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The Nautilus.

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A SLUG OF THE GENUS VERONICELLA FROM GUATEMALA.

BY T. D. A. COCKERELL.

At Puerto Barrios, Guatemala, Mr. E. Bethel recently found a *Veronicella*, which he brought to me alive. Among the species recorded from Mexico and Central America, it closely resembles only *V. mexicana* (Pfeffer), which occurs at Vera Cruz. It appears to be distinguished by the broad sole, and female orifice well caudad of the middle and very close to the sole. Internally, the accessory glands are numerous and very long. On the whole, however, it is so close to *V. mexicana* that I record it as a variety; its status will only be precisely determined when more material is available for comparison. It is not impossible that *V. mexicana* was composite; certainly the example sent by Strebel to Semper seems doubtfully identical with the animal figured in Strebel's work on the Mollusca of Mexico.

One species of *Veronicella*, *V. stolli* von Martens, has already been described from Guatemala. Its anatomy is unknown, but it is readily known from Mr. Bethel's slug by the presence of a narrow median longitudinal yellow band. It may be that *V. stolli* is identical with *V. olivacea* Stearns from Nicaragua. An unnamed *Veronicella* from Honduras, briefly described in Nautilus, April, 1895, p. 142, seems on the whole intermediate between our slug and *V. mexicana*. It is most probably conspecific with our animal, but it may represent a different, allied, species. Its anatomy is unknown.

Veronicella mexicana betheli v. nov.

Above, warm red-brown, paler toward the sides, with scattered pale dots; dorsal and subdorsal regions irregularly and not densely speckled with blackish; on the anterior third this speckling is resolved into a pair of obscure bands, a little nearer to each other than either to the lateral margin. Beneath pale reddish, darker posteriorly, and speckled with pale. Sole pale ochreous. Tentacles dark grey. There is not the slightest indication of a pale dorsal line. Under a lens, it is seen that the body above and below (especially posteriorly below) is very closely beset with minute pale dots, which correspond with punctiform depressions, while over this pattern are set numerous much larger diffused pale spots. All this is hardly to be noticed without magnification. Length (at rest) about 50 mm., breadth in middle about 23; breadth of sole 9 mm.; of body on each side of it 7 mm., sole not projecting beyond body.

The above was from the living slug. In alcohol it appears as follows: Length 34, breadth 18 mm.; width of sole 7 mm.; female orifice 19 mm. from anterior end, 16 from posterior, only one mm. from sole; sole with about 7 cross-striæ in one mm.; end of sole broadly rounded, about 2 mm. from hind end. Jaw strongly arched, with about 25 strong ribs; teeth about 54–1–54, ordinary, middle tooth reduced, shaped like a spear-head, marginals quadrate; salivary glands normal, pale yellow; œsophagus longitudinally corrugated; stomach with a portion having a diameter of about 2 mm. not covered by liver; albumen glands large, bright orange-yellow; receptaculum seminis oval, yellowish-plumbeous, about 1.25 mm. long; accessory glands about 38, of which about 24 are 11 mm. long, the others variously shorter, several only half as long.

A PHILOMYCUS FROM THE REPUBLIC OF PANAMA.

BY T. D. A. COCKERELL.

During a recent visit to Central America, Mr. E. Bethel found three specimens of a *Philomycus* at Bocas del Toro, Republic of Panama. The genus is new to Panama. Two specimens are evidently adult (one opened showed fully-developed genitalia), the other is immature. The slug may be described as follows:

Philomycus costaricensis (Mörch), variety *a.*

Length (in alcohol) about 11.5 mm., width of sole 1.5 mm.; very pale ochreous, the mantle with rather sparse grey floccose markings, and a pair of (subdorsal) grey bands, irregular in outline and more or less interrupted, consisting in fact of crowded grey spots. Respiratory orifice about 2 mm. from anterior end of mantle. Sole with a distinct median groove, evanescent anteriorly. Penis-sac cylindrical, the apical end curved over and turned downwards, so that the whole structure looks like a compressed interrogation mark. Jaw broad, strongly arcuate, about 1170 μ across, and 320 deep in middle, the outer thirds wholly without ribs or evident striae, the inner third with six broad ribs, distinct above, but failing below. (The young specimen shows better developed ribs, five in number.) Teeth about 21-13-1-13-21, the central ones strongly tricuspid, the lateral cusps small. The teeth agree in general character with those of *P. dorsalis*, as figured by Binney, differing however in the relatively longer basal plates, the short and broad central teeth not much more than half as long as the plate, certainly not over three-fifths as long. The interesting thing about this species is that it belongs strictly to the group of *P. hemphilli* and *P. secretus*, found in North Carolina. It is apparently *P. costaricensis* (Mörch), at least as described by W. G. Binney (Ann. N. Y. Ac. Sci., May, 1884) from material collected in Costa Rica by Gabb. Our slug differs from Binney's account in the greater number of teeth (Binney says about 28-1-28), and perhaps in the very definite ribbing of the jaw. I call it variety a, so that it can be referred to separately, but it does not seem wise to give it a name. *P. auratus* (Tate), from Nicaragua, may perhaps be a form of the same species. On the other hand the Mexican *P. sallei* (Cr. & Fisch.) and *P. crosseana* (Strebel) appear to belong to the group of typical *Philomycus.*

On his way home, Mr. Bethel collected a couple of *Philomycus* at New Orleans. These are *P. caroliniensis* (Bosc.) of the form which I separated (Ann. Mag. Nat. Hist., Nov., 1890, p. 382) as *nebulosus.* This is the common, widely distributed animal, from Canada southward ; current opinion does not support my attempt to separate the true *P. caroliniensis* from Virginia, but I am not yet altogether satisfied that careful study will not confirm the supposed distinctions.

THE ZOÖLOGICAL STATION AT NAPLES.

BY MAXWELL SMITH.

In 1872 Dr. Anton Dohrn founded at Naples the nucleus of the first biological station to be operated in a scientific manner. The original building was erected through the personal generosity of its founder, who in addition supplied funds for some years until the principal European governments recognized the importance of the work done and the advantages afforded the students of their respective universities. At the present time the zoölogical station, as it is called, receives annual grants from Germany, England and Italy. It is undoubtedly the largest institution of its kind, a fact which may be attributed to the co-operation just mentioned.

The buildings are situated in the Villa Nayionale, a fine park, facing the Bay of Naples. In the centre, on the ground floor, is the celebrated aquarium which is open to the pnblic. Nearby, but with a separate entrance, is the receiving room. Here the spoils of the dredging steamer are brought in and either placed in the tanks or preserved in alcohol. Off this room are smaller rooms, lined with shelves, where rows of glass jars filled with specimens are kept. On the floor above is the splendid library, a high ceiling and long windows, which admit plenty of light, combine to make this an admirable apartment for work at any time of the year. Adjacent is the new museum where Prof. Gast, the curator, is following a pleasing system of arrangement. This consists of mounting the shells of each species upon a piece of glass which is framed in narrow wood. The glass may be turned over, so that the under portion of a specimen may readily be examined. The mounted shells are laid in flat cases on a background of dark green linoleum. To this way of exhibiting specimens I have only one objection. The glue used for mounting too often cracks and falls away, or else if put on thickly it shows and detracts from the general appearance. Personally I prefer glass topped boxes. They exclude dust and may be shifted about without fear of a mix-up. The wall cases of the museum are to be filled with preserved specimens. The lighting comes from above, but is arranged in such a manner that direct sunlight is avoided, the writer noticed on exhibition a fine series of *Aporrhais serresianus* and in a wall case an enormous *Argonanta argo* L., very well preserved.

Visits to the aquarium, of course, were most interesting, the sea water is stored under the buildings and pumped into the tanks mixed with the proper proportion of air. The visitor entering the darkened corridor is at once struck by the brilliant colors and the great size of the living collection. Surely nowhere, in an aquarium, is there such a wealth of animal life. Let us examine the first tank. It is devoted exclusively to echinoderms. In the center are hundreds of feather stars (*Antedon rosacea*) clinging to dead coral stems. At first sight these appear to be plants on account of their yellow or red plumed arms. Crawling all about are other star fish of bright and somber hues. Here and there is a sea urchin and occasionally a sea cucumber. Tank 3 is devoted to mollusks. Swimming about are several squids (Loligo) which have the curious power of suddenly swimming backwards without the inconvenience of turning around These delicate animals, with transparent bodies, and large eyes only live a few days in captivity. The floor of the tank is strewn with gaping red pectens (*P. jacobeus*) which I noticed swimming down from a ledge of rock by suddenly opening and closing their valves, an awkward but quick means of locomotion. Clinging to the surface of a rock is a large *Umbrella mediterranea* and nearby several *Haliotis*. Several huge *Tritonium nodiferus*, with their opercula thrown to one side, may be observed slowly moving about on the bottom of the tank. One of the most interesting forms is *Aplysia limacina*, a large brown sea hare, which crawls about or swims by the aid of its wing-like lateral projections. When stones covered with vegetable matter are brought into the tank the Aplysias immediately bestir themselves and will clean the stones in an hour or two. The longevity of Aplysia in the aquarium may be ascribed to this manner of feeding. *Tethys*, one of the most beautiful naked mollusks of this region, only lives a few weeks after capture. It swims by violent writhings of the body from side to side. *Aeolis* and *Doris* make up for their small size by brilliant coloring. The delicate forms, many of them pelagic, are kept separated in glass receptacles, partly sunken in the water, the perfectly transparent *Pterotrachea*, a long thin animal with a curved proboscus and *Carinaria*, another interesting form rarely live more than a day in captivity. In a similar way are kept the beautiful mushroom-shaped *Medusa* or jelly fish, which propel themselves by opening and closing the body like an umbrella. The *Medusa* are also transparent, some

of them are of a delicate pink. They vary greatly in shape. One is like a narrow ribbon, another resembles a bunch of flowers on a central stalk. The octopus tanks attracts many visitors, especially when a crab is let down on a string for their benefit.

Through the kindness of Prof. Gast I was invited to go out on the dredging steamer "Johannis Müller," which is maintained by the zoölogical station for working the deeper portions of the Bay of Naples. This steamer is about forty feet long and carries a crew of four men, who, when not engaged at the wheel or boiler, assist in sorting out the material on deck, or managing the dredging machinery.

At 7 a. m. we left the small harbor at the west end of the city. The sun rose close to Vesuvius shortly after and promised a good day. After a run of twenty-five minutes, a point in the bay opposite the Capo, a promentory, was reached. From here the course was turned towards the Secca di Benda Palummo banks which consist of coral and sponges. Upon arrival the steamer swung around, and the "beam trawl" was let down. This was kept in the proper position on the sea bottom, by means of glass globes filled with air attached to the net. The trawl was lowered slowly into the water with wire rope, after which the steamer ran very slowly, the trawl thus dragging along the sea bottom and filling all the time. Three hauls were made with this apparatus, the trawl remaining down half an hour in each case. A mechanical indicator was used to ascertain the tension during the work. After the time mentioned had elapsed, the steamer was stopped and turned around, to facilitate the bringing up of the outfit. This done the contents were deposited upon the deck. The first haul was in 200 feet of water, the bottom, stone and mud. This locality, not being especially rich in mollusks as other parts of the bay, yielded only the following:

Leptothyra sanguinea (L.) Living examples.

Pseudomurex (*Coralliophila*). *meyendorffi* (*Calc.*) Two large specimens.

Isocardia cor (L.)

Cardium tuberculatum L.

Tellina exigua Poli.

Pecten pes felis (L.) Only single valves of the last four.

(*To be concluded.*)

NOTES ON POST-GLACIAL MOLLUSCA. I. EMMET COUNTY, MICHIGAN.

BY FRANK C. BAKER.

Authentic records of life from the deposits laid down by the waters of the Glacial Great Lakes are, apparently, exceedingly scarce. It is proposed to record such as have come to the writer's notice. A recent canvas of the available literature revealed the fact that little real work has been done relative to this subject. This is especially true regarding records bearing upon interglacial time, where the majority of records available are "wood and unios," which are said to have occurred in well borings. It is needless to add that this material would be of the utmost value if properly identified.

Some years ago Mr. A. W. Slocum, of the Fried Museum of Natural History, collected a number of mollusks from marl beds at Oden and Kegomic, Emmet County, Michigan. Oden lies between the Algonquin and Nipissing beaches, while Kegomic is on the old lake floor. These marl deposits are reported to be upwards of sixty feet in thickness, and the Kegomic deposit probably represents both the Algonquin and Nipissing stages. The large lakes, Burt and Mullet, as well as the smaller lakes, Crooked, Pickerel, etc., are relics of the wide strait which, during these late stages, connected Lakes Huron and Michigan and separated portions of Emmet and Cheboygan counties from the lower peninsula, the former territory forming an island, with the straits of Mackinac on the north.

The following species of mollusks have been identified from the two localities.

Oden.

Sphaerium striatinum (Lamarck).
Physa niagarensis Lea.
Planorbis autrosus Conrad.
Planorbis campanulatus Say.
Galba emarginata canadensis (Sowb.).
Lymnaea stagnalis appressa Linné.

Kegomic.

Sphaerium striatinum (Lamarck).
Pisidium compressum (Prime).

Physa niagarensis Lea.
Ancylus parallelus Haldeman.
Planorbis deflectus Say.
Planorbis campanulatus Say.
Galba galbana (Say).
Galba humilis rustica (Lea).

Comparisons between the faunas of the two localities would be without significance until more systematic collecting has been done. The list of species will doubtless be greatly extended by future research.

CONCERNING CYPRAEA EXANTHEMA, CERVUS AND CERVINETTA.

BY EUGENE W. PRESBREY.

C. exanthema, Lin., 1767; Gray, 1825; Reeve, 1844; Hinds, 1845; Adams, 1852; Roberts, 1885; Dall, 1903.

C. cervus, Lin., 1771; Lam., (cervina) 1822; Gray, 1825; Reeve (var. ex.), 1844; Adams, 1852; Roberts, 1885.

C. cervinetta, Kiener,——; Desh, 1844; Adams, 1852; Roberts, 1885. Reeves says *cervinetta* is var. of *cervus*. Adams speaks of *cervina*, which was Lamarck's name for *cervus*, as distinct from *cervus*. Gray names var. a, and b, of *exanthema*. Roberts says *cervinetta* is a var. of *exanthema*.

For habitat, Roberts give *cervus* to Panama and West Coast of America. Dr. Dall properly locates *exanthema* from Hatteras to Darien, but he does not mention *cervus* either as a variety or as being found on the Florida east coast. Reeve and Sowerby located *cervus* in the East Indies. Adams said Polynesian Province.

The majority of monographers have distinguished *cervus* from *exanthema*, but none seems to have found a home for it. Nor are the other two definitely placed. Roberts is nearest to the facts.

For three years past the writer has had favorable opportunities for the study of these species in there natural habitat and may, perhaps, presume to record some facts that have forced themselves upon him.

Cypraea exanthema is found from Hatteras to Darien, but in greatest numbers and perfection of development around the Florida keys. They are born in the deep water. When an inch or so in

length, (bullaform) they come up to the mangrove roots that fringe the coral islands. These islands, or keys, are half surrounded, on the sheltered side, by clear channels two or three feet deep. These channels have free communication with the sea. The favorite food for *exanthema* is washed in from the live coral beds by every tide. The mangroves furnish shelter and coloring matter for the shell. *Exanthema*, unless disturbed does not leave the mangroves till ready to breed, when it goes to deeper waters. *Cypraea exanthema* is elongated, cylindrical, with tapering extremities, anterior aperture narrow and not depressed. The head and neck of animals is small, not often extended, because food comes to it. Sides of shell profusely decorated with *ring spots*, particularly near the base. Spots white with dark centers. The mantles, in young shells are purple black, studded with pustules that project flexible papillæ. These papillæ may be extended or withdrawn entirely into the pustule. The pustules become transparent lenses as the shell approaches adult form. The papillæ remain black and receive color through a circulation duct that is easily visible to the naked eye, particularly where it crosses the lens to the papilla. The lenses form the spots and the papillæ form the central dots. These papillæ are loaded with color and probably deposit all the color needed for decoration of the outer shell. The inner mucous membrane supplies the enamel. The papillæ near the outer edge of mantle soon lose the color bearing faculty, or, lacking supply, produce only nebulous white spots near the top of the shell. These papillæ possess a highly sensitive, independent, nerve ganglia. If one be touched, however delicately, it will instantly be withdrawn. The others will not be disturbed.

Color of shell, fugitive purple that turns to shades of brown upon exposure to light. Length of shell three to four inches, altitude about one-third the length.

C. exanthema is found on both sides of the Gulf Stream which is a thousand feet deep between Florida and the Bahamas, with a current of five or more miles an hour. Bahama, Jamaica and Colon specimens are coarser in texture, the spots are less frequent, form less regular and the color much paler. Less food and fewer mangroves. The true *exanthema* is not found on the Florida west coast.

CYPRAEA CERVUS. The most favorable habitat of this shell is

along the Florida west coast, in thirty to fifty feet of water, where it attains fullest growth. But it is also found from Key West to Miami, perhaps farther north, on the east coast. These specimens, sharing *exanthema's* habitat, show some reasonable variation from the west coast specimens, chiefly, however, in coloring.

The shell of *cervus* is not cylindrical, it is dome shape, inflated, swollen, with a rounded fullness of body extending to extremities. Anterior opening large, three times as large as *exanthema*, other dimensions being equal. The anterior opening is not depressed. The larger head and neck of *cervus* is always out in search of food which it prefers to seek in the open waters. It is a constant traveler and must have room for easy manipulation of head and foot.

Mantles of *cervus*, when young, are steely grey. Pustules and papillæ, shorter than *exanthema*, are milky white and remain so. *There are no color ducts.* There seems to be an absence of nerve ganglia; the papillæ are not sensitive. Spots more numerous and solid white, sometimes confused. The mantle-guides (not "teeth!") are usually irregular in *cervus*. Color, pale brown to ashy grey, on West Coast, where it never goes to mangroves. On East Coast it takes on *exanthema* coloring and the anterior opening is slightly smaller. Exertion for food is not necessary. Length, four to seven inches. Altitude, two to four inches.

Cypraea cervus is not found on the West Coast of America. It is not found at Panama. The writer has yet to find a specimen below Key West. Its natural habitat is West Coast of Florida.

Cypraea cervinetta has many of the characteristics of the other two. It is found under rocks at extreme low tide, near coral patches. It finds a fair substitute for mangrove bark from which to extract coloring matter of a purple tone that does not turn to *exanthema* brown. Shell subcylindrical, with straight sides and flattened curves. Anterior opening widened, as in *cervus*, but with cup-like depression around the opening. It has the activity of *cervus* and seeks its own food, which is scarce in its habitat. Like *cervus*, it must have free room for movement. The mantles have the distinguishing features of *cervus* and *exanthema*. Ring spots and solid white ones appear at random on the same shell. *Cervinetta* never attains the size of *exanthema*. Many specimens are fully matured when only one inch long. Color, silver grey purple. Length, one to three inches. Altitude, three-eighths to one inch.

Cervinetta, apparently, belongs exclusively to Panama Province.

The writer has a theory. It is that *cervinetta* is the closest survivor of the original type, that before the Isthmus was formed the habitat of *cervinetta* was both East and West. After the Isthmus became a barrier between the oceans the Gulf Stream currents were turned up the East Coast. These currents carried *cervinetta* northward where it found no volcanic disturbance, better food and environment, and *cervus* and *exanthema* were evolved from *cervinetta*.

But I wish somebody would say why all *Cypraea*, in Florida, are called "micramocks."

UROCOPTIS (ARANGIA) SOWERBYANA (PFR.)—A NOTE ON ITS RADULA.

BY CHAS. T. RAMSDEN.

Being very much interested in procuring specimens of this shell, I took a trip to its habitat, with Drs. Carlos de la Torre, of the University of Havana, and Thomas Barbour, of the Museum of Comparative Zoölogy at Cambridge, Mass.

Unfortunately, althongh we had a hard ride up "Monte Libano," we did not reach the right locality; I, however, promised Dr. de la Torre that I would try again, further up the mountain, as we were both most anxious to procure living specimens to study the radula, which was unknown to Pilsbry.

On March 13, 1913, I again went up the mountain for some twenty miles on horseback, over an infernal road, and upon turning over the first stone, I found, to my great delight, my first living specimen of *Arangia sowerbyana* (Pfr.). I at once concluded that it would be an easy matter to fill my pockets and the small box I had with me, with specimens, and felt sorry I had not brought along more boxes, to take a good supply. A five hours diligent search, however, in crevices, under and on rocks, brought to light some half dozen specimens. I was however satisfied, as we would now be able to know its radula.

Having sent a part of the catch to Dr. de la Torre for examination, he reports the following: The radula is like that of the Jamaican *Spirocoptis*, measuring ten millimeters in length, by one and one-half

in breadth, consisting of some 150 V-shaped rows of numerous small teeth ; of these the central tooth is very narrow and unicuspid, while the laterals are numerous and similar in size and appearance ; the formula being 20.1.20.

Guantanamo, Cuba, 17th April, 1913.

NOTES.

Dr. Pilsbry, who has been studying *Achatinellidæ* in the Hawaiian Islands during the winter, has returned to Philadelphia, reporting a highly successful expedition. Communications for the Nautilus may hereafter be sent to him as usual.

Polygyra (Stenotrema) edwardsi (Bld.).—In his remarks in regard to this species, Ann. N. Y. Lyc., VI, 277, Bland says: "In *barbigerum* the attached, hair-like epidermal processes are produced at the suture and carina into cilia, which are entirely wanting in this species." This is incorrect, as three specimens from "Ky.," with Bland's label, in the collection of the late Mrs. George Andrews, *all* show traces of the sutural and peripheral fringes, and a beautiful *albino*, collected by Mrs. Andrews at Coal Creek, Anderson Co., Tenn., has the fringes as strong as in any specimen of *barbigera* that I have seen. The fringe is perfect from apex to lip and the "cilia" measure about 1 mm. in length. Two other specimens from Coal Creek show the fringes but not so strong. These shells also show that the "acute, raised, transverse tubercles" on the base of the shell, in Bland's description, are the hair-scars which in fresh, unrubbed specimens are surmounted by stiff, erect bristles.

I have examined twenty specimens of *P. edwardsi* from eight localities, and all but one (a dead, weathered shell), show at least traces of the sutural fringe. The trouble appears to be that the shells are generally covered with a thick, very adherent coating of dirt, and in trying to remove it the fringes are rubbed off. Traces of the sutural fringe often remain when the peripheral fringe has entirely disappeared, and shells showing the stiff bristles on the base are, apparently rare.—Geo. H. Clapp.

平瀬貝類博物館　The Hirase Conchological Museum.

THE NAUTILUS.

VOL. XXVII. JUNE, 1913. No. 2

A CONCHOLOGICAL MUSEUM FOR JAPAN.

The opening of a museum devoted entirely to mollusks would be an event of importance anywhere. It is gratifying to learn that the efforts of Mr. Yoichiro Hirase to found such an institution in Kyoto have resulted in a handsome and well-filled museum, of which we give a view.

The opening ceremonies of Mr. Hirase's Conchological Museum were held on March 22d at 1 p. m. Professor N. Kato, of the Doshisha College, an earnest advocate and counselor of the work, presided at the ceremony, which began with an account of the museum, and the causes leading to its establishment, by Mr. Hirase. The Hon. Omori, Governor of Kyoto Prefecture; Dr. Kuhara, President of the Kyoto Imperial University; Mr. Kato, representative of the Mayor of Kyoto, and Dr. Harada, President of the Doshisha University, delivered speeches or read notes of congratulation and good wishes on the completion of the museum. Dr. M. Matsumoto, Professor of the Kyoto Imperial University, delivered an address on the subject, "The Collection of Specimens of Natural History," after which Mr. Tanaka, Assistant Professor in the Tokyo Imperial University, and the most prominent ichthyologist of Japan, read a note of greetings and good wishes. A good number of letters and telegrams from our friends both abroad and at home had been received, but, the time being pressing, only a few of them were read, such as those from Dr. Takamine in America, Mr. Marshall Gaines and Dr. Nolan. Lastly, Shintaro, Mr. Hirase's son, expressed hearty thanks for the kindness and sympathy of the ladies and gentlemen present, and the ceremony closed with refreshments. Over

150 persons were present, chiefly professors of high schools and universities, officials and other public-spirited citizens who were earnest advocates of the undertaking.

On the following day about 150 principals of middle and common schools were invited, and the day following the museum was opened to the public. The daily number of visitors has been about 300.

On March 31st the museum was honored by the visit of a party of royal guests, the Imperial Crown Prince and his two royal brothers. Mr. Hirase and his son were received in audience by His Highness, who expressed great interest in the museum and its contents.

It was at first intended to exhibit as many species as possible, both foreign and Japanese, but when the Japanese shells were installed it was found that there was little space left for the foreign ones, so that only a very small part of them could be exhibited. It was decided that the Japanese species should be replaced with those from abroad twice or thrice a year, and that the first replacement should be made in August next. The foreign species are to be exhibited just as a tourist goes round the world, according to the countries whence they come. For purposes of reference, Mr. Hirase desires to exhibit photographs of museums and exhibit-rooms; of vivaria, or places connected with the cultivation of mollusks; of shell-button factories; also photographs of shores or other natural habitats of mollusks, in any country, and scenes of collecting shells, and of natives who wear shells as ornaments. We hope that American conchologists will supply a creditable exhibit for the United States.

The opening of the Museum was commemorated by the issue of a handsome series of postal cards, which with other gifts were sent to friends and correspondents in Japan and abroad.

UNIO (NEPHRONAIAS) ORTMANNI, N. SP.

BY L. S. FRIERSON.

Shell large and ponderous, length 82, alt. 44, diam. 30 mm., variable in shape, elliptical, to subtrapezoidal, frequently arcuate; sides somewhat flattened, biangulate behind, or very bluntly pointed. The young are obsoletely rayed, greenish yellow; adults are eradiate and dark brown. Beaks small, incurved, pointed, low, and without

any sculpturing. The whole disc is densely and heavily sulcate, nacre white, salmon or purple. Teeth strong; cardinals double in both valves; laterals single in the right valve, cicatrices well marked, confluent behind, separate before. Beak cavities rather shallow.

Dr. Ortmann writes that the anatomy is practically that of the *Elliptio* division of Unionidæ: Marsupium in the outer gills, glochidia subcircular; length 0.23, alt. 0.22 mm., about like *gibbosus* Barnes. Gravid in February. The sexes may not be indicated by any dimorphism. Found by Mr. A. A. Hinkley, in the Conchins River, near Quirigua, Guatemala (Atlantic drainage). Cotypes have been generously distributed by Mr. Hinkley to the Academy of Natural Sciences of Philadelphia, the U. S. National Museum and various collectors cabinets.

This shell is clearly placed in the *Nephronaias* division by its evident near kinship to *melleus* Lea, and to *persulcatus* Lea, from which species *ortmanni* differs in being much larger, and of a different outline.

Some specimens resemble in shape *U. goascoranensis* Lea, and *U. sphenorhynchus* Crosse and Fischer, but these species are not sulcate. The anatomy of this shell being that of *Elliptio* makes it necessary for the systematist to recast his ideas of *Nephronaias*, hitherto supposed to be allied to the *Lampsilinæ*. It is with great pleasure that I dedicate this species to my friend, Dr. A. E. Ortmann.

Mr. Hinkley procured also numbers of the *Unio calamitarum* Morelet, from a mountain stream, "Rio Blanco," whose mouth lies opposite Livingston.

The stones rolling down the stream after the tropical rains play havoc with the Unios, ninety per cent. having met with accidents. Consequently, the outlines of the shells are extremely variable. Mr. Lea made the error of spelling the name *calimatarum*, pointed out by von Martens, who supposes Morelet's name to mean either "the Unio of a little green frog," or "of reeds" (as also Sowerby). These shells of Hinkley's show that Morelet may have intended that his *U. calamitarum* should mean "the unio of calamities" (from *calamitas*), but if so it is rather peculiarly constructed. The synonymy of this shell includes the *U. dysoni* Lea, and *U. hjalmarsoni* Dunker, possibly others.

A plate illustrating *U. ortmanni* will appear next month.

THE PACIFIC CONCHOLOGICAL CLUB.

BY CHESTER STOCK, UNIVERSITY OF CALIFORNIA.

There has long been felt the need of an organization on the Pacific coast which would be valuable to the amateur collector, to the conchologist, and to those using conchology as supplementary to their studies in zoölogy and palaeontology. With such a combined purpose in view, an organization known as the Pacific Conchological Club has recently received its initial start at the University of California. It is to be hoped that the beneficent effects of a society of this sort will stimulate still further interest in conchology as a science on this coast.

The occasional meetings which will be held will bring the conchologist in touch with the invertebrate zoölogist and palaeontologist and with their problems in which conchology so often plays an important rôle. Furthermore, it is the desire of the society to ultimately establish at the university one of the largest collections of shells on the coast. This collection will be augmented from time to time by the results of excursions to the beaches and through the medium of exchange.

On April 23d a meeting was held at the University of California, at which time Mr. B. L. Clark reported on the molluscan fauna of Bolinas Bay, California. A representative collection of this fauna was obtained on a recent excursion held under the auspices of the society. Other features of the program were a discussion on the factors controlling the distribution of mollusks by Dr. F. B. Sumner, and a report by Prof. W. J. Raymond on a thesis entitled, "Variations in the Forms of *Thais* found on the Pacific Coast," by Bertha M. Challis, of the University of Washington.

THE ZOÖLOGICAL STATION AT NAPLES.

BY MAXWELL SMITH.

(*Concluded from page 6.*)

Continuing the account of our dredging trip in the Bay of Naples, on board of the "Johannis Müller," the second haul was in 150 feet

of water and resulted in the capture of a dozen living *Scaphander lignarius*, L., the animal of which is much larger than the shell.

The third haul was in 450 feet of water on mud bottom, which seemed a more congenial home for mollusks. This time the net came up quite full. Its contents were washed cleaner of mud by running the steamer full speed ahead before lifting the net over the rail. The more delicate fish and other animals were removed first, then the mud was scooped up by hand after it had been deposited on the deck. A quantity at a time was then placed in one of two trays in a sifting box, sea water was poured over these, the upper retaining the larger and the lower the smaller objects, the mud and water passing out of an opening below. In this way the material was quickly separated. The larger animals were put immediately into jars of sea water, arranged in baskets on the deck, while the smaller were placed in buckets to be examined and sorted later. Among many small forms I noticed the following:

Hyalaea tridentata Forsk.
Aeolis sp.
Fusus rostratus Olivi.
Nassa limata Chem.
Pecten flexuosus Poli.
Pecten pes-felis L.

At 3 p. m. it was necessary to return, as the catch might have been spoiled by the swell which grew stronger. Upon our arrival in Naples the material was at once transferred to the zoölogical station. The animals which are to be preserved are treated with cocaine. In the case of the mollusca this leaves them extended from the shell, as in life. A 75 per cent. solution of alcohol is finally used for their preservation. The institution issues a priced catalogue, and the specimens are sold and delivered to museums in all parts of the world.

At the time of this writing the zoölogical station is building a much larger steamer for dredging, so that in the future the work will not be restricted to the Bay of Naples, but will include Sicily and the adjacent coasts. This boat will have a laboratory, library, and cabins for sleeping on board, besides more powerful dredging machinery for work in still deeper water. It is to be hoped that the Mediterranean, with its rich cosmopolitan fauna, will soon be better known from a biological point of view.

THE UNIONE FAUNA OF THE GREAT LAKES.

BY BRYANT WALKER, SC. D.

The Unione fauna of the Great Lakes is one of considerable interest to the student of geographic distribution. It might naturally be expected that the St. Lawrence system, extending from Minnesota to the ocean, and affording a continuous waterway of more than 2,000 miles, and which flows nearly east and west through a region of substantially the same climatic and other environmental conditions, and with no natural connections with the Mississippi and Ohio systems, would be inhabited by a common fauna, throughout its entire length. As compared with the Mississippi drainage system, which extends from the far north to the almost semi-tropical regions of the Gulf States, it would seem that the fauna of the latter would naturally be much more diverse in its character than that of the St. Lawrence system, but the contrary is the case. The fauna of the Mississippi Valley, from one end to the other, is a substantially homogeneous fauna, varying simply in the number of species in different parts of its extent. But on examining the Unionidæ of the Great Lakes, we find that, while the fauna of Lake Superior, at the western extremity of the system is similar to that of the lower St. Lawrence, and the New England States, there is in the center of the system, with Lake Erie as its metropolis, an entirely different fauna, which extends eastward as far as the Ottawa River and Montreal, and westward to the Saginaw Valley, and even perhaps as far as Mackinac. The relations of this fauna are entirely with that of the Ohio and Mississippi Valleys.

This interpolation of a distinct faunal area in the middle of a great drainage system is very remarkable, and, so far as I know, is without parallel in any other of the great river systems of the world. And when, in addition to this, we find that there this intermediate fauna is, in almost every case, so modified from the typical form of the several species represented, that, in a very large proportion of the species, the Great Lake forms have, at one time or another, been described as species distinct from the typical forms as found in the Mississippi fauna, and that this fact has recently been made the basis of an argument by Dr. Scharff, in his interesting book on the "Distribution and Origin of Life in America," for his theory of

an unglaciated area in central North America, on the ground that this peculiar fauna of Lake Erie and the adjoining waters is a relict fauna, the remnant of a pre-glacial immigration from the south, rather than a post-glacial invasion, which has been modified since the disappearance of the glacier, the subject becomes one of considerable importance and worthy of careful consideration.

The study of the geographic distribution of the North American Naiades is one of comparatively recent origin, and it is only within the last fifteen or twenty years that any particular attention has been given to it. The fact is that it is only within that time that sufficient data have been accumulated, upon which any reasonable generalizations could be based. The time and efforts of the earlier generation of students, of which Dr. Lea was the leading exponent, were wholly taken up in differentiating and describing the new species as they were collected in various parts of the country. The first attempt to deal in any general way with the distribution of the fauna was that of Simpson, who, in his monumental work, "The Synopsis of the Naiades," published in 1900, not only put the classification of the family for the first time upon a scientific basis, but also separated the fauna into its several main constituents.

According to Simpson, North America, north of Mexico, is divided into three great faunal areas: on the east and limited on the west by the Appalachian Mountains toward the south, and extending in an indefinite direction towards the north and northwest, is the Atlantic region; on the west coast, bounded by the Rocky Mountains and the Sierra Nevadas on the east, is the Pacific region; while the whole interior portion of the country, extending from the Gulf as far north as Unione life can survive, forms one large province inhabited by the fauna, which he calls the Mississippian. The additional information of the subject that has been accumulated since the publication of Simpson's book has served only to confirm the correctness of his general division into these three great regions, but, as might be naturally expected, certain modifications will have to be made as the results of our increased knowledge of the range of many of the species. So far as the purposes of this paper are concerned, it is only necessary to say that, in figure 1, p. 20, I have extended the Atlantic region across the Georgian Bay and about half way along the eastern end of Lake Superior, both on the north and on the south shores.

FIG. 1.

While it is, perhaps, probable that the whole of Lake Superior should be included in this system, I have hesitated to do so on account of the apparent failure of *Unio complanatus*, which may be considered the characteristic species of the fauna, to extend into the western part of the lake. It is quite possible that it may, but we have no definite record of its occurrence west of Marquette county, Michigan, on the south shore, or of the Michipicoten River, on the north shore. It was not found by the University of Michigan expeditions of 1904 and 1905, either in the streams of Ontonagon county,

Michigan, on the south shore, nor at Isle Royale, at the western end of the lake. On the other hand, *Lampsilis luteola*, a characteristic species of the Mississippian fauna, was common at Isle Royale, and is known to extend along the south shore as far at least as Marquette county, and is represented on the north shore by a closely allied form, *Lampsilis superioriensis*, from the Michipicoten River.

The fauna of the Atlantic region, in its northern portion, is a very meagre one. As represented in the New England States, and in a general way as far south as Mason and Dixon's Line, it consists of only thirteen species, but south of that, and increasingly so towards the extreme south, it becomes a wonderfully varied fauna, in which the specific lines in many of the groups seem to be almost wholly obliterated. As an example of this, it might be mentioned that, in the case of *Unio complanatus* Dill., while Dr. Lea, in the northern portion of the region, recognized only the one species, in the southern portion he described no less than forty-six forms as distinct species, which Simpson in his synopsis has referred to the typical form as synonyms.

Taking the Atlantic fauna as represented in New England as the basis of comparison with that of the Great Lakes, as found in Lake Erie and the Detroit River, we find the two faunas represented by the following list:

LAKE ERIE.	NEW ENGLAND.
Truncilla	
triquetra triangularis Bar.	
sulcata delicata Simpson.	
perplexa rangiana Lea.	
Micromya fabalis Lea.	
Lampsilis	*Lampsilis*
ventricosa canadensis Lea.	*cariosa* Say.
	ochracea Say.
multiradiata Lea.	
luteola rosacea DeKay.	*radiata* Gmel.
recta sageri Con.	
nasuta Say.	*nasuta* Say.
iris Lea.	
parva Bar.	
alata Say.	

gracilis Bar.
leptodon Raf.
Obovaria
leibii Lea.
ellipsis Lea.
Plagiola
elegans Lea.
donaciformis Lea.
Obliquaria reflexa Raf.
Strophitus edentulus Say.
Anodonta
marginata Say.
imbecilis Say.
grandis footiana Lea.
grandis benedictensis Lea.
Anodontoides ferussaciana subcylindracea Lea.
Symphynota
compressa Lea.
costata Raf.
Alasmidonta
marginata varicosa Lam.
calceolus Lea.
Hemilastena ambigua Say.
Unio gibbosus Bar.
Quadrula
hippopæa Lea (*plicata* Say ?).
lachrymosa Lea.
pustulosa Lea.
rubiginosa Lea.
undata Bar. (?).
coccinea paupercula Simp.
subrotunda Lea.
tuberculata Raf.

Strophitus undulatus Say.
Anodonta
marginata Say.
cataracta Say.
implicata Say.
Alasmidonta
undulata Say.
marginata varicosa Lam.
heterodon Lea.
Margaritana margaritifera L.
Unio complanatus Dill.

The Atlantic fauna is made up of five genera and thirteen species,

while the Lake Erie fauna includes fifteen genera and thirty-nine species.

Of the Atlantic fauna, three species, *Lampsilis nasuta*, *Anodonta marginata* and *Alasmidonta marginata varicosa*, and perhaps a fourth,[1] are also found in Lake Erie.

Two species, *Margaritana margaritifera*, a preglacial immigrant from Europe, and *Alasmidonta undulata*, do not extend into the Erie basin and have no closely allied representatives there.

The remainder, though not found in the Lake Erie fauna, are, nevertheless, represented there by closely allied species evidently of a common derivation, as indicated in the foregoing list. Eliminating these species, we find the remainder of the Lake Erie fauna to consist of eleven genera and thirty species, which are not represented in any way in the New England fauna.

The relation of these two faunas in the region of the Great Lakes region can, perhaps, be best shown graphically by a comparison of the range of two of their characteristic species, which are closely related to each other, and both of wide distribution, viz., *Unio complanatus* Dill, and *U. gibbosus* Bar.

It will be observed from figure 2, that *Unio complanatus* extends from the Atlantic region proper, northwesterly across Ontario into Georgian Bay, up the St. Mary's River and along the eastern half of both the north and south shores of Lake Superior, and, so far as we know, probably occupies all of the Canadian region north and east of that line as far as Hudson's Bay and Labrador. On the other hand, *Unio gibbosus*, the representative of the Mississippian fauna, extends from the Menominee River, the dividing line between Wisconsin and Michigan, entirely around the shore of Lake Michigan and along the south shore of Lake Huron from Mackinac through the St. Clair River, Lake St. Clair, the south shore of Lake Erie, and east as far as the Ottawa River. At that point the two species are found living together in the same stream. It occupies, of course, the entire inland region south of the Great Lakes in Wisconsin, Illinois, Michigan, Ohio and western New York.

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[1] The specific distinctness of *Strophitus edentulus* and *undulatus* is questioned by eminent authority.

(*To be continued.*)

NOTES.

GALBA FERRUGINEA IN OREGON.—Recently Mr. John A. Allen sent me some small living *Lymnaeas* which, upon comparison with western species, proved to be *Galba ferruginea* (Haldeman). They were collected in a small pool at Oswego, Clockamas Co., Oregon, and furnish the first authentic record of this species for this State.

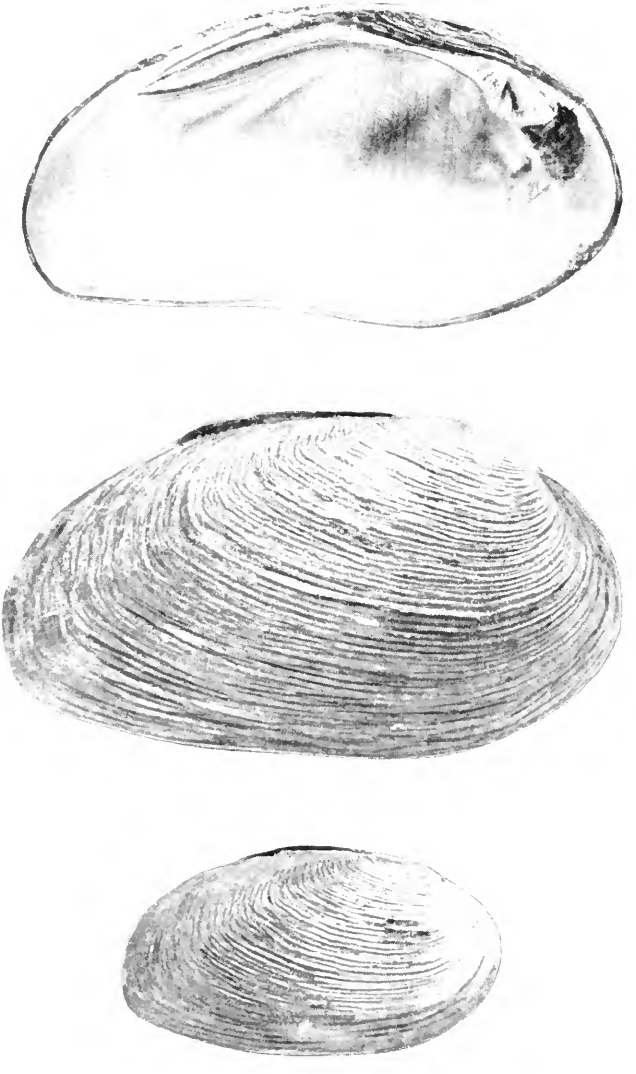
G. ferruginea has been authentically reported from California and Washington. It was originally credited to Oregon by Haldeman, the specimens being collected by Nuttall, but no locality was given. Mr. Allen has added to his collecting laurels by rediscovering this species in the State from which it was first described.

These specimens show that there is considerable variation in the degree of impression of the inner lip on the parietal wall, and hence the umbilicus may be widely open or almost closed. The animal is dark yellowish-horn flecked with small white dots.—FRANK C. BAKER.

REVERSED SUCCINEA OVALIS AND OTHER SHELLS OF FRESH POND, CAMBRIDGE, MASS.—While looking for *Planorbis hirsutus*, I found a number of other interesting things at Fresh Pond. *Vitrea hammonis* (*electrina* Gld.), *Pupa ovata* (*modesta*), *Euconulus fulvus*, *Succinea ovalis*, *retusa* and *avara*, *Vallonia costata* and *excentrica*, *Cochlicopa lubrica*, *Helicodiscus parallelus*, *Zonitoides arborea*, *Pyramidula cronkhitei anthonyi*, etc., and 17 species of fresh-water shells. Among the *Succinea* was one live, full-grown *ovalis* reversed. Is this a common occurrence? I have never found one before.—WILLIAM F. CLAPP, *May* 6, 1913.

PUBLICATIONS RECEIVED.

ON APOREMODON, A REMARKABLE NEW PULMONATE GENUS. By G. C. Robson (Annals and Mag. Nat. Hist., April, 1913).—A minute limpet from Singapore is described under the above caption. The shell is brownish-yellow with red radial stripes, the apex anterior and turned toward the left side. The dentition has a remarkable resemblance to that of *Vallonia*, near which it is for the present classed by Mr. Robson. We suspect that it may turn out to belong to the *Siphonariidæ* when the entire animal is known.—H. A. P.



UNIO ORTMANNI FRIERSON

THE NAUTILUS.

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SHELL COLLECTING ON THE WEST COAST OF BAJA CALIFORNIA.

BY H. N. LOWE.

My long anticipated collecting trip to the coast of Lower California was at last realized in the spring of 1912, when a party was being made up for a month's cruise in Mexican waters.

The staunch little power yacht "Flyer" was chartered for the trip. Besides the crew of three, our party was made up of the owner of the boat, the taxidermist, the tourist, the ornithologist, and the conchologist.

After a day spent at San Diego securing our clearance papers and half a day at Ensenada with the Mexican authorities, we were at last on our way. We cast anchor for the night in a small cove a few miles south of Point Banda. There had been a slow drizzle of rain all day and on going ashore I secured some five live specimens of *Helix stearnsiana* walking over the bushes. On Todos Santos Islands and San Martin (the southern limit of the species) I found live specimens under loose rocks, but none under or near any of the numerous species of cactus which thrive here. On Santa Catalina Island the nearly allied form *Helix kelletti* lives on the cactus (cholla) and is found under it at all seasons of the year. A few specimens of *Glyptostoma newberryanum* were found on the Todos Santos.

At Point Banda I secured my first *Monoceros lugubre*, and though a common species it gave me pleasure to find something I had never before collected. The specimens found here were very small only

about a quarter of the size of the fine ones further south from San Martin and San Gerónimo Islands. Further south, at Cape Colnette, large beds of *Mytilus californicus* were uncovered at low tide. Among the mussels were fine large *Monoceros pauciliratum* Stearns and *Macron lividus*. Wedged in between and attached to the byssus of the mussels we found many *Tapes grata* Sby. and *Tapes staminea* Conr., a rather unique place for that genus to be found. A few good *Saxicava arctica* and one large *Entodesma saxicola* were added to the list. The largest of the *Mytilus* were worm-eaten, wave worn and battered, and altogether the most disreputable looking specimens I had ever seen. Many of the worst shells had quite pretty pearls snugly hidden in their internal anatomy, some having as many as twenty-six small "seed pearls" and others but a single large one. The pearls from this species, unlike the elegant ones from the *Haliotis*, have no commercial value, lacking sufficient luster. The *Tegula gallina* Fbs. found here were mostly var. *tincta* Hemphill. The *Monoceros pauciliratum* were right in their prime here, though we found a few as far south as Cedros. *Monoceros engonatum* Conr. although small were very good specimens but we found none south of here.

Another day's sail brought us to San Martin Island, lying five leagues out from the "Bay of the Five Hills." It is a small island of very evident volcanic origin, the crater of its extinct volcano being visible for many miles. On climbing to the summit of the crater we were dazzled by a wealth of golden daisies which carpeted the interior. The only land shell to be found was the ever present *Helix stearnsiana*, but this seemed to be its southern limit, as we found few here and none further south. A natural breakwater of black lava boulders runs out for half a mile from the south end forming one of the best anchorages for small vessels on the coast. This island, like San Gerónimo, is the breeding place of thousands of sea birds which come here in the spring—gulls, cormorants, terns, osprey, turnstones, oyster-catchers, duck hawk, surf birds, pelicans, etc. On San Gerónimo Is. hundreds of auklets or "mutton birds" were nesting in burrows which they dig in the sandy earth, laying but one white egg about the size of a pigeon's egg.

The wild fauna of these southern islands seems to be having hard luck. On Guadalupe Is. the domestic cat, run wild, has about exterminated a rare petrel and several other birds from that island.

On Cedros the dogs have entirely cleared out a rare dwarf species of deer which formerly lived here. On Todos Santos the common rat has in the last few years made life so strenuous for the sea birds that they have given up nesting here entirely. Since birds' eggs have been cut out of the rat's bill-of-fare, they have developed a fondness for snails and I fear in a year or two Todos Santos will be as destitute of snails as it is of birds' eggs.

San Gerónimo Island is smaller than San Martin, only about one and a half miles in length and as bare as a picked hen. Its barren sandy soil seems incapable of supporting any vegetation save a few stunted bushes. Only very dead specimens of *Helix levis* var. near *crassula* Dall were obtainable, though I made a thorough and systematic search for them. The reefs on the west side yielded a number of good small species.

Margarites acuticostatus Cpr.
Mitromorpha gracilior Hemphill.
Truncatella stimpsoni Stearns
Arca gradata Brod. & Sby.
Mitra lowei Dall.
Marginella varia.
Marginella politula Cooper.
Triforis pedroana B.
Bittium attenuatum Cpr.
Bittium munitum munitoides B.
Cerithiopsis alcima B.
Cerithiopsis pedroana B.
Cerithiopsis carpenteri B.
Turbonilla buttoni D. & B.
Odostomia helga D. & B.
Eulima bitorta Van.
Modiolus opifex Say.
Milneria minima Dall.
Cardita subquadrata Cpr.
Columbella penicillata Cpr.
Fusus luteopictus Dall.
Lucina californica Conr.
Hipponyx antiquatus Linn.
Gadinia reticulata Sby.
Opalia crenatoides Cpr.
Ocinebra gracillima Stearns.
Pecten latiauritus Cpr.
Acmaea asmi Midd.
Mitromorpha filosa Gabb.

On San Gerónimo we found *Acmæa persona* Esch and var. *digitalis*, also a form of *A. spectrum* which seemed to be copying the peculiar shape of *A. persona*, *Acmæa scabra*, *A. pelta* var. *nacelloides* and *Lottia gigantea* Gray were also found on the reefs.

The *Tegula gallina* were the largest I have ever seen.

We left San Gerónimo Island rather hurriedly the evening of the second day as a southeaster was coming up. Next morning found us at the north end of Cedros Island where the Esperanza Mining Company had their wharf and buildings for shipping the gold ore from their mines in the interior of the island. There were prac-

tically no marine species at this end of the island as the shore line drops into deep water. After several days' search I was well repaid by finding some fine live specimens of the beautiful *Helix veatchii* (Newc.) Tryon. This species varies much from almost white to dark many-banded specimens. At first I found a few fairly good dead shells, but search as I might under stones, through cactus, and chaparral not a live one could I find, until by chance I spied one roosting on a limb of the dwarf oak peculiar to this island. This species seems to be entirely a tree snail.

At the south end of the island a *Helix* identified by Dr. Pilsbry with *H. canescens* Ads. and Rve. occurs in colonies in exposed places on rocks. *H. veatchii* is scattered over a larger area on the island, the many color varieties being found sometimes on the same tree.

At South Bay Cedros Island we collected under stones at low water the following:

Semele rupium Sby.
Vermetus fewkesii Yates.
Scurria mesolenca Mke.
Latirus lugubris C. B. Ads.
Drillia moesta Cpr.
Trivia solandri.
Arca reeviana d Orb.
Arca gradata B. & S.
Columbella fasciata Sby.
Mopalia muscosa Gld.
Ishnochiton conspicuus Cpr.
Ishnochiton acrior Cpr.
Ishnochiton didymus B.
Ishnochiton clatheratus Cpr.
Callistochiton crassicostatus Cpr.
Callistochiton decoratus.
Chaetopleura gemmea Cpr.
Cyanoplax hartwegii.
Nuttallina scabra.
Murex incisa.
Murex nuttalli Conr.
Lucapina crenulata.
Macron lividus A. Ads.
Amphissa versicolor Dall.
Tegula aureotinctum Fbs.
Tegula gallina Fbs.
Fissurella volcano Rve.
Fissurella volcano var. crucifera Dall.
Megatebennus bimaculatus.

Cedros Island seems to be the northern limit of the large red crab *Grapsus grapsus*. They are very hard to catch for the moment they see one approaching, they clatter off pell-mell over the rocks as fast as their ten legs will carry them and jump into deep water where they swim like a fish.

On a pebble beach midway the east coast of Cedros I found the following beach-worn shells cast up by some storm; the list is interesting in that it shows the intermingling of northern and southern species at this point.

Cypraea spadicea Gray.
Ranella californica.
Pomaulax undosus Wood.
Conus californicus Conr.
Semele decisa Conr.
Uvanilla regina Stearns.
Venus fordii Yates.
Triton gibbosum.
Macron aethiops.
Cymatium corrugatum Lam.
Conus gradatus Mawe.
Arca grandis B. & S.
Dosinia ponderosa.
Pecten subnodosus.
Fusus dupetithouarsi Kiener.
Drillia penicillata Cpr.
Monoceros muricatum Brod.
Crucibulum imbricatum.
Purpura biserialis Blve.
Venus undatella Sby.
Cassis sp.
Oniscia sp.

For several miles along the cliffs on the southwest coast of Cedros extends a well marked stratum about a foot in thickness of *Lucina californica*, and very strangely not another marine species was found with them.

In about ten fathoms off Palm Spring on the east coast we succeeded in making one haul of the dredge with the following results:
Hemicardium biangulatum.
Nassa insculpta.
Pecten latiauritus.

A number of small or difficult species collected on the trip remain to be identified. A list of them will appear later. Dr. Pilsbry has in press an illustrated paper on the Helices of the *Micrarionta* group collected.

As the weather was unfavorable for a continued southerly cruise, we reluctantly headed the "Flyer" for home where we arrived just four weeks from the time of starting.

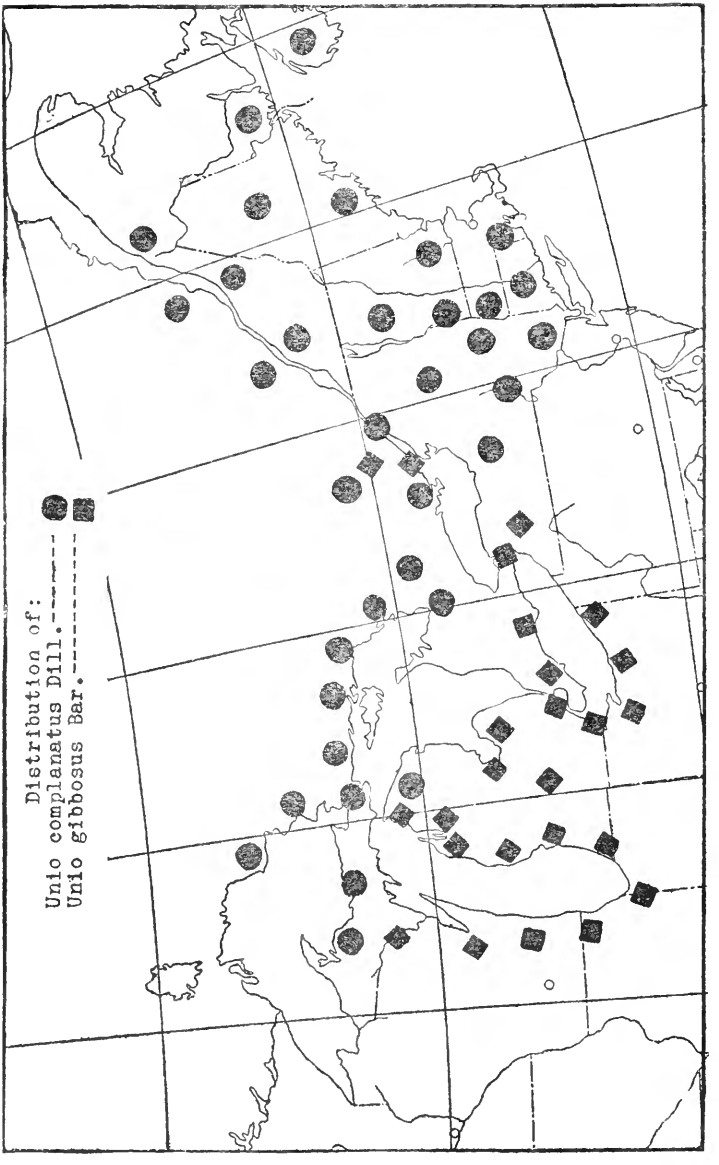
THE UNIONE FAUNA OF THE GREAT LAKES.

BY BRYANT WALKER, SC. D.

(*Continued from page 23.*)

The distribution of these two species, *Unio complanatus* and *U. gibbosus* (fig. 2), in a general way, shows the relative position the Atlantic and Mississippian faunas occupy in the region of the Great Lakes. Of course there are variations in the range of individual species, but these, on the whole, do not interfere with the general proposition to be discussed in this paper.

FIG. 2.



The discussion, then, includes the consideration of four questions: 1st, the origin of the Atlantic and Mississippian faunas; 2d, how and when the peculiar extension of the Atlantic fauna to the northwest took place; 3d, how and when the extension of the Mississippian fauna into the Great Lakes took place; and 4th, whether the peculiarly modified fauna of Lake Erie, as it exists to-day, is the result of a pre-glacial invasion, which survived in that region during the glacial period, or whether it was a post-glacial immigration.

I.

In considering the present distribution of the Naiad fauna of North America it is to be borne in mind that while our knowledge as yet is only fragmentary, and there is a great deal more to be learned before definite final conclusions can be drawn, nevertheless there are certain fundamental facts which seem to be reasonably well established, and with which such tentative deductions as we may attempt to make at the present time must be in agreement.

In the first place, it seems to be well established that the peculiar North American Naiad fauna originated west of the Mississippi, in the region extending from Utah and Colorado north to Athabasca and Saskatchewan, in British America.

The earliest forms of recognizable Naiades that are known are from the Triassic and a few more are known from the Jurassic. All these forms are simple and comparatively uniform in their character. But towards the end of the Cretaceous Period, there was, for some reason or other, an extraordinary epidemic, as it were, of mutation in this group, and, in the rocks that were laid down in these western lands at that time, are to be found prototypes of many of the modern groups, which are to-day characteristic of the recent fauna.

In the second place, it is to be kept in mind that north of the line of glaciation, the entire system of drainage was radically changed as one of the results of the Glacial Period.

Thirdly, assuming the general proposition that the center of distribution of a group must be considered the region of the greatest abundance of individuals and the greatest diversity of specific development, it would seem to be reasonably well established that the present fauna of the Mississippian region has spread out from two great centers; the one on the east, in the head waters of what we

now know as the Tennessee System, and the other in the southwest, probably in the Ozark region.

Assuming the origin of the Naiad fauna in the western region above mentioned, the first question to be determined is the derivation of the Atlantic fauna from this primitive fauna of Cretaceous time in the west.

The oldest land in eastern North America is that known as the Laurentian Highlands of Eastern Canada. With the gradual elevation of the continent in early times, which ultimately resulted in a connected land surface from the east to the mountainous regions of the west, the earliest system of drainage that was established in the region now occupied by the Great Lakes, was, according to the consensus of the best geologic opinion, towards the west, and when, in process of time, the highlands known as the Appalachian Mountains and the Cumberland Plateau were raised up, they formed a water shed, which determined the then existing systems of drainage.

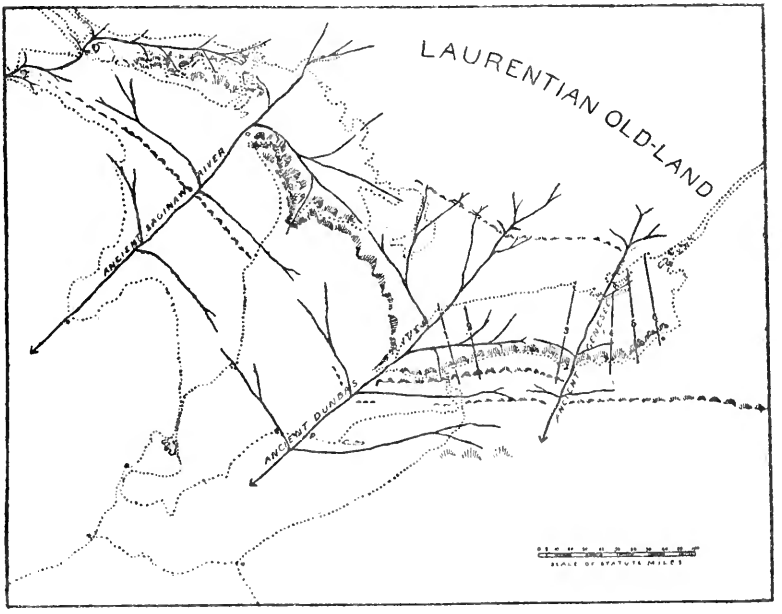
According to Branner (1), prior to Cretaceous times, the then Cumberland Plateau extended continuously from the Appalachian Mountains southwest into western Texas. At that time the Mississippi River was not in existence, the drainage from the south of this great water shed was into the Gulf of Mexico, the drainage from its north side was north and west, and probably in the beginning, ended in the great Mesozoic sea, which extended along the foot of the Rocky Mountains from the Gulf of Mexico to the Arctic Ocean.

While we do not know as much of the exact course of these preglacial rivers as we should like, nor as much as we hope to know in future, there has been of recent years a considerable advance in our knowledge in this particular, and there is enough of data now available to give us at least a general idea of some of the particulars of that ancient drainage system. It was, of course, entirely overwhelmed and nearly obliterated by the effect of the ice cap, which overthrew the ancient system, and from which grew our present system of drainage, but here and there there are enough remnants to afford us some information as to the lines along which this preglacial drainage system was established.

As shown by Fig. 3, which is copied from Grabau (2), the preglacial drainage of the region of the lower Great Lakes was towards the southwest. The ancient Dundas River, originating in the Laurentian Highlands, flowed southwesterly across the present bed of

Lake Erie, and possibly along the general course of the present Maumee and Wabash Rivers towards the western sea. In a similar way the ancient Saginaw River was a western-flowing stream, extending from the highlands on the east across the Georgian Bay, up the Saginaw Valley, and southwest towards the sea. And further north a similar drainage was also established. According to Fowke (3) the present course of the Ohio River is quite different from that of the great river which drained that region in pre-glacial

FIG. 3.



times. The present course of the Ohio is made up of fragments of ancient drainage beds united by connecting links forced through by the glacial waters on the retreat of the ice. According to Grabau the present bed of the Ohio is about 150 feet above the ancient bed of the pre-glacial drainage, and according to Fowke the Great Kanawha River, which is now a southern tributary of the Ohio, at that time flowed northwesterly across southern Ohio into Indiana, and presumably, either as a separate river or as a tributary of the Dundas, flowed westerly towards the sea or into the Mississippi.

If these theories of the ancient pre-glacial drainage of this region are correct, it does not require much imagination to see how, from their ancient place of origin in the west, the primitive ancestral forms of our present fauna were enabled to spread to the east up these ancient waterways to the headwaters of these pre-glacial streams, and then, during the many elevations and sinkings of Tertiary times, through the stream transference consequent upon such orographic changes, this immigration of the primitive fauna was transferred into the eastern drainage, and thus became the ancestral stock of the present Atlantic fauna.

That this emigration from the west to the east was a very early one, there can be no doubt, and that it was long antecedent to the Glacial Period seems beyond question, both from a geological and a zoological standpoint. The fact that not only from the Glacial Period, but for long ages prior to that time, the Appalachian system must have been a barrier to the entrance of the western fauna into eastern waters would seem to be beyond question, and this view is strengthened and corroborated by the fact that the two faunas have been so long separated that they have become specifically differentiated in the great majority of cases. The time that is involved in such a change must be very great. That it must be so is shown by the fact that the fossil Unios found in the inter-glacial drift of eastern Canada are the same as the recent examples of the same species found to-day. It is probable that this emigration from the west took place after the primitive fauna of early times had begun to mutate under the peculiar influence of the later Cretacic times, and while, of course, there is much that is indefinite and purely speculative in regard to these questions, there are some facts, which seem to point with some directness, as to when that migration might have taken place.

One of the characteristic species of the Atlantic fauna is *Lampsilis radiata*, which extends at the present time along nearly the whole extent of the Atlantic drainage. It is very closely related to another characteristic species of the Mississippian fauna, the *Lampsilis luteola*, and, indeed, these two specimens are so closely related that while in the main there is no difficulty for the average student to separate them, yet oftentimes there are individual specimens which are very difficult to place with entire satisfaction.

(*To be continued.*)

NOTES.

Dr. A. E. Ortmann reports excellent collecting of *Unionidæ* in Wise Co., Va., and southward. Some very interesting systematic observations have been made.

Mr. H. F. Carpenter of Edgewood, Providence, R. I., has just returned from a four months' trip to South America.

Mr. C. W. Johnson is about to leave Boston for a collecting campaign in northern Vermont in the interests of the New England faunal collection of the Boston Society of Natural History.

At the Natural History Museum on November 29th, Mr. Edgar Albert Smith, I. S. O., Assistant-Keeper in the Zoological Department, was presented by the Director, Dr. L. Fletcher, F. R. S., on behalf of a large number of subscribers with a silver tea and coffee service, a drawing room clock and a pair of field glasses. Mr. Smith has served the Trustees of the British Museum for 45 years, having joined the staff in 1867. The subscribers included, besides his colleagues on the Museum staff, many friends outside who are interested in mollusca, the group of animals to which Mr. Smith's scientific work has mainly been devoted.—*The Museums Journal.*

PUBLICATIONS RECEIVED.

Catalogue of the British Species of Pisidium (recent and fossil) in the collections of the British Museum, with notes on those of Western Europe. By B. B. Woodward, F. L. S., etc. Printed by order of the Trustees of the British Museum, 1913. Pp. ix + 144; 30 plates. "Of all the genera of British non-marine mollusca none has presented more difficulties to the student than *Pisidium.* The small size of the shells, their great variability, the lack in most cases of any striking external characteristics, as well as the confusion in which the subject has been left by the various authorities, have all contributed to these difficulties, with the result that the genus has

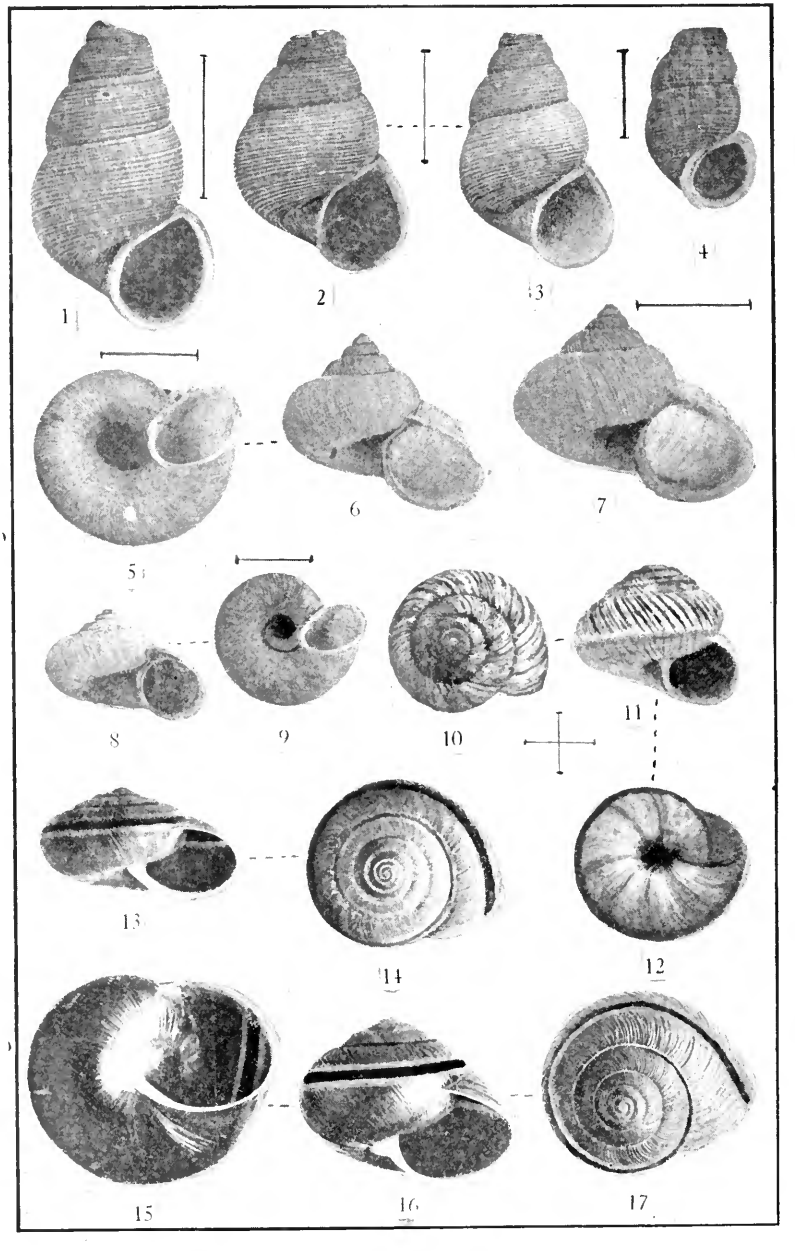
been largely neglected." Conchologists everywhere will heartily agree with the opening paragraph of Mr. Woodward's book, quoted above, which is true not only of British Pisidia, but of the genus throughout its range.

In the discrimination of species, characters of the hinge are chiefly relied upon, the forms of the individual teeth and other details of hinge-structure affording criteria of far more value, according to Mr. Woodward, than external shape and sculpture of the shell. "In one locality, all the species will exhibit less sculpturing than the normal forms; in another, more; all may be dwarfed or all abnormally large; occasionally one species in the gathering will show greater increase in size over the average, while its associates are undersized; or exaggerated inflation may be the prevailing feature." While other authors have described the teeth of Pisidia, the subject has never before been dealt with in the thorough manner of this work. The terminology of M. Félix Bernard is used in the descriptions of hinges.

The author does not venture to establish subgenera, and seems skeptical of those proposed by other writers.

Seventeen species are recognized, fourteen of them living in the British Islands, two extinct. The work on British forms necessitated a critical study of practically all Palæarctic *Pisidia*,—a couple of hundred described forms, most of them synonyms or indeterminate,—so that the scope of the work is far broader than its title indicates. Distribution, both recent and as fossils, is dealt with in the most ample manner. The plates illustrate very fully the local variations, the figures being photographs enlarged two to three diameters and reproduced by gelatine process. It may be questioned whether a smaller number of larger figures would not be more useful. There are also four plates of much enlarged figures showing the hinges.

Whether the development of methods, the examination of vast numbers of specimens from many localities, or the study of an involved and exasperating literature is considered, the practical conchologist will realize that Mr. Woodward's task has involved an enormous total of work. Notwithstanding its geographic limitations we believe that the Catalogue will initiate a new epoch in the study of this family, all over the world. H. A. P.



CUBAN AND WEST AMERICAN LAND SHELLS.

THE NAUTILUS.

VOL. XXVII. AUGUST, 1913. No. 4

ILLUSTRATIONS OF CUBAN AND WEST AMERICAN SHELLS.

The figures on plate III represent types or cotypes of the following species:

Fig. 1. *Chondropoma wilcoxi* P. & H. Cotype. NAUTILUS XXVI, 45.

Figs. 2, 3. *Chondropoma garcianum* Torre MS. Types. Palma Sola, prov. Matanzas, Cuba.

Fig. 4. *Chondropoma carenasense* P. & H. Cotype. Cayo Carenas, Cuba. NAUTILUS XXVI, 44.

Figs. 5, 6. *Annularia ramsdeni* P. & H. ♂ Cotype. NAUTILUS XXVI, p. 42. Fig. 7, ♀ Cotype.

Figs. 8, 9. *Annularia pseudalatum* Torre. Type. NAUTILUS XXVI, 43.

Figs. 10, 11, 12. *Oreohelix pygmæa* Pils. See p. 51.

Figs. 13, 14. *Epiphragmophora dupetithouarsi cuestana* Edson. Cotype. NAUTILUS XXVI, p. 37.

Figs. 15, 16, 17. *Epiphragmophora tudiculata grippii* Pilsbry. Santee, 18 miles from San Diego, California.

SOME WYOMING SNAILS.

BY JUNIUS HENDERSON.

Mollusk records for Wyoming are so scarce that the following species in the University of Colorado Museum, recently collected in that State by Messrs. Don W. Walker, Roy M. Butters and Norman deWitt Betts, may be of interest:

Oreohelix cooperi (W. G. B.). Horse Creek Station, Laramie County, Wyoming (Butters).

Oreohelix cooperi minor (Ckll.). North Fork of Rock Creek, Johnson County, Wyoming (Betts).

Pupilla muscorum (Linné). North Fork of Clear Creek, Johnson County, Wyoming (Betts).

Vallonia cyclophorella Ancey. North Fork of Clear Creek, Johnson County, Wyoming (Betts).

Euconulus fulvus alaskensis Pils. North Fork of Clear Creek, Johnson County, Wyoming (Betts).

Pyramidula cronkhitei anthonyi Pils. North Fork of Clear Creek, Johnson County, Wyoming (Betts).

Succinea avara Say. Ten miles northeast of Basin, Wyoming (Walker).

A NEW OREOHELIX FROM COLORADO.

BY JUNIUS HENDERSON.

In THE NAUTILUS, Vol. XXVI, p. 30, Dr. Pilsbry has indicated that the forms of *Oreohelix* from Glenwood Springs and Newcastle which have been tentatively recorded and distributed as *O. haydeni gabbiana* (Hemp.) are not *gabbiana* at all, but are forms of *O. hendersoni* Pils. I have examined a large series from each place, and have compared them with a large series of typical *hendersoni*. The characters distinguishing the specimens from Newcastle and Glenwood from true *hendersoni* are so constant as to clearly entitle them to a separate name, and yet the relationship, in spite of the lack of intergrading specimens, is so evident it seems best to consider them a subspecies rather than a distinct species.

OREOHELIX HENDERSONI DAKANI n. subsp.

Distinguished from typical *hendersoni* by the following shell characters: Spire much more elevated; peripheral angulation of the earlier whorls disappearing on the penultimate whorl, so that scarcely a trace of it is observable in front of the aperture on the last whorl of the adult shell; shell larger, whorls higher in proportion to width, producing a corresponding difference in shape of aperture.

Alt. 14, diam. 22, whorls $5\frac{1}{2}$.

Types in University of Colorado Museum, cotypes in Academy of

Natural Sciences of Philadelphia. Type locality, northwest corner of Peebles ranch, two miles up Elk Creek from Newcastle, Colorado, where it was found in great abundance by Mr. Albert Dakan, in April, 1908. Mr. Dakan was also the collector of the types of *hendersoni*. I found *dakani* nine miles east of Meeker, Colorado, in 1909, where it was associated with *O. cooperi* (W. G. B.). In color the specimens from both localities average a trifle lighter than typical *hendersoni*, being almost white, with a slight creamy tinge. A large series from the well-known colony on the south side of the Grand River at Glenwood Springs, Colorado, is on an average very much darker and less robust, but otherwise so closely agrees with the Newcastle specimens that I have not thought a separate name advisable. The forms of this species agree in the almost total absence of spiral color lines on the last whorl.

It may not be out of place to say here that Mr. Dakan has recently found at Lyons, Colorado, typical specimens of *O. haydeni betheli* Pils. & Ckll. This carries its range across to the eastern base of the Front Range, which constitutes the Continental Divide, and 100 miles to the northeast of the type locality.

TWO NEW ACHATINELLIDÆ OF OAHU.

BY H. A. PILSBRY.

In March last I went in company with Dr. C. Montague Cooke from Honolulu to Hilo, Hawaii, chiefly for the purpose of studying Mr. Thaanum's superb collection of Hawaiian shells. One of his recent acquisitions was a sinistral *Amastra*, from Waiahole, which is certainly new; and at his suggestion I name it for the companion of my Hawaiian journey. *Amastra montagui* n. sp. is sinistral, imperforate, oblong-conic, rather thin, chestnut colored, with a denuded ecru-olive patch in front of the aperture. The surface has a somewhat silky gleam, due to the rather fine wrinkles along lines of growth. The apex is obtuse, embryonic whorls convex, nearly smooth; outlines of the spire noticeably convex. Suture well impressed, the whorls a little swollen below it. The aperture is not very oblique, slate-violet within; peristome black at the edge, strengthened by a low white callus within; columella with reflexed and adnate edge, bearing a rather strong, white, subtriangular lamella. Length 13, diam. 7.8, length

of aperture 6 mm.; $5\frac{1}{2}$ whorls. It will be figured in the present volume of the Manual of Conchology.

Another species of unusual interest is a fossil *Partulina* which was discovered by Dr. Cooke several years ago in a superficial road cutting at the junction of Manoa road with the upper road, back of Rocky Hill, which terminates the western ridge of Manoa valley.

Only one *Partulina* has been known in Oahu hitherto, that being *P. dubia* (Newc.). The present form, which I will call *Partulina montagui* n. sp., is not related to *dubia*, but to such Molokaian species as *P. dwightii* Newc. I regard these two *Partulinas* and the few Oahuan species of *Laminella* as stragglers from the Molokai-Lanai-Maui evolution-center, which reached Oahu before the subsidence of a ridge which I believe formerly connected the islands.

P. montagui cannot have been extinct for any great length of time, as the specimens occur in the humus, only buried a few inches below the turf. Probably the forest disappeared from where they are found not more than seventy-five to a hundred years ago. It must have been extinct in the early fifties, or it would surely have been found by Newcomb, Gulick or Emerson.

The shell is sinistral, perforate, ovate-conic, with acuminate spire, thick and solid, sculptured with close, irregular wrinkles, the last whorl malleated; whorls $7\frac{1}{3}$, the upper ones nearly flat, the rest convex; suture superficial. Outer and basal margins of the peristome expanded, thick, heavily thickened within; columellar margin thick; columellar fold thick and moderately prominent.

Length 25, diam. 14 mm. (108181 A. N. S. P.).

Length 24.7, diam. 12.5 mm. (111 coll. Irwin Spalding).

Length 26.9, diam. 13.1 mm. (33581 B. P. Bishop Mus.).

THE UNIONE FAUNA OF THE GREAT LAKES.

BY BRYANT WALKER, SC. D.

(*Continued from page 34.*)

Now, according to the geologists, some time about the beginning of the Cretaceous Period there was a great sinking of the land in the Gulf region. It extended from central Texas east to the middle of Alabama, and in a triangular shape north to southern Illinois. It

broke through and separated the ancient Cumberland Plateau, which prior to that time extended continuously from the eastern mountains into western Texas. It admitted the sea to a point, as above stated, north of the present junction of the Ohio and Mississippi, and during nearly the whole of Tertiary times there was a body of salt water between the western highlands and the eastern portion of the Cumberland Plateau, in what is now Tennessee and Kentucky. This invasion of the sea was, of course, an absolute barrier to any communication between the Unione faunas of the two regions.

The evidence afforded by the present distribution of the species of the group, to which these species belong, shows that its center of distribution, as affecting the present fauna, was in the southwest. Not only is the southwest the region of the greatest variation in the species of this group, but, while it extends from Texas easterly along the Gulf States as far as Alabama, and even into Georgia and Florida, and extends north through the entire Mississippi Valley to the Appalachians on the east and the Arctic regions on the north, there is no representative of that group found to-day, so far as records show, in any part of the Tennessee Valley. The inference to be drawn from this fact is that the group originated in the west, and after the great landslide of Cretaceous times. Another example, bearing upon the same general fact, is the distribution of the group, of which the well-known *Quadrula rubiginosa* is a leading example. If we are to rely upon the proposition that the center of distribution is the region where there is the greatest abundance of individuals and of specific forms, it would seem certain that this group originated in the southwest and from thence spread eastward to its present distribution. But *Quadrula rubiginosa*, like *Lampsilis luteola*, is not found in the Tennessee Valley. Its distribution through the Gulf States is similar to that of the *Lampsilis*, and its distribution north through the Mississippi and Ohio valleys is exactly the same. Like *luteola*, it is found in the Lake Erie, but for some reason, that we do not now know, no form of that group ever succeeded in obtaining a foothold at any time in the northern Atlantic fauna.

If the inferences to be drawn from these facts and others like them are to be relied upon, there would seem to be good reason to infer that the emigration, which was the beginning of the Atlantic fauna, took place after the invasion of the sea in the Mississippi

Valley in Cretaceous times, and would probably seem to have been in later Cretaceous or early Tertiary times.

It would seem most probable that the primitive ancestral form of the *complanatus* group also reached the Atlantic region by the same northern route. Although the greatest diversity of forms belonging to it is now peculiar to the southeastern Atlantic states and, under the axiom already quoted, would seem to indicate that that region was the center of distribution of the group, the weight of evidence is against it.

As has already been stated, the invasion of the sea up the Mississippi Valley in Cretaceous times prevented any emigration towards the east from the southwest during nearly the whole of the Tertiary Period. Moreover, during the greater part of that time this region itself was covered by the sea. The invasion of the southeastern States by the present Unione fauna must necessarily have been, comparatively speaking, a recent one. Had it been coincident with the advance of the southwestern fauna that now occupies the Gulf States to the west of the Alabama River, there would, no doubt, be some evidence left in the present fauna of those States. But there is none. The present distribution of the group shows that it stops abruptly before reaching the Alabama River. With one exception, the group is not represented in the fauna of the Alabama at the present time, nor is it found at all in any of the Gulf States west of that river.

The exuberant variability of the group in the southeastern States at the present time would also seem to indicate that it is comparatively a new comer, and that it has not even yet had time to settle down to stable lines of development.

On the other hand, the homogeneity of the group as a whole, in spite of its extreme variability within the group limits, would indicate that it is of ancient origin. The extraordinary range of the typical species, from Lake Superior to the Atlantic and south to Georgia, is evidence in the same direction.

Taking everything into consideration it must be said that, with the exception of a comparatively small number of species that from one cause or another have been able to get into the South Atlantic States from the faunas of the Alabama and Tennessee systems, all the evidence goes to show that the characteristic fauna of that region has been derived from the north.

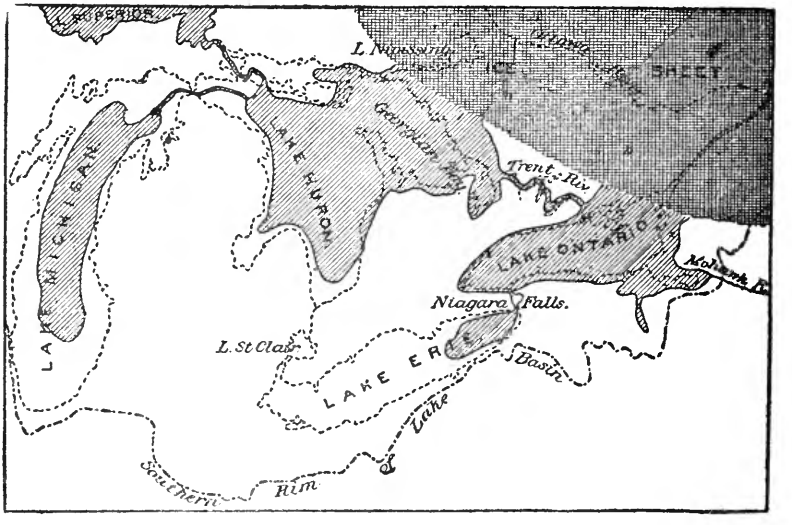
II.

Assuming, then, that the Atlantic fauna, in its inception, was derived from a very early immigration from the west, there has been abundance of time for it to become specifically differentiated. Unless the unanimous opinion of the geologists of this country is entirely wrong, it is clear that whatever remnants of this ancient fauna were left along the course of this ancient track of migration towards the east in the region of the Great Lakes were wiped out absolutely by the invasion of the ice during the Glacial Period. Whatever may be said in regard to there being any geological evidence of an unglaciated area in north central British America, there would seem to be no doubt but that the region of the Great Lakes was the very center of the destruction wrought by the invasion of the ice. As has already been said, the entire system of drainage was absolutely changed. The old system was wiped out and a new and radically different one established. The Great Lakes themselves are entirely the result of changes in the earth's surface, wrought by the invasion and subsequent retreat of the ice. It is stated by Grabau that at Detroit the present surface is 130 feet above the pre-glacial surface, and that the ancient bed of the pre-glacial Cuyahoga at Cleveland is 400 feet below the bed of the present river, and, as has already been stated, the present bed of the Ohio is 150 feet above that of its ancient predecessor. According to Taylor (4) the front of the retreating ice-cap at Toledo, Detroit and Port Huron stood in two hundred feet of water. There is no part of the present area occupied by the Great Lakes and their tributaries that was not included within this area of glacial destruction. We may assume, therefore, that whatever fauna was in existence prior to the advent of the ice was wiped out absolutely from this region. This being assumed, the present extension of the Atlantic fauna to the northwest must be looked for in the various systems of temporary drainage that were established in the post-glacial times prior to the final establishment of the existing St. Lawrence system. There can be no doubt but that here and there in the Atlantic region, north of the glaciated area, there were places in which the remnants of the ancient fauna were preserved, and that, from these harbors of refuge, upon the retreat of the ice, the Unionidæ were able to re-people the barren waters of the new land.

The ice in the lower lake region retreated towards the north and

east, and in the first stage, as soon as the edge of the glacier had passed the height of land north of the Mississippi and Ohio Valleys, the waters were impounded, and in the southern end of the present Lake Michigan and in the western ends of the present Lake Superior and Lake Erie, but at a much higher level, were formed the first post-glacial lakes. Lake Maumee, at that time bounded on the north and east by the ice, found an outlet into the Ohio through the present valley of the Maumee and the Wabash. Upon the further retreat of the ice to such an extent that a way was opened for an

Fig. 4.



outlet towards the east, there were successively different systems established. One of the earliest of these (Fig. 4) was that known as the Trent outlet, which extended, as shown by the figure, from the eastern end of Georgian Bay southeast across Ontario into Lake Ontario. From the south side of Lake Ontario the water flowed through the present Mohawk Valley into the Hudson.

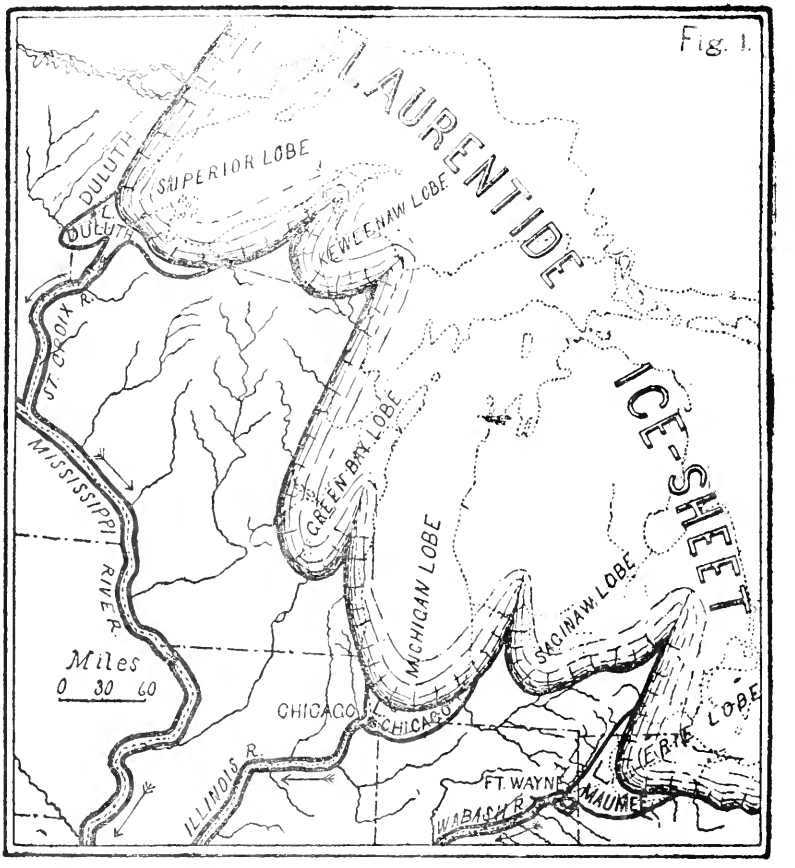
The opening of this new outlet to the east so lowered the water that it was diverted from its former course through Lake Erie, and the present area occupied by that lake became dry land, except for such local drainage as might be necessarily incident to the region

itself. Later, another outlet was formed, known as the Nipissing outlet, at a still lower level, which resulted in the closing of the Trent outlet, and the establishment of a new one along the present valley of the Ottawa into the St. Lawrence. When the Nipissing outlet was first established, however, there had been a lowering of the land toward the east, and the sea had invaded the region to a considerable distance up the Ottawa Valley beyond the present city of Ottawa, and into Lake Ontario. Later, with the subsequent rising of the land, the Nipissing outlet flowed through the present Ottawa Valley into what is now known as the St. Lawrence. It seems reasonably certain that the western invasion of the Great Lake region of the Atlantic fauna was through either the Trent or the Nipissing outlet, and the probability is in favor of the Trent outlet, because that was always entirely fresh water, and there would seem to be every probability, from what we know of the inter-glacial extension of the Mississippi fauna into this region, that the post-glacial lakes were almost immediately invaded by the fish and with them the Unionidæ of the regions to the south and to the east. So far as the particular question here involved is concerned, it is immaterial by which of these routes the invasion took place. Both of them began on the west, at the Georgian Bay, and afforded a continuous waterway from the east to the northwest. Both of these outlets were antecedent to the establishment of an outlet through the Niagara River. That no invasion from the east of the Atlantic fauna could have taken place by that route is clear for the reason that there was always, to a greater or less degree, a falls in the Niagara River, which was an absolute barrier to any migration of the fish upstream from the east, and that there was no such invasion from the east by that route is shown by the fact that in the case of the *Unio complanatus*, there is no evidence to show that it ever reached Lake Erie. The remarkable agreement between the present range of *Unio complanatus* and the route of these earlier post-glacial outlets is evidently more than a mere coincidence. If, then, the invasion was through either the Trent or the Nipissing outlet into Georgian Bay, it is easy to see how the species spread along the north shore of the Georgian Bay into the St. Mary's, and from thence into the eastern Lake Superior, without getting either into Lake Erie, Lake St. Clair, or the lower part of Lake Huron.

III.

As has already been stated, the first post-glacial lakes formed by the retreat of the ice in this region were in the south end of Lake Michigan and the west ends of Lake Erie and Lake Superior,

FIG. 5.



bounded on the south by the height of land and on the north and east by the ice cap.

Glacial Lake Erie (Lake Maumee), at that period, drained southwest into the Ohio, and as I have already shown in my paper on

"The Distribution of the Unionidæ in Michigan," (5) there can be no doubt but that almost immediately there was an invasion of this lake from the Ohio of the dominant species of that region, and it is unnecessary at the present time to discuss that subject further. In the same way, and at about the same time, the St. Croix outlet of Lake Duluth into the Mississippi would have given an opportunity for an invasion of that region by the Mississippian fauna. And it would seem probable that the occurrence of *Lampsilis luteola* and *superioriensis* in the western portion of Lake Superior at the present time is to be accounted for in that way.

(*To be concluded.*)

PUBLICATIONS RECEIVED.

THE GIANT SPECIES OF THE MOLLUSCAN GENUS LIMA OBTAINED IN PHILIPPINE AND ADJACENT WATERS. By Paul Bartsch (Proc. U. S. Nat. Mus., Vol. 45, pp. 235–240, pls. 12–20, 1913). The giant *Limas* here described were obtained during the Philippine cruise of the fisheries steamer "Albatross," 1907–1910. They occur only in deep water—161 to 559 fathoms. "They are by no means abundant or universally distributed, for of the 369 dredgings made in more than 100 fathoms only 18 yielded these mollusks." *Lima* (*Callolima*) *smithi* measures as follows: Alt. 175 mm., lat. 118 mm., diam. 48 mm. The type was dredged off Baliscasag Island in 432 fathoms. *L.* (*Callolima*) *philippinensis* measures, alt. 177, lat. 111, diam. 37; dredged off the outer Tayabas Light in 190 fathoms. *L.* (*Callolima*) *rathbuni* was obtained from eight stations at depths ranging from 161 to 226 fathoms, the largest specimen measuring, alt. 208 mm., lat. 156 mm., diam. 59 mm. *L.* (*Acesta*) *celebensis* has an alt. of 159 mm., and was dredged south of North Island, Buton Strait, in 519 fathoms. The paper is a valuable contribution to our knowledge of the deep-sea mollusca.—C. W. J.

THE PHILIPPINE MOLLUSKS OF THE GENUS DIMYA. By Paul Bartsch (Proc. U. S. Nat. Mus., Vol. 45, pp. 305–307, pls. 27 and 28, 1913). *Dimya lima* was found attached to the shells of *Lima* (*Callolima*) *smithi* and *L.* (*Callolima*) *dalli*, in 161 to 281 fathoms.

MOLLUSQUES DE LA FRANCE ET DES RÉGIONS VOISINES. Par A. Vayssière, professeur à la Faculté des sciences de Marseille, et

L. Germain, prèparateur au Muséum d'Histoire naturelle et à l'Institut Océanographique. 2 vols. in 18vo, 800 pages, with 67 plates containing 707 figures.[1]

The first volume, treating of the Amphineura and Opisthobranchs, is from the pen of Professor Vayssière, than whom no more competent authority could be found, the Opisthobranchs having occupied the author for many years. This connected account of the European species, in which the results of the most recent studies are presented in condensed form, will be a valuable reference book for classification and synonymy as well as a guide to identification.

The second volume contains an account of the land and fluviatile gastropod mollusks, by M. Louis Germain, who treats the subject in a broad spirit, relegating to synonymy many of the so-called species contained in the works of Locard and other writers of the species-splitting school. The work will doubtless be very useful in Europe, and also to conchologists elsewhere who have occasion to refer to European species. The figures, while characteristic, are coarse and crudely executed, and by no means equal to the other qualities of the work. The price is very moderate, 10 francs for the two volumes. —H. A. P.

Diagnoses of New Shells from the Pacific Ocean. By William Healey Dall. Proc. U. S. Nat. Mus., Vol. 45, pp. 587–597. Twenty-two new species from both shores of the Pacific are described, and one new genus, *Halicardissa*, type *Verticordia perplicata* Dall, from near the Galapagos Is.

New Land Shells from the Philippine Islands. By Paul Bartsch. Proc. U. S. Nat. Mus., Vol. 45. *Obba worcesteri* and *Cochlostyla olanivanensis*, from Olanivan I., and *Cochlostyla calusaensis*, from Calusa I., are land shells from small and rarely visited islands.

NOTES.

The ninety-third anniversary of the birthday of the Rev. Joseph Rowell was celebrated by a luncheon on April 20th. Many interesting speeches recalled events in the long career of Mr. Rowell as pastor of the Mariners' Church in San Francisco for 55 years. Two generations of conchologists have known Mr. Rowell as a naturalist. The day was concluded with a dinner and family reunion.

[1] Forming part of the "Encyclopédie Scientifique," issued by O. Doin et Fils, 8 Place de Odéon, Paris.

THE NAUTILUS.

VOL. XXVII. SEPTEMBER, 1913. No. 5

NOTE ON A NEW VARIETY OF EPIPHAGMOPHORA TUDICULATA.

BY H. A. PILSBRY.

This species is widely distributed in the southern part of California where it inhabits regions of quite diverse conditions of climate and soil. As would be expected, it varies conspicuously. Numerous races or local subspecies have been defined. Without entering into any revision of them here, a brief synopsis of the races may be found useful. Typical *E. tudiculata* Binney. Shell large, solid, copiously malleate, moderately to narrowly umbilicate. Type locality San Diego.

E. t. cypreophila Cooper. Smaller, thinner, often less malleate. Tuolumme, Merced and Calaveras Counties. Probably a Lower-Sonoran form.

E. t. umbilicata Pils. Openly umbilicate, solid, finely malleate throughout. San Luis Obispo Co.

E. t. convicta Hemph. Small, copiously malleate, without a band at the shoulder. San Diego Co.

E. t. subdolus Hemph. Similar but banded, and a little smoother. Probably Upper-Sonoran. San Jacinto Valley.

E. t. tularensis Hemph. Perforate, very thin, yellowish citrine or light yellowish olive. Fraser's Mill, Tulare Co.

E. t. binneyi Hemph. "Uniform greenish yellow without blotches or markings except a very faint trace of a band at the periphery. Mountains of San Diego Co."

E. t. grippi n. subsp. Pl. 3, figs. 15, 16, 17.

The shell is thin, *imperforate*, more globose than *tudiculata*,

strongly striate above, smoother and very glossy below, *not malleated*, or with only slight traces of malleation. Color dark raw umber or passing into dark olive, with a conspicuous dark chocolate band above the periphery, bordered with ecru-olive. Sutural line citron yellow. First four whorls russet or sometimes salmon-buff. Columellar lip spreads and is adnate over the umbilicus.

Alt. 24, diam. 32 mm.

Alt. 21.5, diam. 28.3 mm.

Santee, 18 miles from San Diego, California, collected by the late Mr. C. W. Gripp. Figured cotypes and eight others are No. 105300 A. N. S. P.

This very handsome snail is probably most nearly related to *E. t. binneyi* Hemph. which was described from a single specimen. It is known to me by one "dead" shell from Murphy's Canyon Mission Valley, San Diego Co., identified by Mr. Hemphill and given me by Doctor Fred Baker. *E. t. binneyi* is less globose than *grippi*, lighter colored, with no band.

NOTES ON SOME OREOHELICES FROM WYOMING.

BY HENRY A. PILSBRY.

The material giving occasion for these notes was collected by Mr. Don W. Walker in the vicinity of Shell, Big Horn Co., in northern Wyoming, for Mr. Junius Henderson, Curator of the University Museum at Boulder, Colo. We are indebted to Mr. Henderson for the opportunity of studying the shells, and for various notes bearing upon them, in part quoted below.

OREOHELIX YAVAPAI EXTREMITATIS Pilsbry & Ferriss.

Shell Creek Canyon, 10 miles northeast of Shell, Wyo., with *O. cooperi* and *O. pygmæa*, see below. Dry Gulch $2\frac{1}{2}$ miles east and 3 miles north of Shell, a dry place without timber, only a few bushes; dead weathered shells, strongly keeled. White Creek Canyon, 8 miles east of Shell, in very damp pine forest, only dead shells found. Trapper's Creek 7 miles east of Shell, about 4 miles south of White Creek Canyon, dead shells only.

This is a carinated form which differs from *O. hemphilli* (Newc.) by being less excavated above and below the peripheral keel, the

last whorl far less swollen above. In *O. hemphilli* all post embryonic whorls are more convex above. Moreover, *O. hemphilli*, according to Mr. Binney, has well-developed side-cusps on central and lateral teeth. These are entirely wanting in *O. yavapai* and its varieties, in numerous specimens I have examined, including some from Shell Creek Canyon.

The Oreohelices are divisible into two groups by certain peculiarities of the soft anatomy. One of these groups has hitherto been found only in Arizona, and comprised *O. barbata* of the Chiricahua Mts., and *O. yavapai* of central Arizona and New Mexico, with several subspecies in the Grand Canyon.[1] *O. y. extremitatis* lives just below the rim of the Canyon. On comparison with the specimens from Wyoming, no tangible difference, either in the shell or the soft anatomy could be found. Both vary somewhat in the prominence of the peripheral keel, but in the Wyoming specimens it is usually a trifle more prominent than in the average *extremitatis* from Arizona, the most strongly keeled "subfossil" shells reminding one of *O. chiricahuana*. On comparing a large number the difference is minimized, selected *extremitatis* from the type locality having the keel as strong as in any of the Wyoming lot.

The extension of this form northward is unexpected, the whole width of Utah and Colorado as well as most of Wyoming lying between its northern and southern areas. Mr. Henderson writes:

"I suppose little is yet really known of the molluscan fauna of the region intervening between the Grand Canyon and Wyoming. I find but little published literature on Wyoming shells, and do not know of much collecting having been done in eastern Utah or western Colorado. It is true that at present there are great stretches of country unfavorable to land snails in that region, and equally true that semi-arid conditions have prevailed in the southwest for a long time—probably since Pliocene time. Nevertheless, there are several reasons for believing that during that long period of semi-aridity there has been more or less fluctuation within narrow limits. During each cycle of increased moisture favorable conditions would reach greater extent, and if the snails spread with the increase of favorable territory, there would be small areas where they could obtain a

[1] See "Mollusca of the Southwestern States V," 1911, where the Oreohelices of the Grand Canyon are figured.

foothold and continue to thrive locally until the next cycle of moisture, and thus in a few hundred years, perhaps extend their range a long way, and in a few thousand years cross a State or two. I have some interesting mollusk records bearing upon the question of such fluctuations, not yet published. So the mere fact of intervening distance is not a fatal objection to considering the Wyoming shells identical with the Grand Canyon form, if you do not think the difference in the keel is sufficient to separate them, of which I am doubtful myself. * * * * Professor Cockerell was just in the Museum and we went over the *extremitatis* material together, and conclude that in the uneroded shells there is no essential difference between the Wyoming specimens and those from the Grand Canyon, so I am labelling them all *extremitatis*."[1]

OREOHELIX COOPERI (W. G. B.).

Trapper's Creek, 7 miles east of Shell, White Creek Canyon. Shell Creek Canyon, 10 miles northeast of Shell. 2 miles south of Anchor on the north slope of mountain at its foot, among pines and underbrush, on Owl Creek. This place is about 60 miles south of Shell Creek.

OREOHELIX PYGMÆA n. sp. Plate III, figs. 10, 11, 12.

The shell is related to *O. cooperi*, from which it differs in being smaller, with a narrower umbilicus, *much more convex whorls*, and *rougher sculpture*. The spire is convexly conic. Embryonic two whorls moderately convex, finely and weakly striate, with a few distinct spirals on the latter part near the periphery. Post embryonic whorls increase very slowly and are *very convex*, the convexity greater above the middle of each, with sculpture of *strong, irregular wrinkles* along growth-lines and moderate or very weak spiral impressed lines. On the last whorl, which is very convex throughout, the sculpture is strongest above, but continues upon the base. Suture deeply impressed. Umbilicus small, its width contained five to six times in that of the shell. Peristome thin, forming $\frac{3}{4}$ to $\frac{4}{5}$ of a circle. The spire is flesh-colored when worn, fleshy-brown with whitish streaks in young shells; the last 1 or $1\frac{1}{2}$ whorls are impure white with fleshy streaks; marked with a deep brown band below the

[1] Junius Henderson in letter, Nov. 15, 1912.

periphery, and usually several narrower bands above it and on the base.

Alt. 8.7, diam. 11 mm., whorls 5.

Alt. 7, diam. 9.7 mm., whorls $4\frac{3}{4}$.

Alt. 7, diam. 9.3 mm.

Alt. 8, diam. 9 mm.

Shell Creek Canyon, 10 miles northeast of Shell, Wyoming, type and cotypes no. 106977 A. N. S. P., also 106979 A. N. S. P. (dead shells from type loc.). Also in coll. University of Colorado. It was found also in White Creek Canyon, 8 miles east of Shell, in very damp pine forest. Collected by Don W. Walker.

"Mr. Walker, who collected the Wyoming material, says the Shell Creek *pygmæa* and *cooperi* were found together on a steep slope on the south side of the canyon, where they occurred in great numbers, more of the small ones below and more of the *cooperi* above" (Henderson). It was found with *O. cooperi* also in White Creek Canyon.

This snail is exactly intermediate between *O. cooperi* (W. G. B.) and *O. peripherica* (Ancey). The irregular costulæ or wrinkles are stronger than in the first, but weaker and less regular than in *O. peripherica*. Further collections in Wyoming may show that *O. pygmæa* connects with one or the other of these species, but at present it seems best to rank it as a distinct species, since this course is more likely to insure critical examination into its status by those who may secure further material. Moreover, its occurrence in company with *O. cooperi* disposes of the hypothesis that *pygmæa* is a stunted or unfavorable-station form of *cooperi*—an idea which I would otherwise have been inclined to harbor. It is readily distinguishable from young or small *cooperi* by the *far greater convexity* of the whorls of the spire, as well as by the sculpture. As I have seen a great number of *O. cooperi* from many places, it does not seem likely that intergrading forms occur.

O. cooperi minor (Ckll.) is a larger form than *pygmæa*, having less convex whorls, and the other characters of *cooperi*, of which it is, as the name implies, merely a somewhat diminutive race. Specimens from Mr. Henderson, taken at McCoy, Colo., and identified by Professor Cockerell as his var. *minor*, have been compared.

O. peripherica (Anc.) is the prior specific name to include the series of local races described as var. *binneyi*, *newcombi*, *multicostata*,

gouldi, *albofasciata* and *castaneus* Hemphill,[1] all of northeastern Utah. So far as specimens now known to us give evidence, these local forms taken together constitute a species distinct from *O. idahoensis* (Newc.). No real intergrades between *peripherica* and *idahoensis* have yet been found, whatever may exist still uncaught in the territory intervening between their respective areas.

MOLLUSCA FROM WYOMING CO., N. Y.

BY FRANK C. BAKER.

A few years ago the writer spent a week's vacation in Wyoming County, N. Y., and incidently gathered a few shells as opportunity offered.

Banks of Genesee River, near Portage, under bark of dead tree trunk:

Zonitoides arborea (Say).
Gastrodonta ligera (Say).
Pyramidula cronkhitei anthonyi Pilsbry.
Cochlicopa lubrica (Müll.).

In running brook by roadside:

Galba umbilicata (C. B. Adams).

Farm of John Smallwood, near Warsaw, swamp in bottom land:

Galba palustris (Müll.).
Physa gyrina (Say).

Swales in upland woods:

Zonitoides arborea (Say).
Pyramidula cronkhitei anthonyi Pilsbry.
Succinea avara Say.
Physa gyrina Say.
Aplexa hypnorum (Linné).
Segmentina armigera (Say).
Galba palustris (Müll.).
Galba obrussa (Say).
Galba umbilicata (C. B. Adams).
Sphærium occidentale Prime.

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[1] See Second Supplement to Terr. Moll. V, pp. 29–32.

THE GENERIC NAME TO BE USED FOR MUREX TRITONIS LINNE.

BY TOM IREDALE.

In The Nautilus, Vol. XXVI, pp. 53, 59, Sept., 1912, my friend Dr. W. H. Dall, commenting upon a note by Mathews and myself regarding the first introduction of the genus *Septa* by Perry, wrote: "The first name available for the group typified by *Murex tritonis* L. seems to be *Nyctilochus* of Gistel, 1848."

Recently, referring to some notes I made upon Gistel's names a complication seems apparent and I therefore give the data I have.

Gistel in the "Naturgeschichte Thierreiche," 1848, gave a long list of preoccupied names and substitutes. On p. 11 he included; "*Triton* (Laurenti, Lurch) bl: *Triton* (Broderip, Isis 1835, 453, Rankenfüssl): *Nyctilochus* N."

From this it would appear that *Nyctilochus* was provided as a substitute for *Triton* of Broderip as used in the Isis 1835, 453. At this place a résumé of the papers published in the Proc. Zool. Soc. Lond. is given and we find:

"P. 71, *Triton clathratus*, *nitidulus*, *distortus*, *reticulatus*, *mediterraneus*, *ceylonensis*, *lineatus*, *decollatus*."

The "p. 71" refers to the Proc. Zool. Soc. Lond., 1833, where these species are described by "G. B. Sowerby," and a note given after *lineatus* reads:

"These seven may be regarded by some as mere varieties of *Trit. maculosus* of Lamarck, although I am fully satisfied of their being perfectly distinct species."

There is evidently an error in Gistel's reference both to the column of the "Isis" and to the page of the Proceedings of the Zoological Society, the second error deriving from the first. The reference to the "Isis" should be column 452; there is no paper on *Triton* by Broderip on page 71 of the Proceedings, but there is on page 5. Here we have a different list from that of Sowerby, namely, *Triton lignarius*, *constrictus*, *tigrinus*, *rudis*, *lineatus*, *gibbosus*, *scalariformis*, and *convolutus*. None of these is a *Septa*, and *Nyctilochus* judged by either list of species is synonymous with Bolten's earlier names, or with *Fusus* Helbling (*non auct.*).

In the body of his work Gistel however provided a generic name for *M. tritonis* L. alone, and I conclude that this name should be used. On p. 170, Gistel introduced:

"Tritonshornschnecke (*Charonia* Nob.; sonst: *Tritonium*)." Then follows a generic diagnosis and there is given a description of the species "*Ch. tritonis* Nob."

I conclude then, if no name exists prior to Gistel, 1848, that *Charonia* Gistel should be the generic name to be used for *Murex tritonis* Linné.

Two further points require notice: To those unable to refer to Gistel a second *Charonia* might prove troublesome, as on p. 178 with a quaint carelessness he proposes *Charonia* for an Acaleph.

The family name to be used for the *Tritons* I would suggest should be *Cymatiidæ*, based upon the oldest genus name in the family. Basing the family name upon the supposed typical genus seems a quite unscientific method, as so much would depend upon the personal equation; speaking for myself I would have considered *Murex tritonis* Linné, a quite atypical member of the family, glancing over the whole of the molluscs at present associated in it.

THE UNIONE FAUNA OF THE GREAT LAKES.

BY BRYANT WALKER, SC. D.

(*Continued from page 47.*)

IV.

From what has already been said, it would seem to be clear that there is not any possibility that the present fauna of Lake Erie could be a relict fauna that persisted there during the glacial period. The entire region was covered by the ice and the entire configuration of the land was overwhelmed, blotted out, and the system of drainage was entirely changed by the drift deposited on the retreat of the ice. That under the enormous thickness of the ice cap throughout that entire area, there could have been any survival of a Naiad fauna seems absolutely impossible. But there are other facts, which show that the representatives now found in the Great Lake region of the Mississippi and Ohio faunas, are the results of a post-glacial invasion and that the modifications that have taken place in their size, shape, and appearance have been brought about by environmental changes since glacial times. The entire Lower Peninsula of Michigan was in the glaciated area. If the present fauna of that area has been derived from a survival in the Great Lakes, or in

any of the pre-glacial streams of that region, of the pre-glacial fauna, and not from a post-glacial invasion from the south, it would seem a necessary result that the Unione fauna of the entire region should be to-day of the same general character, and that the peculiarities of the present Lake Erie fauna should be also characteristic of the same species as found in the interior waters of the State. But that is not the fact. The differentiation that has occurred is entirely in the race which is found in the colder waters of the Great Lakes. In the warmer waters of the interior of the State, the species attain the same size, the same luxuriance of growth and the same color that they do at the present time in the Mississippi and Ohio valleys. In other words, the interior waters of the Lower Peninsula of Michigan are inhabited by the typical forms of these species just as clearly and as certainly as the examples found in the Great Lakes are peculiarly modified into what is known as the Great Lake forms.

Thus, for example, the Great Lake form of the species known as *Lampsilis recta* is depauperate, and standing by itself, would seem to be specifically different from the typical form. It was described as a distinct species under the name of *sageri* by Conrad. But in the Rouge River, less than ten miles from Detroit River, and in the Clinton River, at Mt. Clemens, at no greater distance from Lake St. Clair, examples of this species are typical in every respect, and are as large and heavy as the average specimens from the Ohio and Mississippi valleys. The same is true of nearly every species now represented in the peculiar fauna of the Great Lakes. That being the case, it is obvious that either one of two things must be true. There has been no natural connection between the St. Lawrence region and the Ohio Valley since the Maumee outlet of the post-glacial Lake Erie was cut off by the retreat of the ice and the establishment of another outlet at a lower level. If the present Lake Erie fauna was the survival of the pre-glacial fauna of that region, then the interior of the State must have been populated by migration upstream from the relict fauna of the Great Lakes, and it hardly seems possible if that were true, that the subsequent modifications of these species from the Great Lake form consequent upon their introduction to a different environment, warmer water, and more abundant food, should have been directly back to and exactly coincident with the typical form as found in the regions south of the glaciated area. On the other hand, if that is not so, the

only alternative is that the present Lake Erie fauna was derived from an immigration of the typical forms from the south, and that where these immigrants obtained a foothold in the interior waters of the State, where the local conditions were substantially the same as those in the Ohio Valley, they retained their characteristic form, while such individuals of this invasion as remained in the Great Lakes and were subject to the peculiar influences of that environment, became modified by it with the result, as shown by the present conditions, of a varietal, but not a specific, differentiation.

In conclusion, the deductions that would seem to naturally result from the foregoing discussion are these:

1. That the Atlantic fauna originated from a very early pre-glacial invasion from the west, probably in late cretaceous or early tertiary times.

2. That the present extension of the Atlantic fauna towards the northwest was the result of an invasion from the west, in post-glacial times, most probably through the Mohawk and Trent outlets into Georgian Bay, and from thence into Lake Superior.

3. That the present existence of so large a representation of the Mississippian fauna in Lake Erie is to be ascribed to a post-glacial invasion from the Mississippi Valley through the Maumee outlet into the post-glacial Lake Maumee.

4. That the original pre-glacial fauna of the present St. Lawrence system was absolutely exterminated during the glacial period, and that the peculiar fauna now characteristic of Lake Erie is the result of the modification from environmental causes of the post-glacial immigrants from the south, and not the result of any survival in that region of any part of the pre-glacial fauna.

NOTE.—By an error on the part of the type-writer, *Ptychobranchus phaseolus* Hild. was omitted from the list of the Lake Erie species on p. 22. It was included in the original draft of the paper and is necessary to complete the tally of "thirty species" peculiar to that lake mentioned on p. 23. It is an abundant species at the western end of the lake, but dwarfed like most of the fauna.

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MARINE SHELLS FROM DRIFT ON UPPER MATECUMBE KEY, FLORIDA.

BY JOHN B. HENDERSON.

In May last while cruising down the Florida keys in the "Eolis," Mr. Simpson, Mr. Clapp and I went ashore on Upper Matecumbe for an assault upon the land shells. Returning along the beach we observed a little sheltered cove, wherein the usual line of small drift shells appeared to be exceptionally rich. We scooped up a pill-box full—containing about the measure of an ordinary tablespoon—of this rubbish. The appended list of species therein contained may be of interest. The presence of *Pyrazus milium* Dall is noteworthy, as this little *Cerithium* has only recently been described from the Pleistocene of Panama. The *Sayella crosseana* Dall is also interesting. This specimen is perfect, of a rich chestnut-brown, and greatly resembles a miniature *Obeliscus* from Cuba. There are some other species in the lot, but the shells are too young or worn for positive identification.

Rissoina chesnelli Mich.
Rissoina laevigata C. B. Ad.
Rissoina decussata Montagu.
Rissoina cancellata Philippi.
Alvania lipeus Dall.
Litiopa bombyx Kiener.
Caecum floridanum Stimp.
Caecum cooperi Smith.
Meioceras nitidum Stimp.
Seila terebralis C. B. Ad.
Cerithium variabilis Ad. (small race).
Pyrazus milium Dall.
Triforis nigrocinctus C. B. Ad.
Bittium varium Pfr.
Mangilia biconica C. B. Ad.
Crepidula fornicata L. (young).
Acmaea punctulata pulcherrima Guild.
Siphonaria alternata Say (young).
Phasianella pulchella Orb.
Neritina viridis Lam.
Neritina virginea L. (young).
Ischnochiton papillosus Ad.
Eulima gracilis C. B. Ad.
Pedipes mirabilis Muhlf.
Actaeon punctostriatus C. B. Ad.
Tornatina canaliculata Say.
Tornatina candei Orb.
Truncatella bilabiata Pfr.

Mangilia atrostyla Dall.
Mangilia stellata Stearns.
Marginella catenata Montagu.
Anachis avara Say (var.).
Anachis pulchella Kiener.
Olivella mutica Say.
Olivella floralia Duclos.
Crepidula convexa Say (young).
Truncatella caribbeensis Sby.
Sayella crosseana Dall.
Odostomia sp.
Augulus tampaensis Conr.
Pleuromeris tridentata Say.
Codakia orbiculata Mtg.
Chione grus Holmes.
Transenella stimpsoni Dall.

CORRESPONDENCE FROM ARIZONA.

Late in May Mr. Ferriss went into camp in Sabino canyon in the southern Catalinas, about 20 miles from Tucson. The following extracts give an idea of the conditions of molluscan life in that vicinity.

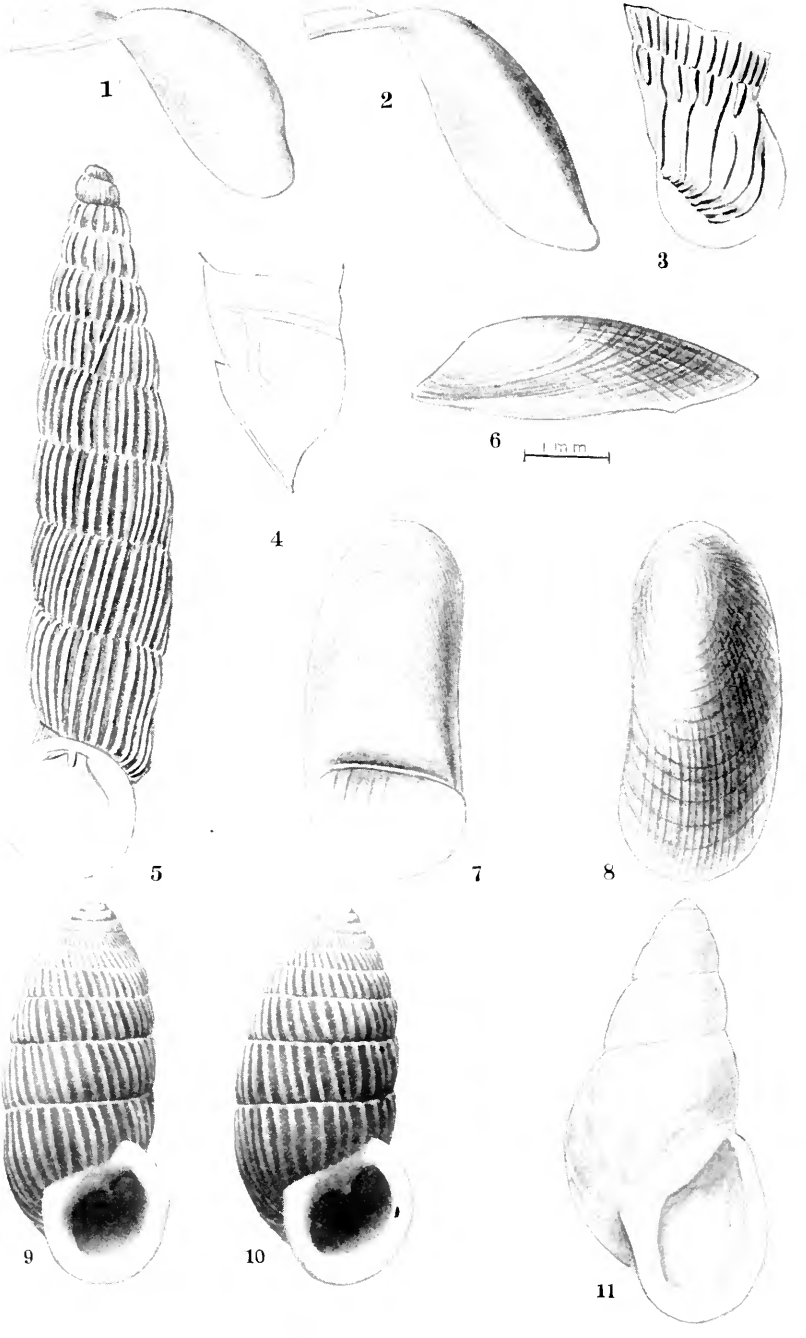
"The climate here is dryer than formerly, or else we have much to find out touching the Sonorellas. This situation will compare favorably with Nine-mile Waterhole in the Chiricahuas, and the Sierra Colorado, as to crumbling granite and quartzite, dryness and heat. I go forth for dead shells, and if any are found alive it is so much velvet. The proportion of dead in fair condition to alive is about 100 to 1, and you have nearly all the live ones. That is, I find about one alive on each day's trip. In some cases one species apparently died out years ago and another came in later; thus I have some very old shells.

"Another thing that makes me feel that the climate has changed is that there are remains of an Indian city at the mouth of the canyon, extending up to the Rincons, ten miles, and about four in width. When the water failed they probably moved. There are similar village foundations on the other side of the mountain and on the east side of the Dragoons.

"There is more bird, fish and mammal life here than in any mountain we have visited, and much of it is interesting, and again I am sorry you are not here. The snakes and lizards are fine. I have a good turtle shell the Acadamy can have if of value. There is also a little "stink pot" in the stream.

"The prairie dog here is a mere puppy, a pigmy. The chipmunks and squirrels are different. The birds are gorgeous. * * *

"JAS. N. FERRISS."



1-5. PILSBRY: CLAUSILIA EMERSONIANA.
6-8. CLAPP: GUNDLACHIA HJALMARSONI PFR.
9, 10. HENDERSON AND CLAPP: CERION BIMINIENSE.
11. PILSBRY: PARTULA EMERSONI.

THE NAUTILUS.

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FURTHER NOTES ON HELIX HORTENSIS IN NEW ENGLAND.

BY CHARLES W. JOHNSON.

About 1834 Amos Binney collected and later described (Boston Journ. Nat. Hist., vol. i, p. 485, pl. 17, 1837) a form of *Helix hortensis* as *Helix subglobosa*, stating that "it is common on the lower part of Cape Cod and on Cape Ann, and is very abundant on Salt Island, a rocky, uninhabited island near Gloucester." Salt Island being the only exact locality mentioned might therefore be considered the type locality of this form. Binney had evidently at that time not seen a banded form from North America, for on page 487, in comparing these with the *Helix hortensis* of Europe, he says: "Ours being yellow, with an olivaceous tint and destitute of bands, while that is remarkable for its great diversity of coloring and brilliant zones."

Again referring to the species under *Helix hortensis* in his "Terrestrial Air-breathing Mollusks," vol. ii, p. 112, he says: "The prevalent character of this and probably of other species in a given locality seems to undergo a considerable change from time to time. When I first visited Salt Island, where this 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 not to be uncommon."

Recently I obtained from Salt Island a number of specimens, all representing the plain olivaceous yellow form described by Binney as *H. subglobosa*. Not a single banded form could be found on the island. On the other hand, on Briar Neck, a rocky promontory only

one-fifth of a mile from Salt Island, to which one can walk at low tide, only the banded form—12345 and occasionally 10345—could be found. Note that Binney in his second work says, "banded varieties are said not to be uncommon." This would indicate that he did not visit the island a second time, and that there is no positive proof that the banded varieties referred to came from there. They were probably found on the near-by promontory.

At Bass Rocks, one-half mile southwest of Briar Neck, and separated by a sandy beach, marsh and creek, both the plain and banded forms occur in almost equal numbers. The yellowish-white form, *subalbida* Locard, comprise about one-half of those classed as plain, the other being the bright yellow form, often with an obsolete brown or translucent band. The banded forms show the following variations: 12345, 123(45), 12045, 00300. After a shower I found these in numbers, but only along the narrow strip of natural growth left between the road and high-water mark. This strip being traversed by a walk, many were crushed under foot by pedestrians. I next visited Emerson Point ("Land's End," Rockport), about two miles northeast of Briar Neck, from which it is separated by Long Beach and a small creek. Here I found both the plain and banded forms, only about 25 per cent., however, being banded.

It seems quite interesting that in the four localities above mentioned, the shells from the two nearest together (Salt Island and Briar Neck) show scarcely any variation in their respective stations, while those found on either side are considerably diversified, and that the form *subglobosa* on Salt Island has undoubtedly remained unchanged since Amos Binney collected it there about eighty years ago.

During the month of July Dr. J. A. Cushman, while collecting material with Prof. J. S. Kingsley in Casco Bay, Maine, visited a number of the islands and made a very interesting collection of *Helix hortensis*, adding materially to our knowledge of its distribution. On the western portion of Brown Cow Island, 96 specimens were collected, of which six were banded—12345; nine had pale translucent bands—v. *arenicola*, and the remainder were the v. *subglobosa*. From the eastern portion of the island the material contains 35 v. *subglobosa* and six banded—12345; among the latter there was a tendency for bands one and two to fuse toward the margin.

From Inner Green Island the collection contained 160 plain; 16 banded—12345; 3—00300; band three is somewhat obsolete, and bands one and two are frequently more or less fused toward the margin; a few with translucent bands.

The collection from Swan Island of 43 specimens are all banded —12345, and show but little variation.

The specimens from White Bull Island show perhaps the greatest variation of any New England locality. The following variations were represented in a series of 95 specimens; 6 *subglobosa;* 4, 00300, band usually obsolete except near the margin; 2, 00340, band four obsolete except near the margin, and bands one and five very slightly indicated near the margin; 68, 12345; 10, (12)345; 1, (123)45; 3, (12345). The species has not before been recorded from the last two mentioned islands.

On Eastern Mark Island only *Pyramidula alternata* Say, and *Polygyra albolabris* Say, were found, with one sinistral specimen of the latter. On Jaquish and Turnip Islands only *Pyramidula alternata* was found.

LAND SHELLS COLLECTED ON THE BIMINI ISLANDS, GUN AND CAT CAYS, BAHAMAS.

BY GEORGE H. CLAPP.

In May 1912 the writer with J. B. Henderson and Charles T. Simpson visited the Biminis and adjacent keys in the yacht *Eolis.* The object of the expedition was primarily for the collection of marine mollusks along the edge of the Gulf Stream which almost touches the shore of these islands; considerable effort was made however, to secure a full list of the land shells and the following represents the results of some hard work under a very hot sun. The identification of these shells was made under the difficulties always presented by a fauna that consists of a mixture of several elements and where the various races of species through isolation have taken on characteristics differing slightly from the typical. The astonishing abundance of *Cepolis varians* is worthy of comment. For the most part, however, land shells are not abundant on these islands, even the Cerions, that standby of collectors in the Bahamas, are only to be gathered in a few restricted localities.

Lucidella tantilla Pils.	Bimini, Cat and Gun Cays.
Opisthosiphon bahamensis Shutt.	Gun Cay.
Thysanophora selenina Gld.	Bimini, Cat and Gun Cays.
" sp.	Bimini.
" sp.	Bimini, Cat and Gun Cays.
Pupoides modicus Gld.	Bimini, and Cat Cay.
Bifidaria servilis Gld.	Bimini, and Cat Cay.
" hordeacella Pils. (?)	Bimini, and Cat Cay.
" sp.	Cat Cay.
Strobilops hubbardi A. D. Br.	Bimini.
Opeas pumilum Pfr.	Bimini.
Oleacina solidula Pfr.	Cat Cay.
Varicella (Pichardiella) gracillima floridana Pils.	Bimini, Cat Cay.
Polygyra microdonta Desh.	Bimini.
Cepolis (Hemitrochus) varians Mke.	Bimini.
Cepolis (Hemitrochus) maynardi Pils.	Bimini, Cat and Gun Cays.
Cepolis (Plagioptycha) duclosiana Fér.	Bimini.
Succinea sp. (juv.)	Bimini.
Cerion maynardi Pils.	Bimini.
" biminiense H. and C.	Bimini.
" pillsburyi Pils. & Van.	Bimini.

The above listed *Bif. servilis* Gld. cannot well be separated from *B. rupicola* Say of the Atlantic coast of the United States.

CERION (STROPHIOPS) BIMINIENSE SP. NOV.

BY JOHN B. HENDERSON, JR., AND GEO. H. CLAPP.

Shell shortly rimate, cylindric in the last two whorls, then gradually tapering to the apex; solid and strong; livid flesh-colored, frequently with whitish blotches, which include two or three ribs, or the ribs may be lighter than the body color; tip generally white and the last whorl much lighter *below* the periphery. Sculpture of regular,

crowded ribs narrower than their intervals; ribs slightly bent forward at the suture, 32 to 36 on the penultimate whorl in average specimens. Whorls about 10, very slightly convex, the last ascending in front. Aperture vertical, slightly flesh-tinted inside; peristome white, thick, well reflexed, terminations slightly approaching; parietal callus heavy, appressed. Parietal tooth narrow and very short, about $\frac{1}{2}$ mm. high, axial fold moderate.

Smallest, length $19\frac{1}{2}$, diam. $10\frac{1}{4}$, aperture $8\frac{1}{2} \times 7\frac{3}{4}$ mm., whorls 9, ribs 33.

Largest, length $27\frac{3}{4}$, diam. 13, aperture $11\frac{1}{2} \times 9\frac{3}{4}$ mm., whorls 10, ribs 37.

Average length $24\frac{1}{2}$, diam. 12, aperture 10 x 9 mm., whorls 10, ribs 36.

There is considerable variation in the number of ribs, as a specimen $21\frac{1}{2} \times 10\frac{1}{2}$ mm. has 38, one $22 \times 11\frac{1}{2}$ has 42, and one $27\frac{1}{2} \times 12$ has only 31.

Plate IV, figs. 9, 10. Over 200 shells have been examined.

Southern end of North Bimini Cay, Bahamas, May, 1912.

These shells were collected on the extreme southern end of the Cay on young sisal plants. From 15 to 30 shells could be gathered from a single plant. An occasional specimen was picked up under or on the "sea-grapes," but it appears to be confined to the southern point of the island, as further up only an occasional dead "crab-shell" was found. About three-quarters of these shells are cleaned perfectly, and these are considerably lighter than the ones in which part of the animal remains. By accident only two young examples were saved, and these show no sign of internal teeth. In collecting we noticed that a number of the adult shells had the lower part of the lip bitten off, as if some rodent had attacked them at that point.

NEW SPECIES OF CLAUSILIA AND PARTULA FROM THE COLLECTION OF MR. J. S. EMERSON.

BY H. A. PILSBRY.

When looking over the fine series of Hawaiian shells in the collection of Mr. Emerson in Honolulu, I had opportunity to note the presence of many shells foreign to the islands. Among them there is a good series of land shells collected by him in Europe, and many

interesting South Sea shells from places visited by the well-known "Morning Star," and from other sources.

Unfortunately the limitation of my time allowed only brief glances at a few drawers of this rich material. The following species were among a few shells which Mr. Emerson put aside for me to take home for determination.

CLAUSILIA EMERSONIANA n. sp. Pl. IV, figs. 1 to 5.

The shell is slenderly fusiform, opaque, vinaceous buff with paler ribs, upper half tapering slowly to an obtuse apex. Whorls about 10, the first 2 corneous, very convex, delicately striate, the tip glossy; riblets then begin, at first rather well spaced on the convex whorls. In the middle of the fifth whorl they become closer, and from there to the last whorl they are close, straight and strong, and the whorls are only slightly convex. The last whorl, in dorsal view, is decidedly narrower, straight-sided, the base convex, indistinctly angular at junction of lateral and basal surfaces. The back of the last whorl has few, widely separated ribs, alternating with short ones below the suture. Last whorl solute, shortly free. Aperture quadrate-rounded, the peristome continuous, free, white, broadly expanded and reflected. Superior lamella low, not attaining the margin, widely separated from the spiral lamella; inferior lamella low, obliquely ascending, sigmoid, penetrating slightly deeper than the spiral lamella, to the middle of the ventral face. Subcolumellar lamella not visible in the aperture. Principal plica strong, conspicuous in the aperture, penetrating to a lateral position, approaching close to the spiral lamella deep within. Lunella lateral, straight, oblique, somewhat protractive, at the upper end terminating in an ill-defined upper palatal nodule which is united by a callus with the principal plica; lower end of the lunella running into an oblique lower palatal plica.

Length 17.5, diam. in the middle 3.5 mm.; $10\frac{1}{3}$ whorls.

Length 15.25, diam. in the middle 3.4 mm.; $9\frac{1}{2}$ whorls.

The clausilium is narrow, parallel-sided, arcuate and twisted, in transverse section v-shaped, much thickened along the longitudinal convexity and at the distal end, which is obtusely rounded; gradually tapering into the filament above. Pl. IV, figs. 1, 2.

Malta. Cotypes No. 108775 A. N. S. P. and in Mr. Emerson's collection.

This species differs conspicuously from *C. imitatrix* Bttg.[1] by its much more slender contour and the sculpture of the last whorl, besides various other details. *C. melitensis* Gatto, differs in sculpture, shape and position of the lunella, etc.

C. imitatrix was placed by Dr. Boettger in the sub-genus *Papillifera*, noting that it is transitional to *Albinaria*. Westerlund in his latest monograph places *imitatrix* and *melitensis* in a new section, *Imitatrix*, of *Albinaria*. The systematic position of *C. imitatrix* is therefore somewhat uncertain, and as that species seems the most closely related one to *C. emersoniana*, I assign the latter to the subgenus *Papillifera* with some doubt. However, from the shape and curvature of the clausilium, I do not think it can be an *Albinaria*. In sculpture and texture, the shells are much like *Siciliaria*.

PARTULA EMERSONI n. sp. Pl. IV, fig. 11.

The shell is rather narrowly, half-covered umbilicate, *elongate*, rather thin, Isabella color or of a slightly more olive shade, having an extremely faint brown band below the periphery and a distinct but narrow whitish border below the suture. Surface very glossy; earlier whorls distinctly engraved spirally, but on the penultimate whorl only the upper half is so engraved; *last whorl not spirally striate, but distinctly and rather coarsely malleate.* Outlines of the spire slightly convex, the summit obtuse. Whorls $5\frac{1}{2}$, moderately convex, the last somewhat flattened above the periphery, very convex beneath. Suture moderately impressed, an inconspicuous cord immediately above and partly covered by it in the intermediate whorls. Aperture long ovate; peristome nearly white, well expanded and reflected, slightly thickened within.

Length 19.1, diam. 9.2, length of aperture with peristome 9.5 mm.

The locality of this species is unfortunately not certain. It was collected on one of the voyages of the "Morning Star," and is labeled "Ponape."? As it is of Melanesian type, and unlike the known Caroline Island *Partulas*, this locality seems doubtful. The species clearly belongs to the subgenus *Melanesica*, but is quite distinct from all known species by the conspicuous malleation and absence of engraved spiral lines on the last whorl. Few other species are so long and narrow as this. It is named in honor of Mr. J. S. Emerson, of Honolulu.

[1] Jahrbücher d. d. Malak. Ges. VI, p. 120, pl. 3, f. 13. Kobelt, Iconographie, n. F. VI, p. 31, no. 1005.

NOTES ON POST-GLACIAL MOLLUSCA, II: WAUKESHA COUNTY, WISCONSIN.

BY FRANK C. BAKER.

A few years ago Mr. Frank M. Woodruff secured a number of post-glacial mollusks near Waukesha, Wisconsin. This locality is in the northwestern part of the County, and is well within the area of the late Wisconsin ice sheet. The body of water in which the mollusks lived was one of the many small lakes left by the retiring lobes of the Lake Michigan glacier. It has not been possible to correlate this marl deposit with any one glacial stage of Lake Chicago. Mr. Woodruff reports the shells as very abundant. Eight species have been identified, as noted below:

Amnicola walkeri Pilsbry.
Physa ancillaria warreniana Lea.
Physa walkeri Crandall. Several scalariform individuals.
Planorbis campanulatus Say.
Planorbis bicarinatus Say.
Planorbis parvus Say.
Planorbis exacuous Say.
Galba nashotahensis Baker.

A NEW SINISTRAL AMASTRA.

BY C. MONTAGUE COOKE, PH.D.

AMASTRA PILSBRYI n. sp.

Shell imperforate, sinistral, elliptical with conic spire which is somewhat contracted near the summit. One cotype is of an old gold color, streaked with chestnut behind the outer lip, and with the spire brownish; the other (dead) cotype is wax yellow in front of the aperture, elsewhere with a yellow gleam under a pale tawny cuticle, the last third of the last whorl chestnut. Surface of the last whorl semi-matt, the spire more shining; smooth to the eye, but under the lens unequal growth-wrinkles are seen. Embryonic 2½

whorls carinate, the keel visible above the suture; first half whorl nearly smooth, the next two whorls sculptured with regular, slightly arcuate ribs, at first rather coarse, becoming finer to the end of the embryonic shell, which comprises $2\frac{1}{2}$ whorls. Whorls $5\frac{1}{2}$, convex, the last swollen below the deeply impressed suture, ventricose, tapering below. The aperture is rather long and narrow, slightly oblique, white within. Peristome slightly thickened close to the edge. Columellar lamella of moderate size, thin and spiral, white; parietal callus thin.

Length 13.1, diam. 7.7, length of aperture 7 mm.

Length 13.4, diam. 8.1, length of aperture 7.1 mm.

Mt. Helu, West Maui. Cotypes in coll. Bishop Museum and Acad. Nat. Sciences. Also in Mr. Thaanum's collection.

While sinistral species are common in *Achatinella* and *Partulina*, they are very rare in *Amastra*. Outside of the section *Heteramastra*, only two have been published, *Amastra thaanumi* Pilsbry and *A. montagui* Pilsbry, both from Oahu.

ON CYPRÆA MILIARIS GMEL., WITH DESCRIPTIONS OF NEW VARIETIES.

BY MAXWELL SMITH.

C. MILIARIS Gmel. Syst. Nat., p. 5420, 1790.

Roberts' description in the Manual of Conchology, vol. vii, p. 192, is as follows: "Differs from the preceding (*lamarcki*) in being narrower, the dorsal spots are smaller and never ocellated, and the sides are white." Melvill writes that the spots "are never eyed, or, at all events, extremely rarely." This and all of the varieties are pitted at the sides. Japan, Philippines, N. S. Wales.

C. MILIARIS Gmel. var. MAGISTRA Melvill. Proc. Manchester Literary and Philosophical Society for 1888, p. 227.

"Characters the same as in the type, but teeth very well developed, and size, long. $2\frac{1}{8}$, lat. $1\frac{1}{8}$ inch. . . . It is a handsome shell, and in fine condition it slightly resembles *C. guttata* on dorsal surface only." Habitat, Japan.

C. MILIARIS Gmel. var. BREVIS var. nov.

Shell shorter, covered on the dorsal surface with larger spots, teeth finer, aperture narrower than the type. Long. $1\frac{1}{4}$, lat. $\frac{7}{8}$ inch. Habitat, Japan. ? Type in the writer's collection.

C. MILIARIS Gmel. var. INTERMEDIA var. nov.

Aperture like the type, sides correspondingly pitted, dorsal surface suffused with white, yellow ground and spots showing through in the center, similar in shape to *C. eburnea*. Long. $1\frac{3}{4}$, lat. $1\frac{1}{4}$ inch. Habitat unknown. This form connects *eburnea* Barnes with *miliaris* Gmel. Type in the writer's collection.

C. MILIARIS Gmel. var. EBURNEA Barnes.

C. eburnea Barnes. Ann. Lyc. N. H. I., p. 133, 1824. *C. lactea* Wood, 1838.

With the material on hand I believe that I am justified in reducing this well-known *Cypræa* to varietal rank. It is surprising that, at this late date, evidence should turn up to prove *eburnea* to be only a variety of *miliaris*. The intermediate form, already described, does so conclusively. Both occur in the Philippines. Roberts places *eburnea* after *miliaris* in the Manual, but writes that it "differs from *lamarcki* Gray in being pure ivory-white." To my mind it only resembles it in the size of the teeth. The aperture of *lamarcki* is often much narrower below.

NOTES.

MR. FRANK C. BAKER, Curator of the Chicago Academy of Sciences, is spending the month of September in northern Idaho, and expects to visit Oregon, Washington and Vancouver before returning.

DR. ARNOLD E. ORTMANN reports success in collecting *Unionidæ* in the North Fork of the Holston, Clinch, Powell and Upper Cumberland rivers. He is now at Knoxville, and writes: "I have secured a tremendous material of *Najades*, and shall be able, from the study of the anatomy, to straighten out the systematic position of many species. Lea's work on the *Najades* of this region is poor —below criticism. He described *individuals*, but not species, but,

on the other hand, he mixed up, in several instances, different species, even genera, in *one* species. The best I did so far was in Clinch River in Claiborne Co., Tenn. 38 species within $\frac{1}{8}$ of a mile of the river. But I have several other good localities; and so far only in a region where the rivers are not too large (where I was able to wade clear across)."

COLORADO COLLEGE at its last commencement conferred the honorary degree of Sc.D. on Professor Theodore D. A. Cockerell, who holds the Chair of Zoölogy in the University of Colorado.

DR. C. MONTAGUE COOKE has returned from a trip by schooner to Palmyra Island, an islet south of the Hawaiian group, near the Equator.

MR. H. N. LOWE, of Long Beach, Cal., reports good success in collecting Helices during a recent trip to Catalina Islands.

MR. D. THAANUM in company with Mr. Kuhns, of Honolulu, spent two weeks in July collecting land shells in Maui. "With the exception of one day, all our time was spent in entirely new territory, and the results are highly satisfactory. Our first headquarters was at an altitude of 4000 feet above Ulupalakua on East Maui. From there we worked two remnants of forest, one at Polipoli (Kula), and one on the opposite side of camp, Auwahi. Kula seemed exhausted. Two species of *Amastra* and five specimens of *Laminella picta* were all we could gather in, besides 'trash' of course. Auwahi turned out better. Four species of *Amastra* and one of *Partulina*, this latter scarce. From there we jumped to West Maui and spent three days in Oluwalu gulch. I have never seen a shell-record from there, nor heard of anybody ever collecting there. No Partulinas were found, except three fragments (*P. perdix* and *kulnsi*); but I know we did not get up high enough. Otherwise the finds were simply amazing! Six species or varieties of *Amastra*, four of them apparently new, and several new species of *Leptachatina*, besides 'pin-heads.'"

LAND SHELLS CARRIED BY BIRDS.—I am sending in a small

vial two shells which I took alive from among the feathers of freshly-shot Bob-o-links here at San Carlos Estate, Guantanamo, Cuba. I shall be very glad to know what this Bob-o-link shell is. Is it a Cuban shell, or did the birds bring this shell from some more southern country, and if so, from what country? [The shells are *Succinea riisei*, a species known from St. Croix and Porto Rico.] This will throw some light on where the birds spent the last few days before starting for Cuba, as the shells were alive and the birds were shot on the second day of their arrival. This is doubly interesting to me, as I am interested in both conchology and ornithology. This may also prove how certain shells are distributed. Did you ever know of shells being found alive on birds? Not *in* them but *on* them. If not, it seems to me that a note for the NAUTILUS is in order.—CHAS. T. RAMSDEN.

ACMÆA FERGUSONI.—A regrettable omission occurs in my discussion of a Long Island *Acmæa* (*A. fergusoni* Wheat) in Science Bulletin, Vol. 2, No. 2, pp. 17–20, published July 16, 1913, by the Museum of the Brooklyn Institute of Arts and Sciences. I have just discovered in "The Molluscan Fauna of New Haven," by George H. Perkins, Proc. Boston Society of Natural History, vol. xiii, pp. 109–163, on p. 127, the description of a single specimen of *Tectura testudinalis* from the vicinity of New Haven, "the only specimen that I have seen from here." Mr. Perkins' description is excellent, and proves the identity of his specimen with *A. fergusoni* from Hempstead Bay and Wading River, L. I.—SILAS C. WHEAT.

CHOANOPOMA (RAMSDENIA) MIRIFICA Preston, Proc. Malac. Soc., London, x, p. 323, June, 1913, was sent me by Mr. Chas. T. Ramsden with the request to compare it with *Ctenopoma nobilitatum* Gundl. I find that it agrees perfectly with Gundlach's species, of which part of the original lot is before me.—H. A. PILSBRY.

MR. J. H. FERRISS is on his way, by team, to the White Mountains of Arizona, which have never been explored by a conchologist. It is rumored that the *Sonorellas* are in a panic.

THE NAUTILUS.

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NOTES ON THRACIA CONRADI.

BY EDWARD S. MORSE.

For years I have hunted in vain for a living specimen of *Thracia conradi*. This year my friend John M. Gould has collected specimens alive in Portland associated with *Solenomya borealis*, and the expanded animal is so interesting that I am induced to publish these observations ahead of my other work on the subject. After storms I have repeatedly found the broken shells, often with the adductor muscles still adhering, but never a perfect specimen. The gulls immediately recognize the conspicuous white object on the beach and break the thin and fragile shell, devouring the fat morsel within. The gulls alone are not entirely responsible for the fractured shells. A live specimen was sent to me from Portland carefully packed in seaweed. It arrived with the umbonal region of one valve broken and the fractured portion standing at right angles to the vertical axis. Jeffreys reports the same feature in the British species of *Thracia*. He says: "The power of tension continually exercised by the strong and elastic cartilage exceeds that of the shell, and the latter being the weaker body gives away and is split in the conflict. Only one species (*T. distorta*), which is comparatively more solid than the others, resists the strain and remains uninjured."

For many years I have collected living specimens of New England mollusca for the purpose of drawing the expanded parts of the animal, and nearly all the larger, and many of the smaller species, have been drawn. I have been led to do this in the belief that the

soft parts are of more importance than the hard parts of a mollusk in any discussion of generic or other taxonomic considerations. The low features of the protobranchia would never have been suspected from the shell alone. The drawings of the soft parts of the lamellibranchs, thus far published, are in most instances valueless and misleading. An important exception to this statement is the work of Meyer and Möbius.[1] The beautiful drawings of the expanded animals have never been surpassed. The drawings of the soft parts of lamellibranchs in Forbes and Hanley's British Mollusca[2] are, with few exceptions, poor and misleading. In one case, indeed, the siphonal tubes are sticking out of the wrong end of the shell! As an illustration of the inaccuracy of most of the efforts of drawing the live creature, reference may be made to a drawing of *Lævicardium mortoni*, which appeared in Gould and Binney.[3] Where the drawing came from I do not know. In no way does it accord with the description of the animal credited to S. Smith, nor does it bear the faintest resemblance to the creature. This cut was reproduced in one of the U. S. Fish Commissioners reports[4] with no comment on its inaccuracy.

A study of the soft parts of Verrill's genus *Gastranella*, in a living state, revealed the fact that it was simply an early stage of *Petricola pholadiformis*, and with this hint I made a complete series of the shell from the extreme young to the adult. Dr. Dall had, however, come independently to the same conclusion regarding the identity of the two forms. With the exception of the classical work of William Clark on the British Marine Testaceous Mollusca the descriptions of the soft parts of mollusca, though rarely given, are usually inadequate and often incorrect. As an illustration of the character of some of this work, could anything be more absurd than the description of the animal of the genus *Thracia*, which may be found in a standard work on British Mollusca.[5] It embraces a line of four words and is given as a generic distinction, "Body oval, tubes separate."

In most of the earlier descriptions the siphonal openings of *Thracia* are described as fringed, and the figures of *Thracia phaseolina* and *distorta* in Forbes and Hanley show densely fringed openings. The figures, of course, are entirely wrong, as the descriptions quoted from Clark indicate. The description in Jeffreys of the animal of *T. papyracea* is the nearest correct of all I have yet encountered:

"Upper tube marked with 8 and the lower with 4 faint longitudinal lines or streaks, which terminate at the orifices in the same relative number of short, thick and blunt cirri."

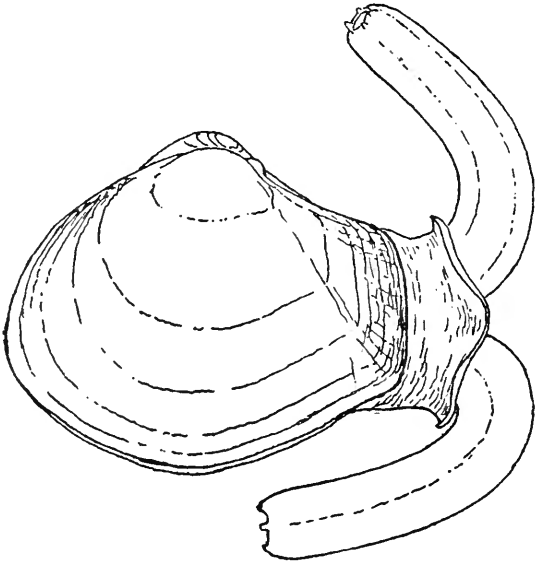
Allusions are made to the anatomy of the animal of *Thracia conradi* in comparing it with European species, but no figure of the expanded creature has ever been published. The nearest approach to a description of its habits is found in a monograph on the family *Osteodesmacea*, by Joseph P. Couthony,[6] published seventy-five years ago. In this monograph is first defined *T. conradi* as a distinct species. He says: "The specimen of *Thracia* serving for the preceding description was obtained in the early part of March last with the living animal. It was buried about six inches below the surface at low-water mark. An accident deprived me of an opportunity to examine the animal, and repeated visits in search of another have been wholly unsuccessful." Professor Verrill says: "The species burrows so deep in the mud or sand that it is seldom taken alive with the dredge."

The specimen of *Thracia conradi* which I examined remained in a vessel of fresh sea water for three days without a sign of life. At one time the occupants of the house were away and there was no vibration caused by their moving about, and then for the first time the creature timidly thrust out its tubes. It was extremely sensitive to any jar, and placing the pencil ever so carefully on the table caused it to immediately retract. The tubes were entirely separate and nearly as long as the shell. The excurrent tube was bent in a sharp curve dorsally and the incurrent tube in a similar manner ventrally. This attitude never varied, and it occurred to me that buried in the sand it might rest its tubes on the surface as figured by Meyer and Möbius of *Scrobicularia piperata*. Clark in the above-mentioned work describes a similar attitude of the tubes in *Thracia phaseolina* as follows: * * * "and posteriorly, for the issue of two moderately long siphons, which are separate nearly their length, but the animal always carries them in a divergent posture at the extremities * * * the tubes are capable of great inflation." The tubes when fully expanded are white and translucent, the upper tube having its orifice surrounded by six short blunt tubercles, while the lower tube has its orifice surrounded by four similar tubercles. These terminate in faint longitudinal lines, marking the siphonal tubes precisely as described in the English species. At intervals the

tubes enlarge as if about to burst, becoming semi-globular at the ends; then suddenly collapsing the tubes become narrow and opaque-white in color. The tubes may perform this action independently.

In the description of the tubes of *Thracia distorta* a behavior is indicated precisely as seen in *T. conradi.* "Tubes globularly inflated at extremity, which increases whole length and then suddenly collapses."

The most marked peculiarity of *T. conradi* is the sharply defined collar which surrounds the base of the siphonal tubes. This collar



is a prolongation of the mantle, with an extension of the periostracum, as seen in many other lamellibranchs, but in no instance have I met with a description of any structure approaching the collar of *T. conradi.* It flares like the cŏrolla of a flower, and its edges are reflected as shown in the figure here given. This prolongation of the posterior border of the mantle is seen in other forms, but in no case with the definition or freedom from the base of the siphonal tubes as seen in this species.

In *Saxicava* and *Mya* the prolongation of the mantle is closely adherent to the tubes. My own observations show that in *Anatina*

papyracea the mantle is prolonged at the siphonal end but does not surround the tubes like a collar, nor are its edges reflected. *Pandora trilineata* has a translucent envelope surrounding the base of the siphons and closely adherent. In *Yoldia limatula* and *Y. sapotilla* there are distinct lobes of the mantle flanking the sides of the tubes. In *Tagelus gibbus* there are two projecting and rounded lappets corresponding to the siphons. The siphonal collar of *T. conradi*, its separateness from the tubes and widely reflected edge is, so far as I know, unique among the lamellibranchs. Whether this feature should constitute a generic character I am not prepared to say. Dr. William Stimpson[7] in mentioning *T. conradi* says: "The absence of an ossiculum in the species would seem sufficient to separate it generically from other *Thraciæ*. But the animal resembles so closely that of the large English species which possess the ossiculum, that I have thought it best to consider the appendage unimportant."

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GUNDLACHIA HJALMARSONI PFR. IN THE RIO GRANDE, TEXAS.

BY GEO. H. CLAPP.

The above-mentioned *Gundlachia* was picked out of drift debris collected on the Texas side of the Rio Grande by Mr. R. D. Camp of Brownsville, Texas. It is associated in the trash with thousands of *Bifidaria*, *Thysanophora*, etcetera, over twenty-five species in all.

Gundlachia hjalmarsoni, which Dr. Pilsbry kindly identified for me by comparison with some of the lot collected by Hjalmarson, was first described in 1858 by Dr. Louis Pfeiffer, whose specimens came from Honduras. No figure has ever been published, and the species was evidently known to Crosse and Fischer and E. von Martens only by the original account. One of my specimens is figured on plate IV, figs. 6, 7, 8. All of the specimens found in three quarts of the " drift " are of the septate form shown in the figure. I have examined the material very carefully with a reading glass, and no *Ancylus* was found. The figured specimen measures 4.1 mm. long, 1.8 wide, 1.2 high.

In some Rio Grande drift from Presidio, Texas, sent to me by Bryant Walker, I found a single *Gundlachia*, which is indistinguishable from *G. hjalmarsoni*, except that it is only $1\frac{1}{2}$ x $\frac{2}{3}$ mm. It is so small that I am sure I would not have noticed it if I had not been looking for *Gundlachia*. It is the Brownsville shell in miniature.

The large size, peculiar shape and strong sculpture of *G. hjalmarsoni* distinguish it from all other species of the United States. As the species is new to the United States fauna, it has been thought desirable by the Editors of the NAUTILUS to append a translation of the original description.

" Shell ancyliform, oval-oblong in outline, thin, radially striatulate, pale corneous; vertex rounded, posterior; basal partition occupying one-third the length, arcuately cut out; aperture dilated in front; basal margin not incumbent in front and behind. Length 4, diam. in the middle scarcely 2, alt. $1\frac{1}{3}$ mm.

" Hab.: Santa Roza, Honduras (Hjalmarson).

" Just as *Gundlachia ancyliformis* in Cuba lives in company with *Ancylus*, and in the same manner, so also Mr. Hjalmarson found this new species in company with a weakly convex, very pale horn-colored species of *Ancylus*, which I do not venture to name, as I have no exact knowledge of the genus." (Pfeiffer, Malakozoologische Blätter, v, December, 1858, p. 197.)

The above description was made from a single example, in which the septum was incomplete. Hjalmarson subsequently obtained the complete septate form in the same locality. The form with a larger shell added to the septate stage was not found.

ON THE NOMENCLATURE OF DRUPA.

BY CHARLES HEDLEY.

A necessary but mournful process in scientific advancement is the elimination of familiar names. It has been shown by Dr. Dall (Journ. of Conch., XI, 1906, p. 294) that *Ricinula* of Lamarck, 1812, and *Ricinella* of Schumacher, 1817, must yield to *Drupa* Bolten, 1798, of which the type is *D. morum* Bolten.

Continuing the process of revision from genus to species, similar changes occur, for with the fall of *Ricinula* go the Lamarckian specific names associated with it. The presentation of the genus most accessible to students is that of Tryon's Manual of Conchology, II, 1880, pp. 182–185. In the genus as there framed the specific names require amendment. Meeting at the first step *Ricinula hystrix* Linn., it is to be remarked that Hanley (Ips. Linn. Conch., 1855, p. 294) has shown that *Murex hystrix* Linn., is an immature *M. ricinus* L., to the synonymy of which it must be accordingly transferred. Other synonyms of *M. ricinus* are *D. tribulus* Bolten, recognized by von Martens (Rumphius, Gedenboek, 1902, p. 116) and *R. arachnoides* Lamk., noted by Tryon.

The place which Tryon gave to *R. hystrix* should apparently be taken by *Drupa rubuscaesius* Bolten, of which *clathrata* Lamarck, 1822, and *speciosa* Dunker, 1867, seem to be synonyms. But *R. reeveana* Crosse, should be parted from its heading and subordinated as an absolute synonym to *D. rubusidaeus* Bolten, an independent species. Again, *R. laurentiana* Petit should be cut away from the species to which Tryon binds it and associated with *R. digitata.*

R. horrida Lamarck, was preceded both by *R. violacea* Schumacher, 1817, and *D. morum* Bolten, 1798. As the same figure in the Conchylien Cabinet was cited by all three authors, the coincidence of names is exact. Similarly another of Martini's figures (979) is given as foundation by Bolten in 1798 for his *D. grossularia*, by Schumacher in 1817 for his *R. dactyloides*, and by Lamarck in 1822 for his *R. digitata.* So that the claim for Bolten's name is here also clear. Deshayes has pointed out (An. s. vert., X, p. 50, footnote) that Blainville unfortunately redescribed the yellow form of this species as "*lobata*," while to the nameless brown form he gave the preoccupied name of "*digitata.*" On the ground of expediency, Deshayes thereupon reversed Blainville's names. Though

his example has been followed, this action is quite illegitimate. For the brown form is available the name of "*fusca*," apparently introduced by Deshayes (*op. cit.*, p. 53) for f. 4, pl. 235, of Sowerby's Genera of Shells.

R. biconica of the Manual represents a group rather than a species, in which we may distinguish *D. spinosum* H. & A. Adams, Genera I, 1851, p. 130, for Reeve's *Ricinula*, f. 12b; *D. iostomus* A. Adams, Proc. Zool. Soc., 1851, p. 267, and Gardiner, Fauna Laccadive, Pl. XXXV, f. 14; and *R. andrewsi*, Smith, P. Mal. Soc., VIII, 1909, p. 369, fig.

So the species grouped by Tryon under *Ricinula, sensu stricto*, may thus be tabulated in revised nomenclature; synonyms in *italics*.

1. DRUPA MORUM Bolten, 1798.
   R. violacea Schumacher, 1817.
   R. horrida Lamarck, 1822.
2. DRUPA IODOSTOMA Lesson, 1842.
3. DRUPA GROSSULARIA Bolten, 1798.
   R. dactyloides Schumacher, 1817.
   R. digitata Lamarck, 1822.
   R. lobata Blainville, 1832.
   var. fusca Deshayes, 1844.
   R. digitata Blainville, 1832.
   var. laurentiana Petit, 1850.
4. DRUPA RICINUS Linne, 1758.
   D. tribulus Bolten, 1798.
   M. hystrix Linne, 1758.
   R. arachnoides Lamarck, 1822.
   var. elegans Brod. & Sowerby, 1828.
   var. albolabris Blainville, 1832.
5. DRUPA RUBUSCAESIA Bolten, 1798.
   R. clathrata Lamarck, 1822.
   R. speciosa Dunker, 1867.
   R. spathulifera Blainville, 1832.
   var. miticula Lamarck, 1822.
6. DRUPA RUBUSIDAEUS Bolten, 1798.
   R. reeveana Crosse, 1862.
7. DRUPA BICONICA Blainville, 1832.
8. DRUPA SPINOSA H. & A. Adams, 1853.
9. DRUPA IOSTOMUS A. Adams, 1853.
10. DRUPA ANDREWSI Smith, 1909.

SPRING COLLECTING IN SOUTHWEST VIRGINIA.

BY CALVIN GOODRICH.

Early in May last I joined Dr. Ortmann at Charleston, W. Va., for two weeks among the richly-stored sources of the Tennessee. The road took us along the Kanawha for an hour or two, and then making a sudden turn swung into the mountains, every slope and valley of which was a lure to the winter-wearied collector. At Princeton we transferred to automobile and, packed amid the hand baggage like shells in a box, were driven into Bluefield, just over the line from the older Virginia.

The first collecting was in the Clinch at Cedar Bluff, Tazewell Co., Va., where there is a long shoal upon a wide and picturesque bend. The river ran swiftly, but not more swiftly than word to the local chief of police. Through him and a zealous deputy we learned two interesting facts, that the Puritan Sunday is not passed completely into history, and that the idea of assessing fines without the formality of trial or pronouncement from the bench is in as good standing in the Appalachians as among the police in the bigger centers of population. However, the village powers did not agree with the chief's conviction as to our condition of hopeless sinfulness, and with a friendliness which paid for the adventure they bade us return to the river.

Pleurocera unciale Hald. and *Anculosa subglobosa* Say, with *Goniobasis simplex* Say, in smaller numbers, were on every stone. *Io* here was all of the smooth form described by Anthony under the name of *inermis*. This locality is some miles above the uppermost locality for *Io* recorded by Adams. Working among the rocks and in the swifter water of the right bank, Dr. Ortmann collected *Fusconaia bursa-pastoris* (Wright), *Truncilla capsaeformis* (Lea), *Ptychobranchus subtentus* (Say), *Eurynia perpurpurea* (Lea) and *Eurynia nebulosa* (Conrad), while in the sandy ground along the left bank the predominating species were *Quadrula cylindrica strigillata* (Wright), *Medionidus conradicus* (Lea), *Strophitus edentulus* (Say) and *Lampsilis multiradiata* (Lea). *Symphynota costata* (Raf.) was everywhere, and because of its manner of hiding all except the edges of the valves it became a source of irritation. The shells had to be dug out, if only to learn that they were not of some other and desired

species. The catch of *Unios* at Cedar Bluff was eighteen species, among them some riddles in *Pleurobema*, which at last account were still making trouble for the Doctor. Out of the drift at the head of the rapids we picked *Sphæria*, which Dr. Sterki has kindly identified as *Sphærium fabale* Pme., *S. solidulum* Pme., *Pisidium virginicum* Gmel., *P. compressum* Pme., and three individuals "apparently near *P. noveboracense* Pme." The next morning I climbed the bluff and found *Polygyra albolabris major*, *rugeli*, *thyroides*, *zaleta* and *stenotrema*; *Gastrodonta acerra* and *gularis*; *Omphalina fuliginosa*, *Zonitoides arborea* and the umbilicated form of *Vitrea indentata*. The weather had been dry for weeks, and the land mollusca had to be dug for. I uncovered *Lymnæa obrussa* and *Succinea avara* glued to leaves in a dried-up brook.

Our next jump was to St. Paul, Wise Co., Va., still on the Clinch. Decided differences were to be remarked in the fauna. In the rapids opposite Fink station, Russell Co., a mile or so above St. Paul, were *Fusconaia edgariana* (Lea), *Crenodonta undulata* (Barnes), *Ptychobranchus phaseolus* (Hild.), and *Nephronaias perdix* (Lea), none of which had appeared at Cedar Bluff. The *Io* at this station was beginning to assume nodules. One specimen equals *Io lurida* of Reeve. *Anculosa subglobosa* Say, which at Cedar Bluff was wholly without bands, so far as we noted, was almost universally banded in the rapids at Fink. To me they seemed also to run larger. In the material brought away from this place appeared *Pleurocera tenebrocinctum* Anth. and *P. opaca* Anth.

The following morning Dr. Ortmann went to Cleveland, Russell Co., up the river, whence he returned aglow with enthusiasm over the discovery of twenty-five species of *Naiades*, while I had a try for land shells among the Russell county hills. The most interesting observations were that the *Polygyra appressa*, *rugeli* and *thyroides* of the region seemed to prefer the stray logs of the high pastures to the woods, that the ratio of banded *Polygyra profunda* to unbanded was 1 to 10, and that there thrived here a *Succinea ovalis* Say, of quite surprising size, one specimen reaching 25 mm., the extreme recorded by Binney. Though the dead of this species was plentiful, only one living individual was found. In brooks fed by hillside springs, I came upon a few specimens of *Pomatiopsis cincinnatiensis* Lea, *Paludestrina nickliniana* Lea, and *Lymnæa obrussa* Say.

(*To be concluded*).

NOTES.

HELIX HORTENSIS: A CORRECTION IN DISTRIBUTION.—When the first survey of Casco Bay was made the authorities should not have allowed the inhabitants there to keep three Rams, two Brown Cows and three Mark Islands. If not a hindrance to navigation, these certainly add confusion to the records bearing on geographical distribution.

The "Brown Cow Island," referred to by myself and others, should be Western Brown Cow Island. This island is divided into an eastern and a western portion, the latter being the larger and the one that has been referred to in former papers as Brown Cow Island. Although *Helix hortensis* is also found in the eastern portion, it is less abundant there. Eastern Brown Cow is an entirely separate island about ten miles east of Western Brown Cow. On this island Dr. J. A. Cushman also found a few *H. hortensis*, all belonging to the variety *subglobosa*.

The "Swan Island" mentioned on page 63 of THE NAUTILUS for October, should have been Seal Island. It is situated on the eastern side of Cape Smallpoint. This should not be confused with the Seal Island, or Seal Rock of the Matinicus group, where *H. hortensis* is also found. C. W. JOHNSON.

LYMNÆA (RADIX) AURICULARIA IN CHARLES RIVER, BOSTON, MASS.—Since Mr. W. F. Clapp recorded the occurrence of this species in the Charles river (NAUTILUS, Vol. XXVI, p. 116), it seems to have greatly increased. My young friend, P. S. Remington, has found it in numbers on the Boston (Allston) side near the Speedway. C. W. J.

MR. T. H. ALDRICH has given his collection of shells, by estimate not far from 20,000 named species, to the Museum of the Alabama Geological Survey. The collection was begun as far back as 1859 in a New York village where Mr. Aldrich passed his boyhood. It includes not only his own gatherings and exchanges from all parts of the world, but many large purchases, notably the Mauritius shells collected by Col. Nicholas Pike, a very large and fine set; the Bermuda and Nova Scotia collections of J. M. Jones; the Parker cabinet of about 5,500 listed species; all the conchological collections

made by the late Wm. Doherty in the Malay Islands, Burmah and Indo-China, and a very full set of Garrett's Polynesian species. The Unionidæ were sold to Mr. Frierson; with that exception the collection is intact. It contains a good many types of species described by Mr. Aldrich and others. The series of operculate land shells is especially rich. All the known terrestrial species of Alabama are represented.

The Museum, an outcome of the Geological Survey, is by law an integral part of the University of Alabama, near Tuscaloosa. Practically it is the State Museum of Natural History, with a general scope, but giving special attention to the geology, fauna and flora of the State. Its set of Alabama fresh-water and land shells, including the Showalter collection, was already extensive and growing rapidly. Mr. Aldrich has been a generous friend of the institution; three years ago he gave to it all his duplicate shells, and the very rich collections of tertiary invertebrate fossils are largely due to him.

Mr. Herbert H. Smith, Curator of the Museum of the Alabama Geological Survey, has recently brought back from the Coosa River the largest and finest collection of fresh-water shells ever made by him. There are about 25,000 selected specimens, including a very large number of species, some of them new to science. The principal locality worked was Weduska Shoals, between Shelby and Coosa Counties, believed to be the richest place on this very productive river. The Shoals will soon be covered with 20 feet of water by the great dam of the Alabama Power Company, now nearly completed. Mr. Smith's expedition was planned in order to obtain large series of the shells while they are still accessible. In all probability some of the Weduska species will not be found elsewhere; many Coosa mollusca are extremely local, even restricted to a small part of one shoal. These Weduska species, if not collected now, would have been forever lost to science; in fact, they are likely to become extinct under the changed conditions. Special efforts were made to secure a full set of the animals of *Pleuroceratidæ* for anatomical purposes, and about 5,000 of these were preserved.

Mrs. M. Burton Williamson, who spent the summer abroad, visited the conchological museums of New York, Philadelphia and Washington on her way to the west coast.

PARREYSIA NYANGENSIS FRIERSON.
PARREYSIA LOBOENSIS FRIERSON.

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TWO NEW SPECIES OF PARREYSIA FROM KAMERUN, AFRICA.

BY L. S. FRIERSON.

PARREYSIA LOBENSIS n. sp. Plate V, lower figures.

Shell small, ovate. Epidermis dark brownish green, or olive, shining on the disc, but dull on the post slope. Surface of the shell densely covered with concentric, irregularly ziz-zag, sulcations, resembling the beak sculpturing of such shells as *Unio simonis* Tristram, giving a somewhat "dried-paint" aspect to the outer surface. By transmitted light, dark blotches may be noted under the epidermis; beaks badly eroded in the specimens seen, but probably high and incurved. Nacre soft, orange, or pale yellowish pink. Muscle scars of medium depth, nearly or quite confluent, lateral teeth single in the right, double in the left valve. Cardinals are much split up in both valves. Beak cavities deep, but not compressed. Length 35, height 25, diameter 18 mm. Dimensions of a cotype, length 32, height 25, diameter 15 mm. The shell's chief character is the sulcated aspect of its exterior, resembling in this regard the *Spatha kamerunensis* of Walker, which accompanied this shell. It shows a distant kinship to *P. hauttecœuri* Bourg, but too remote to be confounded with that species. It more nearly resembles *P. nyangensis nobis*. It was collected in the Lobo River, Kamerun, Africa, by Mr. George Schwab, Jan. 28, 1913, for the Museum of Comparative Zoology, Cambridge. Type No. 20164. A cotype is in my own cabinet.

PARREYSIA NYANGENSIS n. sp. Plate V, upper figures.

Shell small, elliptical or oval. Epidermis brown, slightly greenish, shell rather thin, covered with coarse, irregular concentric sulcations, or corrugations. Post ridge, though very faint, is inclined to be double. Nacre soft, whitish, inclined to pinkish purple in the beak cavities. Muscle scars confluent, not strong. One lateral in the right, two in the left valve. Two cardinals in the right valve, the inner one much the larger. Two cardinals in the left valve, both sulcated. Length 42, height 32, diameter 22 mm.

This species was collected by Mr. George Schwab, in the Nyang River, March 13, 1913 (Kamerun, Africa).

Type deposited in the Museum of Comparative Zoology, Cambridge, No. 21160. The present species is most nearly allied to the preceding species, *Parreysia lobensis nobis*. It differs in being more lenticular and higher behind the beaks, and the anterior portion protrudes forward more. The exterior is much more coarsely corrugated, the corrugations being at least three times as large. Its teeth are less split up.

A NEW GENUS OF TROCHIDÆ.

BY WILLIAM HEALEY DALL.

While working on the Mollusca of the Lightning and Porcupine expeditions in 1883, J. Gwyn Jeffreys described in the Proceedings of the Zoological Society a shell which he called *Trochus cancellatus*. This was not the *Trochus cancellatus* of Münster, and therefore the name must be changed. Moreover no attempt to include this species in a known genus has been satisfactory, and, having found another species in some dredgings from the Galapagos Islands, I propose to name it.

VETULONIA n. g.

Shell turbiniform, small, thin, with radiating ribs crossing spiral threads; umbilicated; the peristome interrupted by the body whorl; the outer lip in the completely adult reflected and somewhat thickened, the aperture unarmed.

Type *V. galapagana* Dall, from deep water near the Galapagos Islands.

VETULONIA JEFFREYSI Dall.

Trochus cancellatus Jeffreys, Proc. Zoological Soc. London, 1883, p. 96, pl. XX, f. 4; not of Münster, in Goldfuss, Petr. Germ. III, pp. 58, pl. 181, f. 5, 1842.

Machæroplax cancellatus Jeffreys, 1883.

Margarita cancellata Kobelt, 1888.

Solariella cancellata Locard, Rep. Moll. Travailleur et Talisman, II, p. 32, 1898.

Distribution: Off the coast of Portugal, in N. Lat. 39° 55′ at a depth of 994 fathoms, bottom temperature 40.3° F. Also Josephine Bank in 340 to 430 fathoms; Jeffreys. Off the coast of Morocco, in 1900 meters, and south of Cape Mondego in 1818 meters; Locard. Yucatan Channel in 400 fathoms; U. S. Fish Commission.

VETULONIA GALAPAGANA n. sp.

Shell small, white, of four moderately convex whorls (the nucleus defective) the suture distinct; spiral sculpture between the sutures of seven or eight close-set flattish threads, crossed by (on the last whorl) seventeen narrow, slightly elevated, laminate ribs which become obsolete toward the umbilicus on the base; the last rib forming the outer lip is markedly larger and thicker than its predecessors; the umbilicus is funicular, shallow and with no marginating rib, it does not penetrate the axis; aperture rounded, interrupted by the body whorl, the outer lip reflected, thickened, but with a sharp edge. Operculum unknown. Height 2.2; max. diameter 3.4 mm.

Distribution: Near the Galapagos Islands in 634 fathoms, sand, bottom temperature 39.9° F., one specimen. U. S. N. Mus., 207607.

This species is larger than *V. jeffreysi*, has coarser spiral sculpture and a smaller umbilicus. I have chosen it for the type, as the Atlantic species is represented in our collection by two specimens which have not formed the thickened lip, and, from the description, the specimens from the Atlantic dredged by the European expeditions were also not quite mature. The type is opaque yellowish white, but when fresh was probably translucent white like the Atlantic species. The whole surface is uniformly spirally threaded except the radiating lamellæ.

STUDIES IN NAJADES.

BY DR. A. E. ORTMANN.

The following studies intend to continue my "Notes upon the families and genera of the Najades," published in the Annals of the Carnegie Museum, vol. 8, 1912, pp. 222–365. They contain additional observations on the anatomy and systematic position of forms which have come to hand since that paper was published.

MARGARITANA SINUATA (Lamarck). (See Ortmann, l. c. p. 232).

I have received from W. Israël the soft parts of two specimens from the eastern Pyrenees, near Perpignan, France.

The gill-structure of this species is entirely like that of *M. margaritifera*, that is to say, the interlaminar connections are irregularly scattered and do not form septa and water tubes, and near the base of the gills there is a slight tendency to stand in oblique rows. The inner edge of the anal opening is almost smooth, with very slight and indistinct crenulations, and does not differ from that of *M. margaritifera*. The connection of the posterior margins of the palpi extends, in the two specimens before me, for a little less than one-half of the margins, while in *M. margaritifera* they are connected for from one-half to two-thirds, but this clearly depends upon the state of the contraction.

MARGARITANA MARGARITIFERA (Linnæus). (See: Ortmann, l. c. p. 220.)

W. Israël sent me 10 gravid females of this species, collected August 6, 1912, in the Goernitzbach, Oelsnitz, Saxony.

These specimens show that there is no difference whatever in the shell of the two sexes, and chief of all, that the so-called "arcuate" shape of the shell is not connected with sex.

The structure of the gills, chiefly the arrangement of the interlaminar connections, is somewhat variable: the tendency of these connections to form oblique rows is variously developed, and, as far as I can see from the present material, is most strongly pronounced in the female. However, I could not venture to warrant that it is possible to distinguish the sexes by this feature.

In the gravid females, all four gills are charged: sometimes practically the whole of the gills is filled with embryos; in other cases a

larger or smaller part at the anterior end of the gills is not charged, but this may be due to the fact that the contents have been partly discharged. The charged gills are very little swollen, and the embryos fill the interstices between the interlaminar connections without forming placentæ; yet a slight mutual cohesion of the embryo is present.

The glochidia are very small. Length, 0.06 mm.; height, 0.07 mm. Their shape is subovato-circular, slightly higher than long. The lower margin is more narrowly rounded, so that a blunt and indistinct point is indicated. Of the published figures, that of Harms (Zool. Anzeig. 31, 1907, p. 817, fig. 5) comes nearest to the actual shape, but is too regularly round. The other figures of Harms (ibid., fig. 4, and Zool. Jahrb. Anat. 28, 1909, pl. 13, figs. 1 and 2) are poor, since they represented oblique views of the glochidium. The figure of Schierholz (Denkschr. Ak. Wiss. Wien. 55, 1889, pl. 4, fig. 65) does not at all represent this species.

Harms gives 0.0475 mm. as the size, which, according to my measurements, is too small. He also describes and figures small teeth or spines in the middle of the lower margin; I cannot see these. In their place there is a narrow flange, which projects toward the inside of the shell, and in a lateral (edgewise) view, this appears sometimes as a short spine.

MARGARITANA MARGARITIFERA FALCATA (Gould). (According to Simpson, Pr. U. S. Mus., 22, 1900, p. 677, synonym to *M. margaritifera*).

Two specimens from Chehalis River, Porter, Chehalis Co., Washington, collected by H. Hannibal, July, 1912.

This western form of *M. margaritifera*, whether we regard it as distinct or not, has exactly the structure of the soft parts of the normal form. In one of the two specimens before me, the arrangement of the interlaminar connections in oblique rows is much more distinct than in the other; the former might possibly be a female.

FUSCONAJA SUBROTUNDA LEUCOGONA nov. var.

This form is the representative of *F. subrotunda* (Lea) in Elk River in West Virginia (Kanawha drainage). I collected it on May 25, 1911, at Sutton, Braxton Co.; on July 8, 1911, at Gassaway, Braxton Co., and July 10, 1911, at Shelton, Clay Co. I also saw

dead shells on July 9 at Clay, Clay Co. The type-set is from Gassaway, Carn. Mus., no. 615399.

This form may be described as a rather small and somewhat flattened *subrotunda*. It corresponds to a degree to the var. *kirtlandiana* (Lea) of the upper Tuscarawas, Beaver and French Creek drainages in Ohio and Pennsylvania, but it is not quite so flat as the latter, is smaller, and has not the subulate shape of the upper posterior part. In fact, in shape it does not differ much from typical *subrotunda*, and moreover, the degree of compression is quite variable.

The soft parts, however, show some very marked peculiarities in their color. While typical *subrotunda* has either orange or whitish soft parts, with the placentæ and eggs (and of course the gills of the gravid female) always of a red color, in the Elk River form the soft parts are of the white type, and placentæ and eggs are white. This, at least, is the rule. But there are rare exceptions: at Gassaway I found a single male, which had orange soft parts, and at Shelton I found a few males and females with orange soft parts, and a few females had cream-colored, pink or red placentæ; in one case only orange soft parts and red placentæ were associated. This shows clearly that the Elk River shell is to be regarded only as a local race of *subrotunda*, probably passing into the normal form in the lower part of Elk River (Shelton, where the greatest number of specimens with red or orange was found, is the lowermost point where I collected.

The anatomy of this form is absolutely identical with that of *subrotunda*. On all three dates I found gravid females, but on May 25 they all had only eggs; on the other days glochidia were present. One specimen collected July 8 had the ovisacs only partly charged, and in a number of them the basal part was empty, while the distal part contained yet parts of the placentæ. This shows that the placentæ are sometimes discharged in sections. Glochidia identical in shape and size with those of *subrotunda* and *kirtlandiana* (Ortmann, Mem. Carn. Mus., 4, 1911, pl. 89, fig. 1). Length, 0.13; height, 0.15 mm.

FUSCONAJA BURSA-PASTORIS (B. H. Wright). (See *Quadrula b.-p.* Simpson, 1900, p. 791).

I collected a number in Clinch River, at Richland and Raven Tazewell Co., Va., on Sept. 20 and 21, 1912.

Structure identical with that of *F. subrotunda*. Anal opening separated from the supra-anal by a very short mantle connection, with fine but distinct crenulations. Branchial with papillæ. Posterior margins of palpi connected for about one-third to one-half of their length.

Gills short and wide, the inner wider. Inner lamina of inner gill free from abdominal sac, except at its anterior end. In the female, all four gills have marsupial structure. None of the females was gravid.

Color of soft parts generally of the orange type, with foot, adductors and mantle margin often deep orange, rarely paler. In a few specimens the soft warts were pale brown to whitish. Gonads in most females intensely red (crimson); also in the males more or less red or pink, but in the latter they were in some cases brownish-gray.

(*To be continued.*)

SPRING COLLECTING IN SOUTHWEST VIRGINIA.

BY CALVIN GOODRICH.

[*Concluded from page 82.*]

Some additions were made the next morning to Dr. Ortmann's Naiad list of the Clinch a mile and a half below St. Paul: *Micromya cælata* (Conrad), *Eurynia recta* (Lam.), and *Nephronaias ligamentina gibba* (Simpson), closely allied to *N. perdix* (Lea). *Io* at this point was seemingly all provided with tubercules. The shells were to be found on the larger stones on the up-stream side, or under an up-stream shelf, in the swifter water. An occasional one appeared in relatively quiet water. The white disintegrating shells of *Campeloma decisum* (Say), were common on the flood plain here.

Our next collecting spot was in the South Fork of the Powell river at Big Stone Gap, Wise Co., Va. The Doctor tackled the stream at once, while I climbed the big ridge, which hangs over it, in search of land material. The ridge proved to be entirely of sandstone and was as barren of molluscan life as the ordinary town lot, no bones at all being seen and only two living individuals, juvenile *Polygyræ*. Joining Dr. Ortmann after a couple of hours, I found

him happy over the plentifulness of the *Naiades;* they made up in this and in new interest what they lacked in variety. The most striking fact was that while *Eurynia vanuxemensis* (Lea), was unknown to the Clinch, it was one of the most common species of the Powell, at least at this station. *Io* was not seen. Two specimens only of *Anculosa subglobosa* were collected. *Pleurocera unciale*, of a heavier aspect than the species in the Clinch, and *Goniobasis simplex* were common. In flood pools, I was lucky enough to make several interesting finds: *Physa crandalli* Baker, *Planorbis bicarinatus* Say, *Lymnæa obrussa* Say, and, best of all, *Ancylus obscurus* Hald., which Mr. Walker tells me has been one of the long-lost species.

The weather turning stormy, we regretfully gave up plans for further collecting in the Powell river and in shoals of the Clinch which could be conveniently reached from Big Stone Gap. So in hopes of getting out of what might happen to be a localized storm area, we went on to Gate City, Scott Co., which brought us into the Holston drainage. Though assured that no shells had ever been seen in the Little Moccasin, which runs as a sort of decorative border to the corporation of Gate City, the results proved, as they usually do in such cases, that the resident sense of observation was of indifferent development. Two species of *Naiades* were found in this stream and, had the creek been clearer, probably more had been collected. The purple-black *Goniobasis spinella* Lea, was an easy mark in the yellow water, and many specimens were taken. The ubiquitous *Pleurocera unciale* was here and also *Goniobasis clavæformis* Lea, a species new to the expedition. *Physa heterostropha* Say, covered the wooden sides of the flume of a grist mill run by this creek.

Following the Little Moccasin slowly down stream, we came to the Big Moccasin creek. Almost at once Dr. Ortmann struck a pocket of clams and in the course of a few minutes had taken seven specimens. But luck quickly deserted, a thunder shower forcing us to the protection of a covered bridge. After it was over there was nothing to do but trudge home, as the water had risen and was carrying a heavy load of clay. The *Pleuroceratidæ* of the Big Moccasin seemed to be the three species of the Little Moccasin—exceedingly eroded—and one other species, *Anculosa subglobosa.*

The weather instead of improving grew constantly worse. The Doctor decided to go to points south for a try at the Holston river

and thence across the mountains into the Atlantic drainage, and I determined upon a search for land shells at Natural Tunnel, a few miles up the line from Gate City. It was the kind of day to bring the snails out, warm and steaming, and they did prove to be out, twenty species being bagged. Here, as in Russell county, *Polygyra profunda* had mostly dispensed with bands. But *Polygyra elevata* had assumed them. An interesting depauperate colony of this species was found on the face of the cliff between the natural and artificial tunnels. It was scarcely more than half the size of *elevata* living just out of the northern mouth of the natural tunnel. A mountain brook contained a small and handsome form of *Goniobasis aterina* Lea. One could stand upright and pick these little fellows from the rocks where they lived in the spray of the falls. From Stock creek, tributary to the Clinch and the stream which carved the natural tunnel, were taken *Pleurocera unciale*, *Goniobasis simplex* and *Goniobasis aterina*—this last surely the same or an offspring of *simplex*.

Acknowledgments are due to Mr. F. C. Baker, Mr. Bryant Walker, Mr. A. A. Hinkley and Dr. Victor Sterki for identifications, and to Mr. George H. Clapp for valuable comment on the land shells.

From a preliminary catalogue made by Dr. Ortmann, and to use which I have his kind permission, the following list of the collections of last May had been made:

Fusconaia bursa-pastoris (Wright). Clinch River, Cedar Bluff, Cleveland, Fink, St. Paul.

Fusconaia estabrookiana (Lea). "Synonyms, *fassinans* Lea and *fassinans rhomboideum* Simpson and others." Clinch, Cedar Bluff, Fink, St. Paul, Powell, Big Stone Gap, Big Moccasin, Moccasin Gap.

Fusconaia appressa (Lea) or *edgariana* (Lea). "Practically nothing but a flattened *edgariana*." Clinch, Cleveland, Fink, St. Paul.

Crenodonta undulata (Barnes). Clinch, Cleveland, Fink, St. Paul.

Quadrula intermedia (Conrad). "Possibly *tuberosa* Lea and *sparsa* Lea." Clinch, Cleveland.

Quadrula cylindrica strigillata (Wright). Clinch. Cedar Bluff, Cleveland, Fink.

Pleurobema maculatum (Conrad). Clinch, Cedar Bluff, Cleveland, St. Paul, north fork of Holston.

Pleurobema oriforme (Conrad). "Runs into *clinchense* Lea." Clinch, Cedar Bluff, Cleveland.

Pleurobema sp.? "Looks like a flattened *obliquum* Lam." Clinch, Cleveland.

Pleurobema argentum (Lea). "With many synonyms, such as *planior* Lea and *breris* Lea." Clinch, Cedar Bluff, Cleveland, Fink, St. Paul, Powell, Big Stone Gap, Big Moccasin, Moccasin Gap.

Elliptio gibbosus (Barnes). Clinch, Cedar Bluff, Cleveland, Fink, St. Paul, also in middle fork of the Holston.

Lastena lata (Raf.). Clinch, Cleveland, St. Paul.

Symphynota costata (Raf.). Clinch, Cedar Bluff, Cleveland, Fink, St. Paul; also in middle fork of the Holston.

Symphynota holston (Lea). "Not an *Alasmidonta*." Clinch, Cedar Bluff, Powell, Big Stone Gap, Little Moccasin, Gate City.

Alasmidonta minor (Lea). Clinch, Cedar Bluff, Cleveland, Fink, St. Paul; also in the Holston.

Alasmidonta marginata (Say). Clinch, Cleveland, Fink, St. Paul; also in middle fork of Holston.

Strophitus edentulus (Say). Clinch, Cedar Bluff, Cleveland, St. Paul.

Micromya caelata (Conrad). Clinch, St. Paul.

Ptychobranchus phaseolus (Hild.). Clinch, Cleveland, Fink, St. Paul.

Ptychobranchus subtentus (Say). Clinch, Cedar Bluff, Cleveland, St. Paul; in middle fork of Holston.

Nephronaias ligamentina gibba (Simp.). Clinch, St. Paul.

Nephronaias perdix (Lea). Clinch, Cleveland, Fink, St. Paul.

Medionidus conradicus (Lea). Clinch, Cedar Bluff, Cleveland, Fink, St. Paul, Powell, Big Stone Gap, Big Moccasin, Moccasin Gap.

Eurynia fabalis (Lea). Clinch, Cleveland, St. Paul.

Eurynia perpurpurea (Lea). Clinch, Cedar Bluff, Cleveland, St. Paul.

Eurynia nebulosa (Conrad). Clinch, Cedar Bluff, Cleveland, Fink, St. Paul, Powell, Big Stone Gap, Big Moccasin, Moccasin Gap.

Eurynia vanuxemensis (Lea). Powell, Big Stone Gap, Little Moccasin, Gate City, Big Moccasin, Moccasin Gap. "Common in Holston."

Eurynia recta (Lam.). Clinch, St. Paul.

Lampsilis ovata ventricosa (Barnes). Clinch, Cedar Bluff, Cleveland, Fink, St. Paul.

Lampsilis multiradiata (Lea). Clinch, Cedar Bluff, Cleveland, Fink, St. Paul, Big Moccasin, Moccasin Gap.

Truncilla capsaeformis (Lea). Clinch, Cedar Bluff, Cleveland, Fink, St. Paul, Big Moccasin, Moccasin Gap.

In September, 1912, Dr. Ortmann found a single specimen of *Truncilla haysiana* (Lea) in the Clinch river at Raven, Tazewell county, Va. This species was missed in the visit of last May.

NOTES.

ANOTHER NOTE ON MARTYN'S UNIVERSAL CONCHOLOGIST.—It may be of interest to those readers of THE NAUTILUS who are lovers of rare books, to learn that there is now a fifth copy of the "Universal Conchologist" in the United States. The volumes are large folio, bound in morocco and gold, and essentially like the magnificent copy in the Stanford University Library (see NAUTILUS, vol. XXII, 1908, p. 72), except that they comprise only the first 81 plates (vols. I–II). The plates are themselves in excellent preservation, but the sumptuous binding is badly worn. A prospectus of the work in French, dated 1787, is laid into the second volume. In neither this copy nor that at Stanford is there any plate of medals, as has been described for other editions. The volumes were acquired from a Paris dealer and are now in the private library of the writer.

The opportunity should be taken to correct a slight error which crept into my former note in these pages as above cited. It is the *fourth* volume of the Stanford University copy which lacks the explanatory table; vol. III appears to be complete.—S. S. BERRY.

LAND SHELLS FROM ELLSWORTH, MAINE.—The following species were taken in a few hours' collecting October last along the shores of the Union River, just below Ellsworth, Maine. The shells were sent to Mr. George H. Clapp, who kindly identified them for me:

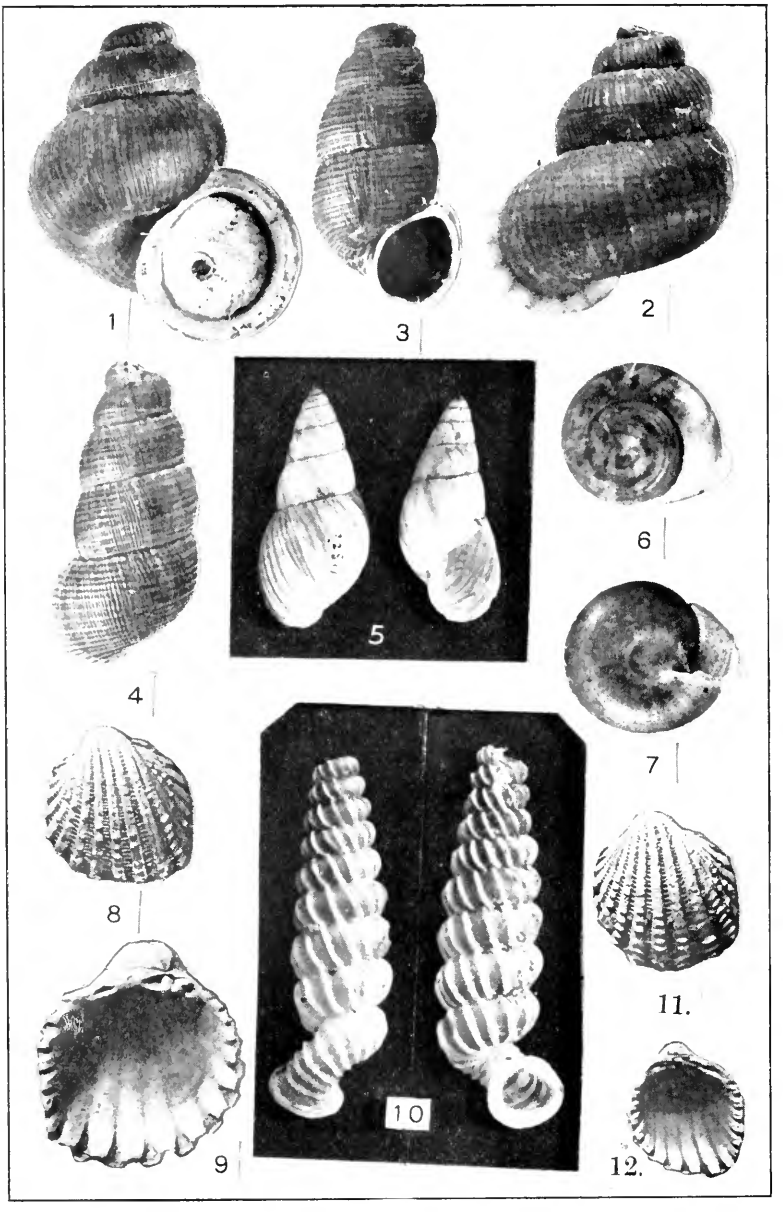
Vallonia pulchella Müll.
Vallonia excentrica Sterki.
Acanthinula harpa Say.
Zonitoides arborea Say.
Vitrea cellaria L.
Vitrea radiatula Ald.
Euconulus fulvus Müll.
Pyramidula cronkhitei anthonyi Pils.
Pyramidula alternata Say.
Vitrina limpida Gld.
Cochlicopa lubrica Müll.
Succinea ovalis totteniana Lea.—JOHN B. HENDERSON.

I NOTICE that, in my note published in THE NAUTILUS, the Editor changed "Schowalter" to "Showalter," as Lea and others wrote it; I wrote it so myself until recently. Being in doubt about the spelling, I asked Dr. Schowalter's son, whom I met at Point Clear, near Mobile. He said that both he and his father always wrote the name with a *c*. It is a small matter, but deemed worthy of mentioning.—HERBERT H. SMITH.

LAND SHELLS OF CECIL CO., MARYLAND, collected by Mr. Bayard Long.—A small lot of leaf-mould gathered in the rocky woods along the Susquehanna River at Bald Friar, contained the following species. As nothing has been published on the shells of this part of Maryland, the records may be of interest, especially *Polygyra fraudulenta* and *Bifidaria procera*, neither of which has turned up in the adjacent part of Pennsylvania:

Polygyra albolabris (Say).
thyroides (Say).
fraudulenta (Pils.).
hirsuta (Say).
Circinaria concava (Say).
Gastrodonta intertexta (Binn.).
suppressa (Say.).
Zonitoides minuscula (Binn.).
Vitrea indentata (Say.).
Vitrea rhoadsi Pils.
hammonis (Strom.).
Pyramidula alternata (Say.).
perspectiva (Say.).
Punctum pygmæum (Drap.).
Bifidaria procera (Gld.).
contracta (Say.).
pentodon (Say.).
Carychium exile H. C. Lea.

—H. A. PILSBRY.



W. F. CLAPP: SHELLS FROM SWAN ISLAND.
AXEL OLSSON: ON MIOCENE CORRELATION.

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LIST OF LAND SHELLS FROM SWAN ISLAND, WITH DESCRIPTIONS OF FIVE NEW SPECIES.

BY W. F. CLAPP.

The following list is based on the land shells found on Swan Island by Mr. George Nelson in April 1913. The material was collected for the Museum of Comparative Zoology, Cambridge, Massachusetts.

Swan Island is situated in the Caribbean Sea about one hundred miles northeast of Spanish Honduras, and three hundred and fifty miles west of Jamaica. About one quarter of the land is cleared and devoted to the raising of cocoanuts; the remaining three-quarters is an almost impenetrable jungle. The soil, rich in lime and phosphate, and the luxurious vegetation, render the island an ideal home for the land mollusca.

From the standpoint of the zoögeographer the fauna of the island is of considerable interest. With so few species represented, it is impossible to be positive when and whence it obtained its molluscan fauna; but further collecting should yield a greater number of species, from which interesting conclusions may be drawn, regarding former land connections in this region.

The *Chondropoma* is most closely related to Cuban or Haitian species; the *Brachypodella* to Cuban, although its resemblance to *B. costulata* of Jamaica is striking. The *Cæcilioides* is also Cuban. The *Lucidella* and *Drymæus* are both closely allied to both Jamaican

and Central American species, while the *Thysanophora* and *Opeas* are so widely distributed that they have little or no significance.

I am greatly indebted to Dr. Pilsbry for assistance in determining the specific values and relationships of the different species, and to Mr. George Nelson for the photographs reproduced on the plate.

The list of species follows:

Thysanophora selenina (Gld.)
Drymæus insulæ-cygni, sp. nov.
Opeas micra (d'Orb)
Brachypodella insulæ-cygni, sp. nov.
Microceramus concisus (Morel).
Cæcilioides consobrina (d'Orb.)
Succinea latior C. B. Adams.
Colobostylus nelsoni, sp. nov.
Chondropoma caribbæum, sp. nov.
Lucidella pilsbryi, sp. nov.

DRYMAEUS INSULÆ-CYGNI, sp. nov. Pl. VI, fig. 5.

Shell perforate, oblong conical, thin, straw-colored or white, the last one or two whorls irregularly marked with faint longitudinal streaks of pale brown or pink, generally delicate pink on the reflexed columellar lip. Surface glossy, spirally striated with numerous fine incised lines. Apex with typical *Drymaeus* sculpture. Whorls $6\frac{1}{2}$–7 slightly convex.

Aperture ovate, oblique to axis of whorls. Peristome simple, slightly expanded below. Columellar surface within the aperture oblique and more or less sinuous. Columellar lip reflexed in a small flat plate above the umbilicus.

Alt. 30 mm., diam. 13 mm., ap. l. 14 mm.

Alt. 28 mm., diam. 12 mm., ap. l. 13 mm.

Alt. 24 mm., diam. 11 mm., ap. l. 11.5 mm.

Alt. 35 mm., diam. 13 mm., alt. l. 15 mm.

Less solid and opaque than *D. immaculatus*, with sutures more impressed, last whorl shorter. Aperture broader and peristome more convex. The spire resembles in shape that of *D. immaculatus* from Jamaica. The aperture is like that of *D. lilaceus* from Porto Rico. The texture resembles that of *D. sulphureus* from Central America.

The animal when alive is dark bluish green above, fading to slate gray on the sides. The outer edge of the foot is tinged with green, which changes abruptly to cream color near the central part.

Types: No. 22877, M. C. Z.

BRACHYPODELLA INSULÆ-CYGNI, sp. nov. Pl. VI, fig 10.

Shell small, white, thin, translucent, cylindrical, tapering with straight outlines to a narrow truncate apex. Surface sculptured with strong white riblets, oblique to axis of shell, about 12–13 occurring on the penultimate whorl, interspaces about 4 or 5 times as broad as the ribs. Whorls strongly convex, the last not carinate or angulate, its latter half free, descending in a cylindrical neck.

Aperture oblique, rounded, slightly angular at the outer margin, lip white, reflexed. Axis simple, slender.

Length 7 mm., diam. 2. mm., whorls 9½ (truncate).

In living specimens the part of the shell containing the animal is dark grey, with very noticeable, small, irregular black spots on the animal showing between the ribs in the lowest whorls. Apex generally truncate, 4 or 5 corneous whorls being lost. In a specimen retaining the apical whorls the first 2 are vertically costulate, the lower ones becoming more obliquely sculptured.

The shell is similar to *B. minuta*, as described in the Manual of Conchology (vol. 16, p. 58), in size, in having the last whorl not carinate or angular, and in the slender axis, but it differs in having much coarser sculpture. From *B. dominicensis* it differs in color, in having deeper sutures, more convex whorls, and no basal keel; but in the spacing of the riblets and form of the axis, it is similar. In color and in having the whorls most strongly convex just below the suture, in the wide spacing, number, and prominence of the riblets, the shell reminds one of the Jamaican *B. costulata*; but *costulata* has the last whorl strongly carinate.

Types: No. 22889 M. C. Z.

COLOBOSTYLUS NELSONI, sp. nov. Pl. VI, figs. 1, 2.

Shell small, umbilicate, turbinate conical, surface longitudinally striate, with coarse sharp striæ on early whorls, becoming finer and more numerous on last whorl. The umbilical region generally showing a few coarse spiral lines, occasionally extending over the entire whorl. Two general color forms are noticeable, one with the upper whorl purple black, the color gradually fading till on the lower whorl it is purple red; the other form is light horn color throughout, with rows of equidistant square spots, the first two or three spots below the suture being frequently connected, forming short longitudinal lines. The number of spiral rows of these spots

on each whorl varies considerably, but average about three on the antepenultimate, five on the penultimate, and seven on the ultimate. The spots are equidistant whether considered as forming spiral or longitudinal rows. Whorls 3–4, the first growth being lost. Aperture vertical, subcircular, color within corresponding to the outside. Peristome with slightly raised white inner rim, and broad flat white expansion, slightly dilated at the columellar margin, and also above where adnate to the whorl.

Length 11.5 mm., width 7 mm.

Length 10.5 mm., width 6.5 mm.

Operculum white, slightly concave, with involuting lines and deeply grooved edge. The dark central core is nearer the columellar margin than any other portion of the peristome.

Types: No. 22879, M. C. Z.

Chondropoma caribbæum, sp. nov. Pl. VI, figs. 3, 4.

Shell subperforate, oblong, truncate, solid, with spiral flattened ridges and more numerous longitudinal lines. Color varying from horn to purple black, remaining whorls $4\frac{1}{2}$, convex, suture deep, nearly simple. Aperture vertical, longer than wide, rounded below, narrowed above. Peristome simple, adnate to the penultimate whorl, upper outer edge slightly broadened and reflexed.

Operculum cartilaginous, rounded below, broadly pointed above; whorls few, rapidly enlarging, outer half having edge turned abruptly out, inner edge turned in.

Length 10.5 mm., diam. 4.5 mm., ap. 3 mm.

Length 10 mm., diam. 4.5 mm., ap. 3 mm.

In size and general appearance this shell resembles *C. simplex*, from Haiti, but the spiral and longitudinal lines are finer and more numerous, and the last whorl is always adnate.

Types: No. 22885, M. C. Z.

Lucidella pilsbryi, sp. nov. Pl. VI, fig. 6, 7.

Shell depressed, with elevated, fine, spiral lines, strongest on early whorls, nearly obsolete on rounded periphery, base nearly smooth, or with more or less numerous, delicate, spiral furrows. Spire depressed, whorls 4, the last slightly deflexed. A thin granular callus extends from the aperture over the umbilical region, ending in a slight depression. Aperture very oblique, peristome white, a

little expanded above, thickened and reflexed below. Basal lip with short, white, obtusely triangular tooth, projecting in the plane of the last whorl, not projecting into the aperture.

Alt. 1.2 mm., diam. 3.5 mm., s. diam. 2.8 mm.

Four living specimens of this shell were collected. It belongs to the subgenus *Perenna* Guppy. It is smaller, more depressed, darker in color and with less acute liræ than *L. lineata.* In other members of the *lineata* group the basal tooth is squarish and projected into the aperture, but in *pilsbryi* it is broadly pointed and is a continuation of the lower whorl, not projecting into the aperture.

The slightly reflexed upper margin of the aperture, with no trace of tubercular teeth and the small size of the basal tooth, suggest a very slight immaturity. Possibly a larger series would contain older specimens, which would be found to have upper marginal tubercles, and a more strongly developed basal tooth. In any case the shell will be found to be specifically distinct.

Types ; No. 22890 M. C. Z.

NOTES ON MIOCENE CORRELATION.

BY AXEL OLSSON.

The deposits which we have come to recognize as of Miocene age on our Atlantic coastal plain differ in many respects from beds of similar age found in other regions. This uniqueness is due to their faunal characteristics, which were developed under conditions of which we have records nowhere else. Therefore, direct correlation or specific identity of forms is possible in only a few cases, and the Miocene age of these beds is based rather more on stratigraphic than on paleontologic grounds.

The seas of our Eocene and Oligocene periods were rather warm, and hence their faunas find their closest affinities in our present tropical seas. At the close of the Oligocene, conditions began to change. In the Oak Grove sands of Florida the fauna in a slight way portraits the coming Miocene one. However, more important, of which this special case is but a preliminary result, is the inauguration of a great series of orogenetic movements which culminated in a great series of Miocene uplifts. In Europe the whole series of

folding extended from the Pyrenees Mountains in Spain to the Himalayas in Asia. In America the union of the North and South Americas, the fusion of the island of Florida with the mainland, which was again severed towards its close.

As we would naturally expect, a series of such great changes would have some great effect upon the direction of oceanic currents. It is to this that an appeal has been made for the explanation of the uniqueness of our Atlantic coast Miocene faunas. This fauna is one typically developed in cold waters. This being shown especially well by the abundance of *Astartidæ*, *Ledas* and of such *Venericardias* related to our recent *Venericardia borealis*. The warm-water-loving series of the Oligocene retreated to the Antillean region, to return again towards the close of the Miocene and in the Pliocene, when conditions again became favorable to them, to retreat again before the general refrigeration which ushered in the Pleistocene glacial advances. Also further proof of a cold oceanic current creeping south along our coast is to be noted that the Miocene floras of the adjacent mainland indicate a warm, mild climate.

In the course of paleontologic work, it became rather desirable to obtain some immature shells of certain species. In order to do so I began the examining of the sand and marl contained inside of closed valves of several large bivalve shells, amongst which was a specimen of *Melina* (Perna) *maxillata* (Deshayes) from the Choptank River, Maryland. In so doing, two small but beautifully preserved valves of a small *Trigoniocardia* were discovered which later were identified as *Cardium* (*Trigoniocardia*) *galvestonense* Harris. They are figured on plate VI, figs. 11, 12.

This species was first described by Professor G. D. Harris from specimens obtained from the deep well drillings of the Galveston Artesian well.[1] Specimens from there are figured, Pl. VI, figs. 8, 9. The maximum depth attained in this well is 2,920 feet of which the interval between 2,158 and 2,920 feet was referred to the Upper Miocene. This fauna is tropical in its make-up, differing conspicuously from the cold Chesapeake fauna which at the same time extended into the Gulf of Mexico, through the Suwanee straits which separated Florida from the main-land. With the typical expression

[1] Bull. of American Paleontology. Vol. I. No. 3, p. 91, pl. 1, fig. 3, 3a. Dec. 2, 1895.

of the Chesapeake fauna as developed in Virginia and Maryland, only a few species are held in common, while with the Upper or Duplin Miocene horizon of N. C., agreement is much closer, due as much to similarity of climatic conditions as to a similarity in age.

Besides *Cardium galvestonense* Harris, two other species are available for correlation in both the Chesapeake beds of Maryland and the Miocene of the Galveston well, namely *Mytilus conradinus* Orb. and *Crassinella galvestonensis* Harris. These two species are rather abundant and occur in nearly the whole series of our Miocene beds. The former from New Jersey southward, the latter as far north as Maryland. *Cardium galvestonense* however until its present discovery in the Choptank formation of Maryland has escaped notice outside of its type area. Its distribution is such as to indicate, that it may be expected anywhere in the intermediate area. Its rarity outside of the Texan region, where it is abundant, indicates that it is a warm-water-loving form, finding as Professor Harris notes, its nearest relations with Antillean species. So far it is the only *Trigoniocardia* discovered in our Atlantic coast Miocene beds, although the group is abundantly represented in the Oligocene beneath.

NOTE ON CLEMENTIA OBLIQUA JUKES-BROWNE.

BY WM. H. DALL.

Mr. A. L. Jukes-Browne in the Annals and Magazine of Natural History for July, 1913, p. 60, has published a description of a new species of *Clementia* under the specific name of *obliqua*, which was supposed to come from Porto Rico. By the kindness of J. Cosmo Melvill, Esq., I have been able to examine one of the two specimens upon which this species was founded. It proves not to be a *Clementia*, not to come from Porto Rico, and to be a species described by Carpenter under the name of *Clementia subdiaphana* forty-eight years ago. As *Clementia* was, according to Adams and Woodward, a Dosinoid animal, and the soft parts of this species are Veneroid, it was transferred by me to the genus *Marcia*, section *Venerella*, in my revision of the Veneridæ in 1902. I figured the species in the Proceedings of the U. S. National Museum in 1891 from an exceptionally rotund specimen. Mr. Jukes-Browne's figures are of the more

common and elongated type. The cotype of *obliqua* examined by me has a specimen of *Galerus contortus* Cpr. adhering to it, which, like the bivalve, ranges from Alaska to the Santa Barbara Islands of California. All true Clementias are more or less concentrically undulated and have a deep linguiform pallial sinus, both of which features are absent from the so-called *C. obliqua.*

NORTHERN IDAHO SHELLS.

FRANK C. BAKER.

During the month of September the writer visited various portions of Oregon, Washington, and Idaho. Nearly three weeks of this period was spent in Northern Idaho in the beautiful Kootenai Valley and about Lake Pend Oreille. This region is quite unknown conchologically and it was hoped that some fine new species of Oreohelix or Polygyra might be found, comparable perhaps to the Sonorellas, etcetera, that our friend Ferriss has dug from the rocks of the Grand Canyon and the stony wastes of Arizona. Evidently we did not tear enough of the mountains to pieces, and so the pleasing sensation of finding a novelty was denied us. Perhaps the fact that we were examining the sturdy young trees of a newly acquired apple orchard (as well as counting the number of boxes of apples we would sell from these trees!) also accounted for our failure to secure a larger number of species.

Considerable time was given to hunting for snails, and a large number of specimens was secured, but of few species. A more detailed and careful search would doubtless increase this number, but the fact seems evident that the forests of pine, hemlock, spruce, and fir in this region do not harbor a large variety of molluscan life. As this is a new region, the list, though small, may be of value. The orchard tract near McArthur, Idaho is a little over 2000 feet in elevation.

Circinaria vancouverensis (Lea). Kootenai Orchard, McArthur, Idaho. This snail is not common the only specimens obtained (two in number) being found near our sleeping tent, one under the floor and the other beneath a burnt log. The specimens are smaller than those living to the westward, at a lower elevation.

Euconulus trochiformis (Montagu)—*fulvus* Müll. Specimens were found plentifully on old boards under the wooden floors of the sleeping tents.

Zonitoides arborea (Say). This is the commonest snail here, as in our eastern forests, and is found everywhere in large quantities. Specimens from Idaho and Chicago cannot be distinguished.

Pyramidula solitaria occidentalis (Marts.). This fine shell was found only high up on the mountain sides at an elevation above 4000 feet. At this height they were very abundant for about 500 feet, when they totally disappeared, their ecological elevation being between 4000 and 4500 feet. They were found in hollows in well-wooded ravines at the base of rocky projections, where there was a vigorous growth of shrubs, and in dell-like valleys between mountain spurs. They were always found (in September) buried under leaves and débris, sometimes to the depth of several inches. The color is rich brown or chestnut, with two reddish bands, which are specially conspicuous in the aperture.

These shells were at first somewhat of a puzzle, for they seemed to combine characteristics of both *Oreohelix cooperi* and *Pyramidula solitaria*. Prof. Elrod[1] notes a similarity between these two species near McDonald Lake, Mission Mountains, Montana. To Mr. Wm. Moss, Superintendent of the Kootenai Orchards, is due the discovery of these shells. We had searched diligently for nearly two weeks without finding even a dead specimen, though the mountain side had been ascended for a thousand feet. Upon mentioning the fact to Mr. Moss, he stated that he had seen piles of big shells way up on the mountains. A subsequent climb to this altitude (2000 feet above the orchard) revealed the coveted Helices.

Galba parva (Lea). This little Lymnæid was found only in a small creek at McArthur.

Physa diaphana Tryon. The Orchard, McArthur; Moravia, about eight miles north of McArthur. This is the common Physa and occurs in some localities in great abundance.

Chaos in the *Physidæ* is painfully realized when one attempts to definitely place a member of this family. *Diaphana* was originally described from California, but the species under discussion, though occurring so far to the eastward of this region, conforms to the

[1] Bull. University of Montana, Biological Series, No. 3, p. 112.

descriptions and figures of Tryon[1] more closely than to any other, both in size (11–13 mill. long) and form. The collumella is precisely as described by Tryon. It is probable that many of the western Physas have a wide distribution west of the Rocky Mountains.

Planorbis antrosus Conrad. A single specimen of this species was picked up on the shore of Pend Oreille River, in front of the fish-hatching building, across the river from Sandpoint. It is exactly like the variety *portagensis* Baker, from Maine. Though the two localities are separated by 2500 miles of territory, there is no question concerning the identity of the Idaho shell. Only three other records of *bicarinatus* (*antrosus*) are known from Idaho, and these are all from the "panhandle," not far removed from the locality under consideration.[2]

At Glacier National Park, Montana, in a ravine about a mile west of the hotel, a number of dead shells of *Oreohelix cooperi* (W. G. B.) were secured. No living specimens could be found, though special search was carried on for them. Glacier Park Station is about 5000 feet altitude.

PUBLICATIONS RECEIVED.

Description of Some New Cerionidæ, by C. J. Maynard (Appendix to Records of Walks and Talks with Nature, Vol. v, pp. 177–200, 1913). The object of this notice is to call the attention of conchologists to this somewhat obscure publication, containing over thirty-five so-called new species. The author states in the introduction that "The following announcements of the discovery of certain laws which govern the evolution of groups and the descriptions of some species are here given preliminary to a revision of my monograph of the *Cerionidæ*." The author's brevity in describing species and his combinations of hyphenated names are something remarkable. The latter method is evidently necessary to emphasize his belief that "a species may become established even though it is still bound to its parent species by living links." Having made no special study of this interesting family, it would be useless for me to comment further, for in doing so I might seriously encroach upon the vocabulary

[1] See Tryon, con. Haldeman's Mon., p. 134, pl. 6, fig. 15.

[2] See Walker, Nautilus, XXIII, p. 25, 1909.

of a specialist on the *Cerionidæ* who might later have occasion to criticise this work.—C. W. J.

A Preliminary List of the Mollusca of Missouri (exclusive of the *Unionidæ*), by F. A. Sampson (Trans. Acad. Science, St. Louis, Vol. xxii, pp. 67–108, 1913). A valuable and interesting list of 132 species, giving their distribution throughout the State.

Observations on Living Solenomya (*velum* and *borealis*), by Edward S. Morse (Biol. Bull., Vol. xxv, pp. 261–281, 1913). An exceedingly interesting article, in which the animals are clearly shown by some 22 figures, and their habits and structure fully described. Their movements consist of a series of vigorous darts, which send them rapidly through the water. They seem to have the peculiar habit of burrowing in the mud posterior end downward, this attitude being contrary to the behavior of all other burrowing lamellibranchs.—C. W. J.

NOTES.

Helix hortensis on White Bull Island, Me.—I have read with much interest your paper in October Nautilus on *Helix hortensis* in New England, and note on page 63, you mention that the species has not before been recorded from White Bull Island, Maine. With this I am sending you a partial catalogue of the land shells in my collection, which I printed in 1889. (Circumstances prevented its completion). On page 32, No. 2066, you will find the species listed from that locality, received from Rev. E. C. Bolles (of Portland, Maine) who sent them to me October 30, 1867. This may not constitute a "record," though copies of the catalogue have been somewhat extensively circulated among my friends and correspondents in this country and abroad, but possibly you may be interested to know that its existence on White Bull Island was known 46 years ago.—Wm. G. Mazyck.

Martyn's Universal Conchologist.—Seeing Mr. Berry's note in December Nautilus reminds me that I have had a copy of the first two volumes of this rare work in my library since May 1908 and as it differs in some particulars from those already put on record I give description below.

It is bound in full tree calf in one volume, trimmed to $10\frac{3}{4}$ by $13\frac{7}{16}$ inches. The frontispiece has elaborate gold grapevine pattern surrounding the figure of *Turritella terebra.* Then follows a title page which does not appear to be in the National Museum or Academy of Natural Science copies. (See Dall, Proc. U. S. Nat. Mus. Vol. xxix, p. 422). This title is as follows:

The / Universal Conchologist, / Exhibiting / The Figure of every known Shell accurately drawn and painted after Nature: / With A / New Systematic Arrangement / by the Author / Thomas Martyn. / Sold at his House, No. 16 Great Marlborough Street, London. / . . . . / Le / Conchologiste Universel, / montrant la figure de chaque coquille aujourd'hui connue: / Soigneusement Dessinee, et peinte d'apres Nature. / Le tout Arrange selon le Systeme / De L'Auteur, / Thomas Martyn. / Se vend chez lui No. 16 Great Marlborough Street, Londres, 1789. /

Then follows the title-page given by Dall; engraved dedication to the King; the bastard title. The Introduction and Preface are as given by Dall, but the two plates of medals are bound between pages 26 and 27 of the Preface. The two Explanatory Tables follow the blank page 40. Close to the lower, right-hand margin of the first Table is engraved *Obser* which probably refers to the sheet of "Observations" in the Henderson copy but missing from this. (See Dall, Proc. U. S. Nat. Mus., Vol. XXXIII, p. 186).

GEO. H. CLAPP.

SHOWALTER OR SCHOWALTER.—In the December NAUTILUS Mr. H. H. Smith mentions Lea's incorrect spelling of the name of Dr. S[c]howalter. It was my privilege to enjoy delightful correspondence with the Doctor for several years, and I can assure any one interested that the Doctor's son is mistaken. He did *not* "always write the name with a *c.*" I enclose a tracing of his very plainly written signature of a letter dated March 11, 1867, at which time he certainly spelled the name Showalter, as Lea, Ravenel, Tryon, I, and others have spelled it. The changed spelling must have been coincident with his marriage in December, 1867, as in his last letter before that event, written in November, he used only *Sh*, and in the first one which I received after it, dated July 10, 1868, the *Sch* appears and so continued to the end.—WM. G. MAZYCK.


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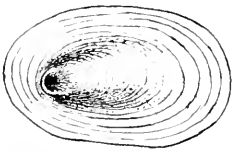
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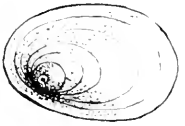
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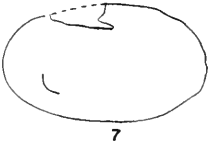
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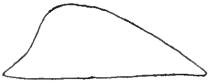
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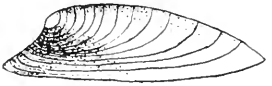
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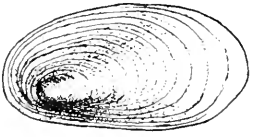
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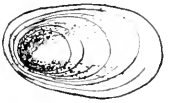
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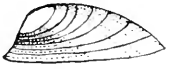
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THE NAUTILUS.

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CAMPS IN THE CATALINAS AND WHITE MOUNTAINS OF ARIZONA, WITH DESCRIPTION OF A NEW AMERICAN LAND SHELL.

BY JAS. H. FERRISS.

On my last vacation last summer I found a new land snail, another wooly one, on a rock slide of the San Francisco river, about ten miles above Clifton, Graham Co., Arizona. It belongs in a group with *Ashmunella walkeri* Ferriss and *A. lepiderma* P. & F. I have held this out to name after Dr. H. A. Pilsbry who has been with me on so many of these vacation excursions and ought to have been with me on this. Dr. Pilsbry has taken the laboring oar on the catch of this expedition otherwise, and together with the findings of the catch of Pilsbry, Daniels and Ferriss in southern Arizona for 1910, the report will be published in the Proceedings of the Academy of Natural Sciences, Philadelphia.

ASHMUNELLA PILSBRYANA n. sp.

Shell lens-shaped, acutely carinated; umbilicus straight and narrow, 1.6 min. wide, enlarging on the last turn to 3 mm. Thin, pale, corneous brown. Surface sculptured with irregular growth striæ, closely papillose, not striated spirally: covered with a thin dull epidermis, with short, light colored, cuticular scales upon the papillæ in young, unrubbed specimens. $5\frac{1}{2}$ whorls, rounded, deeply sutured, last whorl impressed above the periphery; lower side of last whorl three times as wide as the upper surface; deeply guttered behind the lip.

Aperture wide and oblique; parietal callus barely visible, carrying a nearly straight parietal lamella which runs nearly parallel with the lower edge of the aperture, and is bent inward at the outer end, in shape a fair representation of a letter J reversed. 3 teeth upon the outer lip well developed: a wide tooth just below the peripheral angle, somewhat receding or set back from the lip; a pair of teeth upon the basal margin, yoked together at their outer ends, and extending inward across the thickening of the peristome, in shape therefore like the letter U.

Alt. 5.7, diam. 14 mm.

Largest shell 14.8 mm. diam. by 6.4 alt. Smallest, 13.9 diam. by 6.1 alt.

The shell in color and general appearance seems close to *A. walkeri* Ferr., but is larger, being less depressed, and it has a narrower umbilicus and more whorls. In sculpture and epidermal covering it is similar to *A. lepiderma* P. & F., of which the new species is a sort of large edition.

Cotypes in coll. Academy of National Sciences, Philadelphia, and in my own collection.

In a hasty search I found but eight of these, of which two were alive, at the foot of a rocky slide on the east bank of the river in company with *Sonorella* and smaller shells.

May 7th, 1913 I left Joliet just a-crawling, for there had been no vacations since 1910, and the fight for bread had been usually hard. I returned home October 20th, the longest vacation I ever had; and the best of it is, the bread question is settled so that I shall not want, and the vacations hereafter can be as frequent and long as I please.

Until September, I chaperoned a party of invalids in the Santa Catalina Mountains near Tucson. This chaperoning and my own tired feeling prevented me from making a complete survey of that range, though I had done a little of it in 1910. I brought home a large quantity of dirt containing Pupas, many cans of dead Sonorellas, and the skins of five kinds of rattle-snakes, picked off of 'em here and there in the hills.

With Frank Coles, a splended guide and biscuit maker, I drove across the plains and over the mountains from Tucson to Wilcox, then to the Graham Mountains, Solomonville, the Peloncillo Mts., and to Clifton, picking up snails, snakes, terrapins, ferns and daisies; occasionally a few peaches, melons, and our own belongings. It was

an interesting ride. As a rule the condition of the highways for exercise, equals any gymnasium this side of the Alleghanies. We tipped our wagon over in the Graham Mountains, but we held it up all but once, anyhow.

Physa was found in the water tanks and *cienegas*, and *Oreohelix strigosa depressa* and a *Sonorella* were found in the Grahams; another *Sonorella* in the Peloncillos, but more of them are there.

This was a mere scouting expedition to see how the land lay for ferns and snails another year. We seldom remained more than one night in the same camp, hitting high spots for collecting at meal times, and before hitching up.

Coles knew where the water was and where it was not, and so arranged the drinks. At Clifton, we corralled our wagon, and with horses to ride and mules to pack, continued the journey to the White Mountains of Arizona (not new Mexico). On Eagle Creek, the fourth day, we commenced to find *Oreohelix*. As we climbed over the edge of the Blue Range, I found an *Ashmunella* of the *chiricahuana* group and *Oreohelix* in the pine woods under logs. This was at 12,000 feet above the sea, but the ascent had been gradual. It did not seem high. From this point to the top of the White Mountains (Old Baldy, 14,000 feet,) the ascent was easy, the trail fine, the grass high and cattle fat.

Upon the return trip, we left the Eagle Creek trail at the Rim of the Blue Mts. and dropped down Raspberry Canyon to the Blue River, 5000 feet, returning to Clifton by the Blue and San Francisco Rivers. At about 4,000 feet, *Sonorellas* were found again, and *Ashmunella pilsbryana*. The rocky slides looked inviting. It was a hard race for horse feed, as the floods had destroyed grazing on the flats, the bluffs were unscaleable, and duty called me home. I opened only four "slides" in the last fifty miles.

The river's banks have the best prospects. At every slide I scratched, I found a new species. All had been unexplored country conchologically, and I expected to find great things, large as tea saucers, banded and punctuated with scarlet, clothed in feathers and spines. Nevertheless, I found a dozen or so that are new; and next year I hope to revisit the neglected slides and go farther into the big mountains. I know the way now.

Cole shot a bear and we ate it up, also several deer and other smaller things. The streams were full of speckled trout and the

pine and spruce forest a continual delight. The Oreohelix were beautiful in colors, quite equal to those neutral brown tints of the Philippine snails.

Everything, all summer long, in Sonorellas, Ashmunellas and Oreohelix, except one *Oreohelix* and one group of *Sonorella*, was found in the rocky slides or talus, and many were dead. I had theories that dry weather, epidemics, insects or fungi had killed them, but most of these theories are also dead, or in a dying condition. Perhaps I did not stay long enough upon one slide to find their home. It is nearly all slide work, and healthy. After sleeping nearly half a year under the stars in the high woods, I am strong as a farmer. Those invalids I chaperoned are well.

Joilet, Ill., Nov., 1913.

PHYSA HETEROSTROPHA SAY IN EUROPE.

BY ZDENKA FRANKENBERGER.

Of late there have appeared in the literature many statements of the presence of *Physa acuta* Drap. in Central Europe. It was found in Leipsic, Gotha, Königsberg, Jena, Dresden, Munich, Copenhagen, Basil, etc., almost always in botanical or other gardens, where it was thought to have been brought in by the aquarists. In the neighborhood of Prague we could confirm some years ago, a species of *Physa* which was remarkable by its size and quite another form of the shell than are the two common Bohemian species of *Physa*, *Physa fontinalis* L. and *Aplexa hypnorum* L. It could not be identified with *Physa acuta*, but it is surely the American species, *Physa heterostropha* Say, as it was stated already in the Catalogue of Bohemian Molluscs[1] by *Babor* and *Novak*. With some care one cannot be mistaken in the right determination of this snail, for both the shell (with thicker walls, a lip in the aperture and of a large size) and the animal (more robust, olivaceous) are quite different from *Physa acuta*, which does not occur in the eastern parts of Europe, and the eastern frontier of the distribution of which is the

[1] Babor u. Novak, Verzeichniss der posttertiären Fauna der böhmischen Weichtiere. Nachrbl. d. deutschen Malakozool. Ges., 1909.

Rhine. But now Dr. *C. R. Boettger*[1] described a new variety of *Physa actua* from Oppeln in Silesia, which he calls var. *thermalis*. It is said to differ from the type by its larger size, thicker shell and irregular surface. In the same locality lives a species of *Sphærium*, which is described as *Sph. tetensi* sp. n., but the author says that it is quite similar to the American *Sph. simile* Say. From the illustration of the new variety of *Physa acuta* it is evident that there is no *acuta* at all, but that this form is quite identical with the large specimens of *Physa heterostropha*, which occurs near Prague of the same size. How the case stands with other records from Central Europe, I dare not say; but it is very probable that all these supposed *Physa acuta* are in reality *P. heterostropha*, which was introduced with American fishes and plants of aquaristic commerce, and which found in our waters suitable circumstances of life. On the contrary *Physa acuta* as an animal of warmer regions of Western Europe scarcely could live any long time in the cold waters of our pools and brooks.

NOTES ON THE ANCYLIDAE OF NORTH AFRICA.

BY BRYANT WALKER SC. D.

Through the great courtesy of M. Paul Pallary of Oran-Eckmuhl, Algeria, the well-known student of North African Mollusca, I have been recently enabled to study his entire collection of North African *Ancylidæ*.

The collection consists of twenty-nine lots, nineteen from Algeria, six from Morocco, one from Tunis and four from Egypt.

In preparing the following notes, which are based mainly on M. Pallary's collection, I have made use of such additional material as I have in my own collection and such of the literature as I have at my disposal.

I am under special obligations to Dr. E. F. Weber of the Natural History Museum of Geneva, Switzerland, for drawings and inval-

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[1] C. R. Boettger, Beiträge zur Kenntniss der Molluskenfauna Schlesiens. Nachrbl. d. deutschen Malakozool. Ges., 1913.

uable information in regard to several of Bourguignat's types, which have enabled me to definitely determine the species described by that author.

The distribution of the *Ancylidae* in North Africa is entirely in in accord with the faunal limits set forth by Germain in his recent essay on the "Malacographie de L'Afrique Equatorial", (1909, p. 118). According to that author Africa, north of Lat. 17° N. and including the Azores, the Madeira, Canary and Cape Verde Islands, belongs to the Palæarctic Region. In the fluviatile Mollusca, however, the Valley of the Nile forms an exception and is populated by the characteristic fauna of the Equatorial Region. And this is true, also, in regard to the *Ancylidæ*.

In Europe, *Ancylus* is represented by two, and only two, very distinct groups: *Ancylus s. s.*, of which *A. fluviatilis* L. is the type, and *Acroloxus*, of which the type and only species is the *A. lacustris* L.

The latter does not seem to have extended its range across the Mediterranean. But the *fluviatilis* group is found in great abundance and variety from Abyssinia to Morocco.

Two species have been described from Abyssinia by Jickeli, (1874, p. 223), *A. abyssinicus* and *compressus*, for the latter of which Bourguignat, (1883, p. 84), has proposed to substitute the name of *hamacenicus*, *compressus* being preoccupied both by Parreyss and Nyst. Clessin, (1882, p. 31), considers it to be only a variety of *abyssinicus*.

The collection of M. Pallary contains one species from Tunis.

Thirteen species of more or less doubtful validity have been listed from Algeria by Bourguignat and others.

Four species are listed from Morocco by Pallary in his last catalogue (1904, p. 54.), of the fauna of that country.

The *A. aduncus* Gld. from Madeira is referred to the European *A. striatus* Q. & G. by Wollaston, (1878, p. 470).

According to that author the same species, *striatus*, occurs abundantly on the islands of Grand Canary, Palma and Teneriffe in the Canaries.

The *A. rupicola* Mouss. (1872, p. 141), from Teneriffe is an allied and probably depauperate form of the same species according to Wollaston.

All of these species undoubtedly belong to the group of *A. fluviatilis* and show that the ancyloid fauna of these countries is purely palæarctic.

The single species, however, recorded from the Cape Verde Islands, *A. milleri* Dohrn, (1869, p. 18), so far as can be judged from the imperfect description, would seem to be a *Ferrissia*. If so, it probably marks the extreme northern extension of the Equatorial fauna on the west coast.

The family is not represented at all in the Azores.

In Algeria, in addition to the species of the *fluviatilis* group, are found the two remarkable species described by Bourguignat and for which he created the genus *Brondelia*, (1862, p. 89), *B. drouetiana* and *gibbosa*, which retain the apical whorls in maturity. In this respect they resemble the Tasmanian species of *Ancylastrum*. Unfortunately the soft anatomy of these forms is, as yet, unknown and, until that is determined, the systematic position of the group must remain uncertain. In all probability, it will be found to be more closely related to *Ancylus s. s.* than to *Ancylastrum*.

In both *Brondelia* and *Ancylastrum* the apical whorls are sinistral and the animal is, probably, sinistral also. On the other hand, *Ancylus s. s.*, which loses its sinistrally coiled apical whorls at a very early stage and in maturity has the apex usually more or less turned to the right, never to the left, while the animal is sinistral, is commonly (Taylor, 1895, p. 115) considered an example of heterostrophy. As a matter of fact, a careful study of the shells belonging to the different groups of the *Ancylidæ* will show that the species having the apex turned toward the right are really sinistral in their essential construction. In the same way, *Acroloxus* with its apex turned to the left and a dextral animal would have also in reality a dextral shell.

In view of the prevalence of the various forms of the *fluviatilis* group as a characteristic feature of the fauna of Algeria, it was a cause of great surprise to find among the *Ancyli* of M. Pallary's collection a very distinct and curious species of *Ferrissia*.

The genus *Ferrissia*, for in view of the distinct character of the radula, which will be discussed at length in my final paper on the *Ancylidæ* of South Africa now in preparation, I believe it to be entitled to generic rank, has the most extended range of any group of the *Ancylidæ*. While *Ancylus s. s.* and *Acroloxus* are restricted to the Palæarctic Region of the Old World, *Burnupia* to South Africa, *Ancylastrum* and *Latia* to New Zealand, and *Lanx* and *Lævapex* to America, *Ferrissia*, with the exception of the Palæ-

arctic Region of the Old World (Northern Africa as herein stated excepted) has a world-wide distribution.

With its apparent metropolis in North America, it has recently been found abundantly in South Africa (Walker, 1912, p. 142), and extends northerly along the east coast of the Equatorial Region and in the Valley of the Nile to Alexandria.

Ancylus tanganyicensis Smith (1906, p. 184), is a *Ferrissia*.

The species collected by Blanford (1870, p. 472), in a small stream near Mai Wahiz, Tigre, an affluent of the Nile (l. c., p. 61), and doubtfully referred by him to the Indian *A. verruca* Bens., is also a *Ferrissia*. Blanford's specimens, now in the Indian Museum at Calcutta, was sent in 1908 to the Rev. Prof. Gwatkin of Cambridge, England, to enable him to extract and examine the radula, which he informed me was of the *Ferrissia* type. Through his courtesy the shells were sent to me for examination on their way back to Calcutta. At that time I had no specimens of the Indian species in my collection for comparison and, as I had then no expectation of ever doing any work on the African fauna, I unfortunately neglected to make any description or figures. My note, made at the time, was simply that the specimens were Ferrissias. This confirmed Prof. Gwatkin's opinion based on his examination of the radula and settled the generic position of the form, though, unfortunately, its specific character must remain uncertain until it can be more critically examined.

There are, so far as I know, no authentic records of the occurrence of *Ferrissia* on the west coast of Equatorial Africa. As already stated, it seems probable that the *A. milleri* Dohrn from the Cape Verdes belongs to this group, but only an examination of the types can definitely determine that question.

There is every probability, however, that, sooner or later, *Ferrissia* will be found to be of general distribution in Equatorial Africa.

The Indian *A. verruca* Bens., the Japanese *A. baconi* Bgt., the Australian *A. australis* Tate, the New Zealand *A. woodsi* John., (possibly the non-septate form of a *Gundlachia* according to Hedley, 1895, p. 66), and the Hawaiian *A. sharpi* Sykes are all Ferrissias.

This world-wide distribution of *Ferrissia* is very significant and goes to show that, like certain other fresh-water pulmonate types of similar distribution, it is probably of very ancient origin. And the apparent agreement between its present range and the conditions of

land and water in Upper Cretaceous times as depicted by Ortmann (1902, p. 381), may be more than a mere coincidence.

While *Ferrissia* and *Laevapex* are very closely related, the world-wide range of the former is in marked contrast with the restricted one of the latter, which is apparently confined to America.

I can not accept Hannibal's statement, (1912, p. 153), that the *Ancylidæ* have been evolved "from simple, patelliform ancestors". I agree rather with Grabau, (1902, p. 921), that "our modern patelliform species are probably not primitive types", but are descended from ancestors with spiral shells. The persistence of spiral apical whorls in *Brondelia* and *Ancylastrum* and the deciduous spiral apex of *Ancylus s. s.* would seem to be conclusive on that point.

While there may be no great force in an argument based on the usually thinner and flatter shell of *Lævapex* as compared with that of *Ferrissia*, so far as it goes, it tends to show a progressive degeneration of the shell-secreting function in the former group.

For these reasons I can not follow Hannibal, (l. c. p. 150), in subordinating *Ferrissia* to *Lævapex* as a subgenus. To my mind, the reverse is actually the fact and *Lævapex* is a comparatively recent offshoot from the ancient *Ferrissia* stock.

My main purpose in undertaking the examination of the Pallary collection was to determine as far as possible the relative range of *Ancylus s. s.* and *Ferrissia* in North Africa. It would be quite impossible for any one without access to types of Bourguignat and large series of Palæarctic material either to attempt to identify Bourguignat's species or to satisfactorily determine the validity of the African species belonging to the *fluviatilis* group. And I have not attempted to do so.

(*To be continued.*)

POISONING BY THE BITE OF CONUS GEOGRAPHUS.[1]

The following report by Dr. A. Herbert Hallen was forwarded to the Australian Museum, Sydney, by Dr. B. G. Corney, from Fiji, 10th September, 1901. Accompanying it was a shell, identified as *Conus geographus*, said to be similar to the one that inflicted the severe bite described. The following is the extract from the Gov-

[1] From *The Australasian Medical Gazette*, September, 1912.

ernment Medical Officer's Report, Levuka, for the month of June, 1901 :

"I had under observation the case of a European lady here who was the subject of a severe form of poisoning by a shell-fish of the species of which a shell is now sent for identification.

"The lady was fishing not far from the shore in the evening, with her family and native servant in the boat. The shell-fish having been obtained, the boy cracked it to extract the meat, which was large in quantity for the size of the shell, and having cracked the shell, handed it to his mistress with the meat hanging from its internal attachment. To free the flesh she inserted her little finger towards the upper end, and, she declares, felt it shoot out a sharp-pointed thing which penetrated her finger and caused such a peculiar sensation that she at once called out that she was bitten and poisoned.

"The poisonous matter is said to be the yellow pulpy matter at the thicker end of the shell ; it might of course be merely reproductive or digestive tissue, or again there might well be a modification of some secretory gland to form a protective poison gland, and in the latter case, nature would surely provide along with poison, some mechanical means to promote injection into the enemy.[2]

"The point of puncture in this case was minute and only to be seen with great care ; indeed, that it was a puncture was much less readily seen than the local effect of the poison which caused a bluish discoloration of the surrounding tissues. It was situated at the point of the patient's little finger near the side of the nail. Through so small a puncture, and in so short a time as was allowed to its insertion (she did not unfortunately suck the wound), but a most minute quantity of the poison could have entered the circulation, yet the effects were most grave. Locally a numbness was first experienced. This extended rapidly up the arm, which became paralysed and the paralysis spread thence rapidly throughout the body. It was peculiar that not only was general muscular control abolished, even so far that the head had to be supported over the trunk in order that unimpeded breathing might be allowed to continue ; but there was a loss also in a lesser degree (as I think) of sensation, with numbness

[2] The wound was doubtless inflicted by the radula, of which the teeth are well known to be provided with ducts communicating with a poison-secreting gland.—Ed.

and "pins and needles" beginning in the arm and becoming generalised through the body, and to a more marked degree there was a disappearance of muscular sensation and a complete absence of knee jerks. The patient constantly asked where her limbs were. Utterance was thick and indistinct. The respiratory and cardiac muscular apparatus did not at any time participate to a dangerous degree in the paralysis. The stomach, however, may have been effected, for I could not induce vomiting. When at its worst, some three or four hours after the poisoning began, the condition distinctly affected the throat, and a good deal of distress was caused by the difficulty in removing accumulated fluid. The poison seemed to me to clearly belong to the class of which *curare* is the type. Of this I felt assured as soon as I had examined the patient and observed the freedom of the respiratory and circulatory centers from its actions compared with the absolute abrogation of voluntary muscular paralysis, so that, the patient weighing 16 odd stone, I felt a good deal of anxiety as to whether the arms would not dislocate at the shoulder when the body was lifted in the chair by the hands under the armpits; indeed it was exceedingly difficult to move the patient, all the parts being so abnormally yielding. The treatment I adopted was merely directed to the maintaining of life till the poison should have been destroyed. The heart and lungs were quite equal to their work if other circumstances could be kept favorable. This was done by placing the patient in a semi-recumbent position in a canvas chair, and by keeping the head in such a position that breathing and swallowing were facilitated. I should have liked to relieve the circulation by inducing vomiting, but failed to do so. Had I had strychnine with me, I should have injected it hypodermically, but I did not feel justified in leaving the patient to get it. The worst was past in about six hours. The wound was made about 9.30 p. m. Paralysis lasted on with steadily diminishing intensity till late next day, but the numbness lasted considerably longer in the injured finger, and for a month after the patient experienced a shock in the little finger on hard impaction—as in playing the piano. This was the last symptom to clear up, unless the sore eyes, which began and lasted later, are to be attributed to this poison as their cause. Though natives declare that recovery from fish poisoning is often complicated by sore eyes, yet I am not aware that the tradition would apply to this kind. I have heard since of other cases of this

kind of fish poisoning, and among others of a Kadavu woman who died before she could be got from the shore."

NOTES.

A few weeks ago the skipper of my little boat, the EOLIS, made a single dredge haul off Key West, Florida, in 90 fathoms, rough rocky bottom, and just on the edge of the "Pourtales Plateau" and within the Gulf Stream. Although the number of species obtained is small the catch is a remarkable one and seems to me well worth recording. It is as follows;–

1 Sipho (Ptychosalpinx) n. sp.
1 Liomesus stimpsoni Dall
18 Voluta (Maculopeplum) dohrni Sby
2 Voluta (Aurinia) dubia Brod
2 Voluta (Aurinia) gouldiana Dall
4 Calliostoma bairdi V. and S.
6 Murex beaui F. and B.
1 Phyllonotus nuttingi Dall
1 Pteronotus macropterus Desh
2 Coralliophila deburghii Reeve
1 Conus mazei Desh
3 Phos candei orb
10 Nassa hotessieri Orb
1 Cassis inflata Shaw
6 Pleurotoma albida Perry

JOHN B. HENDERSON.

MR. LLOYD B. SMITH collected the following species of shells from a Pleistocene deposit near Sierra Nueva, Santo Domingo. It may be of interest to put the find on record as the type of *C. moenensis* Galb. was found in Costa Rica.

Bullaria amygdalum Dillw.
Columbella mercatoria Lam.
Murex similis Sowb.
Thais coronata L.
Strombus pugilis L.
Cerithium literatum Born.
Cerithium moenensis Gabb.
Natica caurena Lam.
Neritina virginea L.
Chione cancellata L.
Chione paphia L.
Chama lingua-felis Rve.

E. G. VANATTA.

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NOTES ON SOME WEST AMERICAN PECTENS.

BY WILLIAM H. DALL.

Since publishing my notes on West Coast Pectens in 1898, in the Transactions of the Wagner Institute, a very large amount of material has accumulated which enables me to revise and correct the nomenclature then adopted and the views of relationship of the different forms treated. The complete work is reserved for future publication, some notes however having an immediate interest.

In 1839 Anton described under the name of *Pectan excavatus* a species from China afterward named by Sowerly *P. sinensis.* This is a good species. In 1846 the plate of the Mollusca of the "Voyage of the Venus" by Valenciennes were issued and contain a *Pecten* named *P. excavatus.* Whether the name is a mere coincidence, or the species was supposed to be the same as Anton's, cannot be known, as the text was never published. At any rate the shell figured was identical with that commonly known as *P. dentatus* G. B. Sowerby, 1842. But there is a *P. dentatus* described by J. Sowerby in 1829, so that the name of 1842 cannot be used. For this common species of the Gulf of California I propose the name of *Pecten* (*Euvola*) *cataractes.*

The group of Pectens including *P. islandicus* Müller, *P. rubidus* Hinds (= *hindsii* Cpr.), *P. hastatus* Sowerby, *P. hericius* Gould, etc. has always puzzled writers, all of whom, including myself, have been misled by worn specimens or insufficient material.

Possessing the types of Gould, Carpenter, and Arnold, and a full series of the recent shells in good condition, I have reached the following conclusions.

P. hastatus Sowerby, is a good species of small size and limited distribution in the California region.

P. hericius Gould is distinct, and distributed from Port Althorp, Alaska to San Diego, Cal. The variety *albidus* Dall, if not a distinct species, is probably an extreme form of *hericius*.

P. islandicus Müller, extends from the Arctic south in constantly deeper water to the Strait of Fuca. Varieties of this were supposed to be *P. rubidus* Hinds, by Middendorff, who did not know the true *rubidus*, and his name for one variety, *beringiana*, takes precedence of my variety *strategus*, which is identical.

P. hindsii Carpenter (*rubidus* Hinds, not Martyn) has a very wide distribution from Bering Sea to Cape St. Lucas. It is a good species, the typical form of which has the major ribs on the right valve flattish and smooth. In my variety *navarchus* they are rounded and densely imbricate. The two can be separated in the dark.

Pecten (*Plagioctenium*) *circularis* Sowerby, has had a confused nomenclatorial career. It was first named *tumidus* by Sowerby in 1835, but there is an older *tumidus* of Turton, 1822. Sowerby then replaced the name by *ventricosus* under which the species is commonly catalogued. But he had also described in 1835 a *P. circularis* from Guaymas, Mexico, which as figured appears to be merely a color variety of *tumidus*. There is a *P. circularis* of Goldfuss, but it appears to have been published in 1836. The species will then (as indicated by Arnold) take the name *circularis*. It is closely analogous to the Atlantic *P. dislocatus* Say, and its variety *æquisulcatus* bears the same relation to the type that the Atlantic *irradians* does to *dislocatus* (= *gibbus* Lam.)

Pecten (*Patinopecten*) *caurinus* Gould. This species can at once be distinguished from its analogue *P. yessoënsis* Jay, by the fact that its minor surface sculpture is purely concentric, while that of the Japanese shell is reticulate when in perfect condition.

P. digitatus Hinds, is probably only a young specimen of *P.* (*Nodipecten*) *subnodosus* Sowerby.

A NEW SONORELLA FROM THE GRAND CANYON, ARIZONA.

BY JUNIUS HENDERSON.

Among some shells recently received from Mr. Ellsworth Bethel, of East Denver High School, were four dead specimens of *Sonorella*

collected by him on Bright Angel Trail, at Grand Canyon, Arizona, in 1913. He was collecting fungi, and unfortunately did not note the exact locality of the snail find, but writes that he followed the trail closely, and thinks he got the shells "about one hundred yards west of the upper limit of the trail and not more than twenty feet below the top," though he cannot be certain and "may have gotten them as far down as the half way house." He supposed them to be common and made no note of the place. They are much larger than the common *S. coloradoensis* of that region, and differ in other respects. They did not seem to fit the description of any other species, but the finding of so large a species along a trail which has been searched by some of our ablest conchologists and most thorough collectors made me doubt that it could be new, so I sent two specimens to Dr. Pilsbry, who pronounced them undescribed.

SONORELLA BETHELI, new species.

Shell rather large, moderately elevated. Whorls five and one-half convex, increasing regularly in size, the last descending about one millimeter in the last five millimeters to the aperture. Lip slightly everted, more strongly so at the base of the aperture, and somewhat reflected over the umbilicus, its terminations connected by a thin transparent callus. Umbilicus moderate, open to the apex. Aperture shortly oval-lunate, oblique. Growth-lines fine, but well-defined under a lens; numerous wrinkles, usually rounded, occasionally acute, coincident with the growth-lines but of course much less numerous. The most interesting character of the species is the spiral sculpture, unusual in this genus, consisting of numerous incised lines, slightly flexuous over the tranverse wrinkles, covering the last whorl from umbilicus to suture, and extending without diminution over the anterior half of the penultimate whorl, above which they begin to disappear. Though the four specimens at hand are all more or less weathered, one shows the periostracum to be smooth and shiny, and probably originally of isabella color. One dark-brown spiral band, reaching a width of about one millimeter on the last whorl, occurs just above the periphery, so as to be concealed on all but the last whorl and the anterior half of the penultimate.

Measurements in millimeters: Type (in Univ. Colo. Museum), maj. lat. 21, min. lat. 18.5, alt. 14, alt. measured just in front of aperture 10.5, height of aperture 9.5, width of aperture to callus

margin 10.5. Cotype (in Univ. Colo. Museum), broken specimen, maj. lat. 20.5, min. lat. 17, alt. 14. Cotype (in possession of Mr. Bethel), with third whorl depressed, maj. lat. 20.5, min. lat. 17, alt. in front of aperture 9.5. Cotype (in Acad. Nat. Sci. Phila.), maj. lat. 21.2, min. lat. 18.2, alt. 13.1 mm.

Type locality, Bright Angel Trail, Grand Canyon, Arizona.

NOTES ON THE ANCYLIDAE OF NORTH AFRICA.

BY BRYANT WALKER, SC. D.

(*Concluded from p. 117.*)

The following so-called species of the *Ancylus fluviatilis* group have been listed from Algeria by Bourguignat and others:

Ancylus brondeli Bgt.
costulatus Kust.
compressiusculus M. T.
subriparius Bgt.
epipedus Bgt.
fluviatilis L.
bledahensis Bgt. = *fluviatilis gibbosus teste* Westerl.
djurdjurensis Deb.
peraudieri Bgt.
platylenus Bgt.
raymondi Bgt.
striatus Q. & G.
simplex Fer. = *fluviatilis teste* Clessin and Westerlund.
gibbosus Bgt. = *fluviatilis* var. *teste* Clessin and Westerlund.
strictus Mor.

In this connection it seems necessary to call attention to the persistently erroneous use of *Ancylastrum* Bgt. for this group by the continental authors, e. g., Fischer, 1881, p. 504, Clessin, 1882, p. 27, Westerlund, 1885, p. 89, Germain, 1913, p. 261.

As Hedley (1894, p. 118) has already shown, Bourguignat twice gave *A. cumingianus* as the type of that group. "Since the describer of the group clearly and repeatedly declared his type to be *cumingianus*, it is not legitimate for Fischer, Clessin or Tryon to alter the type of *Ancylastrum* from *A. cumingianus* to *A. fluviatilis*.

That Bourguignat also included *A. fluviatilis* and other members of *Ancylus* proper in *Ancylastrum* is unfortunate, but it does not invalidate the genus."

If *Ancylastrum*, *Acroloxus*, *Ferrissia*, etc., are retained as subgenera or sections of *Ancylus*, then the group of *fluviatilis* would belong to *Ancylus* s. s. If, however, these other groups are to be considered, as they should be, of generic value, then there is no occasion for any subgeneric or sectional designation of the *fluviatilis* group at all.

In addition to the various representatives of the *fluviatilis* group represented in the fauna of Northern Africa as hereinbefore mentioned from Abyssinia, Tunis, Algeria, Morocco and the Canary and Madeira Islands, the examination of the Pallary collection has revealed the existence of the following species belonging to *Ferrissia* and *Gundlachia*.

FERRISSIA PLATYRHYNCHUS n. sp. Pl. VII, figs. 1–3.

Shell rather elevated, oval, the left margin somewhat more curved than the right, anterior and posterior margins regularly rounded, thin, translucent, light corneous, lines of growth regular and rather strong; anterior slope somewhat radially wrinkled; apex large and very prominent, radially striate, turned to the right and overhanging the posterior slope, surrounded by a distinct constriction, which is deeper posteriorly, obliquely flattened above, with an enormous apical depression, surrounded by a strong ridge, which is more conspicuous along the posterior margin; anterior slope convex; posterior slope very oblique and nearly straight below the apical constriction; sides compressed; lateral slopes flattened, oblique and nearly straight on both sides.

Length 3.75, width 2.25, alt. 1.25 mm.

Type locality, "Baraki, pres le Gué de Constantine, Algeria." Type in the collection of Paul Pallary.

The occurrence of a species of *Ferrissia* in Algeria was a great surprise. A recent visit to Geneva enabled me to examine the collection of Bourguignat and I was able to satisfy myself that there are no *Ferrissias* from Algeria in his collection. In view of the very considerable amount of collecting that has been done in Algeria in years past, the form here described would seem to be very rare as it has not been found by any other collector and only a single specimen

in this instance, which was collected by Letourneaux. It would seem possible that it may be a stray specimen imported in some way from some other locality.

The species is remarkable for the unusual development of the apex, which is very different from any other form species of *Ferrissia* known to me. It is apparently very similar to that of *Ancylus caliculatus* Bgt. It is possible that in both cases it is an individual abnormality as Clessin has already suggested in regard to Bourguignat's species. Whether this is the fact can only be determined from additional material, which is very desirable. But in any event, it is evidently quite distinct from any of the described species from the Nile Valley.

FERRISSIA ISSELI (Bgt). Pl. VII, figs. 4–8.

1866, *Ancglus isseli* Bourguignat, Moll. Nouv. Lit., p. 214, pl. XXXIII, figs. 13-18.

1882, " " Clessin, Conch. Cab., Ancyliden, p. 61, pl. 4, fig. 9.

The types of this species were collected by Issel at "Rambe", (Ramleh *fide* Pallary), near Alexandria.

The specimens submitted by M. Pallary were collected by L'hotellerie "on the leaves of the papyrus" at Alexandria.

Through the courtesy of Dr. Weber, I have been enabled to definitely determine this species, which was misapprehended by M. Pallary in his "Catalogue de la Faune Malacologique d' Egypte". The species there figured under this name is really the *A. clessinianus* Jickeli.

Bourguignat's description is sufficiently accurate, but his figures are very inaccurate and misleading. Dr. Weber has kindly supplied me with camera-lucida outlines of the type, which are reproduced (figs. 7-8), and in reference to them, he writes: "Vous pouvez ainsi comparer ces dessins avec ceux publies par Bourguignat et voir les differences, car, a notre avis, elles sont notables; pour nous, les dessins de Bourguignat ne sont pas correcte; maintenant, il faut ajouter qu'il existe une assez grande variation de form d'un individu a l'autre chez la meme espece".

Apparently this species is not so abundant as the others collected by L'hotellerie as only two examples were found in the material received from M. Pallary. These agree very exactly with the original description and the figures sent by Dr. Weber and are, undoubtedly, Bourguignat's species.

The shell is small, obovate, with a very prominent, almost bulbous, apex, which is radially striate and decidedly more excentric than in *F. pallaryi*, the anterior slope is very convex and the posterior slope is nearly straight below the depression beneath the projecting apex ; the lateral slopes are steeper and less oblique than in *pallaryi*. Compared with the none-septate form of *Gundlachia l'hotelleriei* it is larger, more decidedly obovate, higher, with a more convex anterior slope and the apex is much more prominent. *A. clessinianus* is entirely different in its shape and proportions. The specimen I have figured measures: length 3, width 2, alt. 1 mm.

A small set from Ismailia, which I think belong to this species, are all very much laterally compressed and are proportionally higher than the typical form. A characteristic example measures 3.25 x1.75 x 1.5 mm. This peculiarity is probably the result of some unusual environmental conditions. A similar instance in *Ferrissia parallela* Hald. was figured by me several years ago, (1904, p. 77, pl. V, figs. 4-6).

FERRISSIA CLESSINIANA (Jickeli). Pl. figs. 9-11.

1882. *Ancylus clessinianus* Jickeli, Jahrb. Deutsch. Mal. Ges., p. 366.

1909. *Ancylus isseli* Pallary, Mem. Inst. Egypt., VI, p. 60, pl. IV, fig. 11.

According to Pallary the types of this species were sent by the collector, L'hotellerie, to Clessin under the MSS. name of *A. l'hotelleriei* Bgt. But it is quite different from the shells that Bourguignat had in his collection under that name. Jickeli did not figure his species, but his description agrees exactly with specimens that I have referred to it and there seems to be no reasonable doubt as to the identification. The example figured is the shell figured by Pallary as *A. isseli* and is in his collection. It measures: length 4.25, width 2.33, alt. 1.25 mm.

The species is larger than any of the associated species of the Nile fauna and entirely different in shape, which in a general way recalls that of the American *A. parallelus* Hald.

FERRISSIA PALLARYI n. sp. Pl. VII, figs. 12–14.

Shell small, subdepressed, rather broadly ovate, the left margin more curved than the right ; anterior and posterior margins regularly

rounded; thin, translucent, light horn color; lines of growth very fine and regular; apex radially striate, obtuse, not prominent, not elevated above the anterior slope, situated at about the posterior third of the length and distinctly turned to the right; anterior slope slightly, but rather evenly curved from the apex, but becoming nearly straight towards the anterior margin; posterior slope nearly straight, being but slightly incurved; lateral slopes oblique, the left quite convex, the right nearly straight, slightly incurved beneath the apex.

Length 3.25, width 2.25, alt. 1 mm.

Type locality, Canal Mahmoudich, Alexandria, Egypt.

Type in the collection of Paul Pallary. Cotype, Coll. Walker.

Although only one mature and two immature examples are before me, this species is so entirely different from the other species of the Nile that I do not hesitate to describe it. Its broad-oval outline, more oblique lateral slopes and the position and shape of the apex are characteristic and quite unlike any of the described species from that region.

Named in honor of M. Paul Pallary, who has done much to elucidate the fauna of Northern Africa.

GUNDLACHIA L'HOTELLERIEI ("Bourguignat") n. sp. Pl. VII, figs. 15–21.

Ancylus clessini Pallary, Mem. Inst. Egypt., VI, p. 59.

Shell very small. The non-septate form (figs. 15–19) is subdepressed, narrowly ovate, being wider anteriorily, mostly on the left margin, the right being nearly straight in the median portion and and about equally curved at both ends; anterior and posterior margins regularly rounded; thin, translucent, light horn color; lines of growth fine and regular, anterior slope somewhat radially wrinkled; apex prominent, very obtuse, radially striate and turned towards the right, situated at the posterior $\frac{1}{4}$ of the length; anterior slope long, decidedly and regularly convex; the posterior slope short and straight, but slightly oblique, from the base of the protuberant apex; left slope very convex above, thence descending in a nearly straight, oblique line to the margin; right slope less oblique and nearly straight, being very slightly concave below the swell of the apex.

Length 2.75, width 1.5, alt. 1 mm.

The septate form (figs. 20–21) is smaller than the non-septate and

the lateral margins are less expanded, they are nearly parallel, the left being slightly convex, the right slightly concave; as usual in this stage the sides of the aperture have the appearance of being drawn in toward each other in the process of constructing the septum, in front of the septum the anterior margin is somewhat expanded; the septum occupies about two-thirds of the entire length, it is decidedly curved along the lateral margins and posteriorly, but the anterior portion is flattened in the center as though from contact with the back of the animal when in motion and towards the septum descends quite obliquely; the margin of the septum is only slightly convex in the center, curving quite abruptly forward as it joins the lateral margins of the shell. The surface conditions are as in the non-septate form.

The fully matured (Gunlachoid) stage is unknown.

Length 2.1, width at margin of septum 1, greatest width 1.2, alt. 75 mm.

Type locality, Alexandria, Egypt.

Types no. 35966 Coll. Walker. Cotypes in the collection of Paul Pallary.

Dr. Weber has kindly furnished outlines (figs. 15–16) of the types of Bourguignat's unpublished species and there can be no question but that this, and not the *A. clessinianus* of Jickeli, was the form that he had intended to describe under the name which I have adopted.

It is also the species that Pallary erroneously referred to as *A. clessini*, but did not describe. Both names being without published description, I have given the preference to the anterior one of Bourguignat.

I have no doubt but that both of the forms above described belong to the same species.

The non-septate form is very similar to the North American *A. shimekii* Pils. and *A. pumilus* Sterki, but differs from both in elevation and other details. Dr. Pilsbry has already suggested that *shimekii* is the non-septate form of a *Gundlachia*, and I am inclined to think that *pumilus* will prove to be the corresponding condition of the Ohio *Gundlachia*, which is probably the *meekiana* of Stimpson.

The occurrence of this species in Egypt was wholly unexpected and was the first record of the genus from the Old World.[1]

[1] Shortly after these shells were received from M. Pallary, I received from

Unfortunately the fully matured form with the secondary growth has not yet been found.

The fact certainly seems to be that the range of *Gundlachia*, like that of *Ferrissia* is world-wide and the two are apparently coincident. It is quite possible that others of the so-called *Ferrissias* will eventually prove to be the non-septate forms of *Gundlachia*. At the same time, if the evidence afforded by the North American species is to be relied upon, it is only certain species of "*Ferrissia*" that ever become septate. There is no evidence, so far as I know, that the typical species of *Ferrissia* ever form a septum.

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UNION OF THE WABASH AND MAUMEE DRAINAGE SYSTEMS.

BY CALVIN GOODRICH.

If only as a matter of record, it may be worth while to set down the fact that the drainage of the Great Lakes and that of the Ohio became united in the great flood of March-April, 1913.

A little southwest of Fort Wayne, Ind., the St. Mary's River, tributary to the Maumee, approaches within three miles of the Little Wabash River, belonging to the Ohio system. The land between is known as "The Prairie" and the dividing line of the two drainage basins upon it is not perceptible to the human eye. It was across this stretch that the St. Mary's River sent its flood waters last spring, and no doubt it was responsible in no small measure for the damage wrought at Peru and Logansport some distance down the Wabash.

The Wabash and Erie canal, now many years abandoned, skirted

"The Prairie" and entered the main stream of the Wabash not far below Huntington. There is excellent reason for believing that the Unione fauna of the Maumee has received additions, by means of this canal, since the days when the upper part of what is now the Maumee water course served as a southward flowing outlet for the glacial lake Maumee. Such additions are *Quadrula cylindrica strigillata* (B. H. Wright), *Pluerobema clava* (Lam.), *Plagiola securis* (Lea) and *Symphynota complanata* (Barnes). *Q. cylindrica strigillata* has proceeded down the river as far as Antwerp, Ohio, and *clava* as far as Defiance. Knowledge of *securis* is confined to one specimen found in a clammer's camp just below Fort Wayne. The lowermost station for *complanata* is New Haven, about seven miles below Fort Wayne. While this species is known to two other streams within the Great Lakes drainage, it is unquestionably a new comer in the Maumee. Call records *Obovaria retusa* (Lam.) from the St. Joseph, which receives the name of Maumee at Fort Wayne. It is highly probable that he had before him specimens or *Quadrula pustulosa*, much produced forward, free of tubercles and suggestive of *retusa*. This form is to be seen not infrequently in many parts of the Maumee.

The *Naiades* of the Maumee and the upper parts of the Wabash now very nearly approximate one another, counting the recent additions for which the Wabash and Erie canal may be thanked. In a rather hurried collecting excursion along the main stream of the Wabash from St. Henry, Ohio, to Bluffton, Ind., last fall, *Unio crassidens* Lam. and *Quadrula heros* (Say) (possibly) were the only species found which are unknown to the Great Lakes drainage. In case either of these species appears some day in the Maumee, its presence might reasonably be accounted for by glochidia-bearing fish which crossed the divide in the course of the flood of 1913.

It is convenient here to chronicle the finding of *Unia tetralasmus sayii* Ward, a stranger from the southern drainage, in Cedar Creek, Lucas County, and Toussaint Creek, Ottawa County, Ohio. These small streams empty into Lake Erie and are only a few miles apart. Further exploration is necessary before it is wise to speculate as to the reason for the appearance of the species so far from home waters.

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A NEW CUBAN LAND OPERCULATE.

BY H. A. PILSBRY.

During a recent visit to Cuba Dr. Henry Skinner, in the intervals of entomological researches, collected a few land shells. Some dirt scraped up on the San Carlos Estate, near Guantánamo, contained over twenty species of shells, including the following new species, which is named in honor of Mr. Charles T. Ramsden, Manager of the Estate, in acknowledgment of his attainments in Cuban entomology, ornithology and conchology.

The new species is by far the smallest cyclophoroid snail yet known from Cuba, and is further of interest for the reason that it is a distinctly phylogerontic or aged form, such as the writer has found in numerous other Antillean groups. The snail fauna of the West Indies contains many groups bearing the marks of old age, and in all probability approaching extinction. Sometimes this is manifested by extravagant development of spines, hollow ribs or knobs, often by more or less uncoiling in the later stages of growth. Some other families of the fauna show no signs of decadence.

The systematic position of the new species is doubtful, since none retained the operculum; but it is evidently congeneric with the Haitian shell described as *Ceratodiscus solutus* Henderson and Simpson (Nautilus XV, p. 73, pl. 5, figs. 1, 2). Both of these species seem related to the *Cyclotus minimus* Gundl., of Pfeiffer (Mon. Pneumon. III Suppl. 2, p. 16; Suppl. 3, p. 31.) which has been referred to *Crocidopoma*, a subgenus of *Aperostoma*, but I believe incorrectly. The operculum of *C. minimus* is extremely peculiar. The nucleus is

at the external border. A smooth, wedge-shaped area radiates towards the columellar margin, and the areas above and below this are lamellose, the lamellæ at right angles to the sides of the median wedge. This is quite unlike all known genera of the region.

CERATODISCUS RAMSDENI n. sp.

The shell is minute, planorboid, the spire slightly sunken, umbilicus open, conic, showing all the whorls. Whorls $2\frac{2}{3}$, tubular, the last whorl descending slightly and becoming free from the preceding a short distance behind the aperture. Initial half whorl smooth ; following whorl having several raised spiral threads ; subsequent whorls with sculpture of fine, somewhat irregular growth-lines only. The aperture is slightly oblique, not quite circular, the inner border being a little straightened. The peristome expands just perceptibly, and is not or scarcely thickened.

Alt. 1.3, diam. 3 mm.

Guantánamo, Cuba, on the San Carlos Estate, numerous speci mens.

This species is far smaller than *C. minimus*, and differs by the restriction of spiral sculpture to the first neanic whorl, and by the free end of the last whorl. In *C. minimus* the spiral sculpture continues upon the last whorl. Although the specimens of *C. ramsdeni* were dirty when collected, I doubt whether they are so in life. *C. minimus* carries a peculiar, bicarinate coat of dirt, firmly cemented on with mucus, and which almost or quite conceals the shell.

C. solutus H. &. S., of Haiti, is a larger shell, more depressed, with the last whorl free for a greater distance.

The new species will be illustrated next month, together with various other new Cuban shells.

NOTES.

BY JAS. H. FERRISS.

A set of *Oreohelix iowensis* Pils. from Prof. B. Shimek of Iowa City, with gentle washing and a slight touch of oil exhibited their pink bands, though resurrected from their tombs in the Loess where they slept some thousands of years. The syringing also brought out five juveniles from one specimen, and some of those were also banded.

While telling "snake stories" I will tell them all. In our collections of 1910 in the Santa Rita Mountains, Arizona (Pilsbry, Daniels and Ferriss), we found a thin and small *Sonorella* belonging apparently to a new group, near *S. rowelli* (Newc.), Again we found a member of the same group in the Santa Catalinas, and last year I extended it into the Grahams and Peloncillos. The habitat and habits of *Sonorella* are usually dry, but these were wet, with a fondness for deep woods and old logs. It was found easily in the dark gulches of the Catalinas last summer, and in its vicinity a bitter odor was noticed, something like that given out by Parnassus grass, skunk cabbage, and a Tennessee goldenrod. It came from the snail. As I picked it from its resting place it shot out a drop or two of juice into the air, but that was the extent of the disturbance. The odor soon disappeared and was not repeated. Of the hundreds found of this odorous group I saw only three shells broken by the chipmunks, and very seldom a dead one. Last summer I gathered over 300 Sonorellas of the *rinconensis* group in one slide of rock, and found only two alive. Often mice and chipmunks defeated me entirely in slides containing both *Oreohelix* and *Sonorella*.

Robert Camp, a student and collector of birds, now at Brownsville, Texas, has found more delight in snail collecting than in truck gardening, and is now sending out some of the finest Texans produced. That region is peculiarly adapted for good colors and good health in snails. His *Euglandina texasiana* Pfr. (not *singleyana* W. G. B.) are perfect as perfect can be, for I was down there in January and helped him catch 'em.

He sent me in Arizona last summer some *Planorbis cultratus* Orb. and *Segmentina obstructa* (Morel) he had found in the dry Texas soil from four to six inches deep. Turned loose in a cup of Arizona water they were soon crawling about. In January we collected in a cotton field that had been cultivated four years, and on the edge of the field in the shade and unbroken ground found the shell alive four inches down in stiff black soil, cracked so long that the cracks were lined with moss. The live shells however were not in the cracks but in the sections of black and baked soil. In a low spot of the field, a springy place, we found them also with a *Succinea*, *Physa* and *Planorbis liebmanni*, Dkr., but none were alive. The latter resembles the *Segmentina* except in wanting teeth. It is also larger. The *P. cultratus* is thin as a sheet of ledger paper and very delicate in appearance.

On this Texas journey we went up the Rio Grande as far as Rio Grande City. In Louisiana I visited Mr. L. S. Frierson and saw his collection of Uniones with great profit. I heard the story of Dr. W. S. Strode of my own State, barefooted, attempting to kick down a cypress knee in Lake St. Charles. These knees in color sometimes *do* look like a toadstool of tropical growth.

I also learned that Mr. Frierson was well supplied with *Anodonta suborbiculata* Say. He found a fragment of that rare queen of the Anodontas at the edge of a pond near his village and employed a gentleman of color to gather them at a nickel per clam. Two days later the black imp of darkness drove up to his house with a two-horse team, the wagon box full of *A. suborbiculata.*

I did not find Rev. H. E. Wheeler at Arkadelphia, Ark. These Methodist conchologists move too often.

CUBAN COLLECTING; SAN DIEGO DE LOS BANOS.

BY JOHN B. HENDERSON.

Mr. Charles T. Simpson and the writer recently made a collecting trip to San Diego de los Banos. This old and very dilapidated Cuban town is about seventy five miles west of Havana and lies just at the entrance to a pass through the southern range of the Sierra de los Organos and is an admirable starting point for daily collecting excursions into the mountains. This is given as the type locality of a number of species and judging from its frequent reference in Cuban lists it must have been a favorite field for the older collectors who first made known Cuba's remarkable land snail fauna. The actual town itself lies in the lowlands and therefore offers nothing to the collector for Cuba's level plains and valleys are almost destitute of shells. On account of this fact Cuba still maintains three quite distinct land shell faunas, each inhabiting its own mountain system. These three systems were once separated by the sea and developed their own island faunas, but now that a general elevation of the whole region has connected them all by dry land a mingling of the three faunas might naturally be expected. Such, however, is the case only to a very slight extent. The connecting land areas are lowlands,—the tobacco fields, the cane fields and cattle ranges of the island. With a very few exceptions the Cuban land shells can-

not find proper conditions for life in the lowlands and the three mountain faunas of the island are almost as effectually separated as when the sea surrounded them.

The great mountain system of western Cuba (Organos) has suffered rapid erosion and it now happens that whole ranges once a part of the main system have been so cut down by atmospheric forces that they exist today only in the form of more or less detached hills, —or "mogotes" as the natives call them. These mogotes, in point of size, may be quite respectable mountains with all the pinnacles and organ-pipe peaks so characteristic of the region, or they may be but a comparative handful of worn down boulders appearing like a little hump on the level landscape. They are practically always heavily wooded and maintaining as they do all the conditions of life needed by the snails, they possess each and every one a little faunula of its own,—modified, of course, by long isolation from the main range. This accounts in one way for the great richness in Cuba of species. Nature has brought this about by dividing her mollusks into thousands of little preserves and isolating them. As erosion cuts down the mogotes and their quarters become more and more restricted the mollusks that can adapt themselves and fight the battle of life the best, persist,—they generally become smaller in size, while others not so adaptable disappear. Thus every mogote has a surprise or two for the collector,—usually a new species or subspecies of Urocoptis.

In most countries there are certain genera of land or fresh water shells that appear to be especially *plastic* or quick to modify their forms to meet new conditions. In the Bahamas the Cerions, in Europe the Clausilias, in the United States the Pleuroceratidæ and in Cuba the Urocoptis. If these last had received the kind of application that some genera in other parts of the world have received, there would be in Cuba about a thousand species of them,—that is after the mogotes had all been explored. But these Urocoptids have much to tell of what has happened to Cuba in the past. They almost indicate three separate migrations into the island from different sources and at different times. One of these may prove to be along a ridge once connecting Cuba through Camaguay, Santa Clara, and the Isle of Pines with Central America, an immigration quite distinct from the one supposedly into Pinar del Rio from Yucatan. Until the land operculates of Cuba shall have been wholly revised as

to genera they can tell but little, indeed, they can only confuse the student. The names *Chondropoma*, *Choanopoma*, *Colobostylus*, *Tudora*, etc., mean nothing applied indiscriminately as they are.

When Simpson and I first attacked the mountains about San Diego our first impression was that we were gathering the very same species taken before many miles west at Vinales, Sumidero etc., and it was easy to fancy ourselves back in our old haunts of two years ago. We were, however, deceived by the *similarity* only of the species of the two localities. The majority are different species, especially, as one might anticipate, among the Urocoptids. It is only the genera and the sections that are the same.

The delights of mogote collecting are hard to exaggerate, and there are many mogotes all about San Diego de los Banos. Each is a little treasure trove full of life and a bower of tropical luxuriance and we worked them all within a distance of several miles of the town. A day spent on La Guida, a splendid mountain of the main range, will give perhaps a good example of our daily work while at San Diego. An early morning walk of about six miles brings us to the "sacred presence" and we leave the so-called road to ford a river and plunge into the fearful jungle at the base of the mountain. There are no shells in this jungle, but upon reaching the actual base of the mountain great rocks are first met and among them the dead shells give an index to what we may expect when we get up a little higher. Traveling is most difficult here until the first line of rocks is passed and the steep sides are reached. Then somebody picks a *Cepolis parraiana* off a tree and we begin to look sharp for Liguus. Then we reach a region of huge masses of limestone broken off and fallen from the great cliffs above, all smothered in vegetation. Here we discover on the rocks and the trees *Urocoptis irrorata* and in the smaller crevices *Urocoptis guirensis*, *saxosa* and one or two closely allied species. Simpson calls out that he has a Macroceramus (*elegans*), and then we grub for a time in the soil about the bases of the rocks and turn out *Megalomastoma mani* and that splendid *Alcadia* (*Emoda*) *sagraiana*, and there are also here many smaller things as *Lyobasis angustata*, *Pichardiella acuticostata* and its curious variety *horrida* of Pilsbry. Climbing still higher we reach the foot of the great perpendicular wall towering naked above us for several hundred feet, and new conditions are at once met. *Eutrochatella regina* is very common and we cease even to gather it. An occa-

sional colony of *Eutrochatella acuminata* keeps our enthusiasm warm, and then we discover a colony of that perfect little gem among land shells, *Eutrochatella chrysochasma*, with its pinkish cast and flaming red aperture. The big *Chondropoma shuttleworthi* are quite abundant and we only take the best looking specimens, but the more rare *Chon. sagebieni* is much more shy; we get but a few of them living. *Annularia blaini* is everywhere, and we tell our Cuban guide not to take any more of them. An occasional *Pleurodonte* (*Thel.*) *rangeliana* with its commoner cousin *Pl. auricoma* is taken. *Oleacina o. straminea* and the smaller *solidula* along with the species that have the incised lines upon their spires are fairly abundant. Less so are the *Rectoleacina cubensis* and *R. episcopalis*, but they are there to be had for the search. Some one warns the rest that it is getting time to pull out for home, and we reluctantly drop the work and scramble back to the river, an hour at least to go half a mile. In the river we enjoy the luxury of a swim in the cool, clear water, and revive our energies for the long "hike" back.

Wherever the naturalist wanders there is always a beyond that is gilded by imagination and mystery. From a high point we could gaze into a beyond of high sierras among which our native guide pointed out the great Pan de Guajaibon, far away and indistinct as a cloud peak above the mass of mountains. Guajaibon has always been our dream mountain for future conquest. It was visited a half century ago by that most enterprising of Cuban collectors, Charles Wright, but since then it has guarded well its conchological treasures.

DISTRIBUTION OF SOME FRESH WATER SHELLS OF THE ST. JOHN'S RIVER VALLEY IN MAINE, NEW BRUNSWICK AND QUEBEC.

BY OLOF O. NYLANDER.

For many years I have been collecting shells in the valley of the St. John's River and its tributaries, the Aroostook and Fish Rivers in Maine, and Madawaska and Green Rivers in New Brunswick and Quebec. Every tributary has some interesting forms, of which many are peculiar to a single locality. Many of the tributaries of St. John's River are in the forest. It is a lumbermen's field for harvest, and great quantities of logs are floated down these rivers every year. Sawmills large and small are to be found nearly every-

where. The sawdust and other waste is thrown in the water, and is forming extensive deposits in the river and tributaries. It is very destructive to Molluscan and other animal life.

Anodonta marginata Say. Is distributed in the main river and the lakes and tributaries on muddy bottom. Common.

Alasmidonta undulata Say. St. John's River at Fort Kent and Conners. Also in the Aroostook and Fish Rivers. Rare.

Margaritana margaritifera Linné. Is found in the Aroostook River and some of its tributaries. I have not seen *M. margaritifera* in any of the St. John's River tributaries above Grand Falls. If it is living in the upper part of St. John's River it is rare.

Unio complanatus Solander. Generally distributed in the Aroostook and Fish Rivers, rare in the St. John's River. In Témiscouata Lake is a small form of this species that is common in deep water in the lakes of Maine (Fish River lakes).

Sphaærium striatinum Lamarck. Common on rocky bottom in Fish River, in St. John's River at Fort Kent, and in Madawaska River at St. Rose.

Ancylus borealis Morse. In 1899 I found five specimens of this rare shell in the St. John's River at Fort Kent.

Lymnæa (*Galba*) *emarginata* Say. Second Eagle Lake, Fish River and St. John's River at Fort Kent, abundant on rock bottom feeding on *Conferva*.

Lymnæa (*Galba*) *emarginata mighelsi* Binney. This variety is represented by fine large specimens at Square, Cross, and Portage Lakes. The type of *Lymnæa ampla* Mighels came from Square Lake.

Lymnæa (*Galba*) *emarginata canadensis* Sowerby. A large colony was found on rocky bottom on the north side of Mt. Wissic, Témiscouata Lake, Province of Quebec. The colony is located in a partly sheltered cove in water two to ten feet deep or more. Among those found here I have noted certain peculiarities that are common to all species that are found on rocky bottom in more or less sheltered position. Each colony has its peculiar variations and need a geographical name to express their habitat rather than a specific designation of any individual. See F. C. Baker's work on "The Lymnæidæ of North and Middle America."

Physa heterostropha Say. Common in the St. John's River at Fort Kent, also in the Fish and Aroostook Rivers.

Physa ancillaria Say. Common at Square Lake inlet; dredged in Second Eagle Lake and Portage Lake on Fish River. A single specimen was seen at Mt. Wissic, in Temiscouata Lake.

Physa sayii Tappan. A large colony exists in the Caribou stream at Caribou village, Me. A second locality is at the Third Falls on Green River, New Brunswick. The shells are common below the falls and of large size.

Planorbis bicarinatus Say. Common in the St. John's River at Fort Kent, in the First Lake on Green River New Brunswick, and in the Fish and Aroostook Rivers, Maine.

Planorbis bicarinatus aroostookensis Pilsbry. Has only been observed in the towns of Woodland and Caribou, Maine.

Planorbis bicarinatus portagensis Baker. It is apparently a deep water form and is found in Fish River, Maine. Specimens of this variety are also found in First Lake, Green River, New Brunswick.

Planorbis companulatus Say. Common in Fish River Lakes, Maine, and First Lake, Green River, New Brunswick.

Planorbis deflectus Say. Salmon Brook, Aroostook County, Maine, and First Lake, Green River, New Brunswick.

Planorbis trivolvis Say. Is well distributed in the Fish River Lakes and in the Aroostook River Lakes. It is represented in the First Lake, Green River, New Brunswick, by a large form with the whorls somewhat flattened.

Of landshells, *Succinea retusa* Lea is common around Temiscouata Lake.

Polygyra albolabris Say, is common on Mt. Wissic, Temiscouata Lake.

Pyramidula striatella and *Zonitoides arboreus* seem to be common in the Northern part of New Brunswick.

Zoögenitis harpa Say, I have collected near Green Mt. on Green River.

Succinea ovalis Say is common at Grand Falls, New Brunswick.

Polygyra monodon cava Pilsbry was collected at St. Leonards, New Brunswick.

When a complete survey can be made of the St. John's River there will be many interesting varieties or mutations discovered. This survey should be made before the lumber operators and the sawmills have destroyed the most important lakes and tributaries.

PUBLICATIONS RECEIVED.

CATALOG OF THE MOLLUSCA OF SOUTH CAROLINA, by William G. Mazyck (Contributions from the Charleston Museum, II, 1913). Little has been published bearing directly on the Mollusca of South Carolina since the days of Ravenel. A new catalogue is therefore hailed with much pleasure. The Introduction, giving a history of the local conchological work, is very interesting. The list of students began with Mr. Stephen Elliott, of Charleston, who was a correspondent of Say and Rafinesque. Following him were Dr. Edmund Ravenel, who published two catalogues of his collections. Prof. Lewis R. Gibbes and Lieut. J. D. Kurtz both published catalogues of the shells of the State.

The list contains 424 entries, but a considerable number of names, quoted from former catalogues, are synonyms, as noted below.

New forms described are: *Polygyra hopetonensis* var. *charlestonensis*. *Marginella spilota* (Ravenel MS.), from Sullivan's Island. *Epitonium elliotti*, Pawley's Island. *Turbonilla kurtzii*, Sullivan's Island. *Cyclostrema zacalles*, entrance of Charleston Harbor. *Lampsilis tenerus* (Ravenel MS.), Santee Canal.

There are many interesting locality records. *Rumina decollata* is reported to be gradually spreading through the State. *Maculopeplum junonia* is very rarely found on Sullivan's Island. Numerous species, which we usually associate with the Florida fauna, are recorded.

In these days, when mollusk nomenclature is so unsettled, the making of a local list covering so wide a range of families and genera is fraught with difficulties. Moreover, the author had to include many earlier records which could not be checked up, among the authentic materials of his own collecting. The authorities for such records are given, and they must be accepted for what they are worth. These difficulties have naturally resulted in some discrepancies and duplications, which it may not be amiss to note here.

Tornatina canaliculata and *Cylichna oryza* belong to different families, and can not both be placed in the genus *Acteocina*. *Busycon eliceans* is only a variety of *carica*, and *plagosum* of *pyrum*. "*Chrysodomus islandicus*" Linné, is now recognized to be a truly Arctic species, and belongs, together with *pubescens* and *stimpsoni*, to the genus *Tritonofusus*. *Seila terebralis* is now known as *S.*

adamsi, H. C. Lea. There seems to be some confusion in the species of Arca. *A. limula* and *lienosa* are only found fossil; the latter has been confused with the recent *secticostata* Rve. (*floridana Con.*). *A. holmesii* is a synonym of *campechensis*, and *pexata* and *americana* are only varieties. *Plicatula cristata* is a synonym of *gibbosa*. *Anomia ephippium* is restricted to Europe, our species being *A. simplex*. *Mytilus domingensis* is a synonym of *M. exustus* Linné. *Mytilus cubitus* is a synonym of *Modiolus citrinus* Bolten, and *M. plicatulus=demissus* Dillw., *Lithophaga appendiculata* and *attenuata* are synonyms of *L. bisulcata*. *L. caudigera* and *forficata* are synonyms of *L. aristata* Dillw., *L. lithophaga* Gibbes (not Linné)= *niger* Orb., *Chama lazarus=macerophylla* Gmel., *Cardium pictum= serratum*, *Dactylina=Pholas*, *P. costata* and *truncata* are now placed in the genus *Barnea*. *P. semicostata* and *M. pusilla* are synonyms of *Martesia striata* Linné, *M. smithi=caribæa* Orb.—C. W. J.

NOTES.

CERION SAGRAIANUM INTRODUCED INTO SOUTH AFRICA.—In August, 1913, I sent some live *Cerion sagraianum* Pfr., which I had received from Cuba, to Dr. Pecker, Grahamstown, Cape Colony, Africa. The Doctor wrote me that he had placed them in a certain part of his garden, and that they had made themselves at home. They burrowed under the dead leaves. He is going to let me know from time to time how they get along. Dr. Paul Bartsch, suggested that I write to you regarding this experiment, in ordes that a proper record of the planting may be made which would save considerable trouble sometime in the future.—G. W. PEPPER.

HESPERARION HEMPHILLI MACULATUS.—A few days ago my friend Mr. S. N. Knudsen gave me a living slug found among plants received at Boulder, through a wholesale house in Denver. The slug proves on examination to be *H. hemphilli* var. *maculatus* Ckll. It is immature, and the genitalia do not show their proper characters, but everything visible agrees with the form to which it is assigned. It must be confessed, however, that the distinctions between *H. niger* and *H. hemphilli* are rather unsatisfactory, especially in view of the variation in the genitalia of *H. niger* observed by Pilsbry and Vanatta. The two supposed species also occupy the

same territory. It will be useful to give a description of the living *H. h. maculatus.*

Length when crawling about 27 mm.; light greyish olivaceous, the head and anterior part of mantle paler and yellower, the oculiferous tentacles reddish ochreous. With a lens the surface of the animal is seen to be sprinkled with pale dots. Mantle almost immaculate, only a few obscure small dark or dusky spots. Sides of body caudad of mantle with conspicuous scattered black spots, none very large. Sole pale, without dark markings. In alcohol the animal is about 14 mm. long; mantle 6 mm., appearing dusky with pallid margins; margin of foot wholly immaculate. Shell convex, $3\frac{1}{3}$ mm. long, $2\frac{1}{3}$ broad, white, opaque. Jaw with eleven flattened ribs, occupying the middle half. Teeth about 27–1–27, the lateral four or five with short blunt cusps.—T. D. A. Cockerell.

Sometimes Locality Adds Interest to a Shell.—In *Notes*, December, 1911, p. 95, appeared a word on *Vallonia* in Chicago. My offer to send some to anyone interested brought many replies, and led to friendly exchanges. I now have two other "finds" to share. The first is *Pisidium huachucanum* Pils., collected in Colorado at an elevation of 7500 feet. Found in one little pond about 10 by 12 feet, all hidden in tall grass. The other, *Planorbis vermicularis* Gld., collected on Modjeskas ranch California in summer of 1913. These were from an artificial pond away off in the desert, miles and miles "away from anywhere." Puzzle—how did they get there? On feet of aquatic birds? If anyone wishes specimens of these let him speak.—Edwin E. Hand, Wendell Phillips High School, Chicago, Ill.

Notice to Subscribers.—There has been no change in the subscription price of The Nautilus since it was established twenty-five years ago. In the meantime the cost of printing has gradually increased. It has only been through the sale of back volumes that we have been able to meet the expenses of publication. This year a further advance in the cost of printing leaves us no alternative but to increase the subscription price to $1.50 per year, beginning with the May number, Volume XXVIII. Such increase will preserve that proper relation between receipt and expenditure which is essential to the continued existence of the journal.—The Editors.