE left San Pedro in February to try out the collecting at Mazatlan and other places southward.

DR. PILSBRY is about to sail for work on certain Caribbean islands, as the guest of the Hon. Gifford Pinchot, on the yacht *Mary Pinchot.*

PUBLICATIONS RECEIVED

A NEW LAND SNAIL FROM LOWER CALIFORNIA WITH NOTES ON OTHER SPECIES. By S. Stillman Berry. (Journ. Entom. & Zool., vol. 20, pp. 73-83, 1928.) An interesting paper on the land shells of the coastal region of northern Lower California. One new species *Micrarionta* (Eremarionta) *inglesiana* is described and figured.

CHECK LIST OF HAWAIIAN LAND AND FRESHWATER MOLLUSCA. By Edward L. Caum. (Bull. 56, Bernice P. Bishop Museum, 1928.) In this paper are listed over 1,000 species and varieties. It is a valuable list and greatly needed.

FOSSIL MARINE MOLLUSKS OF OAHU. By Jens M. Ostergaard. (Bull. 51, Bernice P. Bishop Museum, 32 pp., 2 pls., 1928.) A most interesting paper bearing on the distribution of the Hawaiian Mollusca. The number of marine mollusks in Hawaiian waters, excluding the Nudibranchs, is estimated at between 1,400 and 1,500 species. The fauna is strictly Indo-Pacific, but about 15 percent of the gastropods are endemic, including such species as *Cypraea*

tessellata C. sulcidentata and *C. ostergaardi.* Three are presumably extinct out of 82 fossil species, eight are extinct in Hawaii but living elsewhere and three are on the verge of extinction. The emergent limestones of Oahu are considered Pleistocene.—C. W. J.

INHERITANCE OF SINISTRALITY IN LYMNAEA PEREGRA. By A. E. Boycott. (Proc. Royal Soc. London, vol. 104, p. 729, 1929.) Abstract will be given later.

COLORATION OF MOLLUSCA IN RELATION TO LIGHT. By E. W. Bennett. (Rec. Canterbury Mus., N. Zealand, vol. 3, no. 3, 1928.) The intensity of coloration of both the shell and the animal is due to the degree of exposure to light, in the natural habitat of the particular species.

THE RECENT AND TERTIARY CASSIDS OF NEW ZEALAND AND A STUDY IN HYBRIDIZATION. B. A. W. B. Powell. (Trans. of the New Zealand Inst., vol. 59, pp. 629-642, pl. 74-76, 1928.) A resumé of the classification of the Cassididae is given with full keys to all genera and species found in New Zealand. Six species, three recent and three fossil, are described as new.—W. J. CLENCH.

NON-MARINE MOLLUSCA FROM WEST AFRICA. By Geo. C. Spence. (Jour. Conch., vol. 18, pp. 211-216, pl. 2, 1928.) Two new species including an interesting form of Melaniidae, *Potadoma nyongensis* are described and figured.

THE NON-MARINE MOLLUSCA OF SIERRA LEONE. By M. Connolly. (Ann. Mag. Nat. Hist., 10 ser., vol. I, pp. 529-551, pl. 18, Apr. 1928.) Sixteen new species are described.

STREPHOBASIS: A SECTION OF PLEUROCERA. By Calvin Goodrich (Occas. Papers Mus. Zool. Univ. Mich., No. 192, pp. 1-16, pl. 1, Mar. 1928.) An intensive study of this group, the complication of which may be expressed by the fact that some 23 recorded species are included in the synonomy under *Pleurocera curtum* Hald. *P. roanense* Lea is considered a variety of *curtum.* A new species, *P. walkeri,* is described and figured.