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THE NAUTILUS.

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SHELL-COLLECTING ON THE MOSQUITO COAST OF NICARAGUA—VI.

BY W. H. FLUCK.

Tellina (*Eurytellina*) *angulosa* Gmel. Abundant on the beach all along the coast from Bluefields to Cape Gracias à Dios. The dead shells found were almost always in perfect condition, not even the hinge ligament injured. Live shells in the shallow water on quiet days. This is the most highly colored bivalve on the cost.

Tellina (*Cyclotellina*) *fausta* Donovan. Plentiful in the shallow water about the Man of War Keys.

Sanguinolaria (*Psammotella*) *operculata* Gmel. A common shell on the sandy beaches of the Mosquito Coast. Walpa Siksa is a good locality for it. This very beautiful shell is not as brilliant as *T. angulosa*, but is larger.

Sanguinolaria rosea Lam. This beautiful pink shell is by no means numerous along the east coast of Nicaragua. I searched the beach and shallow water almost daily for four years, but succeeded in finding four specimens only. It inhabits deep water, possibly. It is altogether too fragile to stand the pounding of the surf.

Asaphis deflorata Linn. Abundant in the shallow sea and pools at King's Keys and the other islands along the coast. It seems to be variable in color, being pink, cream, blue, and white.

Strigilla carnaria L. Very abundant. I found two sizes; large, full-grown forms fairly plentiful, and young, brighter colored half-sized specimens, in large quantities. They occurred thus so regularly that I was persuaded they were two distinct species. I felt the more certain of this since in the larger forms the ligament was in

every case more deeply seated. However, both Mr. C. W. Johnson and Dr. W. H. Dall assured me that the smaller form was young and the larger "typical."

Iphigenia braziliensis Lam. My specimens, with the exception of a few dead shells, were found at or near the mouth of the Wawa river, where it is plentiful. It is a dweller of estuaries.

Donax denticulatus L. This is by far the most abundant bivalve on the Caribbean coast of Nicaragua. All the native children, Indian, Creole, as well as the Spanish speaking ones gather it in large basketfuls for the family larder. At low tide these beautiful "wedges" are to be seen all over the beach in favorable places, sitting up in the sand, thin end (posterior) down, with about one-third of the broad anterior exposed, the shell a little open and the siphons at work with every rush of the water as the waves come in and roll out. *Donax* is either stupid or without fear, for it seldom trys to escape by digging, on being approached, as do the *Solens*. The shell is very variable in color and radiations. I have a series of about 25, all different. Wounta Haulover.

Donax cayennensis Lam. Inhabits the same localities and the same sandy stations between tides as the former, but it is not anything like as numerous. It is a larger shell than *denticulatus*, with a more angular anterior ridge, and is more uniform in color, not varying much from pure white, although some specimens tend to bluish, yellow, or purple. Prinzapolka was the first locality at which I found this shell, but one always find them wherever *D. denticulatus* is to be had. A very good authority wrote me some time ago: "In going over the *Donacidæ* in the museum, I find no characters to separate Lamark's *Donax cayennensis* from the *Donax striata* L." I have never seen the latter form. Can these names be synonyms? Both *D. cayennensis* and *D. denticulatus* are called *ahi* by the native Indian population. The former they regard as the male and the latter as the female. *Ahi* means *dimple*. Is not that more beautiful than *wedge*?

Pitar (*Hysteroconcha*) *dione* L. Very abundant. I shall never forget finding my first specimen of this beautiful, sulcate, spinose shell. The Indian boy who was with me further increased the pleasure of the find by telling me that they were *manas*, *without number*. I soon found that he was not far from the truth. Wounta Haulover seems an ideal place for this species, the shore and bottom

being sandy, the sea open with no bars, and the only rocks too far out to be of any injury to their fragile spines. Wounta Haulover.

Chione cancellata. A variety. Much worn odd valves only. Wounta Haulover, on the beach.

Cyrena (*Polymesoda*) *panamensis* Prime. This is the common bivalve of all the lagoons along the Caribbean coast of Nicaragua. It is not always found in the mud, although in the Bluefields lagoon it thrives in that kind of a station. At Wounta Haulover it lives in the lagoon back from the sea, on a sandy bottom, while at Karata it is to be found on the gravel. I have eaten very good chowder made of *klito*, as the Indians call it. The umbones are always, so far as I have observed, corroded in adult specimens.

Tivela mactroides Born. This pretty little clam is quite common on the shore and in the shallow water along the open sea. The shell is solid and looks as though it might stand rougher water than it usually gets on the Mosquito Coast. Dr. Dall, in his "Synopsis of the Family Veneridae" is quite right in saying: "This species may be white, or chestnut-brown or with brown rays on a lighter ground." I have specimens that alternate with white and brown concentrically.

Echinochama arcinella L. A few dead shells, with one exception all left valves.

Chama congregata Conr. Dead shells everywhere on the beach, especially left valves attached to old *Pecten*, *Arca* or *Chione* shells.

Codakia orbicularis L. Plentiful about Man of War Keys; I also have a few from Pearl Key.

Arca umbonata Lam. Man of War Keys. I found but one specimen, although the Indian turtle-hunters, who frequent the Keys, told me that it was a very common shell at times.

Scapharca (*Cunearca*) *incongrua*, var. *braziliana* Lam. Wounta Haulover. Plentiful at all times on the beach, generally with hinge ligament perfect. Also found alive in the shallow water on quiet days.

Arca (*Argina*) *campechensis* Dillwyn. Walpa Siksa, on the sea-beach, both north and south of the river mouth.

Arca occidentalis Phil. Bilwi, just north of the Wawa river mouth, on the open beach.

Melina ephippium L. Man of War Keys. Abundant.

Pinna muricata L. I never found a living shell, but good specimens of dead ones were to be found at almost any time on the beach,

especially about the sand-bars and in the coves at and near the mouth of rivers, as at Wawa, Wounta, and Walpa Siksa.

Pecten dislocatus Say. Wounta Haulover. A few single valves.

Plicatula ramosa Lam. Wounta Haulover. Found attached to soft corals, sponges, and like marine growth. Numerous.

Ostrea virginica Gmel. A very abundant shell in all the lagoons and estuaries, not far from the sea. It seems to multiply very fast, filling up harbors and channels. It does not get as large as our northern oysters, possibly on account of the large quantities of fresh water that cover them for protracted periods during the rainy season.

Discinisca antillarum D'Orb. Wounta Haulover. I found six or eight on an old Pinna. These little brachiopods remind one of miniature Anomia simplex.

Helicina amoena Pfr. In native clearings in the forest along the Wounta (or Kukallaya) river, northwest of the village of Kukallaya.

Helicina dalli Bartsch. Near Wani, Nicaragua.

Nephronaias flucki Bartsch. From the Wounta river, a day's paddling by canoe to the northwest of the village of Kukallaya.

Streptostyla flucki Bartsch. Near Wani.

Neocyclotus (*Neocyclotus*) *chrysacme* Bartsch. Near Wani.

Chrondropoma callipeplum Bartsch. Near Wani.

The region about Wani is quite different from the low, sandy, coastal-plain. It takes many days' canoe paddling, according to the volume of water in the river, to reach it. It is in what the Indians call the "hill country."

The five last-named shells are new. Dr. Paul Bartsch, who has seen my entire collection, is at this writing publishing descriptions of them.

I have a few more Mosquito Coast shells which I might add to this list, but will not do so now. At some future time I shall ask for space for another article.

I am convinced that the shells I collected in the lowlands of eastern Nicaragua do not by any means exhaust the molluscan fauna of that region. The highlands of the interior, the mangrove swamps, rivers, lagoons, sea beaches, and the keys, all have treasures for the man who has time to search for them. As for myself, I picked up only such shells as I stumbled over in the strenuous pursuit of other duties.

A NEW CHINESE SITALA.

BY H. A. PILSBRY.

Sitala hangchowensis n. sp. Shell subperforate, trochiform with rounded periphery, pale brown, surface dull, smoothish, under the compound microscope showing dense, vertical striation, most distinct on the penultimate whorl, and very fine, close spiral impressed lines, the base distinctly striate spirally, with finer spirals in the intervals between coarser lines. Spire conic with nearly straight outlines. Whorls 6, decidedly convex, the last rounded peripherally and convex beneath. Aperture somewhat oblique, lunate, the margins thin and simple; columella concave below, vertical with reflexed edge above. Alt. 3.7, diam. 4.1 mm.

Hangchow, China. Types no. 91131 A. N. S. P., from no. 1074 of Mr. Hirase's collection.

It is not easy to decide whether this species should be considered a *Sitala* or a *Kaliella*, but on account of the fine spiral striation it probably accords best with the first. It is larger than *Kaliella depressa* and *K. monticola* Mlldff. with fewer whorls, 6 instead of $6\frac{1}{2}$, and it has a dull, not glossy surface.

NEW SPECIES OF PISIDIUM.

BY V. STERKI.

PISIDIUM PROXIMUM, n. sp. Mussel of medium size, moderately to rather well inflated, outlines oval without any projecting angles, posterior margin slightly subtruncate in some specimens, beaks somewhat posterior, rather broad to narrow, rounded, or their centers more or less flattened, with a ridge around the flattened area in some specimens; surface with irregular, fine to rather coarse striae and several lines of growth, shining, color light yellowish-horn to brownish; shell opaque to subtranslucent, thin; hinge slight, cardinal teeth of various shapes; ligament rather long.

Long. 5.6 alt. 4.8, diam. 3.4 m. (Wash.)

Long. 6 alt. 5 diam. 3.8 m. (B. C.)

Long. 4.1 alt. 3.5, diam. 2.5 m. (B. C.)

Habitat: Washington, British Columbia: Walla Walla sent by B. Walker, a good number of specimens deep horn to brownish,

beaks rather broad and moderately elevated; "a small pond, Second Summit, B. C., at alt., 6000 ft." (collected by O. W. Spreadborough, 1905, sent by J. F. Whiteaves), about eighty specimens; somewhat larger than the Walla Walla form, of light color becoming brownish over the beaks in older specimens, then with irregular, alternating zones of lighter and darker; the beaks are more elevated and in many specimens narrower. Although of rather different appearance, the two Pisidia seem to be of the same species. "Pond at head of North Fork of Caribou Creek, East of Burton City, West Kootenay, B. C." (by same); considerably smaller, but seem identical; the beaks are full and prominent, the disks rather flat towards the inferior margin.

This Pisidium is under doubt as to its affinities. While apparently somewhat like some forms of *abditum* Hald., it has also resemblance with a South American Pisidium which I take for *boliviense* Sturany. More materials from other places may help answering this question. Our Pacific Slope Pisidia, and more so those of Central and South America are still very insufficiently known.

THE MANATEE SNAIL BULIMULUS DORMANI.[1]

The sooty mould of the orange, *Meliola*, is one of the most serious results of white fly infestation of citrus groves, and is an element in the injury to various plants from aphids and from some of the scale insects, especially the Lecaniums, mealy-bugs, wax scales, and cottony cushion scale. The fungus is not itself a parasite on the plant, but a saprophyte, deriving its sustenance from the sweet honey dew secreted by these insects. The injury to the plant results from the smothering action of the fungus, the heavy coating of fungal threads interfering with the healthful action of sunlight on the leaves. The appearance of the various ornamental and hedge plants is also disfigured by the dark fungus. The sooty mould is especially bad following the white fly attack, owing to the large amount of honey dew secreted by these insects. As the white fly larvæ attach themselves to the under side of the leaves, the honey dew exuded by them falls to the top side of the leaves beneath, thus affording favorable opportunity for the growth of the fungus. So constant is the association

[1] Press Bulletin No. 59, Florida Agricultural Experiment Station. Department of Entomology.

of the fungus and the white fly that badly infested groves and hedges may be recognized at some distance by the heavily coated dark foliage. The fungus develops on the fruit as well as on the leaves and stem, and washing becomes necessary, resulting not only in an added expense, but also in increased danger of decay in shipping. In this connection the habits of the tree snail, *Bulimulus dormani*,[1] are of the greatest interest. This snail has been found in the orange groves in Manatee county feeding upon the sooty mould. Just how long the snail has been present on orange trees in this county it is impossible to say. It was observed as long as two years ago by Mr. F. D. Waite, at Palmetto. It seems to have been present in small numbers in other groves at this time, but attracted no further attention until the present summer. The snail is now widely distributed in Manatee county, occuring in many groves on both sides of the Manatee river. The work of the snails is very characteristic. When well started they occur in great numbers on the tree, spreading over it from base to top. Its favorite food seems to be the sooty mould. The fungus is cleaned from the leaves, stems, and fruit. The leaves thus cleaned have a glossy, shiny appearance as though free from white fly. The fruit thus cleaned has a better color and probably ripens earlier. In addition to the fungus, the snail takes algæ and some lichens from the stem and trunk, giving the trunk a much cleaner and fresher look. The trees that are cleaned stand out conspicuously from the surrounding trees by their bright foliage and clean trunks. The snails increase rapidly under favorable conditions. The eggs are probably deposited in protected places about the trunks of the trees, possibly also about the base of the tree under leaves and other rubbish. That the snails are capable of doing effective work, when present in sufficient numbers, has been shown in numerous groves in Manatee county during the present summer. Such trees in these groves as are well stocked with the snails have been thoroughly cleaned, the fruit not requiring washing.

The snails are of medium size, measuring when full grown, three-fourths to one inch in length. The shells are smooth, white, or corneous-white, and with about four bands of brown spots. Old

[1] This species is now placed in the genus *Drymæus*. A closely allied species, *D. dominicus* Rve. (*B. marielinus* Poey), is also common throughout southern Florida, and frequently confounded with *dormani*. It probably has similar feeding habits.—EDITORS.

shells have often a somewhat corroded surface, the bands becoming indistinct or absent. When the conditions are unfavorable, either cold or dry, the snails take refuge in the hollows of the trees or under leaves accumulated in the forks, or elsewhere, or under sacks at the base of the trees when these are provided. It thus becomes an easy matter to transfer them from tree to tree. A few snails placed by Mr. Wade Harrison in one of his trees in March, increased in such numbers as to free the tree of sooty mould by mid-summer of the same year. The snails are known to range with some variation from the mouth of the St. John's river on the north, to the Caloosahatchie river on the south. The species is probably native to Florida, as specimens in small numbers were observed about the hummocks and elsewhere as long as fifty years ago. Its habit of feeding on the sooty mould of the orange, however, was not known until within the past two years.

In view of the fondness of the snails for the injurious sooty mould fungus, it becomes of first importance to observe their treatment of the beneficial fungi. Among the fungi parasitic on orange insects there are four species of inestimable value to orange growers. These are the brown fungus well known as an effective parasite on the white fly larvæ; the red-pink fungus also parasitic on the white fly; the red fungus, and the gray-headed fungus, both parasitic on the common scales. The brown fungus so effective in control of the white fly, as is well-known, throws out spreading hyphæ for some distance around the body of the dead leaves. It seems that the snails occasionally feed to a limited extent on these spreading hyphæ, but evidently not enough to interfere with the spread of the fungus, since this fungus is doing particularly effective work in the groves in the Manatee region where the snails occur; the red-pink fungus is also abundant in the groves where the snails occur and is untouched by them. The snails have not been observed to feed on either the red or the gray fungi parasitic on the common orange scales, and it is probable that they have no taste for these parasitic fungi. Colonies of the snails are being started in parts of the State where the white fly injury is severe and where conditions seem favorable for the growth of the snail. It is desirable that close attention be given to the habits of the snail, as well as to means of protecting colonies against unfavorable conditions. A few sacks thrown around the tree seems to afford a needed protection against unusual cold. It is probable that sprays can not be used

on trees stocked with the snails without injury to the colony, for, although protected by the shell from the immediate effect, sufficient spray probably clings to the sooty mould on which they feed to destroy them. The beneficial parasitic fungi and the snails may be allowed to work together on unsprayed trees. The snail is here spoken of as the Manatee snail since while recorded as occurring in other parts of the State it was found working on the orange groves first in the Manatee region.

NOTES.

Collecting in the Everglades. I have recently returned from a collecting trip in the Everglades. Most of the collecting was done at a point where the Big Cypress Swamp and the Everglades meet, about 80 miles from Myers and 35 miles from Immokalee P. O. *Drymaeus dominicus* Reeve was found in the air-plants. Dead shells of *Glandina truncata* var. *minor*, were plentiful, but live ones scarce. A few *Zonitoides arboreus* were also found in air-plants. *Polygyra cereolus* var. *carpenteriana* and *uvulifera* I did not collect. Beautiful specimens of the glossy, dark, amber-colored *Physa cubensis* Pfr., were found on the under side of the leaves of water plants. *Planorbis intercalaris* Pils., and *P. tumidus* were very plentiful, the latter in the more shallow water. *Ancylus peninsulae* Pils. & Johns., was found on decayed wood in the Cypress Swamp. *Ampullaria depressa* is abundant on the edge of the Everglades. The shells are heaped around isolated cypress trees, where they are dropped by the hawks which feed upon them; a bright yellow variety without bands is occasionally found. A small *Unio* was common in a stream near Immokalee. A. G. Reynolds.

Output of American Pearls.—Dealers in American pearls state that the past season showed a diminished output of fine gems, but a gain in the traffic in baroques or pearl formations of irregular shapes.

The most valuable pearl discovered last season was taken from the Wabash river, near Mount Carmel, Ill. This was a pink-white gem of eighty grains, and is valued by its owner at $8000.

A pearl valued at $5000 was found in a mussel shell taken from the Skillet Fork river, Carmi, Ill. Other pearls, worth from $500 to $3000, were found last year; but such fortunate discoveries were considerably fewer in number than in former years.

Nearly every year witnesses a shifting of the pearl-hunting industry. The Kankakee river, Indiana, was the newest field last season, and some valuable gems were found there.

Of late, French buyers have been actively represented in the American market. The activity of these foreign buyers, together with the diminished supply, was largely responsible for the fact that prices at the close of the season ranged from 25 to 35 per cent. higher than they did a year before.

Despite the fact that American pearls now command a higher price than ever, the volume of business has shrunk because of the destruction of so many of the mussel beds.

In one year the output of the rivers of Arkansas was valued at $2,000,000. Last year, some experienced dealers assert, the value of the whole American product, exclusive of baroques, was not worth more than $500,000.

Dealers charge that many fine pearls are rendered valueless by the practice of button houses, and those who fish for them, of throwing mussels into hot-water vats, in order to open great quantities of shells rapidly. These button houses seek the mother-of-pearl in the shells.

Baroques, or pearls of irregular shapes, have attained a prominent place in commerce. Some of them have a sheen or opalescence equal to the quality of the finest gems.

Until recently, pearl hunters sought only symmetrical shapes, and the baroques were left as playthings for children along the streams, or were cast aside.

The influence of the "new art" originated a demand for these angular, irregular and eccentric formations.

Jewelers now use the baroques in making scarf pins, chrysanthemums, figures and ornaments.

The long and narrow shapes, especially, lend themselves with readiness to the jeweler's art. As many of these odd formations were found to have attractive color, lustre or iridescence, the public soon found a liking for them.—*North American.*

COCHLIOPA ROWELLI IN CALIFORNIA.—In response to an inquiry in the December NAUTILUS concerning the habitat of this species a single note has been received, referring to the original finding of the shell. It has apparently not been found since. The note follows: "*Cochliopa Rowelli*, was named from shells collected by me, near Baulinas Bay (not Clear Lake) Marin Co., California."—J. Rowell.

ON THE GENERIC NAME ANOSTOMA.—At the time I prepared a monograph of this genus (Man. of Conch., XIV, p. 109, 1901) I did not notice that two modifications of the same name were already in use: *Anostomus* Klein in Walbaum, Pet. Arted., Gen. Pisc., III, p. 659, 1792, and *Anastomus* Bonnaterre, Encycl. Méth., Ornith., p. xciii, 1790. Whether these conflict with the molluscan *Anostoma* depends upon whether the different spelling be held to constitute a different name—a question still in dispute. *Tomogeres* Montf. is the next name applied to the molluscan *Anostoma*.—H. A. P.

ON THE PATHOLOGY OF SPHÆRIUM.—Among thousands of *Sphærium solidulum* Pr., in company with several other species, from Des Moines, Iowa, collected and sent for examination by Mr. T. van Hyning, there were several dozen specimens of special interest, abnormal and evidently of a pathological nature. They were considerably smaller than the average, almost globular, the beaks being nearly as broad as in the normal form—apparently representing a distinct species. At the anterior margin of the shell there was a more or less marked scar, contiguous to the anterior adductor muscle and the lateral teeth. This was evidently caused in all specimens by one and the same agency, probably a parasite affecting the mantle edges in some way and thus causing the deformity of the shell. And the effect was not only local, as is evident by the fact that a coarse line of growth, from that place, all around both valves is noticeable in nearly all specimens thus affected, and the normal growth of the whole mussel was checked. Some larger specimens, of more or less irregular growth, show the same scar at the same place, in some instances only slightly marked.

Similar mussels have been noticed before, from other places, but never in such numbers. Also some *Pisidia* were seen similarly affected. It is hoped that fresh, living specimens will be obtained, in order to ascertain the cause of the deformity.—V. STERKI.

PUBLICATIONS RECEIVED.

CATALOGO DE LOS MOLUSCOS TESTÁCEOS DE LAS ISLAS FILIPINAS, JOLO Y MARIANAS. I, MOLUSCOS MARINOS, por J. G. Hidalgo, 1905, xvi + 408 pp. Since 1840, when the description of Cuming's rich collection was begun, the Philippines have been noted for the great number and beauty of their marine shells. A very large num-

ber of species was first described from there, and in critical researches on other Indo-Pacific faunas, constant reference to and comparison with Philippine topotypes is necessary. Several years ago Elera published a catalogue of the fauna, compiled from previous monographs, etc., but without new material or critical knowledge of the mollusks themselves. Dr. Hidalgo has given many years to the study of the Philippine fauna and has condensed his results in the catalogue before us. 3121 species are admitted, and 704 others, cited from the Philippines on insufficient grounds, are enumerated. Those species actually seen by the author are indicated by a *, and it will be noticed that a large majority are so marked. This gives the records an authenticity far beyond that of a mere compilation, and is a feature of special value since many of the former Philippine citations rested upon Cumingian records only. A figure of each species is cited. This is not only a convenience, but of great value as showing the exact form intended, a significant point in these days of nomenclature changes. In his views of specific limits, Hidalgo takes the middle course, conservative as Crosse and von Martens may be said to have been, but not reactionary as Tryon was in the earlier volumes of his *Manual*. The use of genera is open to some criticism, from the retention of names such as *Triton*, *Vertagus*, etc., now generally held to be untenable. The localities of each form are fully recorded, most of these records being new.

The typography of the volume is excellent. A portrait of the author is given as frontispiece.

Dr. Hidalgo proposes to give in the second part of the *Catalogo*, an enumeration of the land and fresh water mollusks. These catalogues do not replace the more extensive monograghic account of the fauna which is appearing at intervals in the handsomely illustrated *Obras Malacologicas* of the same author. The elaborate design of the latter renders its publication a work of many years. Meantime those interested in Indo-Pacific faunas will find the *Catalogo* one of the most useful of the many scholarly works we owe to the distinguished Professor of Malacology of the Madrid Museum. H. A. P.

Catalogue of the Land- and Fresh-Water Mollusca of Taiwan (Formosa).—By Henry A. Pilsbry and Y. Hirase (Proc. A. N. S., Phila., 1905). In the island of Formosa 128 species of land shells are now known, 28 of them described in this paper. There are 26 species of fresh water mollusks. The affinities of the mollusks are chiefly with those of China, though there is some affinity to the Ryukyuan fauna.

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EPIPHRAGMOPHORA KELLETTII (FBS.) AND E. STEARNSIANA (GABB).

BY GEO. H. CLAPP.

Recent writers on American conchology have united these two species, the latter as a variety of the former, but a careful study of large series of both shows that Gabb was correct when he identified and named *stearnsiana* as a distinct species.

Forbes' original description of *Helix kellettii* was published in P. Z. S., 1850, p. 55, and the type is figured on Pl. IX, 2a, b. He was, however, badly mixed on his localities as he says: "Of the genus *Helix* there are nine species. Of these *H. townsendiana*, *nuttalliana* and *columbiana* are certainly from the neighborhood of the Columbia river. *Helix kellettii* and *pandoræ*, both new, are probably from the same country, though the box in which they were contained was marked 'Santa Barbara.' *Helix areolata* bears no indication of its locality."

Through the kindly offices of John Ponsonby, Esq., of London, England, I was enabled to enlist the services of Edgar A. Smith, Curator of Conchology, British Museum, and he sent me a colored drawing of the type, which agrees very closely with Forbes' figure, and at the same time he checked up Forbes' measurements and found them correct, but was unable to count 6 whorls, unless anything over 5 is called 6.

With this as a starting point and a large series of shells from Santa Catalina Is., and the mainland from San Diego to Rosario and Cedros (Cerros) Is., Lower California. I have tried to separate the two species with the following result:

In looking up the literature, I found that there was considerable diversity of opinion and that authors were not always careful to follow the original description. Binney in Terr. Moll. IV, 17, copied Forbes' description and remarks *verbatim* and copied Forbes' fig. 2b on his Pl. LXXVI, fig. 12.

Pfeiffer in Mon. Hel. Viv. III, 182 changed Forbes' description which gave the size as 22 x 19 x 19 m.m., whorls 6, to size 24 x 20 x 16 m.m., whorls 5.

Tryon in Mon. Terr. Moll. U. S., p. 66 (Am. Jour. Conch. II, 317, Pl. VI, fig. 1.) translates Forbes' description, but his fig. 1, Pl. VI looks as if it might have been drawn from a specimen of *E. arrosa marinensis.*

Binney in Terr. Moll. V, 361 translates Forbes' description *verbatim*, but figures a large depressed shell from Santa Catalina Is., fig. 242, and says:—"I am positive that it is correctly referred to *kelletti.*" In his remarks he refers to the peculiar sculpture where he says:—"There are traces on different parts of each shell of three different kinds of sculpturing; the wrinkles of growth, revolving impressed lines, and a series of minute granulations running obliquely, sometimes almost perpendicularly, to the incremental wrinkles." This is an important observation.

This description and remarks are copied in Binney's Manual, pp. 149–150. There is a typographical error on p. 150 where he says that Forbes' original figure is copied in Terr. Moll. V; the reference should be to Vol. IV; Pl. LXXVI, fig. 12.

Without attempting to give a full bibliography it is only necessary to say that Cooper, Gabb, Newcomb, Carpenter, Stearns and Hemphill have all written on the subject in various publications.

Gabb published the description of *Helix stearnsiana* in Am. Jour. Conch. III, 235, Pl. 16, fig. 1. He gave the number of whorls as $5\frac{1}{2}$, but did not state the size. The type is in the collection of the Acad. Nat. Sciences of Philadelphia.

Binney and Bland in L. & F.–W. Sh., I, 177, changed Gabbs' description somewhat, giving the number of whorls as 5 and adding the size 22 x 17 x 12 mm. This attitude must be the *length of the axis*, as the flattest shell that I have seen is $15\frac{1}{2}$ mm. high, a single specimen, while the others run from 16 to $21\frac{1}{2}$ mm.

In Terr. Moll. V, 362, Binney repeated the description of L. & F–W. Sh. adding notes on the anatomy and comparing with that of

kellettii. This is copied *verbatim* in Manual Amer. Land Shells, p. 151.

In examining a large series of *kellettii* from Santa Catalina I found one shell which agrees exactly with Forbes' original description and figure, and the later figures sent me by Mr. Smith, in size and color, but it has 5 whorls instead of 6. *All* of this lot, about 90 shells, have the peculiar sculpture noted by Binney while *none* of the *stearnsiana* from the mainland of L. Cal. have it, and as Mr. Ponsonby informs me that this sculpture appears on Forbes' type, I think we can safely limit *kellettii* to Santa Catalina Is.

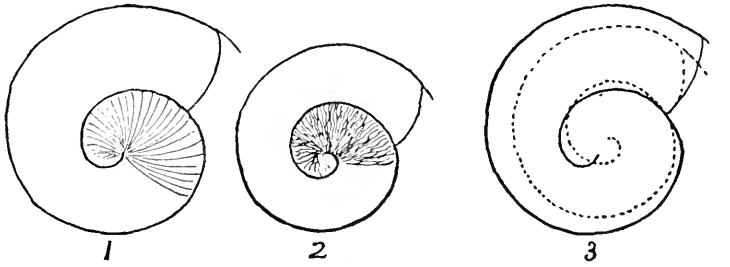


Fig. 1. Embryonic whorls of *E. kellettii* Fbs. "The isthmus," Santa Catalina I.; shell 26 mm. diam.

Fig. 2. *E. stearnsiana* Gabb, San Diego; shell 26 mm. diam.

Fig. 3 shows Fig. 1 superposed upon Fig. 2, the latter in stippled line. All figures × 10.

The sculpture of the embryonic whorls of the two species also indicates that they are distinct, that of *kellettii* consisting of very weak radial lines, *not waved*, so that the whorls appear almost *smooth*, while in *stearnsiana* it is a very closely set series of *wavy* lines, generally bifurcate at the suture, giving the surface a *granulated* appearance under low magnification. The accompanying figures show the difference in size of the embryonic shells of the two species, figs. 1, 2, and in fig. 3 the drawings are superimposed to bring out the difference more distinctly.

A series of 58 *kellettii* from Santa Catalina shows a variation in greater diameter of from $21\frac{1}{2}$ to 27 mm., whorls from 5 to $5\frac{1}{2}$. 26 *stearnsiana*, mostly from San Diego, vary from 20 to $25\frac{1}{2}$ mm., greater diameter, whorls 5 to 6.

Figuring both series into percentages:—

Of 58 *kellettii* 27 or 46.5 per cent. have gr. diam. 25 to 26 mm.

Of 58 " 43 or 74.1 per cent. have gr. diam. 24 mm., and *over*.
Of 26 *stearnsiana* 12 or 46.1 per cent. have gr. diam. 23 to 24 mm.
Of 26 " 21 or 80.7 per cent. have gr. diam. 24 mm. and *under*.

Of 58 *kellettii* 56 or 96.5 per cent. have whorls 5 to 5 +.
Of 26 *stearnsiana* 19 or 73.1 per cent. whorls $5\frac{1}{2}$ to $5\frac{3}{4}$.

A series of 31 *kellettii*, selected by Hemphill to show variation in size, shape and color, but not included in above lot, are from $20\frac{1}{2}$ to 31 mm. gr. diam., whorls $4\frac{1}{2}$ to $5\frac{1}{3}$; 23 or 74.2 per cent.; one 24 mm. and over and 18 or 58.6 per cent. have 5 to 5 + whorls.

Summing up: *E. kellettii* is the species found on Santa Catalina Island, having a large embryonic shell with *smooth* whorls, surface of all the later whorls faintly granulated; generally *over* 24 mm., greatest diam.; whorls 5. (On the mainland at Pt. Vincent, Los Angeles Co., Hemphill found dead shells which agree exactly with those from Santa Catalina, but could find none alive). *E. stearnsiana* is confined to the mainland and the islands of Lower California. Embryonic shell smaller, sculptured with *wavy* lines giving it a granulated appearance, remaining whorls *smooth* except for lines of growth and sometimes faint revolving lines; greater diam. generally under 24 mm., whorls $5\frac{1}{2}$ to $5\frac{3}{4}$.

There is a wide variation in size, color and shape in both species and a number of the forms of *kellettii* have been named by Hemphill. Measurements below show largest, smallest, most elevated and most depressed of 89 *kellettii* and 26 *stearnsiana* in my collection.

E. kellettii, largest, 31 x 26 x 23 mm. whorls $5\frac{1}{4}$.
" smallest, $20\frac{1}{2}$ x $17\frac{1}{2}$ x $16\frac{1}{2}$ mm. whorls —5.
" elevated, 26 x $23\frac{1}{2}$ x 25 mm. whorls $5\frac{1}{3}$.
" depressed, 26 x 21 x 18 mm. whorls 5.

E. stearnsiana, largest, $25\frac{1}{2}$ x 22 x $21\frac{1}{2}$ mm. whorls 6.
" smallest, 20 x 17 x $15\frac{1}{2}$ mm. whorls 5 +.
" elevated, 21 x $20\frac{1}{2}$ x $20\frac{1}{2}$ mm. whorls $5\frac{1}{2}$.
" depressed, 23 x $19\frac{1}{2}$ x 16 mm. whorls $5\frac{1}{2}$.

MOLLUSKS OF OKLAHOMA.

BY JAS. H. FERRISS.

Few if any shells have been recorded from Oklahoma territory. No state or territory in the Union has figured so little in concholo-

gical literature. In 1897 I collected a few hours in Oklahoma City, obtaining the following species:

Polygyra texasiana (Moric).
Polygyra monodon (Rack.).
Helicodiscus lineatus (Say).
Zonitoides minuscula (Binn.).
Zonitoides arborea (Say).
Zonitoides nitida (Müll.).
Euconulus fulvus (Müll.).
Strobilops affinis (Pils.).
Pupoides marginatus (Say).
Bifidaria armigera (Say).
Bifidaria contracta (Say).
Lymnæa probably techella (Hald.).
Planorbis trivolvis (Say).
Planorbis bicarinatus (Say).
Planorbis parvus (Say).
Physa sp.
Lampsilis anodontoides (Lea).
Lampsilis purpuratus (Lam.).
Lampsilis gracilis (Bar.).
Lampsilis parvus (Lea).
Quadrula lachrymosa (Lea).
Quadrula pustulosus (Lea).
Tritogonia tuberculata (Bar.).
Symphynota complanata (Bar.).
Sphærium sp.
Pisidium sp.

NEW SPECIES OF PISIDIUM.

BY V. STERKI.

Pis. minusculum, n. sp. Mussel minute, slightly oblique, medium inflated; superior margin short, moderately curved, bounded by slightly projecting, rounded angles; supero-anterior and posterior slopes little curved or straight, posterior end rounded, anterior a rounded angle situated much below the median longitudinal line, inferior margin rather well curved; beakes slightly posterior, rather large, rounded or somewhat flattened, moderately projecting over the hinge margin; surface with very fine, slight striæ, somewhat shining, color pale horn, shell translucent; hinge rather stout, cardinal teeth: the right strongly curved, its posterior part much thicker and grooved, left anterior rather short, well curved, the posterior longer, oblique, curved; "laterals" strong, the outer ones in the right valve well formed; ligament, short, thick.

Long. 2.2, alt. 1.8, diam. 1.5 mill.

Habitat: Fox river, Wisconsin, collected by the late Geo. H. Marston; types in the collection of the University of Wisconsin and that of the Carnegie Museum.

A number of specimens of this little *Pisidium* was received in 1895 and then recognized as a new species, and again in 1904, when

the Marston collection was revised. In spite of its small size, it ranges under the group Rivulina, and has resemblance, in shape, with forms of *P. compressum* Pr. and with *handwerkii* St.; from the latter it is easily distinguished: it is smaller, more oblique, its beaks are comparatively broader, more posterior, and less elevated, its striæ much finer and slighter.

Pis. fragillimum, n. sp. Mussel rather small, inequipartite, oblique, well inflated; superior margin short, nearly straight, bounded by angles from which the supero-anterior and posterior slopes fall down nearly straight at first, then passing over the rounded anterior and posterior ends into the moderately curved inferior margin; anterior part longer than posterior and anterior end narrower; beaks somewhat broad and full, well projecting over the superior margin, flattened on top; surface with very fine striæ and a few slightly marked lines of growth, dullish, pale horn-colored; shell subtranslucent, very thin and fragile; hinge very slight, short, but well formed, plate narrow; cardinal teeth thin, lamellar, nearly straight and longitudinal, the right long, its posterior end not or slightly thicker, the left ones rather long, nearly parallel; "laterals" slight, thin, the anterior short, their cusps close to the cardinals, especially so the left which is high, sharp pointed, abrupt, the right comparatively large; the outer ones of the right valve small but distinct and rather long; ligament slight.

Long. 3, alt. 2.6, diam. 1.8 mill.

Habitat: Lake Geneva, Wisconsin, sent for examination by Mr. F. C. Baker. Types are in the collection of the Chicago Acad. Sc., and that of the Carnegie Museum.

Although only ten specimens were seen, this *Pisidium* is quite distinct by its shape and the formation of the hinge; the shell is the thinnest and most fragile yet seen in *Pisidia*. The mussel has some resemblance in shape with *P. walkeri* St., but is much smaller, shorter, especially its anterior part, the surface sculpture is finer and slighter, and the hinge is quite different. Its closer affinities are yet unknown.

Pis. levissimum, n. sp. Mussel small, somewhat elongate, slightly oblique, moderately inflated; superior margin moderately curved, posterior rounded, sometimes with a slightly projecting, rounded angle at the scutum; inferior slightly curved, supero-anterior slope, at some distance from the beaks, in some specimens straight or

nearly so, in others obsolete; beaks rather broad, rounded or slightly flattened, little prominent over the upper margin; surface with very fine, slight, irregular striæ, shining; color pale horn to light amber, shell translucent to transparent; hinge very slight, long, curved, plate narrow; cardinal teeth: the right rather long, straight or slightly curved, longitudinal, its posterior end more elevated, slightly thicker and projecting downward over the hinge plate, the left ones rather long, nearly longitudinal and parallel, lamellar, the posterior (upper) slightly curved; "lateral teeth": the posterior much longer than the anterior, slight, curved, the right not raised in a cusp, the left with a slight cusp, the right anterior with a rounded, the left with a sharp and abrupt cusp, outer ones in the right valve wanting, or a mere trace of the anterior; ligament slight.

Long. 2.5, alt. 2.0, diam. 1.4 m., the largest; average: 2.3 m. long.

Habitat: Elk Rapids, Michigan. About 300 specimens were seen, at all stages of growth, most of them dead and bleached shells, sent for examination by Mr. F. C. Baker. Types are in the collection of the Chicago Acad. Sc. and that of the Carnegie Museum.

In shape and appearance, this *Pisidium* resembles a form of *tenuissimum* St., but is much smaller and slighter, and the formation of the hinge is radically different, as ascertained on quite a number of specimens of both species. In fact, the "lateral teeth" are quite different from those of all other *Pisidia* seen.

PISIDIUM SUBROTUNDUM, n. sp. Mussel small, moderately and regularly to rather well inflated; outlines oval to short oblong to nearly circular; superior margin straight or nearly so, as especially noticeable in younger specimens; beaks slightly posterior, rather broad (in most forms), moderately projecting over the hinge margin, thus completing the round outlines, except for the slightly projecting angles at the scutum and scutellum; surface with very fine, subregular to irregular striæ and usually a few well marked lines of growth, dullish to somewhat shining; color horn or light amber to straw to whitish; shell translucent (in the horn colored) to opaque (in the light colored specimens), thin; hinge slight and teeth small; ligament rather short and slight.

Long. 3.2, alt. 2.7, diam. 1.8 (100 : 84.4 : 56.3) average.

Long. 3.6, alt. 3, diam. 2.3 (100 : 83.3 : 63.9) Albany riv.

Long. 2.8, alt. 2.5, diam. 1.8 (100 : 89.3 : 64.3) Isle Royale.

Hab.: New England, Anticosti Is., to Michigan. Jupiter river,

Anticosti Is., Albany river, Ontario (W. McInnes ed., both sent by J. F. Whiteaves); "Vineyard," Pawtuxet, R. I., (J. F. Perry); several places in Aroostook co., Me., (O. P. Nylander); Pine river, Marquette co., and Oswald Lake, Mich. (B. Walker); Isle Royale, Mich. (University of Michigan; some other specimens from waters on the same island were under doubt). Specimens from Union springs, Ontonagon Co., Mich. (B. Walker), are of somewhat different shape: the beaks are more posterior and narrower, and the anterior end is less broadly rounded. One good specimen was among fossils from Arnold's Lake, Washtenaw Co., Mich. (B. Walker.)

Examples of this Pisidium had been in hand for years, unnamed, or a part doubtfully referred to other species. Since last year, several good lots from widely distant places came in and proved the species to be valid.

PISIDIUM FRIERSONI n. sp. Mussel rather small, moderately inflated, outlines somewhat angular; superior margin slightly curved or nearly straight, with projecting, rounded angles where passing into the supero-anterior and the posterior, which are well marked, and nearly straight, inferior moderately curved; beaks scarcely posterior, projecting over the hinge margin, rather narrow, with a somewhat flattened central area; surface with very fine, subregular striæ, dullish to somewhat shining, color pale horn to straw or whitish, shell translucent to opaque, thin, hinge comparatively rather stout; right cardinal tooth curved, its posterior end thicker and grooved, left anterior quite short, somewhat V-shaped, posterior rather short, rather steep oblique; outer laterals of the right valve distinct; ligament short.

Long. 4, alt. 3.5, diam. 2.5 mill.

Hab.: Louisiana, Texas, New Mexico, Colorado.—In 1899, Mr. L. G. Frierson sent me quite a number of specimens at all stages of growth, collected at Frierson, La.; they were regarded as representing a distinct species, but shelved. Since then I have seen the same from Dallas (Cincinnati Museum) and Comal Co., Tex., the Gallinas river, Las Vegas, N. Mex., and a few from Denver, Colo., (T. D. A. Cockerell).

The species seem to range under the group of *P. noveboracense* Pr., and so far as known, shows little variation. It has been named in honor of Mr. L. G. Frierson.

ERRATUM.—NAUTILUS, February issue, p. 119, line 2 from top: after *even*, there should be a comma.

New Philadelphia, Ohio.

A NEW SPHAERIUM FROM ILLINOIS.

FRANK COLLINS BAKER.

Sphærium stamineum forbesi nov. var.

Shell of good size, inflated, solid, subequilateral, trigonal; umbones much elevated, rounded, somewhat inflated, placed a little anterior of the center of the shell, marked by very fine, concentric lines of growth (sometimes coarser), the beaks very closely approximating; dorsal and ventral margins well rounded; anterior end flatly rounded, posterior end plough-shaped; both ends have a somewhat truncated appearance; umbonal slopes convexly rounded; surface inclined to be shining, lines of growth rather crowded, fine in typical specimens, coarser in others; color light greenish or yellowish-horn, lighter on the umbones, indistinctly rayed in some specimens; ligament weak, short, brownish in color; cardinal teeth similar in form and position to those of *stamineum*, the hinge-line not quite so thick as in *stamineum*; lateral teeth not quite so solid as in *stamineum*, the posterior laterals also being shorter, not reaching so high up into the arch of the hinge-plait, the comparative distance between the anterior and posterior laterals being greater in *forbesi* than in *stamineum*; muscle scars and pallial line rather distinct; nacre faint bluish-white, with occasional darker zones.

Length	14.50	; height	11.50	; breadth	8.00	mill.	types.
"	12.00	"	10.00	"	7.00	"	"
"	12.00	"	9.50	"	6.75	"	Havana.
"	11.00	"	8.50	"	6.50	"	"
"	11.50	"	8.00	"	6.50	"	"

Thompson's Lake, Fulton Co. (types); Matanzas Bay, Havana, Mason Co.; Little Fox River, White Co. Types:—Illinois State Laboratory of Natural History; topotypes, Chicago Academy of Sciences, Academy of Natural Sciences of Philadelphia.

This apparently distinct variety of *stamineum* may be known by its peculiar trigonal shape, plough-shaped posterior end and elevated, inflated umbones. The ventral and dorsal margins are much more rounded than in *stamineum* and the lateral teeth are farther apart. The umbonal sculpture is typically very fine, but is also as coarse as typical *stamineum* in some specimens.

The variety will probably prove to be a common form in many localities and will be easily recognized and separated from typical

stamineum. Twenty-two specimens from three localities show very little variation.

I take great pleasure in naming this variety in honor of Prof. S. A. Forbes, Director of the Illinois State Laboratory of Natural History.

LIST OF WISCONSIN SHELLS.

C. H. CHADWICK.

(*Continued*)

C. Fresh-water Univalves.

Carychium exiguum Say. Milwaukee.

" " *exile* H. C. Lea. Milwaukee.

Limnæa stagnalis appressa Say. Menomonee River; Oak Creek near South Milwaukee; Okauchee Lake and Delafield, Waukesha Co., Two Rivers, Manitowoc Co.; Lake Winnebago near High Cliff.

" *columella* Say. Mill-pond at Delafield, Waukesha Co.

" *megasoma* Say. Molas Creek, Manitowoc Co.

" *reflexa* Say. Milwaukee and vicinity (abundant); Oak Creek, South Milwaukee; Sand Ridge Creek, Kenosha Co.; Delafield, Waukesha Co.

" *palustris* Müller. Vicinity of Milwaukee; North shore of Lake Winnebago. ("*Var. michiganensis*" Walker is included).

" *catascopium* Say. Lake Michigan at Milwaukee.

" " var. approaching *L. emarginata* Say. Lake Mich.

" *caperata* Say. Vicinity of Milwaukee; Lake Winnebago.

" " *umbilicata* Adams. Milwaukee and southwestward; Sand Ridge Creek, Kenosha.

" *humilis* Say. Milwaukee (scarce).

" *desidiosa* Say. Milwaukee and vicinity (abundant); Two Rivers, Manitowoc Co.; North shore of Lake Winnebago.

Planorbis trivolvis Say. Milwaukee (common); Delafield and Okauchee, Waukesha Co.; Two Rivers, Manitowoc Co.

" *trivolvis* (large form). Molas Creek, Manitowoc Co.

Planorbis bicarinatus Say. Milwaukee and vic.; Golden Lake, Waukesha Co.; Little Cedar Lake, Washington Co., Lake Winnebago.

" *bicarinatus striatus* Baker. Milwaukee (fossil).

" *campanulatus* Say. Milwaukee aud vicinity (common); Delafield, Okauchee and Golden Lake, Waukesha Co.; Little Cedar Lake, Washington Co.; Two Rivers, Manitowoc Co.; Crystal Lake near Elkhart Lake.

Planorbis hirsutus Gould. Two rivers, Manitowoc Co.

" *deflectus* Say. Vicinity of Milwaukee; Cedar Lake, Washington Co.; Two Rivers, Manitowoc Co.

" *parrus* Say. Milwaukee and southwestward.

Segmentina armigera Say. Milwaukee and southwestward; Two Rivers, Manitowoc Co.

Ancylus rivularis Say. Root River, Milwaukee Co.

" *paralellus* Hald., var. St. Martin's, Milwaukee Co.

" *shimeki* Pils. Near Wauwatosa, (one shell).

Physa sayii Tappan. Milwaukee; Golden Lake, Waukesha Co.; Lake Winnebago near High Cliff.

" *gyrina* Say. Vicinity of Milwaukee and southwestward (abundant;) Sand Ridge Creek near Kenosha; Two Rivers, Manitowoc Co.; Lake Winnebago.

" " *elliptica* Lea. Vicinity of Milwaukee.

" *integra* Haldeman. Milwaukee and vicinity (common;) Golden Lake, Waukesha Co.

Aplexa hypnorum Linne. Milwaukee.

Pleurocera subulare pallidum Lea (?) Lake Winnebago near High Cliff.

" *elevatum* Say. Milwaukee River at Lindwurm.

Goniobasis livescens Menke. Milwaukee River and Lake Michigan.

Amnicola limosa Say. Milwaukee River; Lake Michigan; Lake Winnebago near High Cliff.

" " *parva* Lea. Near Milwaukee.

" " *porata* Say. Lake Michigan at Milwaukee.

" *lustrica* Pils. Honey Creek near Layton Park, Milwaukee.

" *cincinnatiensis* Lea. Milwaukee and Menomonee rivers; Lake Winnebago near High Cliff.

" *emarginata* Küster. Lake Winnebago near High Cliff.

Somatogyrus subglobosus Say. Root River and Kinnikinnick River, Milwaukee Co.; Kenosha; Lake Winnebago.

Pomatiopsis lapidaria Say. Near Wauwatosa, Milwaukee Co.

Valvata tricarinata Say. Milwaukee and vicinity (abundant); Lake Winnebago.

" " *simplex* Gould. Lake Michigan at Milwaukee

" *bicarinata normalis* Walker? North Milwaukee.

" *sincera* Say. Near Milwaukee.

Vivipara contectoides W. G. B. Kinnikinnick River (one shell.)

Campeloma rufum Haldeman. Okauchee Lake, Waukesha Co.; Little Cedar Lake, Washington Co.; Lake Winnebago.

" *decisum* Say. Milwaukee and vicinity; Root River, Milwaukee Co.; Two Rivers, Manitowoc Co.; Lake Winnebago.

" *subsolidum* Anth. Milwaukee and vicinity; Oak Creek, South Milwaukee; Molas Creek, Manitowoc Co.

Lioplax subcarinata Say. Lenosha; Lake Winnebago.

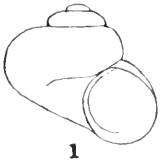
NOTES.

In the May number of the NAUTILUS in an extract from Bulletin 49, Florida Agricultural Experiment station, the writer stated that he did not know how long the Manatee snail (*Drymæus dormani*) had been living on orange trees in Manatee County.

I lived in that county near Bradentown from 1882 until 1886, and during all my residence there diligently collected the land, fresh-water and marine mollusks of that region. During my residence there I collected *Drymæus dormani* in moderate numbers living on the orange trees of a grove in hammock land west of Bradentown, and rarely on trees in a grove north of Manatee river. I also found a few specimens in the Foster Orange Grove south of Manatee. I found several hundred dead shells in the heavy hammock among live oaks north of the Manatee river, and rarely in the air pines on live oaks elsewhere, but I never considered it abundant anywhere.

It may be of interest to state that Mr. E. J. Brown, a neighbor of mine, has found a few specimens of the nearly allied species (*D. dominicus*) living on his grapefruit and orange trees, and two or three specimens of *D. multilineatus* on his trees. *Drymæus dominicus* is rather a scarce species in this region. CHAS. T. SIMPSON.

Little River, Florida, May 21, 1906.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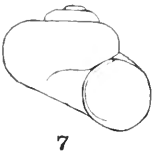
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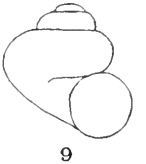
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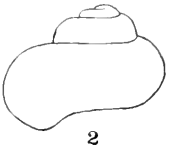
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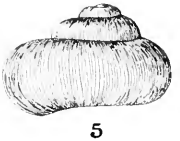
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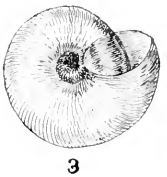
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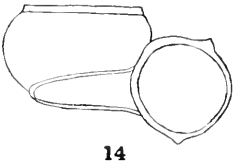
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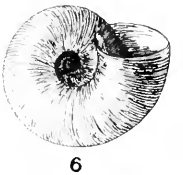
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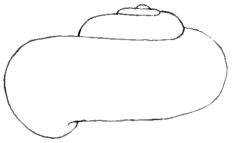
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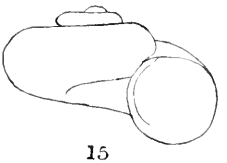
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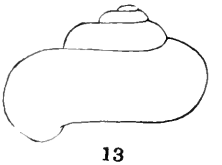
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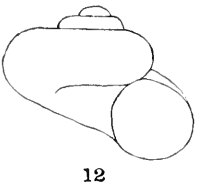
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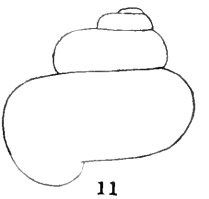
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THE NAUTILUS.

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NOTES ON VALVATA.

BY BRYANT WALKER.

In 1824 Say described an ecarinate form of *Valvata* from the "Northwest Territory" as *V. sincera*. In 1856 Dr. James Lewis described a somewhat similar shell from the Little Lakes, N. Y., as *V. striata*. W. G. Binney (L. & F. W. Shells III, 13.) in 1865, had "no doubt of its identity with *V. sincera*." In this decision Dr. Lewis seems to have acquiesced as it is not mentioned at all in his "L. & F. W. Shells of New York" (1874), nor was it listed in his collection.

In 1868, however, A. O. Currier (Shell-bearing Moll. of Mich. p. 9.) declared Lewis' species to be a valid one and *striata* being preoccupied proposed for it the name of *lewisii*.

Binney's opinion seems to have generally prevailed among American conchologists until within the last year, when Dr. W. H. Dall (Alaska XIII, pp. 22 & 23) declared them to be specifically distinct.

From a critical study of several hundred specimens from more than fifty different localities, I have come to a similar conclusion, viz: that there are two distinct species which have hitherto passed as Say's *sincera*. The one, smaller, more elevated, with a smaller umbilicus, the other, larger, more depressed and widely umbilicated. Both vary in sculpture from being nearly smooth, with subobsolete striæ to very strongly sculptured forms in which the striæ are elevated in "thin, sharp lamellæ."

Owing to the prevalent confusion of the two forms, the existing

records afford but little information as to whether their distribution is the same or not. Taking them together, *sincera* is apparently a northern form ranging through Canada and the northern United States, from the Atlantic to the Pacific. Its range to the south seems comparatively restricted, especially in the eastern states, northern New York, Michigan, northern Illinois and Indiana, and Nebraska being apparently the southern limit, as it is not listed from Philadelphia (Shick) nor Allegheny Co., Pa. (Stupakoff), Cincinnati (Harper & Wetherby), nor Tuscarawas Co., Ohio (Sterki), nor in any of the Iowa, Missouri, Arkansas or Kansas lists. I am informed by Mr. F. C. Baker that the southern range (south to Georgia and Louisiana) attributed to this species in his "Mollusca of the Chicago Area," was a typographical error and should have been placed under *V. tricarinata*. In the extreme west, it would seem to range further south, as Dall quotes the broadly umbilicated form from the San Bernardino Mountains, Cal., and Utah. Ingersoll also (Rep. U. S. G. & G. Survey, 1874, p. 390) quotes *sincera* from Colorado and Utah. The only Utah specimens I have seen, are rather referable to *V. humeralis* Say, and it is possible that all these extreme southwestern citations should be revised.

VALVATA SINCERA Say, Pl. I, figs. 1–6.

As Say's type of *V. sincera* has not been preserved, in determining which of the two forms, which have hitherto passed under that name, is to be regarded as *sincera* we are necessarily restricted to his original description and figure (a very poor one) and such legitimate deductions as can be drawn from the circumstances under which his description was prepared, and his other writings. When Say described his new species in 1824, the only American species known to him was the typical *V. tricarinata* and his purpose was to differentiate these two forms. Owing, no doubt, to the striking and characteristic sculpture of *V. tricarinata*, Say omitted any description of general shape. He states that *V. sincera* is "subglobose-conic" and "very similar" to *tricarinata*, but with a "rather larger" umbilicus. And later in describing his *V. humeralis*, he states that it is "subglobose" and "more depressed" than *sincera*. It hardly seems possible that Say with his remarkable acumen and critical appreciation of minute differences, would have failed to call attention to the depressed form and very wide umbili-

cus in differentiating his new species from *tricarinata*, had he had before him a specimen of *lewisii*. Then too, his figure, whatever else may be said of it, was certainly never intended to represent a shell of that form. Say further describes his species as having the whorls "finely and regularly wrinkled across." An examination of Say's descriptions of other species, especially his earlier ones, will show that he commonly used the terms "wrinkles" and "wrinkled" in the same sense that today we would use striæ and striate. Thus *Polygyra albolabris*, *thyroides*, *profunda* and *sayii*, *Pyramidula solitaria*, *Circinaria concava* and *Bulimulus dealbatus* are characterized as "wrinkled." *Bulimulus multilatus* is "striated with regular elevated lines or wrinkles." And *Valvata humeralis* is stated to be "wrinkled across or rather with slightly raised lines."

Taking all these things into consideration, we should say that Say's *sincera* was a subglobose-conic shell, of about the same size and shape of *V. tricarinata*, but with a rather larger umbilicus and with accurately rounded, finely and regularly striated whorls. Shells answering very exactly to these requirements were collected by the Michigan Fish Commission in 1894, at High Island Harbor, Beaver Islands, Lake Michigan, and were listed as that species, though with no appreciation of its distinction from *lewisii* (Bull. Mich. Fish Com. No. 6, 99; Naut. IX, 5). And there would seem to be no reasonable objection to these being considered as typical examples of Say's species.

As shown by the figures (figs. 1–3) the general shape of the shell, with its "accurately rounded" whorls and round, deep umbilicus is in exact accord with the original diagnosis. The surface is sculptured with fine, close, regular, thread-like striæ, with a marked tendency in many examples to rise in thin, sharp ribs approximating to those of *nylanderi*. But in no instance are these more elevated ribs as strongly developed as in that form, nor are they so widely spaced. The specimen figured has $3\frac{3}{4}$ whorls and measures: Alt. 4, diam. 5 mm.

Many of the specimens have the apical whorls more or less deeply tinged with dull red, the rest of the shell is of a pale greenish, with the apical whorls nearly white in the unicolored examples.

There is some slight variation in height and correlated with that, in the width of the umbilicus, but not sufficient to connect them specifically with the widely umbilicated *lewisii*.

Through the kindness of Dr. Whiteaves I have been enabled to examine some of the Anticosti shells referred to by Dr. Dall. Compared with the High Island specimens, these (figs. 4–6) are thinner, less heavily striated, with a rather wider umbilicus, and the body whorl is less inflated, but they evidently belong to the same species.

As above defined, *V. sincera* appears to be a less abundant species than *lewisii*, but of considerable range, though apparently rather local in its habitats. Specimens have been examined from the following localities, in addition to those above mentioned: River Rouge, Wayne county; Mill Lake, Lake county and Lake Michigan, off New York Point, Charlevoix county, Michigan; Pigeon Lake, Ontario and Milwaukee, Wis. Some immature specimens from Lake George, N. Y., should also probably be included. It has also been found in the marl deposits at Cement City, Jackson county; Ann Arbor; Monitor, Bay county, and Pine Lake, Charlevoix county, Michigan, and Caribou, Me. As all the marl specimens are decorticated, it is impossible to say whether they were originally typical *sincera* or var. *nylanderi*.

V. SINCERA NYLANDERI Dall. Pl. I, figs. 7–9.

Judging from the suite examined, *nylanderi* (figs. 7 and 8) in its original locality is a well marked constant form, and standing alone might well be accorded specific rank. But as stated above, the specimens from High Island Harbor, show decided tendency to accentuate the striæ, and in a considerable number from Isle Royale, Lake Superior (collection of 1905), where typical *sincera* is not represented, all the gradations from close, elevated ribs to the wide spaced lamellæ of typical *nylanderi* are represented. So that there would seem to be no question, but that it is to be considered as a varietal form of Say's species. This form in its various aspects has also been found in Cliff river and Pine Lake, Marquette county, Michigan; Little Lakes, N. Y., and Lake Geneva, Wis. An unusually elevated example from Isle Royale, is illustrated by fig. 9.

V. SINCERA DANIELSI, n. v. Pl. I, figs. 10 and 11.

Shell larger and proportionately higher than the typical form; whorls 4, finely and regularly striate, very convex with a deeply impressed suture. Aperture entire, scarcely appressed to the body whorl.

Alt. 6, diam. 5.75 mm.

Cannon Lake, Rice county, Minn., Types No. 22475, coll. Walker. Cotypes in the collections of L. E. Daniels and the Philadelphia Academy. Sixteen specimens of this fine large form were collected by Mr. Daniels. They differ uniformly from the High Island typical form in the particulars mentioned.

VALVATA LEWISII Currier. Pl. I, figs. 12 and 13.

Dr. Lewis distinguished his *V. striata* by reason of its having the "epidermis brown and very regularly striate." In the same paper (Proc. P. A. N. S., 1856, 260) he describes "*V. sincera*" from the same locality as having the "shell smooth and polished, white and translucent." While unfortunately he does not seem to keep any examples of his typical *striata* in his own collection, there is a set from the Little Lakes labelled "*sincera*" which agrees with his description and which are the same as the form herein described as *V. bicarinata perdepressa*. This leaves practically no doubt as to his *striata* being the ordinary striate form.

V. lewisii in its aggregate form is exceedingly variable in regard to sculpture, ranging from the smooth or obsoletely striate var. *helicoidea* to a heavily ribbed form in which the ribs become low, closely spaced lamellæ very similar to the Isle Royale form of *sincera nylanderi*. In well developed examples of this form, the ribs give a brownish appearance to the shell, especially when not well cleaned, and it is possible that such specimens were the types of Lewis' species, and if varietal distinction were to be made between this and the more common form in which the sculpture is "fine and close like the winding of thread on a spool," it should be considered as the typical *lewisii*.[1] From the material before me, however, I fail to find sufficient evidence of any racial distinction in this particular, (as there is apparently in the case of *V. sincera nylanderi*) to justify such action. The two forms apparently live together and grade indefinitely into each other.

V. BICARINATA Lea. Pl. I, fig. 14.

When I prepared my former paper on *Valvata* (NAUT., XV, p. 123) I had not seen Prof. B. Shimek's "Mollusca of Eastern Iowa," (Bul. Lab. Nat. Hist. State Univ., Ia., I, p. 56, 1888) in which the specific validity of this species is upheld.

[1] This will have to be determined from examination of authentic author's specimens which I have not been able to obtain.

For comparison with the other forms herein discussed, a typical example is figured.

V. bicarinata has recently been collected by Messrs. H. H. Smith and A. A. Hinkley at several localities in Alabama, greatly extending its range towards the south.

V. BICARINATA CONNECTANS n. v.

Unicarinate, only the superior carina present, peripheral and basal carinæ obsolete, periphery rounded, base rounded or subangulated. Type No. 24142, coll. Walker. Lake Michigan, New Buffalo, Mich., also Lake Ontario, N. Y. Cotype in collection of L. E. Daniels, LaPorte, Ind.

Apparently of rather rare occurrence as only two specimens, were collected by Mr. Daniels in a considerable amount of material from several localities along the south shore of Lake Michigan. A single specimen also was found in a small set of *V. bicarinata perdepressa* from Lake Ontario, N. Y., received from Mr. F. C. Baker. This specimen is of special interest as illustrating the relation of this form and the succeeding one. Beginning as a typical *connectans*, the carina disappears about the beginning of the last whorl which is that of a typical *perdepressa.*

V. BICARINATA PERDEPRESSA n. v. Pl. I, figs. 15 and 16.

Shell broadly umbilicated, very much depressed, often planorboid. Ecarinate, whorls regularly rounded, occasionally subangulated around the umbilicus or at the periphery, smooth or obsoletely striate, frequently obscurely malleated, especially on the lower half of the whorl, very pale horn-colored, unicolored or with the apical whorls more or less tinged with dull purple or red. Types (No. 24123, coll. Walker) from Lake Michigan at Michigan City, Ind. Also from Lake Michigan at Chicago, Ills., Millers, Ind., New Buffalo, Mich., Lake Erie at Sandusky, Ohio, Lake Ontario at Jefferson county and ———?, N. Y., and Little Lakes, N. Y. Cotypes in the collection of L. E. Daniels, LaPorte, Ind., and the Philadelphia Academy.

This form is very abundant along the south shore of Lake Michigan. It would be taken for a smooth form of *V. lewisii*, were it not for the connecting links with *V. bicarinata* afforded by the occasional subangulated individuals and *bicarinata connectans.* It is very vari-

able in shape, ranging from planorboid with the apex depressed below the level of the body whorl to specimens with the apex quite as much elevated as in the ordinary specimens of *lewisii*. In sculpture it varies from almost perfectly smooth to a striation nearly as strong as that of typical *lewisii*. Indeed the more elevated and strongly striated examples standing alone would unhesitatingly be referred to that species.

Dr. Dall, who kindly compared specimens with his *V. lewisii helicoidea* writes: "The figured specimen (*helicoidea*) should have (to be adult) about one-half more whorl than it has in the figure. Some of yours, if the same view be taken, are almost exactly like the specimen figured. But, on comparison of adults, it is evident that the *lewisii helicoidea* has a smaller umbilicus; and, taken in profile, is less flattened. Your specimens, too, are on the whole smoother and more polished. The value of these differences remains to be determined."

The wider umbilicus in the Lake Michigan shells is undoubtedly correlated with the more depressed shape. The specimens collected by Lewis in the Little Lakes, N. Y., are indistinguishable from those from Lake Michigan. The Lake Erie and Lake Ontario specimens are uniformly smaller, but otherwise substantially the same.

The difficulty in finding any tangible distinction between the more elevated, substriated individuals of this form and the obsoletely striated examples of *V. lewisii* is similar to that experienced in attempting to separate *V. tricarinata simplex* from the smooth or obsoletely striated forms of *V. sincera*. And this naturally raises a query as to whether there are really more than two polymorphic species differing constantly in shape, but both varying in sculpture, all the way from tricarinate to smooth, and from smooth to ribbed-striate. Both series are complete and parallelism is absolutely exact.

	Group of *V. tricarinata.*	Group of *V. bicarinata.*
Tricarinate,	*V. tricarinata.*	*V. bicarinata normalis.*
Bicarinate,	*V. tricarinata confusa.*	*V. bicarinata.*
Unicarinate,	*V. tricarinata unicarinata.*	*V. bicarinata connectans.*
Smooth,	*V. tricarinata simplex.*	*V. bicarinata perdepressa.*

Obsoletely striate,	*V. sincera* (Anticosti).	*V. lewisii helicoidea.*
Thread-striate,	*V. sincera.*	*V. lewisii* (var. ?)
Ribbed-striate,	*V. sincera nylanderi.*	*V. lewisii* (typical ?)

In view of the recognized variability of all these forms, the inference to be drawn would seem inevitable.

Explanation of Plate I.

All the figures are drawn on the same scale (× 5) except 4, 5 and 6 which were drawn by Miss Helen Winchester, and these are substantially the same.

Fig. 1–3. *V. sincera*, High Island Harbor, Lake Michigan.
" 4–6. *V. sincera*, Anticosti.
" 7–9. *V. sincera nylanderi*, Portage Lake, Aroostook Co., Me.
" 9. *V. sincera nylanderi*, Isle Royale, Mich.
" 10–11. *V. sincera danielsi*, Cannon Lake, Rice Co., Minn.
" 12–13. *V. lewisii*, Traverse City, Mich.
" 14. *V. bicarinata*, Philadelphia, Pa.
" 15–16. *V. bicarinata perdepressa*, Lake Mich., Michigan City, Ind.

HELIX JEJUNA SAY TRANSFERRED TO PRATICOLELLA.

BY HENRY A. PILSBRY.

Recently I received from Mr. George H. Clapp some living examples of this small snail, with a request that they be examined anatomically to determine the generic position of the form, which has of recent years been grouped with the small Polygyras of the "Mesodon" type.

The snails were collected at Lemon City, Dade Co., Florida, by Mr. Chas. T. Simpson. Externally the soft parts do not differ from *Polygyra* and many other genera of Helices.

The terminal ducts of the genitalia are shown in Fig. 1. The penis bears the retractor and vas deferens at its apex. Near the base a very large gland or "appendix" is inserted (*a* in the figure). This seems to be a nearly solid but soft and readily broken gland. The vagina is more than half as long as the penis. The spermatheca

is large and oblong, upon an extremely short duct. Other organs as usual in Helices.

No *Polygyra* or "Mesodon" has a gland or appendix upon the penis, but in the Mexican genus *Praticolella*, represented in Texas by *P. griseola* and *P. berlandieriana*, a similar structure is found. I do not hesitate to refer *jejuna* to the genus *Praticolella* on the evidence of this peculiar organ, which has been noticed in no other genus of Helices within our limits. The Floridian snail differs from the Texan and Mexican forms by having an apparently simple penis retractor muscle, while in the other species it is split and has a triple

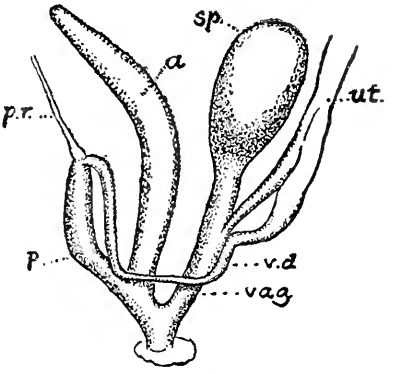


Fig. 1. *P*, penis; *p*, *r*, its retractor; *a*, penial gland; *vd*, vas deferens; *ut*, uterus; *sp*, spermatheca; *vag*, vagina.

insertion on penis and vas deferens. This simple condition was probably the ancestral structure of the genus, since it is that of all other related Helices.

The shell of this species, which we will now call *Praticolella jejuna* (Say), agrees somewhat better with that of *Praticolella* than with any other of our genera of Helices. Not much is known of the habits of the snail. It is quite a local form, which I never happened upon at Miami or elsewhere in some half-dozen visits to Florida. Mr. S. N. Rhoads found it on the "under side of young cabbage palms" at Miami. Further information upon the situations it affects will be of interest In Texas, *Praticolella berlandieriana* lives on bushes with *Bulimulus dealbatus mooreanus*, but during prolonged dry weather it burrows in the ground.

SOME SHELLS OF MISSISSIPPI AND ALABAMA.

BY A. A. HINKLEY.

In the fall of 1904, with the aid of some of my conchological friends, for the purpose of collecting in that region, a trip was made to Abbeville, Grenada, Durant and Columbus, Mississippi, and Tuscaloosa, Boligee, Tuscumbia and Florence, Alabama.

The streams along the Illinois Central railroad where stops were made, have sandy beds and not favorable for molluscan life, with the exception of two specimens of *Pleurocera elevatum*, no representatives of the *Strepomatidæ* were found in these streams.

In determination of material collected thanks are due Messrs. Bryant Walker, Wm. A. Marsh, L. S. Frierson, Dr. V. Sterki, F. C. Baker and H. A. Pilsbry.

Family HELICINIDÆ.

Helicina orbiculata Say. Boligee, Ala., dead specimens only.

Family HELICIDÆ.

Polygyra leporina Gould. Abbeville and Columbus, Miss., Boligee, Ala.

Polygyra troostiana Lea. Florence, Ala.

Polygyra fraudulenta Pilsbry. Florence, Ala.

Polygyra inflecta Say. A common species found at all localities.

Polygyra exoleta Binney. Florence, Ala.

Polygyra palliata Say. Abbeville, Miss., Boligee and Tuscaloosa, Ala.

Polygyra obstricta Say. Columbus, Miss., Florence, Ala.

Polygyra appressa Say. Florence, Ala.

Polygyra appressa perigrapta Pilsbry. Grenada and Columbus, Miss.

Polygyra thyroides Say. Abbeville, Grenada and Columbus, Miss., Tuscaloosa, Boligee and Florence, Ala. At Boligee they were numerous along the railroad right of way. In the same situation though not as numerous were *P. clausa* and *B. dealbatus*.

Polygyra clausa Say. Boligee, Ala., varies a little in size and thickness of the shell.

Polygyra spinosa Lea. Florence, Ala. Common on both sides of the river.

Polygyra barbigera Redfield. Tuscaloosa, Ala., a rare species.

Polygyra subglobosa Pilsbry. Columbus, Miss., Tuscaloosa and Florence, Ala.

Polygyra monodon Rack. Abbeville and Columbus, Miss., Florence, Ala.

Family Bulimulidæ.

Bulimulus dealbatus Say. Boligee, Ala. Dead specimens were very numerous in some of the fields.

Family Pupillidæ.

Strobilopsis labyrinthica Say. Boligee, Ala., Abbeville, Durant and Columbus, Miss.

Pupoides fallax Say. Boligee and Florence, Ala.

Bifidaria armifera Say. Boligee, Ala.

Bifidaria contracta Say. Boligee, Ala.

Bifidaria procera Gould. Boligee and Florence, Ala. At the former place it was found in tufts of grass in an open field, at the latter under stones in an open close pastured place along the river.

Family Glandinidæ.

Glandina truncata Brug. Boligee, Ala. The remains of nests of eggs were often found about old logs and young shells were quite common. A mature horn-colored specimen was an interesting variation.

Family Circinariidæ.

Circinaria concava Say. Tuscaloosa, Boligee and Florence, Ala.

Family Zonitidæ.

Omphalina fuliginosa Griff. Florence, Ala.

Omphalina laevigata Pfr. Abbeville, Grenada and Columbus, Miss., Tuscaloosa, Boligee and Florence, Ala.

Vitrea carolinensis Ckll. Boligee and Florence, Ala.

Euconulus fulvus Mull. Abbeville, Miss., Boligee, Ala.

Zonitoides arborea Say. Abbeville, Grenada Durant and Columbus, Miss., Boligee, Ala.

Zonitoides minuscula Binney. Boligee, Ala.

Gastrodonta demissa Binney. Columbus, Miss., Tuscaloosa, Boligee and Florence, Ala.

Gastrodonta interna Say. Tuscaloosa and Florence, Ala.

Family ENDODONTIDÆ.

Pyramidula alternata, Say. Abbeville, Grenada and Columbus, Miss., Tuscaloosa and Boligee, Ala.

(*To be continued*).

NOTES.

THE RAVENEL COLLECTION.—The museum of the College of Charleston, S. C., has acquired the valuable conchological collection of the late Dr. Edmund Ravenel, of Charleston, which contains some 3,500 species of land, fresh-water and marine shells.

LYMNÆA MEGASOMA SAY.—Fine specimens of this rare species have recently been taken at Lake Minnetonka, Minn., by Mrs. A. W. Abbott of Minneapolis.

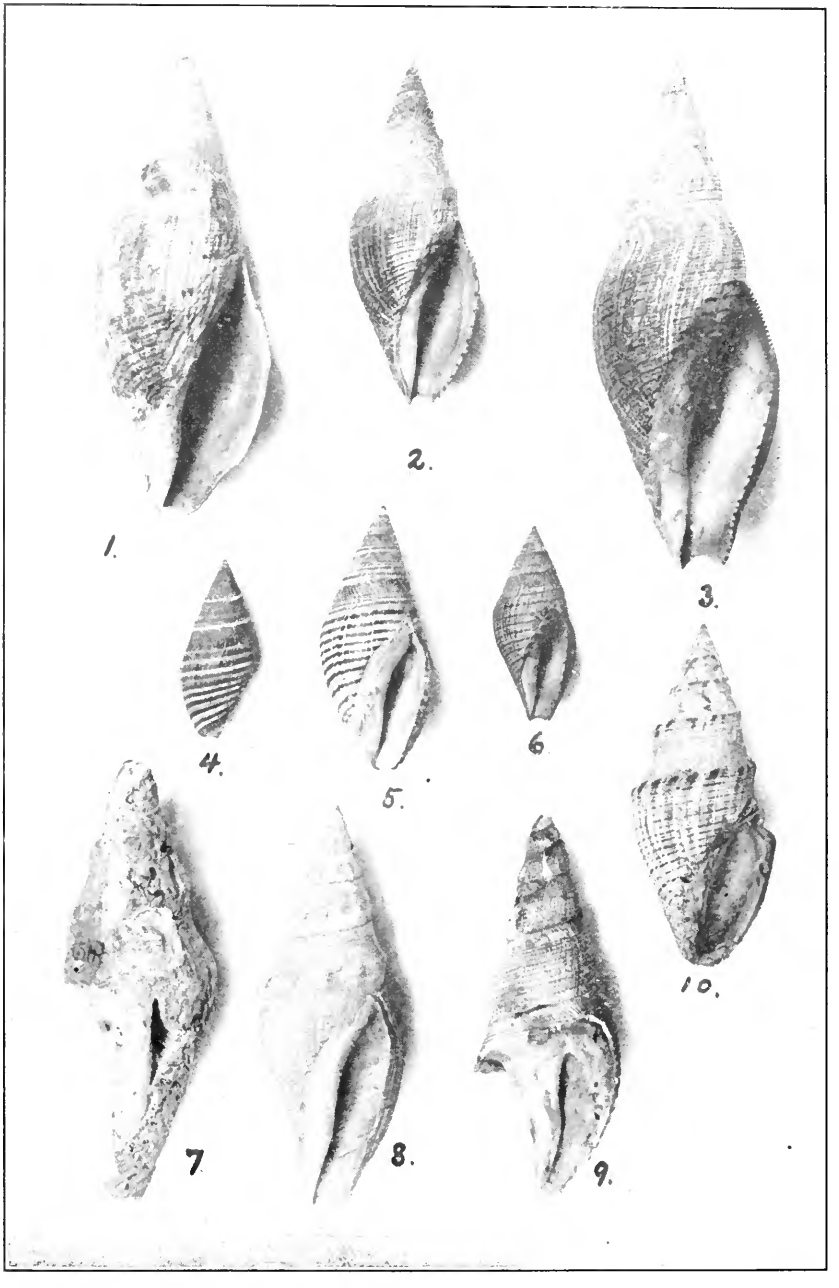
PUBLICATIONS RECEIVED.

NOTES ON JAPANESE, INDO-PACIFIC, AND AMERICAN PYRAMIDELLIDÆ. By Wm. H. Dall and Paul Bartsch, (Proc. U. S. Nat. Mus., XXX, pages 321–369, plates XVII–XXVI, 1906). This valuable work on the *Pyramidellidæ* is based in part on the collection of the museum of Berlin loaned to the U. S. National Museum for study. Some 22 new species are described and figured, and a number of new names are proposed to replace those pre-occupied. Three new subgenera *Nisiturris*, *Babella* and *Egilina* are also defined.

DESCRIPTION OF TWO NEW NAIADS. By Paul Bartsch, (Proc. U. S. Nat. Mus., XXX, pages 393–396, Plates 27–29, 1906). The species are *Nephronaias flucki* from Nicaragua and *Diplodon anapensis* from Argentina.

RECENT MOLLUSCA: A CATALOGUE OF OPERCULATE LAND SHELLS. By G. B. Sowerby and H. Fulton. London, 1906. A useful list of genera and species arranged "with slight modifications" according to Kobelt and Möllendorff's catalogue.

ANATOMY OF ACMÆA TESTUDINALIS MULLER, Part I. Introductory material. External anatomy. By M. A. Willcox. Reprint the American Naturalist, Vol. XL, pp. 171–187, 1906.



RAYMOND: WEST AMERICAN SPECIES OF GENOTA

THE NAUTILUS.

VOL. XX. AUGUST, 1906. No. 4.

THE WEST AMERICAN SPECIES OF PLEUROTOMA, SUBGENUS GENOTA.

BY WILLIAM JAMES RAYMOND.

Five species of the subgenus *Genota*, section *Dolichotoma*, have been described from the Pacific coast of North America. Three of the species have been figured; two have not hitherto. Specimens of all five, including the types of four, being temporarily in possession of the writer, it seemed desirable to bring them together in a single photographic plate. Apparently derived from a common stock, and arising in late tertiary time, the nominal species are closely allied. Yet there is convenience in retaining the present specific designations of forms which are readily distinguishable. Two of the species have not thus far been found living. As the deeper water along the coast is explored, they may possibly be discovered in the dredge, together with other forms not now known.

Pleurotoma (*Genota*) *carpenteriana* Gabb.

Pleurotoma (*Surcula*) *carpenteriana* Gabb. Proc. Cal. Acad. Nat. Sci., 1865, p. 183; Pal. Cal., vol. 2, p. 5, pl. 1, fig. 8.

Pliocene.—San Fernando and Santa Rosa (Gabb); San Diego (Dall).

Pleistocene.—Santa Barbara and San Pedro (Gabb); San Pedro, San Diego and Ventura (Arnold); Santa Monica (Rivers).

Living.—Drake's Bay, 30 fathoms (Arnheim); Monterey to San Diego (Cooper); San Pedro, Santa Catalina Island and San Diego, 10 to 100 fathoms (Raymond); Cerros Island (Dall).

This is the largest and most plentiful species of the group. It is

characterized by a regularly fusiform outline, eight whorls, fine spiral sculpture, slight concavity near the suture, slight convexity of the anterior part of the upper whorls, the obtuse shoulder thus formed being *below* the middle of each whorl and sometimes ornamented with inconspicuous nodes. Plate II, fig. 1, illustrates Gabb's type, found in the pleistocene of Santa Barbara. It is the property of the University of California. Fig. 3 shows an example close to type. It was dredged in about 100 fathoms, off Santa Catalina Island. Length 80 mm. In fig. 2 the nodes are distinguishable, which when better developed are a diagnostic feature of the next species. Length 54 mm.

Pleurotoma (*Genota*) *tryoniana* Gabb.

Pleurotoma (*Surcula*) *tryoniana* Gabb, Pal. Cal., vol. 2, p. 6, pl. 1, fig. 9.

Pleistocene.—San Pedro (Gabb); Santa Barbara and San Pedro (Cooper); Santa Monica (Rivers).

Living.—San Diego (Cooper); San Pedro (Oldroyd).

Typically the angular, nodose whorls, eight in number, separate this species from *Genota carpenteriana*, but intermediate forms like the example shown in fig. 2 are found rarely, and indicate the close alliance of the two species. Plate II, fig 7, illustrates Gabb's type, found in the pleistocene of San Pedro. Fig. 8 represents a specimen found at Santa Monica. Its length is 62 mm.

Pleurotoma (*Genota*) *cooperi* Arnold. Mem. Cal. Acad. Sci., Vol. III, p. 203, pl. vii, fig. 3.

Pleistocene.—San Pedro (Arnold); Santa Monica (Rivers).

Characterized by the angular whorls, seven or eight in number, decidedly concave above the nodose angle, with relatively sharp sculpture. The nodes are more numerous than in the last species and become less prominent toward the aperture. Aperture less than half the length of the shell. Plate II, fig. 10, illustrates the single specimen found in the pleistocene of Santa Monica.

Pleurotoma (*Genota*) *stearnsiana* Raymond. NAUTILUS, Vol. XVIII, p. 1.

Living.—San Diego and Santa Catalina Island, 25 to 40 fathoms (Raymond).

The species is characterized by its small size, eight or more whorls, relatively wide form and broad color bands. Plate II, fig. 6, represents the type. Length 30.5 mm. An old specimen, length 41.5 mm., is shown in fig. 5, and a younger example in fig. 4. All are from San Diego.

Pleurotoma (*Genota*) *riversiana* Raymond. NAUTILUS, Vol. XVIII, p. 14.

Pliocene.—Santa Monica (Rivers).

Characterized by narrow form, sharply expressed sculpture and obtuse angle *above* the middle of the whorls. Plate II, fig. 9, illustrates the type which thus far is the only specimen found. Length 59 mm.

University of California, July, 1906.

NOTE ON THE GENUS GLABARIS GRAY OR PATULARIA SWAINSON.

BY WILLIAM HEALY DALL.

The genus *Patularia* Swainson, appears in his Malacology (1840) pp. 287 and 381. There are two species of which the first is *Anodon ovatus* Swainson, Exotic Conchology pl. xxxvi, 1823, (2nd ed. by Hanley, p. 30, 1841) not *Iridina ovata* Swainson, Phil. Mag., 1823. The second species *A. rotundatus* Swainson, is doubtfully referred to *Anodonta* by Simpson in his Synopsis, p. 638. If it be as he supposes synonymous with *A. woodiana* Lea, Swainson's name dating from 1823, will of course take precedence. In 1841 Swainson cites under his *Patularia ovata Anodonta trapesialis* Lamarck, and Hanley points out that the latter specific name, being four years older, must take precedence of *ovatus* Swainson. *Anodonta trapesialis*, however, in modern classification, is a typical *Glabaris* of Gray. But *Glabaris* Gray, dates only from 1847, when the name was applied to *A. exotica* Lamarck, by Gray, in his list of generic synonyms, Proc. Zoöl. Soc. Lond., 1847, p. 197.

It would seem, therefore, that, since the first species and type of *Patularia* is a *Glabaris*, that the former name should be substituted for the latter in our systems. An examination of the nomenclators fails to show any earlier use of the generic name *Patularia* in zoölogy and there seems to be no reason which would militate against its adoption.

A careful examination of the text of the second edition of the Exotic Conchology shows that this is the only name included in it which is likely to affect the existing nomenclature.

SOME SHELLS OF MISSISSIPPI AND ALABAMA.

BY A. A. HINKLEY.

(*Concluded from July Number, p. 36*).

Family SUCCINEIDÆ.

Succinea concordialis Gould. Durant, Miss., one dead shell was all found. In the summer of 1904 this species was plentiful at the R. R. bridge across Little Muddy near Du Bois, Ill.

Succinea aurea Lea. Florence, Ala.

Family LIMNAEIDÆ.

Lymnæa desidiosa Say. Tuscaloosa and Florence, Ala.

Lymnæa caperata Say. Boligee, Ala.

Lymnæa columella Say. Florence, Ala.

Physa gyrina Say. Florence, Ala.

Physa heterostropha Say. Tuscumbia, Ala.

Physa pomilia Conrad. A rill below Columbus, Miss.

Physa troostiana Lea. Spring above Florence, Ala.

Planorbis trivolvis var. *glabratus* Say. Shoal creek, Florence, Ala.

Planorbis trivolvis Say. Durant, Miss. One specimen.

Planorbis dilatatus Gould. Grenada, Miss.

Segmentina wheatleyi Lea. Boligee, Ala.

Ancylus elatior Anthony. Tennessee river, Florence, Ala.

Ancylus kirklandi Walker. Tombigbee and Yalabusha rivers.

Ancylus rhodaceus Walker. Tennessee river, Florence, Ala.

Family AURICULIDÆ.

Carychium exiguum Say. Abbeville, Miss. Only found two specimens.

Family STREPOMATIDÆ.

Io spinosa Lea. Tennessee river, Florence, Ala. One specimen only of this fine species was found.

Angitrema salebrosa Conrad. Tennessee river, Florence, common.

Angitrema subglobosa Lea. Tennessee river, Florence, Ala.

Angitrema tuomeyi Lea. Tennessee river, Florence, Ala. A few were found in 1894 but none this time.

Angitrema duttoniana Lea ?. Tennessee river, Florence, Ala.

Angitrema lima Conrad. Cypress Creek, Florence, Ala. A few faintly banded.

Angitrema verrucosa Raf. Tennessee river, Florence, Ala.

Lithasia florentina Lea. Cypress and Shoal creeks, Florence, Ala. Found only a few.

Lithasia nuceola Anthony. Tennessee river, Florence, Ala. Doubtful determination.

Lithasia curta Lea. Tennessee river and Shoal creek, Florence, Ala.

Strephobasis plena Anthony. Tennessee river, Florence, Ala.

Strephobasis curta Hald. Tennessee river and Shoal creek, Florence, Ala.

Pleurocera alveare. Tennessee river, Cypress and Shoal creeks, Florence, Ala.

Pleurocera undulatum Say. Tennessee river, Florence, Ala.

Pleurocera excuratum Conrad. Tennessee river, Florence, Ala.

Pleurocera moniliferum Lea. Tennessee river, Florence, Ala.

Pleurocera ponderosum Anthony. Tennessee river, Florence, Ala.

Pleurocera moriforme Lea. Tennesee river, Florence, Ala.

Pleurocera thorntonii Lea. Tennessee river, Florence, Ala.

Pleurocera annuliferum Conrad. Black Warrior, Tuscaloosa, Ala.

Pleurocera elevatum Lea. Yallabusha river, Granada, Miss. Only two specimens found, they were covered with a thick deposit which being removed revealed a polished, olive colored epidermus and two strong bands.

Pleurocera trivittatum Lea. Tombigbee river, Columbus, Miss.

Pleurocera incurvum Lea. Cypress creek, Florence, Ala.

Pleurocera alabamensis Lea. Cypress creek, Florence, Ala.

Pleurocera olivaceum Lea. Tombigbee river, Columbus, Miss.

Pleurocera lativittatum Lea. Shoal creek, Florence, Ala.

Goniobasis acuta Lea. Florence, Ala.

Goniobasis formosa Conrad. Florence, Ala.

Goniobasis hydeii Conrad. Black Warrior, Tuscaloosa, Ala.

Goniobasis interveniens Lea. Florence, Ala.

Goniobasis nassula Conrad. Spring in Tuscumbia, Ala.

Goniobasis thorntonii Lea. Spring in Tuscumbia, Ala.

Goniobasis aterina Lea. Florence, Ala. Found with *Pomatiopsis binkleyi.*

Goniobasis nitens Lea. Florence, Ala. This determination is doubtful.

Goniobasis adusta Anthony. Spring near Cypress creek, Florence, Ala.

Goniobasis paupercula Lea. Small stream above Florence, Ala.

Eurycælon crassa Hald. Tennessee river, Florence, Ala. Only one very young shell found. When at this place in 1894 this form was found of all sizes with three wide bands and the carina of the young shells remarkably developed, Pilsbry says this is *Eu. anthonyi.*

Anculosa carinata Brug. Tennessee river, Florence, Ala. A few specimens can be referred to no other species and are put under this name with some doubt.

Anculosa subglobosa Say. Tennessee river and Shoal creek, Florence, Ala.

Anculosa praerosa, Say. Tennessee river and Cypress creek, Florence, Ala.

Anculosa tintinnabulum Tennessee river and Shoal creek, Florence, Ala.

Family VIVIPARIDÆ.

Vivipara intertexta Say. Rill near Durant, Miss., and a rill near Boligee, Ala., both places in heavy timber.

Campeloma ponderosum Say. Tennessee river, Florence and Tombigbee river west of Boligee, Ala.

Campeloma decisum Say. Tennessee river, Florence, Ala.

Campeloma decisum var. *heterostropha.* One specimen. Tennessee river.

Campeloma coarctatum Lea. Tallahatchie, Yalabusha, Big Black and Tombigbee rivers.

Campeloma decampi Currier. Tennessee river, Florence, Ala.

Family AMNICOLIDÆ.

Amnicola cincinnatiensis Anth. Big Black and Tombigbee rivers.

Amnicola limosa Say. Tallahatchie, Yalabusha, Big Black and Tombigbee rivers.

Amnicola augustina Pilsbry. Tuscumbia, Ala. Found in the

stream running from the spring, they were in algæ and on the muddy bottom.

Somatogyrus subglobosa Say. Tallahatchie and Yalabusha rivers.

Somatogyrus georgianus Walker. Tennessee river, Florence, Ala.

Somatogyrus substriatus Walker. Tombigbee and Tennessee rivers. The most plentiful species of the genus in these two streams.

Somatogyrus humerosus Walker. Tennessee river, Florence, Ala.

Somatogyrus quadratus Walker. Tennessee river and Shoal creek.

Somatogyrus strengi Pilsbry and Walker. Tennessee river and Shoal creek.

Somatogyrus biangulatus Walker. Tennessee river, Florence, Ala.

Somatogyrus excavatus Walker. Shoal creek, Florence, Ala.

Somatogyrus tennesseensis Walker. Shoal creek.

Somatogyrus pumilus Conrad. Tennessee river, Florence, Ala.

Pyrgulopsis mississippiensis Pilsbry. Shoal creek. This little species was numerous a short distance above the canal aqueduct, where sediment had collected on the rock bottom, a few were found on algæ. They were only found in mid-stream.

Pomatiopsis lapidaria Say. Found on leaves after a shower, in a moist situation, always shaded by timber and scrub palmetto. Boligee, Ala.

Pomatiopsis hinkleyi Pilsbry. This species was very numerous in the same places where the types were found in 1894. It was also found across the river high up on the river bluff, on and in damp moss but not in a wet situation like the others. See vol. X, p. 37 of the NAUTILUS.

Family CORBICULIDÆ.

Calyculina transversa Say. Yalabusha, Black and Tombigbee rivers.

Calyculina occidentalis Prime. Creek, Boligee, Ala.

Sphaerium striatinum Lam. Big Black river, Durant, Miss., Boligee, Alabama, one specimen at last place.

Sphaerium stamineum Conrad. Young specimens, Grenada, and one mature at Durant, Miss.

Pisidium virginicum Gmel. Durant, Miss.

Pisidium compressum Prime. Tuscumbia spring; Black Warrior, Tuscaloosa, and Shoal creek, Florence, Ala.

Pisidium variabilis Prime. Big Black river, Durant, Miss.

Pisidium noveboracense Prime. Variety, spring, Tuscumbia, Ala.

Pisidium peraltum Sterki. Yalabusha river, Grenada, Miss.

Pisidium neglectum Sterki. Ms, name; Black Warrior, Tusca loosa, Ala.

Pisidium singleyi Sterki. Black Warrior, Tuscaloosa, Ala.

Pisidium atlanticum Sterki. Floating creek, Columbus, Miss.

(*To be continued.*)

A NEW SCALA FROM CALIFORNIA.

BY WILLIAM HEALEY DALL.

Scala lowei n. sp.

Shell small, conic, with five or more rapidly increasing whorls after the (lost) nucleus; color white, whorls very convex with deep sutures and a small, spiral umbilicus; there is no basal disk or cord; sculpture of about twenty-seven rather thick, strongly reflected, smooth, close-set varices, and very close, fine, spiral threads, covering the whole whorl between the varices, and separated by about equal sulci; aperture sub-circular, slightly higher than wide, the reflected margin wide at the outer lip, patulous at the inner base, narrow between the shoulder and the preceding whorl, and at the shoulder produced into a short, rather stout spine which, repeated on successive varices, coronates the whorls. Length of shell (without nucleus), 7.0; max. diameter, 4.0; max. diameter of aperture, 2.5 mm.

Habitat: dredged off Avalon, Catalina Island, Cala., in 40–60 fathoms, by H. N. Lowe, in 1903.

This species recalls *S. bellastriata* Carpenter, in general character, but is smaller; has more numerous, close-set and more strongly reflected varices; and has the spiral striation and threading much finer than in *bellastriata* of equal size.

The first shell belonging to Mr. Lowe was returned to him after a figure had been drawn from the specimen. A second specimen was sent by him, from the same vicinity, in 1906, which is retained in the National Museum, No. 191548. This also has lost its nucleus. The six remaining whorls measure 7.0 mm. in length.

DESCRIPTIONS OF TWO NEW CLEOPATRA AND A PISIDIUM.

BY C. F. ANCEY.

1. *Cleopatra multilirata*, Anc.

Testa fusco-olivacea, indumento ferrugineo tecta, modice sed pro genere aperte perforata, solidula, concolor vel circa umbilicum brunneo tincta, ovato-turbinata, liris acutis permultis (circa 8–9 in penultimo, 24–25 in ultimo anfractu) angulata. Spira conoidea, erosa. Anfractus superst. $3\frac{1}{2}$ rotundati, sutura profunda, ultimus latus, ovatus. Apertura ovata, fere recta, superne subangulata, marginibus callo appresso nitido junctis, columellari vix patulo. Operculum fuscum, extus medio valde concavum, nucleo paucispirato, subcentrali, attamen propius marginem columellarem sito.

Long. 9, diam. 7, alt. apert. 5 mill.

Hab. Vinaninony, Madagascar (*teste* Ph. Dautzenberg).

A very distict species quite different from other forms recorded from Madagascar, such as *C. amoena*, Morelet, *C. moniliata*, Morelet, *C. grandidieri*, Crosse et Fischer and *C. Trabonjyensis*, Smith. All of these but the latter were not correctly located in their proper genus, as the first was referred to Melania, the second to Paludina and the third to Paludomus by the describers. The present species is somewhat related to *Cl. Trabonjyensis*, but the liræ are much more numerous.

2. *Cleopatra Smithi*, Anc.

Testa ovato-acuminata, anguste perforata, subtenuis, flavescens vel flavo-virens, epidermide tenui induta, liris fuscis infra peripheriam ultimi anfractus evanescentibus regulariter exarata. Spira conoidea, truncata. Anfractus circiter 7 convexi, sed haud tumido-ventricosi, superiores, liris 4 cincti, concolores (lires haud coloratis), ultimus ovatus, liris 5–6 æquidistantibus supra insertionem aperturæ et sæpe una infra medium cinctus et 2–3 parvulis circa perforationem sculptus, inter liras striis incrementi conspicuis eximie peraratus, zona peripherica castanea, alteraque circa basin ornatus. Apertura ovalis, superne et infra paulo acuminata, totius testæ dimidio multo minor. Peristoma tenue, marginibus callo tenui junctis, columellari simplici, non expanso.

Long. (testæ erosæ, 4 anfr.) 11 diam. 7, alt. apert. 5, lat. ejusd. $3\frac{1}{2}$ mill.

Hab. River Chozi, which flows into the Chambézi, region of lake Bangwéolo, British Central Africa (Rev. Fath. M. Guillemé, 1905).

Strikingly like *Cl. Mweruensis*, Smith (Proc. Zoöl. Soc. London, 1893, pl. lix, fig. 10), but smaller, differently colored and more regularly lirate. The locality is very distant from lake Mweru, although belonging to the same geographical region.

For this and numerous other interesting shells collected during his journeys in Central Africa I am indebted to the Fath. M. Guillemé. The material collected by him will be reported upon in the near future. As a species of *Cleopatra* was already named after him, I am respectfully dedicating this new species to E. A. Smith, Esq., of the British Museum.

3. *Pisidium planatum*, Anc.

Concha minuta, lenticularis, parum inflata, compressa, nitidula, tenuis, pallide cinerea, striis concentricis exilibus crebre sub lente sculpta, umbonibus lævibus, depressis, inæquilatera. Pars antica rotundata, postica fere duplo major, regulariter arcuata. Umbones late depressi, obtusissimi, inermes, lævigati. Dens cardinalis parvus, laterales debiles. Ligamentum parvum, lineare.

Diam. $3\frac{1}{5}$, alt. $2\frac{1}{2}$, crass. $1\frac{1}{2}$ mill.

Hab. Andriba, Central Madagascar (*teste* Dautzenberg).

A more depressed form than *P. Madagascariense* Smith, the only other species of the genus described from the island.

NOTES.

On the Habits of Praticolella jejuna:—In the vicinity of St. Augustine, Florida, I found this species locally only west of the city in the white sandy, scrub oak section, near the pines, under boards and leaves, in fact this was the only shell found there. They were undersize, and very thin, probably due to the unfavorable condition for molluscan life. Mr. A. G. Reynolds writes me from Disston City, Hillsboro county, Fla.: "It is found under dead leaves and trash, occasionally under boards, and more rarely on pine stumps." Mr. Charles T. Simpson in his valuable paper, "Contributions to the Mollusca of Florida," (Proc. Davenport Acad. Nat. Sci., v, p. 66, 1886), says: "The only mollusk ever found in high, dry pine woods in Florida. I have seen it crawling on barren dry sand near Braidentown, and around my dwelling, and along the road in Fogartville."—C. W. Johnson.

CHLORITIS EDWARDI, Gude, ascribed with some little doubt to the Moluccas, is found in the Island of Ceram, where it was found by the Rev. Father Le Coq d'Armanville, who lost his life in New Guinea. My specimens were received from the Abbé Mège, *Omphalotropis macromphala*, Bavay (Journ. de Conch., 1905, vol. liii, p. 250, figs. 9, 10, 11), is the same as *O. Quadrasi*, v. Möll., and therefore becomes a synonym of the latter. The shell is from the Island of Guajan (or Guam), Ladrone Islands. Von Möllendorff's paper appears to have escaped the notice of Mr. Bavay.—C. F. ANCEY.

NOTE ON DYAKIA AND PSEUDOPARTULA.—A recent article by Lieut.-Col. H. H. Godwin Austen (Proc. Malac. Soc. Lond., vii, p. 93) has called my attention to the anatomical description of *Dyakia nasuta* (*Helix nasuta* Metcalfe) by the same author (P. Z. S., 1891), which I had overlooked when treating of this species in Manual of Conchology, xiv, p. 12. It appears that the snail belongs to the *Zonitidæ*. There cannot be much doubt that the Sumatran and Javan species forming the group *Pseudopartula*, and which I associated with *nasuta*, will also be transferred to *Zonitidæ*, since their resemblance to *nasuta* seems too strongly marked to be adventitious. —H. A. PILSBRY.

A SYNONYM OF BRACHYPODELLA.—In my monograph of *Urocoptidæ* I overlooked the name *Microstoma hanleyanum* Jousseaume. Mém. Societe Zoölogique de France for 1889, p. 247. This is *Cylindrella hanleyana* of Pfeiffer, a species of *Brachypodella*. The name *Microstoma* will become a synonym of *Brachypodella*. It was probably not intended as a new generic name, being very likely an error for *Mychostoma*.—H. A. PILSBRY.

PUBLICATIONS RECEIVED.

HELICINA OCCULTA Say (Proc. Davenport Acad. of Sciences, ix, pp. 173–180). ADDITIONAL NOTE ON HELICINA OCCULTA (Journal of Geology, xiii, 1905, pp. 232–237). By B. Shimek. The rather extensive records of this species in both conchological and geological literature are reviewed in these papers, with copious notes and comparisons of recent and fossil shells. The alleged depauper-

ation of loess as compared with modern shells is disproved; "while there are variations in size in both recent and fossil shells, there is no marked depauperation of the fossils." *H. occulta* is uniformly found living on well-wooded grounds, leading Prof. Shimek to conclude that the forest areas in the loess region were formerly of much greater extent.

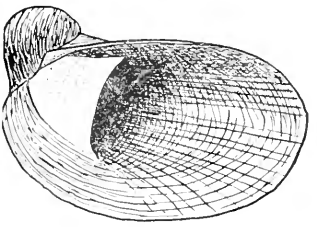
On the Anatomy of Certain Species of Solenidæ. On the Anatomy of Ensis magnus Schum. By H. H. Bloomer. Journ. of Malacol., xii, pt. 4. Several oriental and tropical American species of *Solenidæ* are described anatomically in these papers. Mr. Bloomer has now devoted ten papers to the morphology of the *Solenidæ*, to the great advantage of all interested in Pelecypod anatomy.

HENRY A. WARD.

We deeply regret to record the death of Professor Henry A. Ward, who was killed by an automobile at Buffalo, N. Y., on July 4. He was born at Rochester, N. Y., in 1834. Studied at Williams College and Rochester University, and became an assisiant of Louis Agassiz in 1854. He was Professor of Natural History at the Rochester University from 1860 to 1865. From 1870 to 1900 Prof. Ward traveled in all parts of the world, making large and valuable collections which were shipped to his Natural History Establishment at Rochester and from there distributed among the museums, universities, colleges and private collections throughout the country.

Prof. Ward has perhaps done as much to popularize and encourage the study of natural history than any one man. Mr. Wm. T. Hornaday paid him a glowing tribute, under the well earned title, "The King of Museum-builders." It is probably safe to say that through his agency more shells have been brought into this country than by any other means. His "Catalogue of Specimens of Mollusca" forms a useful hand-book for beginners. At various time his Establishment has employed men who have subsequently become prominent in various branches of the natural sciences.

For some years past Prof. Ward has devoted his energies chiefly to collecting meteorites, bringing together the largest collection in the world. An account of it may be found in the July number of the *Popular Science Monthly.*



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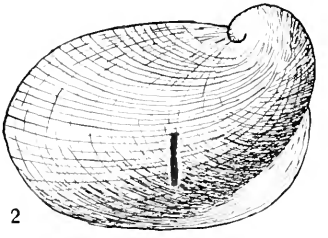

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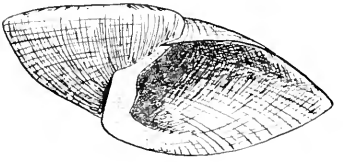

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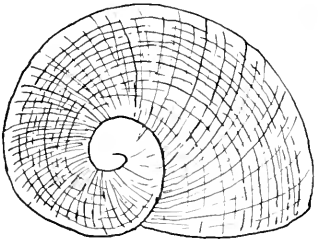

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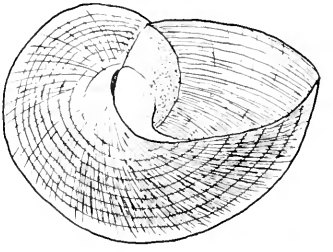

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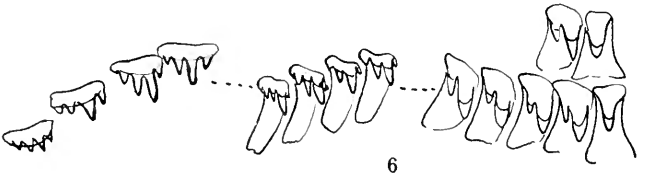


6

AMPHIGYRA AND NEOPLANORBIS.

THE NAUTILUS.

VOL. XX. SEPTEMBER, 1906. No. 5.

TWO NEW AMERICAN GENERA OF BASOMMATOPHORA.

BY HENRY A. PILSBRY.

In the course of a collecting expedition to Alabama in October and November, 1903, Mr. A. A. Hinkley found a number of mollusks of unusual interest and importance.[1] Among them were two species of spiral-shelled gastropods quite unlike any fresh-water snails hitherto known in this country, having affinities with the *Ancylidæ*.

Like Ancylus, the new forms are essentially sinistral in their soft parts, but the shells are dextral. They are very small snails, and were found on or usually under rocks in swift water, and evidently do not depend upon free air for respiration, having a false gill in the pallial chamber.

Genus AMPHIGYRA *nov.*

The shell is minute, Neritoid or Crepidula-like, with a small depressed lateral spire, apparently dextral, composed of about $1\frac{1}{2}$ very rapidly enlarging whorls, the last very convex dorsally, imperforate; the apex is smooth, and the last whorl is spirally striate. The aperture is very large, oblique, transversely oval, the peristome continuous and free, thin. Cavity of the spire very small, a thin, broad, concave columellar plate projecting across the end next the spire, as in *Crepidula* or *Latia*.

The soft parts are sinistral, externally Limnæoid, with large black eyes near the inner bases of the short blunt cylindric tentacles.

[1] See lists of the species collected, in NAUTILUS for August and September, 1904.

Two adductor muscles, kidney-shaped in section, one on each side, replace the usual columellar muscle.

The radula has 18, 1, 18 teeth, arranged about as in *Lymnæa*. Centrals with a single cusp, the laterals bicuspid, the outer cusp smaller. The transition teeth have four or five cusps. The marginal teeth are low, wide and separated, with four or five cusps. Pl. III, fig. 6, teeth of *A. alabamensis*.

There is a short false gill hanging in the pallial cavity.

The shell has some resemblance to *Crepidula* and *Latia*. *Lepyrium* and *Pompholyx* are also slightly similar; but the resemblance is no doubt superficial. *Pompholyx*, like *Amphigyra*, is sinistral with an ultrasinistral shell. It has no plate or lamina across the visceral cavity. The soft anatomy of *Amphigyra*, so far as worked out, seems to show most affinity with the *Ancylidæ*.

The deck of *Amphigyra* is present at all stages of growth observed, in young as well as mature shells. In *Gundlachia* no septum is developed until a period of hybernation or æstivation is reached. The shell is more solid than that of *Ancylus* or *Gundlachia*.

Amphigyra alabamensis n. sp. Pl. III, figs. 1, 2.

The shell is shaped like a convex *Crepidula*, closely, finely and sharply striate spirally, and of a pale yellowish-corneous tint. The last whorl flares in a raised ledge at the baso-columellar region, the back being very convex. The spire is slightly sunken, depressed. The raised parietal margin of the lip is abruptly kinked where it passes across the preceding whorl. The columellar plate or deck extends over nearly one-third the total transverse length of the aperture. Alt. 1.1, diam. 2 mm.

Wetumpka, Alabama, on the under surfaces of rocks in swift water.

Genus NEOPLANORBIS n. gen.

The shell is minute, subdiscoidal, nearly flat above, convex below, perforate, carinate at the periphery, composed of about two rapidly enlarging whorls, the apex impressed and turned in. The aperture is very oblique, wider than high, a little dilated at the base. Peristome thin, not continuous, the columellar margin straight and broadly dilated, somewhat thickened within.

The dentition and so far as known, the soft anatomy, is similar to *Amphigyra*.

Type *N. tantillus*.

The type of this group was at first taken for a *Planorbis* of the *P. dilatatus* group,[1] but when the dentition was examined it became obvious at once that the snail could not belong to the *Planorbinæ*. The radula is not materially unlike that of *Amphigyra*, but the conchological features of the two groups are quite diverse, *Amphigyra* being Crepiduloid with a distinct "deck" or columellar plate, while *Neoplanorbis* is Planorbis-shaped, perforate, with a carinate periphery and no "deck."

Neoplanorbis tantillus n. sp. Pl. III, figs. 3, 4, 5.

Shell very narrowly perforate, slightly convex above, very convex below, with a strongly projecting rounded keel at the periphery; light brown; surface slightly shining, sculptured with very obliquely radial growth-lines and raised spiral striæ, rather coarse for a shell of this size. Whorls 2, rapidly enlarging, the apex somewhat sunken; first whorl very convex, the second much less so, slowly descending in front. Aperture very oblique, shaped like a gothic-arched door, the upper and lower margins arcuate, the outer margin angular, the columellar margin dilated, straight and vertical, with a rather wide whitish callous within. Alt. .8, diam. 1.7 mm.

The specimens occurred at Wetumpka, Alabama with the preceding species. This is one of the smallest fresh-water mollusks yet found in America.

NOTE ON LEPYRIUM.

BY H. A. PILSBRY.

In connection with the genus *Amphigyra* I have had occasion to examine the specimens of *Lepyrium* in the collection of the Academy. It appears that the *Lepyrium* from the Cahawba river differs from *L. showalteri* (*Neritina showalteri* Lea) of the Coosa, in being much smaller, alt. 2.7, diam. 3 mm., with a straighter columellar edge and without a raised outer margin of the columellar area. It will probably prove specifically distinct, but as I have been able to compare only one of the original lot of *L. showalteri*, it may be best to rank the Cahawba form as a subspecies under the name *Lepyrium showalteri cahawbensis*.

[1] It was reported as *Planorbis tantillus* in Mr. Hinkley's list, *Nautilus* XVIII, p. 54.

SOME SHELLS OF MISSISSIPPI AND ALABAMA.

BY A. A. HINKLEY.

(*Concluded from August Number, p. 44.*)

Family UNIONIDÆ.

Truncilla triquetra Raf. Tennessee river, Florence, Ala.

Truncilla brevidens Lea. Tennessee river, Florence, Ala.

Truncilla sulcata Lea. Tennessee river, Florence, Ala.

Truncilla haysiana Lea. Tennessee river, Florence, Ala.

Truncilla propinqua Lea. Tennessee river, Florence, Ala.

Truncilla personata Say. Tennessee river, Florence, Ala.

Truncilla biemarginata Lea. Tennessee river, Florence, Ala.

Truncilla florentina Lea. Tennessee river, Florence, Ala.

Truncilla perplexa Lea. Tennessee river, Florence, Ala.

Truncilla turgidula Lea. Shoal creek, Florence, Ala.

Micromya cælata Conrad. Tennessee river, Florence, Ala.

Lampsilis excavatus Lea. Tallahatchie, Big Black and Tombigbee rivers and Floating creek, Columbus, Miss.

Lampsilis ovatus Say. Tennessee river, Florence, Ala.

Lampsilis multiradiatus Lea. Tennessee river, Florence, Ala.

Lampsilis biangulatus Lea. Tennessee river, Florence, Ala.

Lampsilis hydianus Lea. Tallahatchie, Yalabusha, Big Black and Tombigbee rivers.

Lampsilis affinis Lea. Tombigbee river and Floating creek, Columbus, Miss.

Lampsilis orbiculatus Hildreth. Tennessee river, Florence, Ala.

Lampsilis anodontoides Lea. Tombigbee river, Columbus, Miss., and Yalabusha and Tennessee rivers.

Lampsilis fallaciosus Simpson. Tallahatchie, Yalabusha and Big Black rivers in Mississippi.

Lampsilis rectus Lamarck. Tombigbee and Tennessee rivers.

Lampsilis lineosus Conrad. Tallahatchie, Big Black and Tombigbee rivers.

Lampsilis concestator Lea. Yalabusha river, Grenada, Miss.

Lampsilis ogeecheensis Conrad. Tombigbee river, Columbus, Miss.

Lampsilis apicinus Lea. Tombigbee river, Columbus, Miss.

Lampsilis trabalis Conrad. Tennessee river. One specimen.

Lampsilis parvus Barnes. Tombigbee river, Columbus, Miss.

Lampsilis cromwellii Lea. Yalabusha river, Grenada, Miss.

Lampsilis alatus Say. Tombigbee and Tennessee rivers.

Lampsilis purpuratus Lamarck. Tallahatchie, Yallabusha and Big Black rivers.

Lampsilis gracilis Barnes. All the rivers visited.

Lampsilis leptodon Rafinesque. Tennessee river. Two poor specimens.

Lampsilis claibornensis Lea. Floating creek, Columbus, Miss.

Medionidus acutissimus Lea. Tombigbee river and Floating creek, Columbus, Miss.

Medionidus subtentus Say. Tennessee river, Florence, Ala.

Obovaria retusa Lamarck. Tennessee river, Florence, Ala.

Obovaria tinkeri Wright. Yalabusha river, Grenada, Miss.

Obovaria unicolor Lea. Tallahatchie, Yallabusha, Big Black and Tombigbee rivers, very plenty in the last stream at Columbus, Miss.

Obovaria ellipsis Lea. Tennessee river, Florence, Ala.

Obovaria castanea Lea. Tallahatchie, Yalabusha, Big Black and Tombigbee rivers.

Plagiola securis Lea. Tombigbee and Tennessee rivers.

Plagiola elegans Lea. Tennessee river, Florence, Ala.

Plagiola donaciformis Lea. Tallahatchie, Yalabusha, Big Black, Tombigbee and Tennessee rivers.

Tritogonia tuberculata Barnes. Tallahatchie, Yalabusha, Big Black and Tombigbee rivers. In the Black a few specimens were found with purple nacre.

Cyprogena irrorata Lea. Tennessee river, Florence, Ala.

Obliquaria reflexa Rafinesque. Tombigbee and Tennessee rivers.

Ptchobranchus phaseolus Hildreth. Tennessee river, Florence, Ala.

Dromus dromus Lea. Tennessee river, Florence, Ala.

Strophitus spillmanii Lea. Yalabusha river, Grenada, Miss.

Strophitus tombigbeensis Lea. Tombigbee river, Columbus, Miss.

Strophitus elliotii Lea. Tallahatchie river, Abbeville, Miss.

Strophitus schafferianus Lea. Tennessee river, Florence, Ala.

Anodonta grandis Say. Tallahatchie and Yalabusha rivers.

Arcidens confragosus Say. Yalabusha, Big Black and Tombigbee rivers.

Symphynota costata Rafinesque. Tennessee river. Only dead and poor ones found.

Symphynota complanata Barnes. Tombigbee river, Columbus, Miss.

Margaritana monodonta Say. Tennessee river. Large numbers were piled up by rocks, logs and in places on the river bank, where the musk rats had opened them. The living ones were plentiful under rocks in the shallow water, as many as two hundred being found under one slab.

Unio gibbosus Barnes. Tombigbee and Tennessee rivers.

Unio crassidens Lam. Tombigbee and Tennessee rivers.

Unio arctatus Conrad. Tombigbee river, Columbus, Miss.

Unio tetralasmus geometricus Lea. Yalabusha river, Grenada, and a rill near Durant, Miss.

Pleurobema holstonensis Lea. Tennessee river, Florence, Ala.

Pleurobema edgariana Lea. Tennessee river, Florence, Ala.

Pleurobema tumescens Lea. Tennessee river, Florence, Ala.

Pleurobema dolabelloides Lea. Tennessee river, Florence, Ala.

Pleurobema decisa Lea. Tombigbee river, Columbus, Miss.

Pleurobema curta Lea. Big Black and Tombigbee rivers.

Pleurobema taitiana Lea. Tombigbee river near Boligee, Ala.

Pleurobema nux Lea. Tombigbee river, Columbus, Miss.

Pleurobema bulbosa Lea. Tombigbee river, Columbus, Miss.

Pleurobema nuculopses Conrad. Tombigbee river, Columbus, Miss.

Pleurobema aesopus Green. Tennessee river, Florence, Ala.

Quadrula asper Lea. Tallahatchie, Yalabusha, Big Black and Tombigbee rivers.

Quadrula plicata Say. Tennessee river, Florence, Ala.

Quadrula perplicata Conrad. Yalabusha and Black rivers.

Quadrula latecostata Lea. Tombigbee river, Columbus, Miss.

Quadrula heros Say. Tallahatchie, Yalabusha and Tennessee rivers.

Quadrula trapezoides Lea. Yalabusha, Big Black and Tombigbee rivers.

Quadrula cylindrica Say. Tennessee river, Florence, Ala.

Quadrula metanevra Raf. Tombigbee and Tennessee rivers. Common in both streams.

Quadrula intermedia Conrad. Tennessee river.

Quadrula stapes Lea. Tombigbee river, Columbus, Miss.

Quadrula rumphiana Lea. Tombigbee river near Boligee, Ala.

Quadrula pustulosa Lea. Tallahatchie, Yalabusha, Big Black, Tombigbee and Tennessee rivers. Those from the Yalabusha, Tallahatchie and Big Black have few pustules, and occasionally one is smooth.

Quadrula rubiginosa Lea. Tallahatchie river, Abbeville, Miss.

Quadrula cerina Conrad. Yalabusha and Tombigbee rivers.

Quadrula hebetata Conrad. Big Black river, Durant, Miss.

Quadrula rubida Lea. Big Black river, Durant, Miss.

Quadrula obliqua Lamarck. Tennessee river, Florence, Ala.

Quadrula solida Lea. Tennessee river, Florence, Ala.

Quadrula plena Lea. Tombigbee and Tennessee rivers.

Quadrula pyramidata Lea. Tennessee river, Florence, Ala.

Quadrula subrotundus Lea. Tennessee river, Florence, Ala.

Quadrula ebenus Lea. Tombigbee and Tennessee rivers. Common.

Quadrula granifera Lea. Tennessee river, Florence, Ala.

LYMNÆA DANIELSI SP. NOV.

BY FRANK COLLINS BAKER.

Lymnæa danielsi sp. nov.

Shell elongated, attenuated, of medium thickness; color ranging from very light-yellowish horn to dark chestnut or purple; surface shining, growth lines generally fine and close-set, but occasionally, as near the aperture, coarse and often raised into ridges; last whorl often malleated; spiral sculpture of fine impressed lines; apex smooth, spermaceti-white in color; whorls 7, flat sided or slightly convex, slowly increasing in diameter; spire long and sharply attenuated, longer than the aperture; sutures impressed; aperture ovate, often a little triangular, somewhat flaring; peristome sharp, simple, bordered by a dark purple or chocolate band in many specimens; parietal wall with a thin callus, generally closely appressed to the shell and almost closing the umbilical region, leaving a small chink; axis gyrate as in stagnalis, forming a heavy, ascending plait; interior of aperture varying from white to dark purple.

Length 28.5, breadth 12, aperture length 14, breadth 6.5 mm.

Length 27.5, breadth 11.5, aperture length 12.5, breadth 6.0 mm.
Length 29.01, breadth 11.25, aperture length 13, breadth 6.0 mm.
Length 25.5, breadth 10, aperture length 11.5, breadth 6.0 mm.
Length 23, breadth 9, aperture length 9.5, breadth 4.75 mm.
Length 20, breadth 10, aperture length 10.5, breadth 5.5 mm.

Types: Chicago Academy of Sciences, L. E. Daniels; cotypes, Academy of Natural Sciences, Philadelphia; State Museum, Indianapolis, Ind.

Range: Lake Maxinkukee, Indiana, collected by Mr. L. E. Daniels.

This distinct species may be known by its acutely pyramidal spire and small, flaring aperture. It somewhat resembles elongate forms of *stagnalis*. Some time ago Mr. Daniels sent six specimens of this *Lymnæa* for identification. It remained unnamed until a recent visit to Washington, when a large collection of the same form was seen which had been secured by Dr. Paul Bartsch, of the Smithsonian Institution, and its novelty was thereby established. Later, Mr. Daniels sent several hundred specimens for examination. Lake Maxinkukee also contains *Lymnæa palustris*, *desidiosa* and *parva*. The juvenile *palustris* are liable to be mixed with *danielsi* if care is not taken to observe the form of the shell particularly the form of the axis.

The material collected by Dr. Bartsch contains one monstrosity in which the aperture is entire and separated from the body whorl. The lot recently sent by Mr. Daniels is wonderfully uniform, showing that the species is quite stable. A few curious variations occur in which the spire is shortened and the aperture is enlarged and expanded. In some specimens the columella plait is exaggerated to such an extent that it forms a pseudo-tooth. In other specimens the lower part of the aperture is somewhat effuse. The variation in color is remarkable, and it would be of interest to know the cause of the rich chestnut and purple color. The normal form is horn-colored like *stagnalis*.

The species is named in honor of Mr. L. E. Daniels, of La Porte, Indiana, whose assiduous collecting has added many new and interesting shells to the fauna of the middle west.

NOTE ON MITRA PICTA REEVE.

BY SLOMAN ROUS.

Mitra picta Reeve (Conch. Icon., p. 123, 1844) has been placed by Tryon in the synonymy of *M. barbadensis*. This, I think, is an error. A very cursory examination of the two shells will at once show them to be distinct. The sculpture of *barbadensis* consists of spiral raised lines, with fine microscopic, spiral and longitudinal lines decussating the spaces between them. In *picta* the spiral lines are impressed, closely, deeply foveolated, microscopically striated longitudinally and pitted where they cross the revolving lines. The fine spiral lines of *barbadensis* are absent in *picta*.

In color *M. picta* is a much darker brown, with the white patches much more conspicuous, being larger and more numerous often in wide longitudinal lines from end to end of the shell, but broken at the suture, or often massed on the suture so that the white predominates. I think usually one-fourth of the surface is white.

The folds on the columella of *M. barbadensis* are five in number, sometimes a sixth being just perceptible, in *picta* there are only four, the fourth being very small. I do not recollect ever to have noticed a fifth fold, but if it occurs it will be as rare as six in *barbadensis*.

Tryon also says "Sowerby erroneously refers the latter (*picta*) to the Cape of Good Hope." This is not an error of Mr. Sowerby. I was resident in the Cape over forty years, during which I had the pleasure of supplying him with many examples, and I have many still in my possession, most, or I think all, of them collected in Algoa Bay.

There can be no doubt that *M. picta* Reeve, is a valid species, and that its habitat is the Cape of Good Hope. That other writers have followed Tryon in this synonymy is sufficient reason for bringing this error to the notice of conchologists.

NOTE ON VITREA APPROXIMA AND V. VANATTAI.

BY H. A. PILSBRY AND BYRANT WALKER.

Owing to the fact that the proof of the article in which these species were described (Proc. A. N. S. P. 1902, pp. 431–3) was not read by both us, some errors unintentionally crept in, which were

not discovered until too late to be corrected in the original publication.

The localities of the two species were reversed and the proper credit was not given for the discovery of *V. approxima*. The types of that species were not collected by Ferriss and Walker and did not come from Wilson's Cove. They were collected by Henry Hemphill many years before and were distributed by him as "*V. wheatleyi* Bld." As Hemphill's stay on Mt. Mitchell was very limited (See Proc. P. A. N. S. 1900, page 149) they were no doubt collected either along the trail to the summit or on Mt. Mitchell itself. Collectors who received specimens from Hemphill as *V. wheatleyi* would do well to reëxamine them carefully.

V. vanattai was collected by Walker in Wilson's Cove.

SUBSPECIES, MUTATIONS AND FORMS.

BY T. D. A. COCKERELL.

Messrs. Pilsbry and Ferriss in discussing the variations of *Bulimulus alternatus* (Proc. Acad. Nat. Sci. Phila., 1906, p. 140) say: "we can find no ground for dividing them [the different forms of subsp. *mariæ*] into several races, as Prof. Cockerell proposes."

It seems opportune to protest against this interpretation of my paper of 1891; the more so, since Prof. Pilsbry has before tried to insist upon the erroneous nature of my proposed classification. There is not, and never has been, the least divergence of opinion as to the actual facts. In 1891, of course, we did not know as much about the subject as we do to-day, thanks to the excellent researches of Messrs. Pilsbry and Ferriss; but now, as before, the objections to my nomenclature have no valid basis, except in a mere difference of opinion as to what should receive a name.

I grew up in England, accustomed to the methods of the Jeffreysian school, which paid little attention to slightly differentiated races, but bestowed names on all sporadic or individual variations which were striking enough to be easily recognized. Professor Pilsbry pays little attention to sporadic variations, but is very much interested in geographical races or subspecies. It was undoubtedly a

serious fault in the English work, that we were so little alert for racial characters, and we were also to blame for confusing under the name "variety" several different phenomena. I have watched the development of the American researches with admiration, and certainly have no fault to find with the methods adopted; but at the same time I believe we make a great mistake if we assume that sporadic varieties are not worth noting and recording. Professor Pilsbry will probably concede all this, in principle, but will object to giving them names. It is unavoidable, I suppose, that there should be differences of opinion about this; but it is certainly true that only when they are named and find a place in the manuals do they get properly noticed and recorded.

The best example of the English method which has so far appeared is found in Taylor's "Monograph of the Land and Freshwater Mollusca of the British Isles," now in course of publication. I can hardly believe that any naturalist can study this work without admiring its exhaustive treatment of variation, and perceiving the value, from the standpoint of evolution, of the orderly presentation of so great a mass of information. At the same time, it is not without its faults, one of which is the confusion together of different races and mutations, treating them all as "varieties," without discrimination. Thus under *Testacella scutulum*, the geographical form *major*, from Algeria, appears as a variety; while its mutation *albina* is made to include all pallid forms, whether from Algeria or elsewhere. It is evident that *albina* should be treated under *major* as a mutation; and the name *pallida*, proposed for the pale mutation of the typical *scutulum*, should be so applied. Following the Jeffreysian method, the term "monstrosity" is applied in an illogical manner to sinistral mutations and various distortions of the shell, which have nothing particular in common.

Deviations from the normal may be conveniently included under three heads:

1. *Subspecies*, as generally understood in this country; forms occupying a distinct territory (or it may be ecological position) of their own, but intergrading with the species.

2. *Mutations*, the so-called spontaneous variations, arising sporadically from some modification of the germ-plasm, and often persisting in limited strains. These include, among other things, sinistral and albino variations; and it is desirable that analogous variations of

different species should receive the same mutational name: *e. g.*, *sinistrorsum* for all sinistral mutations.

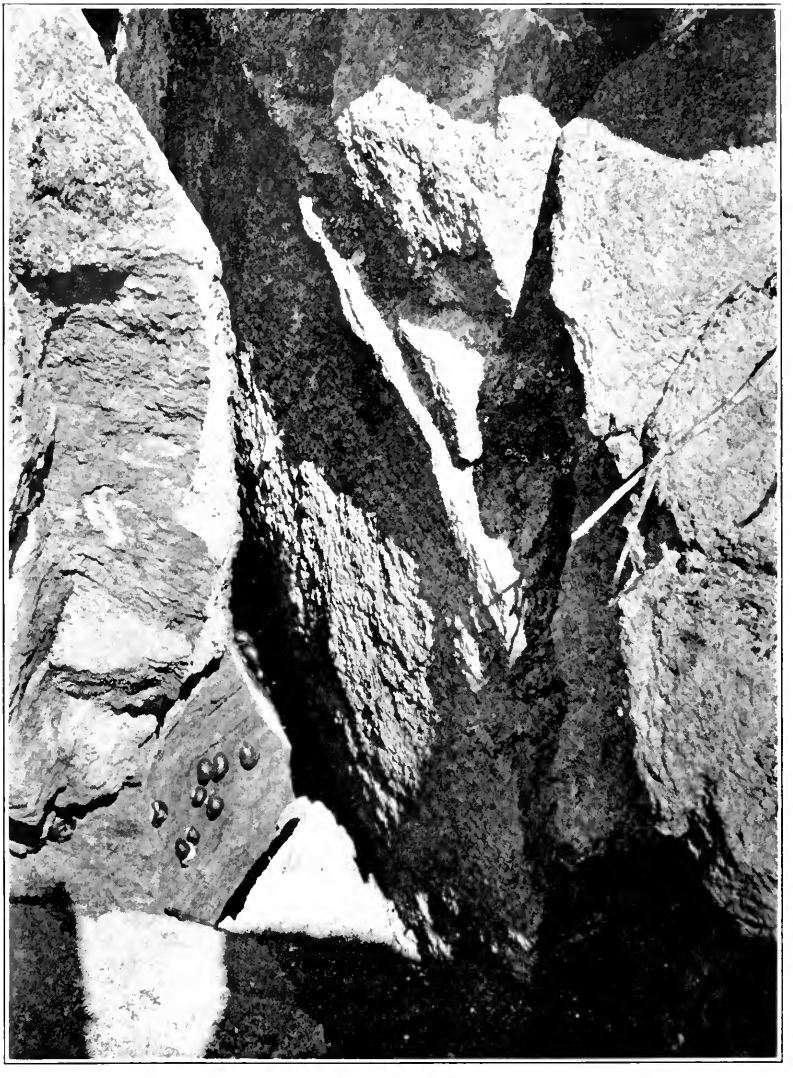
The interest attaching to these variations is very great at the present time, when so much is being said about the theories of de Vries and the Mendelian phenomena. We have, moreover, pretty good evidence that such "sports" have given rise to genuine specific characters, certain shells (*e. g.*, *Vitrea crystallina*) being permanently "albino," while whole genera have become sinistral. The sinistral mutations are perhaps of especial significance, inasmuch as in the nature of the case they must arise "all at once."

3. *Forms*, resulting from the immediate effect of the environment upon the individual, and presumably not inheritable in the proper sense of the word. I notice that Messrs. Pilsbry and Ferriss, in the work already cited (p. 169) name a "form" of *Goniobasis*.[1] These variations might be held to have the least significance of the three, but they are often striking, and are usually of interest from a physiological if not from an evolutional standpoint. It must be remembered, also, that while they are said to be immediately due to the environment, this is only true in a partial sense; there must already exist the inheritable power of *responding in this particular way* to the conditions found. This power of response, as exhibited under diverse environments, is itself a thing of great interest to every biologist, and no one can doubt its significance in relation to the persistence and spread of species.

The term "variety" may well be retained for use in cases which cannot clearly be referred to one of the above categories. The simple trinomial may be used for the subspecies; in the case of the others, "var.," "mut." or "f." should be placed before the last name.

It should be added that not unfrequently "mutations" belong to particular races, which are distinguishable only from their power of producing them. Thus, I cannot see that the *Cochlicopa lubrica* of the Rocky Mountains and of England are in any wise different shells; but in England certain mutations are frequently produced, which are never seen in the Rocky Mountains.

[1] Omitting, however, to name the very distinct mutations, figs. 27 and 28, p. 167. According to the method I advocate, fig. 28 would be mut. *spiralis*, and the same name would be applied to similar mutations of other species, except when a different one had been earlier provided.



KELSEY: COLONY OF EPIPHRAGMOPHORA TUDICULATA.

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A HEALTHY COLONY OF EPIPHRAGMOPHORA TUDICULATA.

BY F. W. KELSEY.

While enjoying a short vacation, during the month of July of this year, I sojourned with an old-time friend, Mr. I. J. Frazee, in Pamoosa cañon, about fifteen miles north of Escondido, in San Diego County, and whenever I went prowling around among the hills with my camera I always kept my weather eye open for anything that carried a shell on its back.

My efforts were rewarded by a goodly find of *Glyptostoma newberryanum* Binney, and *Epiphragmophora tudiculata* Binney. The latter, in one instance, were so plentiful as to deserve more than passing notice, and I went to a good deal of trouble to enable me to get a photograph to present to the readers of the NAUTILUS.

By means of bars, I moved a rock weighing over a ton, back from the face of the cliff, so as to allow the light to enter and to give an unobstructed view of the colony of helices hibernating in the lower part of the cleft between the two masses of rock, and occupying a space of not more than two square feet.

Of course, only a portion of the group shows in the picture, but after making the exposure, I collected fifty-eight adult shells and left more than half that number of immature ones for seed.

With one exception, I have never before seen snails in their wild state so plentiful. This was in the summer of 1902 when I collected over one thousand live *Epiphragmophora stearnsiana* Gabb, in a space not over fifty yards square at Pacific Beach, near San Diego.

REMARKS ON CERTAIN NEW ENGLAND CHITONS WITH DESCRIPTION OF A NEW VARIETY.

BY FRANCIS N. BALCH.

The recent announcement by Dall [’05 a. and b.] of a new *Chiton* from New England—the first local addition to the group in many years—makes this a favorable moment to introduce an allied novelty with a few remarks.

Tonicella Blaneyi Dall, was founded on a single specimen dredged by Dwight Blaney, Esq., of Boston, off Ironbound Island, Frenchman’s Bay, Maine, in twenty fathoms.

Its diagnostic marks consist substantially in conspicuously radially ribbed lateral areas and terminal valves.

Dall says it seems: “somewhat intermediate between *Tonicella* and *Trachydermon*, with a leaning toward the former, while it seems to be most nearly related specifically to *Tonicella marmorea*”—an opinion in which I concur.

But this “intermediate” character raises the whole question of the true relation of these forms, which I now propose to discuss.

Trachydermon ruber and *Tonicella marmorea* are both common north of Cape Cod in from five to one hundred fathoms; the former, in my experience, outnumbering the latter (which favors the deeper waters,) at least ten to one.

They much resemble one another and in fact Gould [’70] (who retained them both in the Linnean genus *Chiton*) says of *ruber:* “It is not difficult to distinguish at sight well marked individuals of this species from those of *C. fulminatus*” (i. e., *Tonicella marmorea.*) “But there are intermediate specimens which it is not easy to pronounce upon. In general, this species is smaller, more solid, more convex, the valves more beaked, lines of growth more deep, the zigzag lines never appearing, though the posterior margin of the valve is sometimes dotted with white and red. The impunctured or ungranulated surface, however, is the best, as it is a constant, characteristic.”

But Gould’s diagnostic points will not stand. The color-patterns *do* duplicate, and the surface of *ruber is* punctate, as Dall has himself pointed out [’79]. I may add that in the coarseness of the punctation the two overlap.

The fact is, as Gould indicates, that while the extremes of the two

forms are well separated the series yet approach very near if they do not overlap.

In spite of this the two are to-day almost universally placed by American and British malacologists in two distinct genera—genera which, in Pilsbry's monograph [Pilsbry '92] are rather widely separated.

I propose very briefly to review their recent generic history.

Both were included in Gray's genus *Ischnochiton*, from which Carpenter ['63] split off *Trachydermon* as a sub-genus, naming no type though his own *retiporosus* was the first of the species referred to it. Neither *ruber* nor *marmoreus* was mentioned. He later declared it corresponded to the "second section" of Gray's *Ischnochiton* "* * * scales of mantle minute, granule-like," and raised it to the rank of a genus.

In 1873 [Carpenter '73] he published brief and informal, but important, notes of his observations on the *Chitons* of our New England Coast made during work with our Fish Commission expeditions. Of *C. ruber* he said: "It belongs to Gray's genus *Ischnochiton*, * * * 'section †, mantle scales minute, granular;' but as the gill-rows are short * * * it is necessary to establish a fresh genus, *Trachydermon* * * *."

Of *C. albus*—now by far the commonest species all along our shore, outnumbering *ruber* and *marmorea* combined a great many times over and scarcely to be missed by any dredger—he said: "I twice captured a live specimen; but each time it eluded the aftersearch. I do not doubt that this is also a *Trachydermon* * * *." While not germane to the present inquiry this is interestingly suggestive of changes in the *Chiton* census.

Of *C. marmoreus*, he said: [it] "is *Tonicia* of H. Adams and Gray, simply because the girdle is smooth. The true southern *Toniciæ*, however, have pectinated insertion-plates and ambient gills, like the typical *Chitons;* while the northern species so-called have sharp plates and short gills. They differ, in fact, from *Trachydermon* simply in the girdle being destitute of the minute scales. I distinguish the group as *Tonicella.*"

This is the origin of the latter genus, which we now know is far removed from true *Tonicia.*

Tonicella, then, was originally nothing but a scaleless-girdled *Trachydermon*, with *marmorea* as its type-species. I have looked in

vain through Dall ['79,] Fischer ['87,] Pilsbry ['92] and other leading modern authorities for some other tangible distinction between the two genera, but all the cited authors retain the two nearly in the exact Carpenterian sense above given, though the single diagnostic difference results in their rather wide separation under Pilsbry's scheme.

The trouble with this single diagnostic difference is that according to my observations it does not exist in the type-species, *marmorea*.

According to my observations neither *ruber* nor *marmoreus* has scales, strictly speaking. In both (in *ruber* always, in *marmorea* usually) the girdle is set with minute, stumpy spines. In *ruber* these have some such shape as a thimble or short finger-cot and are thick-set, giving a shagreen-like surface, while in *marmorea* they are proportionately longer and thinner, commonly absolutely much smaller, usually (if not always) much less thickly set, often very sparse indeed and apparently sometines lacking entirely.

In other words my observations bear out the beautiful accuracy of Sars ['78,] Tab. 8, figs. 3 a.—1. and 4 a.—1., on the basis of which he erected the genus *Boreochiton* expressly to contain our two forms, in ignorance of Carpenter's prior *Trachydermon*.

If Sars' figures and my observations are correct there is no more ground for generically separating *ruber* and *marmorea* on the basis of girdle-character [and no other has been suggested] than there would be for putting No. 3 and No. 1 sandpapers in different genera. If indeed the two species do not actually intergrade in this character, at least the difference between the coarsest and finest (or naked) *marmorea* is far greater than the difference between the coarsest *marmorea* and the finest *ruber*.

The upshot is that I feel confident *marmorea* must be removed to *Trachydermon* and stand close beside *T. ruber*. What is to become of *Tonicella* after the removal of its type-species to a prior genus I leave to others.

Admitting that *ruber* and *marmorea* stand close beside one another in the same genus, how are they specifically distinguished? I think the answer must be—only by what Dall calls "the sum of the characters." Gould's supposed diagnostic differences have been dealt with already. Great as is the apparent difference between the rough red-and-white striped narrow girdle of an extreme *ruber* and the smooth, leathery, green, wide girdle of an extreme *marmorea* they almost if not entirely overlap on this point also.

The most reliable features known to me are the arrangement of the notches and radial canals of the anterior valves (which in *marmorea* are confined to a central segment of say 100°, while in *ruber* they spread through nearly 180°, the limiting pair being obscure); and the form of the tegumentum of the mid-valves (which in *marmorea* has a rather sharply convex anterior edge, and in *ruber* concave or sinuated). These characters are ascertained in so few specimens that I am not sure how constant they are.

I have no doubt, however, that *ruber marmorea*, taking the "sum of the characters," are quite valid species as such things go.

With these conclusions behind us, let us take up the new forms to be discussed.

The affinities of *T. Blaneyi* may be analyzed as follows[1]: girdle-covering, like *marmorea;* girdle-color, like *marmorea;* punctation, like *ruber;* notches and canals (anterior valve,) like *marmorea;* form of tegumentum (mid-valves,) like *ruber.*

I may add that, examining large series for ribbed specimens, I find distinct though slight "ribbing" of the anterior valve in several specimens of *ruber* but none in *marmorea.*[2]

What, now, is *T. Blaneyi?* It may be pathological, but nothing suggests it. It may be a unique specimen of an established distinct species, but if so, since said to be conspicuous and occurring in much-worked waters, it must be highly local or excessively rare. It may be a "connected variant" of *marmorea*, but the intermediate stages of "ribbing" are missing, occuring rather in *ruber;* it may be a "connected variant" of *ruber*, but seems closer to *marmorea;* it may be a "disconnected variant," "sport" or "mutant," which will either become extinct or found a species and which merely happens to come from the *ruber* end of the *marmorea* series. Finally, it may be a hybrid, with the *ruber* tendency to wrinkling (possibly ancestral?) intensified by the cross as is not uncommon in such cases. My own provisional judgment would be for the latter.

While Mr. Blaney was working in Frenchman's Bay I was at work (in the summer of 1899 and 1901) in the next bay west—Blue Hill Bay. My richest ground was a small, stony area in about 12 fathoms off Harriman's Point where *T. ruber* was abundant while

[1] Based entirely on Dr. Dall's descriptions and figures. The unique specimen is in the U. S. Nat. Mus.

[2] Series much smaller.

T. marmorea was rather uncommon—as indeed I found it throughout. On this spot I dredged the form described below—one adult and one half grown in 1899, and a young specimen in 1901.

Tonicella ruber (Lowe) var. *index*. nov.

In every respect typical except in color,[1] which is in life an ivory-white slightly tinged with green (taking on in alcohol or formol the exact appearance of old ivory tinged faintly with yellow,) highly polished and absolutely unmarked except for a few extremely faint and minute light pink dots on the posterior edges of the mid-valves and a very conspicuous dark purple elongated triangle pointing posteriorly on the keel of the fifth valve. Girdle very pale, otherwise typical.

A color variety connected with the typical form by intermediate stages is perhaps not worth describing, but this form, while clearly close to typical *ruber*, appears to be quite discontinuous. Dr. Dall pronounces it new to him, which is practically to say new to science.[2] In spite of the fact that the mark on the fifth valve is often recognizable in typical specimens (and is probably present in all, though disguised by the strong color-patterns) and in spite of the fact that very pale, almost white, valves frequently occur and sometimes (as Dall has noted) to the number of four or five in a single specimen, yet the present variety can be distinguished from any other specimen of *ruber* I have ever seen, across an ordinary room. It is not a mere case of faintness of the rosy markings. The markings are wiped out and a totally new color scheme (viz. green) introduced. My three specimens, dredged two years apart, are absolutely indistinguishable except for size. The first specimen dredged was adult (probably hatched the year previous) the last very young (probably breeding the next year.) It is, therefore, not connected with age and has persisted on the same spot probably for at least four years; but is not a true geographical race (in the sense, for instance in which ornithologists use the term) since it is a cohabitant with the typical form.

What, then, is *T. ruber* var. *index?* It may be pathological, or a "physiological variety"—an albino in short—but it's local persist-

[1] Radula not examined.

[2] In this connection *Chiton marmoreus* var. *cœruleus* Winkley should be considered. See NAUTILUS VIII, p. 78, 1894.—ED.

ence for at least four years looks otherwise. It is scarcely a "variety" in the ordinary sense, for the intermediate terms are completely lacking. It is a "sport" or "mutant" in the sense of a discontinuous variant, breeding true and founding a new centre of variation? To my mind the evidence, while wholly inconclusive, suggests that possibility.

T. Blaneyi and *T. ruber* var. *index*, add two extremely interesting problems to New England malacology-problems which are all the more interesting because further work by Mr. Blaney or some other fortunately situated student, should go far to yield a solution in the course of a few years.

I may add that the feature from which var. *index* takes its name—the striking dark backward-pointing triangle on the keel of the fifth valve—suggests an interesting inquiry of a different nature. It appears to be a very wide spread and definite feature, appearing in various species in various groups, now more, now less disguised by conflicting color-patterns. It is by no means confined to the fifth valve though commonest there. I find no notice of this odd *Chiton* character in such examination of the literature as I have been able to make. The fifth valve appears to have no specially significant topographical relation with the internal anatomy, nor, indeed, is the hollow of the keel in any of the valves occupied by any special organ so far as I know. Has this mark, then, relation to some specialization of the complicated tegumentary system of organs?[1]

Jamaica Plain, Mass., September, 1906.

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[1] Postscript. Since the above was written I have noted that in the "List of British Marine Mollusca" published in 1902 by a committee of the Conchological Society of Great Britain and Ireland—apparently a very careful revision in the course of which generic questions were well considered—*T. ruber* and *T. marmorea* are, indeed, united in one genus, but that genus is *Tonicella*. How this result was reached I do not know.

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SOME OBSERVATIONS ON THE OVA OF UNIONIDÆ.

BY L. S. FRIERSON.

When the ova of those species of Unionidæ, with which I am acquainted, are first noted in the marsupia, they are spherical in shape, and consist of a single mass of yolk, surrounded with a clear fluid, probably albumen, all confined in a spherical egg-shell membrane. Soon after fertilization takes place, the yolk undergoes segmentation, and goes through a "mulberry" stage, and finishes with the familiar glochidium. Several interesting facts have been noted, which may prove of interest. Some young ova of a *Quadrula trapezoides* Lea were under observation, and being called off a short time, on my return I noticed that some of the ova had changed their

shapes in the interim. Some of these ova resembled dumb bells in shape (except that the two balls were in close juxtaposition). Close observation showed that on the side of the spherical vitellus would appear a slight bump or projection. This would slowly grow until it had become as large as the remainder of the yolk, thus producing the dumb bell, apparently the fluid contents of the yolk would pour itself from one ball into another, and a motion similar to that of the well known Amœba would result.

The other case was that of the ova of *Anodonta imbecillis* Say, which were in the mulberry stage. These were revolving about an axis, making in some instances six complete turns per minute, while the axis was fixed for each individual, the direction of this axis bore no relation to anything that I could see, but were in every direction. Some were horizontal, others perpendicular and many oblique.

This revolution was confined to the inside of the shell. The egg as a whole remaining unmoved, neither the cause or object of this rotation could be noted or conjectured by me. Possibly when packed together in the marsupium, the motion would influence the shell, and so in a measure prevent *congestion* in the narrow gill passages.

A solution of salt would in a minute or two cause a visible contraction of the vitellus, and the stoppage of the motion. Being curious to know if alcohol would stimulate their motions I placed a drop on the slide. In an instant an appearance resembling a violent effervescence took place, and at its close every egg-shell had *burst open*! Apparently the endosmosis had so far exceeded the exosmosis as to burst the membranes.

Frierson, La., August, 1906.

SPHÆRIUM HENDERSONI N. SP.

BY V. STERKI.

Mussel large, almost equipartite, well inflated; superior margin curved, with slightly marked rounded, or no angles where passing into the supero-anterior and posterior slopes which are slightly marked; scutum and especially scutellum distinct; anterior and posterior ends rounded, the latter scarcely drawn downward; beaks near or in the middle in half-grown and adult specimens, markedly

anterior in the young, well prominent over the hinge margin, slightly inclined towards the anterior, moderately large, rounded in the adult, but with a small, more or less flattened area near the center, in some specimens bounded by a slight ridge, most noticeable in the young; surface with moderately coarse, subregular sulcation, rather sharp to shallow, rugulose, slightly shining, with one or sometimes two well-marked, dark lines of growth; color generally grayish in the adult, lighter over the beaks and with light, yellowish zones along the margins, often with dark mottlings; in some specimens there are irregular zones of bluish; shell moderately thick, substance white, muscle insertions distinct, those of the protractor pedis separated from the anterior adductors; hinge moderately stout, curved, formed rather as in *Sph. solidulum* Pr., plate narrow, cardinal teeth short and slight; ligament rather long, covered, or a narrow median line uncovered in old specimens.

Soft parts, in alcohol, pale, the syphons with a yellowish tinge; palpi large; outer branchiæ comparatively small; metapodium distinct, but rather small, with the retractor pedis; branchial cavities with numbers of young at different stages, the largest 5 mill. long, seems to be free in the cavity (not in a marsupium).

Size: long. 17.5, alt. 14, diam. 9.5 mill. (= 100 : 80 : 54.3); one specimen 18 mill. long.

Habitat: Water holes, Crow Creek, 25 miles N. E. of Greeley, Colorado, collected by Mr. Junius Henderson, curator of the museum of the University of Colorado. There were over 120 specimens in the lot, of all stages of growth, few of them full-grown; some also were in alcohol.

So far as can be judged, the present *Sphærium* is distinct from all described species, and except for the largest forms of *S. simile* Say, is the largest. The mussel is higher than in *simile*, the beaks narrower and more prominent, the shell and hinge are stouter, the sulcation coarser, and the color and surface appearance quite different.

There is a *Sphærium* from several parts of the Mississippi valley, somewhat smaller and more inflated, and partly of different outlines, regarded as distinct since 1896, but shelved. It may be a form of the present species, which was named in honor of its discoverer.

A few specimens were affected in the same way as those of *S. solidulum* Pr. from Iowa, recently described in the NAUTILUS.

NOTES.

POPULAR CONCHOLOGY.—Karl Soffel, of Paris, the well-known naturalist, has discovered that snails snore. He was experimenting with several specimens, which he had placed in a glass jar in his library, and one evening while writing he noticed a peculiar noise issuing therefrom. It sounded like a person snoring in the next room. M. Soffel approached and found that the snails were sleeping soundly and snoring peacefully, the loudest snorer of them all being the one that had lived among grape vines.—NEW YORK AMERICAN.

PUBLICATION RECEIVED.

THE TERTIARY AND QUARTERNARY PECTENS OF CALIFORNIA. By Ralph Arnold. (U. S. Geol. Survey, Professional paper No. 47, Series C., Syst. Geol. and Paleont., 76.—Pp. 264, plates LIII; plate I, a sketch map of California). Students of West American Mollusks are greatly indebted to Dr. Ralph Arnold for his monograph on this subject. In the introduction he says, of the first part, it "Is a brief outline of the different Tertiary and Pleistocene formations of California, giving the type localities, where, when and by whom first described, their salient characters, where they and their supposed equivalents are known to occur, the species of *Pecten* found in them and their typical fauna as far as known." These faunal lists will be very useful to students. The second part of the work describes and illustrates the Tertiary, Pleistocene, and recent Pectens, from Alaska to the Gulf of California, including the latter. The classification follows Dr. Dall's "Tertiary Fauna of Florida."

The number of Pectens listed for California is 93, of these fifty species and varieties are described as new.

The well-known form of *Pecten æquisulcatus* Cpr. is figured as a variety of *Pecten circularis* Sowerby, instead of *P. ventricosus* Sby. *Pecten hindsii* Cpr. is listed as a var. of *Pecten hastatus* Cpr. rather than *hericeus*, as lately listed, the latter now ranking as a variety also of *hastatus*. Dr. Arnold writes the name as *hericius* Gould rather than the better known form "*hericeus*." Dr. Dall's Ms. name of *Pecten* (C.) *hericius* var. *albidus* and *P.* (*Pseudamusium*) *randolphi* Dall, var. *tillamookensis*, are two new varietal names of Pectens known only among recent forms.

The bibliography ranges from 1829 to 1905.

A list of bulletins issued by the U. S. Geol. Sur., under Series C., Systematic Geology and Paleontology, is appended to this valuable monograph.—Mrs. M. Burton Williamson.

The Urocoptid Mollusks from the Mainland of America in the collection of the U. S. National Museum. By Paul Bartsch. (Proc. U. S. Nat. Mus. 1906, pp. 109–160, 3 plates). This paper deals chiefly with Mexican species, describing a number of new species and subspecies, and several new subgenera of great interest. The United States forms represented in the National Museum are also reviewed, and two described as new: *Holospira goldfussi anacachensis*, from the Anacacha Mts., near Cline and Spofford, and from near Eagle Pass, Texas. It differs from *goldfussi* by the fewer and stronger ribs. *Holospira* (*Haplocion*) *tantalus*, from "somewhere in Arizona or New Mexico." No comparisons are given, but it is said to be distinct from *H. pilsbryi*. It is what has been reported as *pilsbryi* from the above territories. *H. pilsbryi* is to be removed from the U. S. list.

The following errors or emendations require notice because they enter into nomenclature:

Microceramus texasianus (p. 158) is used for *M. texanus* Pils.

Microceramus mexicanus (p. 159) should be credited to von Martens, not Pfeiffer.

Cælocentrum eiseni (p. 119) is used in place of *C. eisenianum* Pils.

If these changes are intended as corrections or emendations, that fact should, we think, have been stated; but the introduction of new forms or spellings of specific names on any grounds is to be deprecated. —H. A. P.

Notes on Wisconsin Mollusca. By George H. Chadwick (Bull. Wis. Nat. Hist. Soc., IV, pp. 67–99, 1906.) A valuable annotated list containing 115 species, giving their distribution throughout the State, bibliography, etc.

Notes on Some Land and Fresh Water Shells from British Columbia. By J. F. Whiteaves (The Ottawa Naturalist, XX, pp. 115–119, 1906). An interesting faunal list containing upwards of thirty species.

THE NAUTILUS.

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ON THE DISTRIBUTION OF HELIX HORTENSIS MUELLER, IN NORTH AMERICA.

BY CHARLES W. JOHNSON.

The object of this paper is to record in full our present knowledge of the distribution of this species in North America, and to bring together the scattered literature bearing on the subject.

This species which presents such an interesting problem in geographical distribution was first recorded from North America in 1829 by a Mrs. Sheppard, of Woodfield, in an article "On the recent shells which characterize Quebec and its environs."[1] In this she states that *Helix hortensis* is "found on the bank near the plain of Abraham, common in the spring." In 1837[2] Amos Binney described the "olivaceous yellow," non-banded variety as *Helix subglobosa*, stating that it "is common on the lower parts of Cape Cod and Cape Ann, and is very abundant on Salt Island, a rocky uninhabited island near Gloucester." This seems to be the first New England record, for it is not mentioned by either John M. Earle or Col. Jos. G. Totten in their lists of Massachusetts and New England shells in 1833.[3]

Dr. A. A. Gould in 1841,[4] under *Helix hortensis*, adds to the

[1] Transactions of the Literary and Historical Society of Quebec, I, p. 193' 1829.

[2] Boston Journal of Natural History, I, p. 488, pl. 17, 1837.

[3] Hitchcock's Rept. on the Geology, etc., Mass., pp. 557, 559, 1833.

[4] Report on the Invertebrata of Massachusetts, p. 172, 1841.

localities above cited, "the region of Portland, Maine," and also gives the St. Lawrence. In 1843 Dr. J. W. Mighels, in his catalogue of the shells of Maine,[1] refers to *H. hortensis* as follows: "Captain Walden has recently detected this species on a little island in Casco Bay. It must be very plentiful as he obtained more than five hundred specimens in a few hours. * * * Most of them have five dark brown bands on a yellow ground; some four, some two, and a few none. Some have light fawn-colored bands on a white ground; in others, in place of colored bands the yellow ground is interrupted with nearly transparent zones, one beautiful specimen is heterostrophed." The latter probably represents the mutation *sinistrosum* of British authors, and seems to be the only American record. In the same year James E. DeKay[2] under *H. subglobosa* says: "I am indebted to Col. Totten of the United States engineers for my acquaintance with this species, which he found near the shore of the St. Lawrence, two hundred miles below Quebec."

In 1851[3] Amos Binney adds to his previous remarks on its geographical distribution, as follows: "It is also said to occur in the northern part of Vermont, in Maine, Canada on the St. Lawrence, Nova Scotia, and the islands of St. Pierre and Miquelon." In referring to changes which have taken place he says: "The prevalent characters of this, and probably of other species in a given locality, seem to undergo a considerable change from time to time. When I first visited Salt Island, where the species abounds, ten years ago, it was impossible to find a single specimen with either lines or bands. One uniform color prevailed throughout. At the present time the banded varieties are said to be not uncommon." To this Dr. Gould appends the following note: "They have recently been discovered by Dr. Samuel Cabot, in great numbers, on House Island, another of the little islets in the vicinity of Cape Ann, where all of them are of the banded variety. On the Outer Gooseberry, another neighboring islet, he found still another variety.

Mr. Samuel Tufts, Jr., in "A List of Shells Collected at Swampscot, Lynn and Vicinity" (Proc. Essex Inst., I, p. 32, 1853), says:

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[1] Boston Journal of Natural History, IV, p. 332, 1843.

[2] Natural History of New York, Mollusca, Pt. V, p. 32, 1843.

[3] The Terrestrial Air-breathing Mollusks of the United States (edited by A. A. Gould), II, p. 112, 1851.

"*Helix hortensis* may be added to this list on the authority of Wm. A. Phillips, Esq."

Prof. Edward S. Morse in 1864, in his valuable paper, "Observations on the Terrestrial Pulmonifera of Maine, etc.,[1] places the species under the genus *Tachea* with the following note: "This species has been found in abundance on several islands from Casco Bay to Grand Manan; Mr. Fuller found them on one of the extreme outer islands of Casco Bay in great profusion."

In 1868 O. A. L. Mörch, under *Helicogena hortensis* in his paper "On the Land and Fresh-water Mollusca of Greenland,"[2] says: "Dr. Beck writes in his manuscript above this species: 'Wormskiold has told me that he has found on the leaves of the small shrubs of *Salix lanatus* in the vicinity of the interior of the Gulf of Tgaliko a banded snail not unlike our garden snail. Two years ago (1844?) I obtained a dead specimen from Greenland, probably introduced.' It is certainly found in Iceland." See, also, Mörch, "On the Land and Fresh-water Mollusca of Iceland," page 42, of the same journal.

In 1869 W. G. Binney and T. Bland in "Land and Fresh-water Shells of North America,"[3] refer to the distribution of this species as follows: "An European species introduced by commerce (?) to the northeastern portion of North America. It is found on the islands along the coast from Newfoundland to Cape Cod, and on the mainland plentifully at Gaspé, C. E., also along the St. Lawrence, Vermont (?), Connecticut (?), etc."

The above records give all we know of what may be called the early history of this species in America, and clearly show that at that time its distribution was practically as it is at present. The following records are, therefore, probably only the results of more careful collecting over the same area. In taking up in detail the distribution of *H. hortensis*, I will commence at the most southern locality and go northward.

The Connecticut record is very doubtful, being based entirely on J. H. Linsley's Catalogue of the Shells of Connecticut, 1845.[4]

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[1] Jour. Portland Society of Natural History, I, p. 10, 1864; also American Naturalist, I, p. 186, fig. 16, 1867.

[2] American Journal of Conchology, IV, p. 38, 1868.

[3] Smithsonian Miscellaneous Collection, VIII, p. 181, 1869.

[4] American Journal Science, XLVIII, p. 280, 1845.

"*Helix subglobosa* (?) Binney, Weston, Gould, 172." The late John H. Thomson, in his paper on "The Land Mollusca of Bristol County, Massachusetts,"[1] says: "I have found large numbers of the bright lemon-yellow variety of this shell on Martha's Vineyard near Gay Head, never on the mainland. Of course introduced from Europe. I tried some in my garden [New Bedford], but the slugs Limax, Arion, etc., devoured the young, and I could never succeed in getting matured specimens." Rev. H. W. Winkley informs me that Rev. Geo. D. Reid has found it in the shell heaps on Martha's Vineyard.

In 1870 Dr. H. A. Pilsbry records this species from Nantucket.[2] They were taken by the late Dr. Harrison Allen at Sciasconset, the four specimens showing the following variations: uniform yellow (var. *lutea*), four and five bands, and one with five translucent almost colorless bands. During the same year Dr. Benj. Sharp also found it in the town of Nantucket, and later, on the adjacent island of Tuckernuck, all of the uniform lemon-yellow variety.

In 1904 the writer reported the finding of this species at Chatham, Mass.[3] Although I am aware that it was collected there long before, it apparently has not been recorded. They were all very pale yellow and bandless, the var. *subalbida* Locard. Some of the older specimens had entirely lost their epidermis, and were chalky-white, but still as active as their offspring. They were abundant on the steep bluff in front of the light-houses, although I did not discover their presence until a rainy day brought them from their hiding place; not even a dead shell indicated their existence. Mr. L. R. Reynolds informs me that he has collected *H. hortensis* on Morris Island, a wooded island just south of Chatham.

There is a tray of specimens in the museum of the Boston Society of Natural History from Provincetown, Mass., collected by Mr. L. L. Thaxter. All are the bright yellow, bandless variety (*lutea*). A few uniform light yellow specimens were found by Mr. A P. Morse among some cedars near "Old Harbor," Cohasset, Mass.

The next localities to consider are those of the Cape Ann region. W. G. Binney in his Manual of American Land Shells,[4] page 496,

[1] Journal of Conchology (British), IV, p. 373, 1885.

[2] The NAUTILUS, IV, pp. 24 and 48, 1890.

[3] The NAUTILUS, XVIII, p. 45, 1904.

[4] Bulletin, U. S. National Museum, No. 28, pp. 467 and 496, 1885.

gives "Eagle Island, Marblehead; House Island, Manchester; Kettle Island, Cape Ann." It is also to be found on the mainland at Manchester, Magnolia, Gloucester and Rockport.

Prof. T. D. A. Cockerell, in a paper on "Helix hortensis in America,"[1] describes the following varieties from Magnolia: *pallida* Ckll., "pale purplish or purplish-brown, without bands;" *quinquevittata* Moq., "yellow with five bands;" *rufozonata* Ckll., straw-colored with red-brown bands, five in number; also the varieties *subalbida*, *lutea* and *subglobosa*. Later Prof. Cockerell, on the "Variations of Helix hortensis at Rockport, Mass.,"[1] describes the following varieties: *subglobosa; arenicola*, "bands colorless, translucent, 12345;" *subalbida* and *lutea*, the latter showing some fifteen different band formulæ including 00000, 12345, 123(45), (123)(45), 10345, 12045. The latter specimens were collected by Mr. G. H. Clapp, who is quoted as follows: "The bandless or very faintly banded forms were by far the most common. Typical shells were scarce, even less plentiful than the transparent banded variety. On rainy days the shells were out by the hundreds."

The first locality north of Cape Ann from which this species is recorded is some of the outer islands of Casco Bay. Mrs. A. S. Packard has kindly donated to the Boston Society of Natural History a large series of this species from the collection of the late Prof. Packard. These were collected on Brown Cow Island, Casco Bay. The olive-green variety (*subglobosa*) predominates, grading insensibly into the yellow (*lutea*); the banded forms represent about ten per cent, while a corresponding number could be referred to the variety *arenicola*. Rev. H. W. Winkley has found it on Inner Green Island, and Mr. W. H. Weeks, Jr., on Cliff or Crotch Island. In a letter from Mr. H. K. Morrell, he writes: "I was at Seguin two days this week and the keeper, Capt. H. L. Spinney, happened to say that *Helix hortensis* was found on Pumpkin Knob, on the east side of Sheepscot Bay, and was abundant on Matinicus." Mr. Owen Bryant found the five-banded form on Seal Rock, one of the Matinicus Group. Mr. Arthur H. Norton also reported it from Seal Rock, and has found it on Mosquito or Little Egg Rock, Muscongus Bay. I have a specimen in my collection labeled "Spruce Head, Me." Mr.

[1] The NAUTILUS, III, p. 139, 1890.

[2] The NAUTILUS, XIII, p. 32, 1899.

Morris Schick collected it at Bar Harbor. Mr. H. S. Colton and later Mr. Dwight Blaney record it as "common" on Little Duck Island, near Frenchman's Bay.[1]

It is also reported from Grand Manan, Halifax and Cape Breton, while from the Gaspé region it has been collected by a number of persons. Dr. John M. Clarke found it very common on the limestone area at Perce. Mr. A. W. Hanham, in an article on the "Mollusca of the Gaspé region,"[2] says: "*Helix hortensis* was very common on the hillside, generally buried in the sand, several varieties were taken, the plain form seemed to be the most abundant." They were collected at Barachois, and in a beautiful series which he sent to me at the time, I find several specimens in which the bands are all united (12345). It has also been found at Gaspé Basin by Mr. F. R. Latchford. Abbé Provancher lists it from the Province of Quebec as "*H. nemoralis*."[3]

Specimens from Wreck Harbor, East Cape, Anticosta, collected by members of the "Arethusa" expedition in 1880, are in the collection of the Boston Society of Natural History. In Newfoundland the species seems to extend along the greater portion of the west coast. In a recent letter from Mr. L. P. Gratacap he says: "I found *H. hortensis* in considerable numbers in Newfoundland, in damp, woody ravines, in the two Codroy valleys, principally in the Little Codroy. They were deep in color, with and without bands. I did not see it on the east coast." Mr. Owen Bryant also failed to find it on the east coast. Mr. G. H. Clapp[4] says: "A friend has just brought me a living example of *H. hortensis* (12345) from the headwaters of Robinson's River, west coast of Newfoundland." This locality is not far above the Great Codroy. Mr. John Bryant, Jr., found it at the Serpentine River, June 20, 1905, and Dr. John Bryant at the mouth of East River, Hawkes Bay. During the past summer (July 8, 1906) Drs. C. W. Townsend and G. M. Allen also collected a beautiful series from the same locality on Hawkes Bay. They found them only at the one place, feeding on the "cow parsnip." All were the bright yellow variety (*lutea*) with (12345) and without bands.

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[1] The NAUTILUS, XVII, p. 99, and XVIII, p. 46, 1904.

[2] The NAUTILUS, VII, p. 65, 1893.

[3] Le Naturaliste Canadien, XIX, p. 186, 1890.

[4] The NAUTILUS, XIV, p. 72, 1900.

Dr. Wm. H. Dall in his work on Land and Fresh-water Mollusca,[1] gives Labrador, but the exact locality is not recorded. Only the single specimen referred to by Mörch has been found in Greenland. Dr. Dall thinks that it is doubtless an accidental importation. In Iceland the species still exists, as will be seen from the following letter from Mr. Gratacap: "I found *hortensis* this last summer in Iceland, where it assumes a very dark tint, with the longitudinal yellow threads strongly marked and the revolving dark bands reduced to one. They were fragile and very scarce. I have only three from Seydisfiord, on the east coast."

The origin of this species in America has been the subject of considerable discussion. Amos Binney, in describing *subglobosa*, and comparing it with the European *hortensis*, and the possibility of its being introduced by commerce, says: "It would be difficult, however, to account for their inhabiting the barren and retired situations at the extremity of Cape Cod, and the rocky islands in the neighborhood of Cape Ann, while in the intermediate country they are not found." Later (1851) he believed its origin in this country to be due to commercial intercourse with Europe. Prof. Edw. S. Morse in 1864 (*loc. cit.*) asks this question: "If this species is really identical with the *Tachea hortensis* of Europe, it seems a little singular that here it should only be found on islands frequently barren and far out from the land, * * while in the old country they become a nuisance in gardens." This is only another way of saying that if this species was introduced by commerce, why do we not find it in the gardens of Portland, Salem and Boston, instead of on the barren islands and exposed headlands?

W. G. Binney has always questioned its introduction by commerce, and later (1890) informs Prof. Cockerell (NAUTILUS, III, 139) that he regards the species as naturally present in America, an opinion in which Prof. Cockerell also concurs and refutes the theory "that the hardy Norsemen of old may have carried the snails about for food, and so imported it where they went." It seems too bad to shatter this fabulous, though pertinent story, before the poet has had a chance to versify. Dr. Pilsbry did not, however, coincide with Prof. Cockerell's idea that it is a native American (see NAUTILUS, IV, 24, 1890), and later in the Manual of Conchology (IX, p. 321, 1894), says: "*H. hortensis* inhabits many of the islands off the New

[1] Harriman Alaska Expedition, XIII, p. 20, 1905.

England coast, and being found in pre-Columbian kitchen-midden deposits, cannot be regarded as a recent immigrant. Possibly it may be the sole survivor of that Viking incursion in the eleventh century." Rev. Henry W. Winkley, in an interesting article, "Helix hortensis in New England" (NAUTILUS, XVII, p. 121, 1904), suggests that it is a survivor of the pre-glacial period. When we consider its present distribution and power to withstand even the climate of Iceland, this seems to be the only solution of the problem, which is further strengthened by its discovery in the Pleistocene by Dr. Dall (*loc. cit.*), who says: "The wide distribution of the species, often on uninhabitable islets off a coast little frequented, and its presence, which I have verified, in the glacial Pleistocene of Maine, tends to confirm the view that it is a prehistoric immigrant if an immigrant at all."

The question which now arises is this: Why does *Helix hortensis* continue to occupy the outer islands and headlands and not spread further inland? I think this can be quite readily explained, as far as the New England coast is concerned, by taking into consideration the geological character of the coast and the conditions most favorable to the life of land mollusks. The New England coast is composed almost exclusively of granitic rocks, or, on Cape Cod, of sand and gravel, both very unfavorable geological conditions for mollusca, owing to the absence of lime; even the more common species of the eastern United States are comparatively few on the coastal area. Again, the atmospheric conditions even slightly removed from the outer shore line are very different from the islands and headlands, continually bathed by the ocean's spray. These barren locations make up in lime and moisture what they lack in vegetation; the islets are also probably much more free from mice, rats and forest fires, which on the mainland destroy large numbers of snails. *Polygyra albolabris* and *Pyramidula alternata* are much more abundant on the islands than on the adjacent mainland, nor do these remarks apply only to the New England coast. The sandy pine and scrub oak barrens of southern New Jersey are void of land shells, while on the islands separated from the mainland by a wide expanse of salt marsh, and numerous creeks and bays, *Polygyra albolabris* var. *maritima* is quite abundant. The distribution of *hortensis* along the broad estuary of the St. Lawrence is undoubtedly due to favorable physical conditions.

A LIST OF SHELLS FROM NEBRASKA.

BY BRYANT WALKER.

The shells enumerated in the following list were all collected by Dr. R. H. Wolcott, of the University of Nebraska, Lincoln, Neb.

Many of the localities represented are in counties not covered by Aughey's List (Bull. U. S. Geol. Survey, 18, p. 697), so that while not large, the collection makes a considerable addition to our knowledge of the distribution of the different species in the State.

Dr. Pilsbry has kindly identified the *Vertigo* and *Bifidaria*.

Polygyra profunda Say. Omaha.

Polygyra multilineata Say.

Polygyra multilineata alba Witter.

Polygyra multilineata rubra Witter.

Omaha. A rather small, solid and elevated form. The four specimens measure $20\frac{1}{2}$ x $15\frac{1}{2}$, $20\frac{2}{3}$ x 15, 20 x $15\frac{1}{2}$, $20\frac{1}{4}$ x 14 mm.

Bellevue. A single, small, globose, greenish-brown, unicolored specimen measuring $16\frac{2}{3}$ x $12\frac{1}{2}$ mm.

Polygyra fraterna Say. Omaha. A small elevated, perforate form varying from $12\frac{2}{3}$–$13\frac{1}{2}$ x $4\frac{2}{3}$–$5\frac{1}{2}$ mm. Salt Creek, Roca. Similar in shape, but rather larger, 13–14 x 5–$5\frac{1}{2}$ mm.

Bifidaria contracta Say. Roca.

Bifidaria pentodon tappaniana Ad. Monroe Canyon, Sioux Co.

Vertigo ovata Say. Monroe Canyon.

Vitrea hammonis Ström. Roca.

Euconulus chersinus polygyratus Pils. Omaha, Roca and Monroe Canyon.

Zonitoides arborea Say. Lincoln, Roca and Monroe Canyon.

Pyramidula cronkhitei anthonyi Pils. Monroe Canyon.

Vallonia parvula Sterki. Roca.

Succinea grosvenori Lea. Salt Basin, Lincoln. A small, rather thick-shelled form, largest specimen 10 x 8 mm.

Hackberry Lake, Cherry Co. A large, thin-shelled form, quite variable in contour, the two largest specimens measuring $14\frac{3}{4}$ x $10\frac{1}{2}$, aperture $7\frac{1}{2}$ x 11 and $15\frac{1}{2}$ x 10, aperture 7 x 10 mm. Immature shells are very similar to those from Lincoln, but more inflated.

Succinea retusa Lea. Hackberry Lake and Marsh Lake, Cherry County.

Succinea avara Say. Roca and Monroe Canyon.

Lymnæa reflexa Say. St. Michaels, Buffalo Co., and Bellevue.

Lymnæa caperata Say. West Point, Cuming Co., and Dewey's Lake, Cherry Co.

Lymnæa desidiosa Say. Monroe Canyon.

Lymnæa palustris Mull. Dewey's Lake and Marsh Lake, Cherry County.

Physa anatina Lea. Lincoln; Washington, Cedar Co.; Roca and Platte River.

Physa gyrina Say. West Point, St. Michaels and South Bend.

Physa gyrina hildrethiana Lea. Lincoln and Hat Creek Valley, opposite Monroe Canyon.

Physa gyrina oleacea Tryon. Bellevue.

Physa heterostropha Say? Omaha. A few very young specimens seem referable to this species.

Physa ancillaria Say. Hackberry Lake, Dewey's Lake and "Sink" near Dewey's Lake, Cherry Co. Fine, large specimens. Those from the "Sink" are elegantly striped like *Lymnæa reflexa zebra*, a rare occurrence in this genus.

St. Michael. A more typical example.

Physa sayi warreniana Lea. Lincoln.

Physa Sp.? Dewey's Lake, Cherry Co. A single specimen resembling *P. aplectoides* Sterki, but with a short, obtuse spire and well-impressed suture.

Aplexa hypnorum L. Dewey's Lake and Marsh Lake, Cherry Co.

Planorbis trivolvis Say. Bellevue, St. Michael, Lincoln, Hackberry Lake and Dewey's Lake, Cherry Co., Omaha and South Bend.

Planorbis bicarinatus Say. Sidney, Cheyenne Co. One example is slightly transversely striate, approaching var. *striatus*.

Planorbis parvus Say. Omaha and Lincoln.

Segmentina armigera Say. Omaha.

Ancylus shimekii Pils. Calloway.

Ancylus rivularis Say. Deadman's Run, Lincoln.

Ancylus tardus Say. Lincoln.

Ancylus Sp.? Lincoln.

Amnicola limosa Say. Lincoln.

Sphærium simile Say. Lincoln.

Sphærium stamineum Con. Salt Creek, Lincoln.

Sphærium striatinum Lam. Lincoln.

Musculium jayanum Prime. Lincoln.

Musculium transversum Prime. South Bend, Cass Co., and Woodlawn Creek, Lincoln.

Musculium securc Prime. Lincoln.

Pisidium Sp.? Omaha.

Lampsilis luteolus Lam. Blue River, Crete.

Lampsilis parvus Bar. Lincoln.

Lampsilis subrostratus Say. Lincoln.

Unio tetralasmus Say. Lincoln.

Anodonta grandis Say. Lincoln.

NOTES.

LYMNAEA MEGASOMA. This species is abundant in Cobalt Lake, the centre of the wonderful silver-cobalt mines that now hold the attention of the world. No shell is found in an environment of such enormous qualities of precious mineral. Untold millions in value of silver ores, running in many cases over $5,000 to the ton, surround the placid lake, the waters of which are so strongly impregnated with arsenic as to cause serious intestinal trouble to those who use it. *L. megasoma* however lives and thrives, attaining large size and preserving to a ripe old age the beautiful brown epidermis characteristic of young shells. I have also found *L. megasoma* in Lake Temagami, the terrestrial paradise of the Algonquins—the North West Arm of Lake Nipissing, and at the mouth of French River. It doubtless occurs in suitable waters across New Ontario from the Albany River to Lake Abittibi.—F. R. LATCHFORD, Ottawa, Ont.

MIGRATION OF SCALLOPS.—The fact that beds of scallops in New Bedford and Fairhaven waters and along the Cape shore are being rapidly thinned out, and in some places completely exhausted, while new beds are being constantly located about Nantucket, is alleged to be causing the Massachusetts Fish and Game Commission to perfect a system of procuring more definite data regarding the movements of this toothsome shellfish.

Although the Nantucket fishermen will not commence dredging before November 1st, they are keeping up a continual watch for new scallop beds, and almost daily one of the boatmen will report large beds of the shellfish on flats and shoals which only a week or so before were barren. And the old beds which give promise of such a

rich harvest again this year are being watched with interest. The scallops at Nantucket are in prime condition this year, and the "eyes" are much larger than usual.

The Fish Commission experts are now desirous of obtaining definite data concerning the movements of scallops, and have liberated in Nantucket harbor a number of the shellfish to which copper tags have been attached. For the success of this experiment the commissioners look to the fishermen themselves, who are requested, whenever a tagged scallop is found, to record the same to the experts on their next visit to the island. It is known that the scallop is capable of moving through the water quite rapidly by simply opening and closing its shell, but how far it can go in a certain length of time is what the Fish Commission wants to find out. Perhaps it may develop through this experiment that scallops migrate from the Cape shore across the sound to Nantucket.—(*Boston Evening Transcript.*)

The Senior Editor of The Nautilus, in company with Mr. Jas. H. Ferriss, is on a collecting trip in Arizona. He expects to be absent about six weeks.

PUBLICATIONS RECEIVED.

The Behavior of the Pond Snail. *Lymnæus elodes* Say. By Herbert E. Walter (Cold Spring Harbor, Monographs, vi). An interesting series of experiments and observations.

New Mollusca from the Persian Gulf, etc. By J. Cosmo Melvill (Proc. Mal. Soc., London, vii, p. 69). Thirty-one new species of Gastropoda and one new Scaphopod are described and figured.

Capulus lissus Smith, as Type of a Proposed New Subgenus (Malluvium) of Amalthea. By J. Cosmo Melvill (Proc. Mal. Soc., London, vii, p. 81). Under this subgenus is also placed the *Amalthea benthophila* Dall.

Mollusca from Three Hundred Fathoms off Sydney. By C. Hedley and W. F. Petterd (Records of the Australian Mus., vi, p. 212). About 100 species are recorded, of which 11 are new.

THE NAUTILUS.

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ABALONES AND THE PENAL CODE OF CALIFORNIA.

BY MRS. M. BURTON WILLIAMSON.

A rule, or tape-measure, is not considered necessary when collecting shells along the beach, but if one would not pay too dear for his shells on the Pacific Coast of North America it were well to take some cognizance of the size of the Halioti detached from the rocky coast, especially during certain months of the year.

Some years ago the writer presented to the American Association of Conchologists a series of young *Haliotis cracherodii* Leech; but one would not dare to undertake it now that the law was passed prohibiting the collecting of such shells; for it is the young or small specimens that the statute protects.

In the Penal Code of California, section 628, the law prohibiting the collecting of abalones[1] was incorporated and approved February 12, 1903, as an amendment to the section for the protection and preservation of lobsters, crabs, etc. The law as then amended in regard to abalones reads, "or any abalone shells or abalones the size of which shall measure less than fifteen inches around the outer edge of the shell." In 1905 this statute was amended, the size of the shell allowed by law being three inches less in circumference for the black abalone. It now reads as follows:

"Every person who between the 1st day of April and the 15th day

[1] Monterey county appears to have taken the initiative in regulating abalone-fishing by passing an ordinance. See Dr. R. E. C. Stearns' article in THE NAUTILUS for Nov., 1899, Vol. xiii, p. 81.

of September of each year, buys, sells, takes, catches, kills or has in his possession * * * any abalones or abalone shells of the kind known to commerce as the black abalones (*Haliotis Californica*), the shell of which shall measure less than twelve inches around the outer edge of the shell, or any other abalone shells, or abalones, the shell of which shall measure less than fifteen inches around the outer edge of the shell, is guilty of a misdemeanor."

Is this law enforced?

H. I. Pritchard, Deputy State Fish Commissioner, says: "Section 628 has been enforced the same as any other section of the fish and game laws."

In answer to my inquiry for THE NAUTILUS, he writes: "I can only give you the names and dates of my personal cases: August 13, 1904, at Anacapa Island Bay, Webster of Venture, small shells, fined $20.00, first offense. Same day and place, Henry Ireland, of Los Angeles, same fine. September 13, 1906, James Greenbeck, at Redondo, small shells, fined $20.00. There has been a gang of Japanese arrested near San Clemente Island, and again near Santa Cruz Island and heavily fined both times, but cannot give names and dates; they used a diving suit and took 45,000 shells in 60 days."

Instead of mentioning "*Haliotis californica*" as the name of the black abalone, our lawmakers would have done better had they left the shell with the familiar name of commerce instead of giving the scientific one. It is to be presumed the name "*Haliotis californica*" is intended for *Haliotis californiensis*,[1] but this latter name belongs to a rare variety of the black abalone (*Haliotis cracherodii*), not, to my knowledge, collected north of the Mexican line. No conchologist would testify that the common young black abalones were *H. californica* or *H. californiensis*, but there is a saving clause in the statute that would prohibit a culprit from escape because of the technicality of a wrong name. It is this: "or any other abalone shells, or abalones," evidently intended for the larger red and green species (*Haliotis rufescens*, *Haliotis fulgens*, etc.).

Abalone fisheries are confined to California. One is located a few miles from Monterey, another at Whites' Point in Los Angeles county. Dried abalones are prepared and shipped to China from

[1] Dr. H. A. Pilsbry on *Haliotis cracherodii* var. *Californiensis* Swains. THE NAUTILUS, Vol. xii, no. 7. p. 79.

San Diego. The Japanese are the men employed as divers. In 1900 the diving armor with air pumps came into use. Before that the product from the Los Angeles county abalone fishery was in one year, 1899, "60,000 pounds of dried abalones and 30,000 pounds of shells of $7,800 value."[1]

It is said that the Chinese and Japanese are the consumers of this white, boneless mollusk (the foot of the animal is the part used, and this is white, no matter what the color of the shell may be); but I have known of persons eating this shell-fish—not previously dried as prepared for shipping—perfectly unconscious that the name given to the soup, or fritters, masked the real one. Cans of daintily prepared abalones, with another name, are among grocery supplies and the contents of a can with butter, milk, salt and pepper, all heated in a chafing-dish, is odorous and tender enough to please the palate of any fish consumer.

Hollywood, Los Angeles, Cal., November 9, 1906.

NEW PISIDIA.

BY V. STERKI.

Pis. neglectum, n. sp. Mussel of small size, slightly to scarcely oblique, rather rounded in outlines, moderately to rather well inflated; superior margin slightly curved or nearly straight, with more or less marked angles where passing into the anterior and posterior, supero-anterior slope generally marked, slightly curved, anterior end rounded angular, posterior part subtruncate, inferior margin moderately curved; beaks slightly posterior, rather narrow, rounded or somewhat flattened on top, moderately projecting over the superior margin; surface with fine, subregular to irregular, crowded, concentric striæ, microscopically rugulose, dullish or somewhat shining; over the beaks there are much finer concentric striæ to the center, and the surface is not rugulose, more shining; color light to yellowish horn to whitish, shell translucent to rather opaque, rather thin; hinge rather slight, well formed, plate comparatively broad; right cardinal tooth rather short, strongly curved, not reaching the lower

[1] Ann. Rept. Fish Commission, 1901.

edge of the plate, its posterior end much thicker, deeply grooved or bifid; there is an impressed groove between it and the edge of the plate; left anterior strongly curved to sharply angular and bent upward, the posterior oblique, curved; "lateral teeth" moderately stout, the outer ones of the right valve distinct, the anterior left cusp pointed, abrupt, the surfaces of all cusps rugulose; ligament rather strong.

Long. 3, alt. 2.6, diam. 1.8 m., types, and average.

Soft parts not examined.

Habitat: North America; widely distributed and common in Ohio, Michigan and Illinois, and probably over the Nearctic province, seen also from New York, Canada and Alabama; living in all kinds of waters. The specimens regarded as types are from a brook at Krumroy, Summit Co., Ohio, 1900 (No. 3265, collection of Cycladidæ).

This *Pisidium* was regarded as probably distinct years ago; since then the material has been looked over and compared dozens of times. It seems to be the central form of a group which is one of the most difficult to deal with of all our *Pisidia*. There are a host of forms ranging under it or near it, really or apparently, and if only a few specimens from various places were on hand, they might well be regarded as distinct. But among the thousands seen, there are more or less plainly intermediate forms. Some are still under doubt and scrutiny, and waiting for additional material in order to ascertain their true positions. Some forms have a slight resemblance to some small forms of the polymorphous "*abditum* Hald.," others to small forms of *noveboracense* Pr. It may also be said that the more typical specimens resemble *Pis. pusillum* Gmel. more than any other of our *Pisidia* does.

Var. (?) *corpulentum* n. Larger, more inflated, somewhat more elongate and oblique, beaks generally somewhat more posterior, large, prominent; concentric striæ coarser, surface more dull, color whitish to yellowish, to grayish, and even bluish with lighter zones along the margins.

Hab.: Grand River, Grand Rapids, Mich., collected repeatedly by Dr. R. J. Kirkland in good numbers; a similar *Pisidium* is from Sillycash creek, near Joliet, Ill., collected by Messrs. J. H. Ferriss and J. H. Handwerk. It seems that these forms are connected with *Pis. neglectum*, although the Grand River, Mich. form, is considerably different and appears to be distinct.

Pis. trapezoideum St. (described in the NAUTILUS, IX, p. 124, 1896), from the middle Atlantic States, and probably the same from Grand Rapids, Michigan, is very different from *neglectum*, yet there may be intermediate forms connecting the two. Should that prove true, *trapezoideum* would probably better be regarded as a specially differentiated form, a variety of *neglectum*, and not vice versa. Priority cannot be considered if there are better reasons for a different point of view.

THE BROOKLYN CONCHOLOGICAL CLUB.

To the Nautilus:

The Brooklyn Conchological Club was formed over two years ago by a number of collectors and admirers of shells. Several of the members have extensive and valuable collections, the product of many years of careful selection and world-wide correspondence with collectors. THE NAUTILUS is a welcome visitor at the club. Two of our members' names are found on its advertising pages, and occasionally an article appears from the pen of our esteemed friend and conchologist, Mr. Sloman Rous. We hope to hear of similar clubs in other cities, and from individual collectors.

At the October meeting of the Brooklyn Conchological Club, Mr. Maxwell Smith exhibited specimens of the shells collected by him last summer in Otsego County, N. Y., also a map of the stations visited. Mr. Smith gave an interesting account of his experience in collecting. A list of the shells exhibited includes 54 species.

SILAS C. WHEAT.

SHELLS OF RICHFIELD SPRINGS, NEW YORK AND VICINITY.

BY MAXWELL SMITH.

The following species were all found in Otsego Co., with the exception of those from Weaver and Young's Lakes (Little Lakes), Herkimer Co. The collection was made in July and August, 1906. It is interesting to note that *Lymnæa gracilis* Jay was reported from Canadarago Lake previous to 1870 by a number of authors. I hunted diligently for this species but did not find it. From Allan

Lake the water flows into Otsego Lake and a number of species occur which are not found in Canadarago. From the latter the streams empty into the Susquehanna River and species finally intermingle.

Amnicola limosa Say. In every lake and a large number of streams.

Pomatiopsis lapidaria Say. Canadarago Lake.

Valvata tricarinata Say. Weaver, Canadarago and Allan Lakes.

Somatogyrus integer Say. Sunset Creek.

Campeloma decisum Say. Canadarago Lake.

Omphalina fuliginosa Griff. Sunset Hill, near Canadarago Lake.

Omphalina inornata Say. Sunset Hill.

Zonitoides nitidus Müller. Woods near Richfield Spa.

Zonitoides arboreus Say. Sunset Hill.

Gastrodonta ligera Say. Sunset Hill.

Pyramidula alternata Say. Everywhere with other species (one albino farm).

Pyramidula striatella Anthony. East of Sunset Hill.

Polygyra tridentata Say. Sunset Hill, west of Canadarago Lake.

Polygyra Sayi Binney. Sunset Hill, east of Canadarago Lake, near Oak Creek.

Polygyra albolabris Say. Cooperstown, near Canadarago Lake, Sunset Hill.

Polygyra palliata Say. Washed down Town Creek.

Polygyra thyroides Say. East of Canadarago Lake.

Polygyra monodon Rack., var. *fraterna* Say. Woods near Richfield Spa.

Vallonia pulchella Müller. In fields, everywhere.

Circinaria concava Say. Sunset Hill, near Allan Lake.

Vertigo ovata Say. Under bark, near Richfield Spa.

Vertigo milium Gould. Near Sunset Creek.

Cochlicopa lubrica Müller. Cooperstown (Council Rock), Richfield Spa. (town), near Young's Lake.

Carychium exiguum Say. Near Sunset Creek.

Succinea ovalis Gld. Near Canadarago Lake, near Oak Creek, Cooperstown.

Succinea obliqua Say. Sunset Hill, in fields.

Succinea totteniana Lea. Near Allan Lake.

Succinea retusa Lea, var. *pearlensis* Walker. Near Oak Creek.

Lymnæa stagnalis Linn. Canadarago Lake.
Lymnæa columella Say. Allan, Weaver Lakes.
Lymnæa palustris Müller var. Canadarago Lake, Otsego Lake.
Physa ancillaria Say. Allan Lake.
Physa heterostropha Say. Canadarago and Otsego Lakes and many streams.
Planorbis trivolvis Say. Allan Lake.
Planorbis dilatatus Say. Canadaraga Lake.
Planorbis campanulatus Say. Canadarago Lake.
Planorbis bicarinatus Say. Sunset Creek, Canadarago Lake.
Planorbis exacutus Say. Near Weaver Lake.
Planorbis deflectus Say. Young's Lake.
Planorbis albus Müller. Allan Lake, Otsego Lake.
Ancylus rivularis Say. Oak Creek.
Ancylus tardus Say. Weaver Lake.
Ancylus fuscus Adams. Allan Lake.
Ancylus parallelus Hald. Town Creek.
Sphærium simile Say. Sunset Creek, Town Creek, Allan Lake, Weaver Lake.
Sphærium rhomboideum Say. Allan Lake.
Sphærium striatinum Lam. Sunset Creek.
Pisidium ventricosum Prime. Canadarago Lake.
Pisidium noveboracense Prime. Canadarago Lake.
Lampsilis radiatus Gmelin. Canadarago Lake.
Strophitus edentulus Say. Sunset Creek.
Anodonta marginata Say. Weaver Lake.
Alasmidonta undulata Say. Sunset Creek.
Unio complanatus Solander. Oak Creek.

A NOTE UPON THE INSUFFICIENCY OF THE OPERCULUM AS A BASIS OF CLASSIFICATION IN ROUND-MOUTHED SHELLS.

BY L. P. GRATACAP.

In 1801 Lamarck established the genus Cyclostoma which he made for the reception of a very miscellaneous and unclassified group of shells, characterized however by certain common features as the entire round aperture, continuous peristome, and operculum.

Among this unassorted assemblage were placed marine, fluviatile and terrestrial shells. Later Lamarck withdrew the marine and fluviatile shells, and in 1819 he limited the genus Cyclostoma to terrestrial species.

In 1829 the Rev. M. G. Berkeley described the anatomical structure of *Cyclostoma elegans* (Zoölogical Journal, vol. iv, p. 278), and alluded to the operculum as "ovate spiral, calcareous." This description was, up to that time, the most extended and accurate that had been published, of the soft parts of the animal of this group of mollusca.

In the second edition of the *Histoire Naturelle des Animaux sans Vertebres*, edited by Deshayes and Milne-Edwards (1838), the diagnosis is *Testa varia; anfractibus cylindraceis. Apertura circinata, regularis: marginibus orbiculatim connexis, aetate patenti-reflexis. Operculum.*

In his observations Lamarck alludes to the similarly circular and entire margins of the aperture of *Paludina*, but remarks that in adult cyclostomas the edge of the peristome is reflected, whereas in *Paludina* and generally in fluviatile shells these edges are sharp and plain.

The comments of the editors exhibit the diversity of views then held by naturalists as to the affinities of these interesting shells; some gave full weight to the fact of their aerial respiration and grouped them in a special order, in which their manner of respiration, their terrestrial habit, and the possession of an operculum formed distinguishing or separative features; while others considering their respiration unimportant, dwelt upon morphological resemblances to *Turbo*, *Trochus* and *Scalaria*. These resemblances were the two tentacles, the absence of eye-stalks, the eyes placed at the base of the tentacles, and the respiration anteriorly open. This latter view was advocated by Cuvier. It was further emphasized by their unisexual nature, and in the armature of their lingual ribbon, which however rather coincides with that of pectinibranchiate gasteropods. Milne-Edwards and Deshayes regarded the cyclostomas as terrestrial Turbos breathing air.

Amongst the forty-five species enumerated by Lamarck in 1838, are representatives of the genera *Pterocyclas*, *Cyclophorus*, *Choanopoma*, *Tudora*, *Chondropoma*, *Helicina*, *Cyclotus*, *Otopoma*, *Leptopoma*, *Truncatella*, *Megalomastoma*, and *Realia*.

Draparnaud had first separated the marine round-mouthed shells from their supposed terrestrial congeners, which led Lamarck to erect his genus *Delphinula* for the reception of some of the marine forms, and later *Paludina* for others, which genus was substituted for his own *Vivipara*. *Helicina* although proposed as a genus by Lamarck was not grouped by him near the cyclostomous genera. Its operculiferous character was known, but in spite of this fact its position was assigned in the family of the Colimaces (Pulmonifera), amongst the helices, bulimi and pupas. Ferussac had first recognized that the genera *Helicina* and *Cyclostoma* were closely related, and had, in deference to their similar breathing organization, placed them at the end of the air-breathing gasteropods.

Reeve united *Pupina*, *Truncatella*, *Cyclostoma*, and *Helicina* in the single family Cyclostomacea. Menke as early as 1828 appears to have separated the operculate shells into two families, typified by *Helicina* and *Cyclostoma*. Dr. Gray (1842) first pointed out the significant morphological distinction between *Cyclostoma* and *Helicina*, and assigned to the family Helicinidae the three genera *Helicina*, *Lucidella*, and *Alcadia*, while Swainson (1840) had grouped together *Helicina* Lam., *Pachytoma* Swains., *Oligyra* Say, *Trochatella* Swains., and *Lucidella* Swains. In the monograph (1846) in Kuster's Conchylien Cabinet upon "Die gedeckelten Lungenschnecken," by L. Pfeiffer, the family Helicinacea was regarded as composed of the genera *Trochatella* Swains., *Lucidella* Swains., *Helicina* Lam., and the family Cyclostomacea of *Cyclostoma* Lam., *Choanopoma* Pfr., *Cyclophorus* Montf., *Leptoma* Pfr., *Megalomastoma* Guilding, *Pupina* Vignard, *Cullia* Gray, *Pomatias* Studer, *Aulopoma* Trosch., *Craspedopoma* Pfr., *Myxostoma* Trosch., *Pterocyclas* Bens., *Acicula* Hartmann, *Geomelania* Pfr., *Hydrocena* Parreyss.

The generic divisions thus slowly evolved had been largely based upon the characters of the opercula, and it seems that the credit of emphasizing this feature was due to J. E. Gray, who in 1825 published in the Zoölogical Journal and Philosophical Transactions the results of his observations on their structure, formation and growth, and insisted on their affording "characters for the division of families and genera as the shell of the gasteropods themselves, and that to neglect them in the description of the genus or species is quite as rational as to describe only the single valve of a bivalve shell." The

closing words of this quotation allude to Gray's opinion that the operculum of the gasteropods was homologous or identical with the second valve of a lamellibranch.

(*To be continued.*)

HELIX HORTENSIS IN NEWFOUNDLAND.

BY T. D. A. COCKERELL.

Mr. L. P. Gratacap has very kindly permitted me to examine a dozen specimens of *Helix hortensis* which he collected at Little Codroy river, Newfoundland, as reported in NAUTILUS, November, p. 78. They are thin, and the dark bands when present are dull reddish-brown, not black. The forms represented are:

(1) Clear yellow, bandless = *lutea* Moquin. Two.

(2) Greenish-yellow, bandless = *subglobosa* Binney. One. This seems to have been stained owing to the decay of the animal, and may originally have been more nearly a pure yellow.

(3) Yellow, five-banded = *quinquevittata* Moquin. Five.

(4) Yellow, formula (123)45 = *pauluccia* Locard. One.

(5) Yellow, all the bands united = *bouchardia* Moquin. Three.

In the British museum there is an example of the variation *vallotia* Moquin, from Labrador. It is yellow, with formula, O_{345}.

Mr. Gratacap has also permitted me to see the shells collected at Seydisfiord, Iceland, as reported in NAUTILUS, p. 79. They are *Helix arbustorum*, rather thin, but otherwise typical.

NOTES.

OYSTERS CARRIED BY SEAWEED.—Some time ago an oyster-breeder in Morbihan, France, named Martine, called the attention of the French Academie des Sciences to the appearance of unknown algae that threatened to ruin the oyster-beds established at the mouth of the river Vannes. These algae (which the breeders called ballons—balloons) assume the form of little brownish-green leather bottles or wineskins, which stick to the oysters, and which, microscopic at the start, very soon reach the size of a large hen's-egg. Formed of a very thin, elastic and rather frail coat, these bottles, usually full of

water, fall in upon themselves at the moment of low tide. They become empty then by the rents in their exterior; but, in virtue of their elasticity, they fill up again with air. At the return of the tide, they thus form a float more than sufficient to raise up the oyster that serves them as support. Therefore at each great tide, when the beds are wholly uncovered, the oysters are seen to disappear in the offing upon this automobile algae.

According to M. Bornet, we have the *Colpomenia sinuosa*, abounding notably in the Mediterranean in the tracts adjacent to the Atlantic. It was pointed out for the first time at Cadiz at the beginning of the last century, and has never been seen farther north. It no doubt came upon the hull of a vessel, and, having found in the gulf of Morbihan suitable water, it multiplied there.

Hitherto no other effective means has been found of combating this alga than to sweep the beds with prickly fagots. It is to be hoped that a rigorous winter will be sufficient to cause it to disappear.—*Scientific American.*

British Columbia Shells.—Mr. Stewardson Brown, of the Academy of Natural Sciences of Philadelphia, collected the following species of land shells while on a botanical expedition in the Canadian Rocky Mountains. At Field, B. C.: *Thysanophora ingersolli* Bld., *Vertigo gouldii* Binn, *Vertigo v. elatior* Sterki, *Vertigo modesta* Say, with the form *parietalis* Anc., *Vitrea hammonis* Ström, *Vitrea binneyana* Mse., *Euconulus fulvus* Drap., *Zonitoides arborea* Say, *Pyramidula c. anthonyi* Pils., *Sphyradium edentulum* Drap., *Succinea avara* Say, and at Banff, Alberta: *Vertigo modesta* Say, *Vitrea binneyana* Morse, *Euconulus fulvus* Drap., *Pyramidula c. anthonyi* Pils., *Sphyradium edentulum* Drap.—E. G. Vanatta.

Additional Localities for Helix hortensis.—Since the publication of my article on the distribution of *Helix hortensis* in the November Nautilus, I have received the following additional records. From Curtain Island, Richmond Bay, Prince Edward Island, a specimen of the plain yellow variety was received by Rev. Henry W. Winkley from a Mr. Ives. In 1902 Mr. Geo. H. Clapp collected the banded variety (12345) at Cape Porpoise, about three miles from Kennebunkport, Maine. Mr. Francis N. Balch has found it at Orleans, Massachusetts, and also at Cohasset.

I overlooked Mr. L. P. Gratacap's record of "Hare Island," St. Lawrence River, given in his catalogue of the Binney and Bland collection of the terrestrial air-breathing mollusks, etc. (Bull. Amer. Mus. Nat. Hist., XIV, p. 396, 1901). This species seems to be more widely distributed than has been generally supposed. It is to be hoped that these articles will lead to a still further knowledge of its geographical distribution.—C. W. JOHNSON.

PUBLICATIONS RECEIVED.

STUDIES ON AUSTRALIAN MOLLUSCA, PT. IX. By C. Hedley (Proc. Linn. Soc., N. S. Wales, pt. iv, 1905). Twelve new species are described and figured, with critical notes on other species.

SOUTH AUSTRALIAN NUDIBRANCHS, AND AN ENUMERATION OF THE KNOWN AUSTRALIAN SPECIES. By Herbert Basedow and Chas. Hedley (Trans. Royal Soc., S. Australia, xxix, p. 134). About 80 species are recorded, six new species described, and a number of others redescribed and illustrated by 12 plates of beautifully-colored figures.

REPORT ON MOLLUSCA COLLECTED BY MR. HERBERT BASEDOW ON THE SOUTH AUSTRALIAN GOVERNMENT EXPEDITION 1903. By Charles Hedley (Trans. Roy. Soc., S. Australia, 1905). A valuable contribution to knowledge of the snails of the "Eremian Region" of Central Australia. "Though quite unrelated to the forms that people the arid regions of Asia, Africa or America, these Australian shells repeat in their chalky texture and rough sculpture the features of foreign species subjected to similar environment." Several new species of *Thersites* and *Xanthomelon* are described, and a beautifully-drawn plate illustrates the principal forms.

A CATALOGUE OF THE MOLLUSCA OF ILLINOIS. By Frank Collins Baker (Bull. Illinois State Lab. Nat. Hist., vii, pp. 53–136, Sept., 1906). An excellent catalogue, giving in full the distribution of each species throughout the State. The number recorded is 241 species of fluviatile and 91 species of terrestrial mollusks. A very exhaustive bibliography is also given.

THE NAUTILUS.

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MOLLUSKS OF CAZENOVIA, N. Y.

BY JOHN B. HENDERSON, JR.

The village of Cazenovia, Madison Co., N. Y., about 20 miles southeast of Syracuse, is upon the northern edge of the elevated plateau of central New York. It is surrounded by hills more or less wooded which in conformation form series of north and south valleys of considerable depth, in one of which lies Cazenovia lake, with the village at its southern end. At the altitude of Cazenova (1100 ft.) the sedimentary rocks are shaly, but about two hundred feet below a white limestone appears. The hills are grooved by deep ravines, cutting many feet down into the limestone. These "Gulfs" as they are locally called, are heavily wooded, always damp, and offer excellent collecting-grounds. Within a radius of a mile about the village many types of station can be found with favorable soil, forest, stone, and moisture conditions.

Messrs. Pilsbry, Walker, Clapp and the writer enjoyed a three days' collecting trip through the Cazenovia valley, and the following catch, remarkable in the number and quality of specimens, was made. Comparatively little time was given to the lake.

Vallonia pulchella Müll.
" *excentrica* Sterki.
Polygyra tridentata Say (small).
" *sayi* Binn.
" *alboldris* Say.
" " *dentata* (Walker).
" *dentifera* Binn.
" *palliata* Say.
Polygyra thyroides Say.
" *fraterna* Say.
Strobilops labyrinthica Say.
Bifidaria contracta Say.
Vertigo pygmæa Drap.
" *gouldi* Binn.
" *ventricosa elatior* Sterki.
Cochlicopa lubrica Müll.

Circinaria concava Say.
Omphalina fuliginosa Griff.
" *inornata* Say.
Vitrina limpida Gld.
Vitrea cellaria Müll.
" *hammonis* Ström.
" *indentata* Say.
" *rhoadsi* Pils.
Euconulus chersinus polygyratus Pils.
Zonitoides nitida Müll.
" *arborea* Say.
" *minuscula* Binn.
Gastrodonta intertexta Binn.
" *ligera* Say.
Agriolimax campestris Binn.
" *agrestis* L.
Philomycus carolinensis Bosc.
Arion fasciatus Nils. (very abundant)
Pyramidula alternata Say.
" *perspectiva* Say.
" *striatella* Anth.
Helicodiscus lineatus Say.
Succinea retusa Lea.
" " *peoriensis* Wolf.
" *ovalis* Say.
" " var. (a striking form, apparently new).
" *avara* Say.
Limnea reflexa Say.
Limnea catascopium Say.
" *umbrosa* Say.
" *emarginata* Say.
" *desidiosa* Say.
" *palustris* L.
" *humilis* Say.
" *columella* Say.
" *owascoensis* Baker.
Planorbis trivolvis Say.
" " *binneyi* Tryon.
" *campanulatus* Say.
" *bicarinatus* Say.
" *deflectus* Say.
" *parvus* Say.
" *exacutus* Say.
Valvata tricarinata Say.
Physa gyrina Say.
" *sayii* Tapp.
" *integra* Hald.
" *heterostropha* Say.
Aplexa hypnorum L.
" " *glabra* DeKay.
Ancylus rivularis Say.
Pisidium variabile Prime.
Sphærium striatinum Lam.
" *occidentale* Prime.
" *simile* Say.
" *fabale* Prime.
" *stamineum* Con.
Calyculina securis Prime.
" *transversa* Say.
" *partumeia* Say.

NEW PISIDIA.

BY V. STERKI.

Pis. superius n. sp. Mussel rather small, well inflated, ovoid in outlines, rounded or subangular; beaks rather posterior, broad, rounded or somewhat flattened on top, projecting over the superior

margin which is slightly curved, with slightly projecting, rounded angles at the scutum and scutellum, the latter often covered in lateral aspect, in full-grown mussels; supero-anterior slope well marked, slightly curved to nearly straight, posterior part subtruncate to rounded; young specimens are generally more angular in outlines than adults; surface with very fine, crowded, concentric striæ and generally a few well marked lines of growth, somewhat shining; color light to deeper horn, generally with lighter zones along the margins; shell rather thin, more or less translucent; hinge slight, well formed, plate narrow, right cardinal tooth moderately to strongly curved, its posterior part thick and grooved; a deep, impressed groove in the plate between its inferior edge and the cardinal tooth; left anterior strongly curved, posterior oblique, slightly curved to nearly straight; "lateral teeth" with short, slight, thin cusps, the left ones and the right anterior pointed, the outer anterior of the right valve distinct, the posterior quite small; ligament rather slight.

Long. 3.2, alt. 2.8, diam. 2.2 m. (100 : 37.5 : 69) average.

Long. 3.5, alt. 3, diam. 2.4 m.

Soft parts not examined.

Habitat: Mountain Lake and Pine River, Marquette county, Michigan, on the south shore of Lake Superior, Mono Lake, Muskegon county, Michigan, collected by Mr. Bryant Walker. A *Pisidium* from the Isle Royale, in Lake Superior, and some specimens from other places in Michigan, seem to range under the same. Several hundred specimens at all stages of growth, collected in Mountain Lake from 1895 to 1905, are remarkably uniform and characteristic in appearance, although showing slight differences in outline. There is none of the described species under which the present *Pisidium* might be ranged, and it is similar only to *trapezoideum*, being of about the same size and approximately the same shape. But the latter mussel is much more angular in outline, its supero-anterior slope is steeper, the anterior end is more angular and more below the longitudinal median line, the beaks are narrower, the surface more dull, and the hinge much stouter. Although known for over ten years, this *Pisidium* has not been published before, as I thought it might be connected with some other species.

Pis. succineum n. sp. Mussel of moderate size, moderately inflated, somewhat elongate, little oblique; beaks slightly posterior, rounded or slightly flattened, somewhat projecting over the upper

margin, which is slightly curved, supero-anterior slope slightly marked, curved to nearly straight, anterior end rounded angular, posterior part subtruncate, inferior margin moderately curved; surface with fine to very fine irregular striæ, shining, shell thin, transparent to translucent, of wine to deep amber color; hinge of the same formation as that of *P. noveboracense*, but less curved and slighter; ligament rather short and strong.

Long. 3.6, alt. 3, diam. 2 m. (100 : 83 : 55.5) average.

Long. 4, alt. 3.3, diam. 2.4 m.

Soft parts not examined.

Habitat: North America, probably of wide distribution; seen from the Atlantic States from Maine to Virginia; New York (near Mohawk), Ohio, Michigan, Indiana; common e. g. in the vicinity of Washington, D. C., and Alexandria, Va., where it was collected in 1896 by the writer, and in the vicinity of New Philadelphia, O.

In shape it has a resemblance to *P. noveboracense* Pr., with which it seems to range under the same group, but is smaller, the beaks are less prominent, and it is at once recognized by its transparent shell, its color and glossy surface. In the latter respect, it is also similar to *P. splendidulum* St., but averages larger and its shape is different. Like a number of other Pisidia, this has been a stumbling-block for over ten years; but it seems constantly distinct, and is of wide distribution.

Erratum. On p. 88 of the December number line 4 from bottom, correct *Sillycash* to *Lilycash* creek.

LAND SHELLS FROM EAST SHORE OF CAYUGA LAKE.

BY SILAS C. WHEAT.

The following list of land shells were found by the writer in July and August, 1905, on the east shore of Cayuga Lake, between Ithaca and Portland Point, N. Y., and between the lake and the top of the cliffs:

Omphalina fuliginosa Griffith. Abundant, woods.
Omphalina inornata Say. Common, woods.
Vitrea ferrea Morse. Rare, one found.

Zonitoides nitida Müller. Abundant in low, wet fields.

Zonitoides arborea Say. Common.

Euconulus fulvus Müller. Rare, found four.

Gastrodonta ligera Say. Abundant, woods.

Gastrodonta multidentata Binney. Rare.

Pyramidula alternata Say. Abundant everywhere. One specimen is turreted, having a sharp angle at the periphery, and the suture placed far below the angle.

Pyramidula striatella Anthony. Rare.

Pyramidula perspectiva Say. Rare, west side of lake.

Helicodiscus lineatus Say. Rare.

Polygyra tridentata Say. Common.

Polygyra sayi Binney. Rare, 8 on 1 sq. yd. No others found.

Polygyra albolabris Say. Abundant.

Polygyra albolabris dentata Walker. Rare.

Polygyra exoleta Binney. Rare.

Polygyra palliata Say. Common.

Polygyra thyroides Say. Common.

Polygyra hirsuta Say. Rare.

Polygyra monodon Racket. Rare.

Polygyra monodon fraterna Say. Common.

Vallonia pulchella Müller. Common.

Circinaria concava Say. Rare.

Pupoides marginata Say. Rare.

Vertigo ovata Say. Rare.

Vertigo ventricosa Say. Rare.

Cochlicopa lubrica Müller. Abundant.

Bifidaria corticaria Say. Rare.

Bifidaria contracta Say. Common.

Bifidaria armifera Say. Rare.

Bifidaria pentodon Say. Rare.

Strobilops labyrinthica Say. Rare.

Succinea obliqua Say. Abundant.

Succinea obliqua totteniana Lea. Rare.

Succinea retusa Lea. Common.

Succinea avara Say. Common.

A NOTE UPON THE INSUFFICIENCY OF THE OPERCULUM AS A BASIS OF CLASSIFICATION IN ROUND-MOUTHED SHELLS.

(*Continued*).

BY L. P. GRATACAP.

The naturalists who subsequently worked upon the classification of the mollusca were all sensibly influenced by these observations, and the operculum became a diagnostic note in the separation of genera. Troschel (1847) and Pfeiffer (1852), thoroughly applied this method of discrimination, and augmented the number of genera. M. Petit de la Saussaye (1850) questioned the significance of the operculum as a real generic feature, and especially so far as the nature of the substance of the operculum had been used by Pfeiffer to distinguish genera. He says (*Journal de Conchyliologie*, Vol. I., 1850) "the nature more or less calcareous or corneous of the opercula arises rather from accidental circumstances, such as the habitation of these animals, their nourishment, the character of the ground upon which they live, the force of the sun, etc. As to the variable form of the volutions of the spire, observed in these accessory parts, it doubtless arises from the modifications, that the tissue secreting them presents; modifications which do not seem adequate for the establishment of generic groups."

Benson reiterated the importance of the operculate features of the round-mouthed shells, and the system of classification incorporated in H. and A. Adams, "Genera of Recent Mollusca" (1858) still further imbedded in the science the critical relations of the form and substance of the operculum to the natural limitations of the genera.

In the latest important systematic treatise, Tryon's Structural and Systematic Conchology, the operculum is perhaps less exhaustively used for descriptive purposes, but the author remarks that the operculum "presents many beautiful modifications of structure, characteristic of the smaller groups, which are often peculiar to limited regions as in the Helicidæ."

In an examination of this group of shells in the general collection of the American Museum of Natural History and representing the Jay, Haines, and Constable cabinets, the somewhat exaggerated importance of the separative features of their opercula seemed apparent.

It is quite evident that the opercula vary in substance and form; that these variations are related to groups and genera; that in some instances (*Opisthoporus*, *Stoastoma*) they present in one family a unique and generally well-maintained uniformity of structure. But their determinative character has been overestimated. The prominent characters of the opercula are repeated in diverse sections of the entire group, and the elements of their composition are more nearly significant of habitat than they are of systematic differences in the shells themselves.

It is noteworthy in this connection to recall the demonstration made by Blanford (Annals & Mag. Nat. Hist., 1869), that the opercula of *Georissa* (Blanford's genus) and *Hydrocena* Parreyss are almost identical, whereas the former shell is entirely terrestrial, and the latter marine.

(A note of importunity to traveling or exploring naturalists may be appropriately inserted here. The character of the environment of species or genera of land shells is generally not closely enough observed. The moisture, temperature, mineral nature of the ground, seasonal features, and frequency and amount of sunlight, the vegetation, are all influential factors in the physiological life of shells. They do, in land shells especially, have a clearly marked relation to the coloring, thickness and operculum of the shells, and they are not as particularly dwelt upon by collectors as they might be, both for the purpose of elucidating the effect of environment and the sometimes misleading rules of systematists.)

Poey has called attention (*Memorias sobre la Historia Natural de la Isla de Cuba*) to a striking illustration of local influence in the sierras of the Isle of Pines. The Sierras de Casas and de Caballos are respectively a short distance to the west and east of Nueva-Gerona; in the latter region the shells display regular spires, and the crustaceans are destitute of spinose surface, as *Trochatella stellata*, *Pineria beathiana*, *Cyclostoma pupoides*, among the shells; *Oniscus* sp.? among the crustaceans. In the former area the *Trochatella* is represented by a denticulate, roughened, and loosely coiled shell (*constellata*); the *Pineria* resembles a screw (*terebra*); the *Cyclostoma* separates its last volution (*moreletianum*), and the *Oniscus* presents spiny asperities, preserving otherwise a very similar appearance to the de Casas species.

The geological formations are identical, and Poey has suggested

the differing intensity of the sun's rays as a partial explanation of these surprising differences.

This same author has protested against any sweeping conclusions as to the importance in the operculate shells of the operculum, in establishing genera, and agrees with Petit de la Saussaye in considering this feature of quite subordinate value, remarking, "porque varia el operculo de los Cyclostomas en los grupos mas aproximados por el caracal y las costumbres del animal. No suce de asi en los turbineos, entre los cuales se nota que los que viven apegados a los arrecifes tienen el operculo corneo, y los que se apartan a mayor profundidad lo tienen calcareo: de aqui un excelente caracter para diferenciar las Litorinas de los verdaderos turbos y trocas."

Poey has also pointed out the confusion that results from the adoption by different authors of varying or diverse morphological characters for the classification of this group.

A *Cyclostoma* becomes a *Chondropoma* because of a corneous operculum, or the same shell a *Megalostoma* by its thickened peristome, a character participated in by the *Cyclophorus* of Montfort, and the *Tropidophora* of Troschel.

It is perhaps interesting to recall that Poey in a protest against classification based upon the shelly parts of these mollusca, has called attention to the method of progression of the Cyclostomas, their divided pedal muscle allowing the movement forward of one-half of the foot alternately with the other. It is not at all likely that this feature would ever be useful in separating the round-mouthed shells, but Poey has made of this observation an opportunity to emphasize the preponderant significance of the physiology of molluscs over the form, etc., of their shells for purposes of classification. Cyclophorus has not a divided foot. Pfieffer, in his *Monographia Pneumonopomorum Viventium*, analyzes the Cyclostomacea as composed of three series, in each of which the form of the operculum is regarded as the separative character. The entire systematic table is as follows, so far as the opercula are here discussed.

FIRST SERIES.

Operculum circular, frequently concave exteriorly, formed of many slowly-increasing whorls. Nucleus central.

I. Operculum shelly (testaceous).

Genera, *Cyclotus*, *Alycæus*, *Diplommatina*.

Cyclotus. Operculum orbicular, shelly, arctispiral, externally rather con-

cave, with the margin of the whorl thickened, or raised in an incurved lamina, nucleus subcentral.

Alycæus. Operculum circular, subtestaceous, obsoletely multispiral.

Diplommatina. Operculum subtestaceous, thin, with few whorls, outer edge with thin lamella.

II. Operculum cartilaginous?

Genus, *Pterocyclos.* Operculum subcartilaginous, multispiral, interiorly concave.

III. Operculum corneous.

Genera, *Craspedopoma*, *Aulopoma*, *Cyclophorus*, *Leptopoma*, *Megalomastoma*, *Cataulus*, *Pupinella*, *Pupina*, *Registoma*, *Callia*.

Craspedopoma. Operculum horny, solid, closely whorled. Nucleus central, external lamina plane, internal furnished in its last whorl with a circular prominence, centre profoundly concave.

Aulopoma. Operculum horny, arctispiral, planorbal composed of two laminæ, with an intermediate channel, with the last whorl furnished interiorly with a circular groove. (The outer edge larger than the aperture and reflexed over the peristome of the shell.—Adams.)

Cyclophorus. Operculum horny, thin, arctispiral, externally more or less concave.

Leptopoma. Operculum membranous, arctispiral, flat.

Megalomastoma. Operculum subcircular, thin, horny, arctispiral, planular.

Cataulus. Operculum orbicular, plane, corneous, arctispiral.

Pupinella. Operculum horny, arctispiral.

Pupina. Operculum thin, membranous, arctispiral, subplanum.

Registoma. Operculum circular, thin, horny, arctispiral.

Callia. Operculum thin, membranous, arctispiral.

(*To be continued.*)

NOTES.

HELIX HORTENSIS ON MAGDALEN ISLAND.—In 1901 the Carnegie Museum of Pittsburg sent an expedition to the Magdalen Islands and Labrador to collect birds and eggs, and on June 23d, while at Grand Entry, Magdalen Island, one of the party collected a lot of *Helix hortensis* Müll., which show a remarkable tendency towards a single type of banding. There are about 330 shells in the lot, counting young and old, and all are the form with yellow ground. The following table, based on matured shells only, gives the number of each form:

186—12345.

48—(12)345.

1—12045.
22—00300. No. 3 very faint, translucent.
8—00000.

In a large proportion of the 186, 12345, bands 1 and 2 are *very close* together, but separated by a distinct but very narrow light line. In many of the (12)345 the union of 1 and 2 is indicated by a lighter space in the center of the band. It will be interesting to get further collections from this locality and see if the proportion of (12)345 shells increases, as this lot seems to indicate.

The shells are rather thin and very uniform in size, the average being about 18 × 15 × 14 mm. The largest shell measures 21 × 18 × 16½ mm., and in this shell bands 1 2 and 3 are unusually wide. The smallest shell measures 16½ × 14 × 12 mm.

Since my note in THE NAUTILUS, xiv, p. 72, I have received 8 additional *H. hortensis* from near the headwaters of Robinson's River, Newfoundland, as follows: Four (12345), one 1(234)5, three 00000. —GEO. H. CLAPP.

PUBLICATIONS RECEIVED.

MOLLUSCA OF THE SOUTHWESTERN STATES. II. By H. A. Pilsbry and J. H. Ferriss. Proc. Acad. Nat. Science, Philadelphia, 1906, pp. 123–175.

This important paper completes the review of the southwestern mollusca collected by the authors in Texas, New Mexico and Arizona, with the exception of *Omphalina* and the *Unionidæ*. Although any attempt to a complete faunal monograph is expressly disclaimed, this paper and its predecessor (P. A. N. S. P., 1905, p. 211) will be found to contain practically all the reliable data extant upon the fauna of southeastern Arizona and western Texas. The molluscan fauna of this region, like the reptilian, shows that the transcontinental zones of distribution as established by Merriam cannot be maintained in the Mediocolumbian region for these lower forms of life, but that "these zones are secondary divisions of vertical life areas of which the molluscan faunas were evolved in large part independently."

While the range of practically all the Austroriparian species is limited on the west by the rise between the 96th and 98th meridians of longitude, marking the approximate limit of the Cretacious forma-

tion and the Sonoran area in Texas, there is along its border an apparent, rather than a real, intermingling of the fauna, owing to the fact that the eastern species follow up along the river valleys, while at the same time "the fauna on the bluffs or away from the streams is frankly Sonoran." The scope of the present paper is, in the main, restricted to the species of the Sonoran region, only such of the Austroriparian species are mentioned as were actually collected by the authors.

The list of the forms considered characteristic of the Sonoran region in Texas includes twenty-one genera and thirty species. Of the former, nine are not known to occur in the Austroriparian or humid region of Texas. And of the latter, nine species and varieties are described as new. The larger and more important part of the paper is taken up with a monographic revision of the Texan *Bulimuli*, which have so long been a source of exasperation and despair to the American collector. It appears that the typical forms of *B. alternatus* and *schiedeanus* do not, so far as known, occur in the United States. The Texan series is restricted to *B. dealbatus* and *B. alternatus mariæ*. The specific distinction of *dealbatus* and *alternatus* is clearly established by the details of the genitalia. The typical form of *dealbatus* ranges from Alabama and Kentucky west to Kansas. West of the Mississippi from southwestern Missouri through Arkansas and the Indian Territory to Texas a number of well characterized local races have been differentiated, of which six are recognized and fully described and figured. *B. alternatus mariæ* ranges through a wide territory along the Rio Grande from the Gulf as far west as the Pecos river. Its exact western range has not been determined. While there are some general differences between the eastern (typical) and western forms, the intergradation is so complete that the authors do not deem it advisable to attempt to separate them into the distinct races.

Another important part of the paper is a revision of the genus *Helicodiscus*, of which four species and one variety are recognized. It is something of a shock, like that of losing an old friend, to learn that *lineatus* of Say must be given up, but fortunately it is replaced by another name, *parallelus*, of the same author.

Other corrections in nomenclature to be noted are, that *Helix sayi* of Binney was preoccupied by Wood for an uncertain species of *Polygyra*, but probably *auriformis;* and our well-known eastern

species will be known as *P. sayana* Pils., hereafter, and that *Pyramidula striatella* Anthony for like reason must give way to *P. cronkhitei anthonyi* Pils.

Among the large number of new forms of land species described the most remarkable is *Bifidaria tuba*, the type of a new subgenus Chænaxis, characterized by its "large hollow axis, open below and about one-third the total diameter of the shell," found in the drift of the San Pedro river, Cochise county, Arizona.

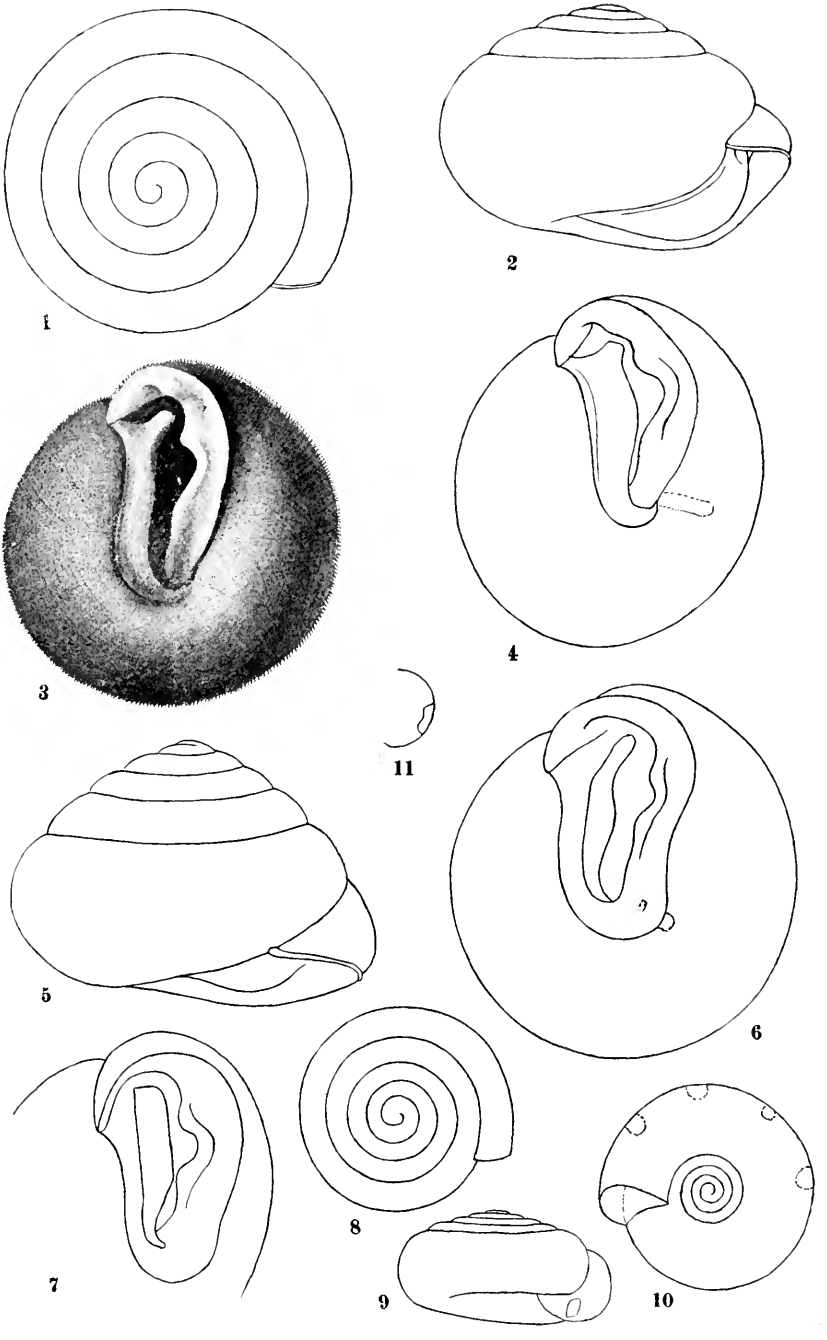
Radiodiscus millecostatus from the Huachuca Mountains, Arizona and Mexico, a minute Endodontid, is likewise both a new species and the type of a new genus.

The fresh-water forms of the region are also fully discussed, and afford several novelties in *Planorbis*, *Valvata*, *Amnicola* and *Paludestrina*, all minute, and some of them the smallest species yet discovered. The several varieties of *Lymnæa bulimoides*,—*sonomaensis* Hemp., *techella* Hald., and *cockerelli* (new)—are fully differentiated and figured, but unfortunately the typical form is neither figured nor discussed comparatively.

In *Segmentina*, attention is called to the difference in the character of the apertural lamellæ in the North American forms included in s. g. *Planorbula* Hald., and in the Antillian and Mexican group represented in our fauna by *S. obstructa* (Morel.). In *S. armigera* and *wheatleyi* the lamellæ, though differing in development, are "fundamentally identical." The Section *Haldemanina* recently established by Dall (Alaska, xiii, 97, 1905) for the latter species would therefore seem to be a synonym of *Planorbula* Hald.

The most important item in this portion of the paper is the discovery of a species of *Cochliopa* (*C. riograndensis*) in the drift of the Rio San Felipe, Val Verde County, Texas. The occurrence of *C. rowelli* Tryon, a Central American species, in California has always been doubted. The present discovery confirms the genus as a member of our fauna.

The authors intimate that their discussion of the southwestern mollusks will be concluded by a third paper. Its appearance will be eagerly looked for by all students of our North American fauna. But, unless their well-known skill in the field has deserted them, it is confidently expected that the expedition of 1906 to the Grand Canyon will yield results quite as important as did their former ones, and that the fauna of the southwest will in the near future be still further illuminated by their labors. BRYANT WALKER.



STENOTREMA AND PARAVITREA.

THE NAUTILUS.

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NEW SPECIES OF STENOTREMA AND PARAVITREA FROM ALABAMA.

BY GEORGE H. CLAPP.

VITREA (PARAVITREA) ALDRICHIANA n. sp. Pl. V, figs. 8, 9, 10, 11.

Shell small, widely, perspectively umbilicate, flattened, slightly convex above and below, the periphery well rounded; greenish-white almost transparent, highly polished with very faint growth lines and on the body-whorl a few impressed lines spaced irregularly. Whorls five, those of the spire rounded at the well-impressed suture; umbilicus contained about three times in the diameter of the shell and showing all of the volutions; peristome forming two-thirds of a circle; lip simple.

Slightly below the periphery, and in the last half of the body whorl are about four teeth which are longer, vertically, than wide, and, apparently, project at both the upper and lower ends; *i. e.*, they are double pointed.

Greater diam. 2, lesser 1.9, alt. 1 mm.

Type from the slope of the Cumberland Plateau in Jackson County, Ala., close to the state line, and about 2 miles S. E. of Anderson, Tenn. Collected by Herbert H. Smith, who found but four specimens of this excessively rare species, the others being from "Buck Creek Cove," Franklin County, Tenn., "Cove in Valley of Little Crow Creek," and "Bennett's Cove, near State Line," both Jackson County, Ala.

These four localities are near together on the Cumberland Plateau, and along the Tenn.-Ala. boundary.

It is interesting to note that Mr. Smith collected both *V. multi-*

dentata and *lamellidens* in the same general locality, although he did not find the latter in Alabama.

The species is so distinct from all others of the genus that it can not be compared with any of them. The fact of finding four specimens at different places and all of practically the same size, shows that it is not likely to be the young of a larger species.

I take great pleasure in naming it after Hon. T. H. Aldrich so well-known by his work on the fossil mollusca of the South.

Type in my collection; the other specimens in the collections of Bryant Walker, John B. Henderson, Jr., and T. H. Aldrich.

POLYGYRA (STENOTREMA) BREVIPILA n. sp. Pl. V, figs. 1, 2, 3, 4.

Shell imperforate, globose, thin, light reddish-horn color; *densely hirsute with fine, short hairs.* Whorls five, those of the spire convex with a well-impressed suture; the body-whorl *very convex*, equally rounded above and below, *deeply impressed* in the umbilical region, abruptly deflected at the aperture and contracted behind the lip. Aperture transverse, narrow, *widening anteriorly:* parietal tooth large, strong but narrow, erect, with the sides nearly at right angles to the whorl and projecting beyond the lip, with which it is not parallel, *but diverges for three-fourths of its length*, when it is abruptly bent inward and downward, terminating opposite the second notch in the lip, its distal or outer extremity connected with the end of the peristome by a ridge of callus, the axial end *sweeping around and "pocketing"* the basal end of the lip; outer lip reflected back against the body-whorl, but with its *sharp edge free from the whorl its entire length;* very much thickened along its inner edge which forms a raised margin around the wide notch, and a well-developed tooth or fold beyond it, after which the margin is incurved around the outer extremity of the parietal tooth. *Fulcrum long.*

An average shell measures, diam. 8½, alt. 6 mm.

The largest seen measures 9 x 6, and the smallest 7¾ x 5¾ mm.

Collected by Herbert H. Smith on Horseblock Mountain, Talladega Co., Ala., at an altitude of about 2,000 feet. On some of the U. S. Geological Survey sheets this mountain is called "Talladega," but "Horseblock" is the local name.

"The mountain sides, near the top, are littered, or rather piled with talus, big and little rocks; the shells are found almost invariably on the lower sides of these rocks, and generally they chose

the biggest and heaviest; you turn over perhaps fifty to find one shell. They are obtained by sheer hard work." H. H. S.

This is one of the most striking species of the *Stenotrema hirsuta* group, and differs from all others in having a *continuous free lip;* the lip-notch is also of an entirely different type, as it will be noticed by a reference to the figures that the notch is *not* an indentation in the center of the lip, but the lip forms a curve from the columellar end to the highest part of the notch when it is suddenly deflected and bent forward. The parietal tooth differs in being more perpendicular to the body-whorl, *not bent toward the lip,* as in *Stenotrema*, where the tooth is very convex on its outer side and concave on the side next the lip, which it frequently overhangs. On looking into the aperture, through the notch, the whole of the long fulcrum can be plainly seen.

The only species with which this is likely to be confused is *P. altispira* Pils., but the resemblance, due to the wide notch in each case, is only superficial; for, as pointed out above, the notch is of a different type. The hairs are also much finer, closer and shorter, and the shape of the shell is entirely different.

Type in my collection; cotypes in the collections of the Academy of Natural Sciences, Phila., Bryant Walker, T. H. Aldrich and John B. Henderson, Jr.

Reference to Figures.

Figs. 1, 2, 3, 4. *Polygyra* (*Stenotrema*) *brevipila* Clapp.

Figs. 5, 6, 7. *Polygyra* (*Stenotrema*) *altispira* Pils. Roan Mtn., N. C., specimen 9 x 6 mm., size of type.

Figs. 8, 9, 10. *Vitrea* (*Paravitrea*) *aldrichiana* Clapp. Type.

Fig. 11. Apparent shape of teeth of *V. aldrichiana.*

A NEW CARDIUM FROM PUGET SOUND.

BY WILLIAM HEALEY DALL.

Among the specimens of *Cardium* received from the Pacific coast during a series of years was occasionally a specimen with more numerous ribs, smoother surface and small, compact shell, which was doubtfully referred to the young of *C. californiense* Deshayes, better known under Gould's name of *blandum.* Recently in an endeavor

to identify one of these shells, sent in from Monterey by Mr. Berry, all the available specimens were brought together and carefully compared, leading to the conclusion that the shell is a distinct species.

Cardium (*Cerastoderma*) *fucanum* n. sp.

Shell small, plump, compact, solid for its size, covered with a smooth brown or gray periostracum usually more or less eroded; form varying from nearly circular to slightly ovate, with rather prominent slightly prosocœlous beaks, situated a little anterior to the middle of the shell; valves moderately convex, equal and nearly equilateral, sculptured with numerous (40 to 58) similar, small, low, flattish radial ribs separated by much narrower interspaces; these ribs are not nodulous nor keeled, they are sometimes slightly rippled by the incremental lines, and, as usual, are smaller, fainter and more crowded distally; the interspaces are rounded; near the dorsal margins on each side of the beaks there is an ill-defined narrow space which is devoid of ribs; the average number of ribs is about 50; the inner margins of the valves are crenulated; the hinge delicate and normal; the inner surface of the valves white, polished; the outer surface usually shows three or four concentric sulci due to resting-stages. Length 38, height 33, diameter 18 mm., of a fully adult specimen; a shorter variety measures 25.5, 24.5 and 16 mm. for the same dimensions.

From Bering Sea (in 70 fathoms, temperature 39.0°) south to Monterey Bay, California (in 20 fathoms); the depths varying from 20 to 70 fathoms and the temperatures from 39.0° to 52.3°. Collected by Kennerley, Swan, the U. S. F. Com. Str. Albatross, and Mr. S. S. Berry, of Stanford University.

This species somewhat resembles *C. hayesii* Stimpson from the Arctic Sea but has more numerous and more uniform ribbing. It wants the angulation (in fresh specimens fringed with periostracum) which is characteristic of *C. ciliatum* Fabr. in the young stages, and has more, and more crowded, ribs, and a more solid shell. It is most nearly allied to *C. californiense* but has a thicker and more ventricose shell, is less attenuated posteriorly and less oval in form, the ribs are more closely adjacent and more uniform in size than in *californiense;* though the number is about the same the diminutive size of *fucanum* makes them appear much more numerous. Most of the 14 specimens examined came from the Straits of Fuca.

A NOTE UPON THE INSUFFICIENCY OF THE OPERCULUM AS A BASIS OF CLASSIFICATION IN ROUND-MOUTHED SHELLS.

(Concluded).

BY L. P. GRATACAP.

SECOND SERIES.

Operculum subcircular, few whorls, rather quickly widening, nucleus subcentral.

I. Operculum horny.

Genera, *Jamaicia*, *Licina*, *Choanopoma*.

Jamaicia. Operculum horny, exteriorly convex, with few rugose whorls, obliquely striated, sublammellose.

Licina. Operculum not described.

Choanopoma. Operculum horny, subcircular, whorls rather quickly widening, with free external margin, acute, frequently raised into lofty lamella, nucleus subeccentric.

II. Operculum cartilaginous.

Genus, *Adamsiella*.

Adamsiella. Operculum circular, thin, subcartilaginous, with few whorls, gradually increasing, with somewhat free edges, nucleus subcentral.

THIRD SERIES.

Operculum oval or angulated, few whorls, more or less quickly increasing, nucleus eccentric.

I. Operculum shelly.

Genera, *Lithidion*, *Otopoma*, *Cyclostomus*, *Tudora*, *Leonia*.

Lithidion. Operculum subcircular, shelly, whorls rather rapidly increasing, with a subcentral keel, strong, convex, furnished with simple margins.

Otopoma. Operculum horny, solid, few whorls, convex center, simple margin.

Cyctostomus. Operculum suboval, horny, plane, four to five whorls, gradually increasing, simple margin, nucleus subeccentric.

Tudora. Operculum oval, horny, plane, two or three whorls rapidly increasing, obliquely arcuate, striate, or sulcate, nucleus quite eccentric, with the left and lower margin closely fitting to the peristomes.

Leonia. Operculum oval, shelly, externally perconvex, unispiral, nucleus placed near the columellar margin.

II. Operculum cartilaginous, covered externally with a thin shelly layer.

Cistula. Operculum oval, thin, cartilaginous, externally furnished with a thin horny layer, with a few whorls gradually increasing, margin generally free, nucleus eccentric.

III. Operculum entirely cartilaginous.

Chondropoma. Operculum oval, subcartilaginous, plane, few whorls, rapidly increasing, nucleus generally quite eccentric.

IV. Operculum double interiorly concamerated.

Pomatias. Operculum cartilaginous, few-whorled, made up of two laminæ, interiorly concamerated.

V. Operculum corneous.

Genera, *Realia, Omphalotropis, Bourciera.*

Realia. Operculum thin, horny, few-whorled.

Omphalotropis. Operculum thin, horny, few-whorled.

Bourciera. Operculum oval, somewhat solid, horny, with few rapidly increasing whorls.

Later authors have extended this list of genera, but Pfeiffer's synopsis practically embraces the important and distinguishing genera. The force assigned to the operculum as separative of the genera naturally appears exaggerated, when their characters are thus isolated, but in view of the purpose of this paper to emphasize their secondary, or in cases, entirely negligible weight, this isolation serves the more explicit object of fixing attention solely upon the operculate features.

To begin with, in the genus *Cyclotus*, there exist differences in the opercula of many species almost as great as that between the opercula of recognized genera. In the species *C. corrugatum*, Swb. the whorls of the laminae in the operculum are margined by erect incurved slightly striate free fillets, the whole operculum presenting the appearance of a watch-spring; whereas in typical examples of the operculum of *Cyclotus*, the laminae are flat with edges strictly in contact or slightly overlapping, the latter feature becoming extreme in *seminudum*. There is here no essentially different principle of construction involved but the formal contrast in appearance might as safely be invoked to make another genus in the case of *C. corrugatum* (as it has been) so far as opercula offer signs of generic distinction. Troschel and H. and A. Adams have indeed placed this shell, along with *asperulus*, *cingulatus*, *crassus*, etc., in all twenty-five species, in the subgenus *Aperostoma.*

The shelly substance of the operculum of *Cyclotus* is however a quite constant feature. The shelly opercula are found in such small shells as *fodiens*, *hunanus*, *parvulus*, *minimus*, where it might be expected that the calcareous secretions would be less complete.

The opercula of the small shells *Alycaeus* and *Diplommatina* are not often found in shells in collections. Where I could examine them under a one-inch objective they certainly offer no determinative differences from the opercula of *Cyclophorus*, and like the latter are horny (corneous). Compare for instance the opercula of *Alycaeus rathouisiana*, Hende, *Cyclophorus parapsis*, Benson.

The genus *Pterocyclos* is certainly closely allied to genera *Opisthoporus*, *Spiraculum*, *Rhiostoma*, but the opercula of these four genera exhibit two contrasted forms. Taking *Pterocyclos angulifer us* Soul. as an example of one form, the operculum forms a calcareous button, concave upon the outer side, interiorly filmed by a horny scale covering its entire width, grooved at the sides, and showing on its exposed surface closely wound narrow whorls, throughout obliquely striate. This configuration and structure is quite as naturally and truly referable to the opercula of some species of *Cyclotus* as *C. auriculata*, Kob., etc.

This form of operculum is found in some species of *Opisthoporus* (vide *biciliatus*, Mouss., *birostra*, Pfr.) and the distinction made by H. and A. Adams between the opercula of *Opisthoporus* and *Pterocyclas* is certainly misleading if universally applied. Another more common type of operculum, seen in *Spiraculum*, *Rhiostoma*, some species of *Opisthoporus* and *Pterocyclos* is a spiral lamina, concave interiorly, more or less deep with the free edges of the laminae erect or explanate and horizontal, arising screw-wise steeply around a solid nucleus (*Rhiostoma*) or more spreading with corneous intercalation (*Spiraculum*). The morphology of the shells themselves separates these genera, though it is probable the distinctions should form subgenera, but the opercula present two forms, which while partially restricted are surely not enough so to offer any basis for strict classification.

But the confusion, so far as opercula are considered, does not end here. The opercula of the second type of *Pterocyclos, Opisthoporus*, *Spiraculum*, *Rhiostoma*, in substance and structure, is practically repeated in those of *Choanopoma*. Both groups show the exsert, erect, or spreading laminae, the spiral curvature, the union of calcareous and corneous texture, though the inner surface of the operculum in *Choanopoma* is usually flat, and in some instances as *C. pulchrum*, Gray, the coarse expansive character of the whorls contrasts with the analogous feature in *Pterocyclas*, etc.

The operculum of *Leptopoma* is essentially that of many species of *Cyclophorus* (compare *Leptopoma sericatum*, Pfr. with *C. fulguratus*, Pfr. and *C. borneense*, Mtf.). It is membranous, corneous, arctispiral suppressedly striate, on the laminae, concave, with a polished inner surface. The fimbriated shaggy exfoliated surfaces of many opercula of the larger *Cyclophorus* (see *C. arthritis*, *C. nilagirianus*, *C. oculus-capri*, *C. tuba*, *C. validus*, etc.) are age characters, and seem also to have some relation to the moist habitats of the animals. This type of operculum is repeated in *Megalomastoma*, though the shell in the latter case is pronouncedly and divergently different (see *M. ventricosum*, *M. verruculosum*.)

Cataulus is in its operculate character identical with the foregoing. Although from the size of the apertures the opercula are small, they are in construction, substance, expression, and microscopic features, inseparable from the opercula of *Cyclophorus*, *Megalomastoma*, and *Leptopoma*. The flatness usually observable in the opercula of the last two genera is shown in *Cyclophorus* in small shells, the concavity of the operculà of the latter genus being the result of the natural curvature produced by the protruding fibres of the larger foot in larger species.

The operculum of *Pupina* is unmistakably indicated in structure, nature, and physical appearance with all the foregoing, its tenuity alone and flatness offering only the most evanescent and unreal discrimination from the other genera. *Pupinella*, *Registoma*, *Callia*, are quite inseparable in their operculate character. *Aulopoma* is a shell very near in external characters to *Pterocyclos*, *Opisthoporus*, *Spiraculum*, *Rhiostoma*, omitting the lip expansion and spiracle, but the operculum is sharply contrasted. The operculum in *Aulopoma* is corneous, consisting of a flat spiral made up of tubular whorls coarsely striate and embracing, cap-like, the margins of the shell aperture. If the distinction of this genus is based upon the operculum it rather forcibly separates a shell from its natural generic position.

In structure, at least, the sub-orbicular operculum of *Otopoma naticoides* Rec., with its cycloidal development with the tangential striæ leaving the whorls and extending outward, but forming flexuous lines on the limits of the last whorl, is repeated in the authentic operculà of *Cyclophorus metabletus* Crosse & Fischer.

The instances of exact repetition in the opercula of *Cyclotus* and *Cyclophorus* ase numerous. The operculum of *Cyclotus translucidus*

Sowb. is certainly reproduced in those of *Cyclostoma xanthocheilus*, *C. barclayanus*, *C. campanulatus*. The flat thin spiral, almost equal with the slightly overlapping ascent outward to the last whorl, striate on its exterior edges, is closely repeated in each.

In *Adamsiella grayana* Pfr., *A. variabile* Ad., there is a spiral operculum with exsert laminæ, somewhat multifolded or lamellose on edges, but structurally distinctly like *Choanopoma* and *Opisthoporus*.

The operculum of *Tudora* and *Cistula* with their rapidly increasing whorls, the last expansive and filling one-third of the aperture, nucleus subcentral, are practically identical. The thin substance of the operculum of *Chondropoma* gives it some essential differentiation, but in the theory of its form it is exactly like *Tudora* and *Cistula*. The outer surface of the operculum of *Tudora* is frequently (*T. shepardianus* Ad., *T. pupoides* Morelet) fibrous-rayed, whereas in *megacheilus* its surface is smooth, or obsoletely striate which form is closely imitated by the operculum of *Chondropoma*.

The following table exhibits the substance of the operculum in the genera of round-mouthed shells, as observed in the collection of the American Museum of Natural History, and as given by Pfeiffer. The two columns afford slight differences, but such differences might readily be referred to individual variations in the shells examined by two observers, using different groups of specimens.

SUBSTANCE OF THE OPERCULUM.

Observed in Collection.		*Pfeiffer.*
Testaceous to subtestaceous. Subtestaceous in *C. crassus*, Ad. *C. triliratum* Pfr., *C. rugatus* Guppy, *C. suturale* Swb.	*Cyclotus.*	Testaceous.
Corneous.	*Alycæus.*	Sub-testaceous.
Corneous.	*Diplommatina.*	Sub-testaceous.
Testaceous to Sub-testaceous in *P. rupestris* Bens.	*Pterocyclos.*	Sub-cartilaginous.
Not seen.	*Craspedopoma.*	Corneous.
Corneous.	*Aulopoma.*	Corneous.
Corneous.	*Cyclophorus.*	Corneous.
Corneous. Membranous.	*Leptopoma.*	Membranous.
Corneous.	*Megalomastoma.*	Corneous.
Corneous.	*Cataulus.*	Corneous.
Corneous.	*Pupinella.*	Corneous.
Corneous.	*Pupina.*	Membranous.

Corneous.	*Registoma.*	Corneous.
	Collia.	Membranous.
Corneo-testaceous.	*Jamaicia.*	Corneous.
Not seen.	*Licina.*	?
Testaceous to Corneo-testaceous. In *C. majusculum* Morelet the corneous layer is quite intimately and equally developed with the testaceous.	*Choanopoma.*	Corneous.
Corneous.	*Adamsiella.*	Sub-cartilaginous.
	Lithidion.	Corneous.
Testaceous.	*Otopoma.*	Corneous.
Testaceous.	*Cyclostomus.*	Corneous.
Corneous layer quite thick in instances as *C. bicarinatum* Swb., *C. filosum* Swb., *C. madagascariense* Gray, *C. rangelinum*, *C. xanthocheilus.*		
Testaceous to Testaceo-corneous.	*Tudora.*	Corneous.
Testaceous.	*Leonia.*	Testaceous.
Testaceous.	*Cistula.*	Cartilaginous.
Corneo-cartilaginous.	*Chondropoma.*	Sub-cartilaginous.
Not seen.	*Pomatias.*	Cartilaginous.
Not seen.	*Realia.*	Corneous.
Not seen.	*Omphalotropis.*	Corneous.
Not seen.	*Bourciera.*	Corneous.
Testaceous to Sub testaceous.	*Hybocystis.*	
Testaceous.	*Cyclotopsis.*	
Testaceous to Sub-testaceous.	*Ctenopoma.*	
Testaceous.	*Diplopoma.*	

Collections of the Cyclostomacea are often sadly deficient in opercula, and this very interesting feature is as frequently absent as present. It seems most probable that opercula have no exact generic value, and should not be regarded with the extreme importance assigned to them by Pfeiffer, H. & A. Adams, and other authors.

It is hoped that a more detailed and illustrated study of them will be made in the future.

NOTES.

THE WINKLEY COLLECTION OF SHELLS.—"A most gratifying gift was received last June from the Rev. Henry W. Winkley, of Branford, Conn.; it consists of a large series, some 1600 species and

varieties of land shells from all parts of the world, except New England. His New England collection Mr. Winkley retains for study, but he writes that he thinks in time it too 'will find its way to the Museum.' The shells received are in excellent condition. Mr. Winkley, as a member of the class of 1881, recalls with pleasure his undergraduate work in the Museum, and gives the collection as his contribution toward the twenty-fifth anniversary celebration of the class. It is hoped that Mr. Winkley's gift will prove an incentive to other graduates to associate their college work with the interests of science and the Museum."—(*From the Annual Report of the Curator, Museum of Comparative Zoölogy*, 1905–1906.)

THE MUMFORD COLLECTION OF SHELLS.—Through a bequest of the late Mr. Henry Mumford, the Museum of the Brooklyn Institute of Arts and Sciences has secured an unusually fine collection of shells, comprising about 15,000 specimens, representing 2,400 species; this will be known as the Phebe L. Mumford Collection. It was originally brought together by Mr. Isaiah Greegor, for many years a resident of Jacksonville, Florida, who made a special effort to secure the best possible specimens. This makes the collection particularly valuable for a museum, since the shells are in their natural condition, retaining the outer layer or "epidermis," which is usually removed to show the brilliant coloring beneath, a proceeding that makes the shell "look pretty," but utterly destroys its scientific value; there are, however, series of shells cleaned and polished so that the student and the lover of the beautiful may alike find what they wish.

Two years ago the Museum received a valuable gift of shells from Mr. Julius Brunn, so that the division of mollusks is now very well represented.—(*The Museum News.*)

PUBLICATIONS RECEIVED.

AN ILLUSTRATED CATALOGUE OF THE MOLLUSCA OF MICHIGAN: Part I, Terrestrial Pulmonata (Land Snails). By Bryant Walker (From Report of the Michigan State Board of Geological Survey, 1906). "This catalogue has been prepared to supply the need for a convenient manual of Michigan mollusks for the use of teachers and students of biology throughout the state." It contains

chapters on the history of Michigan conchology, the relations of the Michigan fauna, on collecting and preserving mollusks, on classification, measurements and descriptive terms. While these subjects are concisely treated, yet Mr. Walker has condensed into his pages the practical results reached by the modern group of American workers in both field and laboratory, so far as applicable to the Michigan fauna. There are few collectors who will not profit by reading the "Hints on collecting mollusca," and "Arrangement of the collection." The classification and nomenclature of the catalogue are up to date.

The list comprises 81 species, all described and illustrated by cuts in the text, most of them borrowed from Binney's standard series of figures, though with a considerable number of original drawings. Full references are given to previous Michigan literature, as well as to the original descriptions, and to Mr. Binney's Manual. Excellent keys to the species are given.

It is no disparagement of other lists to say that the Michigan catalogue as here presented is the most thoroughly worked-up state catalogue we have had. Every species has been the subject of special investigation, as to its characters and identity, and its distribution in Michigan. The time and labor involved in working up a state fauna in this thorough manner will be appreciated only by those who have undertaken the rigid verification of every record in the fauna of an equal area.

A summary of the work on distribution done up to this time is given in the tabular census, giving the distribution of all the species by counties. Records have been received from all but 16 of the 84 counties in the state. It will be noted that the comparatively remote and inaccessible Upper Peninsula is well represented in the Census, and the Boreal character of its fauna is well shown by the absence of nearly all of the Polygyras, larger *Zonitidæ*, etc.

Species interesting because of their rarity or on account of notable extensions of their known range, are *Vitrea wheatleyi* and *rhoadsi*, *Pallifera hemphilli*, *Succinea retusa peoriensis* (here for the first time figured), *Vertigo morsei*, *Cochlicopa lubrica morseana*, etc. Excellent and much-needed original figures of *Strobilops labyrinthica*, *S. virgo* and *S. affinis* are given.

Mr. Walker is at work upon the fresh-water mollusks, to form the second part of the catalogue. We will all look with interest for his treatment of the aquatic pulmonates.—H. A. P.

THE NAUTILUS.

VOL. XX. MARCH, 1907. No. 11.

A NEW FOSSIL BUSYCON (FULGUR) FROM FLORIDA.

BY T. H. ALDRICH.

BUSYCON MONTFORTI n. sp. Plate VI.

Shell large, solid. Whorls about seven; those of the spire with slight nodules, which on the body whorl develop progressively into small, medium, and then large spines, ten in number on the specimen figured; these spines are flattened above, and partly so below, and differ from those of *Busycon eliceans* Montf., by being filled by the successive growth additions. Surface covered with raised lines, except on the middle of the body whorl. Aperture within still yellowish-brown. Canal contracted and twisted somewhat to the left. Inner lip with a strong callus carrying a fold at the angle with the canal; outer lip corrugated within. The specimen has the spire slightly broken, but it is probably pointed like *Busycon eliceans*. The canal is considerably shortened by breakage.

Locality: Shoal River, Walton County, West Florida.

Remarks: The geological horizon is in the Upper Oligocene of Dall. This species is especially interesting because it shows that *Busycon eliceans* Montf. is a distinct form with an Oligocene (?) ancestor. There are a number of minor differences between the two species, but when placed side by side they show without question their intimate relations. The descent of the group will need to be cousiderably modified to conform to the new discovery.

A NEW SPECIES OF SEGMENTINA.

BY BRYANT WALKER.

SEGMENTINA CRASSILABRIS n. sp., Pl. VII, figs. 4–6.

Segmentina wheatleyi, Witter, J. of Conch., I, 388 (1878).

" " ? Walker, Naut. VI, 137 (1893).

" " Walker, Rev. Mich. Moll., 18 (1895).

Shell dextral, broadly umbilicate, planorboid, smooth, slightly wrinkled by subobsolete growth lines and microscopic transverse lines and undulations; light horn colored; whorls $4\frac{1}{2}$, regularly increasing, those of the apex flattened and concavely depressed, antepenult and body whorl rounded above, the latter deflected and slightly expanded towards the aperture, and sharply contracted at the lip, forming an obtuse crest just behind the edge of the lip, obtusely angled below, around the deep, subfunicular umbilicus; aperture oblique, subtriangular, greatly contracted by a heavy callous ridge just within the lip, the face of which is concave, the edge of the lip being sharp and black; the extremities of the labial ridge are connected by a slight callus across the parietal wall; apertural lamellæ six; two parietal and four (palatal) on the outer wall. The principal parietal lamella is a thin, broad, sigmoid blade rising from the lower third of the parietal wall, and extending upward and backward nearly to the suture, it is widest in the center, the anterior extremity is subtruncate and rather abruptly bent outwards, posteriorly it slopes gradually to its termination; below this and just behind the curve in the anterior portion and about halfway between it and the base is a short, sharp denticle projecting obliquely forward and downward; the lower palatal fold extends transversely nearly across the entire base of the whorl and is a low, strong fold, the upper surface of which is parallel with the base, the inner extremity is opposite the lower parietal lamella and rises abruptly at right angles to the base, the outer extremity is rounded and bent forwards, sloping down to its termination, viewed externally the base of this fold roughly resembles a figure-7; immediately above this, about halfway between it and the lower extremity of the third palatal fold, and about at the periphery of the whorl is a short, trans-

versely diagonal lamella, the anterior end of which is lower than the posterior, which is slightly bent upwards; above the anterior extremity of this fold is the third palatal fold, a short, slightly oblique lamella, the posterior end of which is slightly curved backwards and slopes more gradually to its termination than the anterior extremity; above this and at its posterior extremity is a short, transverse denticle, which lies immediately below the superior arch of the whorl.

Alt. 3, greater diam. 7½, lesser diam. 6 mm. Types (No. 2998 coll. Walker) from Hamtramck, Wayne Co., Mich. Also from Kent and Monroe counties, Mich.; Muscatine, Ia.; Knox county, Vincennes and Brownston, Ind.

This very distinct species was first seen in 1878, when specimens from Muscatine, Ia., were received from Prof. F. M. Witter, labelled *S. wheatleyi* Lea, on the authority of the late Dr. Jas. Lewis. Subsequently, when the species were detected in Michigan, in reliance on this identification it was so listed in the two papers cited above. The recent receipt of the true *S. wheatleyi* from Princeton and Boligee, Alabama, collected by H. H. Smith and A. A. Hinkley, has shown that the reference of this form to that species was erroneous.

Although occupying an intermediate position between the well-known *S. armigera* and *S. wheatleyi*, *crassilabris*, is quite distinct from either. In external appearance, compared with *armigera* (Fig. 1–3), it is smaller and more compactly coiled and higher in proportion to its width, the umbilicus is smaller and deeper, and the angulation of base of the whorl around the umbilicus more pronounced. In *armigera*, the whorls are more regularly rounded and the aperture lacks the crest behind the lip, and is not at all contracted, the thickening within the lip is very slight and does not sensibly diminish its calibre. In *wheatleyi* (Fig. 7–9) the distinctive features of *crassilabris* are all intensified. The apical whorls are more depressed, the body-whorl is obtusely angulated above and sharply carinated around the umbilicus, which is funicular, the inner whorls scarcely, if at all, obtruding beyond the curve of the body-whorl; the aperture is more oblique and more contracted in front of the crest, which is more prominent. The inner ridge of callus is less developed and lacks the regular concave slope to the edge of lip characteristic of *crassilabris*.

As recently stated by Pilsbry and Ferriss (Proc. A. N. S. P., 1906, p. 166) in regard to *S. armigera* and *wheatleyi*, the arrange-

ment of the apertural lamellæ in these three species is fundamentally the same. Their number, position and character are the same in all. The differences, which are, however, specifically characteristic, are only in the degree of development.

In *armigera*, the principal parietal lamella is much shorter, less oblique and its anterior end is less curved and truncated than that of *crassilabris*, the palatal folds are all less developed, and the spaces between them consequently greater; the upper extremity of the basal fold is less deflected and scarcely noticable externally. In both these species, there is a marked tendency to develop an additional fold in connection with the central palatal giving it a V-shape, which is quite noticeable from the exterior.

In *wheatleyi*, the position of the principal parietal lamella is more like that of *armigera* than of *crassilabris*, being, taken as a whole, less oblique and the anterior end is less bent forward than in the latter species, but the posterior extremity is more prolonged than in *armigera*, and is continued for a short distance parallel with the suture; the basal palatal is much wider than in either of the other species and is abruptly contracted at its base, while the upper extremity is deflected as in *crassilabris;* the second palatal fold is remarkably developed, rising abruptly near the base of the whorl; it runs back for a short distance parallel with the base, and curves upward, terminating just below the superior carina, having much the shape of a boomerang. The third palatal is only slightly oblique, the lower end is bent backwards and close to the upper extremity is a small knob, not sufficiently differentiated from it to be called a distinct denticle, but evidently similar to the accessory fold noticed in the other species; the upper extremities of this fold and of the basal palatal are about on the same level. The fourth palatal is situated directly under the superior carina and is a short, straight, transverse, club-shaped fold, the posterior extremity being the thickest.

EXPLANATION OF PLATE VII.

Figs. 1–3. *S. armigera* Say, Mohawk, N. Y.
Figs. 4–6. *S. crassilabris* (Type), Hamtramck, Mich.
Figs. 7–9. *S. wheatleyi* Lea, Princeton, Ala.

DESCRIPTIONS OF NEW SPECIES OF LYMNÆA.

BY FRANK C. BAKER.

LYMNÆA DALLI n. sp.

Lymnæa parva Baker, NAUTILUS, XIX, p. 52, 1905. (Not of Lea.)

Lymnæa dalli Baker, Bull. Ills. State Lab. N. H., VII, p. 104, 1906.

Shell very small, thin, ovate-conic, turreted; color greenish or whitish-horn; surface dull to shining, marked by heavy, crowded growth-lines, which are elevated into distinct ribs in some specimens; protoconch very small, flatly rounded, light-horn colored; whorls $4\frac{1}{2}$ to 5, rounded and distinctly shouldered; spire generally obtusely conic, turreted, a trifle longer than the aperture; sutures very deeply impressed; aperture elongate, ovate or elliptical, the peristome continuous in many specimens; outer lip acute; inner lip forming a rather flat extension over the umbilical region, leaving a rather pronounced chink; the lower part of the aperture is somewhat effuse; the columellar extension of the inner lip is appressed so as to form a pseudo-plait; the inner edge of the outer lip frequently forms a rib-like ridge in very old specimens.

Length 3.25, breadth 2, aperture length 1.5, breadth 1 mm. Lake James, Ind.

Length 4, breadth 2, aperture length 2, breadth 1 mm. Lake James, Ind.

Length 3, breadth 2, aperture length 1.25, breadth, .9 mm. Lake James, Ind.

Length 4.25, breadth 2, aperture length 1.75, breadth 1 mm. Lake James, Ind.

Length 4.5, breadth 2.5, aperture length 2, breadth 1.1 mm. (scalariform).

Length 3.75, breadth 2.75, aperture length 2, breadth 1.25 mm. Rockford.

Length 4, breadth 2.1, aperture length 2, breadth 1.1 mm. Rockford.

Types: Chicago Academy of Sciences; cotypes, Academy of Natural Sciences, Philadelphia; Smithsonian Institution, Washington.

Type Locality: Lake James, Steuben Co., Indiana.

Range: Indiana to Montana, south to New Mexico and Texas.

Station: Same as *humilis*, *curta*, and the other small Lymnæas.

Remarks: This little species, the smallest of our American Lymnæas, is related to *parva*, appearing at first sight to be a small example of that species. It differs from *parva* in its smaller size, rounder and more turreted whorls, more slender outline, longer and narrower aperture and smaller and less conspicuous umbilicus. The whorls are inclined to be shouldered also, a feature not emphasized in *parva*. There is some variation in the length of the spire, many specimens having a rather long spire, while in others the spire is much depressed, and the whorls are humped, this last being in slightly abnormal forms.

In THE NAUTILUS (XX, p. 52), this species was described as the *parva* of Lea, but a careful study of Lea's types in the Smithsonian Institution makes it evident that it is not that species, but a new one, hitherto unnoticed. Young specimens of *parva* are similar to *dalli*, but may be distinguished by the lesser number of whorls in shells of the same size and in the different shape of the whorls. The two small forms, *parva* and *dalli*, are related, but are easily separated when attention is given to the details of form and size.

This peculiar little species is named in honor of Dr. William H. Dall, Curator of the Division of Mollusks of the Smithsonian Institution.

LYMNÆA LEAI n. sp.

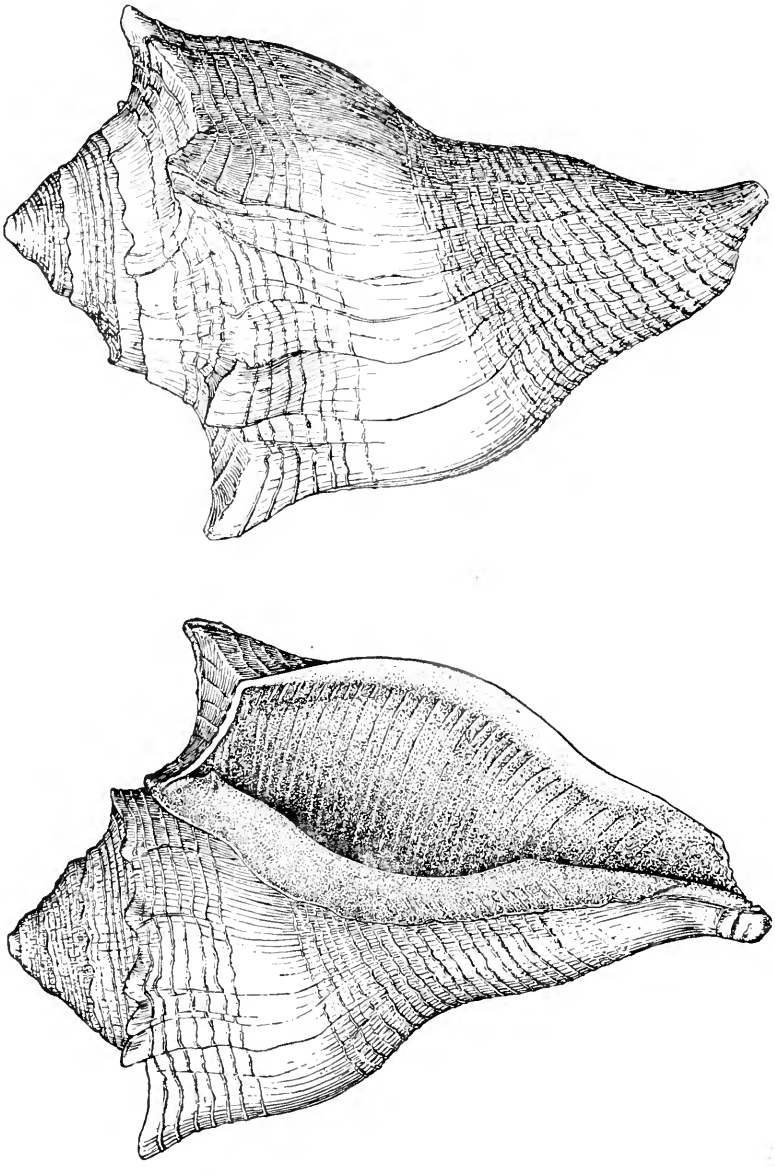
Shell large, ovate, thin; color, yellowish-horn; surface with fine lines of growth crossed by equally fine spiral lines; whorls 6, flatly rounded, very rapidly increasing in diameter, the last whorl very large; spire short, broadly, ovately conical; sutures well impressed; aperture elliptical or elongate-ovate, narrowed above, longer than the spire; outer lip thin, only slightly thickened by a longitudinal rib; inner lip thin, narrow, appressed to the umbilical region so as to leave a well-marked chink; callus on the parietal wall thin, wide, well marked; columella twisted, with a strongly developed ascending plait.

Length 30, width 13.5, aperture length 18, width 8.5 mm. Type.

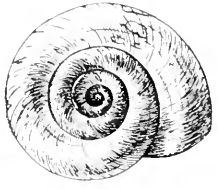
Length 28, width 13.5, aperture length 17, width 8 mm. Type.

Length 31, width 14.5, aperture length 18.5, width 9.5 mm. Type.

Types: The Chicago Academy of Sciences; 1 specimen, cotypes, collection W. A. Nason, 2 specimens.



ALDRICH: BUSYCON MONTFORTI.



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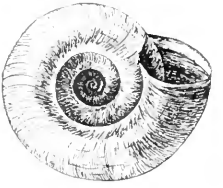

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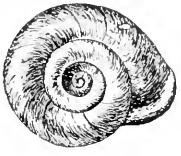

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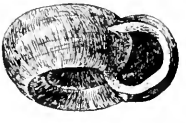

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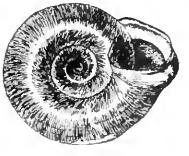

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1-3. SEGMENTINA ARMIGERA. 4-6 S. CRASSILABRIS.

7-9. S. WHEATLEYI.

Type locality: Near San Francisco, California.

Range: California, near San Francisco (W. A. Nason); San Joaquin River (Mrs. E. E. Bush, Phil. Acad.); Merced Lake (Stearns, Dall, Smithsonian Institution); between Animas and La Plata, Colorado (Ingersoll).

Remarks: *L. leaii* seems to be a very distinct species, easily recognized by its short spire, very large aperture and heavy columellar plait. It is more nearly related to *L. proxima rowellii* Tryon than to any other species, but seems to be distinct. It has probably been heretofore identified as a form of the protean species *palustris*, but it is unquestionably distinct from any form of that species. It also resembles *L. reflexa hemphilliana* Baker, but differs in being very much broader and has a differently shaped and larger aperture. It is named in honor of one of America's best known conchologists, Dr. Isaac Lea.

THREE NEW SPECIES OF SCALA FROM CALIFORNIA.

BY WILLIAM HEALEY DALL.

During the last year or two, among the minute shells, collected by various correspondents on the Californian coast, there have been several undescribed forms of *Scala*, descriptions of which follow.

Scala berryi n. sp.

Shell small, white, six-whorled: nuclear whorls polished, smooth, without varices; later whorls with rather strong, reflected, faintly axially striated varices, on the last whorl about 20 or 21 in number; these varices are quite close-set, not angulated in front of the suture and markedly reflected, with the interspaces smooth; base with no basal disk or cord, the coil imperforate, the peristome rather callous on the pillar side. Long. 3.5., max. diam. 1.75 mm.

Dredged in 200 fathoms, San Pedro Bay, Cala., Mrs. Oldroyd; and in 12 fathoms off Del Monte, Monterey Bay by S. S. Berry. U. S. Nat. Mus. 107,724.

This species is, perhaps, nearest to *S. clathratula* A. Adams, and to the next species.

Scala rectilaminata n. sp.

Shell very similar to *S. berryi*, with the same number of whorls and varices, but having the nuclear shell smaller, the test less heavy,

the varices nearly vertical to the surface of the whorl, instead of reflected, which makes them appear sparser, though really the same number occur on the whorl; the varices are narrower and the peristome less heavy and wide. Long. 3.25, max. diam. 1.6 mm.

Dredged in twelve fathoms mud, Monterey Bay, S. S. Berry. U. S. Nat. Mus. 110,430.

The specimens seen are of a more yellowish-creamy-white than *S. berryi* which has a bluish subtranslucent appearance.

Scala (*Cirostrema*) *montereyensis* n. sp.

Shell small (probably not full grown), the nucleus lost but with five subsequent rapidly increasing whorls; shell substance in two layers, the inner translucent white, solid, the outer opaque white, frothy, porous, with numerous puncticulations arranged in harmony with the incremental lines, except on the basal disk where they form spiral lines; varices low, solid, with a spongy surface, nine in number; basal disk conspicuous, slightly concave; bordered by a conspicuous cord; aperture gibbous, patulous near the imperforate axis. Long. 2.5, diam. 1.5 mm.

Dredged in 25 fathoms mud, off Del Monte, in Monterey Bay, Cala., by S. S. Berry. U. S. N. Mus. 110431.

This shell represented by two specimens, of which one is in Mr. Berry's collection, is doubtless immature, but there is no other species known north of Cape St. Lucas belonging to this special group, and, though the characters require rather high magnification to see them clearly, it cannot be confounded with any other Californian species.

NOTE ON THE GENUS PSILOCOCHLIS DALL.

BY WILLIAM H. DALL.

This curious *Turbinella*, collected by Mr. McCallie in the Eocene of Georgia, was described in THE NAUTILUS for May, 1904, p. 9. Additional material shows that the mature shell is covered with a coating of enamel which extends to the very apex of the spire, obscuring the sutures, a feature not hitherto reported in connection with the genus *Turbinella* or any of its close allies; so that *Psilocochlis* described as a subgenus, seems fully entitled to generic rank. Only the typical species, *P. mccalliei* Dall, is at present known.

PUBLICATIONS RECEIVED.

A REVIEW OF THE AMERICAN VOLUTIDÆ. By Wm. H. Dall. (From the Smithsonian Miscellaneous Collections, vol. 48, 1907.) This paper is the revision promised by the author in his "Notes on some names in the Volutidæ," in THE NAUTILUS for April, 1906. Some years ago Dr. Dall outlined two important groups of the *Volutidæ* as follows:

1. Subfamily *Scaphellinæ*, with a membranous protoconch which is lost early in the intracapsular development and is replaced by a shelly envelope, the secondary nature of which is evident in well preserved specimens.

2. Subfamily *Volutinæ*, a shelly protoconch. In these forms there is no membranous stage, the protoconch being shelly throughout its history. This shelly apex is never naturally lost.

His recent researches have shown that the type of the genus *Scaphella* belongs to the *Volutinæ*, and therefore the subfamily name *Scaphellinæ* has been given up and *Caricellinæ* substituted for it. In his review Dr. Dall employs not only the apical shell characters which he regarded as important in his earlier papers, but also many features of the soft anatomy. Stress is laid on "the presence or absence of a cæcum to the œsophagus; the characters of the radula; of the verge, or external male organ; and the presence or absence of an operculum." A new three-fold division of the *Volutidæ*, here outlined, is regarded as provisional. It may be briefly summed up as follows:

1. Subfamily *Volutinæ*. A shelly, persistent protoconch, sessile eyes, operculum usually absent and the radula teeth usually in one tricuspid series.

2. Subfamily *Caricellinæ*. A membranous protoconch, operculum absent, radula variable or absent. Otherwise as in *Volutinæ*.

3. Subfamily *Volutomitrinæ*. Protoconch supposedly shelly; adult unicolored, with a conspicuous periostracum; small stalked eyes, "radula of a single long series, the separate teeth unicuspidate, with deeply arcuate bases." No operculum.

The genera and species are distributed among the subfamilies as follows:

Volutinæ: Voluta (Linné) Lamarck, with the following species: *musica* L., *virescens*, Sol., *ebræa* L.

Lyria Gray with the species *beauii* Fischer and Bernardi.

Enæta Adams with the species *barnesii* Gray, *cumingi* Brod., *pedersenii* Verrill, *cylleniformis* Sowb., *archeri* Angas, *reevei* Dall, *guildingii* Sowb.

Plejona Bolten containing species "conchologically related to the *V. spinosa* Lamarck."

Caricellinae: Adelomelon Dall, with the species *ancilla* Sol., *subnodosa* Leach, *benthalis* Dall, *martensi* Strebel, *magellanica* Lamarck, *ornata* Lahille, *beckii* Brod., *tuberculata* Swainson, *brasiliana* Sol., *ferussacii* Donovan, *paradoxa* Lahille, *stearnsii* Dall, *philippiana* Dall.

Zidona H. and A. Adams with the species *angulata* Swainson.

Tractolira Dall with the species *sparta* Dall.

Aurinia H. and A. Adams with the species *dubia* Brod., *robusta* Dall, *gouldiana* Dall.

Maculopeplum Dall with the species *junonia* Hwass, *dohrni* Sowb.

Volutomitrinæ: Volutomitra Gray with the species *gronlandica* Beck and *alaskana* Dall.

Owing to the scarcity of specimens, we do not realize that on the coasts of North and South America there are 33 recorded species. There are considered to be two centers of distribution for the American species, the southern end of South America is taken as one center and the Antilles as the other. The paucity of species along the Pacific coast north of south latitude 40° is remarked upon.

Under the genus *Aurinia*, typified by *A. dubia*, Dr. Dall says: "This genus is the degenerate descendant in one line, as *Maculopeplum* is a normal descendant in another, from the Eocene *Caricella.* Its most prominent feature is the enfeebled plaits of the pillar, usually of diminished number as well as size, its thin shell and prominent Caricella-nucleus. The absence of the radula it shares with *Maculopeplum*, though *Halia*, evidently a close relative, and even more degenerate as regards the shell, has retained the radula." The type of the genus *Maculopeplum* is the well-known *Voluta junonia* Hwass.

In his note on the *Volutidæ* which appeared in THE NAUTILUS for April, 1906, Dr. Dall calls attention to the fact that the type of Swainson's genus *Volutilithes* is not *Voluta spinosa* but *Voluta muricina* Lam. This point was ably confirmed by Mr. R. Bullen Newton[1] in June, 1906.

[1] "Note on Swainson's Genus *Volutilithes*," Proc. Malac. Soc., Lond., June, 1906, p. 100.

Volutilithes muricina is evidently well removed from the forms usually described as *Volutilithes spinosus* and *Volutilithes petrosus*. The use of the generic name *Plejona* to designate such forms as the the latter, seems, however, to be without warrant. As Mr. Newton has pointed out, Bolten refers his *Plejona fossilis* to four figures in d'Argenville. These four figures represent not only four different species, but four different genera!

The very existence of the name *Plejona* rests, therefore, on a poor basis, and it is hard to see how its type *P. fossilis*, can be restricted to *V. spinosa.*

But to return to the application of *Plejona* to American Eocene forms, the study[1] of very large and carefully collected series from our Gulf States has convinced the reviewer that the forms described as *Athleta tuomeyi* by Conrad are nothing but races of his *Voluta petrosa* which have been subjected to an unfavorable environment. They are of one genetic stock, and the differences can in no sense be regarded as generic; in fact they are not even specific.

M. Cossmann[2] in reviewing this study pointed out that if its results are to be accepted, *Athleta* must be substituted for *Volutilithes* Swainson (1840 *non* 1831).

Athleta rarispina is the type of *Athleta* and is probably related to Lamarck's *Voluta spinosa* in about the same way that *A. tuomeyi* is related to Conrad's *Voluta petrosa.* With our present knowledge it seems better to adopt *Athleta* for Conrad's *Voluta petrosa*, its variations, mutations and allies, than to revive *Plejona.*

In conclusion it is noted with regret that Dr. Dall has not provided this interesting and important paper with figures, which would have been of the greatest assistance to workers having only small collections or small libraries at their command.—BURNETT SMITH.

FOSSIL MOLLUSCA FROM THE JOHN DAY AND MASCALL BEDS OF OREGON (Univ. of California Publications, Bull. Dept. of Geology, V, no. 3, pp. 67–70). By Robert E. C. Stearns. The new species are *Epiphragmophora dubiosa*, *Pyramidula lecontei* and *Lymnæa maxima.* The first is apparently related to *fidelis* or *mormorum ;*

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[1] Smith, Burnett: "Phylogeny of the Races of Volutilithes petrosus," Proc. Acad. Nat. Sci., Phila., May, 1906, p. 52.

[2] Revue Critique de Paléozoologie, p. 222, October, 1906.

the second to *Oreohelix strigosa*. Together with Dr. Stearns' previous report on John Day land shells (*Science*, 1902, 153), this paper is of great interest, showing the antiquity of the present generic groups of land shells, which were manifested in forms not unlike those now existing in the same region, as far back as the miocene.—H. A. P.

Catalogue of the Mollusca of Illinois. By Frank Collins Baker (Bull. of the Ill. State Laboratory of Natural History, VII, article 6, 1906). This catalogue "is intended to record every reference to the mollusca occurring in the state, which may be found in the published lists, and also all scattered references wherever published." Under each species the author quotes every locality from which specimens have been recorded, giving the authority for each in parenthesis. 241 aquatic and 91 terrestrial species are recorded. No less than 28 species and varieties have been based upon Illinois specimens, seven of them being now considered synonymous. From only ten counties, says Mr. Baker, have careful lists been made. In this catalogue records have been obtained from 69 counties, of from 1 to 145 species. What has been done, and the great amount of work still to be done, is graphically shown in the map. The richest portions of the State, along the Wabash and Ohio rivers, are still very little known; but in the upper counties several energetic naturalists have thoroughly worked up the fauna, so that this first attempt at a State catalogue is very creditable to the author, as well as the other naturalists, Messrs. Ferriss, Hinkley, Handwerk, Marsh, Nason, Strode, Hart and others, who have contributed records.

It is inevitable in a first attempt to cover so large an area, that some doubtful records, demanding careful verification, must be included, and this catalogue is naturally no exception. Baker and his co-workers will doubtless now set about the task of investigating these questionable records. A paper by Prof. Shimek on his investigation of *Pyrgulopsis* in Rock River seems to have been overlooked. Together with Baker's "Mollusks of the Chicago Area," this catalogue forms an excellent basis for further work in Illinois.

The Fossil Mollusca of Florissant, Colorado.—By T. D. A. Cockerell (Bull. Amer. Mus. Nat. Hist., xxii, 1906). The following species are described as new. *Omphalina* (?) *laminarum*, *Planorbis florissantensis*, *Lymnæa sieverti*, *scudderi*, *Sphærium florissantense*. The new name *Columna haydeniana* is proposed for *Bulimus teres* M. & H., not Olivier.

THE NAUTILUS.

VOL. XX. APRIL, 1907. No. 12.

NOTES ON SOME NEW MEXICAN ASHMUNELLAS.

BY H. A. PILSBRY AND JAS. H. FERRISS.

Since the publication of the results of our work on Ashmunella in 1905,[1] various correspondents have contributed specimens which throw light upon a number of dubious points relative to the group of species inhabiting the Sierra Blanca and Sacramento ranges, in New Mexico, east of the Rio Grande.

There can be no doubt that a systematic campaign in this region by collectors who are not afraid of hard work, and who get live shells, would be well rewarded by a most interesting catch. It is absolutely essential, however, to get to the mountain-tops, and to dig deep in the rock-heaps. You will need a Ferriss hoe and stout gloves, and you must forget fatigue.

ASHMUNELLA RHYSSA TOWNSENDI (Bartsch). Plate VIII, figs. 1, 2.

Ashmunella townsendi Bartsch. Smiths. Misc. Coll., xlvii, p. 13 (Aug. 6, 1904).

Ashmunella rhyssa townsendi Bartsch, Pilsbry. Proc. A. N. S., Phila., 1905, p. 231.

This race differs from *A. r. miorhyssa* chiefly by its strongly-ribbed surface, like *A. altissima*, which, however, is far smaller, more depressed and more openly umbilicate. Three of the original lot of *townsendi*, taken by Prof. Townsend in the Sierra Blanca

[1] Mollusca of the Southwestern States, Proc. A. N. S., Phila., 1905, pp. 223–253.

above Ruidoso, N. M., sent by Prof. Cockerell, one with the spire broken, measure:

Alt. 8.8, — 8 mm.

Diam. 14.1, 14.8, 13 mm.

Whorls $5\frac{1}{2}$, — $5\frac{1}{2}$.

Ribs on the last whorl 60, 48, 46.

The number of ribs on the last whorl is only approximately stated, since on account of irregularities and minor wrinkles or ripples it is impossible to make a quite definite count.

The weak trace of a parietal tooth is visible in one of the specimens.

The two specimens examined by Mr. Bartsch measure 8.2 x 15 mm. The number of ribs is not stated.

These specimens are intermediate in character between the smaller and more strongly-wrinkled examples of *A. rhyssa*, collected by Mr. Ashmun, and the following form.

Thirteen examples, all dead and bleached, were taken by Mr. F. J. Phillips on the north slope of a small brook near Nogal Creek, at an elevation of 7500 ft., Lincoln Co., N. M., and recently sent to one of us, one being drawn in figs. 1, 2 of plate VIII. In general character the lot is quite uniform. There are 30 to 35 ribs on the last whorl; in a few cases as many as 40, by splitting or breaking up of a number of ribs. Ten of them, unbroken, measure as follows:

Alt. 8.1, 8, 7.9, 7.5, 8, 7.8, 7.8, 7.5, 7.1, 6.6 mm.

Diam. 13, 12.9, 12.8, 12.25, 12.2, 12, 12, 12, 12, 11.5 mm.

In 8 out of 10 fully adult shells a parietal tooth is developed, varying from a mere trace in some to a well-developed though small tooth in three or four. In two fully adult shells there is no trace of a tooth. A low basal tooth is present in all, but in two or three it is barely perceptible. The largest shell has $5\frac{1}{3}$ whorls, the smallest barely 5.

This colony has the character of *townsendi*—small size and heavily-ribbed surface—more emphatically expressed than in the original *townsendi*, and compared directly with *rhyssa* it appears to be quite distinct; yet it is connected with *rhyssa* through the more finely-ribbed forms from above Ruidoso, so that the use of a trinomial seems to express its relations better than an arbitrary specific separation.

ASHMUNELLA RHYSSA (Ckll.) Plate VIII, figs. 3, 4, 5.

Professor Cockerell having found the unique type specimen of

A. r. hyporhyssa kindly sent it for study. It is wholly bleached, has lost the cuticle, and measures, alt. 9, diam. 15 mm., umbilicus 3.1 mm., and has $5\frac{1}{2}$ whorls. There is a very slight basal lip-tooth, and a small oblique parietal tooth, about 1.8 mm. long. The sculpture is decidedly finer than in *A. rhyssa*, agreeing closely with specimens of *A. r. miorhyssa* collected by Ashmun, which, however, differ by having a slighly smaller umbilicus, 2.3 to 2.5 mm. wide in a shell of nearly 16 mm. diam., and the aperture in *miorhyssa* is slightly larger. I can find no other differences between *miorhyssa* and *hyporhyssa*.

A. r. hyporhyssa was taken by Prof. C. H. T. Townsend "on the lower slopes of White Mt., above head of Ruidoso, Aspen belt, at about 9500 ft."

A. rhyssa and *A. r. miorhyssa* are from the Sierra Blanca.

Ashmunella rhyssa edentata Ckll.

A. rhyssa hyporhyssa Pils. Proc. A. N. S., Phila., 1905, pp. 228–231, pl. 12, f. 7–13, exclusive of synonym "*Polygyra r. hyporhyssa*" and quoted description of same.

Similar to *A. r. miorhyssa*, but frequently more depressed, with wider umbilicus, and generally without a parietal tooth, which is present in less than 5 per cent. of the specimens examined.

Sacramento Mountains, at various elevations, as given in the paper cited above. While but weakly differentiated from the Sierra Blanca forms, it is well to have a name for the Sacramento race, common in James Canyon near Cloudcropt.

I formerly united this race and *A. r. hyporhyssa*, in the absence of the type of the latter.

ABALONES AND THE EARTHQUAKE.

BY ROBERT E. C. STEARNS.

The Japanese abalone fishermen who have made their headquarters at Carmel Bay, a few miles south of Monterey, had planned to extend their operations to the more southerly part of the coast, on the shore of San Luis Obispo County. This was in August. Upon examination later on of the rocky region near Morro, where they expected to make a great haul, it was found that the sea-bed was coated with a greasy slime of a supposed bituminous character, which

had killed the abalones. Abalones were found in abundance for miles along the shore, so it was reported, but all dead. As the "meats," as the dried soft parts are called, constitute the chief profit of the fishery, no doubt the Japanese were disappointed.

The earthquake of April 18th, which was felt very slightly at Morro, was credited with the killing, though it may have been caused by some subsequent seismic disturbance. The abalones that occur along this part of the shore belong principally to the species *Haliotis rufescens* and *H. cracherodii*.

The Japanese parties engaged in the fishery at various places, in some instances, use a diving-suit for working in or below the laminacian zone, and are stripping some localities quite thoroughly. The Chinese are said to confine their collecting generally to shallow water. The greater part of the dried meats, if not all, are exported to China.

There is one cannery in or near San Pedro where the abalones are packed, the can-labels bearing the trade name of "Eno-labo," which it will at once be seen is merely Obalone spelled backwards. Here is an instance on a small scale where commercialism overreaches itself. The dear public don't know what "Eno-labo" means, and, as my grocer tells me, don't buy the goods. Fresh-packed "Eno-labo," however, is quite palatable and wholesome food, good enough for anybody.

Los Angeles, Cal., February 1, 1907.

EPIPHRAGMOPHORA (MICRARIONTA) HUTSONI N. SP.

BY GEO. H. CLAPP.

Shell openly umbilicate; rather thin but strong, smooth and shining when fresh; reddish-horn color on the upper surface, much paler to creamy-white below, with a rather narrow brown band, about 1 mm. wide, above the periphery, visible only on the last $1\frac{1}{2}$ whorls, the band margined above and below by wider white bands, the lower shading off into the light-colored base. Whorls about $4\frac{1}{3}$, the inner ones convex, the last somewhat flattened above, well rounded below and at the periphery. The embryonic shell consists of $1\frac{2}{3}$ whorls,

terminating with an inconspicuous whitish line; the first $\frac{1}{3}$ whorl is depressed and highly polished; the remaining embryonic whorls are evenly and densely covered with elongate-oval papillæ arranged in spiral lines. In the following $1\frac{1}{2}$–2 whorls, beginning the neanic stage, the epiconch bears *exceedingly delicate*, very short hairs arranged in obliquely descending series, but less regular than the papillæ of the embryonic whorls. These are entirely lost in mature shells, although the hair-scars are generally visible on fresh specimens. The body-whorl shows the usual slight growth-lines, but is otherwise smooth except for varical impressions showing resting periods, of which there are usually 2 on the body-whorl and others clear up to the nuclear whorls. The body-whorl enlarges rapidly, and is suddenly deflected and expanded at the aperture, which is large, almost round, oblique, with a slightly reflected and thickened margin; lips widely expanded at the columella and partly reflected over the umbilicus. Ends of lip converging, forming about four-fifths of a circle. Gr. diam. $14\frac{1}{2}$, lesser $11\frac{1}{2}$, alt. 8 mm. Aperture 7 mm. high, 7 mm. wide. Umbilicus $2\frac{1}{2}$ mm.

The figured specimen measures, alt. 7.5, diam. 14 mm. The largest and smallest shells that I have seen measure 15 and $12\frac{1}{2}$ mm. diam. respectively; both are dead shells.

Collected by Geo. S. Hutson, after whom the species is named, about 8 miles from Quartzsite, Yuma Co., Ariz., in the foothills, at an alt. of about 1600 ft.

Types, No. 5659 of my collection; co-types, coll. A. N. S. P.

The sculpture of the embryonic whorls of this beautiful little shell puts it in the group of *Sonorella wolcottiana* Bartsch (Smiths. Misc. Coll., xlvii, p. 187, pl. xxviii). A large series from young shells of $2\frac{1}{2}$ whorls to adults show the sculpture and epiconch in all stages, the latter being so thin and delicate, however, that it apparently entirely disappears by the time the shell has completed the third whorl. The shells are remarkably uniform in size and color, and most fresh specimens show occasional translucent spots scattered over the body-whorl. The resting periods are shown by well-marked varical impressions at all stages of growth, as is common in most species from a semi-arid region. The body of the animal is intensely black, with a gray mantle.

ON THE SOFT ANATOMY OF E. (MICRARIONTA) HUTSONI.

BY H. A. PILSBRY.

The animal is purplish-black, with gray mantle-edge. The surface is finely and evenly granulose. There is a weak impressed line on the ridge of the tail, and a pair of contiguous dorsal grooves, scarcely noticeable except between the tentacles. Foot-margin very narrow, hardly differentiated. The sole is conspicuously tripartite in color, the sides being purplish or slaty-black, while the middle field is of a much paler gray tint. The pale area is somewhat wider than the dark sides.

The genitalia, fig. 6, show a very short penis, swollen basally, an epiphallus of about the same length or somewhat larger, and a flagellum longer than either. The long retractor muscle is inserted on the epiphallus, and distally on the lung floor. At the base of the vagina a well-developed dart sack (*d. s.*) is inserted; on each side of its base enter the ducts of the mucous glands, which ascend as high as the dart sack and then descend, their flattened, glandular portions being bound to the vagina and atrium. The general relations of the dart sack and mucous glands are shown diagramatically in fig. 8. As usual, the two glands are unequal. The spermatheca is ovate, on a long, slender duct. Length of penis 2 mm.; of epiphallus 2.8; flagellum 4 mm.; length of spermatheca and duct 16.5 mm.

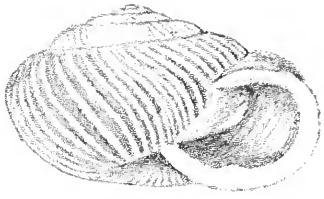
The right ocular retractor passes between the ♂ and ♀ branches of the genitalia.

The general features of the alimentary tract are as usual in the Helices. The crop is long, the salivary glands equally lengthened, lying on the upper side of the crop, and concrescent throughout their length.

The jaw is of the usual arcuate shape, with only three ribs, grouped in the median third (fig. 7).

The radula has 17,10,1,10,17 teeth (pl IX, fig. 5). The central and lateral teeth have simply mesocones without side cusps. The marginal teeth have the ectocones developed, and in the outer ones the larger cusp is bifid. I noticed no teeth with the ectocone bifid. The transition from lateral to marginal teeth is quite gradual.

The venation of the lung is faintly outlined with gray pigment. The kidney is about half as long as the lung, and nearly twice the length of the pericardium.



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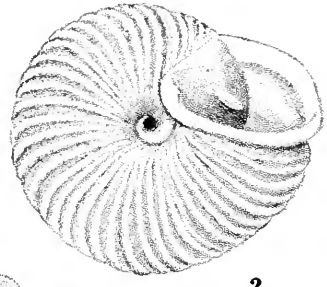

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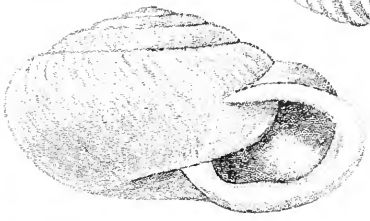

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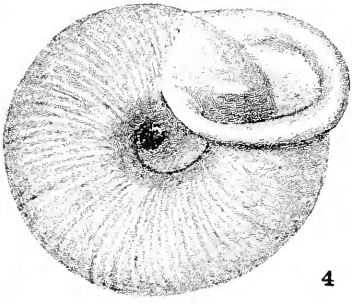

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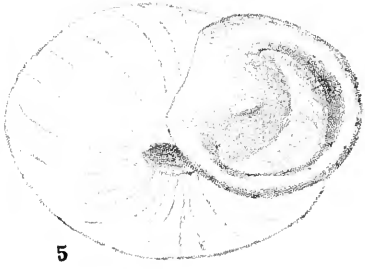

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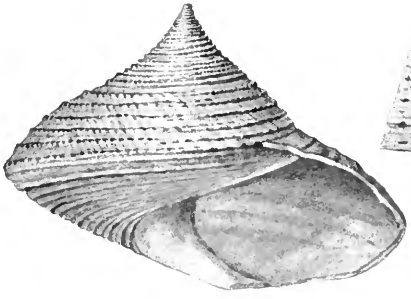

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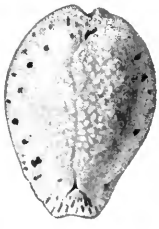

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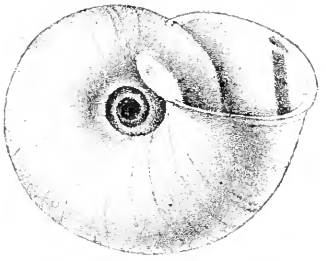
PILSBRY: ASHMUNELLA FROM NEW MEXICO.
PRESTON: CALLIOSTOMA AND CYPRÆA.



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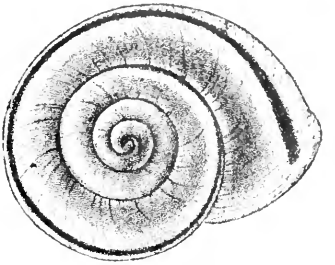

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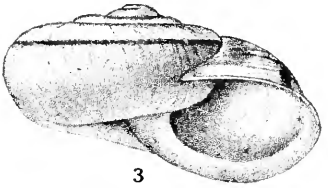

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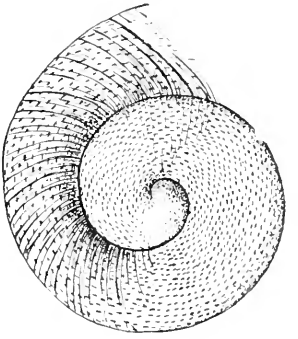

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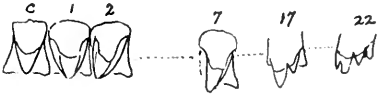

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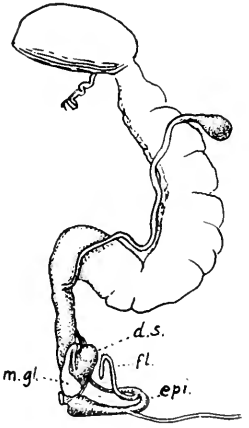

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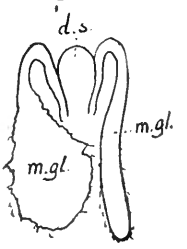

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CLAPP: EPIPHRAGMOPHORA HUTSONI.

While the shell of this species has all the appearance of a *Sonorella*, the soft anatomy shows that it belongs to the subgenus *Micrarionta*, of *Epiphragmophora*, represented by *E. gabbi, facta, stearnsiana*, etc., the genitalia being typical for that group. In *Sonorella* I have figured the anatomy of eight species and subspecies. All agree in having a well-developed penis, and the flagellum is excessively short or wanting, usually about half a millimeter long, in one case one mm. long, but its length is always a very small fraction of that of the epiphallus. In no *Sonorella* is there any trace of dart sack or mucous glands. This is very unlike these organs in *E. hutsoni*.

The unexpected internal anatomy of this species emphasizes the uncertainty of dealing with *Sonorella*-like Helices without examination of the soft anatomy. How many of the supposed *Sonorellas* of southeastern California may really prove to belong to *Micrarionta* is problematic, but perhaps all those with the embryonic sculpture like *E. hutsoni* will eventually be removed from *Sonoralla*.

EXPLANATION OF PLATE IX.

Figs. 1–3. *Epiphragmophora hutsoni*, shell.
4. Apex, enlarged.
5. Teeth.
6. Genitalia.
7. Jaw.
8. Diagram of dart sack and mucous glands. *d. s.*, dart sack; *epi.*, epiphallus; *fl.*, flagellum; *m. gl.*, mucous glands.

DESCRIPTIONS OF CYPRAEA BERNARDINÆ AND CALLIOSTOMA CARNICOLOR N. SP.

BY H. B. PRESTON.

CYPRAEA BERNARDINÆ n. sp. Pl. VIII, fig. 8.

Shell oval, with a well-defined dorsal line dividing into a small fork near the anterior extremity; dorsal surface brownish-gray flecked with white spots and streaks; sides white, sparsely spotted with chestnut, a number of dashes of the same color appearing at the anterior extremity and slightly crenulated at the margins of the dorsal surface; extremities obtuse; base white; columella somewhat straight, bearing seventeen rather fine, white teeth; peristome very slightly curved, having fifteen teeth; aperture narrow.

Length 28.50 mm., greatest breadth 20 mm.

Hab.: Celebes (?).

A striking shell, whose nearest ally is perhaps *Cypraea turdus* Lk. From this, however, it may be easily distinguished by the remarkable white flecking on the dorsal surface, by the finer and more numerous teeth on the columella and the narrower and straighter aperture; moreover, it is much flatter than is the case with *Cypraea turdus*.

CALLIOSTOMA CARNICOLOR n. sp. Pl. VIII, figs. 6, 7.

Shell conical, keeled, imperforate, somewhat glossy, flesh-colored; spire concave; whorls 8–9, the last three rapidly increasing and much flattened, sculptured with nodulous spiral ridges, almost every alternate nodule being of a rich chestnut-brown; sutures not well defined above, and only slightly impressed between the last whorls; base very inflated and sculptured with closely-set spiral ridges intercepted by lines of growth, thus presenting a coarsely, granular appearance; columella arched, reflexed outwards, forming a thick callosity over the umbilical area, a slight callosity extending upwards to the lips above; peristome simple; aperture subquadrate; interior of shell nacreous and irridescent.

Alt. 41 mm., diam. maj. 53 mm.

Aperture, alt. 25 mm., diam. maj. 25 mm.

Hab.: Celebes (?).

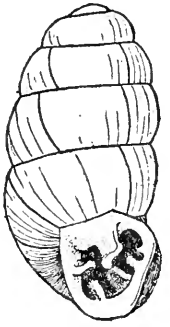
The above shell at first sight much resembles *Calliostoma cunninghami* Gray, from New Zealand; the spire is, however, more concave, the last whorls are much more flattened and expanded outwards, and the nodulous spiral ridges are far less numerous than is the case with that species; moreover, the inflation of the base easily separates it from *C. cunninghami*.

DESCRIPTION OF A NEW BIFIDARIA (B. AGNA).

BY H. A. PILSBRY AND E. G. VANATTA.

When working on *Bifidaria pentodon* some time ago we found one specimen of a species evidently distinct though related to that, from "Silver Lake, Kansas," collected by Mr. J. B. Quintard. Recently a few more examples of the same form were found in river débris

taken last October at Trinidad, in southeastern Colorado, by Mr. J. H. Ferriss and the senior author.



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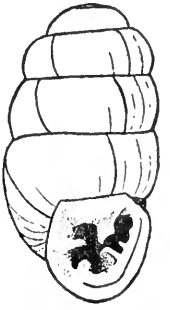

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BIFIDARIA AGNA n. sp.

The shell is rimate, cylindric, the last three whorls of about equal diameter, the summit very obtuse; surface nearly smooth; of a sperm-aceti-whitish color. There are $4\frac{3}{4}$ convex whorls, the last with a strong rounded crest behind the outer lip, rather close to it above, but being more oblique, it is further behind the lip at the base. Behind this crest the whorl is a little flattened laterally, and shows the lower palatal plica, though as a white spot. The aperture is brought forward nearly in line with the ventral convexity of the whorls. The peristome is thin, slightly expanded, strengthened a short distance within with a low callous rib. The parietal lamella appears distorted and angular in front view; seen from the base it is seen to consist of an angular and a parietal lamella, completely united inwardly. The columellar lamella is sinuated or bent and strongly developed. The basal fold is strong, arising on the callus but extending inward beyond it. The lower palatal fold is large and pliciform, more or less immersed, standing chiefly inward from the palatal callus. The upper palatal fold is much smaller, and stands rather near the lower, upon the palatal callus. There is a small or minute suprapalatal fold, also on the callus.

Length 1.75, diam. 1 mm.

Trinidad, Colorado, type no. 93052 A. N. S. P.; also Silver Lake, Kansas.

This species resembles some forms of *B. pentodon* (Say), especially those from northern Alabama, in which the lower palatal fold is long

and enters somewhat beyond the palatal callus; but it differs by the distinctly bifid parietal tooth. The very strong crest behind the lip is characteristic of *B. agna*. Like the related forms, this species has the somewhat translucent whiteness of spermaceti or paraffin.

In the specimen from Kansas the teeth are somewhat smaller than in the type. It may be less mature.

CORRESPONDENCE.

Editor Nautilus: I have to thank Mr. Burnett Smith for his extended review of my paper on American *Volutidæ* in the March NAUTILUS. There are, however, a few points on which further light is desirable, and I wish to note them briefly.

1. So far from this being the general revision of the family upon which I have been for some time at work the recent publication is only a small part of it, which I thought I had made clear in my remarks on page 341. My regret at not being able to illustrate the paper is quite as great as that of my reviewer, but only those cognizant of the facts know, since we lost Dr. McConnell, how many fruitless, or almost fruitless, efforts have been made to obtain a competent draughtsman. An important paper has been for more than a year at a complete standstill, owing to the absence of an artist who could do the drawings.

2. I pointed out in 1890 the identity of the so-called *Athleta tuomeyi* with *Volutilithes petrosa* Conrad, and ascribed the deformity to some special conditions of the environment. We have some two thousand specimens in the National Museum, a part of which are normal. But while the most conspicuously deformed specimens are from Wood's Bluff and the lower Eocene generally, we have also distorted forms from Jackson, Miss., and several other Jacksonian localities, and one specimen from the Claibornes ands. These I shall be happy to show Mr. Smith if he can pay us a visit.

That the true *Athleta rarispina* bears any such relation to *Voluta spinosa* Lam. as *V. tuomeyi* does to *petrosa* is impossible, for Mr. Smith's suggestion is incompatible with the fact that *A. rarispina* is confined to the upper Oligocene, Miocene and Pliocene of Europe, while *V. spinosa* is restricted to middle Eocene (Calcaire Grossiere). There is no species contemporaneous with the *Athleta* which could take the place of *V. spinosa* in such a relation, and, further, the two species of *Athleta* are normal and not abnormal shells.

3. The remarks about *Plejona* which were made by both Mr. R. B. Newton and Mr. Smith indicate unfamiliarity with nomenclatorial questions, which indeed are sometimes sufficiently puzzling. But there is no ambiguity or difficulty in the case of *Plejona*, if the rules are complied with. Bolten's genus (for the period remarkably homogeneous) contains 24 species, all of which are identifiable, in terms of the older authors, and only one of which is a fossil. The first (fossil) species is based upon four very fair figures of "spiny murices," which Argenville referred to one species, but which represent three or four, as species are now reckoned. If we prefer to take our type from the first species in Bolten's list, it reduces itself to a simple process of elimination which leaves us with *V. spinosa* (one of those figured) as the type. If we regard the solution as vague, there still remains my absolute right to revive Bolten's name for any species contained in his list, and for which there is no prior valid name. This I did several months before Mr. Newton proposed *Volutospina* for the same shell.

If we reject Bolten's *P. fossilis* as vague, we are left to take *Voluta ebraea*, his second species, as type, which involves the loss of the generic name *Voluta* (Lam.), as now universally used, which it seems to me would be foolish, since the preceding method enables us to retain *Voluta* for *V. musica* and its allies without upsetting any accepted name.

I regard *Athleta* (*rarispina*) Conrad as a good genus, perfectly distinct from *Plejona* (*spinosa*) Bolten, as well as from the *V. petrosa* deformities. The latter were erroneously referred to the genus *Athleta*, which they really only superficially resemble, and consequently any attempt to use *Athleta* for the *spinosa* group is fallacious. *Athleta* does not occur in America, but there are probably three European species.

WM. H. DALL.

Smithsonian Institution, March 6, 1907.

PUBLICATIONS RECEIVED.

WEST AMERICAN MITRIDÆ.—By Mrs. M. Burton Williamson (Proc. Biol. Soc., Washington, xix, Dec., 1906). *Mitra idæ, fultoni, lowi*, and the Peruvian *M. orientalis* are discussed at length and with the exception of *M. lowi*, figured. A useful work, since these black Mitres have been involved in some confusion.

THE UNIONIDÆ OF KANSAS, part I, by Richard E. Scammon, (Kansas University Science Bulletin, iii, no. 9). "In this catalogue are listed 61 species and 5 subspecies. There is no doubt that future collecting will add many more species to the list. The author has tried to make certain of the identification and localities of every species listed, and with three exceptions has examined native specimens of each." Nearly all of the species are illustrated by line drawings occupying 23 plates, and all are described. Since only about 40 species were previously known, it will be seen that one-third of those now recorded are new to the state. Mr. Scammon proposes two new descriptive terms: "*interdentum*," for that part of the hinge-plate lying between the pseudocardinal and lateral teeth, and "*branchial outline*," to designate the slight groove in the cavity of the more solid Unios, caused by the edge of the branchiæ. It is proposed in future papers to discuss the geographic distribution and soft anatomy of the species.

NOTES.

In a recent letter Prof. Josiah Keep says: "The principal part of my edition of 'West American Shells' was destroyed in the great San Francisco fire, so there are no more copies in the book stores. Fortunately the cuts were stored in my home, and may be used again if there should be a considerable demand for a revised edition. Of this matter, however, I do not feel certain, though I have received some very kind letters upon the subject." We are sorry to learn of Prof. Keep's great loss, and hope that he will receive sufficient encouragement to undertake a new edition of his work.

ZONITOIDES ALLIARIA IN COLORADO.—A couple of weeks ago Guy H. Mason found in the Knudson greenhouse, Boulder, Colo., a specimen of *Zonitoides alliaria* Drap., a species well known to European conchologists, but of which American records seem to be rare, and confined, so far as they have come to my attention, to greenhouses. It occurs to me that the rarity of records may have resulted from American conchologists unfamiliar with the species placing it in their collections under some other name, particularly *Z. cellaria*. We are indebted to Dr. Wm. H. Dall for confirmation of the identification, he having compared it with British specimens as named by Jeffreys. It was at once recognized by Prof. Cockerell as of that species, but his long absence from Europe made him feel somewhat uncertain about it without opportunity to make direct comparisons. The specimen is now in the University of Colorado Museum.—JUNIUS HENDERSON.