THE

NAUTILUS

A QUARTERLY JOURNAL
DEVOTED TO THE INTERESTS
OF CONCHOLOGISTS

VOL. XLIV
JULY, 1930 to APRIL, 1931

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THE VARIATIONS OF APORRHAIS OCCIDENTALIS BECK

BY CHARLES W. JOHNSON

This interesting species presents considerable variation throughout its range from the Georges Bank off Massachusetts to northern Labrador, in depths of water varying from 6 to 120 fathoms. Although naturally merging into each other there are three quite distinct forms. One is found along the coast of Maine and Nova Scotia, the second along the coast of Labrador, while the typical form seems to occupy the Gulf of St. Lawrence and the deeper waters of the Gulf of Maine. In my list of mollusks from Labrador, Newfoundland and Nova Scotia, collected by Mr. Owen Bryant (1926), I gave to the coarse ribbed form from Maine the varietal name of *mainensis*, considering those from Labrador to be typical. Further study however shows that these are also quite different from the typical form, in fact, more so than the variety *mainensis*.

APORRHAIS OCCIDENTALIS (Beck). Pl. I, fig. 1.

Rostellaria occidentalis Beck, Guerin's Mag. de Zool., 1836, vol. 6, classe 5 (text) pl. 72.[1]

[1] Beck refers to a paper as follows:—"in Lyell Catl. of the Fossils of St. Laurence Bay, in Geol. Trans". This paper did not actually appear until 1841. Trans. Geol. Soc. London, vol. 6, (2 ser.) 1841 (read April 24, 1839). The real title of the paper is—"Remarks on Some Fossils and Recent Shells collected by Captain Bayfield R. N. in Canada," by Charles Lyell. A list of fossil shells from Beauport near Quebec, is followed by the following remark: "For the sake of comparison I subjoin a list of the recent marine shells of the Gulf of St. Lawrence, forwarded to me by Capt. Bayfield in the naming of which I have been assisted by Dr. Beck and George Sowerby." *Rostellaria occidentalis* appears in the list on page 138.

Rostellaria occidentalis Gould, Inv. Mass., 1841, p. 298, fig. 205.

Arrohoges occidentalis Gabb, Amer. Journ. Conch., vol. 4, p. 145—1868.

Aporrhais occidentalis Gould, Inv. Mass., 2 ed. 1870, p. 320, fig. 589.

Aporrhais (*Arrhoges*) *occidentalis* Johnson. Fauna of New England. List of Moll. Occas. Papers, Boston Soc. Nat. Hist, p. 128, 1915.

The shell described and figured by Beck is 57 mm. in length, diameter of the penultimate whorl 15 mm., width of the lip 20 mm. The last whorl has about 25 longitudinal costae. Specimens were from the Gulf of St. Lawrence and Newfoundland.

This is the form found in the deeper waters of the Gulf of Maine and in the Gulf of St. Lawrence, varying in size from 50 to 70 mm. The specimen represented by figure 1 is from Newfoundland and is what may be considered as typical. Its length is 62 mm. penultimate, whorl 18 mm. in diameter, width of the lip 25 mm. The penultimate whorl has about 19 longitudinal costae and the body whorl about 25 costae which become obsolete on the expanded portion. In perfect specimens the entire shell is ornamented with fine raised spirals, but these are usually eroded on the spire, the peripheral and subperipheral ridge on the body whorl often quite distinct. In most cases the extension of the lip extends across the penultimate whorl and in a few specimens onto the adjoining whorl.

A fine series was obtained by Mr. W. S. Schroeder of the United States Fish Commission steamer "Albatross II" in 88 fathoms, off the Isles of Shoals, New Hampshire, the larger specimens measuring 70 mm. The most southern records are the Georges Bank 50 fathoms Lat. 41° 23′ N. Long. 68° 46′ W. and off Gurnett Point, Plymouth, Mass., 20 fathoms (R. K. Smith and W. F. Clapp). In 1871 J. F. Whiteaves dredged a living specimen in 120 fathoms, N. E. of the Island of Anticosti.

APORRHAIS OCCIDENTALIS, var. MAINENSIS Johnson, Pl. 1, figs. 4-6. THE NAUTILUS, vol. 39, pp. 133-134, 1926.

This form is distinguished by its more slender spire and fewer longitudinal costae. The number of costae on the penultimate whorl is 14 and on the body whorl about 18. The young (fig. 6) of this and the typical form are often difficult to separate. The length of the type (fig. 5) is 62 mm. The type lot was dredged by Dr. C. W. Townsend near Gillpatrick Ledge, off Northeast Harbor, Maine, in 5 to 6 fathoms, also taken at Eastport, Maine, 20 fathoms (Hyatt) and at Digby, Nova Scotia, by E. W. Roper. The figure by Gould represents the typical form and not this variety as stated in 1926.

APORRHAIS OCCIDENTALIS var. LABRADORENSIS n. var. Pl. 1, figs. 2, 3.

This is readily separated from the typical form by its smaller size, more slender spire, smaller and more numerous costae and less expanded lip. On the penultimate whorl there are about 24 longitudinal costae and on the body whorl about 29, peripheral lines obsolete or wanting. Width of the lip 15 mm. The lip is confined to the body whorl, usually not reaching the suture and rarely extending onto the penultimate whorl. The length of the holotype (fig. 3) is 52 mm. and of fig. 2, representing an unusually high spire, 63 mm. Holotype and paratypes are from Egg Harbor, Labrador, 7 fathoms (Owen Bryant). Most of the specimens from the Labrador coast are badly eroded.

For this species Gabb in 1863 proposed the genus *Arrhoges*, based on the following characters "Anterior canal nearly obsolete, no posterior canal, outer lip expanded, simple." Fischer made it a subgenus of Aporrhais defining it as having anterior and posterior canal very short, lip simple. The study of a large series of *Aporrhais pespelicani* Linn. shows in senile specimens a thickening of the lip until the posterior canal becomes obsolete. This feature is best shown in three specimens from Clyde, Scot-

land, labeled var. *bilobata* in which the mantle has receded until only about half of the thickened lip is covered by the mantle, the posterior canal is wanting and the shape of the aperture closely resembles that of a small *A. occidentalis* var. *labradorensis*. The shell characters mentioned therefore seem of little generic value and it seems doubtful if there is any marked anatomical difference.

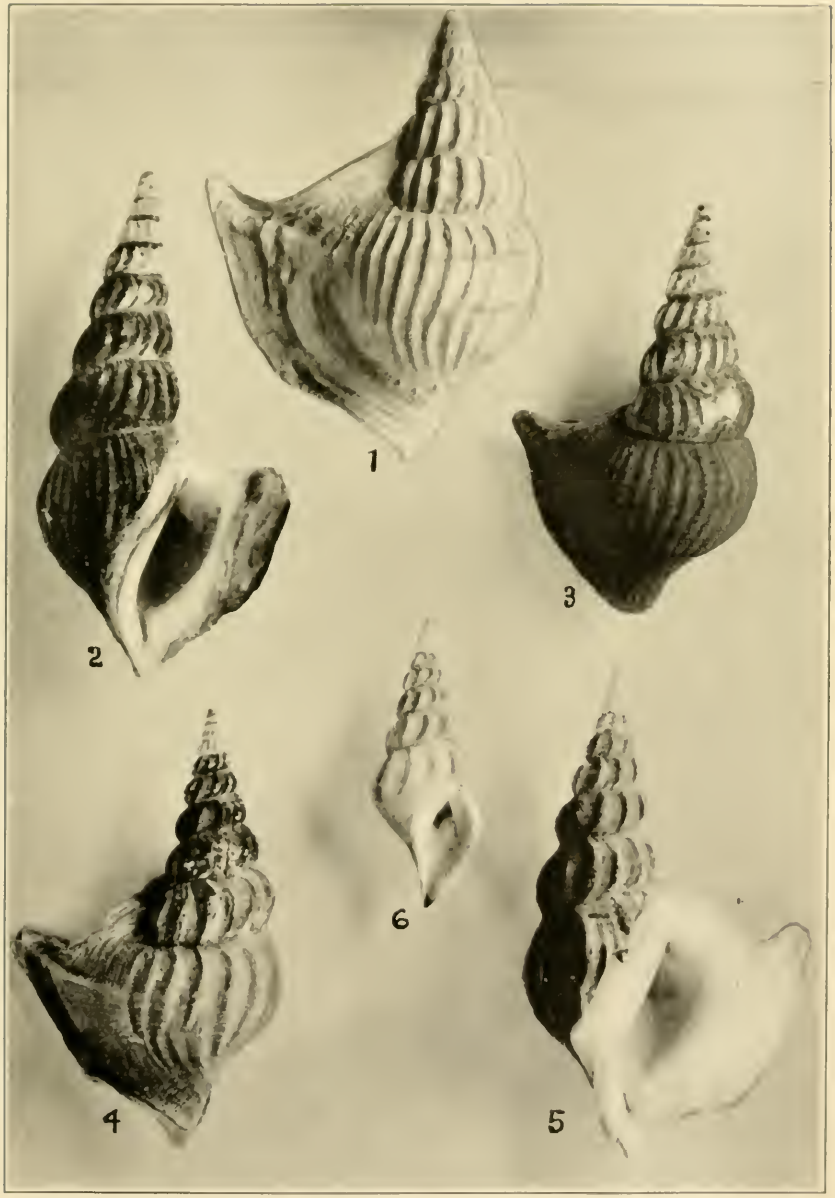
I am indebted to the Boston Society Natural History for the photograph of the varieties of this shell and to Mr. C. V. MacCoy for figure one.

DESERT HELICOIDS OF THE MICRARIONTA HUTSONI GROUP

BY G. WILLETT

For some time past the writer has had in his collection shells of small Micrariontas from the California desert that were apparently closely related to *Micrarionta hutsoni* Clapp and *M. desertorum* Pilsbry and Ferriss. Awaiting a better study series of these two Arizona forms, the disposition of the California shells has been held in abeyance. The opportunity to visit southwestern Arizona arrived recently and on March 7, 1930, the writer and his wife visited the type locality of *M. desertorum*, collecting eighty specimens, a considerable number of which were living. On the following day the approximate type locality of *M. hutsoni* was visited and about 50 specimens, both living and dead, were secured.

The type locality of *M. desertorum* given by Pilsbry and Ferriss, (NAUTILUS XXI, 134), is "twelve miles south from Parker, Arizona." As there is only one mountain that this description could possibly apply to, it seems safe to assume that the locality visited by us was the correct one. The type locality of *M. hutsoni*, "eight miles from Quartzite, Arizona," (NAUTILUS XX, 136), is less definite but it must lie in the Dome Rock Mountains, the range west of Quartz-



THE VARIATION OF APORRHAIS OCCIDENTALIS, Beck

ite and the only one within eight miles of the settlement. Our lot of shells obtained in this range, about four miles west of Quartzite, are apparently identical with specimens from the type lot that were given to the writer by Dr. S. S. Berry.

After a careful study of these specimens, together with those from the California desert above mentioned, it seems to the writer that there are at present four known races of *Micrarionta hutsoni*, as follows.

Micrarionta hutsoni hutsoni Clapp. From the Dome Rock Mountains, Yuma County, Arizona. Apparently the largest of the group. Though the diameter of the largest specimen of the type lot is given as 15 mm., one specimen in our lot measures 16.5 mm. In typical *hutsoni* the white zone above the narrow peripherical band is abruptly bordered by another brown band that extends to the suture. This is lighter in color, consequently less conspicuous, than the band above the periphery, and about twice as wide. It is particularly apparent inside the aperture and gives the shell the appearance of being doubly banded.

Micrarionta hutsoni desertorum Pilsbry and Ferriss. After comparing our series of *desertorum* with *hutsoni* it seems apparent that the former should be considered a somewhat stunted, albinistic form of the latter. The northern extremity of the Dome Rock Mountains, the habitat of *hutsoni*, is only about fifteen miles from the small, unnamed mountain that is the type locality of *desertorum*. Though the shell of *desertorum* is said to be unbanded, eighteen specimens out of our series of eighty show traces of bands: furthermore, an albinistic specimen of *hutsoni*, taken alive, together with normal specimens is indistinguishable from *desertorum*. That these two forms intergrade geographically is doubtful, as several miles of desert intervene between their mountain habitats, but that they do intergrade by individual variation is clearly shown in our series. Our largest specimen of *desertorum* has a maximum diameter of 14.4 millimeters.

Micrarionta hutsoni unifasciata, new subspecies.—Description: Similar to *M. hutsoni hutsoni*, but smaller, somewhat more depressed, and with only the narrow peripherical band showing on the last whorl and within the aperture. The white zone above the peripherical band merges gradually into the horn-color of the upper part of the shell, not abruptly as in the typical form.

Type,—No. 1023 Collection of Los Angeles Museum; paratypes in collection of the writer. The type and eight additional specimens were collected by G. Willett at Newberry Springs, north end of Kane Mountains, San Bernardino County, California, February 11, 1929.

Measurements	Max. Diam.	Min. Diam.	alt.	umbil.	No. of whorls
Type	13.5	10.9	6.1	1.3	4⅛
Paratype	13.5	11	6.2	1.3	4⅛

Though the type localities of *M. hutsoni hutsoni* and *M. hutsoni unifasciata* are 150 miles apart, and separated by desert, several mountain ranges and the Colorado River, the two forms are so nearly alike that it seems best to consider the differences only subspecific.

Micrarionta hutsoni hilli, new subspecies.—Description: Similar to *M. hutsoni hutsoni*, but differing in smaller size, more depressed form, and in relatively larger umbilicus; also in lack of any perceptible band between the upper white zone and the suture. Differs from *M. h. unifasciata* in slightly more depressed form and larger umbilicus.

Type, No. 1024 Collection Los Angeles Museum: paratypes in collection of the writer. The type and ten additional specimens were collected by G. Willett in the Sheep Hole Mountains, San Bernardino County, California, on the road leading from Amboy to Twenty-nine Palms, November 8, 1929.

Measurements	Max. Diam.	Min. Diam.	alt.	umbil.	No. of whorls
Type	13.8	10.5	5.3	2	4⅛
Paratype	12.8	10.4	5.6	2	4⅛

The type locality of this form lies about seventy-five miles southeast of the type locality of *M. h. unifasciata*. Between these two localities are three mountain ranges, the Bessemers, an un-named range and the Bullions. Visits to these ranges at several different points have resulted in no traces of shells being found.

I take pleasure in naming this shell in honor of Mr. Howard R. Hill, conchologist at the Los Angeles Museum.

Los Angeles Museum, Los Angeles, California.
March 11, 1930.

TWO SEVEN-VALVED CHITONS FROM MENDOCINO, CALIFORNIA

By E. P. AND E. M. CHACE

Among the fifty or more specimens of chitons taken in two days collecting at Mendocino last July, (1929), there were two specimens of particular interest, having only seven valves each. The first, an *Ischnochiton regularis*, Cpr. has valves V and VI fused together. From the outside the abnormal valve shows the median areas of valve V about one-fourth longer than usual, and V's normal lateral areas and then the lateral areas of valve VI. There is a distinct line separating the lateral areas of valves V and VI but it shows a joining and not a joint. No trace of median areas of valve VI is visible. Examination of the interior shows the length of the joined valves to equal that of two normal valves but about seventy percent of this is valve V, a distinct groove separating valve V from valve VI for about one-third of their width at each edge, while the portion under the apex is smoothly joined. Measurements of this specimen:

Length of valves, 29 mm.; width of valve III, 11 mm.; width of valve V, 11.5 mm.

A normal specimen measures:

Length of valves, 29.2 mm.; width of valve III, 11 mm.; width of valve V, 11.2 mm.

The second is an *Ischnochiton mertensii*, Cpr. In this specimen valves I to V are normal in shape and sculpture. All show old breaks at the top of the arch. These are covered with a callus on the inside, the callus in valves II and III being heavier than in the other valves. Valve VI is perhaps ten per cent longer than in a normal specimen. The lateral area on the right side is normal and has five rows of pustules, while that on the left is somewhat larger and shows eight rows of pustules. There is no mark to indicate a possible fusion of valves VI and VII. This valve also shows a break at the apex and a callus inside.

The tail valve *appears* slightly smaller than normal for a specimen of this width and does not fit as tightly against the adjacent valve as is usual. It is short on the left side where it adjoins the wide lateral area of valve VI and long on the right where a small portion at the anterior edge is slightly depressed but still distinct from the central area. This bears three fairly distinct rows of pustules and parts of a fourth row in the slight groove which marks the normal edge of the tail valve.

In spite of the fact that these abnormally sculptured portions of valve VI and the tail valve might be portions of the missing valve (VII) there is no indication on the inside of the shell that valve VII ever existed. Comparative measurements of *I. mertensii* follow:

	Normal spec.	7-v. spec.
Length of valves	31.7 mm	26.5 mm.
Width of valve III	14.4 mm.	14.1 mm.
Width of valve VI	13.7 mm.	13.3 mm.

NEWFOUNDLAND A PROMISING CONCHOLOGICAL FIELD

BY JUNIUS HENDERSON

As far as I have learned, the mountainous portions of Newfoundland have been but little explored by anyone especially interested in mollusks. The recent discovery of unglaciated areas there, and the interesting results of botanical studies therein, and in unglaciated areas of Labrador and the St. Lawrence Gulf region,[1] suggests the importance of a thorough conchological exploration of the region by some husky young fellow who is not afraid of difficult travel in a pathless mountain country.

Many species of western American plants, which perhaps in preglacial times extended across the intervening region, now survive on the unglaciated areas about the Gulf of St. Lawrence, and in Labrador and Newfoundland, associated with many endemic species, which have not been able to reinvade the neighboring regions from which they were probably destroyed by the continental glaciation.

If this large flora has existed there since pre-glacial time, one should expect also an interesting survival molluscan fauna, a study of which would throw some light upon the former distribution of species, as well as upon their antiquity. Several brief lists of non-marine Newfoundland mollusks have appeared in THE NAUTILUS, but the shells were picked up incidentally by botanists. A careful search of the unglaciated mountains by someone particularly seeking mollusks would likely yield much more significant results. In the latest list[2] one species, *Vertigo coloradensis* Cockerell, is especially suggestive. It (and its varieties) had long been known from the southern Rocky Mountains and adjacent region—Colorado, Utah and Ari-

[1] See, for example, Fernald, "Unglaciated western Newfoundland," Harvard Alumni Bulletin, Jany. 23, 1930; "Some relationships of the floras of the northern hemisphere," Proc. Internat. Congress of Plant Sciences, II, 1487-1507, 1929; "Persistence of plants in unglaciated areas of boreal America," Mem. Gray Herb., II. (Mem. Amer. Acad., XV, 1925.)

[2] Vanatta, NAUTILUS, XLIII, 133-134, 1930.

zona. Now it is reported in Newfoundland, with no records, so far as I am aware, for the vast stretch of land between the two regions. What agency could have transported it for a distance of about 2,500 miles and dropped it in the mountains of Newfoundland, and left none along the route? The line does not follow the direction of the migration flight of birds. If it was carried by wind there should be more along the line of travel than at the farthest known extremity, but they have not been found. It has not been reported from Wyoming, Montana[3] or the Rocky Mountain region of British America, thus indicating the improbability that it extends through the conchologically but little known regions of northern Canada and down the Rocky Mountains.

If the isolated occurrence of this species in Newfoundland really means a survival of the species at the extreme eastern end of its pre-glacial range, then it shows the antiquity of the species. More thorough exploration may reveal other western species in the same region, whence they have not been able to reinvade the surrounding territory since the retreat of the continental glaciers. I am not sure that the Newfoundland *Vertigo* was found in the unglaciated area, but it could not have been far from it.

A NEW HUMBOLDTIANA FROM TEXAS

W. J. CLENCH AND H. A. REHDER

Among a large number of shells from southwestern and middle western sections of this country sent one of us by Mr. Ernest J. Palmer, there was a lot of the genus *Humboldtiana* from Mt. Livermore, Davis Mountains, Texas. Upon examination and comparison with other species in this genus it was found to be new and has been named for

[3] *V. coloradensis basidens* is known from Montana and British Columbia.

the collector, who is connected with the Arnold Arboretum of Harvard University, and who, in his botanical expeditions, has shown a keen interest, not only in the botanical, but also in the geological and zoölogical characteristics of the country.

A note on the habitat of the snail may be of interest, this information being taken from Mr. Palmer's paper, "The Ligneous Flora of the Davis Mountains, Texas". (Jour. Arnold Arboretum, X, no 1, Jan. 1929).

The Davis Mountains are in Jeff Davis county in western Texas. They are a group of rugged mountains, some peaks being isolated, and others arranged in irregular groups separated by deep canyons and high cliffs. These mountains are of igneous rock, except for an exposure of sandstone in one place, and for some beds of Comanchean limestone on the northern slopes of the mountains.

The highest peak is Mt. Livermore also known as "Baldy Peak", which has an elevation of 8,382 feet. Several canyons lead up to this peak, and this species was found at the head of Madera Canyon, which is on the north side of the mountain, at a height of approximately 7,350 feet. These canyons end up under high cliffs which rise up along the western and northern sides of the peak. At the base of these cliffs is a deep slope of talus, covered with moss and lichens. In depressions considerable soil and humus has accumulated, and as a result a dense growth of shrubs and small trees is found over a part of the talus, indicating that considerable moisture must be received. The cliffs also furnish some protection from the hot dry winds and from the direct sunlight during part of the day.

Mr. Palmer tells us that as he was collecting here at the base of the cliffs, a light shower mixed with a little hail came up, and immediately these snails began coming out in large numbers from the bases of the male fern and from under mossy rocks and beds of *Selaginella*. (op. cit., pages 27-28).

Two bleached specimens of a *Humboldtiana* were also

taken by Mr. Palmer at Sawtooth Mountain (7,748 ft.), which lies several miles northwest of Mt. Livermore. We hesitate to describe this apparently new species or variety owing to the condition of the specimens. It approaches *H. ferrissiana* Pils. in size but has a higher spire. The two specimens measure:

Height, 33, greater diam. 34 mm.

Height, 27.5, greater diam. 31 mm.

The only other species, *H. ferrissiana,* from the Davis Mountains is from Miter Peak.

Humboldtiana palmeri, n. sp. Plate 2, fig. 1-4.

Shell: thin but strong, subglobose, whorls 4, umbilicate, buckthorn brown in color with occasional irregular straw yellow mottlings along growth lines. Three seal-brown bands encircle the shell. The young shells, of 3½ whorls are somewhat lighter, honey yellow in color. First half whorl smooth, following ¾ whorl finely rugulose-granulose, following whorls distinctly granulose even over the last quarter of the final whorl; granulations extend over the base though somewhat less distinct. The whorls marked by irregular growth wrinkles, the granulations continuing over the wrinkles (fig. 1). Whorls convex, increasing rapidly, the last whorl descending slightly. Aperture oblique, and appearing almost circular; peristome thin, only occasionally very slightly thickened on the inside. Columellar margin strongly reflected over the umbilicus. Interior nacreous-whitish, bands showing through distinctly.

Ht. 22, gt. diam. 26.1, less. diam. 20.5, ap. h. 17.9, ap. w. 14.4 mm. Holotype.

Ht. 21, gt. diam. 25, less. diam. 19.5, ap. h. 16.1, ap. w. 14.1 mm. Paratype.

Ht. 25. 5, gt. diam. 24.5, less. diam. 21.5, ap. h. 15.7, ap. w. 13.2 mm. Paratype.

Ht. 20.5, gt. diam. 23.7, less diam. 19, ap. h. 15, ap. w. 12.9 mm. Paratype.

Head of Madera Canyon, 7,350 alt., Mt. Livermore, Davis Mountains, Jeff Davis County, Texas. Coll. by Ernest J.

Palmer. Holotype M. C. Z. No. 79779. Paratypes M. C. Z. No. 79780. Also collections A. N. S. P. 151227, A. F. Archer and H. Rehder.

This species differs from the four other Texan species of *Humboldtiana* described by Pilsbry (Proc. Acad. Nat. Sci. Phila., 1927, p. 165, and NAUTILUS, vol. 41, p. 82, 1928) by its distinct and strong granulose sculpture which extends up to the peristome and over the base. In this respect it seems to resemble most closely the Mexican species, occupying a position midway between the Mexican and Texan species. Besides differing in the intensity and amount of granulation, *H. palmeri* n. sp. differs in the following respects from the other Texan Humboldtianas. From *H. texana* Pils. it differs in being of much darker color, in being more depressed, and all three bands being equally broad and distinct. *H. chisosensis* Pils., which it perhaps resembles most closely, is usually somewhat larger and more depressed. From *H. ultima* Pils., it differs in lacking the whitish mottling and in the bands being more solid. From the only other Davis mountains species, *H. ferrissiana* Pils., it differs in being smaller, darker in color, the lower band not weak and interrupted but solid.

ADDITIONAL NOTES ON THE COLONY OF HELIX NEMORALIS AT MARION, MASS.

BY W. J. CLENCH

On May 12, Mr. Archer, and Mr. Rehder, together with the author paid a visit to the colony of *Helix nemoralis* that has been established at Marion, Massachusetts, on Buzzards' Bay. Dry weather has been the rule during the past few weeks, and as a consequence only a few individuals were found actively moving about.

The colony is roughly limited to about six acres of ground, four acres of which are for flower gardens and homes and about two acres of open grassland. The species is, by far, most abundant in the open field, in and around

the grass roots and especially at the base and under the leaves of dandelions, daisies and clover. Some small clumps of daisies yielded as many as twenty-five specimens.

About six hours were spent collecting, most of the time in the open field. A series of 1,867 adult specimens were found, and these alone were saved. The adults constituted about 40% of the total population seen. Previous published records about the numerical ratios of the color forms and bands are: (Johnson, NAUT., Vol. 40, p. 93, 1927; Johnson, NAUT., Vol. 41, p. 47, 1927; Crampton, NAUT., Vol. 41, p. 49, 1927.)

Five bandless specimens of *H. nemoralis castanea* Picard were also found, adding a new color form to this locality.

An observation of considerable interest was made. It was noted that only a few dead shells were seen; far too few considering the abundance of live specimens. The lack of dead shells was not due to a low mortality in this particular colony, but rather to the "feeding" upon the dead shells by live snails. More than fifty individuals were seen in the act of rasping away portions of other shells. There is but little lime at this region of igneous rock and this lack has caused these snails to seek a direct supply, rather than depend upon the slight calcium content contained in their food plants.

Formula	libellula[1]	rubella	Formula	libellula	rubella
00000	413	178	10300	..	1
00045	..	1	10345	3	..
00300	399	475	12345	70	92
00340	..	3	123(45)	7	9
00305	8	1	1(23)45	..	1
00345	84	104	(12)3(45)	1	2
003(45)	1	6	1(23)(45)	1	..
02345	..	1	(123)(45)	..	2
Total				987	876

[1] This form which is called the variety *libellula* Risso, is really *H. nemoralis nemoralis* Linn., as the type color form is yellow, and should be known as such.

WEST INDIAN MOLLUSKS. NO. 1:—TWO NEW VARIETIES OF UROCOPTIS LIVIDA TORRE[1]

BY CARLOS DE LA TORRE AND WILLIAM J. CLENCH

UROCOPTIS LIVIDA ATKINSI nov. subsp. Plate 2, figs. 5, 6.

Shell fusiform greatest diameter just a little below the middle; shining. Two decided contrasting colors, the upper 5-6 whorls of a pinkish buff, the lower 5-6 whorls a milky purple. Adults usually truncated, rarely found with complete spire. Sculpture of very fine oblique riblets, more pronounced on the base of the last whorl. Portion of last whorl free, reflected peristome white. Aperture circular, interior a deep reddish brown. Columellar axis twisted. Whorls 10-12.

Length 14.5, width 2.5, ap. diam. 1.5 mm.; 12½ whorls.

Length 13.5, width 2.6, ap. diam. 1.6 mm.; 10½ whorls.

Holotype: M. C. Z. 59108. Vilches Potrero, Central Scledad, Cienfuegos, Cuba. W. J. Clench and C. Goodrich, (1927); G. Aguayo and C. de la Torre (1928), collectors.

This subspecies is more highly colored than *U. livida* Torre, and the contrasting colors of pale pink and purplish are more decided. The columellar axis is about 1/75 of an inch in diameter (first whorl above aperture). In *U. livida* Pfr. the axis is about 1/100 of an inch in diameter. *U. livida atkinsi* runs a little smaller in length between the aperture and the truncated spire. In general outline it is quite similar to *U. livida barbouri.*

UROCOPTIS LIVIDA BARBOURI nov. subsp. Plate 2, figs. 7-9.

Similar in general outline to *U. livida* and *U. livida atkinsi* but differing materially in coloration. This subspecies has a pale yellowish brown coloration throughout its entire length, with numerous irregular narrow bars of darker color on each whorl. Riblets very fine on the early whorls, more pronounced and more widely spaced on the last two

[1] Contributions from the Harvard Biological Laboratory in Cuba. (Atkins Foundation).

whorls. Reflected peristome white. Light yellow brown within the aperture.

Length 14.9, width 2.7, diam. ap. 1.5 mm.; 13 whorls.

Length 13.2, width 2.4, diam ap. 1.4 mm.; 11½ whorls.

Holotype: M. C. Z. 59111. La Portuguesa, Central Soledad, Cienfuegos, Cuba. W. J. Clench, and C. Goodrich, (1927); G. Aguayo and C. de la Torre, (1928), collectors.

Remarks: The above species are both found on the massive outcrops of limestone—the "seborucos" of the Santa Clara region (mogotes of western Cuba). Neither species occurred on the smaller masses of limestone that are protruded only a few feet above the general level of the ground. They were most abundant on the north side, existing in vast numbers in some places. They were less abundant, but by no means rare, on the southern exposures in the full glare of the sun.

NOTES ON THE LAND SHELLS OF RIO, KENTUCKY

BY A. F. ARCHER

During the second week of April, 1930, I made a collecting trip to Rio, Kentucky for the purpose of collecting land shells. The object of the trip was to supplement the work of Mr. W. J. Clench in 1924 and 1925, in which years he stopped at Rio mainly for the purpose of collecting freshwater mollusks. He also obtained a number of records of land shells by incidental collecting near Glenbrook Spring. I collected in the same region, on Grindstone Knob North of Glenbrook Spring, and on Knox Knob flanking the south side. The north side of the Spring yielded very good collecting, the specimens being relatively abundant. South of the Spring the best results were obtained on the side of Knox Knob directly above the Green River. In the list given below I have added two records obtained by collecting in the Cave region in Edmondson County, Ky. All other species from the latter region were the same as those of

Rio. I failed to obtain *Gastrocopta armifera* Say, which Mr. Clench got in 1924.

Polygyra elevata (Say). Scarce
Polygyra thyroidus (Say). Not abundant
Polygyra albolabris (Say). Not abundant
Polygyra zaleta (Binn.). Very abundant
Polygyra appressa (Say). Very abundant
Polygyra tridentata (Say). Very abundant
Polygyra stenotrema (Fér.). Very abundant
Polygyra inflecta (Say). Rather common.
Polygyra plicata (Say). Very abundant on top of the knob
Polygyra hirsuta (Say). Great Onyx Cave, Edmondson Co., Ky.
Anguispira alternata carinata Pilsbry & Rhoads. Scarce
Gonyodiscus perspectivus (Say). Very scarce
Haplotrema concavum (Say). Not common
Mesomphix laevigata Beck. Common
Omphalina cuprea Raf. Not common
Omphalina friabilis (Binn.). Great Onyx Cave, Edmondson Co., Ky.
Gastrocopta contracta (Say). Scarce
Glyphyalinia indentata (Say). Rather common
Paravitrea capsella (Gould). Plentiful
Retinella radiatula (Alder). Not common.
Paravitrea andrewsae (Binn.). Not common
Ventridens ligera (Say). Not plentiful
Succinea avara Say. Scarce

REDISCOVERY OF POLYGYRA ROPERI PILSBRY

BY G. D. HANNA AND J. L. NICHOLSON
California Academy of Sciences

This interesting little *Polygyra* was described as long ago as 1889[1] from three specimens reported to have been

[1] Pilsbry, H. A. A new Californian Helix [*H.* (*Triodopsis*) *roperi*]. NAUTILUS, Vol. 3, 1889, p. 14, 3 text figs.

found in "river drift" at Redding, Shasta County, California. R. C. McGregor found it in 1898[2] under the same circumstances and at the same place.

Many conchologists have since visited Redding and searched diligently for the species without success. The Sacramento River at that point is a fairly large, swift stream and I have not found drift accumulated along its banks in which dead shells would be expected to accumulate. The surrounding country does not appear favorable for the existence of this group of organisms; at any rate the portions searched have been barren.

It is therefore extremely gratifying to be able to announce that the species was discovered in abundance in 1929 at a locality six miles east of Ingot, Shasta County, California. It occurred in a slide of limestone detritus on the north side of the road between Redding and Alturas. The road at that point follows close beside Cedar Creek, and on the north side.

This locality is about 25 miles east of Redding and not in the drainage system which flows by that town. It is therefore inconceivable that shells from this colony floated down stream to Redding and it seems almost certain that the species will be found to have a fairly wide distribution among the isolated limestone outcroppings of northern California.

The three species *roperi*, *penitens* and *tehamaensis* form a compact group in the genus and the available information indicates that the three live in similar situations; that is, well drained limestone talus slopes over which there is some protective shade.

Incidentally it should be added that specimens from the Ingot colony of *roperi* have been compared with the type specimen in the Philadelphia Academy of Sciences by Dr. H. A. Pilsbry and the identification is fully confirmed.

[2] Pilsbry H. A. Shells of Redding, Shasta Co., California. NAUTILUS, Vol. 12, 1898, p. 59.

LAMPSILIS VENTRICOSUS COHONGORONTA IN THE POTOMAC RIVER

BY WILLIAM B. MARSHALL, U. S. NATIONAL MUSEUM

The southernmost locality known to A. E. Ortmann[1] in his first records of the occurrence of this shell in the Potomac and its branches was Shenandoah River, Harper's Ferry, Jefferson County, Maryland, Aug. 16, 1911, a single male, below medium size.

Marshall later recorded one specimen from the Potomac at Great Falls, Maryland, Sept., 1915,[2] and five specimens from Midriver Island, July, 1918,[3] a mile and a half above. Great Falls is about 18 miles north of Washington.

It was scarce in that locality at that time. It is now abundant near Midriver Island and probably also at Great Falls, and perhaps farther south. In numbers *Elliptio complanatus* is the only naiad competing with it. Evidently *cohongoronta* is well established as a member of the river fauna of that neighborhood. As a rule the shells found now differ from those found in 1915 and 1918 in form, size, color and thickness. Those found in 1915 and 1918 were small, the largest having a length of 72 mm., and were rather thin. The general background of color was olive with greenish and yellowish tints, and the surface in general showed broad radiating green lines.

The shells were moderately inflated, with high beaks; not markedly angulate at the postero-ventral margin. Three specimens collected by C. W. Cooke in May, 1923, just above Midriver Island were small, with general ground color lighter, green rays narrower and confined to posterior half of the shell. The shells were less inflated, the beaks not so high, and the ventral margin forming a marked angle with the posterior margin. Perhaps none of the shells so far discussed had attained full size. There is no

[1] NAUTILUS XXVI, pp. 51-54, 1912. In a later work Ortmann classifies both *ventricosa* and *cohongoronta* as varieties of *ovata* Say.
[2] NAUTILUS XXXI, pp. 40-41, 1917.
[3] NAUTILUS XXXII, pp. 51-53, 1918.

difficulty in separating all the above from *Lampsilis cariosus*. In May 1926 Cooke collected a lot at Black Rapids which are just above Midriver Island. Many of these resemble typical *L. ventricosus*. The ground color is yellowish with some olive tints. In most of them green rays are absent on the part in front of the posterior ridge, the ridge is higher and more angular, the posterior end is more angular, the shell is more compressed and many of them are much thicker and larger; the longer in proportion to height. The longest is 112 mm.

In NAUTILUS (XXXII, pp. 51-53, 1918) I suggested the possibility that *cohongoronta* and *cariosus* might hybridize. Whether or not this has occurred is not certain at this time, but the indications are that they have hybridized and that *cariosus* is going to the wall except for an influence on color. The lot from Black Rapids, 1926, and two large lots collected in June 1928, and September 1929 do not contain a single typical *cariosus*. Several males which may be *cariosus* are larger and longer than we have heretofore found here. Females in the three lots mentioned are too small for *cohongoronta* and too large for *cariosus*. The largest unmistakable female collected in 1926 is 91 mm. long. The largest collected in 1929 is 98 mm. long. The largest female *cariosus* from this region is 73 mm. long. Collections made a few years from now when compared with material collected during the past few years should throw considerable light on the question. The indications at present are that *cariosus* in that neighborhood, though hybridizing, will succumb to *cohongoronta* which is a more robust mollusk, possessed of greater vitality; much more numerous, and able to adapt itself with ease to new surroundings. Judging by size, weight, and general appearance of well-being, *cohongoronta* of the present day has found the world so far to its liking. It will be interesting to watch future changes in it—whether it remains as it is now, develops to still greater size, deteriorates to a comparative weakling like the *cariosus* of this region, or possibly passes out. It is pos-

sible that its fine condition at present is due to a strong vitality stored up by a vigorous and fortunately located ancestry.

In addition to the many specimens from the vicinity of Midriver Island and the one specimen from Great Falls, the National Museum now contains a female specimen 68 mm. long from Cacapon River, Morgan County, West Virginia, one mile from its confluence with the Potomac, collected by J. O. Greene in November, 1924; and a male 103 mm. long, collected by a little girl in the Potomac River near Harper's Ferry, West Virginia, May 30, 1926, and presented to the Museum by Miss Harriet Bundick; a male 98 mm. long, and a left valve of another male, 105 mm. long, collected in the winter of 1926-27, by Marshall, Cooke and McNamara, in the Chesapeake and Ohio Canal, at Great Falls, Maryland. The canal has been out of use for several years but some mollusks are found in a little stream running along its bottom. When in use, the canal was fed at many points by water from the Potomac so that it was easy for the river fauna to find entrance to the canal.

THE VARIATION OF MOLLUSCAN LIFE DURING PLEISTOCENE AND RECENT TIME

BY FRANK C. BAKER

Professor Shimek's paper "Helicina (Hendersonia) occulta Say, again" in the April NAUTILUS interests me greatly. While I do not feel competent at present to pass on the validity of *Hendersonia occulta rubella* Green as varietally distinct from *occulta*, there are certain remarks in Professor Shimek's paper which call for some comments from me. The statement that "there is no warrant for the separation of modern and fossil forms" indicates either that Professor Shimek has not compared the recent with the fossil forms carefully or else that he has made up his mind that there is no difference and wishes to "stand pat". The

statement that "to separate the living form as a named variety gives an impression of differences which do not exist" is without foundation of fact, as any one may see by comparing certain Pleistocene forms with the recent forms. During the evolution of the land and fresh water mollusks throughout the million years, more or less, of Pleistocene time, varieties have arisen which differ in some cases markedly from the recent form of the species. For example, among the land species, *Gonyodiscus macclintocki* is as different from *Gonyodiscus perspectiva* as two species can well be, yet the former is probably the ancestor of the latter. To call these two forms the same species is a contravention of the truth and renders classification valueless. *Succinea grosvenori* is so different from the Pleistocene variety which has been named *gelida* that it might be designated a species. *Vertigo loessensis* is quite different from *Vertigo gouldii*. Among the Polygyra group, *P. multilineata altonensis* is different from anything now living, as is also *P. multilineata wanlessi*, although that form resembles somewhat the *algonquinensis* of Nason.

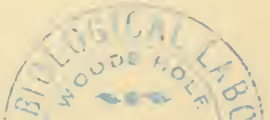
Among the aquatic forms, *Pomatiopsis scalaris* is uniformly different in several particulars from the recent *lapidaria*. Professor Shimek has stated in one place that "some authors are still publishing this species as a fresh water species when it is wholly a land species". I cannot believe that he has studied this species in the recent fauna for it is always an amphibious species, living in water in the spring and on wet, or even dry, ground in the fall and summer. So with the Pleistocene forms *Amnicola leightoni*, *A. gelida*, *Valvata lewisi precursor*, *Gyraulus altissimus*, and others, which are confined to the past and their exact counterparts are not known among the recent related forms.

In all classes of animals evolution has acted differently with various groups, accelerating in some species and genera, retarding in others, and we have in the Pleistocene certain species which have changed radically and others

which have remained unchanged throughout the entire period of glaciation. The mollusks show this difference in active evolution remarkably well and it is the height of absurdity to say that there has been *no* change in species during this long period when animal life was subjected to the most drastic climatic and environmental agencies. The remarkable fact is that so many species have come down with so little change. Another fact which has become increasingly evident is that at the close of the Wisconsin stage there was a great acceleration in evolution, due largely to the prevalence of lake conditions, and many species and varieties were evolved which do not occur in Pleistocene time.

The writer has been giving the life of the Pleistocene intensive study for the past fifteen years, in connection with the Illinois State Geological Survey, of which he is Pleistocene Invertebrate Paleontologist, and during this time a very large collection of the molluscan life of the various interglacial intervals has been collected. The new species and varieties found during this work have been diagnosed in the pages of THE NAUTILUS and the reader can easily formulate his own opinion concerning the validity of the supposed novel forms. Professor Shimek says "Manifestly there is no excuse whatever for a varietal separation of the fossil and modern forms where both exhibit the same range of variations". I quite agree with Professor Shimek in this statement and if he would without prejudice examine the various forms which the writer has diagnosed during the past few years he would agree, I am sure, that most of these, at least, represent recognizable variations which must bear names if we are to understand the action and reaction of evolutionary agencies during the period of the Pleistocene.

Molluscan students, as well as students of other branches of zoology, may be divided into the so called schools of "lumpers" and "splitters". The writer frankly chooses the latter in preference to the former, feeling that more is to



be learned from a comprehensive division of specific groups than from the throwing together of various types of varieties. I have no controversy with Professor Shimek on account of his opinion that Pleistocene and recent species do not differ, but I do object to the dogmatic manner of stating that his opinion represents the truth and that all those who differ with him in this respect are mistaken. I honor Professor Shimek for his great work in the study of Pleistocene faunas, especially the loess faunas, and we must all give him credit for having established beyond doubt the fact of the aeolian genesis of these interesting deposits.

I regret the necessity that calls forth this criticism but the remarks above cited cannot remain unchallenged.

SHELL COLLECTING ON THE WEST MEXICAN COAST, II

BY H. N. LOWE

Before leaving Mazatlan, letters were secured to the Governor of the Tres Marias Islands, Mexico's penal colony, making a visit to that place possible.

Obtaining passage on a small cargo boat, the "Dos Hermanos," the trip was made in eighteen hours, landing at Balleto, the administration headquarters on Isl. Maria Madre.

This lies in the eastern, or lee side of the island and was rather poor for shore collecting. About six miles S. W. at another prison camp called Salinas where sea salt is evaporated in shallow cement basins, the sand beach gives way to flat shelving rocks and coral below low water. On these rocks were the finest specimens of the giant Patella I have ever seen, not eroded by heavy surf like so many are nor encrusted with foreign matter. Even the large specimens showed the fine sculpture.

A horseback trip was made to the north west end of the island, to the prison camp at Rio Hondo where I stayed

three days. On the beach at Rio Hondo, I was told there were no shells. But here I had my best luck. Under rocks, at and below extreme low water I found living specimens of *Mitra lens* and a large *Cardita* buried in the sand under stones and large bunches of coral. Some extremely beautiful *Chitons* were taken here.

At Playa de Cameron, they said there were plenty of shells. After a two hours ride on horseback and an equal distance further on foot we reached the place only to find the beach swept clean of shells. Immediately after storms there may be an abundance of shells on these beaches but at other times there is nothing.

On one rocky point midway on the South coast the large *Patella* and *Chiton petholatus* Sby. were so numerous they could have been taken by the thousand at extreme low tide, but at other times they were inaccessible owing to the heavy surf. The shells were of very poor quality however and not worth much as specimens.

A few species of small land shells were found alive under stones, but the most diligent search failed to disclose a single live *Oxystyla*. I suppose they must burrow into the soil during the dry season. Almost every dead shell had been broken into by the parrots or other large birds which were very plentiful. I found these conditions the same at Manzanillo and Acapulco, but further south at San Geronimo in the State of Oaxaca, I found another species of Oxystyla estivating in plain sight on the trunks of small trees on the brush-covered hills. (See Plate 3).

After ten pleasant days spent on the islands I was fortunate to secure passage on the Mexican coast guard boat "Guaymas" for a none too comfortable trip to Manzanillo.

With a set of low tides here, I had good luck under small stones pried loose with a bar, on the inside of the breakwater. In other places there was little or nothing, so that before the construction of the breakwater, Manzanillo must have been a poor place for shells.

Off the headland just west of town, I had extremely good

luck dredging in twenty-five fathoms. Beautiful *Pleurotoma, Terebra, Turritella, Lyria*, etc., were thus secured.

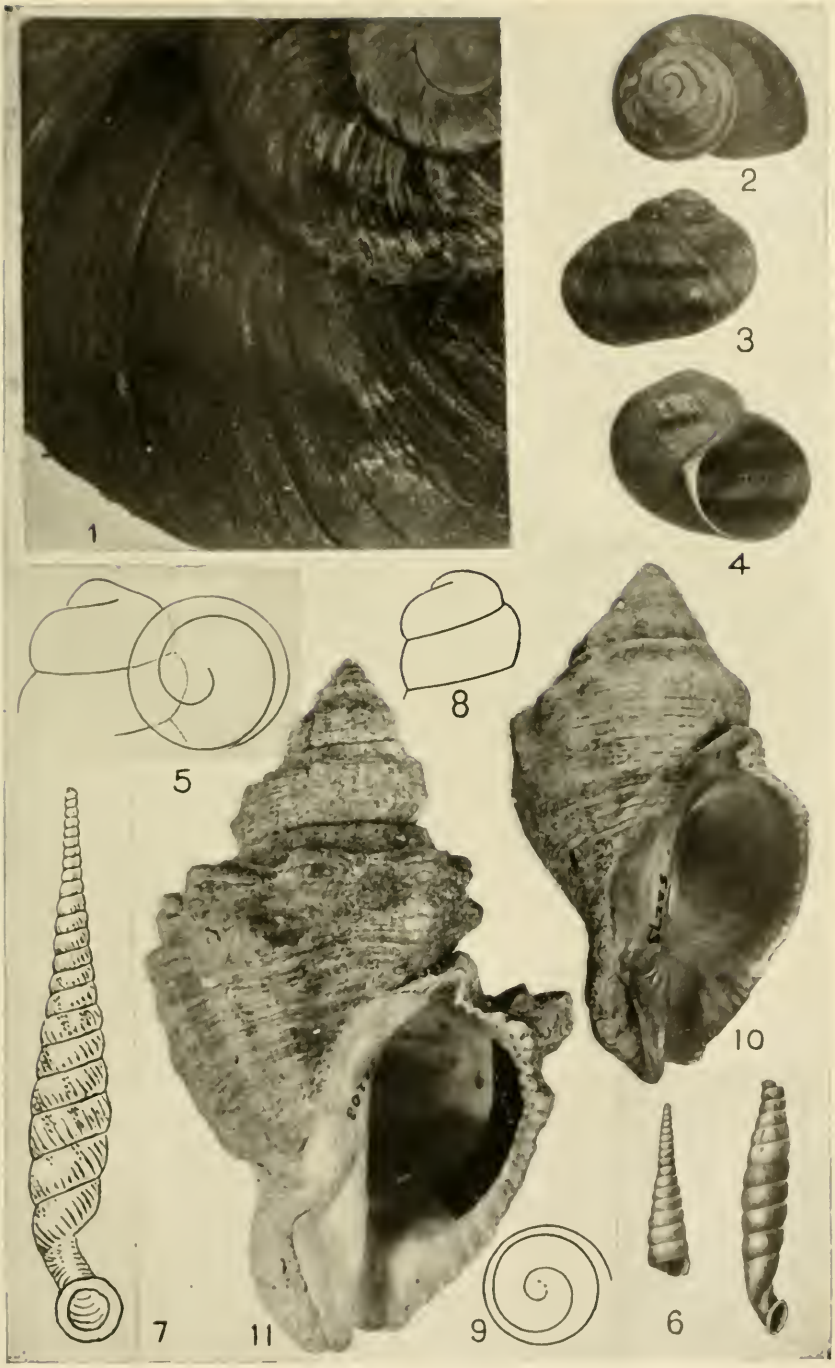
From Manzanillo, I went by steamer "Bolivar" to Acapulco. This beautiful landlocked harbor apparently so favorable to molluscan life along its steep shore line is almost destitute of specimens. But in a few coves and beaches on the outer coast five or six miles from town much better collecting was found at low tide.

A small crowbar is absolutely necessary to dislodge the rocks which seem to be grown together with foreign incrustations.

Dredging here was even better than at Manzanillo and a very pleasant pastime in the early morning hours before the heat of the day—the dredgings sorted over at leisure in the flower filled patio of the Hotel Jardin.

Every day at sunset the Indian women brought to the plaza great baskets of shells and fancy articles made from them. By keeping careful watch every day a number of rarities were picked up. The large number of bivalve species seem to be washed up only after storms, and one vendor would have species which none of the others had found. Considerable bargaining was necessary, for they always asked about twice what they expected to get, and for showy *Murex* they asked more than the curio stores in the States. During Holy Week the women did a thriving business with the crowds from the Capitol, many of whom had never seen the ocean and bought largely of artifically colored coral, sea horses, porcupine fish and the large *Strombus* and *Murex*.

The next port south, Salina Cruz, has been completely sanded up for several years making access by water impossible. The only way to reach it was by auto to Mexico City, thence by train to Vera Cruz where connections are made with the Guatemala road and the Isthmian line. From San Geronimo, the junction with the Guatemala road, the trains run but three times a week to Salina Cruz. So, as luck would have it, I had three days to spend in this windy,



Figs. 1–4. *Humboldtiana palmeri* Clench und Rehder. Figs. 5, 6. *Urocoptis livida atkinsi* Torre and Clench. Figs. 7–9. *Urocoptis livida barbouri* Torre and Clench. Figs. 10, 11. *Thais floridana haysæ* Clench, NAUTILUS XLI, p. 6.

Estivating colony of Oxystyla boucardi (Pfr.)
Photo by H. N. Lowe

barren, God-forsaken looking place. A hike one morning early to the neighboring hills amply repaid me with a goodly number of fine live Oxystyla before mentioned.

At Salina Cruz, as at Manzanillo the only collecting was inside the breakwater and that not so good since the blocking of the harbor entrance, leaving the water inside a dead sea with no tidal flow.

A species of *Oliva*, ranging from white to dark brown is found here at times in great numbers. These are skillfully worked into shell curtains which are sold all over Mexico. They are really quite beautiful, a design of a peacock or other bird worked out in dark shells on a white background.

I retraced my way through Oaxaca to Mexico City and thence to Acapulco where I have waited two weeks for a steamer *twenty days overdue*. But that is a small item in this land of manana where time means nothing at all.

THE BOSTON MALACOLOGICAL CLUB

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

The first meeting of the season was devoted to the summer experiences in collecting of various members, one telling of exploration-work in Yucatan, and of finding a few dead land-forms in the ruined Maya temples—and another, of finding live ones during a tour of Europe, success rewarding his search in such spots as the Roman Forum, and Coliseum, The Bois de Boulogne, the grounds at Versailles, and the Campo Santo at Genoa, and a third telling of collecting in Florida, Georgia and Cuba.

At the November meeting, the President, Mr. William J. Clench, gave a talk on New Zealand and its mollusks, dealing with the topography of the islands, and the various

forms. This was followed by a paper by Mr. A. F. Archer, on the land-shells of the same region.

In December Prof. P. E. Raymond addressed the Club on "The Arctic Ocean as a Route of Migration." He emphasized the fact that exploration has brought to light more and more fossil forms, of species originally native to regions of present polar cold, and spoke of the changes in the areas of land and water during countless ages, and the currents and temperatures which governed the distribution of what are now found as fossil form.

At the January meeting, Mr. Charles W. Johnson, of the Boston Society of Natural History, gave a paper on "Coral-inhabiting Mollusks", illustrated by specimens of the Coralliophilidae and others—among the most interesting being the *Magilus antiquus*—and in February, Mr. Clench told of his recent collecting trip to the small uninhabited island known as Navassa, some forty-five miles west of the tip end of Haiti, where with two companions, he spent twelve days, using the abandoned lighthouse buildings as a domicile, and exploring the island, with its rough rocks, and cacti, to be rewarded by finding only three species of land snails, while the collecting of marine forms was made practically impossible by the steep cliffs with their overhang. At the February meeting, also, Mr. Archer gave a short paper on the "Land-shells of Mauritius".

In March, the Club celebrated the twentieth anniversary of its founding, and welcomed as a speaker, one of the three honorary members, Dr. Henry A. Pilsbry, of the Academy of Natural Sciences of Philadelphia. Dr. Pilsbry told of a trip taken last summer with Ex-governor Pinchot and party, on the Governor's yacht, and of touching at many of the smaller islands among the West Indies—Grand Cayman, St. Andrews, and others, after which they went through the Panama Canal, and visited Cocos Island, then spending some time at the Galapagos group, the Marquesas and Tuamotus. This being a gala occasion, refreshments were served at the adjournment of the meeting.

"The Mollusks of the Andes" was the subject for the meeting in April, Mr. A. F. Archer and Mr. H. A. Rehder being the speakers. Mr. Archer dealt with the geographical features of the mountains and valleys, as well as with the mollusks found there, while Mr. Rehder spoke in detail of the various families, genera and species, of both land and fresh-water forms—and an exhibit, of many of them, was of much interest.

In May, the Club again listened to an outside speaker, Dr. H. L. Clark, of Harvard University, who told of a collecting trip on the coast of Australia, with a side-trip to Tasmania, the object of his search being chiefly echinoderms, many of which were found, including some very rare forms. Dr. Clark spoke with much praise of the excellent museums now to be found in Australia, notably at Sydney, Melbourne and Adelaide.

This being the Annual Meeting, the following officers were elected, to serve for the ensuing year:

President,	Francis N. Balch
Vice-president,	Allan F. Archer
Secretary-treasurer,	Theodora Willard
Executive Committee,	Charles W. Johnson
	William J. Clench

At this writing, plans are being made for the Club's annual outdoor meeting, to be held June 7, at Bass Rocks, Gloucester.

THEODORA WILLARD,
Secretary.

NOTES AND NEWS

A NEW COLLECTING GROUND.—At several points along the East Coast of Florida are shrimp stations from which the small fishing boats go out every favorable day to the dredging grounds in about 30 fathoms of water some two or three miles off shore. It occurred to the writer that the

nets must bring up sea dwellers other than shrimps and arrangements were made whereby the men were to save and bring in any "live" shells found. The results were highly gratifying, yielding some twenty or more excellent specimens of *Murex fulvescens* Sowb. ranging in size from four inches to over six in length and a generous assortment of *Busycon carica* var. *eliccans* Montf.; *B. perversum* Linn., *Fasciolaria distans* Lam., *Polinices duplicata* Say and various species of Arca.—F. S. WEBBER.

SNAILS CLIMBING TREES.—Some time ago there was a little article in THE NAUTILUS "*Monadenia fidelis* Gray, a tree-climber". *Helix aspersa* Müll, the pest of our gardens, is frequently found on the trees along the River Hondo up to a height of from 4-12 ft., and indicating their adaptability to almost any situation, I recently found a number of colonies living under iceplant and other vegetation on the sandy beaches above Point Conception, among *Helminthoglypta walkeriana* and *H. umbilicata* Pils.—STANLEY C. FIELD.

THE VALVATA OF AROOSTOOK CO., MAINE.—*Valvata tricarinata* Say, is a common species in the Fish River Lakes, and extremely abundant in Little Madawaska River, New Sweden.

Valvata sincera nylanderi Dall, has been obtained in dredging in Portage, Eagle, Square, Cross and Mud Lakes, and the Fish River in from 10 to 25 feet of water on aquatic plants. From published records this seems to be the only locality in New England where it has been found, common as a fossil in many of the marl deposits of Aroostook Co.

Valvata lewisi Currier. In 1895-96 while collecting in the northwest branch of Caribou stream, sometimes called Hacket's mill brook, I obtained some young and imperfect specimens of a species I could not identify. Later the place was visited many times without results. On September 15, 1924, at the lower end of the bog opposite Mr. Nils

Esbjörnson house, in water from 6-15 inches deep, among bunches of coarse grass in soft mud, I found this species abundant and collected over 200 specimens, in all stages of growth and quite variable in form. The place was again visited in 1926 and 1928 and the species was still common. On September 8, 1925, I collected a number of specimens in Meadow Lake, Fort Fairfield, where it seemed to be generally distributed. It is common and extremely variable in the marl deposit at Little Mud Lake, Westmanland.—OLOF O. NYLANDER.

ANCYLUS COLORADENSIS, NEW NAME FOR A. HENDERSONI WALKER, 1925, NOT 1908.—In 1925 (Occas. Papers Museum of Zool., Univ. Mich., No. 165) Dr. Bryant Walker described a true *Ancylus*, the first American species, under the name *A. hendersoni*, from Colorado, basing the species upon material sent by me from Lake Eldora. It has since been reported from Alberta (NAUTILUS, XL, 56, 1926). I have just discovered that the name is preoccupied by *Ancylus* (*Ferrissia*) *hendersoni* Walker (NAUTILUS, XXI, 138, 1908). The latter, having been described as an *Ancylus*, the name became and remains preoccupied in that genus, under the rules of nomenclature, notwithstanding the fact that *Ferrissia* was inserted in parenthesis as a subgenus and has since been elevated to generic rank. Consequently the Colorado species must be renamed. It cannot be called *A. walkeri*, as I should like, in recognition of his great work upon the fresh-water limpets, because that name has already been used by Pilsbry and Ferriss for an Arkansas species which should doubtless be transferred to *Ferrissia*. Therefore I propose that the Colorado *A. hendersoni* be henceforth called *A. coloradensis*. Doubtless the reason that Dr. Walker used the name *A. hendersoni* for the second species is that during the many intervening years the North Carolina species had been known to him as *Ferrissia*, and he naturally had forgotten that he originally assigned it to *Ancylus*.—JUNIUS HENDERSON, University of Colorado.

A NEW FORM OF LIGUUS FROM FLORIDA.—In arranging late additions to the collections of *Liguus* my attention was drawn to a form long in the collection which seems as worthy of a name as many now on the list, being clearly distinct from *L. solidus lignumvitae* and *L. s. pseudopictus*, the forms most resembling it.

Liguus solidus innominatus, new form. The shell has the form and thin, light texture of *L. s. lignumvitae* and *L. s. pseudopictus*. First 2½ whorls pink, axial stripes then set in, soon becoming broad, violet-slate, more or less oblique markings, wider below, not reaching the sutures; on the last whorl these are replaced by a few streaks. The base has a series of rhombic blotches in the half grown shells, reduced to small spots in two series in the adult stage. The ground color is pale yellow, with white below suture, at periphery and around the axis. There are narrow brown subsutural and peripheral lines. Columellar and parietal callus pink. Columella is thin, not truncate. Length 44, diam 24 mm.

I figured this as a form of *L. fasciatus* in Manual of Conchology, vol. 12, pl. 59, fig. 97. The type, No. 11497 ANSP. and three other specimens were collected by Hemphill on Noname Key, Florida.—H. A. PILSBRY.

NEWS FROM THE SCHOONER M. M. HAMILTON (in letter from William F. Clapp).—I have at last obtained the floating marine laboratory I have longed for, and the way I feel now I am going to live on it until I die or go broke. This old schooner is 100 feet long and 27 feet wide and the cabin I am sitting in is about 20 ft. square with every comfort a reasonable man could desire. As I write I can see a half dozen pet snakes, two turtles, two alligators, five white rats, and I don't know how many marine animals in various jars and temporary containers I am using for marine aquaria.

PUBLICATIONS RECEIVED

FAUNA MALACOLOGICA TERRESTRE Y DE AQUA DULCE DE CATALUÑA. Por el Dr. F. Haas. (Trab. Mus. Cien. Nat. Barcelona, vol. 13, 1929.) A most exhaustive study of the molluscan fauna of northeastern Spain. The work comprises 491 pages with 187 excellent figures in text.

NEW LAND AND FRESH-WATER MOLLUSKS FROM SOUTH AMERICA. By Wm. B. Marshall. (Proc. U. S. Nat. Mus., vol. 77, art. 2, pp. 1-7, pl. 1, 2, 1930.) *Bulimulus felipponei, Drymaeus harringtoni, Odontostomus teisseirei, O. chuquisacana, Planorbis paysanduensis, Ampullaria palmeri, Diplodon yaguaronis* and *Anodontites palmeri* are described as new.—C. W. J.

UPPER CRETACEOUS AND LOWER TERTIARY GASTROPODA FROM ALBERTA. By Loris S. Russell. (Transac. Royal Soc. of Canada, 3rd Series, vol. XXIII, sec. IV, pp. 81-90, 1929.) This paper is very interesting because it pushes the genus *Oreohelix* and perhaps *Polygyra* back into the Cretaceous Age. Both genera had been already recognized from the Miocene and Eocene, but Russell now transfers to *Oreohelix, Patula obtusata* Whiteaves and *P. angulifera* Whiteaves, from the St. Mary River Upper Cretaceous, and *Helix* (*Pyramidula*?) *thurstoni* Russell, from the Paskapoo Paleocene and the upper part of the Saunders formation, which is tentatively assigned to the Upper Cretaceous. He removes *Anchistoma parvulum* Whiteaves to *Paravitrea*, and *Bulimus limnaeformis*, or *Thausmastus limnaciformis* Meek and Hayden and variety *tenuis* Warren to *Campeloma*. Following Wenz, *Bulimus* or *Columna haydeniana* Cockerell and *vermicula* Meek and Hayden are referred to *Pseudocolumna*. He describes as new *Polygyra rutherfordi* and *Gonyodiscus sandersoni*, from the upper Saunders formation, and *Grangerella mcleodensis* and *Goniobasis tenuicarinata* var. *whiteavesi* from the St. Mary River Cretaceous, the latter being called *Euconulus* in the text, but is changed to *Grangerella* in a footnote.—JUNIUS HENDERSON.

FOSSILIUM CATALOGUS, pars 46, XI: *Gastropoda extramarina tertiaria*, by W. Wenz. The concluding part of the section of this great work relating to land and freshwater shells has now appeared. It contains the end of *Thcodoxus*, the Helicinidae, addenda, and an index to the whole.

The Helicinas of the Ballast Point bed, *H. ballista* and *posti*, are referred to *Hendersonia*, but in shape of the whorls, sculpture and columella they are typical helicinas of the *Oligyra* group, close to heavy forms of *H. orbiculata*. *Dimorphoptychia* is referred to the Helicinidae as by me in Man. Conch. 28: 11 (1927), a reference Wenz did not give. The Florida planorb properly known as *Helisoma* (*Pierosoma*) *scalaris* appears under the name *Isidora* (*Amerianna*) *scalaris*, thus introducing a genus which is unknown in our continent, and an Australian subgenus. In this, however, Wenz followed Dall. I have dissected *H. scalaris*, and found it altogether similar to *Helisoma*. I take space for these notes because Wenz's work is of such general accuracy and excellence, and will be used so widely, that it may not be amiss to point out a few blemishes, such as are inevitable in dealing with such a vast number of species.—PILSBRY.

"THE VENUS", a new quarterly journal on Mollusks. (Subscription: $1.00 per year. Dr. Tokube Kuroda, Geol. Institute, Science College, Kyoto Imperial University, Kyoto, Japan.) This publication has now been running for over a year; the first number of Vol. I, was published in November, 1928, and to date five numbers have appeared. Most of the articles so far published deal with Japanese shells and are very well illustrated with fine plates. The text is both English and Japanese, most of the descriptions of new species appearing in English, but many papers dealing with general subjects such as "Some Ecological Observations on Lymnaea japonica Jay; Bibliography of the Conchological Classics in Japan; Note on a handy Specimen Tray"; etc. are in Japanese, and, of course, will be unavailable to American and European stu-

dents without a knowledge of Japanese or someone capable of making a translation. The table of contents of each number, is, however, in both English and Japanese.

The entire scope of the journal seems to be most excellent and Japanese scientists are to be congratulated upon starting and maintaining such a publication.—WILLIAM J. CLENCH.

PRASHAD, B. "Recent and fossil Viviparidae: A study in distribution, evolution and paleogeography." Memoirs of Indian Museum, Calcutta, India, Vol. VIII, No. 4, pp. 153-251, 1928.

This monograph recognizes only three genera in the Viviparidae, namely *Viviparus* Montfort, and tentatively *Cleopatra* Troschel and *Larina* A. Adams. All of the other usually-recognized genera, including the American *Campeloma, Lioplax* and *Tulotoma,* he assigns to *Viviparus* as subgenera. Perhaps most American conchologists will refuse to follow him in this, though the differences between some of them are confessedly slight, making their biological rank somewhat a matter of individual opinion, hence I decline to be very highly excited about it. He makes *Lioplacodes* Meek a synonym of *Lioplax* Troschel, but by some incomprehensible mistake he cites *nucalis* M. and H., instead of *veternus,* as the genotype of *Lioplacodes.* He rejects, apparently with good reason, Cossmann's section *Paludotrochus,* proposed in 1921 to accommodate *Viviparus trochiformis* M. and H.

Familiarity with early geological literature of the western United States, in which various non-marine formations were erroneously called Laramie, and apparent unfamiliarity with more recent publications, has led Prashad into come curious conclusions, which show how misleading a mere examination of descriptions and figures, or even of specimens, may be. For example, he says that *Campeloma macrospirum* Meek "was probably evolved from" *C. vetulum* M. and H., though it is now known that *macrospirum* long antedates *vetulum,* being found in the Bear River forma-

tion, hundreds of feet below the Judith and Hell Creek beds, in which *vetulum* occurs. He considers *Viviparus trochiformis* (M. and H.) the ancestral form of *Tulotoma thompsoni* White, and says they are found together. I have never found them associated or in the same stratum. The former seems to be a fresh-water form and is found in the Laramie Cretaceous and Fort Union Eocene, while *T thompsoni* appears to be a brackish-water form and is found ranging from the Laramie downward far into the Mesaverde Cretaceous, hundreds of feet below the range of trochiformis.

Viviparus raynoldsanus M. and H., to use the original spelling (not *raynoldsianus*, as Prashad spells it, following White), cited as a Laramie species, was described from and occurs chiefly in the Fort Union Eocene, though it may extend into the Laramie. *V. leidyi* (M. and H.) is a Fort Union species, not Laramie. *V. couesii* White is a Bear River species, several thousand feet below the Laramie, in which he places it, misled by the old designation of this formation as "Bear River Laramie." *Campeloma multistriatum* (M. and H.) is mentioned as having a wide distribution in the Laramie, but it was originally described from the Fort Union.

He assigns *Campeloma productum* White to the subgenus *Lioplax*, which White himself at one time suggested, but he does not mention *Goniobasis endlichi* White, from the Bear River formation, which is now generally considered a Lioplax. Incidentally it may be mentioned that there are about a dozen American fossil species of *Viviparus*, *Campeloma* and *Lioplax*, not discussed by Prashad in his revision.

Viviparus gillianus, in which he follows White, 1885, not 1877 or 1895, should read *V. gilli* M. and H. *V. subglobosa* Emmons (described as *Paludina subglobosa* in 1858, not *P. subglobosa* Say, 1825) should be called *V.? emmonsi* Henderson, 1920, if it a *Viviparus* at all, or possibly should be considered a synonym of *Turbo glaber* Lea, 1846, as Conrad suggested, the generic position of the latter being also very doubtful. He makes *V. leidyi* var. *formosa* Meek a distinct species.—JUNIUS HENDERSON, University of Colorado.

THE NAUTILUS.

Vol. XLIV OCTOBER, 1930. No. 2

PLEISTOCENE AND RECENT MOLLUSKS

BY B. SHIMEK

The caustic remarks in the July number of the *Nautilus*, by Mr. F. C. Baker, concerning the writer's references to variations in *Helicina occulta*, made in the April number, call for a rejoinder.

First of all, it is evident that Mr. Baker did not read the writer's paper very carefully. He quotes the statement that "there is no warrant for the separation of (the) modern and fossil forms" as though it applied to *all* pleistocene species. As a matter of fact the reference was specifically to *Helicina occulta*, and the foot-note references apply to this species only. Mr. Baker disconnects the quotation from its context and omits the article "the", thus placing a false construction on it.

His second quotation, that "to separate the living form as a named variety gives an impression of differences which do not exist" is similarly misrepresented. The statement quoted applies specifically to *H. occulta*, and his misinterpretation of it is absurd.

Truly, Mr. Baker appears very much in the light of a Don Quixote fighting an imaginary foe!

So far as *Helicina occulta* is concerned the writer stands by the declaration that there is no warrant for separating the recent and fossil forms, and that any attempt at such separation *does* give "an impression of differences which do not exist."

This statement is based on the study of 4,084 fossil specimens of this species, collected from 225 loess exposures in

seven states, and of 1,400 recent specimens from 20 different localities. Generous additions will be made to both groups from unassorted material on hand, and a detailed paper on the species will be prepared.

Mr. Baker again persists in calling *Pomatiopsis lapidaria* an amphibious species, thus contradicting himself, for in his "Fresh Water Mollusca of Wisconsin" (1928) he says of this species: "Though essentially a terrestrial animal, the gill is of the usual pectinated form as found in the Amnicolidae. Few specimens have been personally collected in water but it has been found in many places under leaves and on damp or wet mud in places more or less subject to overflow from streams or rivers."

The writer has collected this species not infrequently in the past 48 years, and he has yet to find a living specimen in water excepting when washed in temporarily with other terrestrial species during the brief flood periods. If this species is to be called "aquatic" or "amphibious" then we must apply the same term to *Gonyodiscus cronkhitei anthonyi*, its most common associate, and to *Zonitoides arborea*, *Z. minuscula*, *Polygyra multilineata*, and other terrestrial species with which it is usually found.

It really seems that Mr. Baker "has made up his mind" that it is "aquatic" or "amphibious" because of its relationship, "and wishes to 'stand pat'."

With the same persistence he refers to the form which he has described as *Pomatiopsis scalaris* as "aquatic." The writer has collected more than 2000 specimens of this form in 18 loess exposures near New Harmony, Indiana. They were normally distributed in the loess, not drifted, and their most common associates were strictly terrestrial forms, such as *Helicina occulta*, *Polygyra monodon*, *P. hirsuta*, *Helicodiscus parallelus*, *Strobilops*, etc., numbering hundreds of specimens, and no water-forms were found excepting that, after careful search, three of the exposures yielded a few shells (9 all told!) of a small more or less amphibious *Lymnaea* (*Galba*). Surely this does not point to aquatic habits!

As to the validity of *P. scalaris*, which he now maintains so positively, it should be noted that only two years ago (in the Trans. of the Ill. State Acad. of Sci., Vol. XXI, p. 309) he made this statement: "Scalaris is ancestral to *lapidaria* and might perhaps be considered simply a race of that species."

The limits of this paper do not permit a discussion of some of his other "species" and "varieties" from the loess, but these will be taken up in due time.

Throughout his paper Mr. Baker casts reflections on the carefulness and fullness of my observations. Of course this is only surmise on his part and may be another illustration of his characteristic hastiness, but it comes with poor grace from one who has blundered so often in his loess discussions and references. From the very first his advent into this field has been unfortunate. In his "Revision of the Physae of N. E. Illinois" (*Nautilus*, vol. XIV, 1900) he reported a number of species of *Physa* from the loess,—a manifest error; later he referred species of the genera *Pleurocera*, *Goniobasis*, *Vivipara* and *Campeloma* to the same horizon, —another glaring error; he has reported the reference to the Otis Mills, S. Dakota, section as loess, though it is clearly Aftonian; and other illustrations of his lack of understanding of the horizons from which the fossils were derived could be cited. It should, moreover, be noted that much of the work which he has published was done with material which he had not studied in the field, but which was submitted by others, often in small quantities.

Mr. Baker seems to think that the writer's objection is to the recognition of varieties. As a matter of fact varietal names are often convenient and necessary, particularly where they are correlated with definite ecological conditions. But too often Mr. Baker assumes conditions for which there is little foundation. Repeatedly in his papers he refers to depauperate shells as evidence of a colder climate during the deposition of the loess, and this attitude is further shown by such names as *gelida* for some of his varieties. He has simply gone back to the conclusion advanced by

McGee and Call in 1882 (Am. Jour. of Sci., 3rd Ser., vol, XXIV), at a time when geologists still accepted the aqueous theory of loess origin, in the following words:

"In such a basin the loöss was deposited, just as was all that of eastern Iowa, the coldness of the waters and the low temperature of the air being attested by the depauperate shells found imbedded in it."

Of course Mr. Baker has no more evidence of a colder loess-climate than was possessed by McGee and Call. Some of his "evidence" is decidedly weak, as, for example, when he refers to *Vallonia gracilicosta* as evidence of a cooler climate, for this species is one of the most common land snails living in the prairie groves and border areas in Iowa.

As to the depauperation of certain species, if Mr. Baker would make a wider study of both the loess and modern faunas he would find that such depauperation (notable also in living forms) as is evident can be explained better on the score of periodic comparative drouth rather than of cold. It is evident that he has been influenced by contact with physical geologists (as Call was 48 years ago), some of whom have been making desperate efforts to connect the deposition of loess closely with glacial conditions.

There is much variation in both modern and fossil faunas, but the two groups blend in such manner that any attempt to represent marked changes is extremely unfortunate and misleading. Mr. Baker is making this attempt both by representing that well-marked forms have become extinct, and by the application of such names as *pleistocenica, yarmouthensis,* etc., without giving due heed to the variations in modern and fossil faunas.

The writer has no objection to Mr. Baker's playing with minor variations and applying names to express them, excepting that this will doubtless clutter up the synonymy, —a favorite pastime with some of our ultra-modern students of shells. More than that, the writer welcomes any new name of species or variety which expresses something definite, but he desires to enter an emphatic protest against the application of names which not only do not correctly

express an actual state or condition, but which are positively misleading.

FORMER AND PRESENT TERMS USED IN DESCRIBING FRESH-WATER MUSSELS

BY WILLIAM B. MARSHALL
U. S. National Museum

Having occasion to translate Brugière's descriptions of two fresh-water mussels from French Guiana, viz.: The genus *Anodontites*[1] and the species *Anodontites crispata*[1] and *"Unio granosa"*[2] *(Diplodon granosus)*, I became interested in the terms he applied to various features. Some of his terms are exactly the opposite to what they should be and others are inaccurate. These remarks are not to be taken as a criticism of Bruguière's work, which was excellent for its day, but rather as indicating the difficulties attending the early steps in the study of mollusks, due to lack of even the most elementary knowledge concerning them.

[1] Journ. Hist. Nat. Paris, I. p. 131, 1792.
[2] Loc. cit. p. 107.

English equivalents for terms used by Bruguière in his descriptions.	Terms for the same now in use and substituted in the translation.
Length	=height.
Breadth	=length.
Transverse striae	=concentric striae.
Longitudinal striae	=radiating striae.
Anterior	=posterior.
Posterior	=anterior.
Summit	=beak or umbo.
Muscular attachment	=muscle scar.

The early use of "anterior" for what we know to be posterior end, and of "posterior" for what we know to be anterior, was probably founded upon supposition instead of upon anatomical knowledge. It may have been supposed that in going into the sand or mud the animal would back

in so as to have its "head" end above the soil. The procedure is just the reverse of this. It goes in "head" first so as to have the "tail" end above the bottom in order that the incurrent and excurrent apertures, which are at the rear end, may admit water, carrying air and food, and allow discharge of the vitiated water and fecal matter.

In that day they had no inkling of the delicate, yet efficient means of conveying food by ciliary action to the mouth, nor of the way in which the intestinal tract and gill action keep fecal matter and vitiated water from mixing within the shell with the fresh, life-sustaining water taken in from stream or lake. They knew nothing of glochidia, nor of other embryonic mollusks, very little about the nacre, prismatic structure or periostracum. To the internal anatomy of mollusks they gave scarcely a thought.

We, of this day are not exactly satisfied with the progress that has been made in the study of mollusks, but it is comforting to feel that if Bruguière and the other old-timers could return to the scene of their labors they would be astounded by the strides that have been made—and the promising outlook of the future. They could easily understand why the term conchology is gradually becoming obsolete and the term malacology is looked upon with favor as more truthfully describing a science which is no longer a mere amusement, but which has a dignity and importance equal to those of any other branch of natural science.

A NEW LAND SHELL FROM SAN BENITO COUNTY, CALIFORNIA

BY HERBERT N. LOWE

On a visit to the Pinnacles National Monument in the summer of 1917 the writer collected a single living specimen of a form of *Helminthoglypta* which appeared to be new. In July 1929 a special trip was made to search for further specimens, which resulted in seven living adults and several dead ones in good condition.

It seems to be a very distinct and well marked species, nearest to *H. dupetithouarsi* but having some resemblance to the *H. traski* series.

HELMINTHOGLYPTA BENITOENSIS, new species Plate 5, fig. 1.

The shell is umbilicate, rather solid, dilute russet, fading to isabella color on the base, having a narrow russet band enclosed between two yellowish-white ones. Spire moderately elevated, whorls 6, somewhat convex, slowing increasing. Surface glossy, with sculpture of fine, rather sharp, slightly retractive lines of growth, and showing microscopic very short hairs or their scars arranged in diagonal series in places on the antepenult whorl, the later whorls finely malleate, the malleation more conspicuous on the base, becoming weak on the last half whorl, which is finely papillose immediately behind the lip. Aperture oblique, oval, banded within. Lip thickened, rounded, expanded above, outer and basal margins reflected, the columellar margin dilated over part of the umbilicus.

Type: Alt. 13.5, max. diam. 21.9, min. diam. 17.9, umbilicus 3.5 mm.

Largest: Alt. 13.9, max. diam. 24.5, min. diam. 19.6, umbilicus 3.9 mm.

Smallest: Alt. 12, max. diam. 20.1, min. diam. 16.9, umbilicus 3 mm.

Paratype: Alt. 12.3, max. diam. 21.7, min. diam. 18.4, umbilicus 3 mm.

Type No. 1021 L. A. Mus., collected by H. N. Lowe. Paratypes in coll. Acad. N. S. Phila. No. 151404, and coll. Cal. Acad. Sci.

From the *dupetithouarsi* series this new form differs by the more depressed shape with decidedly smaller aperture. The peristome is, relatively to the size of the shell, better developed than usual in *H. dupetithouarsi*, and far more reflected and thickened than in the allied helminthoglyptas of San Luis Obispo county.

MULLUSKS COLLECTED IN BASS ISLAND REGION, LAKE ERIE

BY ELBERT H. AHLSTROM

The following collections were made during the summers of 1928 and 1929 under the supervision of Dr. Frederick Krecker while at the Franz Theodore Stone Laboratory on Gibraltar Island, Lake Erie. The identification of the material itself was made at Marietta College. Professor H. R. Eggleston aided in the identification of the naiades, while David T. Jones reviewed the snails. Professor Calvin Goodrich of the University of Michigan identified *Carunculina parva, Quadrula pustulosa prasina,* and *Dysnomia perplexa* possibly variety *rangiana.*

Vallonia costata (Müller), Gibraltar Island, Green Island.

Vallonia parvula Sterki, Gibraltar Island, Green Island, Sandy Beach at East Harbor.

Vallonia pulchella (Müller), Buckeye Island, Green Island.

Polygyra albolabris (Say), East Sister Island, Green Island, Middle Bass Island, Put-in-Bay Island, Sandy Beach at East Harbor.

Polygyra inflecta (Say), Gibraltar Island, Green Island, Middle Bass Island, Put-in-Bay Island, Sandy Beach at East Harbor.

Polygyra monodon (Rackett), Lakeside (Michigan)—one specimen.

Polygyra multilineata (Say), Lakeside (Michigan), Put-in-Bay Island, Sandy Beach at East Harbor.

Polygyra multilineata rubra (Witter), Lakeside (Michigan).

Polygyra profunda (Say), East Sister Island, Gibraltar Island, Green Island, Lakeside (Michigan), Put-in-Bay, Sandy Beach at East Harbor.

Polygyra profunda strontiana Clapp, Green Island.

Polygyra thyroidus (Say), Middle Bass Island, Put-in-Bay Island.

Gastrocopta armifera (Say), Buckeye Island, Gibraltar Island, Green Island.

Gastrocopta contracta (Say), Buckeye Island, Gibraltar Island, Green Island, Sandy Beach at East Harbor.

Cochlicopa lubrica (Müller), Gibraltar Island, Green Island, Sandy Beach at East Harbor.

Glyphyalina indentata (Say), Buckeye Island, Gibraltar Island, Sandy Beach at East Harbor.

Zonitoides arboreus (Say), Buckeye Island—high spired form, Gibraltar Island, Green Island.

Zonitoides nitidus (Müller), Buckeye Island, Green Island.

Pseudovitrea minuscula (Binney), Buckeye Island, Gibraltar Island.

Anguispira alternata (Say), East Sister Island, Gibraltar Island, Middle Bass Island, Put-in-Bay Island, Sandy Beach at East Harbor.

Anguispira alternata eriensis Clapp, Green Island, Sandy Beach at East Harbor.

Anguispira solitaria (Say), East Sister Island, Gibraltar Island, Middle Bass Island, Put-in-Bay Island.

Anguispira solitaria strontiana Clapp, Green Island.

Gonyodiscus cronkhitei anthonyi (Pilsbry), Buckeye Island, Gibraltar Island, Green Island.

Helicodiscus parallelus (Say), Buckeye Island, Gibraltar Island, Green Island.

Succinea avara (Say), Green Island, Sandy Beach at East Harbor.

Succinea retusa (Lea), Lakeside (Michigan), Middle Bass Island, North Bass Island, Put-in-Bay Island, Sandy Beach at East Harbor.

Radix auricularia (Linné), Lakeside (Michigan), Squaw Harbor at Put-in-Bay.

Stagnicola palustris elodes (Say), Wehrle's Pond.

Stagnicola reflexa (Say), Small pond on Buckeye Island, Dollar's dock at Put-in-Bay, Fisher's Pond, Fox's Pond, Small pond near Fox's, Haunch's Pond, Lakeside (Michigan).

Fossaria parva (Lea), Buckeye Island shore, Gibraltar Island dock, Sugar Island dock, Terwilliger's Pond on Put-in-Bay Island.

Fossaria obrussa (Say), East Harbor, Gibraltar Island dock, Lakeside (Michigan), Squaw Harbor, Terwilliger's Pond.

Helisoma antrosa percarinata (Walker), Lakeside (Michigan).

Helisoma trivolvis (Say), Dollar's dock, East Harbor, Fisher's Pond, Fox's Pond, Haunch's Pond, Lakeside (Michigan), Squaw Harbor, Terwilliger's Pond, Wehrle's Pond.

Menetus exacuous (Say), Fisher's Pond.

Gyraulus parvus (Say), East Harbor, Wehrle's Pond.

Planorbula crassilabris (Walker), Fox's Pond.

Physella gyrina hildrethiana (Lea), Dollar's dock, Fisher's Pond, Fox's Pond, Small pond near Fox's, Haunch's Pond, Lakeside (Michigan), Terwilliger's Pond, Wehrle's Pond.

Physella sayii (Tappan), Lakeside (Michigan).

Physella magnalacustris (Walker), Buckeye Island Shore, Dollar's dock, East Harbor, East Sister Island shore, Gibraltar Island dock, Squaw Harbor, Sugar Island dock.

Ferrissia parallela (Haldeman), Squaw Harbor.

Ferrissia rivularis (Say), East Harbor, Sugar Island dock, Middle Bass Island shore.

Campeloma decisum (Say) Alligator bar off Gibraltar Island —large form, Dollar's dock, Lakeside (Michigan), Mouth of Detroit River.

Valvata tricarinata (Say), Dredgings from Lake Erie; Lakeside (Michigan).

Bithynia tentaculata (Linné), Lakeside (Michigan).

Amnicola limosa parva (Lea), Dredgings from open lake, East Harbor.

Somatogyrus subglobosus (Say), Dredgings from open lake.

Somatogyrus integer (Say),—possibly a northern variety— Lakeside (Michigan), Sugar Island dock.

Pleurocera acuta Rafinesque, dead shells abundant along lake shore.

Goniobasis livescens Menke, Buckeye Island shore, Dollar's dock, East Harbor, Fishery Bay, Gibraltar Island dock, Middle Bass Island shore, Mouth Raisin River, Squaw Harbor, Sugar Island dock.

Quadrula pustulosa prasina (Conrad), Shells on Gibraltar Island shore; living—East Harbor.

Quadrula quadrula (Rafinesque), Shells—Lakeside (Michigan).

Cyclonaias tuberculata (Rafinesque), Shells — Gibraltar Island shore, Lakeside (Michigan), Middle Bass Island shore.

Amblema plicata (Say), Shells everywhere; living—East Harbor.

Fusconaia flava parvula Grier, Shells everywhere; living—off Buckeye Island, East Harbor, off Rattlesnake Island.

Pleurobema coccineum pauperculum (Simpson), Shells—Lakeside (Michigan), Middle Bass Island shore.

Elliptio dilatatus sterki Grier, Shells everywhere; living—off Rattlesnake Island.

Strophitus rugosus (Swainson), Shells common; living—East Harbor.

Anodonta grandis Say, Shells common; living—off Rattlesnake Island.

Ptychobranchus fasciolare (Rafinesque), Shells everywhere.

Obliquaria reflexa (Rafinesque), Shells—Lakeside, Michigan, Put-in-Bay; living—East Harbor.

Proptera alata (Say), Shells everywhere; living—off Rattlesnake Island.

Leptodea fragilis (Rafinesque), Shells abundant; living—off Rattlesnake Island.

Obovaria leibii (Lea), Shells everywhere; living—off Rattlesnake Island.

Carunculina parva (Barnes), living—East Harbor—one specimen.

Eurynia nasuta (Say), Shells everywhere; living—East Harbor.

Ligumia recta (Lamarck), Shells everywhere; living—East Harbor, Channel near Sugar Island.

Lampsilis siliquoidea rosacea (DeKay), Shells abundant; living—East Harbor, off Rattlesnake Island.

Lampsilis ventricosa canadensis (Lea), Shells everywhere; living—East Harbor.
Truncilla donaciformis (Lea), Living—East Harbor, off Rattlesnake Island.
Dysnomia perplexa possibly variety *rangiana* (Lea), Shells everywhere, but not common.
Dysnomia triquetra (Rafinesque), Shells common.

THE STATUS OF PAPHIA TENERRIMA ALTA WATERFALL

BY DON L. FRIZZELL
Seattle, Washington

In a study of the paleontology of the Fernando Group of California L. N. Waterfall (Univ. Calif. Pub., Bull. Dept. Geol Sci., Vol. 18, No. 3, 1929, p. 85, pl. 6, fig. 1) described *Paphia tenerrima* subspecies *alta* from the "Saugus" Pleistocene. He said (*loc. cit.*) of the supposed subspecies: "This subspecies is very similar to *Paphia tenerrima* Carpenter, but is readily distinguished by its relatively greater height and more strongly vertical truncated posterior end." And also: "Similar types of variations to this are noted in the living *P. tenerrima*, so that the writer has no hesitation in placing the two specimens collected in the same subspecies" —in spite of which he listed (*op. cit.*, checklist opposite p. 78) the "subspecies" as extinct.

During an examination of a fauna from the Pleistocene of the Puget Sound region a specimen was found which proved to be indistinguishable from *P. t. alta*. A study of the validity of this name was made resulting in the following conclusions.

First, the variety "*alta*" is simply an unusually high specimen of *P. tenerrima* Carpenter which falls within the distribution curve of that species as a perfectly normal end member. As it is coexistent, both geographically and temporally, with the typical form it cannot be regarded as more than a variety, and does not, in my estimation, merit even a varietal name.

Second, this variety, if accepted, must be considered as a living form, and cannot be of any great stratigraphic value. A specimen from Puget Sound (No. 1366 in the collection of the University of Washington Museum) has both the relative height and vertically truncated posterior which serve to distinguish the variety *alta*.

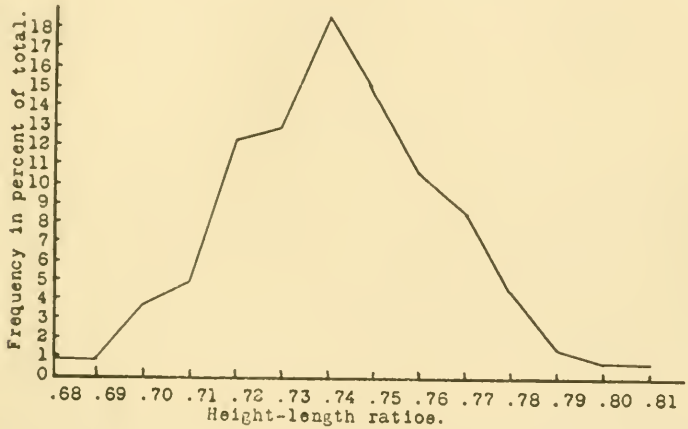


Fig. 1. Height-length ratios of a series of 239 specimens of *Paphia tenerrima* Carpenter from the Pleistocene of Port Blakely, Washington.

As evidence of the relation of the type of *alta* to a series of typical specimens the accompanying graph is submitted. Height-length ratios are plotted against frequency in per cent of the total number of specimens. 239 specimens collected indiscriminately from the Upper Pleistocene at Port Blakely, Washington, were measured. In this graph it will be seen that greater numbers indicate relatively higher shells. The type of *alta*, from the dimensions in the original description, has a ration of .82. While this is very slightly higher than any of the shells in the measured series it fits perfectly at the extreme upper end of the distribution curve. Although variation in outline, such as might not be shown by the dimensions, does not lend itself well to graphical expression it was observed to have a corresponding distribution and would doubtless fit the same sort of curve.

If the varietal name *alta* is accepted the only consistent course will be to recognize and name the equally distinctive low form at the opposite end of the curve—an encumbering of the literature to which I am sure any conscientious worker would object.

VARIATION IN THE SCULPTURE OF ACILA CASTRENSIS HINDS

BY DON L. FRIZZELL
Seattle, Washington

The fossil species of *Acila* are, because of the similarity of the various species, as well as because of their individual variability, more or less of a problem to the paleontologist. Dall[1] considered that, ordinarily, only one species occurs in a geologic horizon. If this were the case there would be difficulty enough in differentiating between species. Subsequent workers have, however, often listed several species from beds of a single age, only one of which might be important as a marker. It is obviously important, then, that the range of variation be known, so that a single valid species of stratigraphic importance might not be split into several of doubtful worth. It is hoped that this study may help to show the limits of variation, in the sculpture at least, of this genus.

Work on this species was suggested by Dr. H. G. Schenck of Stanford University, who is preparing a comprehensive study of the fossil and recent species of *Acila*, and to whom I am endebted for many helpful suggestions. I am also under obligation to Professor Kincaid of the University of Washington for suggestions and constructive criticism during the course of the work.

Material in the form of some three hundred and fifty-eight specimens of *Acila castrensis* was obtained from the Marine Biological Station of the University of Washington, located at Friday Harbor, Washington. As no record was kept of

[1] U. S. Geol. Sur., Prof. Paper 59, 1909, p. 102.

localities, depths, conditions of bottom, etc. (I was unable to do the collecting myself), it was impossible to attempt to formulate any relation between the different types of variation and their environment. I am inclined to believe, however, from bits of mud adhering to most of the specimens, and from what I have been told of their habitat, that the Puget Sound forms live in an almost uniform environment. They are said to be found in mud at depths of 25 to 35 fathoms.

It will be noticed from the figure that the apices of the divaricate sculpture of a specimen of *Acila* form a line of divarication or "primary bifurcation"[2] extending from the umbo to the ventral margin. Specimens of some species show other similar lines starting at the umbo or, more often, appearing toward the margin. Dr. Schenck calls the latter "secondary bifurcation". In this study the angle at which the line of primary bifurcation crosses the shell was measured, and the presence of any secondary bifurcation recorded, in order to show the variation in these characters within a single species.

The angle at which the line or lines of primary bifurcation cross the shell was measured with a celluloid protractor. Its measurement may be illustrated as follows. Suppose a right angle to be drawn, one side touching the umbo and "lunular" area of the shell, the other touching the ligamental area. A straight line connecting the apex of this angle with that part of the line of bifurcation on the most inflated portion of the shell, and extending beyond the margin, is drawn. This line and the umbo-"lunular" area line form the angle to be measured. Error due to the curvature of the shell was avoided by using that part of the line of bifurcation at the most inflated portion of the shell on all specimens. Error due to equipment or personal judgment will not exceed four degrees, and, as it is not constant, may be ignored. Variation,

[2] Schenck, H. G., according to a personal communication proposes in manuscript the terms "primary bifurcation" and "secondary bifurcation". He writes, "They are doubtless clear to you without definition". I am assuming that my usage conforms to Dr. Schenck's definitions.

throughout this study, will be referred to in terms of the right valve.

(*See Illustration on opposite page*)

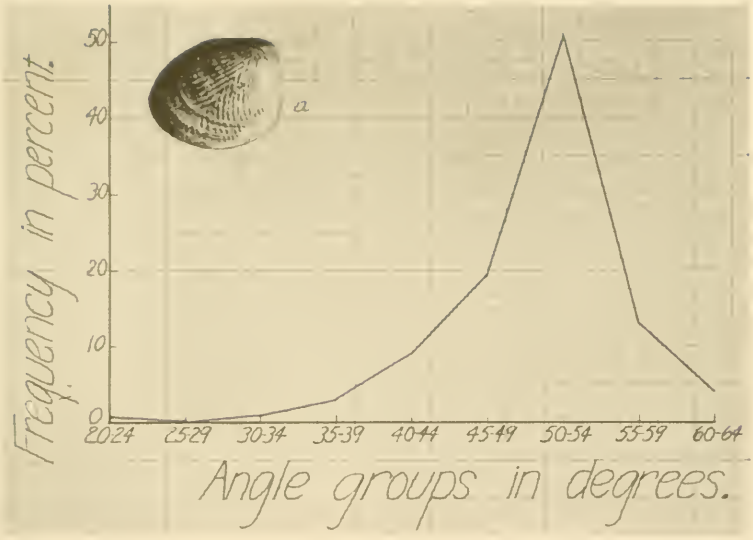
From the accompanying graph it is seen that, although there is an actual range of 38° between maximum and minimum (62° and 24°, respectively), the specimens fall into a series with 51% of its members having angles between 50° and 54°. This would indicate a normal distribution curve and that the angles on a large series are of value as a specific character.

As a test of the foregoing conclusion figures of two fossil forms, five of one and four of the other, were measured. Each species had a characteristic angle, different from that of *castrensis*. While results from so few measurements are not of any great value they suggest, at least, a real taxonomic importance for this character.

In dealing with the various lines of bifurcation certain new terms are needed. Primary and secondary lines (of bifurcation) are used as proposed by Dr. Schenck. In addition the terms *primary pattern* and *umbonal lines* (of bifurcation) are here proposed. *Primary pattern* refers to the initial sculpture on the umbo and consists of primary and umbonal lines. *Umbonal lines* are lines of bifurcation starting at the umbo and dying out within from 3 to 5 millimeters.

Observation of the shells reveals that there are six primary patterns, *with any of which may or may not occur secondary lines*. The primary patterns, with percent of the total, are as follows: (1) a single primary line, 54% (2) a single primary plus a single umbonal line, 24% (3) two primary lines, 16% ; (4) two primary lines plus a single umbonal line, 3% ; (5) a single primary line plus two umbonal lines, 2% ; (6) three primary lines, 0.6%. These differences may be due to environment or, more likely, to tendencies inherent within the genus. In either case they are not shown to have any value as specific characters.

Roughly two-thirds of the specimens examined are marked with secondary lines of bifurcation. These are from one to



At *a* a left valve of *Acila castrensis* Hinds, × about 1¼, showing divaricate sculpture.

five in number. Of these, 61% have a single secondary line, 30% two secondary lines, 8% three secondary lines and 1% have five secondary lines. When more than one line are present they are usually initiated at the same stage in the growth of the individual.

Dr. Schenck[3] suggested that these secondary lines are related to the age of the specimen. To check on this the occurrence of secondary lines was charted against age of the individuals. As lines of growth are not consistent, this was measured in terms of length in millimeters along the main line of primary bifurcation.

Secondary lines were found beginning at from 2 to 12 mm. along the main primary line. The majority, however, start at about 8 mm. This is construed to mean that secondary lines tend to be initiated when the individual is about half grown.

The results of this study may be briefly summarized as follows: (1) The main line of primary bifurcation crosses the shell at an angle which gives evidence of being distinctive for the species. (2) Various primary patterns are present, reasons for which are not established, and which do not seem important as specific characters. (3) Secondary lines of bifurcation are present in about two-thirds of the specimens examined and when present are definitely related to age of the individual.

A STUDY OF THE VARIATIONS IN THE RADULA OF A SNAIL WITH PARTICULAR REFERENCE TO THE SIZE OF THE MEDIAN TEETH*

BY SAM W. HOWE

I. Introduction

In 1856, C. Troschel began his systematic study of the radulae of molluscs. Since then malacologists have lacked agreement in the interpretations which have been placed

[3] Personal communication.

*Contributions from the Zoological Laboratory of the University of Illinois, No. 360.

upon radular characters in the classifications of gastropods. While some workers have maintained that the radula provides safe criteria for generic and specific diagnosis, others have ignored radular characters or have denied their validity. E. W. Bowell (1924) implies that radular characters must be used with discretion in specific diagnosis. H. M. Gwatkin (1914) says that the redular characters do not always have the same value in the diagnosis of genera or species, "Often it is decisive, sometimes useless" is the way he states it. A. E. Boycott (1914) concludes that for the radula to yield characters of any value in classification, the size of the animal must be stated with the description of the radula. Friele (1879) regards the radula as possessing characters of little value in classification of species as compared with external characters. E. W. Bowell (1920) maintains "that certain characters (of the radula) formerly relied upon for determination of species are unimportant."

Despite these conflicting views held by outstanding investigators, very little has been done to establish specifically the constancy or variability in radulae of individual species. Some observations have been published on the changes within the radula during individual development from embryo to adult. V. Sterki (1893), in working on the radulae of embryos and adults of some ten species of snails, discovered distinct changes in the shape of the teeth, number of rows of teeth, and number of teeth in the rows, from embryo to adult. The number of rows and the number of teeth in each row were found to increase with advance in age of the animal. He even expressed the view that one may think of it as a "true metamorphosis" of the radula.

Most of the workers who have given attention to this problem have confined themselves to the number of rows, number of teeth in each row, and the size of the whole radula. F. G. Cawston (1926), while examining the radulae of snails that were intermediate hosts of parasitic trematodes in Natal, observed that the number of rows and num-

ber of teeth in each row differed in small and large individuals. A. E. Boycott and J. W. Jackson (1914), in working on *Helicella heripensis* and *H. caperata*, found the number of rows and the number of teeth in each row to increase definitely with increase in size of shell. A. E. Boycott (1914) determined that the size of the whole radula, and the number of transverse rows in the radula increased definitely with the increase in size of the shell of Hyalina. A. H. Cooke (1918) found the number of denticles to be variable in a number of gastropods. E. W. Bowell (1908) also found the number of teeth in the Helicids to vary and concluded that "the number of teeth in any given radula may be a matter of comparatively little importance". M. V. Lebour (1906) noticed variation in the number and shape of teeth in the radulae of certain Buccinidae but she saw "no correlation of variation with regard to the radula and the shell".

For the most part, however, recent malacologists have assumed that specific variations in the radula are non-existant, or at least unimportant. Particularly has this been true in the assumptions regarding the size of the individual teeth. Some have gone so far as to say that there is no variation in the size of the individual teeth (Sterki, 1893). However, Boycott (1914) after finding the number of rows in the radula of Hyalina to vary from 38 to 48 and the estimated number of teeth to vary from 850 to 1,632, concluded that the "increase in size (radula) which accompanies growth is mostly due to an increase in the size of the individual teeth". He estimated the size of the teeth, however, rather than measured them.

Dr. H. J. Van Cleave of the University of Illinois suggested that the writer undertake a detailed study of the radulae in certain fresh-water gastropods to determine the reliability of radular characters in taxonomic studies. This problem has consequently been pursued under his direction. The writer also wishes to express his indebtedness to Mr.

Frank C. Baker who gave much valued assistance during the progress of the study.

Materials and Methods: As the initial object of this investigation, snails of the genus *Goniobasis* were selected because of the relatively simple radula formula characteristic of the family Pleuroceridae. The specimens which have served as the basis for this investigation were collected from the Salt Fork at Homer Park, Illinois, in June and July, 1929. Through the courtesy of Mr. Calvin Goodrich, the specimens upon which this investigation has been carried out were identified as *Goniobasis livescens* Menke.

The radula of *G. livescens* has only seven longitudinal rows of teeth. The formula for *G. livescens* as given by Baker (1928) for individuals from Wisconsin is

$$\frac{1}{8\text{–}9}\quad\frac{1}{5\text{–}6}\quad\frac{1}{5}\quad\frac{1}{4\text{–}1\text{–}4}\quad\frac{1}{5}\quad\frac{1}{5\text{–}6}\quad\frac{1}{8\text{–}9}$$

The radula formula of specimens used in this study was found to vary from that published by Baker. I found the formula in the specimens under observation to be

$$\frac{1}{9\text{–}12}\quad\frac{1}{5\text{–}7}\quad\frac{1}{5}\quad\frac{1}{3\text{–}1\text{–}3}\quad\frac{1}{5}\quad\frac{1}{5\text{–}7}\quad\frac{1}{9\text{–}12}$$

There seemed to be some variation in this formula as in one or two specimens the median tooth was like that found by Baker,

$$\frac{1}{4\text{–}1\text{–}4}$$

Concerning the differences in the formulas recorded by Baker for *G. livescens* and by the present writer, no final conclusion may be drawn at this time. However, it should be kept in mind that the specimens were from two distinctly different localities. Individuals figured by Baker

were from relatively large rivers in Wisconsin, while the objects of the present investigation were from a small stream in Illinois. Superficially the shells of specimens from the two localities seem to be identical, and have been so determined by Goodrich, but the radular differences here set forth may serve as a basis for distinguishing ecologically distinct variations of *Goniobasis livescens*.

The radulae under investigation were extracted with NaOH 40%, stained with chromic acid 1%, dehydrated in 95% alcohol, and mounted in diaphane.

Three measurements of the shells are given for comparing the size of individuals. This was done because in some cases the apical whorls of the shells were decollated. This would make some slight difference in the relative sizes. In no case, however, was there much decollation of the apical whorls. This fact invalidated the use of the number of whorls as a practical criterion for determining age.

Statement of Problem: An analysis of the reliability of radular characters in the taxonomy of gastropods involves so many problems that only a few have been selected for this initial study. The most significant aspects of the problems treated in this paper are:

1. An accurate determination of variability in size of median teeth in the same radula, whether graded variation from one end to the other, chaotic, or definitely correlated with worn, functional, and newly developing regions of the radula.
2. An examination of the influence of age upon the relative width of the median teeth, as encountered in snails of different sizes.
3. Relative widths and length of the central cusp on the median teeth of radulae from snails of different sizes with especial reference to change in size of central cusp with change in size of median teeth.

II. Observations on Radulae

Morphology: Three regions are readily distinguishable in the radula though they are not sharply delimited, for one

grades without distinct boundary into another. The oldest, anterior-most portion bears about 15 to 35 transverse rows of somewhat broken and very much worn teeth. Adjacent to this worn region is a portion in which the teeth are all perfect and not noticeably worn. The posterior region of the radula bears teeth in the process of development. These new teeth comprise 14 to 20 transverse rows which by the technique here employed take very little or no stain.

Variability of median tooth. A. *In the same radula.* Six entire radulae were examined to determine the variation in size of the median teeth in the same radula and the relation of this variation to the position of the teeth in the radula. The widths of the median teeth were found to vary as much as 14μ (78μ to 92μ), in the same radula. In four of the radulae, the teeth in the undeveloped region were the smallest (70μ to 78μ), the teeth in the oldest or worn region were largest (76μ to 96μ), and the teeth in the perfect region were between these two in size (74μ to 88μ). Thus we have evidence of a definite increase in size from the younger region to the older region of the same radula. In the other two radulae, the teeth in the perfect region were the largest (44μ to 54μ) while there was very little difference in the size of the teeth from the other two regions. In one case the teeth in the older region (40μ to 44μ) were a little larger than in the undeveloped region (40μ) and in the other case the teeth in the undeveloped region were so arranged on the slide that measurements in that region were impossible. These conditions, found in the two last mentioned radulae, have not been explained.

B. *In different radulae.* The other radulae examined showed variations in widths of median teeth in the same radula as great as 16μ (from 84μ to 100μ, in specimen 29, Table I). By pressure on the cover glass, the radulae were broken so that isolated teeth were available for accurate measurement and drawing but due to this isolation the original position of the teeth in the radula could not be determined. From the results obtained in the examination

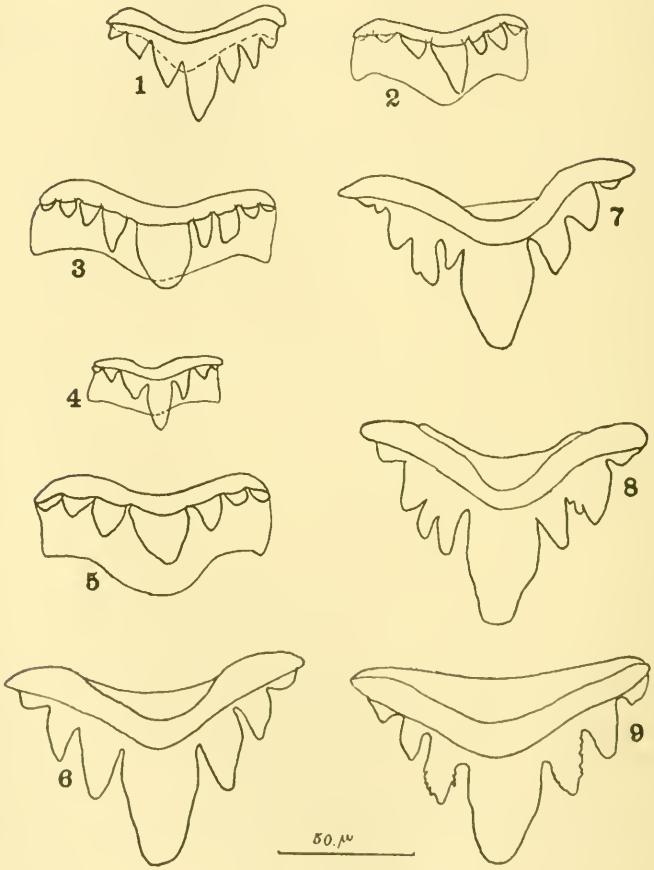
of the six entire radulae, it seems probable that the size differences in the same radula depend very largely upon the position of the teeth in the radula and are not chaotic. These results are shown in Table 2.

Variability in the central cusp. A. *Width.* The measurements of five entire radulae yielded the results shown in Table. 3. This table shows in three of the five radulae, a definite progressive increase in width of the central cusp of the median teeth from the undeveloped end to the worn or oldest part of the radula. In specimen number 47 (a small shell 5.8 mm. in length) the central cusp on the older end were narrower (8μ) than those in the perfect region (10μ). In specimen number 42, the central cusps in the perfect region (21μ) and the worn region (20μ) were practically the same in size. The results shown in Table 1 are the measurements of central cusps in isolated median teeth in the radulae of some 40 broken up radulae. The differences in width of central cusps in the radulae of the same individual were as great as 8μ (16μ to 24μ) in specimen 27. The size differences shown here are probably correlated with position in the radula as in the five entire radulae mentioned above. This could not be determined because of the shifting of the teeth from the original position during the process of isolating them. It is probable, however, that the width of the central cusp varies directly with position in the radula as does the width of the entire median tooth.

B. *Length.* The lengths of the central cusps of the median teeth are also shown in Table 1. In the five entire radulae, the central cusps of the perfect teeth are the longest. The central cusps of the worn teeth are about the same length (16μ in specimen 37) as those of the undeveloped region (16μ in specimen 37) though in some cases the worn cusps are shorter (6μ to 15μ in specimen 46). This decrease in length of the central cusp of the worn teeth is due to the wear to which they have been subjected. The lengths of the central cusps were found to vary from 2μ to 14μ in the

individuals that were broken up in isolating the median teeth.

Correlation of Tooth and Shell Size. Forty two specimens



Figs. 1 to 5. Central teeth from radulae of *Goniobasis livescens* showing range in size and variability in number and arrangement of the cusps.

Figs. 6 to 9. Central teeth from the radula of the same individual showing a normal tooth (6) and different types of abnormality (7 to 9) occurring in the same radula.

of Goniobasis varying in length of shell from 5.6 mm. to

20.8 mm. were examined for variations in size of median teeth of radulae from different animals. Even a superficial glance at the data shown in Table 2 gives conclusive evidence that tooth size varies directly with body size. Variations in width of median tooth from 40μ in the smallest specimens to 108μ in the largest specimen were found. Some digressions from a progressive increase in width of median tooth with increase in length of shell were discovered. These can be explained in the variations within the individual radula mentioned above. There is a definitely uniform increase in the size of individual teeth of radulae from different individuals progressing with increase in size of shell. This does not show so well from looking at the smallest or largest tooth of a given radula and comparing it with that next in size. However, it is shown in the overlapping of the sizes of the teeth in different radulae. In the radula from all shells 10.9 mm. to 20.8 mm. in length some individual teeth may be found that are approximately 80μ in width. If the width of every tooth in every radula were compared with the width of the corresponding tooth in every other radula, the correlation of increase in size of teeth and shell would probably be still closer.

The differences in width of individual teeth from different radulae seem to be as great in the larger snails as in the smaller individuals, showing a range from 44μ to 68μ in shells from 7.5 mm. to 8.4 mm. in length and a range from 78μ to 108μ in shells from 10.6 mm. to 20.8 mm. in length.

Variability in Number of Teeth. There were considerable variations in the number of transverse rows of teeth in the six entire radulae examined. These variations were from 68 transverse rows in specimen 46, from a shell 12.3 mm. in length, to 112 transverse rows in specimen 41 whose shell was 20.0 mm. in length. The increase in number of rows coincided progressively with increase in size of shell. No instances of variations in the number of teeth in each transverse row were observed, each row consisted of seven teeth which is the constant, normal number for the species.

In most of the recorded variations in the radulae of other genera of snails, by Sterki (1893), E. W. Bowell (1908), A. E. Boycott (1925), F. F. Cawston (1926), A. E. Boycott (1914), and M. V. Lebour (1906), there were definite variations found in the number of teeth in the transverse rows. Most of the radulae studied by the above named investigators were those having a relatively large number of comparatively small teeth in each transverse row, while *G. livescens,* used in this study, has a relatively small number of comparatively large teeth in each transverse row.

The results obtained in the present investigation show no variations in number of teeth in each transverse row but a definite variation in size of individual teeth, while the above investigations show definite variations in number of teeth in each transverse row but no conclusive evidence of variation in size of individual teeth. This may mean that in radulae of few but large teeth, the variation is in size of individual teeth, while in radulae of many but small teeth, the chief variation is in number of teeth.

Continuity of Abnormality in Teeth. H. M. Gwatkin (1914) maintains that any abnormality found in the teeth in a radula will be continued posteriorly through the longitudinal row in which it occurs. In one specimen (No. 12) used in this investigation, some of the central teeth were abnormal. However, the abnormality was not uniform throughout the entire row. There were a number of malformed teeth in the central row (figures 7, 8, 9) each one of which had a distinctive type of malformation. Some of the teeth in the same longitudinal row were perfectly normal (figure 6). The relative positions of the malformed teeth in the row could not be determined because the teeth were isolated. That they were all from the same row is self-evident because each radula has but a single row of central teeth.

III. Summary and Conclusions

1. The number of transverse rows in the radulae *G. livescens* increases definitely with increase in the size of the shell but there is no variation in the number of teeth in each transverse row.

2. A distinct increase in the size of the individual median teeth and the central cusp of median tooth in radulae of *G. livescens* accompanies increase in size of the shell. The increase is fairly uniform from very small animals to comparatively large individuals.

3. Distinct differences in size, both of the central cusp and of the entire median teeth, occur in individual radulae of *G. livescens*. There is progressive increase in size of the tooth and its central cusp from the undeveloped end to the worn end of the radula.

4. Malformations in the radula may be chaotic i.e. not continuing uniformly throughout the longitudinal row.

5. In using radular characters in classification, the size of the shell must be recorded with the description of the radula. The width of median teeth has no value in specific diagnosis of Goniobasis unless snails of practically the same size are used in every case. The size of the median teeth in young snails can not be used in specific diagnosis in comparison with radulae from older snails, for tooth size increases directly with age. Thus in species showing wide divergence in size of the mature shells, a comparison of radulae from shells of the same size could not yield a valid basis for comparison of the two species.

Table 1. Relation between size of shell, central cusp, and entire median tooth in 42 individuals of *Goniobasis livescens*.

Spec. No.	Length of shell in mm.	Greatest diameter of shell in mm.	Length of Aperture in mm.	Central Cusp of Median tooth Length in μ	Central Cusp of Median tooth Width in μ	Width of Median tooth in μ
15	5.6	2.7	3.0	10–12	8	44–50
47	5.8	3.1	2.9	13–16	6–10	40–50
48	5.9	3.1	2.9	14–16	9–10	48–54
23	6.0	3.3	3.2	18	7–8	44–48
24	6.5	3.5	3.7	14	8	48–54
45	7.1	3.6	3.9	16–18	9–10	56–60
20	7.5	4.0	3.7	12–14	8–11	40–56
31	7.5	4.0	3.8	12–20	8–16	44–56
33	7.5	3.6	3.7	10–12	8–16	52–56
44	7.5	3.8	4.0	20–24	12–16	52–60
17	8.0	3.9	4.0	.....	.....	62–64
36	8.2	4.3	4.5	16–20	10–12	60–68
18	8.4	4.0	4.3	20–24	12–16	56–62
32	10.9	5.7	5.7	20–24	12–14	68–72
35	12.0	5.7	5.7	16–24	16	84
2	12.1	6.0	5.9	.....	.....	86–88
46	12.3	5.8	6.2	18–28	14–18	76–84
25	12.4	6.1	6.1	22–24	16–18	68–80
43	12.5	6.1	6.4	14–21	16	70–76
34	12.6	6.4	6.4	20–22	16	74–76
26	12.7	6.0	6.1	20–24	18–20	64–76
27	13.3	7.3	7.8	18–32	16–24	88–92
16	13.6	6.4	6.6	28	20	84–88
22	15.8	7.8	8.5	20–26	14–18	80–84
28	15.8	7.2	7.3	20	16	80–82
42	16.1	7.4	7.5	24–32	16–21	80–92
19	16.4	7.3	7.4	30	22	80–84
3	16.7	7.9	7.7	.....	.....	74
30	17.4	7.9	7.7	20–26	16–20	80–84
7	17.8	7.8	8.1	24–36	20–24	102–108
13	18.4	8.0	8.0	35	28	90–100
21	18.4	7.7	7.6	20	20	92–96
29	18.4	8.1	8.6	30–36	22	84–100
37	19.0	8.3	8.3	21–22	16–20	82–88
10	19.5	7.9	8.0	44	24	100
40	19.6	8.4	8.7	16	18–20	84–96
6	19.8	7.9	7.7	.....	.....	96–102
39	19.9	8.6	8.6	32–36	22–26	88–96
41	20.0	8.6	8.9	20–26	18–22	78–92
38	20.2	8.0	8.1	16	18–20	84–92
12	20.6	8.5	9.0	.....	.....	104–108
14	20.8	8.9	9.10	24–28	24–28	100–104

TABLE 2. Showing (a) correlation of size of shell and number of transverse rows of teeth in radulae of *G. livescens*, and (b) variation in size of median teeth in relation to position on radula.

Spec. No.	Length of shell in mm.	Number of transverse rows in				Width of individual teeth in μ		
		Total	Post. Undev.	Per- fect	Ant. worn	Post. Undev.	Per- fect	Ant. worn
47	5.8	88	15	53	20	40	44–50	40–44
46	12.3	68	15	35	18	..	50–54	48
43	12.5	97	14	63	20	70	74	76
42	16.1	104	10	79	15	80	84–88	90–92
40	19.6	107	18	56	33	..	84–88	96
41	20.0	112	15	80	17	78	84–88	90–92

TABLE 3. Showing variation in lengths and widths of central cusp in relation to position in the radula of *Goniobasis livescens*.

No. of Specimens	Region	Length in μ	Width in μ
47	Undeveloped	14	6
	Perfect	16	10
	Broken	12	8
45	Undeveloped	15	8
	Perfect	17	9
	Broken	6	10
43	Undeveloped	12	10
	Perfect	19	15
	Broken	12	17
42	Undeveloped	24	16
	Perfect	29	21
	Broken	16	20
37	Undeveloped	16	14
	Perfect	18–20	16–20
	Broken	16	20

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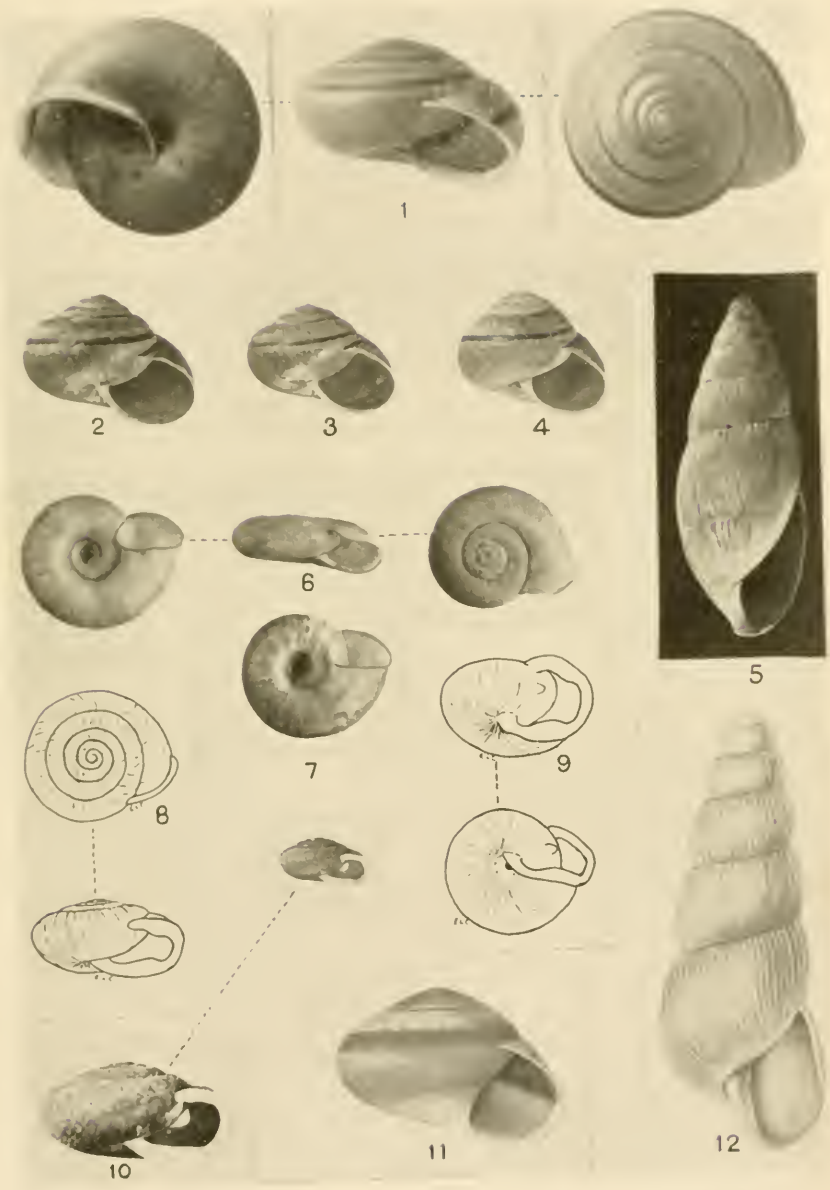
NEW CALIFORNIAN SNAILS

BY H. A. PILSBRY

A sending last June from Mr. Stanley C. Field of Los Angeles contained an apparently new race of *Helminthoglypta traskii* and a *Haplotrema* closely allied to one which had been recognized as new for some time, but not yet described.

HELMINTHOGLYPTA TRASKII FIELDI n. subsp. Pl. 5, figs. 2, 3, 4.

The shell is more elevated than *H. t. phlyctaena*, the height 74 to 77 percent of the diameter (in *phlyctaena* 60 to 66 percent); umbilicus smaller, about 2 mm. wide; post-nuclear whorls are not papillose; last 2½ whorls are spirally engraved with lines cutting the striae, strongly developed on the last whorl. Color cinnamon-brown, with a darker, chestnut-brown band broadly bordered on both sides with chamois. Peristome



1. Helminthoglypta benitoensis, Lowe. 2, 3, 4. H. traskii fieldi. 5. Englandina lowei Pils. 6. Haplotrema alameda. 7. H. a. fieldi. 8, 9, 10. Polygyra mullani tuckeri Pils. & Hend. 11. Helicina ouenensis Ckll, vol. 43:134. 12. Opeas micra mazatlanicum Pils.

No. 5, 8-10, 12, will be described in January NAUTILUS.

narrowly expanded, the columellar margin reflected.

Height 18 mm., diam. 24.5 mm., 6⅓ whorls.

Height 20.7 mm., diam. 26.3 mm., 6½ whorls.

Surf, Santa Barbara Co., California, under ice plants and sage on the beach. Cotypes 151516, collected by Stanley C. Field.

This seashore race appears to differ so much from the inland *phlyctaena* that it may usefully be ranked as a separate subspecies. Unfortunately the type locality of *phlyctaena* is indefinite. "40 miles north of Santa Barbara" would be a long distance inland.

HAPLOTREMA ALAMEDA, n. sp. Pl. 5, fig. 6.

The shell is discoidal, the upper surface nearly flat, base broadly umbilicate. Color, cartridge buff to marguerite yellow. Whorls about four, slowly increasing to the last, which is very wide. Sculpture of fine, close rib-striae, and in places some microscopic spiral impressed lines. The strongly oblique aperture is wide. Peristome slightly thickened, narrowly expanded outwardly and a little reflected basally, the upper margin curving downward moderately. Height 4 mm., diam. 11.1 mm. Paratypes from 10 to 11.5 mm. diam.

Niles Canyon, Alameda Co., California. Type and paratypes No. 82879 A.N.S.P. Coll. by Fred L. Button.

This is a miniature of *H. transfuga* Hemphill, of the San Diego region, and was formerly referred to that species in our collection. It is what Hemphill called "*simplicilabris* Ancey". It has from half a whorl to one whorl less than the southern species, and the sculpture is finer. It is also related to *H. keepi* Hemph. My attention was called again to this form by a series from the Giants' Forest, Sequoia National Park, received from Mr. Field, which seems to belong to the Alameda Co. species, but differs enough to require separation subspecifically. It may be called *Haplotrema alameda fieldi*, n. subsp. Pl. 5, fig. 7. Striation decidedly weaker than in *H. alameda*, and unevenly developed; umbilicus narrower within. Height 3.8 mm., diam. 10 mm. Paratypes 9.7 to 10.8 mm. diam.

NOTES AND NEWS

A CORRECTION.—Naut. 44, July, 1930, pl. 2, fig. 10, should read: *Thais floridana* Conr. This figure was included for comparison with fig. 11 which is the new variety, *Thais floridana haysae* Clench.

DR. RALPH B. STEWART, who has been working on Californian Cretaceous and Tertiary fossils at the Academy of Natural Sciences for several years, has been appointed an assistant geologist on the U. S. Geological Survey.

DR. WENDELL P. WOODRING, for the past few years on the staff of the California Institute of Technology, resumed full time service with the U. S. Geological Survey on July 1, 1930.

MR. CALVIN GOODRICH, taking advantage of the low water, has been collecting shells in Georgia and Alabama during August.

HELIX LIBERIAE A. D. Brown was described from Cape Palmas, Liberia, in Amer. Journ. Conch. I, 1865, p. 136. In the course of some recent comparisons I find that the type, No. 1088 A. N. S. Phila., is completely identical with *Holkeion anceps* (Gould), a well-known snail of Tenasserim and neighboring regions. There can be no doubt that Brown was misled by a false locality label, and did not think to compare with species of the Malay Peninsula. *H. anceps* was not contained otherwise in Brown's collection, now in the collection of the Academy of Natural Sciences.—E. G. VANATTA.

THE TYPE OF PARAHELIX.—*Parahelix* von Ihering, Zeitsch. Wiss. Zool., vol. 54, 1892, p. 492, was proposed as a provisional genus for haplogonous helices of unknown affiliation, preferably oxygnathous, such as *Sagda*, *Geotrochus*, *Lucerna* and their allies. The genera mentioned by von Ihering were known to him by the works of Binney, Semper and others. I select *Helix jayana* C. B. Ad. (Bland and Binney, Ann. Lyc. N. H. of N. Y., vol. 10, 1872, p. 219) as genotype of

Parahelix. The name becomes a synonym of *Sagda*.—PILSBRY.

SCHIZOTHAERUS NUTTALLII CAPAX GLD. NOT MAXIMA MIDD. —In a faunal list from a Pleistocene deposit in Puget Sound Henderson (U. of Colo. Studies, Vol. XVI, No. 1, 1927, p. 2) refers a rotund specimen of *S. nuttallii* to the variety *maxima* Midd. rather than to *capax* Gld. because of the dimensions in the descriptions of the latter. Unfortunately these dimensions are rather misleading. According to Carpenter (Smiths. Misc. Coll. 252, 1872, pages 11, 17) this species assumes both elongate and rotund varieties which completely intergrade. The rotund form must take the varietal name *capax* Gld., *maxima* Midd. (originally described as *Lutraria*) being preoccupied by *Lutraria maxima* Jonas 1844. Although giving no synonymy or discussion Oldroyd (Pub. Pug. Sd. Biol. Sta., Vol. 4, 1924, p. 61) recognized this, giving Middendorff's description to supplement the original of Gould.—DON L. FRIZZELL, Seattle, Wash.

LAMPSILIS RADIATA GMEL. IN AROOSTOOK COUNTY, MAINE. —On August 14, 1929, while travelling along the Molunkes stream in the southern part of Aroostook County, I stopped to examine the rocks. Looking toward the stream I noticed a number of cardinal flowers (*Lobelia cardinalis*) the first I had seen in Aroostook County. Going to the stream to pick some of the flowers I noticed some shells and to my surprise found my first specimen of *Lampsilis radiata*. After a careful search I found three young *L. radiata*, two *Anodonta fragilis* Lam. and a number of *Elliptio complanatus*. At the Town of Linneus is situated Meduxnekeag Lake (Drew Lake). On September 26, 1929, at the outlet of the lake and a short distance below in the Meduxnekeag stream I collected *Anodonta fragilis* common, *Alasmidonta undulata* two, *Elliptio complanatus* common, *Lampsilis radiata* ten, *Psidium variabile* two, *Campeloma decisa* many small shells, *Amnicola limosa* two, *Planorbis antrosus* of small size, *P. campanulatus* a small form, *Physa heterostropha* young. The Meduxnekeag

stream is a tributary of the St. Johns River at Woodstock, New Brunswick. The Molunkes stream is a tributary of the Mattawamkeag River and enters the Penobscot River at the town of Mattawamkeag. I have explored a large part of the head waters of the Penobscot River and many of the lakes of the East Branch of this river, but never found *L. radiata*, nor have I found *L. radiata* in any of the upper St. Johns River tributaries in Maine or New Brunswick.—OLOF O. NYLANDER.

A NOTE ON THE HABITAT OF VIVIPARUS SUBPURPUREUS (SAY).—This rather uncommon species was obtained at two localities on a collecting trip during September, 1927, the localities being the Tradewater River in western Kentucky and the Little Wabash River in southern Illinois.

For a *Viviparus*, their station generally in swift water is rather unusual. In the Tradewater River they were found on a small shoals clinging to stones, mostly underneath and in the dead shells of the larger Unionidae. At Carmi, Illinois, in the Little Wabash River, they were very abundant, occurring both exposed on the top and sides of stones as well as underneath. However, there was a decided preference for the more protected places under the large flat stones.

They gripped by suction very tenaciously to the stones and very seldom lost their hold when the stones were taken out of water. Say states (Am. Conch. III, 1831) that they probably hibernate in the valves of dead Unios, but this is, perhaps their station throughout the year as they seem to prefer solid objects to crawl over, rather than the muddy or sandy stations generally associated with other species in this genus. —W. J. CLENCH.

LIST OF SPECIES FROM THREE LOCALITIES IN SWITZERLAND. —This list is based on material collected by myself (July, 1929) in two localities in the canton of Schwyz, and one in the canton of Vaud. The first locality is Axenstein, and the following are the species listed therefrom.

Helix pomatia Linn. Several color forms.
Helix nemoralis Linn. One color form.
Helicogona lapicida (Linn.).
Hygromia incarnata Müll.
Hygromia hispida (Linn.).
Helicogona personata Drap.
Helicodonta obvoluta Müll.
Buliminus obscurus (Müll.)
Pirostoma rugosa Drap.
Vitrea cellaria Müll.
Pomatias septemspiralis maculata Drap.

Axenstein is at some elevation above Brunnen whose species are next listed. The latter locality is right on the shore of a branch of Lake Lucerne sometimes known as the Lake of Four Cantons. The specimens were taken in a field bordering on the lake.

Helix hortensis Müll. Several color forms.
Helix nemoralis Linn. Several color forms.
Helicogona arbustorum Linn.
Hygromia hispida (Linn.).
Vitrea cellaria (Müll.).

It can be seen that the number of species in this list is limited, the first four mentioned being very abundant in the quantity of individuals inhabiting the locality, the last two being quite rare. Those species which abound in Brunnen are scarce in Axenstein. The latter locality is composed of Tertiary (Miocene) deposits mixed with igneous rocks, and is inhabited mainly by species typical of the higher altitudes.

Montreux the third locality to be listed is located in Eastern Switzerland yields an interesting series of species. The list is as follows.

Helix nemoralis Linn. Color forms.
Helix aspersa Müll. Very abundant.
Helix pomatia Linn. Very abundant.
Helicogona lapicida (Linn.).
Eulota fruticum (Müll.). A species quite rare and localized.
Pomatias septemspiralis maculata Drap.
Cochlicopa lubrica (Müll.).
Buliminus obscurus Müll.
Pirostoma rugosa Drap.
Vitrea cellaria (Müll.).

—A. F. ARCHER.

PUBLICATIONS RECEIVED

ZOOLOGY OF COLORADO. By Theodore D. A. Cockerell. Published by the University of Colorado, Boulder, Colo. If zoology is ever to become popular as contributing to the culture and pleasure of our people it must be presented in an interesting and readable way. At present there has been little attempt to do this in America except in bird study. In this book of 262 pages Professor Cockerell has given a delightfully written account of the animals of Colorado. In the more numerous groups, such as insects, only the more prominent or interesting forms could of course be mentioned. Beginning with an interesting chapter on THE PAST, the following chapters take up Colorado mammals, birds, mollusks and the other phyla successively. It is illustrated with plates and figures in the text. As it is a book to be read, not a mere work of reference, such as most of us write, it will be found interesting far beyond the limits of Colorado.—H. A. P.

MOLLUSQUES TESTACÉS MARINS DE MADAGASCAR, par Ph. Dautzenberg. (Fauna del Colonies Françaises, III). No less than 909 species and numerous varieties are enumerated with their distribution and the most useful references, most of them being widely spread forms of the Indo-Pacific region. Four plates and a few text figures illustrate new or little known species.

CATALOGUE DES INVERTEBRES DE LA SUISSE, fasc. 18, Gastéropodes, par G. Mermod avec la collaboration de J. Piaget. Mus. d'Hist. Nat. Genève, 1930. This handsome volume of XII+583 pages is much more than a mere catalogue, as it gives descriptions, synonymy and very full locality records. It is thus a manual of the fauna. The 87 figures are all anatomical. The genera are defined, but without discussion of the nomenclature adopted.—H. A. P.

THE NAUTILUS.

Vol. XLIV JANUARY, 1931. No. 3

THE GENUS OREOHELIX IN CALIFORNIA

BY S. STILLMAN BERRY, REDLANDS, CALIFORNIA.

One of the strangest anomalies[1] in distribution encountered by the student of our western land snails is the occurrence on Santa Catalina Island off the coast of southern California of a species of the genus *Oreohelix*[2], a great genus characteristic of the Rocky Mountains and the scattered ranges of the Great Basin region. With all the wealth of forms brought to light beginning with the days of Hemphill, no other member of the genus has hitherto been shown to occur within the boundaries of this state or nearer than the Charleston Mountains in Nevada where *Oreohelix handi* Pilsbry & Ferriss was brought to light by the late James H. Ferriss a few years ago[3]. Many Californian students have felt that if *avalonensis* really belongs systematically where we at present rank it, some trace of the occurrence of the genus in one or more of the numerous mountain ranges occupying the wildnesses of the immense intermediate area, at present so wholly empty on our distribution maps, would sooner or later be discovered. There has been an avid search and on the part of many, especially in the San Bernardino and Cuyamaca Ranges, but only a general barrenness of

[1]Possessed of all the facts, we would of course find this to be no real anomaly at all, at least in any sense of the abnormal or unreasonable.

[2]*O. (Radiocentrum) avalonensis* Hemphill.

[3]*O. handi* belongs to the typical section of the genus. The case for the subgenus *Radiocentrum* is considerably worse, all known forms other than *avalonensis* being confined to the Chiricahua and Big Hatchet Mountains in southeastern Arizona and southwestern New Mexico.

result if we except an unconfirmed rumor of a snail of this general type somewhere in the Cuyamacas.

Prof. Edmund C. Jaeger and I have thought for some time that the surest way of bringing typical *Oreohelix* into the Californian fauna lay in exploration of some of the mountains near the Nevada line, among which the Clark Range, and more especially its culminating peak Clark Mountain, which rises to an altitude of better than 7,900 feet in northeastern San Bernardino County, both by reason of its elevation and the occurrence of similar limestone exposures and associated plant formations similar to those known to exist in established *Oreohelix* country in the Charleston Mountains to the northward in Nevada, appeared to offer the most promise.

After having made other visits to the region without notable result, Prof. Jaeger has come back from his last one with a nice series of specimens, including both living animals and empty shells, which are *Oreohelix* indeed. They were taken (4 Oct., 1930) in large limestone slides among fir needles and rock fragments near the head of the gulch on the west slope of the main peak (Clark Mountain) and prove to represent a race closely allied to *O. handi* of the Charlestons which is being dealt with more fully in another connection as a new Californian species. Occurring in association with the *Oreohelix* were found a few dead shells of *Succinea avara* Say and two immature specimens of a *Vallonia* which appears to be *V. cyclophorella* Ancey.

Back of Redlands, where I write this, looms Mount San Gorgonio, highest elevation of land in southern California. Standing on the summit of this great massif, one's view in clear weather extends on the westward down the great valley of southern California to the waters of the Pacific and on to the blue mass of Santa Catalina Island, itself a mountain range of no mean dimensions and the one maritime seat of *Oreohelix*. One turns to the northeast where loom the mountains of the Nevada boundary and the Charlestons,—more *Oreohelix* country. Over on the eastern horizon beyond the Colorado River are visible some of the

Oreohelix-inhabited ranges of northern Arizona. All in between, and around and about one, tumble and roll in range upon range, a sea of mountains incalculable, and from none of them is any member of the genus as yet known. On most of them there seems doubtless little chance of its occurring, but on some of them it may. So although we have at last definitely established *Oreohelix* over on the California side of the line, there remain the greater problem of its further distribution and the possible occurrence of additional species, steps toward the elucidation of which we may hope will soon be taken.

A NEW LYMNAEID FROM IDAHO

BY JUNIUS HENDERSON

LYMNAEA IDAHOENSIS, new species. Plate 6, Figs. 8.

Shell rather small, globose, spire somewhat dome-shaped. Whorls about 4, the last constituting a very large part of the whole shell, the penultimate one usually much swollen, the others very small and inconspicuous, but little or not at all elevated above the succeeding whorl. Suture well impressed. Aperture more than half the length of the entire shell, widest below the middle. Peristome thin, not thickened by internal callus in any specimen at hand, gracefully curved above, somewhat more abruptly curved below. Columella forming a heavy, twisted plait, with thin callus reflected and closely appressed over the umbilicus. Without a lens the surface looks smooth and dull, but a good lens reveals crowded, wavy growth lines, crossed by faint spiral lines, with small malleations on some specimens. Color medium brown. Type specimen, in University of Colorado Museum: Altitude 17, diameter 11.5, height within aperture 8.5, width within aperture about 6 mm. Another example: Alt. 15.5, diam. 11, height within aperture 8.5 mm. In a large lot examined there is but little variation, chiefly in the elevation of the spire, as shown by the figures, and in the

prominence of the spiral sculpture, which is almost obsolete on some examples.

From the material figured as *apicina* and *solida* Lea in Baker's Lymnaeidae of North and Middle America, *idahoensis* differs markedly in form and in the swollen penultimate whorl. It bears little resemblance to Lea's original figures of those two species, which were both described from the same locality, near the mouth of the Willamette River in Oregon. Indeed, it may be that *solida* is not distinct from *apicina*. *L. binneyi* Tryon, which has been found not a great distance to the eastward, has a very different spire and differs in other respects.

Type locality of *idahoensis*, Little Salmon River, 16 miles north of New Meadows, Idaho, where it was abundant on rocks in a mountain stream, on July 31, 1930, all alive. Specimens were sent to Dr. F. C. Baker and Dr. H. A. Pilsbry, both of whom confirmed my belief that it was an undescribed species. We found no dead shells, and none of the live ones had the thickened peristome indicative of maturity in limnaeids. This is a common occurrence in Rocky Mountain limnaeids, and raised two inquiries, the answer to which I have not discovered. 1. What becomes of the shells of the snails which die? Our mountain streams are not usually sufficiently charged with acid to rapidly destroy the shells, which, even in slough water rendered highly acidulous by decomposition of vegetation, resist destruction for some time. Perhaps in some cases they are destroyed by attrition in swift water, but the absence of empty shells has been observed in quiet portions of streams where living specimens with their peristomes unthickened were abundant. In the present instance, possibly the empty shells, being lighter after the soft anatomy disappears, are swept away down stream. 2. Is it possible, as has been suggested by others, that under some circumstances certain species of limnaeids reach adult size and reproduce without thickening the aperture, though the same species under other conditions may thicken it? May one not also suspect that the short, dome-shaped spire of *L. idahoensis* is a distinct ad-

vantage in a swift stream, where a long, slender spire would be easily broken off? I am not yet certain as to which subgeneric group this species should be assigned.

VARIATION IN CARINIFEX NEWBERRYI (LEA) AND LYMNAEA UTAHENSIS (CALL).

BY JUNIUS HENDERSON

Carinifex newberryi (Lea) was originally described as a *Planorbis*. Later the genus *Carinifex* was created to accommodate it, because of obvious differences in shell characters. Dr. Henry A. Pilsbry has recently written me that he has dissected *Carinifex* and found that the anatomy is the same as that of *Helisoma*. Consequently Carinifex should be reduced to subgeneric rank. As the tendency is to raise the old subgenera of *Planorbis*, such as *Helisoma*, *Menetus*, and *Gyraulus*, to generic rank, because of both shell and anatomical characters, probably hereafter the practice will be to write *Helisoma (Carinifex) newberryi*.

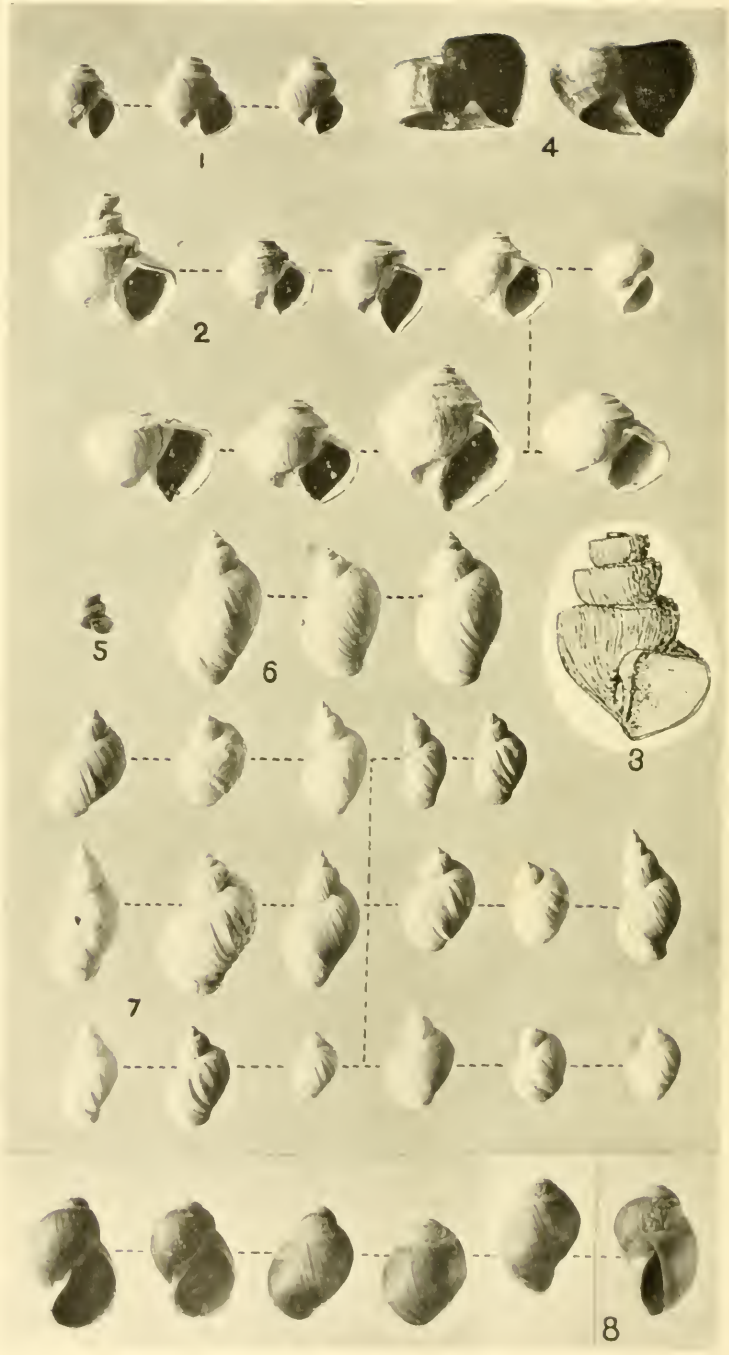
This has long been known as a very protean species, but conchologists have not been inclined to establish varietal names, as the variations are very numerous and intergrade thoroughly. If one begins naming them it is difficult to see where any lines may be satisfactorily drawn. It is doubtful whether the variations can be properly called even mutations. The variation is chiefly in the amount of elevation of the spire above the last whorl and a marked tendency toward scalariformity, with inevitable effect upon the general shape of the shell, and upon the width of the last whorl and of the umbilicus. The variation is so great and the gradation so minute that it is almost impossible to determine just what should be considered the normal form.

Chamberlin and Jones (The Mollusca of Utah, Bull. Univ. Utah, XIX, No. 4, p. 156, fig. 73, 1929) have recently described as a distinct species a remarkably scalariform specimen from Bear Lake, Utah, under the name *Carinifex ato-*

pus. After studying the description and figures, and examining the windrows of *C. newberryi* piled up on the shores of the lake at the type locality of *atopus* and at other places, about 15,000 specimens of which were brought to the laboratory for more careful examination, I feel quite certain that *atopus* is a freak, not a distinct species. The distinguishing characters given in the description are all just what should be expected in an extremely scalariform specimen of *newberryi*. Of course, those naturalists who believe that a name should be given to every deviation from the normal form of a species, will approve such a course in this instance, in which case there should be several other varietal names proposed, but I fail to see that it would serve any scientific purpose.

On Plate 6 there are several photographic figures, of approximately natural size, of *newberryi* from Bear Lake—3 specimens (Fig. 1) being in The Academy of Natural Sciences of Philadelphia and 9 specimens (Fig. 2) being in the University of Colorado Museum, together with a photographic copy of the original very much enlarged figure of *atopus*, for the purpose of comparison. Note especially the left-hand figure in the upper line of Fig. 2, a remarkable specimen from the exact type locality of *atopus*, near the camp ground north of Garden City. Scalariformity is not an extremely rare occurrence. Some examples of *Fluminicola* in Bear Lake show a decided tendency in this direction, and Fig. 5, of the plate, exhibits a fine scalariform example of *Menetus planulatus* Cooper, from west of The Dalles, Oregon. Scalariform specimens of many species of various genera have been described and figured, some of which have received names and recognition as distinct species, only to be afterwards relegated to synonymy.

At Bear Lake, as well as at Utah Lake, variation in the relative elevation of the spire is very marked also in *Lymnaea (Galba) utahensis* (Call), as shown in the same plate, Fig. 6 (Utah Lake) and Fig. 7 (Bear Lake). This species varies greatly also in the prominence of the transverse ribs. These *Carinifex* and *Lymnaea* shells all appear to be fossil.



J. Henderson: Carinifex and Lymnaea.

They have not been found alive in Bear Lake and only a few, many years ago, in Utah Lake. It has been heretofore suggested that the variable ribbing of *L. utahensis* was the result of salinity of the water or other unfavorable conditions during a former period in the lake's history. May not the variation in the elevation of the spire of both species be due to some such cause? A fact of some interest in this connection is that *C. ponsonbyi* Smith (same plate, Fig. 4), now living in upper Klamath Lake, Oregon, where there is no reason to suspect salinity, is not so variable. In the 50 specimens in the University of Colorado the variation is very slight, but the left-hand Fig. 4, of a specimen in the Academy of Natural Sciences of Philadelphia, collected in 1929 by Dr. H. Burrington Baker, has the apex sunken below the top of the last whorl by the twisting of the axis during growth, thus forming a shallow, flat-bottomed "crater."

EXPLANATION OF PLATE 6

FIG. 1. *Helisoma (Carinifex) newberryi* Lea. Three somewhat scalariform examples in Acad. Nat. Sci. Phila. Bear Lake, Utah.

FIG. 2. *H. (C.) newberryi.* Nine examples in Univ. Colo. Museum, showing variation in elevation of spire. Bear Lake, Utah-Idaho.

FIG. 3. *Carinifex atopus* Cham. and Jones. Copy of original figure of the unique type specimen. Bear Lake, Utah.

FIG. 4. *H. (C.) ponsonbyi* E. A. Smith. I (right) normal example, l (left) with depressed spire, in Acad. Nat. Sci. Phila., the right-hand specimen now donated to Univ. Colo. Mus. Upper Klamath Lake, Oregon.

FIG. 5. *Menetus planulatus* Cooper. A scalariform example in Univ. Colo. Museum. West of The Dalles. Oregon.

FIG. 6. *Lymnaea (Galba) utahensis* (Call). Three specimens showing variation, in Univ. Colo. Museum. Provo, Utah Lake, Utah.

FIG. 7. *Lymnaea utahensis.* Seventeen specimens showing variation in shape and sculpture, in Univ. Colo. Museum. Bear Lake, Utah-Idaho.

CAMPTOCERAS (CULMENELLA) PRASHADI NOM. NOV.

BY WILLIAM J. CLENCH

At the suggestion of Dr. Bryant Walker, I published a description of a new subgenus and species, *Culmenella hirasei*, considering it as a subgenus under Bulinus. (Naut. 40, 1927, p. 121.) Dr. Prashad has kindly called my attention to the resemblance of this species to certain species of *Camptoceras*. The genus *Camptoceras* contains two rather strikingly different groups, namely, the long, rather loosely coiled forms and the lower spired, more compact forms. It is to the latter group that my Japanese species belongs. Inasmuch as the name *hirasei* has been used in *Camptoceras*, my name will have to be changed. *Culmenella* will now be placed under *Camptoceras* as a subgenus to contain the short compact forms. The following is the bibliographic summary.

CAMPTOCERAS Benson, 1843, *s.s.*

Type: *C. terebra* Benson.

1843 *C. terebra* Benson, Calcutta Journ. Nat. Hist., 3, p. 465. Moradabad, Rohilkhund, India.

1871 *C. austeni* Blanford, Jour. Asiat Soc. Bengal 40, p. 40, pl. 2, fig. 2. Nazirpur, Mymensing, Dacca, India.

1919 *C. hirasei* Walker, Occ. Pap. Mus. of Zool. Uni. of Michigan no. 64, p. 1, pl. 1, figs. 1-5. Near Osaka, Prov. Kawachi, Japan.

Subgenus CULMENELLA Clench, 1927.

Type: *C. hirasei* Clench (=prashadi Cl.).

1871 *Camptoceras lineatum* Blanford, Jour. Asiat. Soc. Bengal, 40, p. 40, pl. 2, fig. 3. Nazirpur, Mymensing, Dacca, India.

1920 *Camptoceras subspinosum* Annan. & Prash., Jour. & Proc. Asiat. Soc. Bengal, n. s. 16, p. 28, fig. 1-2. Between Khanabal and Islamabad, Kashmir, India.

1931 *Camptoceras prashadi* Clench. New name for *Bulinus (Culmenella) hirasei* Clench, 1927, Naut. 40, p. 121, fig. 1. Prov. of Kawachi, Japan. *Non Camptoceras hirasei* Walker, 1919.

LAND SHELLS COLLECTED BY MR. H. N. LOWE IN WESTERN MEXICO

BY H. A. PILSBRY, WITH NOTES BY H. N. LOWE

In the course of a collecting journey early in last year, the following land shells were found by Mr. Lowe:

Averellia (Trichodiscina) coactiliata Fér. Quite rare; found with *Polygyra paucicostata* and the two species of *Euglandina* under outcroppings of rock on the eastern side of Maria Madre Is., Tres Marias. The location is rather interesting being at the point where the cactus and desert vegetation of the coastal area blends with the tropical forests of the mountains. Orchids and trailing cactus on the same trees. Giant Adiantum (maidenhair ferns) five ft. in height in company with several species of tree cacti. This place is far northwest of any former record for the genus.

Polygyra richardsoni v. Martens. Isla del Faro, Mazatlan, under dead leaves on trail to the summit.

Polygyra paucicostata "Pilsbry" Dall. Maria Madre, Tres Marias.

When identifying land shells with the aid of our collection some years ago Dr. Dall found specimens labelled "*P. richardsoni paucicostata* Pilsbry" which matched some he had, and he used that name in his paper. The name had not yet been published by me, so that it will date from his publication in Proc. Cal. Acad. Sci., Vol. 15, 1926, p. 476, pl. 36, figs. 3, 4, 5. It must be admitted that the account there given leaves much to be desired, and in such a difficult group of Polygyras nobody could identify by it, but the good photographic figures of his plate, supplied by Dr. Hanna, make the form recognizable. Lowe found it rather plentiful, under stones.

Polygyra behri Gabb. Topolobampo, under rocks in company with *Bulimulus baileyi*, along the eastern shore of the bay near the town. Living specimens quite rare and required considerable digging. Dead shells common.

Bulimulus baileyi Dall, in company with the above spe-

cies at Topolobampo. Living examples not so rare. At Guaymas they were taken in very small numbers by digging in rock slides on north slopes in the valley east of the mountains back of town, about three miles east of Guaymas.

Drymaeus trimarianus (v. Martens). Maria Madre, Tres Marias Is., rare; only two living ones found.

Oxystyla boucardi (Pfr.). San Geronimo, Oaxaca. Found in fair numbers aestivating on the trunks of trees on a small hill two miles west of the town. This is only about ten miles from the city of Tehuantepec, the type locality.

Oxystyla melanocheilus (?) Maria Madre, Manzanillo, and Acapulco. After hours of diligent search not a living example was found at any of the three places. This being the dry season (February, March and April), they were certainly not aestivating on the trees like the preceding species, and from what the natives told me I presume they burrow in the loose soil during the dry season. On the Tres Marias, the parrots evidently feed on them from the number of shells found with spire broken out. Those found at Manzanillo and Acapulco while scarce were not broken.

Within a radius of five miles of Mazatlan I did not find even a broken shell. They must be entirely extinct at present, or perhaps those reported in earlier records were brought from the mountains many miles east of the city.

OPEAS MICRA MAZATLANICA n. subsp. Pl. 5, fig. 12.

Under stones in the trail to the summit, Isla del Faro, Mazatlan, Type No. 151314 ANSP., collected by H. N. Lowe, January, 1930.

A peculiar form with strong and very regular costulation, the riblets thread-like.

Opeas micra is often rather strongly ribbed, but the ribbing is irregular on the later whorls, more widely spaced than in this form. The eight specimens sent agree in sculpture.

Leptinaria sp. undet. Isla del Faro, Mazatlan. A single immature specimen.

Euglandina mazatlanica (von Martens)

Glandina mazatlanica von Martens, 1891, Biologia Centrali-Americana, Mollusca, p. 65, pl. 4. figs. 2, 2a, and var. *abbreviata*, f. 3. Mazatlan and Tres Marias Is.

Euglandina mariana Dall, 1926. Proc. Cal. Acad. Sci (4) vol. 15, No. 15, p. 470, pl. 34, fig. 4. Maria Madre and Maria Magdalena, Tres Marias Is.

Maria Madre, under rocks with *Polygyra paucicostata* (Lowe). The specimens vary in shape from typical to the shorter form of "var." *abbreviata*.

I am unable to see any difference between *mazatlanica* and *mariana*. Dall apparently did not compare his specimens with von Martens' earlier account, or at least, he did not mention it.

EUGLANDINA LOWEI new species. Pl. 5, fig. 5.

Maria Madre Island, Tres Marias, under rocks with preceding species. Type No. 151320 ANSP., collected by H. N. Lowe, March, 1930.

The shell is oblong-fusiform, cinnamon-buff colored, with long, turrited spire having slightly convex outlines. Apex obtuse, the first three whorls smooth, axial striation then beginning, the striae somewhat unequal, recurved and decidedly stronger below the suture; on the fifth whorl engraved spiral lines appear. The last whorl has unequal striae, strong at the suture, and many spiral lines; below the periphery both striae and spirals weaken. The whorls are rather weakly convex. The suture is weakly, irregularly crenulate. The aperture is small, less than half the length of the shell; outer lip sharp, regularly curved; columella short, concave, abruptly truncate.

Length 46 mm., diam. 17.8 mm., length aperture 21.7 mm.; 8 whorls.

Length 32.7 mm., diam. 13 mm., length aperture 17.3 mm.; 7 whorls (immature paratype).

In Proceedings Acad. Nat. Sci. Phila. for 1925, p. 307, I have enumerated the Euglandinae of western Mexico. There would seem to be enough of them, but the present form ap-

pears quite distinct from all. The long spire of numerous whorls, combined with distinct subsutural beading and spiral impressed lines, are its more prominent features. In a dorsal view the spire and last whorl are about equal in length. *E. turris* Pfr. differs by the shape of the aperture, widened below, and the different sculpture.

CENTRAL AMERICAN PACHYCHILUS AND POLYMESODA

BY H. A. PILSBRY

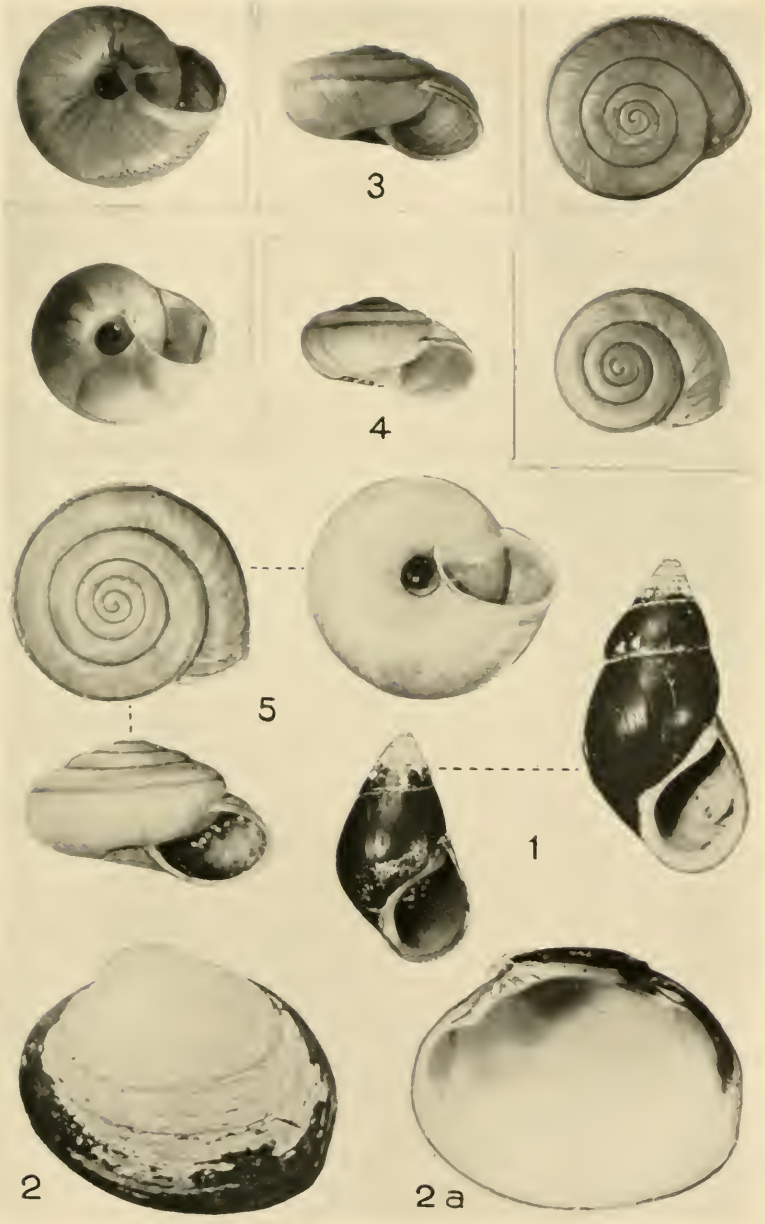
In 1899 Mr. Silas L. Schumo, a member of the Academy of Natural Sciences of Philadelphia who was interested in natural history, visited Guatemala to look after certain business interests. In several places he collected shells which were given to me on his return. One lot from Chamá was determined to be a new species, but by oversight was put into the collection before description. My attention was called to it again in the course of determining Pachychili from Honduras recently collected by Mr. J. A. G. Rehn (*P. oerstedi*, from Lancetilla). So far as I can learn, the species has not been noticed by anyone in the meantime.

PACHYCHILUS SCHUMOI, new species. Pl. 7. fig. 1.

The shell is oblong-conic, solid, covered with a smooth brownish black periostracum. The short spire is eroded above. Whorls are rather weakly convex. The sculpture consists of weak, irregular wrinkles of growth and microscopic spiral striae which are seen under a high power to be lines of weak granules. The broad, ovate aperture is broadly rounded below, acute above, subvertical, bluish white within. Columella is rather thick. Parietal callus moderate, thickened into a callous pad near the posterior commissure.

Length 39.3 mm., diam. 20.5 mm.; five whorls remaining.

Guatemala: Rio Negro (a head stream of the Rio Usumacinta) at Chamá. Type and three paratypes No. 76231 ANSP., collected by S. L. Shumo.



1. Pachychilus schumoi. 2, 2a. Polymesoda zeteki.
3. Helminthoglypta greggi Willett. 4. Micrarionta hutsoni amboiana Willett. 5. Helminthoglypta graniticola arida Pils. & Field (diam. 15.5 mm.)

It is more shortly conic than *P. pannucula mexicanus* (Rve.) or *P. p. tumidus* (Tristr.), with a thick, callous parietal pad in the posterior angle of the aperture, wanting in those forms. The spire is shorter, the whorls more convex and the minute sculpture better developed than *P. corvinus* (Morel.), of which I have seen great quantities. *P. Corvinus* is like the new form in having a callus in the aperture.

POLYMESODA ZETEKI new species. Pl. 7, fig. 2, 2a.

Near Chamá, Panama. Type and paratypes No. 130409 ANSP., others in coll. James Zetek (No. 2431), who collected the specimens.

The shell is oval, moderately solid, strongly inequilateral, the beaks at the anterior third of the length; moderately convex, posterior ridge indistinct. Upper and lower margins rather weakly convex, anterior end rounded, posterior wider and less convex, weakly subtruncate. Beaks small and low. Periostracum dull, dingy, buffy brown to olive-brown, minutely, densely lamellose-scaly, retained only on the lower half or third of the valves. Sculpture of fine weak, irregularly spaced wrinkles of growth, with a few more distinct grooves marking growth rests. Color: The exterior where wanting periostracum is white, the interior white with a light tyrian blue ray from under the beaks to the posterior end, and a plum purple stripe at the end. The hinge is rather weak. Median and posterior cardinal teeth bifid, Lateral teeth short, the anterior laterals near the cardinals, posterior laterals remote, partly purplish.

Length 43 mm., height 31 mm., diam. 24.3 mm. Type.

Length 39.6 mm., height 30.5 mm., diam. 20.5 mm.

This form is chiefly notable for its anterior beaks, which are very small and low. It appears nearly related to *P. zulia* H. B. Baker from Maracaibo, but that species is not so wide posteriorly, and though smaller has decidedly larger, more developed beaks, among other differences. *P. mexicana* (B. & S.) seems also to be related, but it also has prominent beaks, as in *P. zulia*.

NOTES ON THE OCCURRENCE OF MICRARIONTA KELLETTII (FORBES) ON THE CALIFORNIAN MAINLAND NEAR SAN PEDRO

BY STANLEY C. FIELD

Large numbers of dead shells of this S. Catalina Island snail are scattered over the terrain, among cacti growing in clumps, all along the sea cliffs from Point Firmin to Portugese Point and beyond. It is my belief that in early days the living colonies existed there, and were probably destroyed by fires. In March, 1929, I found a colony living in a large grove of cactus at Portugese Point. This grove has now been cleared away in laying out an estate.

When I returned from my Catalina Island collecting trip, having found *Micrarionta gabbi, ruficincta, etc.,* I made a careful search all along the Palos Verde district, to see if any of these other species had been colonized on the mainland, but though I covered ten miles or so closely, not a trace of the other island species was seen, living or dead. On the north side of Portugese Point I found another dense thicket of cactus, with many *M. kellettii* under the roots, together with two or three *Helminthoglypta traskii.* I told Mr. E. P. Chace about this colony, and he has written me that it covers probably about two acres. He intends to scatter some in various other places so that local collectors will not clean them out.

[Possibly the colony at Portugese Point was started by someone who brought over cacti to plant there, though it must be admitted that it would be like carrying coals to Newcastle. On Santa Catalina Island *M. kellettii* is found on *Opuntia* throughout the island, and in some places is extremely abundant. Perhaps some Californian collector can tell whether there are any early collections or records of collecting in the district around Portuguese Point, and whether the species was there when the first collecting was done.]—H.A.P.

RED CEDAR RIVER COLLECTIONS (IOWA)

BY DAVID T. JONES, MARIETTA COLLEGE, MARIETTA, OHIO

The following list is of mollusks collected in the vicinity of Vinton, Iowa, during July and August 1930, from the Red Cedar River, its tributaries, and the wooded banks of the same. It supplements and extends the range of the list published in The Nautilus of April 1930 (Vol. XLIII, No. 4). The *Strobilops labyrinthica* of that list should be *Strobilops labyrinthica virgo* Pilsbry. Its habitat at West Bluffs has been all but destroyed by the building of a new road. This summer's work has also proven that the boundaries of the colony of *Hendersonia occulta* at East Bluffs were not as circumscribed as they first appeared. Both living and subfossil specimens were taken quite plentifully at several points. The range of the former list was within a radius of approximately five miles of Vinton, whereas this list ranges from Vinton some forty miles northward. Records already in the previous list are not repeated, though many such were duplicated this season. No mussels were reported in the previous article. Old names of mussels reported herein are given after the preferred names for the convenience of collectors that have learned the older terminology. I am under obligations to Prof. H. R. Eggleston of Marietta College for helping with the identification of the mussels, and locally to Stanley Peterson, Russell Burkhart, and Oscar J. Workman for aid in collecting snails and mussels.

Polygyra hirsuta (Say). East Bluffs and Stony Cut near Vinton, Dry Run and Evangelical Camp Grounds near Cedar Falls.

Polygyra monodon (Rackett). Black Hawk Creek near Waterloo.

Polygyra fraterna (Say). Dry Run near Cedar Falls.

Polygyra multilineata (Say). Dry Run near Cedar Falls—var *rubra* Witter-common.

Polygyra profunda (Say). Cedar River below dam at Cedar Falls—drift material.

Strobilops l. virgo (Pilsbry). West Bluffs and East Bluffs near Vinton.

Gastrocopta armifera (Say). East Bluffs near Vinton.

Gastrocopta contracta (Say). East Bluffs near Vinton.

Retinella hammonis (Ström). Dry Run and Evangelical Camp Grounds near Cedar Falls.

Glyphyalinia indentata (Say). East Bluffs near Vinton; Black Hawk Creek near Waterloo.

Zonitoides arboreus (Say). East Bluffs and Stony Cut near Vinton.

Agriolimax agrestis (L.) East Bluffs near Vinton.

Agriolimax campestris (Binney). Dry Run near Cedar Falls; Black Hawk Creek near Waterloo.

Anguispira alternata (Say). Dry Run and Evangelical Camp Grounds near Cedar Falls.

Gonyodiscus cronkhitei anthonyi (Pilsbry). Dry Run and Evangelical Camp Grounds near Cedar Falls; Stony Cut near Vinton; Black Hawk Creek near Waterloo.

Succinea avara (Say). Below dam at Cedar Falls, Big Creek at La Porte City; Black Hawk Creek at Waterloo.

Succinea ovalis (Say). Dry Run and Evangelical Camp Grounds near Cedar Falls; Stony Cut near Vinton.

Succinea retusa (Lea). East Bluffs near Vinton; Dry Run, Cedar River below dam, and Evangelical Camp Grounds near Cedar Falls; Black Hawk Creek near Waterloo.

Stagnicola caperata (Say). Dry Run and Evangelical Camp Grounds near Cedar Falls.

Fossaria modicella rustica (Lea). East Bluffs near Vinton; Dry Run near Cedar Falls.

Fossaria parva (Lea). Cedar River at Stony Cut near Vinton.

Gyraulus parvus (Say). Dry Run near Cedar Falls.

Helisoma trivolvis (Say). Cedar River below dam and Dry Run near Cedar Falls; Black Hawk Creek near Waterloo; Cedar River at Stony Cut near Vinton.

Planorbula crassilabris (Walker). Dry Run and Evangelical Camp Ground near Cedar Falls; Black Hawk Creek near Waterloo.

Physa gyrina (Say). Cedar River below dam, Dry Run, and Evangelical Camp Grounds near Cedar Falls; Cedar River at Stony Cut near Vinton; Black Hawk Creek near Waterloo.

Physa integra (Hald). Cedar River below dam at Cedar Falls; Cedar River at Stony Cut near Vinton.

Physa michiganensis (Clench). Dry Run and Evangelical Camp Grounds near Cedar Falls.

Ferrissia tarda (Say). Cedar River below dam at Cedar Falls.

Campeloma decisum (Say). Cedar River below dam at Cedar Falls (with embryonic shells); mouth of Mud Creek near Vinton.

Somatogyrus integer (Say). Cedar River below dam at Cedar Falls.

Pomatiopsis cincinnatiensis (Lea). Dry Run and Evangelical Camp Grounds near Cedar Falls.

Pomatiopsis lapidaria (Say). Cedar River below dam, Dry Run, and Evangelical Camp Grounds near Cedar Falls.

Pleurocera acuta Raf. Cedar River near mouth of Mud Creek and Cedar River at Stony Cut near Vinton (drift material); rapids below dam at Cedar Falls (living).

Quadrula pustulosa (Lea). Cedar River at East Bluffs and Stony Cut near Vinton; also Cedar River at Vinton.

Quadrula quadrula (Raf.) =*Quadrula lachrymosa* (Lea). Two doubtful, immature specimens from Cedar River at Stony Cut near Vinton.

Amblema peruviana (Lam.) = *Quadrula plicata* (Say). Cedar River at East Bluffs and Cedar River at Stony Cut near Vinton; Black Hawk Creek near Waterloo; Big Creek at La Porte City; below dam in Cedar River at Cedar Falls.

Fusconaia flava (Raf.) =*Quadrula rubiginosa* (Lea.) Cedar River at Stony Cut and East Bluffs near Vinton; also at Vinton.

Fusconaia ebenus (Lea).=*Quadrula ebena* Lea. Cedar River at Stony Cut near Vinton.

Strophitus rugosus (Swainson) =*Strophitus edentulus* (Say). Cedar River at Vinton.

Anodonta grandis Say. Black Hawk Creek near Waterloo; Cedar River below dam at Cedar Falls; Big Creek at La Porte City; Goarcke's Lake at Vinton; Cedar River at Stony Cut near Vinton.

Lasmigona complanata (Barnes)=*Symphynota complanata* (Barnes). Cedar River at East Bluffs near Vinton; Cedar River at Stony Cut near Vinton (two juveniles); Cedar River at Cedar Falls.

Lasmigona costata (Raf.)=*Symphynota costata* (Raf.). Cedar River below dam at Cedar Falls; Cedar River at Stony Cut near Vinton.

Proptera alata (Say)=*Lampsilis alata* (Say). Cedar River at East Bluffs, one fine large specimen 18.5x13.0x7.4 cm.

Actinonaias carinata (Barnes) =*Lampsilis ligamentina* (Lam.) Cedar River at East Bluffs and Stony Cut near Vinton; Cedar River below dam at Cedar Falls; Big Creek at La Porte City.

Carunculina parva (Barnes) =*Lampsilis parva* (Barnes). Cedar River below dam at Cedar Falls—one perfect valve.

Ligumia recta latissima (Raf.)=*Lampsilis recta* (Lam.) Cedar River at East Bluffs near Vinton—shells with both white and pink nacre.

Lampsilis siliquoidea (Barnes)=*Lampsilis luteola* (Lam.) Big Creek at La Porte City, male and female; Black Hawk Creek near Waterloo, male; Cedar River below dam at Cedar Falls, male; Cedar River at Stony Cut near Vinton, male.

Lampsilis ventricosa (Barnes). Black Hawk Creek near Waterloo; Cedar River below dam, and Dry Run at Cedar Falls; Cedar River at Vinton; Cedar River at East Bluffs and Cedar River at Stony Cut near Vinton. By far the most common form in the Red Cedar Valley.

Sphaerium rhomboideum (Say). Cedar River below dam at Cedar Falls.

Sphaerium simile (Say). Cedar River below dam at Cedar Falls.

Sphaerium solidulum (Prime). Cedar River below dam at Cedar Falls.

Sphaerium striatinum (Lam.) Dry Run and Cedar River below dam at Cedar Falls; Big Creek at La Porte City; East Bluffs near Vinton.
Pisidium abditum (Hald.) Stony Cut near Vinton.
Pisidium variabile (Prime). East Bluffs near Vinton, Iowa.

A PLEISTOCENE MOLLUSCAN FAUNA FROM NEAR GOLETA, SANTA BARBARA COUNTY, CALIFORNIA

BY I. S. OLDROYD AND U. S. GRANT IV

The fauna considered in this paper was obtained from a fossiliferous stratum exposed in the embankment back of the beach about a mile and a half west of Goleta Point and four miles west-southwest of the town of Goleta, Santa Barbara County, California.

The fossils ocurred abundantly in a very fine-grained unconsolidated sand of a bluish gray color, stained in some places a yellowish brown due to iron rust. The stratum is only three or four feet thick and dips at a very small angle toward the west. It overlies unconformably a bluish gray clay shale and is overlain by sand and soil which covers the low terrace.

The underlying clay shale was only briefly examined but appeared to be nearly devoid of fossils, only a non-diagnostic *Cryptomya* being seen in the short time devoted to its examination. Lithologically, this underlying sediment much resembles some of the Pico clay shale, of Pliocene age, which occurs in the foothills some miles to the east of the town of Ventura. Alternate swelling and shrinking of the shale on the face of the bank, due to variation in moisture content, has caused flaking off of irregular pieces with curved surfaces.

The fossils are concentrated in the lower part of the sandy stratum overlying the clay shale. Many individuals of *Pholadidea californica* are still in the holes in the clay shale in which they lived, and other mud-loving fragile species could not have been transported very far. A noticeable feature of the collections we have examined is the excellent preservation of

those species which prefer a silty or muddy habitat, such as *Cryptomya californica, Platyodon cancellatus,* etc. On the other hand, the specimens which are distorted due to growth among the rocks show evidence of erosion due to transportation.

We are indebted to Mr. Ralph Hoffman, Director of the Santa Barbara Museum of Natural History, for calling our attention to this fossiliferous deposit, and to Mr. David Rogers, ethnologist of that institution, who has made collections of fossils which were studied by us. Mr. A. M. Strong, conchologist of Los Angeles and Balboa, kindly assisted in comparing some of the small gastropods.

Cardita subquadrata Carpenter. One valve.
Cardium corbis Martyn. A few imperfect specimens.
Cardium quadregenarum Conrad. Six broken valves.
Cryptomya californica Conrad. Common.
Cumingia lamellosa Sowerby. Rare; two valves.
Macoma balthica Linnaeus. Two valves.
Macoma incongrua von Martens. Common.
Macoma inquinata Deshayes. Seven valves.
Macoma nasuta Conrad. Very abundant.
Macoma yoldiformis Carpenter. Four valves.
Macoma sp. One valve; small.
Nuculana taphria Dall. Not common.
Panope generosa Gould. Few valves.
Paphia staminea Conrad. Common.
Paphia staminea ruderata Deshayes. A few valves.
Parapholas californica Conrad. Common.
Phacoides nuttallii Conrad. Rare.
Platyodon cancellatus Conrad. Common.
Saxicava arctica Linnaeus. Three valves.
Saxidomus giganteus Deshayes. Several good pairs of valves.
Saxidomus nuttallii Conrad. Not common.
Schizothaerus nuttallii Conrad. Several specimens.
Solen sicarius Gould. A few valves.
Spisula catilliformis Conrad. Several valves.
Tellina bodegensis Hinds. One valve.
Tellina buttoni Dall. Several valves.

Tellina carpenteri Dall. Several valves.
Venerupis lamellifera Conrad. One valve.
Acmaea instabilis Gould. One specimen.
Acmaea insessa Hinds. One specimen.
Acteocina culcitella Gould. One specimen.
Alectrion fossatus Gould. Several specimens.
Alectrion mendicus Gould. Common.
Alectrion perpinguis Hinds. Not common.
Alectrion indisputabilis Oldroyd. Two specimens.
Amphissa columbiana Dall. Rare.
Argobuccinum oregonensis Redfield. Four imperfect specimens.
Bittium armillatum Carpenter. Common.
Calyptraea fastigiata Gould. Many perfect specimens.
Crepidula adunca Sowerby. Several specimens.
Crepidula nivea C. B. Adams. Two specimens.
Fusinus (Barbarofusus) sp. One imperfect specimen.
Hipponix antiquatus Linnaeus. One specimen.
Lacuna cf. *porrecta* Carpenter. Several specimens.
Leptothyra carpenteri Pilsbry. Five specimens.
Lora? regulus Dall. Two specimens.
Mangilia? hamata Carpenter. One specimen.
Margarites parcipicta Carpenter. One specimen.
Mitrella carinata Hinds. Common.
Odostomia sp. One specimen.
Olivella biplicata Sowerby. Common.
Olivella pedroana Conrad. Several specimens.
Pseudomelatoma moesta Carpenter. One young individual.
Pseudomelatoma torosa Carpenter. One specimen.
Tegula brunnea Philippi. Rare.
Tritonalia lurida Middendorff. Four specimens.

More intensive collecting will no doubt add a considerable number of species to the above faunal list. The list as given is sufficient for us to assume that at the time these mollusks were alive the water was probably cooler than the present ocean temperature along the beach. Such species as *Argobuccinum oregonensis*, *Macoma inquinata*, and *Cardium corbis* would suggest a water temperature somewhat cooler than the

present, while the absence of such species as *Chione gnidia, Dosinia ponderosa, Cardium elatum,* etc., which occur in the warm water upper Pleistocene deposits of the San Pedro region, is noticeable. Correlation with better known horizons should not be attempted until further collecting furnishes a larger faunal list.

JOSEPH SWIFT EMERSON

The death of Joseph Swift Emerson occurred in Honolulu on May 15, 1930. Mr. Emerson was born July 13, 1843, at Lahainaluna, on the island of Maui. He was the son of the Rev. John S. Emerson, one of the early missionaries. By profession he was a civil engineer and surveyor.

While a boy at Waialua, Oahu, Mr. Emerson became interested in the collecting of Hawaiian shells and his interest continued up to the time of his death. His earliest recorded collecting date is 1854, and the last, 1927. Thus his collecting in the field occupied seventy-three years, which is far more than the active period of most collectors. Mr. Emerson undoubtedly began his collecting prior to 1854, as he told me, in conversation, that he had given shells to Frick and Newcomb. Since Newcomb's most important publication appeared in 1853 in the Proceedings of the Zoological Society of London, Mr. Emerson's collecting life must have extended over a period of at least seventy-five years.

Several years ago Mr. Emerson willed his collection of land and marine shells to the Bernice P. Bishop Museum. Shortly after his death they were received and are now incorporated into the collection of that Museum.

In arranging Mr. Emerson's collection prior to its incorporation into the Museum collection, it was interesting to note three distinct collecting periods in his life. The first as a boy, until he graduated from Punahou Academy. The second, during the early nineties, when he was not actively interested in the collecting of shells. At this time he obtained shells by exchange with a number of local collectors. The third, after his retirement from business about 1911

when he became extremely interested in Hawaiian land shells. During this last period he was far more interested than at any other time of his life. From 1911 to 1924 he was continuously in the woods. That a man in his seventies could tramp along the mountain trails and climb trees is very remarkable. About half of his land snail collection was made during this period, some of it being purchased from local collectors.

The collection, especially of his last period, is accompanied by full notes on the exact localities and stations of the shells. Probably the most valuable parts of his collection are fine series of extremely rare snails which have never been collected by the last two generations of collectors. Some of these species have probably been extinct for over sixty years, as the forests where they lived were destroyed either by fire or the introduction of cattle.

During the seventies and eighties Mr. Emerson's interest in shells was confined mostly to marine, of which he had a very large collection, acquired by purchase, from the Marshall and Gilbert Islands, and supplemented by his collecting in the Hawaiian Islands. Mr. Emerson's collection also contains large series of shells which he made in Switzerland and material received in exchange from collectors in other parts of the world.

At the time of his death, his collection contained more than a hundred thousand specimens, of which more than half were Hawaiian land shells. C. MONTAGUE COOKE.

JOHN BRAZIER, 1842-1930

The dates will indicate that Brazier belonged to the last century, but it is due to the memory of a great conchologist that his death should not pass unnoticed though most of his work was done over thirty years ago.

Australian conchological history shows three great names, Angas, Brazier and Hedley, and in his own field Brazier was unrivalled. Angas was the pioneer, a great conchologist, a great collector, and a great artist. Following upon Angas

came Brazier, a great conchologist, we may not say-greater, but surely even a greater collector, as no one could surpass the ability of Brazier in this direction. Hedley, Brazier's successor, passed away before the latter, and owed not a little of his conchological skill to Brazier's assistance, but a great artist of shells was also a much greater philosophical student than either, and he was also another great collector.

Angas published a list of New South Wales Mollusca in 1867, totalling 408 species. Almost immediately Brazier sent many new species to Angas who began describing them in 1869. Angas then furnished a supplement in 1871 of 109 species, and in 1877 added another 176 species, almost all the additions being due to Brazier's energy. Yet during this ten years Brazier was away on collecting trips in 1865, 1872, 1873 and 1875. This skill as a shell collector must have become known at a very early age, as in 1865 he was invited to accompany Julius Brenchley on a cruise in the H. M. S. "Curaçoa" round the South Sea Islands. Upon his return he wrote some notes which he sent to the Zoological Society of London, and was elected a Corresponding Member in 1869, that is, over sixty years ago. In January 1875 the Linnean Society of New South Wales was formed and Brazier was one of the original members. He lived to survive all the others. Later that year he acted as shell collector on the "Chevert", which, under the direction of Sir William Macleay, investigated the natural history of the coast of Queensland and the islands of Torres Straits.

The Mollusca he collected were reported upon by himself but when he had catalogued some 600 odd species of Gastropods, the Pelecypods were left untouched. Brazier joined the Australian Museum in 1880 but was retired during the financial depression of 1893, and has done little conchological work since. During the years 1869-1898 he contributed well over a hundred papers to various scientific journals, but his fame will rest solidly upon his great collecting skill.

He was born in Sydney on Sept. 23, 1842 and died in Sydney, Aug. 20, 1930, having lived all his life in this city.

TOM IREDALE.

BERNARD BARHAM WOODWARD

Mr. Woodward died on October 27, aged seventy-seven years. He was a nephew of G. P. Woodward, author of the well known "Manual of the Mollusca." Mr. Woodward was Curator to the Geological Society of London from 1873 to 1876, thereafter in charge of the general library of the Natural History Museum at South Kensington. He was author of several books chiefly on land and fresh water mollusks, among them "The Life of the Mollusca," 1913; "The British Species of Pisidium," 1913, and joint author of "The Synonymy of the British Non-Marine Mollusca," 1926, together with numerous papers on British fossil land and fresh water shells. His death is mourned by many friends and correspondents.

JAMES HENRY EMERTON

In the death of James H. Emerton we have lost another of those few surviving men who may really be called naturalists, for his profession, scientific artist, brought him in contact with all departments of science .

Mr. Emerton was born in Salem, Massachusetts, in 1847 and died in Boston, December 5, 1930, in his eighty-fourth year. He began his scientific work early in life, making many of the drawings for the first edition of Packard's "Guide to the Study of Insects," published in 1869, Scudder's "Butterflies of North America," Verrill's "Report on the Invertebrates of Vineyard Sound" and "Catalogue of the Marine Mollusca of New England," Minot's "Textbook of Embryology," etc. His models of large cephalopods in the museums of Cambridge, New Haven, New York, and Washington have been greatly admired. He published in 1880 an interesting book "Life on the Seashore". It was, however, in his work on the North American spiders that he was best known. His "Common Spiders of the United States" is a popular book on this subject.

Mr. Emerton was a member of the Boston Society of

Natural History for sixty years, was one of the founders of the Cambridge Entomological Club, a member of the Boston Malacological Club and of many other organizations. His many friends will truly miss him.

C. W. JOHNSON.

NOTES AND NEWS

THE STATUS OF BULLA.—The molluscan genus *Bulla* L. has been thought to be invalid on account of a supposed subgenus *Bulla* in Insecta, proposed by Linnaeus on an earlier page of the "Systema Naturae", but of course of the same date. The case being submitted to the Commission on Nomenclature, the following resolution was adopted to cover this and any similar cases which may arise.

New Recommendation to Art. 36 (on homonyms).—When homonyms are of the same date, whether by the same or by different authors, then any name proposed for a genus takes precedence over a name [its homonym] proposed for a subgenus. The same principle is applicable to homonyms of species and subspecies of identical date.

Bulla in Mollusca will therefore stand, and the name will be discarded in Insecta. We are indebted to Dr. C. W. Stiles for an advance copy of this Recommendation, with permission to publish.—H. A. P.

HELIX WHITNEYI Newcomb.—Through the kindness of Dr. W. G. Van Name and Mr. Gugelmann, I have been able to examine two paratypes of this "species" (1864, Proc. Cal. Acad. Sci. 3: 118) from Lake Tahoe, Cal.; they form lot 194 of the Binney and Bland collection, now in the American Museum of Natural History. Both shells are faded and weather-worn; each has lost about ¼ whorl by corrosion. The remaining 4½ whorls of the larger individual, possibly that figured by W. G. Binney (1869, Smith. Misc. Coll. 194: 32, f. 37; 1885, Bull. U. S. Nat. Mus. 28: 86, f. 50), measures: alt. 2.08 mm., maj. diam. 198 (4.12 mm.),

min. diam. 181 (3.76 mm.); umbilicus 6.2 times in maj. diam. They are indubitably examples of the widely distributed *Zonitoides arboreus* (Say) !—H. BURRINGTON BAKER.

SIZE OF THE GIANT SCALLOP, (*Pecten grandis* Sol., P. *magellanicus* Gmel.)—A scallop of this species, from waters "outside of" Matinicus, Seal Island, or the outer part of the Penobscot Bay, Maine, was received by the Portland Society of Natural History, some time ago. The animal was taken alive in a flounder drag, (or small otter trawl,) operated at about 65 fathoms depth, by Capt. Clarence Turner, of the schooner "Barbara" of Portland.

Its length, (from anterior to posterior) is 9 inches; depth, (from dorsal, or hinge margin to ventral aspect), 8.20 inches; width, (from right to left), 2.25 inches. Though large in external measurments, the shell is thin for the species; it is well preserved, or not bored by those organisms which attack the surface of large old shells.

A partial survey of local literature would seem to indicate that the size is exceptional. W. G. Binney[1], gives the modest dimensions of length 5½ inches, depth 5 inches, and width 1½ inches. Dr. A. G. Drew[2], gives as "good sized" specimens, length 7 inches, depth, 6½ inches and width 2½ inches, which seems to be a fair average for the species taken in Maine waters. Blaney[3], says of specimens dredged in deep water in Frenchman's Bay, "growing to over 7 inches in diameter" [=length ?].

Lermond[4], mentions a specimen in the collection of the Portland Society of Natural History, as "7 3/16 long and 6 11/16" deep. This is a normally heavy shell, smooth and unbored; it is labelled, "Portland Harbor, Fuller Collection". In the same collection is a specimen slightly larger, taken alive by the writer in Casco Bay, between Great Chebeague and Basket Islands in about 7 fathoms. It has a

[1]1870, Binney, Rept. Invert. Mass. p. 197.
[2]1906, Drew, Univ. Maine Studies, No. 6. p. 7.
[3]1904, Blaney, Proc. Boston Soc. N. H. 32, p. 23.
[4]1908, Lermond, Shells of Maine, p. 7.

very thick shell, much eaten by boring animals. Its measurements are given in the following table, which gives the sizes of the forgoing specimens, brought to a uniform scale.

Locality	Collector	Length	Depth	Width
Portland Harbor	C. B. Fuller	184 mm.	169 mm.	52 mm.
Casco Bay	A. H. Norton	189 mm.	171 mm.	64 mm.
Seal Island	C. Turner	230 mm.	208 mm.	58 mm.
Maine Average (?)	according to Drew	178 mm.	166 mm.	57 mm.

ARTHUR H. NORTON.

BULIMULUS HENDERSONI, n. n.—My attention having been called to the fact that the name *Bulimulus (Scutalis) felipponei* Ihering, Nautilus XLI, P. 95, 1928, has priority over the name *Bulimulus (Bulimulus) felipponei Marshall*, Proc. U. S. Nat. Museum, vol. 77, article 2, p. 1, pl. 1, fig. 9, 1930, I propose the specific name *Bulimulus hendersoni* for the latter in honor of Prof. Junius Henderson. Both species come from Uruguay.—WM. B. MARSHALL.

CORETUS Adans, is said by the nomenclature pest, E. Strand (Arb. Syst. Zool. Inst. Lettl. Univ. Nr. 27, p. 68) to have been used by Bruguière, Encycl. Méth. I, but it was not adopted by Bruguière, appearing only in a list of Adanson's genera. It is thus of no significance in nomenclature.—H. A. P.

HELIX HAEMASTOMA var. *concolor* Pils., Nautilus IV, p. 59, and Man. Couch. VI, p. 303, is a homonym of *Helix concolor* Férussac. It may be called *Acavus haemastoma monochroa*.—PILSBRY.

DR. BAINI PRASHAD of the Indian Museum, Calcutta, has been visiting museums of the United States. American malacologists, who have long known Dr. Prashad by his valuable publications, have thus had the pleasure of meeting him in person.

MAJOR M. CONNOLLY delivered an address on "The Distribution of Non-Marine Mollusca throughout Continental Africa," at the annual meeting of the Conchological Society held in London, October 18.

POLYGYROIDEA HARFORDIANA (J. G. Coop.).—It was somewhat of a surprise to find the *P. harfordiana* in a new locality, ¼ mile above the junction of Alder Creek with the South Fork of Merced River, Mariposa Co., Cal., elevation 4000 ft. These shells all run smaller (diam. 8.2 to 9.4 mm.) than the ones Baker found in the Big Trees Grove at Wawona Point, where I was fortunately able to find a few also. I venture to predict that it will be found scattered through the Sierra in localities where conditions of moisture, shade, rock slide, and leaf mold are just right. At this new locality it was possible to lift off the dried and matted leaf mold in slabs of a square foot or two at a time, and down to moisture among the rather small angular rocks of the well-shaded slide to find the *harfordiana* rather common, as land snails of the Sierra generally come. Unfortunately I was not able to get as many as I should have liked, for some of the limited time had to be spent on the acquisition of a mess of 15-20 inch Rainbow and Loch Leven trout, which provide great sport in the South Fork of the Merced River at that place. Snails and fish were both there, so I compromised by getting some of both. There are plenty of both left for the next fellow who goes to the proper place.—ALLYN G. SMITH.

POLYGYRA COLUMBIANA MEGASOMA (Dall) has been found in some numbers by Mr. and Mrs. E. P. Chace in the course of a collecting trip in northern California. Specimens were sent from the following localities: about 4 m. south of Eureka; Clam Beach, 11 m. north of Arcata; Jordan Creek near Scotia; canyon back of Williams Ranch, across the river from Requa; all in Humboldt Co. The neotype of *megasoma* (No. 11140 ANSP.) was from Humboldt Co., without more exact locality, collected by Hemphill. The *umbilicus is very narrow or closed,* and there is often a little kink in the lip near it; the basal lip is thickened on the face, and the epidermal hairs are finer and closer than in *P. c. pilosa* J. Hend. The parietal tooth is variable, and

more often wanting than present. All the large individuals appear to lack the tooth. Diameter 13 to 16 mm.

In a series from Inverness, Marin Co., there are, I think, two forms: (1) a larger, diameter 15-16 mm., has the very narrow umbilicus, the parietal tooth and the extremely fine close sculpture of *P. c. megasoma;* and (2) a smaller form, diam. 12-14 mm., without a tooth, the umbilicus slightly larger and the hairs not quite so close. These appear referable to *P. columbiana pilosa* J. Hend.—PILSBRY.

OREOHELIX "GROWING ON TREES."—Recent items in THE NAUTILUS concerning the tree-climbing propensities of *Monadenia fidelis* and *Helix aspersa,* and Lowe's fine plate showing an estivating colony of *Oxystyla* in a tree, reminds me of an experience with *Oreohelix,* a genus which would surely not be expected to climb trees. Several years ago, on Grand Mesa, Colorado, when it was raining almost every day, we found *O. cooperi* (W. G. B.) clinging to the trunks of many aspens, up to heights of ten feet or more. In searching for snails, most of us are in the habits of keeping our eyes "glued to the ground," because experience has taught us that we are more likely to find them there. Perhaps if we should form the habit of searching trees also we would make many interesting finds otherwise so easily overlooked. —JUNIUS HENDERSON, University of Colorado Museum.

PUBLICATIONS RECEIVED

GABB'S CALIFORNIA CRETACEOUS AND TERTIARY TYPE LAMELLIBRANCHS. By Ralph B. Stewart. (Special Pub. No. 3, Acad. Nat. Sci. Phila., 1930). Having been interested in Tertiary and Cretaceous mollusks in years past, I started to read this paper little dreaming that it would in any way affect the nomenclature of our recent shells. I used to think that Dr. Dall under the title "Tertiary Fauna of Florida" put too much into that work that was not the Tertiary of Florida, a criticism with which many European concholog-

ists agreed. In this case, however, the author has far exceeded Dall. As the work is apt to be overlooked by workers on recent shells I feel that some notes on its contents are necessary, although I cannot do justice to the paper in this limited space.

It seems more and more apparent that the original rules of nomenclature were made too soon, and before the many problems that might arise were fully understood. In adopting generic names Dr. Dall's decisions were based largely on the selection of "type by elimination." A later ruling (Article 30) "type by subsequent designation" has been adopted by the author, hence the many changes. Some of the changes were really necessary, but many will criticise the taking of *Noetia* out of the family Arcidae, substituting *Volsella* Scopoli for *Modiolus* Lamarck, and the raising of too many subgenera to generic rank. It is however a great nomenclatorial discourse, much involved, and requiring a great deal of careful study.—C. W. JOHNSON.

SOME RISSOID MOLLUSCA FROM THE GULF OF CALIFORNIA AND SOME MOLLUSCA OF THE FAMILY EPITONIIDAE FROM THE GULF OF CALIFORNIA. By Fred Baker, G. D. Hanna and A. M. Strong. (Proc. Calif. Acad. Sci., 4th Ser. vol. 19, pp. 23-56. 3 pls. 1930). Of the Rissoidae 9 new species and one subspecies are described and of the Epitoniidae 3 new species are described.

MARINE MOLLUSCA OF GUADALUPE ISLAND, MEXICO, MARINE MOLLUSCA OF THE REVILLAGIGEDO ISLANDS, MEXICO, AND MARINE MOLLUSCA OF THE TRES MARIAS ISLANDS, MEXICO. By A. M. Strong and G. D. Hanna (Proc. Calif. Acad. Sci., 4th ser. vol. 19, pp. 1-22, 1930). From Guadalupe 87 species are recorded, from Ravillagigedo 61 and from the Tres Marias 211 species. In the latter list it is interesting to note the occurrence of *Cypraea isabella* of Polynesian origin and *C. cervinetta* from western Central America.—C. W. J.

NOTES ON SOME SPECIES OF EPITONIUM, SUBGENUS NITIDISCALA, FROM THE WEST COAST OF NORTH AMERICA. By A. M. Strong (Trans. San Diego Soc. Nat. Hist., vol. 6, pp. 183-196, pl. 20, 1930). An excellent review of the west coast species, one new species *(E. cooperi)* is described and figured. —C. W. J.

NEW LAND SNAILS FROM TANGANYIKA TERRITORY. By Wm. J. Clench and Allan F. Archer (Occas. Pap. Boston Soc. N. H., vol. 5. July, 1930). *Euacthiops loveridgei* is described as a new genus and species from the Mluguru Mts. It differs from Achatina by the normal insertion on the diaphragm of the penial retractor, as in *Limicolaria* and *Cochlitoma crawfordi*. *Achatina madaziniana* n. sp. is placed next to *A. immaculata* Lam.—H. A. P.

THE NORTH AMERICAN RETINELLAE. By H. Burrington Baker (Proc. A. N. S. Phila. 1930, pp. 193-219, 6 plates). The group of small zonitids which have gone under the generic names of *Zonites, Hyalina, Vitrea, Glyphyalinia* etc. has been revised in the light of their anatomical structure, and referred to the Holarctic genus *Retinella*. The considerable variations in genitalia and teeth give characters for dividing the series into six subgenera and sections. Keys to the species are given. A new species, *R. praecox*, and five new subspecies are described and figured. The anatomy of many species is illustrated on six beautifully drawn plates. Knowledge of the Zonitidae of our fauna has advanced a long stride by Dr. Baker's work in this paper and his "Minute American Zonitidae," published in 1928. It is hoped that the nomenclature of these snails, which has suffered many vicissitudes, will be stabilized by Dr. Baker's careful work.—H. A. P.

SOME SPECIFIC CRITERIA IN *Conus*. By Burnett Smith. (Proc. A. N. S. Phila. 1930, pp. 279-288, 12 figs.). Evidence is presented to show that the embryonic whorls of *Conus* show at least four distinct apical types, and it is thought

that many others are to be found in a wider range of species than those the author examined from the Atlantic coast, Recent and Tertiary. "Somewhat less useful, but apparently of higher taxononic value are the characters shown by the subsutural flexure." A new Pliocene species, *Conus waccamawensis*, is described. These neglected characters appear to have a high value in the classification of this difficult genus, so abundantly represented in Tertiary and modern faunas.—H. A. P.

Some studies on the biology of tulla (*Corbicula manillensis* Philippi), a common food clam of Laguna de Bay and its tributaries. By Deogracias V. Valladolid and Fidel G. del Rosario. (The Philippine Agriculturist XIX. Nov. 1930). The "tulla" is extensively used as food for ducks and also for the native inhabitants of the Laguna de Bay region; and the shells are manufactured into commercial air-slaked lime. This interesting study concerns the rate of growth, size at sexual maturity and the quantity available. Recommendations are made for conservation of the supply. One plate illustrates the shell, anatomy, eggs and larva, etc.—H. A. P.

Monografia de las melanopsis vivientes y fósiles de España. Por Florentino Azpeitia Moros, Madrid, 1929. This handsome volume of 402 pages and 14 plates (12 in color) contains a very full descriptive and synonymic treatment of this intricate genus in peninsular Spain and the African provinces. The full illustration of the more variable species by excellent colored figures makes the work indispensable to those who have to deal with the group.—H. A. P.

Noticia de un nuevo ejemplar de *Conus gloria-maris*, etc. Por Florentino Azpeitia Moros (Revista de la Real Acad. Cienc. etc. Madrid, XXIII, 1927). The new specimen is figured in color. An interesting historical sketch treats of the twenty-two examples of this rare and beautiful shell known in collections, with references to other conchological rarities notable for beauty, scarcity or the high prices they have brought.

EL DOCTOR HIDALGO Y SUS PUBLICACIONES MALACOLOGICAS. Por Florentino Azpeitia Moros. A short biographical sketch with a portrait, followed by a list of species described by or named for this eminent Spanish conchologist, and a bibliography of his works published in Spain.—H. A. P.

MOLLUSCA FROM THE HENRY MOUNTAINS and some neighboring Points in Utah. By Ralph V. Chamberlin and Elmer Berry. Bull. Univ. of Utah, vol. 21, No. 2, Oct. 24, 1930. The mollusks listed were taken by a biological expedition sent by the Department of Zoology and Botany of the University of Utah to the isolated Henry Range of Wayne and Garfield Counties. A number of species new to Utah were found, among them one new to science, *Aplexa microstriata,* a very distinct form from Fish Lake, Utah, where it is abundant in shallow water.— H. A. P.

MEXICAN MOLLUSKS COLLECTED FOR DR. BRYANT WALKER IN 1926. By H. B. Baker. (Occas. Papers, Mus. Zool. Univ. Mich., No. 220, pp. 1-45, pls. 8-11, 1930)) This is the second paper covering the land shells of this region. The author has gone deeply into the anatomy of many of the species. Three new species and three new subspecies are described.— C. W. J.

NOTES ON PHYSIDAE WITH DESCRIPTIONS OF NEW SPECIES. By Wm. J. Clench (Occ. Papers Boston Soc. Nat. Hist. 5: 301-315, 4 figs.). This paper carefully describes 3 new species *(Physa salina* from Utah, and *P. plena* and *P. remingtoni* from Mo.) and discusses nomenclature in this perplexing family. However, Sowerby's (1822) *Limnea (Physa) rivalis (=Aplexa rivalis)* is neither preoccupied nor affected by the dubious *Bulla rivalis* (1807), if the latter become *Physa fontinalis rivalis* (Turton) Clench. Also, *P. sowerbyana* (tod. of *Stenophysa)* is a synonymous substitute for *L. rivalis* Swby.; d'Orbigny's figures represent his "variété de Cuba". Moreover, my anatomical notes are based on the typical, West Indian form of *A. rivalis; P. peruviana* Gray was founded on a shell of about twice its dimensions. —H. B. BAKER.

NEW SPECIES OF MOLLUSKS. By Fred Baker and V. D. P. Spicer (Trans. San Diego Soc. Nat. Hist., vol. 6, pp. 173-182, pls. 18, 19, 1930.) Four new species are described and figured.

INFLUENCE OF THE GLACIAL PERIOD IN CHANGING THE CHARACTER OF THE MOLLUSCAN FAUNA OF NORTH AMERICA. By F. C. Baker. (Ecology, vol. 9, pp. 469-480, with 9 figures in text, 1930). A most interesting paper. I notice that in figure 7 showing the distribution of *Acella haldemani* the species is not recorded from Lake Champlain.—C. W. J.

A REVIEW OF OUR PRESENT KNOWLEDGE CONCERNING THE CHARACTER AND DISTRIBUTION OF THE PLEISTOCENE AQUATIC MOLLUSCAN LIFE OF ILLINOIS. By F. C. Baker. (Trans. Ill. State Acad. Sci., vol. 22, pp. 411-434, 1930). One new var. *Fossaria dalli grandis* is described.—C. W. J.

MOLUSCOS DEL LAGO DE XOCHIMILCO, D. F., por el profesor Francisco Contreras. Anales del Instituto de Biologia I, No. 1. A list of the species of this Mexican lake, with descriptions and figures. Six species. *Anodonta impura* Say is the only unionid.

A MONOGRAPH OF THE DIBRANCHIATE CEPHALOPODS OF THE JAPANESE AND ADJACENT WATERS. By Madoka Sasaki (Journal College of Agriculture, Hokkaido Imperial University, XX, Supplementary number. Sapporo, 1929. Quarto, 357 pages, 30 plates. This magnificent work makes the Japanese cephalopod fauna one of the best known in the world. 125 species are described, the genera *Polypus*,[1] 29 species, *Sepia*, 20 species, and Loligo, 10 species, being extraordinarily well represented. Besides full descriptions and figures of the animals, there are often interesting details of the fishing and utilization of many species. The work appears to be very well done. It is a loss to science that the author died in Europe while the volume was in press.

H.A.P.

[1] It is a pity that the author followed Hoyle in using the untenable name *Polypus* in place of *Octopus*. That name has no proper standing in the nomenclature of cephalopods.

THE MOLLUSCAN FAUNA OF THE SOUTHERN PART OF LAKE MICHIGAN AND ITS RELATIONSHIP TO THE OLD GLACIAL LAKE CHICAGO. By F. C. Baker. (Trans. Ill. State Acad. Sci., vol. 22, pp. 186-194, 3 figs., 1930.) A new genus VANCLEAVEIA, genotype *Amnicola emarginata* (Kuster). A new var. of *Valvata perdepressa* and *V. sincera* are also described and figured.

SOMNIUM IREDALEANUM.—In his interesting "Notes on some Desert Snails", Victorian Naturalist, Nov., 1930, Mr. Tom Iredale devotes about half a page to comments on the Central Australian "*Pupa*" *beltiana* Tate. In my monograph (1921, Man. Conch. 26: 145) this form was transferred to the genus *Pupoides*, on account of its very close conchological resemblance to American, Asiatic, African and other Australian species placed in that genus. *Pupoides* was recognized in my work as a widely distributed genus, like *Pupilla*, typically developed at least as far back as the Lower Miocene, and therefore no doubt much older. Mr. Iredale does not take the trouble to discuss my generic reference of *P. beltiana* dismissing it curtly with the remark "with [*Pupoides*] it has no real relationship, so it is here named *Themapupa*". My good friend is so accustomed to getting away with these bluffs in Australia, where a "new" molluscan genus does not mean much of anything now, that he forgets that such a bob-tailed flush may be called. I willingly admit that *any* animal which has not been exhaustively studied and its whole structure worked up may possibly turn out to be of a new genus, but there is no reason for the genus until some special structural character is found. In this case, *P. beltianus* has not been dissected, but it looks like any other *Pupoides*. It is up to Mr. Iredale to indicate some differential character, however trivial, for his supposed new genus. Not merely hot air about discontinuous distribution,—though I realize how discouraging it must be to him that there are so many Australian mollusks still referred to genera common in the Northern Hemisphere. Wake up, Mr. Iredale!—H.A.P.

THE NAUTILUS.

Vol. XLIV APRIL, 1931. No. 4

THE PROBLEM OF THE MOLLUSCA OF BEAR LAKE AND UTAH LAKE, IDAHO-UTAH

BY JUNIUS HENDERSON

Bear Lake is situated in extreme southeastern Idaho and northeastern Utah, about equally divided between the two states. Utah Lake is some distance south of Salt Lake City, with Provo as the largest city on its shore. At many places along the shore of Bear Lake immense quantities of mollusk shells have been piled in windrows by the waves, a splendid example of the efficiency of waves in sifting and sorting materials which differ in size, shape and specific gravity, the upper portions of the shell heaps being washed quite free from sand in many instances. The predominent species in these windrows is *Carinifex newberryi*. Next in importance are *Lymnaea utahensis, Valvata humeralis californica, V. utahensis* and *Paludestrina longinqua*. In July, 1930, Mrs. Henderson and I scooped up about eight quarts of these shells at four widely separated localities and sorted them. Locality A, north end of the lake. B, east side not far from south end. C, west side, some distance south of Garden City. D, west side at Lakota resort. We recognize the following species:

	A	B	C	D
Carinifex newberryi (Lea)	x	x	x	x
Physa ampullacea (Gould)	x	x	x	x
Lymnaea utahensis (Call)	x	x	x	x
Lymnaea sp., of palustris group	x			
Fluminicola fusca (Hald.)	x	x	x	x
Valvata humeralis californica Pils.	x	x	x	x
Valvata utahensis (Call)	x	x	x	x

Paludestrina longinqua (Gould)	x	x	x	x
Planorbis vermicularis Gould	x			x
Planorbis exacuous Say	x			
Planorbis trivolvis Say	x			
Gonyodiscus cronkhitei anthonyi Pils....				x
Succinea sp., 1 broken specimen.....	x			
Pisidium compressum Prime.....	x	x	x	x
Sphaerium pilsbryanum Sterki.....	x	x	x	x
Anodonta californiensis Lea? (valve) ...				x

In 1917 Daniels and I (Proc. Acad. Nat. Sci. Phila., 1917, p. 58), from a more extended search of the north shore, reported from there also *Gonyodiscus cronkhitei anthonyi* Pils., *Vertigo ovata* (Say), *Planorbis parvus* (Say), *Lymnaea proxima* Lea and *Lymnaea stagnalis appressa* (*jugularis*) Say. The *P. parvus* should be *vermicularis, L. jugularis* was represented by a broken specimen, and *P. ampullacea, P. t. binneyi* and *L. proxima* are fresh-looking specimens, still retaining the epidermis, their state of preservation totally unlike that of the other species, such as *Carinifex, L. utahensis, Fluminicola*, etc. Probably the *L. "promixa"* is a case of mistaken identity. It should be more carefully studied.

Referring to the north end of the lake in our report just mentioned, we said: "The soil of this broad barrier is in places composed largely of fossil shells of the same species that abound along the beach, leading to the belief that the beach shells have been mostly washed from the sand by the waves and are fossil." We found no living mollusks in the lake. In "The Mollusca of Colorado", etc. (Univ. Colo. Studies, XIII, 181, 1924), under *Carinifex newberryi*, I said that "many of the shells were very fresh is appearance". That statement is misleading, resulting from quoting notes which referred to the whole collection, including *Planorbis binneyi*, etc., not applying to *Carinifex, Fluminicola, Valvata, Paludestrina*, etc., which constitute the great bulk of the beach material. The latter group have all lost their epidermis, the shell material of a large proportion of them has been altered and they have assumed a blue color, with surfaces often highly polished by wind and wave. Some speci-

mens have fragments of rather hard, sandy matrix clinging to them. Chamberlin and Jones (Descrip. Cat. Moll. Utah, Bull. Univ. Utah, XIX, 156-157, 1929) suggested that the bluish shells were fossil, and Sterki, in describing *Sphaerium pilsbryanum* from Bear Lake, designated it, with the associated *Planorbis*, *Carinifex newberryi*, *Lymnaea utahensis* and *Fluminicola fusca*, as fossils (NAUTILUS, XXII, 141-142, 1909).

In July, 1930, Mrs. Henderson and I made a much more thorough examination of this lake, and fully confirmed the belief that all of the shells lying in windrows along the beaches, except perhaps a few specimens at the north end, consist of fossils, washed out and sorted from the sand by the waves. We travelled entirely around the lake, examining the shores and the shallow water a little ways out. We also used a boat for dredging for several hundred feet out from shore on the west side, where beach shells were abundant. We did not find a single living mollusk in the lake, but there are some in sloughs near the lake, though not of the species found in the beach deposits. The water deepens very gradually from the shore out, and from the boat we could see the bottom on calm days 300 feet from shore and to depths of from 6 to 8 feet. The bottom was remarkably free from even dead or fossil shells, which were common only on shore or close to it. If they were being washed in from greater depths and are still living in the lake, the bottom off-shore should be as well supplied with them as is the shore itself.

Dr. Vasco Tanner, of Brigham Young University, Provo, Utah, has since been more thorough in his dredging. He has written me, under date of September 13, 1930: "I spent one week at Bear Lake and I had at my disposal one of the large motor boats and three men. I went around the entire lake with the boat, and I dredged at various depths from 50 feet to 190 feet, in the south and north ends and east and west sides, but did not collect a single living mollusk with my dredge net."

There is scarcely a doubt that these species, once so abundant in the lake, no longer live there. During the past 15

years or so the water level has retreated a long ways, due to the use of water for irrigation and power purposes. The water line is now far from the former shore line, and the present littoral conditions are not favorable to such mollusks as formerly populated the lake. This, in connection with the well-known fact that fluctuations in climatic conditions have caused great oscillations in western lakes within the not very remote (geologically speaking) past, suggests what probably destroyed the Bear Lake molluscan fauna. It is probable that the shrinkage of the lake during a cycle of decreased precipitation and perhaps increased evaporation, either entirely desiccated the lake or rendered it so saline as to be uninhabitable for mollusks of these kinds. Bearing upon this explanation, Dall suggested to me some years ago that the ribbed condition of many of the *Lymnaea utahensis* indicated saline conditions.

Around the shores of Utah Lake also many mollusk shells are found, of species which have not in recent times been found living in the lake, or in the adjacent streams or sloughs. We did not find them anywhere in such piles as we found at Bear Lake, except near the power plant at the north end, where they had evidently been washed out from mud thrown out by the dredge in digging a canal from the lake to the power plant; and at one locality near Provo, where they had evidently been washed out from the shore deposits by the waves. Here the most abundant species is an *Amnicola*, a genus not found living in the Sale Lake Basin or Rocky Mountain states. In travelling entirely around the lake the only living species we found in the lake itself is an *Anodonta*, fresh valves of which are also abundant on the beach near Provo, but we did find, in several streams, living species different from those found dead along the shore. Dr. Tanner, who has done much dredging in the lake and is continuing the work, had not, at the last account I had from him, found any living mollusks in this lake except *Anodonta*.

Call, in describing *Lymnaea utahensis*, which he obtained in Utah Lake, near Lehi, said "dentition unpublished", though on a preceding page he had said that "the dentition

differs from typical *R. ampla* Mighels very materially", thus indicating that he obtained the species alive. He also described the operculum of *Valvata utahensis*, dredged at the same place, so he probably found that alive. He says that *Carinifex newberryi* "was discovered living in Utah Lake", that living forms of *Fluminicola fusca* are common there, and that "numerous living examples" of *Lymnaea stagnalis* (*jugularis* or *wasatchensis*) occur in Utah Lake at American Fork. He says *Sphaerium dentatum* (probably meaning *pilsbryanum*, since described) "is a very abundant species in Utah Lake, where it attains a great size", but does not definitely say he found it alive. However, Sterki, in describing *pilsbryanum*, says it is fossil at Bear Lake and "recent" in Utah Lake, leaving us to surmise whether he actually had obtained live specimens from there. Some examples from American Fork retain the epidermis. In view of all this, what has happened? Are these species still living there, eluding the search for them, or have they been exterminated from the lake since Call's report was published? As with Bear Lake, the water level of Utah Lake has been much lowered within the past few years.

MOLLUSCA OF LAMB'S CANYON, UTAH

BY ELMER G. BERRY
University of Utah

Lamb's Canyon, a small tributary of Parley's Canyon, is situated about twenty-three miles from Salt Lake City. The altitude rises from about 7,500 feet at the mouth to about 11,000 feet at its head, a distance of only seven miles. The dense verdure and frequent rainfalls which occur in this canyon creates an ideal collecting ground for the conchologist. This canyon is typical of nearly all Salt Lake County canyons with similar altitudes. The list below comprises the collecting of three summers. The Columella is a new record

for Utah other than the indefinite record of Binney's "Wasatch Mountains, 1878".

Pisidium variabile Prime. Found abundant in a lake bottom at the head of Lamb's.

Vallonia albula Sterki.

Vallonia cyclophorella Ancey.

Oreohelix cooperi Binney. These specimens are the largest *O. cooperi* found yet to our knowledge. They are high spired forms and generally without color markings, producing a weathered appearance. The locality of these specimens is very limited.

Microphysula ingersolli (Bland). The most common and abundant of all species in Lamb's.

Vertigo modesta corpulenta (Morse).

Vertigo concinnula Cockerell.

Pupilla blandi Morse.

Pupilla syngenes dextroversa P. & V.

Gastrocopta quadridens P. & V. Only one specimen was found.

Columella alticola (Ingersoll).

Euconulus fulvus alaskensis (Pilsbry).

Zonitoides arborea (Say)

Vitrina alaskana Dall.

Agriolimax agrestis (Müll.).

Gonyodiscus cronkhitei (Newcomb).

Punctum pygmaeum (Draparnaud).

Fossaria obrussa (Say).

Fossaria modicella (Say).

Paludestrina longinqua (Gould). Collected on the face of a limestone cliff where spring water continually dripped. Encrustations of limestone covered the entire shell of these specimens leaving only the aperture open. Shell variations were common in the lot collected.

OBSERVATIONS ON REPRODUCTION IN THE SNAIL GONIOBASIS*

BY DOROTHEA DOWD JEWELL

This study of reproductive organs, breeding habits and embryonic development of *Goniobasis livescens correcta* (Brot) has been carried on as a part of the larger problem of working out the life-history of this river snail. The material used for this study was obtained from the Salt Fork River east of Urbana, Illinois during the fall and spring of 1929-1930.

The writer wishes to express her sincere appreciation to Dr. H. J. Van Cleave, under whose direction this study was carried on, for his helpful suggestions throughout the investigation. She is indebted also to Mr. Frank Collins Baker for his kindly interest in the work and for identification of the snail studied. Mr. Calvin Goodrich has also kindly verified the identification of the variety under consideration.

Since the work of Stimpson, published in 1864, little has been done in the investigation of the reproduction of Goniobasis. Summarizing his own studies, Baker in the Fresh Water Mollusca of Wisconsin (Vol. 1, Page 176) comments on the pioneer work of Stimpson on the Pleuroceridae in the following words: "Half a hundred specimens of Pleurocera and Goniobasis have been examined without finding anything essential not indicated by this careful student." In the same reference, Baker further states that nothing is known concerning the development of members of this family.

The present study, by means of dissections and serial sections, has demonstrated conclusively that the sexes are separate. Specimens examined during the fall, winter and spring months invariably showed a single gonad with no evidence of hermaphroditism. Since there are no external genitalia in Goniobasis, the only observable difference in

*Contributions from the Zoological Laboratory of the University of Illinois No. 395.

the external form of living specimens of the two sexes is the presence in the female of a small pit located just posterior and lateral to the base of the right tentacle. The significance of this pit for sex recognition was pointed out as early as 1864 by Stimpson whose observations on this point are widely quoted but have never been extended further. The pit is bordered on either side by fleshy folds. Below the lower fold, a shallow groove extends posteriorly for a short distance. The corresponding region in the male is smooth, with no trace of pit or groove. The pit extends inward for some distance, but in the present investigation no connection has been found between it and the reproductive organs.

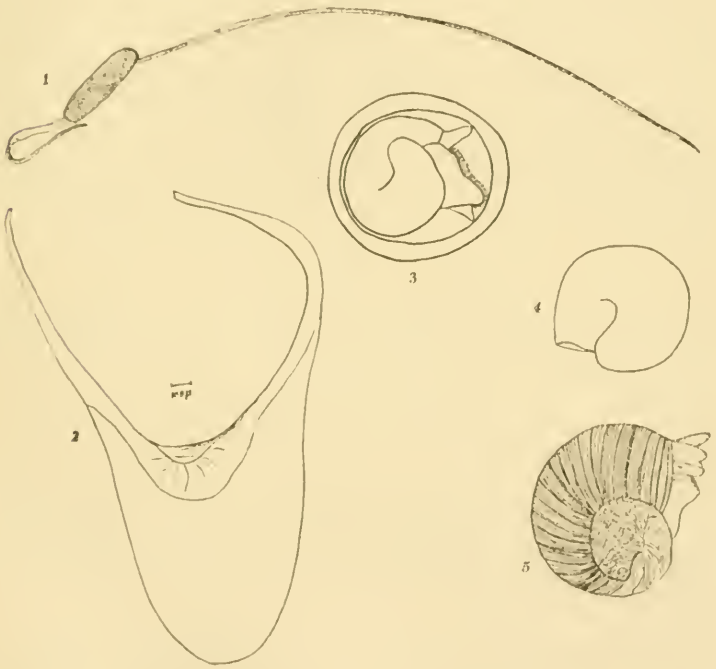
Dissections and microscopic examination of serial sections have shown only spermatozoa or only ova to be present in the gonad of each individual examined. In the fall the testes were packed full of mature spermatozoa appearing as a thick white substance. This condition was found also both in winter and spring when the testes were so distended that the slightest scratch ruptured them. Ova of various sizes were always present in the ovaries but, because of their minute size and the presence of much follicular material about them, examination of serial sections was necessary for absolute recognition of eggs before maturity.

Individual sperms have a distinctive form. The headpiece consists of a somewhat cylindrical portion (Fig. 1) about 5μ in length and bears a terminal hook-shaped structure. The entire head has a length of about 10μ. The tail is 50μ in length. Spermatophores of definite shape (Fig. 2), full of active spermatozoa, were found in the water in the snail containers in the laboratory during the latter part of March and in April. The spermatophores vary a little in size; one of average size measured 1.1mm. by 1.02 mm with a pair of thread-like arms about 1.19 mm. in length.

Eggs of this species have been unknown previously. They were deposited in the laboratory containers in the last week of March and during April and May. The eggs always appeared singly or in lines of two or three with no covering except the simple shell membrane which remained until time of

hatching. Little variation was found in the size of the newly laid eggs. The size most frequently found was 306μ as the diameter of the egg itself within a membrane of 382μ to 425μ in diameter.

The snails were observed for some time each day in an attempt to discover any evidence of copulation. Since these snails have a habit of crawling over each other, it has so far



Figs. 1-5, *Goniobasis livescens correcta* (Brot.) Fig. 1, A mature spermatozoön. Length of head 10μ; length of tail 50μ. Fig. 2, A spermatophore which was discharged into the water. Scale equals 100μ. Fig. 3, An 11-day embryo within its egg membrane. Fig. 4, Shell of a newly hatched snail. Fig. 5, A young snail three or four days after hatching.

been impossible to distinguish between their ordinary movements and those associated with copulation. When spermatophores were found near two associated individu-

als, these snails were removed to another container and kept under observation. Sometimes this mutual interest continued and another spermatophore or two appeared in the water, but no sign of external copulatory organs or of copulation other than mere contact was evident. The snails always dropped apart from each other immediately if disturbed even very slightly.

In a female dissected about the time of oviposition, mature spermatozoa were present in the upper end of the uterus. There were also present in this region strands of fiber which closely resembled bits of spermatophore. Although fertilization is probably internal, the lack of specialized intromittent organs often leads to the loss of some of the spermatophores into the water. It has not yet been possible to determine how the spermatophores are deposited or whether they enter the female pit or the uterus directly.

After once observing the eggs under laboratory conditions, the next objective was the discovery of the eggs in the natural habitat. The minute size of the eggs and the dense algal growth covering all the stones in the stream-bed rendered this a difficult task. On April 14th, Goniobasis eggs were found on rocks in the Salt Fork River. They were always in the same linear series of two or three or singly deposited as in the laboratory. These eggs were in early cleavage and veliger stages when discovered. Miss Margery Washburn, who co-operated in collecting the snails, reported that eggs were present on the rocks as late as the eighth of June.

Eggs laid in the laboratory were observed under the microscope at regular intervals. Observations concerning time for development were obtained by segregating snails and noting the time of appearance of eggs in the containers. In the first twenty-four hours after eggs appeared, those laid earliest were in the 32-celled stage. Rotating movements were observable within the egg membrane by the time the embryo was four days old and by the seventh day the veliger stage had been reached. At the beginning of the eleventh day some of the embryos observed had pushed out

one side of the membrane into a definite bulge or pouch (Fig. 3). By constant rotating movements and feeling out with foot and rostrum, the embryo moved into the bulge repeatedly until at last the membrane was ruptured freeing the young snail. The time for embryonic development of these snails under laboratory conditions was eleven and a half days.

The newly hatched snails varied slightly in size. The largest one measured was 425μ in its longest diameter on the ventral surface. The shell of a newly hatched snail measured 306μ by 348μ (Fig. 4.). One complete, finely reticulated whorl is present in the shell of the newly hatched snails as a rule, although there may in some cases be the beginning of a second whorl. As additional whorls are formed after hatching, their thin transparent walls show distinct cross-striations.

DESCRIPTION OF A NEW VARIETY OF VALVATA LEWISI CURRIER

BY FRANK COLLINS BAKER*

VALVATA LEWISI ONTARIENSIS, new variety.

Shell discoidal, of three whorls, the first one and a half or two flattened and coiled in the same plane, the last one or one and a half free from contact with the preceding whorls and rapidly descending, forming a rounded tube; sutures deeply impressed; sculpture fine and thread-like on the first two whorls, becoming heavier on the last whorl where they develop into sharp, elevated, rib-like lamellae which are more or less equally and rather widely spaced; aperture rounded; umbilical opening of the two first whorls shallow and wide.

Height 3.5; diameter 4.2 mm. Holotype.

Height 2.2; diameter 3.5 mm. Paratype.

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*Contribution from the Museum of Natural History, University of Illinois, No. 64.

Type locality: Shakespeare Island Lake, Ontario, Canada. This is a small lake draining into Lake Nipigon. Dredged from a sand and mud bottom, with vegetation, in water 4 feet 1 inch deep.

Types: Museum of Natural History, University of Illinois, No. Z31241. Academy of Natural Sciences, Philadelphia, No. 153471.

This Valvata is one of the most striking of the many forms found in northern waters. It starts out as a very good *Valvata lewisi helicoidea* Dall, with flattened whorls and fine sculpture. After making about two turns the whorl leaves its contact with the preceding whorl forming a distinct tube, and uncoiling, like some of the cephalopod shells of Cretaceous time, and the sculpture becomes coarse and rib-like. In this last feature the sculpture is like that of *Valvata sincera nylanderi* Dall, but the form is depressed. The sculpture is quite like typical *lewisi* from Tonawanda Creek, near Batavia, N. Y. The form is almost distinct enough to constitute a distinct species, but as the amount of deflection of the uncoiled last whorl is variable it appears best to consider it a variant of the *helicoidea* type of *lewisi*.

The same form was recently noted in a collection of mollusks from Ontario made by Dr. Alvin R. Cahn of the University of Illinois. Two small specimens were found with other material but were thought to be pathologic examples of *helicoidea*. They are from Kimmewin Lake, north of Drayton, Ontario. The shells mentioned by Whiteaves (Ottawa Naturalist, XIX, p. 65, 1905) from the Kawinogans River, Ontario, as having the outer half of the last whorl free and partly uncoiled are probably this variety. This was listed as *lewisi*. The same form from the same locality, evidently, was listed in the Annual Report, Canadian Geological Survey, XVI, p. 5, 1906, as *Valvata sincera*, four specimens being noted. Two specimens are noted from the Attawapiskat River.

It is apparent, therefore, that this uncoiled form is a true race or variety of *lewisi* having a wide range in Ontario and possibly occurring in other parts of British America. True

helicoidea is known from the Mackenzie River and Alaska. The variety is common in Shakespeare Island Lake, the collection containing 19 specimens from four dredgings, ranging in depth from four to eight feet, always on a mud and sand bottom, with or without vegetation.

The material was submitted to the writer for determination, with other fresh water species from the same lake, by Miss Myra W. Cronk, of the University of Toronto, Toronto, Canada.

A NEW SUBSPECIES OF POLYGYRA FROM IDAHO

BY H. A. PILSBRY AND JUNIUS HENDERSON

POLYGYRA MULLANI TUCKERI, n. subsp. Pl. 5, figs. 8, 9, 10.

Shell depressed; color medium to dark brown; whorls 5½, closely coiled, increasing gradually in size from apex to aperture; suture well impressed; umbilicus open, but partly covered by the reflected columella; aperture lunate; lip light-brown, expanded, rather thinly so at the periphery, widened toward the columella by slightly-developed lamellae above and below; type specimen exhibiting some irregular, microscopic, spiral striae on the surface, apparently due to slight wrinkles in the epidermis; surface sparcely covered with short, flattened, scale-like, curved hairs, smaller on the base, which are must better exhibited on a well-preserved, immature paratype, but show on all of the specimens examined. Some specimens have a small, triangular, white parietal tooth, others have none.

Type: No. 17001-a, University of Colorado Museum, is non-dentate; greater diameter, not including reflection of lip, 13, lesser diameter 12, altitude 6.5 millimeters. *Cotype No. 1:* Univ. Colo. Mus. No. 17001-b, dentate, diameter 12 by 11, altitude 6 mm. *Cotype No. 2:* Academy of Natural Sciences of Philadelphia, No. 152334; diameter 12.4 by 10.6, altitude 7 mm. Two paratypes are in the collection of their discoverer, Prof. H. M. Tucker, College of Idaho, Caldwell,

Idaho, who obtained them on Clearwater River, near the junction with Fourth of July Creek, northern Idaho, July 30, 1930. The shells at hand are fresh, but no live ones were obtained. The figures 8 and 9 were drawn by Miss Elberta L. Craig, of the University of Colorado Museum.

This form differs from all recognized races of *P. mullani* by the strongly developed hairs of the periostracum. In *P. m. clappi* (Hemph.) there are extremely minute and much closer hairs in places, but all of the other subspecies have the surface smooth and more or less glossy.

A NEW CALIFORNIAN RACE OF MONADENIA

BY S. STILLMAN BERRY
Redlands, California

Among other fine things from the north brought in by those assiduous collectors, Mr. and Mrs. Emery P. Chace, is the very striking new subspecies of the old *Monadenia fidelis* (Gray) briefly described in a preliminary way in the following paragraphs.

MONADENIA FIDELIS PRONOTIS, new subspecies.

Diagnosis: Shell small for the species, heavy, the spire conic and usually well elevated; whorls 6 to 6½. Aperture scarcely descending above, the peristome little thickened or everted above, but more definitely reflected below and with a moderate umbilical flare. Umbilicus more or less covered but usually permeable, its diameter contained about 13 times in that of the shell.

Periostracum almost completely dehiscent on mature shells but where persisting on young specimens showing a well developed spiral sculpture on the upper surface.

Ground color ashy white to dark brown above, zoned by a wide suprapheral band of dark brown and usually one or more lighter bands between this and the suture; base uniformly brown, but the shade varying in intensity in different shells.

Measurements: Maj. diam. 27.5, alt. 18.7, diam. umbilicus 2.0 mm.

Holotype: Cat. No. 6961 of the author's collection. *Paratypes* in the collections of the Academy of Natural Sciences of Philadelphia, Emery P. Chace, and the author.

Type locality: Point St. George, near Crescent City, Del Norte Co., California; occurring alive in some abundance; E. P. and E. M. Chace coll., 25, Aug., 1929.

Remarks: This strongly differentiated maritime race, found under very different habitudinal conditions than the typical form, is so divergent from the other smaller races of *M. fidelis* which have received names as hardly to require any special comparison, and it must doubtless be regarded wholly as an independent offshoot. It is being given more complete treatment in a forthcoming monograph of the Californian snails of this group, but as the appearance of the larger paper has encountered some unanticipated delay, advance notice of this form is felt advisable so that the name may be used in connection with some of the material to be distributed.

TWO NEW HELICOIDS FROM THE MOHAVE DESERT, CALIFORNIA

BY G. WILLETT

MICRARIONTA HUTSONI AMBOIANA, new subspecies. Pl. 7, fig. 4.

Description: Similar in shape and size to *Micrarionta hutsoni hilli* Willett from the Sheep Hole Mountains, about thirty miles to the southward. Differs from *hilli* in somewhat smaller umbilicus, lighter coloration, and narrower and less sharply defined peripherical band. In coloration most like *M. hutsoni desertorum* Pilsbry and Ferriss, but differs from that form in proportionately larger umbilicus and banded periphery. Differs from *M. hutsoni unifasciata* Willett,

from Newberry Springs, in lighter coloration, narrower band, and smaller umbilicus. The color of amboiana is a very light horn—almost white—with a very narrow, brown band at the periphery of the last whorl: color of animal black, with the exception of the middle part of the last whorl, which is smoky gray. Dead, faded specimens of *unifasciata* are very close to living amboiana in coloration, but living specimens of the former are much darker, with wider and more pronounced band.

Measurements of type: Max. diam., 12 mm.; min. diam., 10.3; alt., 6.3; umbilicus, 1.7; number of whorls, 4¼. The largest specimen found (a dead one) has a maximum diameter of 13 mm., and minimum diameter of 10.6.

Type: No. 1029 coll. Los Angeles Museum; paratypes in collection of the writer. The type, two other living specimens and four dead ones were taken by the writer among rocks on a small hill about six miles northwest of Amboy, San Bernardino County, California, February 7, 1931. The type locality is about one mile north of the highway running from Amboy to Needles, and is separated from the ranges of all other known Micrariontas by several miles of desert floor.

HELMINTHOGLYPTA GREGGI, new species. Pl. 7, fig. 3.

Description: Shell thin, rather small, depressed conic in outline; whorls convex, sutures grooved; last whorl descending in front. Aperture nearly round, oblique. Outer lip slightly thickened, reflected, and encroaching somewhat on the umbilicus. Umbilicus small, about one-sixth of minimum diameter of shell. Spiral sculpture absent; entire surface of shell minutely, rather weakly papillated, this papillation being greatly obscured on most of the shell by the crowded growth striae. Periostracum thin, light brown, with a narrow, darker-brown band encircling the periphery.

Measurement of type, in millimeters: Max. diam., 13.5; min. diam., 11.8; alt., 6.8; umbilicus, 2; number of whorls, 4¾. The largest specimen found has a maximum diameter of 14.6, and minimum diameter of 12.3.

Type: No. 1031, coll. Los Angeles Museum. Paratypes in

collection of the writer and A.N.S.P. The type and 21 additional specimens were collected by the writer and his wife in rock slides on the side of a hill, three and one-half miles south of Mohave, Kern Co., California, February 23, 1931. This hill is an isolated outlier to the southeast of the Tehachapi Range, and the type locality is about one-half mile west of the Mohave-Los Angeles highway.

Remarks: The affinities of this shell are plainly with the Mohavean group of Helminthoglyptas hitherto known only from the Victorville region. The distance from the type locality of greggi to the nearest of these species, *H. mohaveana* Berry, is something over fifty miles, and no species of helicoid has been reported from the intervening territory to date. *Greggi* is apparently about the size of *H. graniticola* Berry, but differs from that species in much more depressed form, and wider and more open umbilicus. From *H. mohaveana* Berry it differs in smaller size, more depression and much lighter papillation. From *H. crotalina* Berry, which it resembles in general outline, *greggi* is distinguished by much smaller size, more prominent banding, glossier surface and lighter papillation.

So far as is known to the writer, the closest described helicoid to the type locality of *greggi* is the species recently named *Micrarionta micrometalleus* by Dr. S. S. Berry (Ann. & Mag. Nat. Hist., VI, 1930, p. 189), which is found in Last Chance Canyon, about twenty-five miles northeast of Mohave. A series of this interesting little shell in the writer's collection seem to have more of the aspect of a stunted *Helminthoglypta* than of a *Micrarionta*. The examination of the animal, however, may confirm Dr. Berry's determination.

It is a pleasure to name this species in honor of Dr. W. O. Gregg, the well-known student of California shells.

Los Angeles Museum, Los Angeles, California, February 25, 1931.

LIMA INFLATA AND ITS NEST

BY CHARLES W. JOHNSON

About 1882 while collecting on an extremely low tide around the water battery of old Fort Maria at St. Augustine, Florida, I turned over a large stone just below the low-water mark and in doing so tore apart the nest of this species, exposing to view a beautiful bright orange colored animal, the mantle bearing a profusion of long tentacular filaments. It began opening and closing its shell evidently endeavoring to escape from this new and unexpected enemy. I do not know which was the most surprised the *Lima* or the shell-hunter. Aroused to a high state of excitement over my discovery, I made a little pool near by, so as to watch the gorgeous creature while I continued a fruitless search for another. The species must be very scarce at St. Augustine for it is the only one I found dead or alive during my eight years' residence there.

Some of the species of *Lima* construct a nest of byssal threads, attaching to the threads fragments of shells, gravel and other material, the structure so closely resembling the surroundings as to escape detection. Here it lives comparatively free from prowling fish and other enemies. Among the closely woven portions of the byssal threads are often found a great number of diatoms, many of these have probably been ejected by the *Lima* in the process of feeding. The *Lima* is capable of moving through the water quite actively by opening and closing its valves, but their movement is in the opposite direction from that of the *Pecten*.

This shell has been referred by Dr. Dall to *Lima inflata* Lam., with *L. pellucida* C. B. Adams, as a synonym. The gaping shells of the section *Mantellum* vary so much in form that a careful study of the European and American species seems necessary. In my list of the shells of St. Augustine (NAUTILUS, vol. 4, p. 6, 1890) it was inadvertently referred to *L. tenera*.

MOLLUSKS COLLECTED IN NORTHERN WEST VIRGINIA

BY F. R. WILSON

Biology Department, Marietta College,
Marietta, Ohio

The Biology Department of Marietta College proposed and partly financed a trip into West Virginia, where new territories were opened in the study of the distribution of mollusks. Two days, November 7th and 8th, 1930, were spent in collecting at West Union, Grafton, and Pennsboro. The drought of the past year affected collecting a great deal. However, a small region in Middle Island Creek, located at West Union, submitted a large group of mussels. The creek was dry and most of the mussels had recently died. *Campeloma rufum* was found in abundance, many of them living in the mud of the river bed, some distance from water.

At Grafton collecting was very poor, probably due to drought or high altitude. The streams were contaminated by mine and factory wastes and revealed no sign of living things whatsoever.

I wish to thank David T. Jones, instructor of Biology of Marietta College, who accompanied me on the trip and supervised this study; also, Prof. H. R. Eggleston, who reviewed the collection of mussels. The records from Powhattan Point were collected and submitted by A. Blickle and John Jordan. Two records from Parkersburg were secured by J. W. Miller, and another by Roy Ash; and one record from Williamstown, by Christine Stage.

Many West Virginia mussel records are given in A. E. Ortmann's Monograph of Naiades of Pennsylvania, Part III, Memoirs Car. Mus., Vol. VIII, No. 1, 1919. Previous land records seem rare and extremely scattered. The following list, while not complete, is inserted before the list of our recent collections, for the convenience of future workers:

SOME PREVIOUS WEST VIRGINIA MOLLUSCAN RECORDS

Polygyra tridentata juxtidens Pils. West Virginia: Pilsbry, H. A., A classified catalog of American land shells with localities (continued), THE NAUTILUS, Vol. XI, No. 7, Nov., 1897.

Polygyra fallax (Say) (equals *Helix introferens* Bld.). West Virginia: Pilsbry, as above.

Omphalina kopnodes (W. G. B.). West Virginia: Pilsbry, Class. Catal., THE NAUTILUS, Vol. XI, No. 11, March, 1898.

Gastrodonta interna (Say). West Virginia: Pilsbry, same reference as for *Omphalina* above, p. 132.

Hyalina (now *Striatura* or *Striaturops*) *ferrea* (Morse). Randolph Co., West Virginia: Sterki, Victor, Some notes on Zonitidae, THE NAUTILUS, Vol. VII, No. 2, June, 1893, p. 17.

Vitrea (now *Glyphyalinia*) *rhoadsi* Pilsbry. Wirt Co., West Virginia: Fox, Wm. J., Pilsbry, H. A., New American land shells, NAUTILUS, Vol. XII, No. 9, Jan., 1899, p. 102.

Zonites (now *Paravitrea*) *capsella* (Gould). Mountains of West Virginia: Binney, W. G., Man. Am. Land Shells, p. 221, 1885.

Pyramidula (now *Anguispira*) *alternata mordax* (Shuttl.) West Virginia, Pilsbry, H. A., Class. Catal., NAUTILUS, Vol. XI, No. 12, April, 1898, p. 140.

Planorbis bicarinatus Say (now *Helisoma antrosa* [Conrad]). West Virginia records: Four miles from Romney; Kanawha River, forty miles south of Ohio River, Wirt Co.; North River, Sedan, Hampshire Co.; Warm Spring Creek, Morgan Co.; Salt Sulphur Spring, Monroe Co.; Patterson's Creek, Mineral Co.; Potomac River, Cherry Run (Pils.); Potomac River, Harper's Ferry (Walker). Walker, Bryant, Notes on Planorbis II, *Planorbis bicarinatus*, THE NAUTILUS, Vol. XXIII, No. 2, pp. 27-28, June, 1909.

Sphaerium ohicnse Sterki. West Virginia: Baker, F. C., Moll. of Wis. II, p. 341, 1928.

Recent Collections in West Virginia

The numbers in parentheses below refer to the number of specimens taken.

Polygyra albolabris (Say). West Union in Doddridge Co. (2).
Polygyra hirsuta (Say). Grafton in Taylor Co. (2); West Union (11); Pennsboro in Ritchie Co. (1).
Polygyra monodon (Rackett). West Union (2).
Polygyra pennsylvanica (Green). West Union (one identifiable fragment).
Polygyra profunda (Say). Powhattan Point on Ohio River in Marshall Co. (4).
Polygyra thyroides (Say). Williamstown in Wood Co. (1); West Union (4); Pennsboro (2).
Polygyra tridentata (Say). Neal's Hollow near Parkersburg in Wood Co. (1); West Union (15 adults, 1 juvenile); Pennsboro (6); Powhattan Point (4).
Cochlicopa lubrica (Müller). West Union (1).
Haplotrema concavum (Say). West Union (5); Powhattan Point (4).
Mesomphix cuprea (Raf.). Powhattan Point (1).
Mesomphix inornata (Say). Powhattan Point (many); West Union (12 adults, 1 juvenile); Grafton (4).
Glyphyalinia indentata (Say). West Union (6).
Paravitrea lamellidens (Pilsbry). West Union (2).
Paravitrea multidentata (Binn.). West Union (2); Pennsboro (2).
Paravitrea capsella (Gould). Grafton (3, hardly mature).
Zonitoides arboreus (Say). Parkersburg (3).
Gastrodonta intertexta (Binn.). West Union (2).
Gastrodonta ligera (Say). Grafton (2).
Agriolimax agrestis (L.). West Union (3).
Agriolimax campestris (Binn.). West Union (1); Grafton (1).
Philomycus carolinianus (Bosc). Parkersburg (1).
Pallifera dorsalis (Binn.). Pennsboro (1).
Anguispira alternata (Say). Powhattan Point (1).
Succinea ovalis Say. West Union (1 juvenile and 2 identifiable fragments).

Helisoma antrosa (Conrad). Pennsboro (7); West Union (1).

Physa gyrina Say. Pennsboro (8).

Physa integra Hald. West Union (18).

Ferrissia parallela (Hald.). West Union (2).

Campeloma rufum (Haldeman). West Union (many); embryonic shells of same also secured and examined.

Somatogyrus integer (Say) var. West Union (3).

Amblema costata (Raf.). Middle Island Creek near West Union (5).

Fusconaia flava (Raf.). Middle Island Creek near West Union (many); animal observed to be reddish.

Pleurobema coccineum (Conrad). Middle Island Creek near West Union (1).

Elliptio dilitatus (Raf.). Middle Island Creek near West Union (1).

Strophitus rugosus (Swainson). Middle Island Creek near West Union (6); salmon-colored nacre in umbones.

Anodonta grandis (Say). Middle Island Creek near West Union (1).

Lasmigona costata (Raf.). Middle Island Creek near West Union (2).

Obovaria subrotunda (Raf.). Middle Island Creek near West Union (11).

Eurynia iris (Lea). Middle Island Creek near West Union (1).

Lampsilis siliquoidea (Barnes). Middle Island Creek near West Union (many). More males than females. Two old specimens resemble *Actinonaias carinata* (Barnes).

Lampsilis ventricosa (Barnes). Middle Island Creek near West Union (many).

Sphaerium striatinum (Lam.). Middle Island Creek near West Union (very many). The most abundant species found.

NOTES ON WEST INDIAN VERONICELLIDAE

BY H. BURRINGTON BAKER

Veronicella (*Tenacipes*) *tenax*, from western Cuba, is described as a new section and species on account of its aberrant anatomy. The penis of *Vaginulus* (*Sarasinula*) *plebeius*, from Trinidad, B. W. I., is described and figured. Brief outlines of the Old World genera *Imerinia* and *Filicaulis* are also included.

VERONICELLA (TENACIPES) TENAX, new section and species. Plate 8, figs. 3-5.

This slug was obtained by Dr. Henry A. Pilsbry during the summer of 1928, from cliffs on the north side of Cueva de Tiburón, Ensenada de San Vicente, Pinar del Rio, Cuba (type locality) and also from similar rock-faces in the mogotes near Viñales, Pinar del Rio. According to his field notes, it lived on the exposed, vertical faces of the cliffs, to which it clung so tenaciously that, without use of a knife, he was unable to dislodge animals that had braced themselves. He noticed that the living slug appeared softer, was far larger (6 inches in length) and secreted a more glutinous mucus than *V. floridana*. Besides, the latter was a more secretive animal, that was usually found, at least during the day, under rocks and boards, especially in the vicinity of cultural conditions.

The following description is made from specimens preserved in alcohol; the anatomy has many features in common with that of *V. floridana* (Leidy) and only divergent details will be noted.

Notum: relatively broad and low; dorsum slightly arched; hyponotum and sole forming a plane surface; back velvety or with small papillae, drab in color, with minute points and small spots of whitish, sometimes blotched (especially in young specimens), with large and irregular patches of black pigment, but without longitudinal bands; hyponotum broad, somewhat lighter and uniform in color. Sole: considerably shorter than notum and completely surrounded by hypo-

notum; relatively narrow, with sides almost parallel; truncate anteriad and rounded posteriad; crossed by numerous, fine, transverse grooves; greenish drab. Head and tentacles: deep bluish black. Anus: conspicuous, as in *Leidyula*.

Hermaphroditic duct: as in genus, coarsely convoluted, constricted where it passes into tubular carrefour (called spermoviduct in my 1925 paper) ; talon only represented by swollen apical loop of carrefour. Uterus: slightly swollen apically into a thick-walled sac, which receives slender oviducal connecting duct from carrefour and duct of albumen gland; principal loop coiled into a dextral spiral with sacculate apical and more slender basal limbs juxtaposed. Spermatheca (fig. 3) : sac flattened subspherical, large; stalk medium in length, contractile, not extensively looped or spirally wound. Vagina: short, unswollen, entirely sheathed in body wall; without accessory bursa. Vas deferens: first free region quite stout; second more coarsely convoluted, entering base of verge. Canalis junctor: medium in length, stouter than continuation of vas deferens, joining spermatheca near base of stalk. Penis (figs. 4, 5) : relatively very small. Verge: stout cylindrical; chalky-white glans mammilliform, with crescentic orifice on its right dorsal surface; spiral ridges very prominent, left one looped around at about two-fifths length of verge from base; anterior three-fifths with accessory, longitudinal ridges. Vergic retractor: short and stout; lateral margins curled ventrad near insertion around base of verge, so as to form a sheath through which vas deferens enters; origin from body wall about 7 mm. (one-half distance between heart and mid-ventral line) in front of and mesiad to pericardium. Dart retractors: two; origins laterad and mesiad to that of vergic retractor; branching distally to insert on short basal sheath of dart tubules. Dart-papilla: short, abruptly acuminate. Dart-gland tubules: very numerous (98 counted in type; 94 in a paratype) ; outer third of them (33 and 37) long (slightly over half length of notum) ; inner two-thirds (65 and 57) only about one-third as long (one-sixth to one-seventh length of notum) ; inner and

shorter ones swollen at tips and sometimes bifucate or even trifid.

Pedal nerves: divergent at level of anterior end of pericardium.

DIMENSIONS

	Notum		Sole		Female Opening Distance from	
	Long	Wide	Long	Wide	Ant. end	Foot
Type	100	52(52)	87(87)	17(17)	53(53)	21(4.8)*
Paratypes	96	47(45)	90(86)	18(17)	54(52)	18(5.6)
Viñales	105	50(53)	84(88)	18(19)	52(55)	19(5.3)

*The distance of the female opening from the pedal groove (foot) is expressed as a precentage of the total width of the hyponotum with its reciprocal ("Querindex") in parentheses.

Veronicella tenax is evidently quite closely related to the section *Leidyula* H. B. B. (1925, Proc. Acad. Nat. Sci. Philadelphia 77: 158), but completely lacks the accessory vaginal bursa of that group. Also, its verge develops much stronger, spiral ridges and its dart-papilla possesses about 4 times as many tubules, which are peculiarly differentiated into a long outer and a short inner series. Although this new species agrees with *Veronicella* s. s. in the absence of the accessory bursa, its spirally ridged, small verge and relatively short, stout spermathecal stalk are more similar to these structures in *Leidyula*. In the peculiar truncation of its verge, caused by the transverse loop of the principal (left) spiral ridge, *V. tenax* also distinctly resembles the typical group of *Angustipes*. As it differs from these other groups by such important characters, it is made the type of a new section, *Tenacipes*.

In a recent paper (1928, NAUT. 42: 46), I doubtingly suggested that "If '*Belocaulus sloanei*' does completely lack the vaginal pouch, it would be a species that I have 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 *V. floridana*." Dr. Pilsbry's discovery of a new Cuban species, obviously related to *Leidyula*, but without the accessory vaginal bursa, now forces me to admit that the first proposition, at least, seems quite probable; *V. tenax* does

agree with Hoffmann's *"Belocaulus sloanei"* (1925, Jena. Zeitschr. 61 : 249) in these particulars, and also in the absence of black notal bands. As the name *"sloanei"* is untenable, further comparison seems unnecessary.

In passing, attention is called to a new synonym of *Leidyula: Cylindrocaulides* Strand (1928, Arch. Naturg. Abt. A. 92 [8] : 69), type *Vaginula moreleti* C. et F. Strand apparently launched this substitute for *Cylindrocaulus* Hoffmann with the haphazard hope that he might appear as an "authority" on a subject about which he evidently knew nothing.

VAGINULUS (SARASINULA) PLEBEIUS (Fischer). Plate 8, figs. 1 and 2.

Vs. plebeius Fischer (1868, Jour. de Conch. 16: 145), Nouméa, New Caledonia. *Sarasinula plebeja* G. & H. (1925, Zeitschr. wiss. Zool. 124: 25, fig. 10) ; G. & H. (1925a, Nova Caledonia, Zool. 3 (3) : 357, figs. 2-9; pl. 6, figs. 1-3) ; Hffm. (1925: 251, pl. 6, figs. 45 i, 2).

Va. dubia Smpr. (1885, Reis. Arch. Phil. 2 (3) : 296, pl. 26, fig. 12), St. Thomas; *Vs. dubius* H. B. B. (1925: 179, pl. 6, fig. 27), Antigua.

At the time of my 1925 paper, I had not examined Grimpe and Hoffmann's (1925a) more detailed account of the anatomy of *"S. plebeja"*. Recently, Dr. T. D. A. Cockerell has kindly sent me for examination some specimens collected by him at Bourail, New Caledonia. In addition, Mr. W. E.

DESCRIPTION OF PLATE 8

All figures are made with aid of camera lucida. Uppermost scale is for fig. 1 and represents one millimeter; lowest is for figs. 3 and 5 and indicates a length of five millimeters.

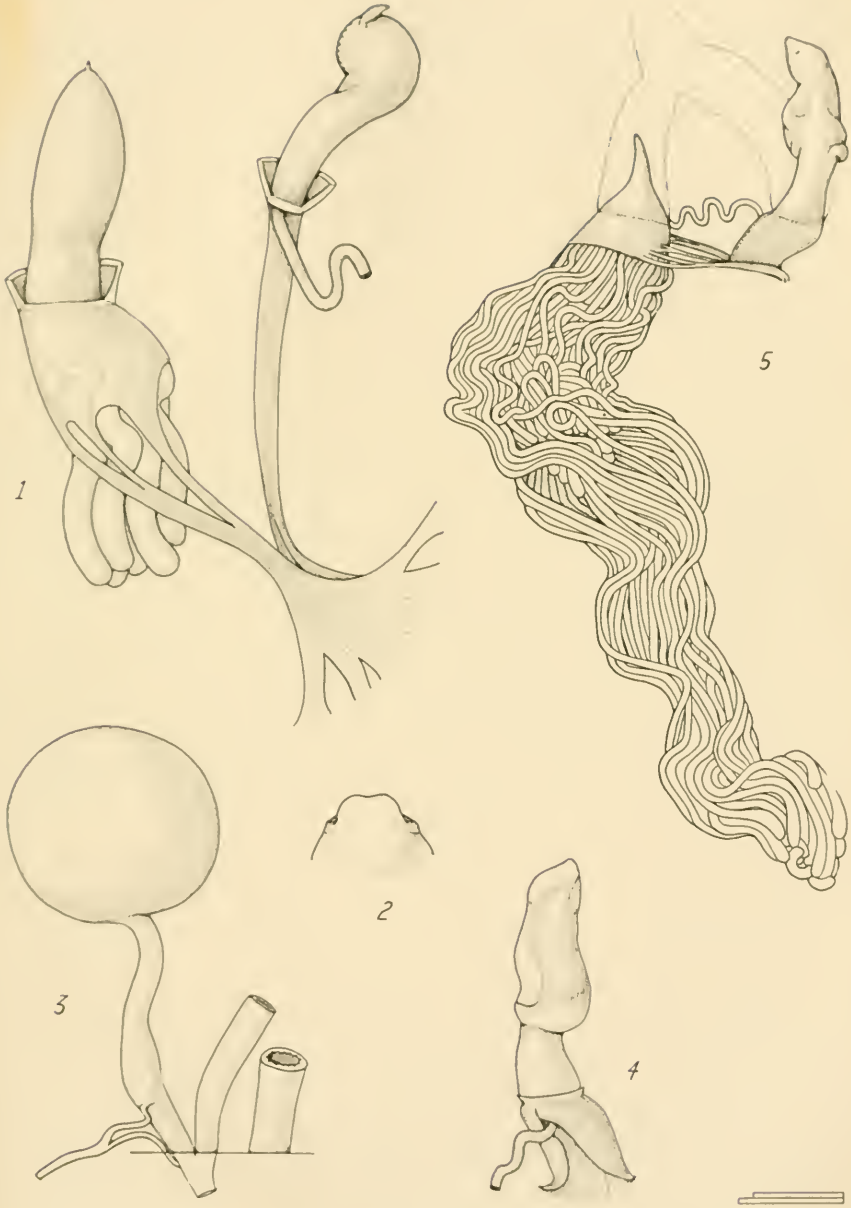
Fig. 1. *Vaginulus* (*Sarasinula*) *plebeius* (Trinidad, B. W. I.). Penis and accessories after removal of outer wall of vergic and dart sacs. Verge and dart-papilla are viewed from their right sides.

Fig. 2. *V. plebeius*. Tip of verge, dorsal view.

Fig. 3. *Veronicella* (*Tenacipes*) *tenax* (type, Pinar del Rio, Cuba). Terminations of female genitalia, dorsal view. Horizontal line represents cleft where organs enter body wall.

Fig. 4. *V. tenax*. Verge and its retractor, turned back and viewed from ventral side.

Fig. 5. *V. tenax*. Penis and accessories after dissection, dorsal view. Outline of penial wall shown by dotted lines.



H. B. Baker: West Indian Veronicellidae

Broadway has contributed a series from Trinidad, British West Indies. A careful comparison of these two lots with the specimens from Antigua shows no significant differences, just as Grimpe and Hoffmann have previously decided. However, the necessity for a trans-Pacific land-bridge to explain this wide distribution seems very dubious; more probably, *Vaginulus plebeius* is an American species, which has been accidentally introduced into the Pacific and Mascarene Islands during recent times.

Also, the verge (fig. 1) in both the New Caledonian and Trinidad specimens shows the characters which I believed distinctive of *dubius* from Antigua. Its shaft is compressed dorsoventrally and is concave on the dorsal side so that its lateral margins, from this view, appear thickened, although actually they are compressed into weak wings, which become almost obsolete on the sides of the rounded head. On either side of the dorsally-directed apex, these wing-like ridges again appear as the outer supports of a prominent lip, which usually hides the external orifice. As viewed in profile, this lip looks like a papilla, but in dorsal (fig. 2) or ventral view, is seen to be a broad, weakly emarginate flap. The single dart-papilla retractor expands posteriad to cover that of the verge; the combined origins are very broad and are redivided into a number of radial bands.

Dimensions

New Caledonia,						
Largest	38	47(18)	97(37)	10(4)	58(22)	47(2.2)
Trinidad,						
Figures (largest)	29	60(17.5)	93(27)	14(4)	59(17)	43(2.3)
Next largest slug	26.5	60(16)	94(25)	17(4.5)	57(15)	50(2)

As *Angustipes* is used here as a subgenus of *Vaginulus*, with *Angustipes* s. s. and *Sarasinula* as sections, a more complete explanation of my position in regard to the prior name, *Imerinia*, seems to be in order. Unfortunately, I have been unable to examine the African species, but Simroth (1913, Voeltzkow, Reis. Ostafrika 3(3) : 129-216, pls. 13-17) has described and figured the detailed anatomy of many of them.

All of the species which he included in his Armatae (p. 203) have a double spermatheca quite unlike that in *Angustipes*. Largely on this basis, I believe that *Angustipes* and *Imerinia* should be kept in distinct genera; also, the former is an American group and the latter centers around Madagascar. For these two groups, the following classification is proposed:

Genus *Vaginulus* Férussac.
  Subgenus *Angustipes* Colosi.
    Section *Angustipes* s. s., type *Va. difficilis* Colosi.
      syn. *Belocaulus* Hffm., t. *Va. angustipes* Heynemann.
    Section *Sarasinula* G. & H., t. *Vs. plebeius* Fischer.
      1. *V.* (*Sarasinula*) *plebeius* (Fischer).
      2. *V.* (*S.*) *linguaeformis* (Smpr.).
      3. *V.* (*S.*) *laurentianus* (Colosi).
      4. *V.* (*S.*) *erinaceus* (Colosi).

Genus *Imerinia* Cockerell.
  Subgenus *Imerinia* s. s.
    Section *Imerinia* s. s., t. *Va. grandidieri* (C. & F.)
      syn. *Rhopalocaulis* Srth., same type.
    Section *Flagellicaulis* Srth., t. *Va. grossa* Heynemann.
      syn. *Spirocaulis* Srth., t. *Va. lactea* Srth.
    ?Section *Desmocaulis* Srth., t. *Va. subaspera* Fischer.
      syn. *Curticaulis* Srth., same type.
  Subgenus *Drepanocaulis* Srth., t. *Va. braueri* Srth.
    syn. *Prismatocaulis* Srth., t. *Va. voeltzkowi* Srth.

Key to Groups of *Angustipes*

A. Verge without S-shaped curve, greatest width usually below middle of length. Sect. *Angustipes* Colosi.

AA. Verge (as view laterally) with S-shaped curve; greatest width usually above middle of length. Sect. *Sarasinula* G. & H.

Key to Groups of *Imerinia*

A. Secondary spermathecal sac joining base of primary one.
  B. Primary spermathecal sac not fused with uterus; verge large and armed. Subg. *Imerinia* Ckll.

C. Verge with flattened apical region, which develops bosses. Sect. *Imerinia* s. s.

CC. Verge attenuate apically, armed with slender papillae. Sect. *Flagellicaulis* Srth.

BB. Primary sac fused with uterus; verge vestigial? ?Sect. *Desmocaulis* Srth.

AA. Secondary spermathecal sac mounted on primary one; verge papillate. Subg. *Drepanocaulis* Srth.

As may be seen from the above, my use of the genus *Imerinia*, although founded on characters of the spermatheca instead of those of the verge, coincides with Simroth's Armatae, except for the additional inclusion of his *Curticaulis* (=*Desmocaulis*). According to Hoffmann (1925: 212), Simroth's (1913: 159, pl. 16, figs. 106-110) account of the anatomy of *I. subaspera* (type of *Desmocaulis*), may have been founded on a young specimen of *I. grandidieri*.

Also, Simroth's Inermes (minus *Curticaulis*) are contained in what I regard as the genus *Filicaulis* Srth., which also includes *Vc. bleekeri* Keferstein, the type of *Vanigula* G. & H. This genus *Filicaulis* is divided into two well-marked subgenera: *Eleutherocaulis* Srth. (Hoffmann's expanded *Meisenheimeria* G. & H.) and *Filicaulis* s. s. (including Hoffmann's *Vanigula seychellensis* and his *V. bleekeri*). In an earlier paper (1925, NAUT. 39: 18), I followed Pilsbry's use of *Laevicaulis* in preference to *Eleutherocaulis*, but now realize that Simroth's own use (1913: 202) of the latter as the ranking term makes *Eleutherocaulis* the valid name and *Laevicaulis* the synonym.

VAGINULUS (LATIPES) OCCIDENTALIS OCCIDENTALIS (Guilding).

Mr. W. E. Broadway has sent me a series of this form from Trinidad, British West Indies. The largest specimen supports Guilding's statement that this species is oviparous; the uterus is greatly distended by numerous large eggs, each in a gelatinous capsule. A young specimen, sent me by Dr. Clench of the Mus. Comp. Zool., Cambridge, and collected Mar. 7, 1927, by George Salt at Sevilla, Colombia, also appears to be this subspecies.

SOME TYPE DESIGNATIONS IN HELICES AND FERUSSACIDAE

BY H. A. PILSBRY

My attention has been called to certain type designations which affect the nomenclature of several groups ranked as subgenera of *Pleurodonte* in my volume on helicid classification (Manual of Conchology IX). This volume was written a long time ago (1894), before the present rules for type fixation were formulated, and when the best authorities clung to the fallacious method of arriving at a type by "elimination". Hence changes from this source, as well as from the finding of forgotten names, are not surprising. I am indebted to Dr. H. Burrington Baker and Dr. Witmer Stone for suggestions bearing on the nomenclature considered.

PLEURODONTE F. de Waldh., 1808. Type *Helix lychnuchus* Müll., designated by Herrmannsen Ind. Gen. Malac. II, p. 297. It will thus pertain to the Section called *Caprinus* Montf., 1810, of Man. Conch., vol. 9, p. 90. *Lucernella* Swainson, 1840, p. 330, mt. *L. hippocastaneum*, is a synonym.

CAROCOLLA Schumacher, 1817, Essai, pp. 59, 192. Type here designated *C. gvaltieriana* (*Helix gualtieriana* L.). The name becomes a synonym of *Iberus* Denys de Montf., 1810.

DENTELLARIA Schumacher, 1817, Essai, pp. 69, 230, is virtually monotypic; his first species, *D. globularis* was not defined, leaving the type *D. sinuata* (=*Helix sinuata* Müller). *Lucerna* Swainson, 1840, tsd. *Helix acutissima* Lam., Herrmannsen, I: 628, is a synonym, or at least, based on a species of the same group.

Leiostoma Swainson, 1840, Malac., p. 328, (*Helix jamaicensis* here designated type), is a homonym of *Leiostoma* Swainson l. c., p. 308, mt. *L. bulbiformis* (=*Fusus bulbiformis* Lam.).

DISCODOMA Swainson, 1840, p. 329. Type here designated *D. albilabris* (=*Carocolla albilabris* Lam.). Herrmannsen (I:394) named *Helix lampas* Müller as type. This name is not contained in Swainson's list, therefore it cannot be the

type, although the species *D. gigas* Swainson has been recognized as identical with *H. lampas*, being based on figures which have been referred to that species.

THELIDOMUS Swainson, 1840, pp. 191, 192, 194, 330 (not pp. 228, 353). The only species Swainson mentioned by name is "*T.* (*Helix*) *striolata* Guild." (p. 330), which was never described by Guilding, and was not defined until 1848, by being placed in the synonymy of *Helix incerta* Fér. by Pfeiffer (Mon. Hel. I, 266). However, Swainson added after *striolata* Guild. "also Fér. Moll. 44, f. 1-4". These figures represent *Helix aspera* Fér., which, it appears, will have to be taken as type of *Thelidomus*.

Herrmannsen (II: 571-2) restricted *Thelidomus* to the neuropterid larva case figured by Swainson, and thought that the use of that name by Swainson on the pages first cited above was an error for *Thelidonta* (which Swainson mentions only once, on page 194, without any species or definition). This opinion of Herrmannsen's may or may not be correct, being incapable of proof. He cited *Helix aspera* Fér. as the type of *Thelidonta* (+*Thelidomus*).

Thelodomus and *Thelodonta* Herrmannsen and *Thelydomus* Agassiz are suggested emendations of Swainson's names.

It may be mentioned here that *Hemicycla* Swainson, commented on without mention of any species on page 193, is stated by Swainson in his Errata to equal *Polygyra*. This might also be inferred from his remarks. He used *Hemicycla* in another sense on page 331, and since a type is named there, this second use of the name will have precedence, as the date is the same, 1840. *Cyclodoma* Swains., p. 193, may be presumed from his remarks to be *Daedalochila* or *Triodopsis*, at least mainly. He mentioned no species or type, and abandoned the name later.

The practical effect of these type fixations will be as follows:

Pleurodonte s. str. will stand for the group I called *Caprinus* in Man. Conch. IX, p. 90.

Dentellaria will replace *Pleurodonte* (Man. Conch. IX, p. 87) as a subgeneric name for the Jamaican group.

Thelidomus will replace *Dendrocochlis* Pils. for the Jamaican group of *Helix aspera* and *H. cognata* Fér.

Granodomus, type *Helix lima* Fér., is a new subgenus for the Porto Rican and Virgin Island species formerly placed in *Thelidomus;* for definition see Man. Conch. IX, p. 96, under *Thelidomus.*

The other cases are believed to affect synonymic references only.

The type of *Macrospira* Swainson (1840, Malacology, p. 171, 335). Dr. H. Burrington Baker has called my attention to the fact that no type has been selected for this group. Swainson attributed the name to Guilding, but it was never described by that author. Two species were included, thus: "M. octona (*Helix octona* Auct.) aperta *Guild* (fig. 97, *e, f*)." *Helix octona* Gmelin, which seems to be what Swainson intended, has as first reference Müller's *Buccinum acicula.* As a var. B he gave a reference to Chemnitz's figure of *Subulina octona.* Swainson evidently intended the first, and *M. octona* (=*Cecilioides acicula* Müll.) is here named as type of *Macrospira. M. aperta* Guilding has been defined only by Swainson's poor figures; in the absence of dimensions or locality I have considered these figures to be insufficiently diagnostic of the well-known *C. gundlachi* (Pfr.), although E. A. Smith in 1895 found specimens labelled *M. aperta* from Guilding in the British Museum, which are identical with *C. gundlachi.*

PUBLICATIONS RECEIVED

CEPHALOPODS OF THE GENUS ATURIA FROM WESTERN NORTH AMERICA. By Hubert G. Schenck. (Univ. Calif. Pub. Bull. Dept. Geol. Sci., vol. 19, pp. 435-490, pls. 66-78, 1931.) A most interesting account of this group of Nautiloid shells. Some 38 species and varieties of the cosmopolitan genus have been named from formations ranging from the

Cretaceous to lower Pliocene. On the Pacific Coast they are found from the Cretaceous to middle Miocene. The author does not think that Hercoglossa forms a transition from Nautilus proper to Aturia, as anatomical evidence shows that Nautilus is a very primitive form. Chemical and optical tests shows that the outer porcelaneous layer of both Nautilus and Aturia is of calcite, whereas the septa are all aragonite. One new species and two new subspecies are described and figured.—C. W. JOHNSON.

AN APPARENTLY EXTINCT EUGLANDINA FROM TEXAS. By T. D. A. Cockerell. (Proc. Colorado Museum of Nat. Hist. Tx., No. 5, Dec. 16, 1930.) *Euglandina exesa*, new species, was taken from a cinnabar mine about 90 miles north of Alpine, Texas. [The cinnabar mines are south, not north, of Alpine.] The shell was found in an old-filled limestone crevice deposit about 350 feet below the surface. It has some resemblance to *E. rosea parallela* and the Mexican *E. coulteri* (Pfr.) and measures about 71 mm. long, 24.5 mm. wide.

NEW SPECIES OF PARTULA. By C. Montague Cooke, Jr., and Henry E. Crampton. (Bernice P. Bishop Museum Occasional Papers, vol. 9, No. 11, Dec., 1930.) *Partula cytherea*, Tahiti, *P. lanceolata* Mango I., Fiji, *P. thurstoni* Ofn I., Samoa, and *P. montana*, Upolu, Samoa, are described and figured. *P. lanceolata* is important as the third species known from the Fiji group. It is related to *P. lirata* Mouss. *P. nematoraphe* Pils., the habitat hitherto unknown, was collected on Moala Island, Fiji, by E. H. Bryan, Jr. The two Samoan species are interesting additions to the group containing *P. stevensoniana*.—H. A. P.

LAND SHELLS FROM LUBANG ISLAND, PHILIPPINES. By William J. Clench and Allan F. Archer. (Occas. Pap. Boston Soc. N. H., vol. 5, 1931.) *Helicostyla cincinniformis* subsp. *lubanensis, ultima* and *demesana, Leptopoma kejong, Cyclophorus reevei lubanicus, Helicina ignava* and *H. ignava tablasensis* are described as new.

A New Mollusk of the Genus Pupoides from Southern Utah. By Ralph V. Chamberlain and Elmer Berry. (Proc. Biol. Soc. Washington 44: 7, Feb. 21, 1931.) *Pupoides cupleura*, from the Henry Mountains, also found at Cannonville, Utah, does not appear to differ in any way from *P. hordaceus* (Gabb). The authors were probably misled by Binney's figure, which represents (or misrepresents) a species of *Gastrocopta*, not Gabb's species.—H. A. P.

Studies of African Land and Freshwater Mollusks: I, On some African species of Bulinus. By Joseph Bequaert and W. J. Clench. (Occas. Pap. Boston Soc. N. H., vol. 5, 1931.) Eighteen species are discussed, twelve figured. As some of these snails are hosts of trematodes, their proper discrimination is important in medical science as well as in zoology.

A Bibliography of the Recent Mollusca of Maine—1605-1930. By Norman W. Lermond and Arthur H. Norton. (Maine Naturalist, vol. 10, pp. 49-73, 1930.) This covers the first part of a very comprehensive and useful bibliography of the publications pertaining to the Mollusca of the State.

The Land Snail Genus Haplotrema. By H. Burrington Baker. (Proc. Acad. Nat. Sci. Phila., vol. 82, pp. 405-425, 1930.) The constant changes in nomenclature keeps one guessing, with some fifteen different generic and subgeneric names applied to the old "Circinaria". It has been a long race, we hope for the end, now that the anatomy has been so thoroughly worked out. With only one species, *H. concavum* (Say), in New England, I naturally turned to see how it had fared in this section. Not a single record for the typical form (17 mm.) and only one ("Maine") for the var. *minus* Ancey. Specimens before me from Bethel, Me., St. Johnsbury, Manchester and Bolten Mt., Vt., all measure 14 mm., while those from Jackson, N. H., are 12 mm. in diameter. These should no doubt all be considered *minus*, although the type of that variety is only 11 mm. diameter—C. W. Johnson.

NOTES AND NEWS

DR. C. MONTAGUE COOKE, JR., has been appointed a Trustee of the Bernice P. Bishop Museum. Dr. Cooke has served on the staff of the Museum as Malacologist since 1902.

A NEW NAME IN POTAMOPYRGUS.—*Aroapyrgus* is substituted for *Aroa* H. B. B. [1930, Oc. Papers Mus. Univ. Mich. 210: 35; not Walker 1855, List Lep. Brit. Mus. 4: 791] which was proposed as a subgenus of *Potamopyrgus*, with tod. *P. ernesti vivens* H. B. B. (1930: 33) from Boquerón, Venezuela. The shell of *Aroapygrus* is without spines and its penis lacks papillae.—H. BURRINGTON BAKER.

LYMNAEA (RADIX) AURICULARIA L. IN IDAHO.—I have just received from Professor Harold M. Tucker, of the College of Idaho, at Caldwell, a single fresh, unweathered shell of this species, which was found by him about September 1, 1930, in the Snake River at Homedale, Idaho. How it arrived there is not yet explained, but it seems to add another state to those into which the species has been introduced.—JUNIUS HENDERSON, University of Colorado.

THE TYPE OF SULCASTRUM.—Dr. Sterki did not explicitly name a type in his proposition of this group (NAUTILUS 43: 93). *Sphaerium sulcatum* (Lam.) is here designated the genotype.—H. A. PILSBRY.

POLYGYRA ESPILOCA ("Rav." Bld.) AT BEAUFORT, N. C.—Three specimens were found in January, 1931, on the N.E. outskirts of the town, about 100 yards from shore of bay, at edge of dense thicket of holly (*Ilex vomitoria*). This spot is rather damp and shady. Specimens were found under dead leaves and grass. This find extends the range of *P. espiloca*, not known before from north of Wilmington, N. C., I believe. —W. E. BURNETT.

I AM SORRY TO INFORM YOU that on February 12th, at 11.20 a. m., a fire broke out within the roof of the building of the Geological Institute of the Kyoto Imperial University. Rapidly spreading, it destroyed all the roofs and the ceilings, together with some rooms. The fire is attributed to the leak-

age of an electric circuit. Mr. T. Kuroda, the representative officer of the Malacological Society of Japan, lost his private specimens of rare shells, including many of new species which were not yet described. The Institute removed temporarily to the Zoological Institute which stands adjacent to the former. The February Number (vol. 2, No. 4) of the "Venus" was already in press, and will be issued as usual.—IWAO TAKI, Zool. Institute.

We hear of this loss to science and to our friend Kuroda with deep regret.—H. A. P. and C. W. J.

A UNION OF AMERICAN CONCHOLOGISTS

There seems to be a general feeling that the organization of a union or society of American shell collectors and workers on mollusks is needed to stimulate the study of our fauna. Mr. N. W. Lermond, who during his winter sojourn in Florida has corresponded extensively with conchologists as Secretary pro tem. for the proposed organization, has printed a list of 168 who have signified their intention to become members. No doubt there are others who will join. Names should be sent to Mr. Lermond or the Editors of this journal.

It is proposed to hold the first meeting at the Academy of Natural Sciences of Philadelphia on Thursday, Friday and Saturday, April 30, May 1 and 2, the first session at 2.00 P. M. April 30. All interested in shells are urged to attend. Besides papers or talks by leading malacologists already arranged, there will be opportunity for communications and discussions on any phase of shell study and collecting. Facilities will be given for exhibits, which it is hoped will be numerous. Bring along anything interesting you have collected.

It is proposed to make the Robert Morris Hotel, 17th and Arch Sts., the hotel headquarters. It is near railway terminals and Academy.

Those expecting to attend should notify Dr. Pilsbry, Academy of Natural Sciences, Logan Square, as soon as possible.

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MORRIS E. CARUTHERS, 120 E. Chestnut St., Glendale, Calif.

WANTED: Melanidæ, Physidæ and Planorbidæ of the world. Will exchange local or foreign material for same. WILLIAM J. CLENCH, Museum of Comparative Zoology, Cambridge, Mass., U. S. A.

WANTED: Planorbis of the Helisoma group especially from Florida, Louisiana and other Southern States. Material will be either paid for or received in exchange. F. C. BAKER, Natural History Museum, University of Illinois, Urbana, Ill.

WANTED: Back Volumes and Numbers of THE NAUTILUS. Especially Vols. 3, 4, 18, 20, 21, 22, 23 and 24. Address

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