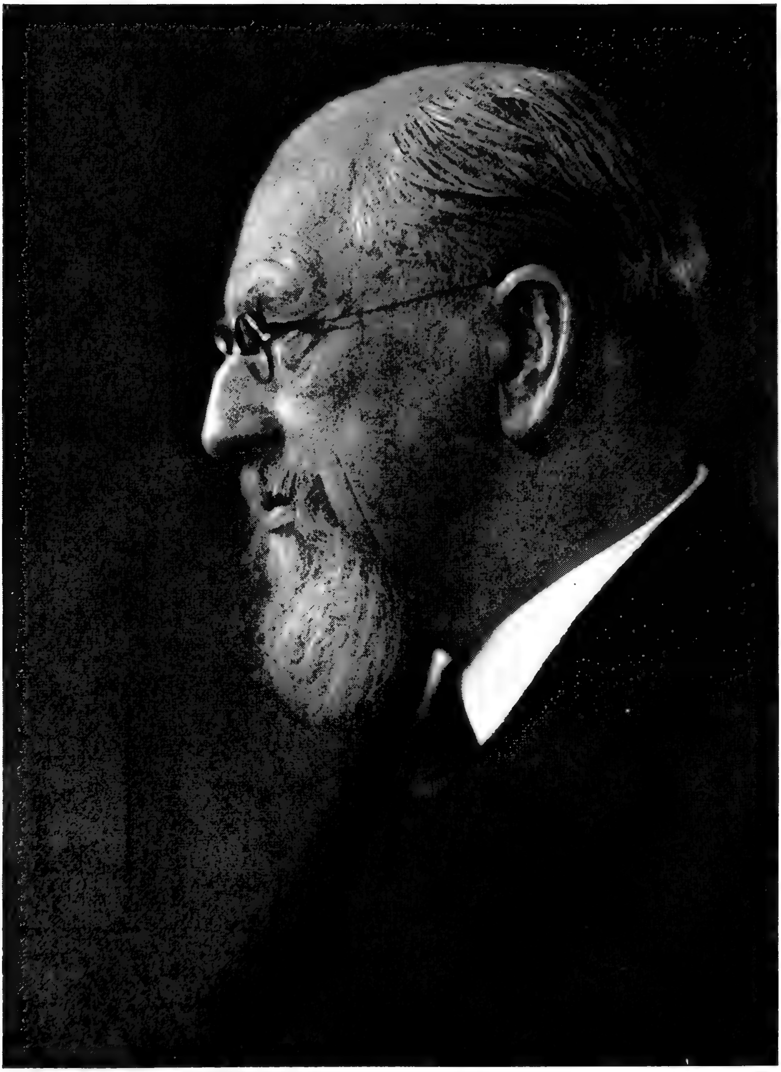
INDEX

TO

THE NAUTILUS, XXIX.

INDEX TO SUBJECTS, GENERA AND SPECIES.

INDEX TO AUTHORS.



WILLIAM HEALEY DALL
1915

THE NAUTILUS.

VOL. XXIX. MAY, 1915. No. 1

THE JAPANESE SPECIES OF BLANFORDIA.

BY HENRY A. PILSBRY.

I have recently received a series of Blanfordias, representing a new species, from Prof. Seitaro Goto of the Zoological Institute of the Science College, Imperial University of Tokyo. Professor Goto writes as follows: "I am interested in these snails as the intermediate hosts of the Japanese blood fluke, whose life-history a former student of mine has succeeded in making out. He has already published a short preliminary paper on the subject and I hope that he may be able to quote your authority in his full paper in regard to the specific identity of the snails. The locality of these specimens is Sakai, Saga Prefecture (Kyushu)."

BLANFORDIA NOSOPHORA (Robson).

The shell is perforate, turrited, solid, of a russet color, the worn summit pink or dark vinaceous. The surface is glossy, faintly marked with growth-striæ. The early whorls are wanting in the adult stage, 5 to 7 whorls remaining. These are strongly convex, united by a deep suture. The last whorl swells out to form a rounded ridge or varix behind the peristome. The aperture is vertical, ovate, somewhat diagonal; deep within it is of a vinaceous color, then yellowish in a band under the varix, finally olive at the edge of the lip. The peristome expands and is narrowly recurved at the edge, and a transparent callus connects the outer and inner margins.

Length 7.2, greatest diam. 3 mm. (old specimen, 5½ whorls remaining).

Length 8.2, greatest diam. 3 mm. (less eroded specimen, 7⅓ whorls remaining).

Length 6.6, greatest diam. 2.6 mm. (younger specimen, 6½ whorls remaining).

This species is related to *Blanfordia japonica* A. Adams, of Sado Island, both having a well-developed varix behind the lip; but the Sado shell has a higher varix, and a much more rapidly tapering spire, the later whorls much wider. A specimen of *B. japonica* 7.3 mm. long is 4.3 mm. in greatest diameter. It is usually larger, about 8 mm. long, after having lost a whorl or two at the tip in the adult stage.

Blanfordia is probably distributed over the whole of the main island of Japan, Sado, Kyushu and southern Yesso. The following species are known to me by many specimens of all of them sent by Mr. Y. Hirase and also from other sources:

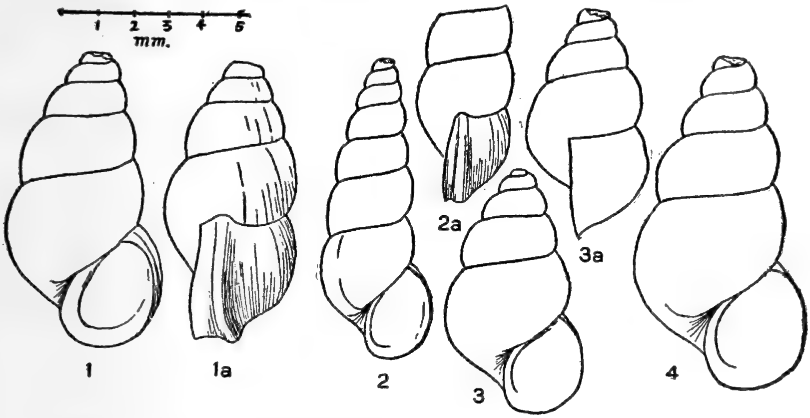
a. Outer lip of the shell strengthened by a rounded varix.
- *b.* Shell slender, slowly tapering, the greatest diameter less than half the length. *B. nosophora* (Robson) Kyushu.
- *bb.* Shell stout, conic, the greatest diameter more than half the length. *B. japonica* (A. Ad., 1861) Sado.

aa. Outer lip of shell without any external varix.
- *b.* Larger, the length 8 or 9 mm. *B. bensoni* (A. Ad., 1861) Hokkaido.
- *bb.* Smaller, the length 6 to 6.5 mm. *B. simplex* Pils., 1902, Uzen, etc.

I have a smaller form than *B. simplex*, with the apex perfect, from Izumo and Omi, but as there are very few specimens, I do not feel sure that it is distinct from *B. simplex;* especially since a snail which seems to be not specifically distinct from *simplex* has been sent by Mr. Y. Hirase from Kajima, Satsuma (his no. 406).

Erosion of the early whorls in fresh-water gastropods seems to be consequent upon extensive parasitization of the liver. It may be that on breaking down of the peripheral (terminal) cells by the Distomata, etc., shell-material is deposited there, and the filled-up distal end of the shell becomes dead and liable to abrasion by mechanical, chemical or organic external agencies.

Blanfordia has been associated with the *Truncatellidæ* by Fischer and Tryon. The first one I saw was referred to the genus *Pomatiopsis* (*Amnicolidæ*), on account of the dentition, which I described in NAUTILUS for May, 1900, p. 12. Two years later I recognized that my species was a *Blanfordia* (*cf.* Proc. A. N. S. Phila., 1902, pp. 26, 27); and I retained the



FIGS. 1, 1*a*, BLANFORDIA JAPONICA. 2, 2*a*, B. NOSOPHORA. 3, 3*a*, B. SIMPLEX. 4. B. BENSONI.

genus distinct from *Pomatiopsis* because of small differences in the animal as described by Dr. Arthur Adams. The dentition is, however, that of *Pomatiopsis*, which is rather characteristic from the small number of denticles on the two outer teeth—nearly all other *Amnicolidæ* having very numerous denticles on these teeth. My removal of *Blanfordia* from the *Truncatellidæ* and its approximation to *Pomatiopsis* was, I believe, justified.

The type of *Blanfordia* is *B. japonica.* If the genus be thought identical with *Pomatiopsis*, the name may be retained for the varicose species, in a subgeneric sense.

P. S.—Since the above was written, I have received (April 16) a paper "Observations on the Spread of Asiatic Schistosomatosis," by Dr. R. T. Leiper and Surgeon E. K. Atkinson,

R. N., in the *British Medical Journal*, Jan. 30, 1915, dealing with *Schistosoma*, and having as an appendix a note by Mr. G. C. Robson describing the mollusk which serves as host for its cercariæ. This mollusk is called *Katayama nosophora* n. g. et sp. It is undoubtedly identical with the form sent me by Professor Goto, and described above. As I have already had the figures for my article engraved, I allow it to stand as written, merely substituting Mr. Robson's specific name for my own. It may be useful to point out that the mollusk in question belongs to the long-known genus *Blanfordia*, and that the new genus *Katayama* is therefore superfluous. Mr. Robson was naturally misled by the wrong position assigned *Blanfordia* by the older authorities.

SOME EXCEPTIONAL CASES OF BREEDING AMONG THE UNIONIDÆ.[1]

BY ARTHUR D. HOWARD.

In collecting material for the study of a somewhat peculiar case of breeding among the Unionidæ, I have incidentally come upon some other instances, which I believe have not been reported. In 1912 I undertook to work out for the United States Bureau of Fisheries, methods of propagation of the Washboard mussel, *Quadrula heros* Say, with other species of Quadrula. This species was somewhat uncommon in the vicinity of the laboratory where I was stationed, so that there was a question as to a supply of material. One day I noticed a boatload of shells containing an unusual number of *Q. heros* with many young shells. Enquiring of the owner the source of these, I learned they had come from Moline, Ill., some 25 miles above. I subsequently visited the place, finding it accessible and the species sufficiently abundant to furnish considerable data on breeding as well as material for experiments in propagation.

While collecting the Washboard mussel at this point I obtained evidence of peculiarities in the breeding of three other Unionidæ which, although they may not be of immediate im-

[1] Contribution from United States Biological Station, Fairport, Iowa. Published by permission of Commissioner of Fisheries.

portance to the commercial shell buyer, are of undoubted interest to the conchologist. These forms are *Margaritana monodonta* Say, *Hemilastena ambigua* Say, and *Anodonta imbecillis* Say.

Quadrula heros proved to be for this locality a fall breeder, thus an exception to the summer breeding habit of other known Quadrulas. Although the time of breeding is different, the evidence obtained pointed to no change as to tachytictic or short breeding habit characteristic of the Quadrula group. October seemed to be the principal breeding season, as an abundance of gravid mussels was then obtainable. In November, among many specimens examined, no gravid individuals could be found. I have been interested to learn of cases of breeding during later months. These come from localities further south,[1] and apparently are explainable on the basis of climate. There is, however, the possibility of two breeding times in one season, as has been claimed for some other short-period breeders, for example, *Margaritana margaritifera*. I did obtain one breeding in May from many examined, and a similar case is reported by Lefevre and Curtis, who questioned the correctness of placing this form among winter breeders. These cases seem, however, to be very rare and quite exceptional. There is a difference here, worthy of note I believe, in that the time of retention of glochidia in *Q. heros* is relatively short as compared with other winter breeders. I have given other observations upon this mussel and a discussion of the literature in another paper,[2] so need not cite them here.

With the collections of *Q. heros*, *Margaritana monodonta* seemed fairly abundant, so that I saw an opportunity to investigate the breeding of this species. Certain indications pointed to an early spring breeding season, and in one expedition in search of it on March 10th, by reason of the collapse of the ice, I came nearer to its place of abode than I cared to be.

[1] Mr. U. T. Utterbach reports gravid *heros* for January and February, and I desire here to acknowledge his kindness in submitting to me material and notes. For other observations see Howard, A. D., 1914, "Experiments in Propagation of Fresh-water Mussels of the Quadrula Group." Appendix to the report of the U. S. Commissioner on Fisheries for 1913, pp. 1–52, 6 pls.

[2] Howard, A. D., 1914, *op. cit.*, pp 28, 29.

On May 2nd I succeeded in securing a gravid specimen with eggs and glochidia. All four gills were gravid, the inner containing many more than the outer. Upon removing the mussel from the water I at once placed a portion of the inner and outer gills in preserving fluid. Even with this precaution, the initiation of abortion was evident. The remainder of the mussel, shell and soft parts, I wrapped in cloth, not having a container large enough to fix at once. Upon arrival at the home station I found that complete abortion of the contents of the marsupia had taken place.

Glochidia were present, somewhat immature, but Dnapping, with a number of eggs presumably unfertilized. The glochidia are sub-circular in form, *i. e.*, circular except for the rather short straight hinge line. Harms (1907–1909) figuring the glochidia of *M. margaritifera* presents them somewhat pointed and toothed. I can make out neither of these characters in *M. monodonta.* The dimensions are: Height 0.055–0.065 mm., length 0.055–0.0065 mm., thus being a little larger than those reported for *M. margaritifera* and among the smallest of glochidia. As the ovaries are well distended with eggs near maturity I think there is no doubt that at least two broods are produced in a season, as reported (Conner, Harms and Ortmann)[1] for *M. margaritifera.*

I observed segmentation of ovarian eggs in this species in a specimen which had been cut open and exposed to river water. No data to my knowledge has been obtained relative to the hosts for this species.

Hemilastena ambigua :—Nets placed near the mussel bed, for the purpose of determining the host fishes of *Q. heros* yielded some material that presented quite another problem. With the fishes caught were a number of mud puppies, *Necturus maculosus*, Rafinesque. From a total of fifteen caught twelve or 80 per cent were infected with glochidia of mussels. Upon attempting to identify these a few were found to be *Q. heros* not imbedded, nor becoming so, after an attachment for a known period of twenty-four hours and more. Evidently they were merely ac-

[1] See Ortmann, 1914. Annals Carnegie Museum, vol. 8, no. 2, 1912, p. 232.

cidental infections upon an inappropriate host. The great majority of infections were by a glochidium unknown to me. They were deeply imbedded in the external gills of the Necturus and by keeping the animals alive all winter I succeeded in carrying the young mussels through to the juvenile stage, these being shed the last week in May, soon after which I obtained the young mussels. The parasitic period is a long one from the date the infected salamanders were captured, October 17th to the last of May, being over 7 months. By this test the appropriateness of the host was satisfactorily demonstrated.

These glochidia were different from any in our station collection of which we supposedly had a complete faunal set with one or two exceptions which I knew did not answer the case in question. I looked up all the known Najades which might have a range to the Mississippi River in Eastern Iowa and found that one species was given which we did not have. This was *Hemilastena ambigua*, Say or *Unio hildrethianus*, Lea. An inquiry at the Academy of Sciences, Davenport, Ia., disclosed the fact that there was one record of collection for Davenport.[1]

Lea[2] figures the glochidium of this species but it is so small and so like that of other species that without dimensions a certain identification could not be made from it. As the likelihood of finding material in some collection seemed slight I decided to look for gravid mussels and make a direct comparison. From the literature and such information as could be gathered from experienced collectors, this rare species has the peculiar habit of living under flat stones. This seemed to present a difficulty in collection, for the water was deep at the point where the Necturus had been taken. I had dredged here considerably but no example of this species were in the hauls. Their habitat would seem to account for this failure to secure them as an ordinary boat dredge would be likely to miss them protected as they are by the stone above. The best chance for success seemed to be to locate them in some small stream. In Mr. F.

[1] I am indebted to the Davenport Academy of Sciences for their assistance in this matter and especially to Mr. Paarmann and Miss S. F. Sheldon who kindly looked up the specimen and records.

[2] Lea, Isaac, Observations on the Genus Unio, vol. vi, p. 49, pl. 5, fig. 31.

C. Baker's "Mollusca of the Chicago Area," he cites the collection of this species under such conditions. By correspondence with Mr. Baker I learned the names of the collectors[1] who kindly gave me directions for locating the species which they had taken many years previous. The first five specimens I found were not gravid; so that I feared it was too early or too late. Upon examination with a microscope all proved to be males. Returning to the stream again I found 9 gravid mussels out of a total of 17. The first of these contained glochidia which corresponded exactly with the glochidia found on Necturus in the Mississippi, thus giving me the link I desired to make out the life history.

The glochidia are clear white in color, of the triangular type with well-developed hooks, contrary to the description given by Lea, who however suggested the possibility of hooks in more mature specimens. The dimensions are as follows: Height 0.265 to 0.274 mm., length 0.247 to 0.555 mm.

All of the adult individuals were found under flat stones of the flag-stone type characteristic of the limestone in the region. Beneath a single rock I found four. While exploring the under surface of these I felt and seized a wriggling animal which proved to be a mud-puppy, demonstrating the manner in which Necturus becomes inoculated. Glochidia shed by the mussels in such a location would not have a rapid dispersal by currents so that the Necturus commonly seeking such a shelter would run the chance of a heavy infection. The finding of a mussel parasitic upon a salamander as the appropriate host instead of a fish is the first instance I have known recorded among American mussels. Faussek[2] in St. Petersburg experimented with Amphibia artificially infected with glochidia of Anodontas. He reported successful infection upon *Axolotl* and *Proteus*.

Anodonta imbecillis:—While endeavoring to identify the gloc-

[1] I wish here to acknowledge the kindly assistance and courtesies extended to me by the following gentlemen: Mr. F. C. Baker, Chicago Academy of Sciences; Messrs. J. B. Brown, J. H. Ferriss, J. H. Handwerk and Dr. Alfred Houston, of Joliet, Ill., and Mr. Bryant Walker, of Detroit.

[2] Faussek, 1901. Ueber den parasitismus der Anodonta-Larven. Verhandlungen des V. Internationalen Zoologishen-Congresses (Berlin), pp. 761–766.

hidia which have been described above as parasitic upon Necturus I observed a similarity to the glochidia of *Anodonta imbecillis*, Say. A minute comparison showed differences however and I made an effort to determine if the differences might come within the range of normal variation. To do this I secured as many gravid examples of *A. imbecillis* as I could from the place where the Necturus were captured. In a measurement of glochidia from 16 individuals I found that only the very lowest point of variation in *A. imbecillis* corresponded with the larger of the unknown. It was quite obvious they could not be the same species. While making this examination which yielded negative results to my original search I noted a peculiarity which proved quite a diversion. In measuring the glochidia I came upon individuals which had advanced far beyond the larval stage, having in fact reached a point of development equal to that to be seen in most Unionidae after metamorphosis parasitically upon fishes.

The young mussels, mostly of the same stage, lie crowded in the marsupial gill of the parent without apparently any matrix or conglutinate structure whatever. In this respect we have a condition quite different from that reported by Lefevre and Curtis[1] for the non-parasitic development of *Strophitus edentulus* (Say), in which there is a matrix sub-divided into the so-called cords.

Among the six lots of marsupial juveniles that I collected the degree of development varied slightly as to amount of shell growth, otherwise there seemed to be little difference. This growth consists of a narrow rim only, around the edge of the glochidial shell. The hooks of the glochidium are still much in evidence, but are much weaker than in parasitic forms. A noticeable feature is the large proportion of gaping shells as compared with a similar lot of glochidia. It would seem that with the loss of the powerful single adductor muscle the action of closing is less vigorous. Between the gaping valves can be seen the ciliated foot, two adductor muscles, the mantle, on each side, the gill papillæ, etc.

[1] Lefevre and Curtis. Bull. of the Bureau of Fisheries, vol. xxx, 1910 (issued 1912).

Observations upon the seasons of breeding reveal further peculiarities. Among lots examined in May and November were found individuals carrying in the marsupial gills embryos representing all stages of development except unsegmented eggs. The following counts from two collections will illustrate this:

Locality.	Date.	Stage of Gravidity.					Total.
		Eggs.	Early Embryo.	Late Embryo.	Glochidia.	Juveniles.	
Moline, Ill.	November 7, 1913	....	7	3	7	5	22
Fairport, Ia.	May 1, 1914	....	2	1	5	6	14

This lack of uniformity in the late fall and early spring counts, it will be seen, does not correspond with the usual conditions to be found in the bradytictic or winter breeders.

In the absence of parasitism this species must lose the usual method of distribution through the migrations of the host fish. What seems to be a compensatory provision for this loss is to be seen in the peculiar light and flattened type of shell of the juvenile, which subjects it to ready transference by water currents. I have described in another paper[1] with fuller discussion the finding of this species in artificial ponds and reservoirs, whither, in the loss of the parasitic habit, they had been carried doubtless by the water supply.

To summarize:

1. *Quadrula heros* as compared with other Quadrulas and members of the Crenodonta group shows a postponement of breeding time from summer to autumn and winter.

2. *Margaritana monodonta* possesses exceptionally small glochidia, and there is evidence of at least two broods in a season.

[1] Howard, A. D., 1914. A Second Case of Metamorphosis without Parasitism in the Unionidæ. Science N. S., vol. xi, no. 1027, pp. 353–355, Sept. 4, 1914.

3. *Hemilastena ambigua* is parasitic in nature upon the amphibian, Necturus maculosus, which in the cases observed became inoculated in the fall, the young mussels being released the last of May.

4. *Anodonta imbecillis* develops without parasitism and gives evidence of broad limits in the range of the breeding season.

THE DALL BANQUET.

A banquet to Dr. William Healey Dall, commemorating the completion of fifty years of service to science, was given by his friends at the Cosmos Club, Washington, on the evening of April 21.

Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, was to preside, but in his absence, due to the death of his father-in-law, Dr. Robert S. Woodward, President of the Carnegie Institution of Washington, took the part of toastmaster with wit and grace.

The Toasts:
Dall the Alaska Pioneer—Dr. Alfred H. Brooks.
Dall the Anthropologist—Prof. Wm. H. Holmes.
Dall the Coast Pilot—Mr. Isaac Winston.
Dall the Malacologist—Dr. Henry A Pilsbry.
Dall the Paleontologist—Dr. T. Wayland Vaughan.
Dall the Zoologist—Dr. C. Hart Merriam.
Dall the Nomenclatorist—Dr. Ch. Wardell Stiles.
Dall the Poet—Justice Wendell P. Stafford.
Dall the Man—General A. W. Greely.
Dr. Dall's response.

Letters from absent friends of Dr. Dall were read by Dr. Whitman Cross, Dr. Frederick A. Lucas, Mr. W. E. Safford and Mr. Paul Brockett.

The speakers were in friendly rivalry to claim Dall for their own special branches of science. Among paleontologists he is acknowledged the great leader in all relating to cenozoic faunas. His "Tertiary Fauna of Florida" is a classic of American paleontology. For years he has been the foremost authority on zoological nomenclature in America. Malacologists almost forget that Dall's work on recent mollusks is only one phase of his many-sided scientific activity, since that alone seems so large an achievement for one man. We study his works on deep-sea mollusks, on the rich Alaskan and West Coast faunas, the memoirs on land and fresh-water shells of Alaska, of Lower California, the Galapagos, the Mexican boundary, and hundreds of others, and each has the lucidity and easy command of the subject of a specialist in these several departments of conchology.

As an anthropologist, Dall is the author of several important papers, and the editor of standard books. As a geographer and hydrographer, the author of the Alaskan Coast Pilot, his works are in daily practical use.

A portrait of Dr. Dall formed the frontispiece of the beautiful and epigrammatic banquet card. The arrangements of the committee, of which Dr. Paul Bartsch was chairman, were perfect at every point. It was an occasion of delightful goodfellowship.

Participants.—Charles G. Abbott, Vernon Bailey, Frank Baker, Job Barnard, Paul Bartsch, L. A. Bauer, Alexander Graham Bell, Marcus Benjamin, Paul Brockett, Alfred H. Brooks, H. P. Buehler, J. McKeen Cattell, Robert H. Chapman, George H. Clapp, Frank W. Clarke, John M. Clarke, C. Wythe Cooke, F. V. Coville, W. T. Councilman J. C. Crawford, Whitman Cross, Charles Whitney Dall, Charles A. Davis, Henry E. Davis, F. W. De Wolf, J. S. Diller, Edward A. Fay, James H. Ferriss, J. W. Fewkes, James M. Flint, Herbert A. Gill, Charles C. Glover, A. W. Greely, Gilbert H. Grosvenor, Arnold Hague, Oliver P. Hay, Otto Heidemann, John B. Henderson, H. W. Henshaw, Arthur Hollick, William H. Holmes, A. D. Hopkins, George F. Kay, William Bruce King, F. H. Knowlton, E. de K. Leffingwell, A. F. Lucas, Frederic A. Lucas, Marcus W. Lyon, Jr., Wendell C. Mansfield, C. L. Marlatt, Collins Marshall, J. Rush Marshall, William B. Marshall, George C. Martin, George C. Maynard, Edgar A. Mearns, C. Hart Merriam, George P. Merrill, Truman Michelson, J. D. Mitchell, Charles E. Munroe, E. W. Nelson, S. N. D. North, William A. Noyes, Henry Fairfield Osborn, Sidney Paige, Theodore S. Palmer, E. W. Parker, George H. Parker, Francis H. Parsons, Henry A. Pilsbry, Richard Rathbun, Charles W. Richardson, Charles W. Richmond, Robert Ridgway, Henry C. Rizer, Alfred G. Robinson, W. E. Safford, Waldo S. Schmitt, E. A. Schwarz, T. W. Smillie, Erwin F. Smith, George Otis Smith, Hugh M. Smith, J. W. Spencer, Wendell P. Stafford, T. W. Stanton, Leonhard Stejneger, Ch. Wardell Stiles, O. H. Tittmann, A. C. True, E. O. Ulrich, T. Wayland Vaughan, David White, Harvey W. Wiley, Isaac Winston, Robert S. Woodward, Fred. E. Wright.

THE NAUTILUS.

VOL. XXIX. JUNE, 1915. No. 2

THE NEW MEXICAN EXPEDITION OF 1914—ASHMUNELLA.

BY H. A. PILSBRY AND JAS. H. FERRISS.

Few shells have been collected in the Mogollon range, in the western part of Socorro County, New Mexico, prior to the reconnaissance made by one of us and Mr. L. E. Daniels. The only *Ashmunella* known from there was *A. mogollonensis* Pils., collected by Prof. E. O. Wooton in 1900. In the limited time spent there last summer only a few canyons on the southwestern slope were explored, so that this paper, and those on the other genera to follow, may be regarded as a mere sketch of the snail fauna, to be filled out by further field-work. The localities mentioned may be found on the Mogollon Quadrangle of the U. S. Geological Survey Topographic Map, a rough tracing of which is given in Fig. 1, with the positions of collecting stations indicated by their serial numbers.

The affinities of the snails seem to be with the Chiricahuan fauna. The species of *Ashmunella* are different, but they have an unmistakable Chiricahuan appearance. This leads us to believe that they were evolved from the same ancestral species, which must have been in Pliocene times able to migrate over a great area now destitute of snails.

The gorges in the canyons of the south-west side of the Mogollon mountains were so narrow that the talus ran down to the edges of the stream, well shaded by the cliffs and the trees. Conditions were much alike with the different colonies except in the item of shade, and in Dry Creek it was but a stone's throw from one colony to another for two or three miles. The small stone-fields with sufficient depth contained the most living examples, perhaps because these contained the shortest routes to the outside feeding grounds. Where the trees had

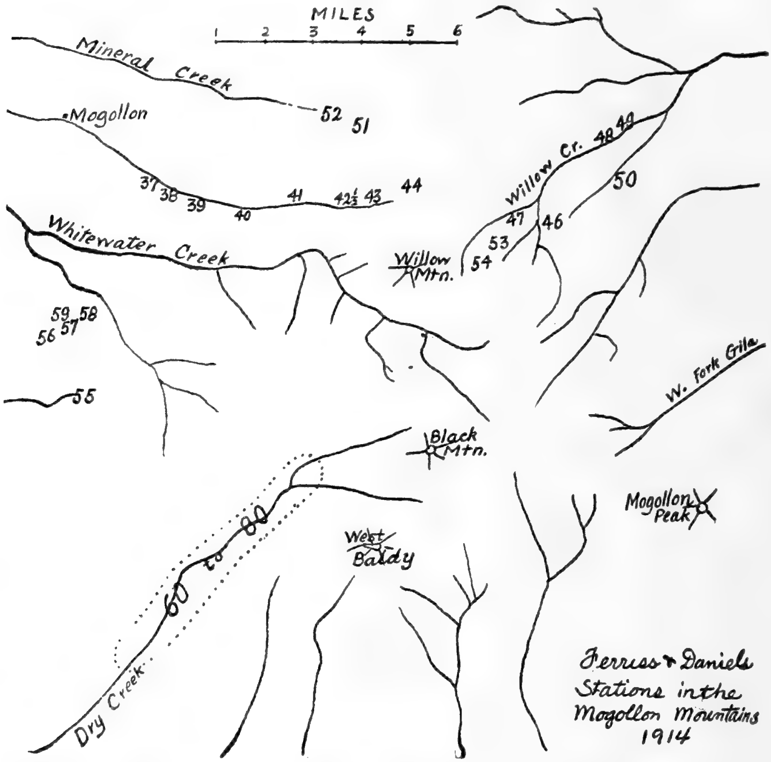


Fig. 1. Tracing reduced one-half from U. S. G. S. Topographic Map, Mogollon Quadrangle, edit. of June, 1912, showing locations of snail colonies, numbered 37 to 80.

fallen and let in the sun dead shells were numerous. In one thickly inhabited slide, no living specimens remained.

If one of the moulds or a mouse or a chipmunk family moves in, there is trouble in snaildom. Otherwise, with a well-drained rock pile, not too deep nor too shallow, a little leaf mould and the shade of a gooseberry, an elderberry or a rose, there is snail happiness. Perhaps the small gnawers like some snails better for dinner than others, but it has not been proven. For weeks of collecting there may be no broken shells, but the next day, another range or canyon, dead and broken shells will be the rule. Very few broken *Oreohelix* were found in the summer of 1914, but in 1913 the same species of *Oreohelix* met with terrible slaughter from the gnawers; some colonies were entirely destroyed. A group of Sonorellas equipped with an offensive odor seem to be well protected. Of the thousands turned up in 1913 not more than half a dozen had been broken, and these were probably mistakes made by meat-eaters lacking in the knowledge of conchology.

Ashmunella tetrodon n. sp. Plate 1, figs. 1, 2.

The shell is umbilicate, width of umbilicus contained nearly six times in the diameter of the shell; depressed, angular in front, the angle situated above the middle, and nearly or quite disappearing on the last third of the last whorl; spire and base convex; thin, cinnamon or cinnamon-brown above, fading on the base. The surface has a silky luster, and is very weakly marked with growth-lines; on the base some excessively weak spiral lines may be seen under strong magnification. There are 5½ convex, closely-coiled whorls, the last descending a little in front, having a deep, narrow constriction or gutter behind the peristome; behind this gutter it is rather swollen and distinctly striate. The umbilicus is cylindric within, and enlarges at the last whorl. The aperture is very oblique; peristome white or pinkish, reflexed throughout, with a recurved edge, the face rounded. Outer margin bears a long, very slightly retracted, flat-topped or slightly notched tooth. Basal margin is armed with two marginal teeth, the outer one slightly larger. These two teeth are somewhat compressed laterally, and are yoked together by a callus on the edge of the broad lip. The spaces between the three teeth are about equal. The transparent parietal callous bears an obliquely radial tooth, set rather far in, and in old examples having the inner end slightly curved towards the basal lip. The outer end often has a low callus outwardly and sometimes one running in.

Young shells form a quite thin lip-callus at resting stages, but these seem to be absorbed subsequently, as no opaque streaks are visible in the adult stage.

Height 6.7, diam. 15 mm.

Locality.—A mile or two above the box of Dry Creek Canyon, Station 70, south slope of the Mogollon Mts. (4 miles south of the Little Whitewater station); elevation from 6000 to 7500 feet. Also at various stations mentioned below, in the same canyon.

Explanation of Plates.

Note.—Figures on plate I, and figs. 1–3 on plate II, are $1\frac{2}{3}$ natural size; figures 4–8 on plate II are natural size.

Plate I. Fig. 1. Ashmunella tetrodon. Type and paratypes. Station 72.

Fig. 2. Ashmunella tetrodon. Station 79.

Figs. 3, 3a. Ashmunella tetrodon. Variety with small parietal tooth. Station 60.

Fig. 4. Ashmunella tetrodon mutator. Station 60.

Fig. 5. Ashmunella tetrodon mutator. Type and paratypes. Station 80.

Fig. 6. Ashmunella tetrodon mutator. Station 67.

Fig. 7. Ashmunella tetrodon inermis. Type and paratypes. Station 69.

Plate II. Fig. 1. Ashmunella danielsi. Type and paratypes. Station 57.

Fig. 2. Ashmunella danielsi dispar. Type and paratypes. Station 55.

Fig. 3. Ashmunella pilsbryana Ferriss.

Fig. 4. Sonorella peninsularis Pils. Type. Lower California.

Fig. 5. Sonorella ultima Pils. Type. Sinaloa.

Fig. 6. Epiphragmophora ellipsostoma Pils. Type. Lower California (?).

Fig. 7. Sonorella lioderma Pils. Type. Lower California.

Fig. 8. Sonorella lohrii (Gabb). Type. Lower California.

(*To be continued*)

THE SIERRA DE CUBITAS, CAMAGUEY, CUBA.

BY JOHN B. HENDERSON.

Modern railway extension in Cuba has opened many new fields of exploration in that delightful island which were denied to the past generation of collectors. This is especially the case in the central provinces of Santa Clara and Camaguey. In northern Camaguey there is an east and west range of hills known as the Sierra de Cubitas which raise their limestone crests about six or seven hundred feet above the level plains of the province. Like all limestone elevations in Cuba these present a forested region of great variety and richness which in this instance contrasts strongly with the almost treeless prairies that surround them.

The first mollusk record from the Cubitas was made by Carlos de la Torre who gathered there a few shells some ten years ago. Stillman Berry traversed one of the passes of the range about two years ago and took a few specimens en route. These he generously divided with me and at the first glance I then and there decided to take the very first opportunity to visit the region. All his shells were new. In December last, Mrs. A. C. Reed of Camaguey, an American who takes a great interest in Cuban land shells, spent a day collecting at the Loma de Borje, an outlaying isolated hill of the Cubitas system, and her catch was remarkable in the number of new operculates and long slender Microceramus belonging to quite a new group. Save for two species (*Macroceramus hendersoni* Torre and *Microceramus longa* Hend.) none of the novelties obtained here have been published.

In February last the looked-for opportunity arrived, and Charles T. Simpson, Carlos de la Torre and I proceeded to Camaguey, where we outfited for an assault upon the hills. Four days were spent in an almost frenzied siege upon the mollusks along a ten or twelve mile front, and I believe we have overlooked very little. We made little or no effort to collect the larger tree snails of wider distribution, but persisted in our search for the special things that are confined to this range. The two particular and striking elements are the development of a series of operculates that cannot very definitely be placed in any genus unless in Dr. Dall's *Opisthosiphon*, although even there they fit only by virtue of having a siphon back of the aperture, but otherwise do not resemble nor have much in common with the *Ctenopomas* that form the bulk of Dall's genus; and secondly, the remarkable development of large *Macroceramus* of the *M. hendersoni* group and of long, slender *Urocoptis*-like *Microceramus*. Like the operculates these all appear to be new in species and groups.

The absence of all *Urocoptids* (save the one *U. camagueyana* Torre) is striking. None of the other shells that do seem referable to published species are typical except the *Pleurodonte* and *Liguus*, which are widely distributed over the island, and signify but little in questions of local distribution.

The strangeness of this mollusk group which appears to be removed from the Oriente and Trinidad groups gives rise to some perplexing queries in distribution. There seems to be a sort of vague line of connection with northern Santa Clara and diagonally south across the island and including the Isle of Pines. This is hinted at by a few species rather than proclaimed by the total. We have still much to learn about Cuban land shells.

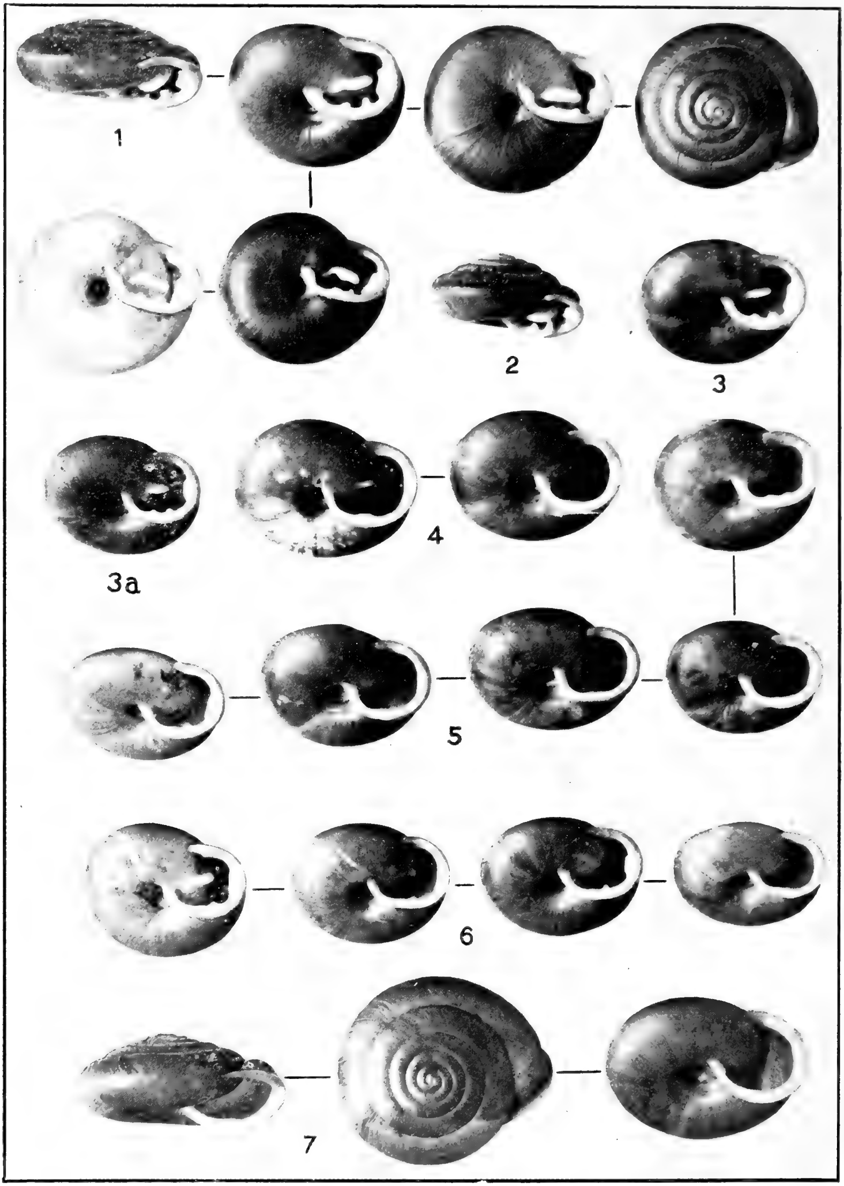
What we had anticipated would be a very hard trip turned out to be one of our easiest ones. The open, level country made travel in a volanta-like trap possible and the few natives living in this sparsely settled country are hospitable to the point of embarrassment. We slept in our own hammocks and strangely enough our only discomfort was occasioned by the cold nights. We nearly froze to death.

SHELLS OF PUT-IN-BAY ISLAND, LAKE ERIE.

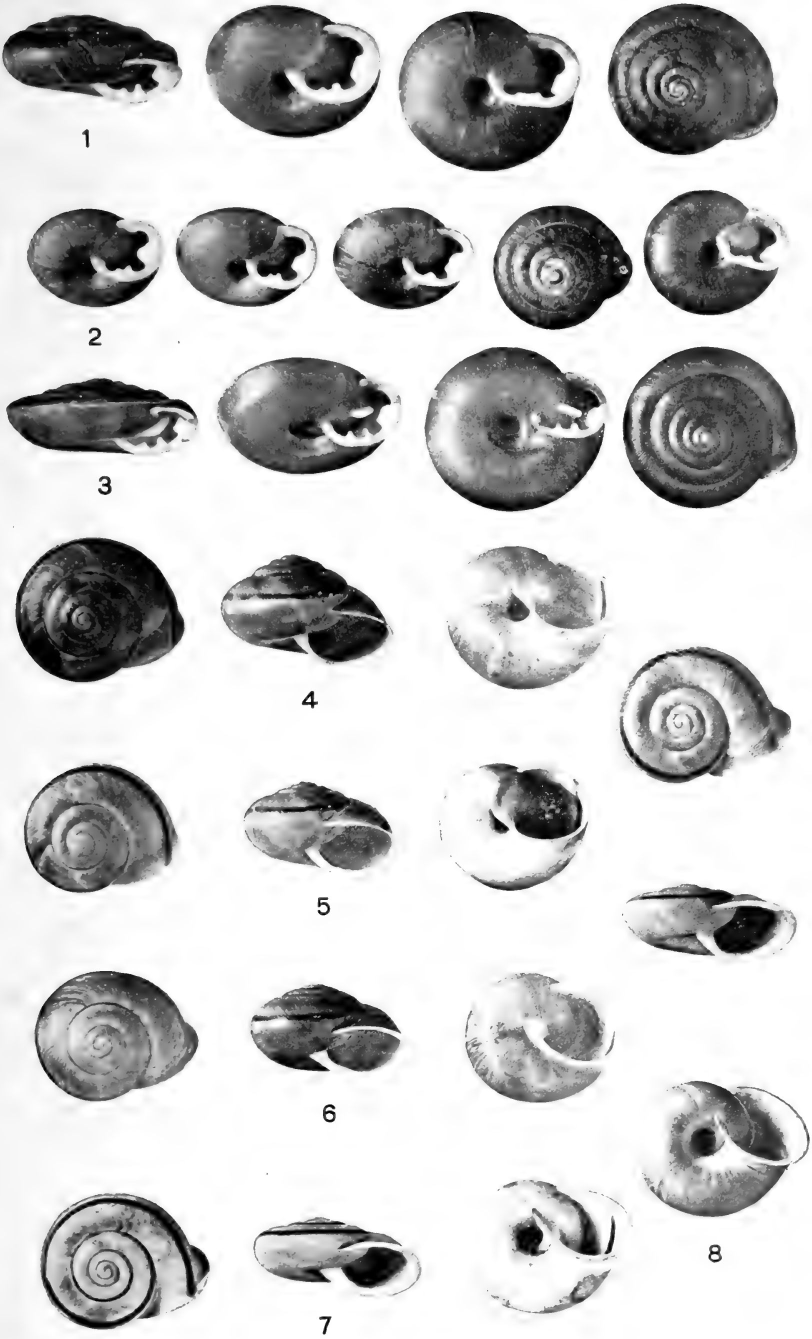
BY JOHN A. ALLEN.

Put-in-Bay is a beautiful island in Lake Erie, nearly all cultivated with orchard and vineyard, but retaining some rocky forest. It is of limestone formation, contains caves, and at places is faced with cliffs, and in the wilder parts is adorned with brilliant flowers, scarlet Silene and blue Pentstemon .

The island is about three miles from the Ohio shore, is about



1–3a. ASHMUNELLA TETRODON PILS. & FERR.
4–6. ASHMUNELLA TETRODON MUTATOR P. & F.
7. ASHMUNELLA TETRODON INERMIS P. & F.



1. ASHMUNELLA DANIELSI PILS. & FERR.
2. ASHMUNELLA DANIELSI DISPAR P. & F.
3. ASHMUNELLA PILSBRYI FERRISS.
4-8. SONORELLA OF LOWER CALIFORNIA.

three and a half miles long and about one and a half miles across at the broadest place. It is divided into two unequal parts by an isthmus. Nearly the whole breadth of this isthmus is occupied by a pool, which until lately was bordered on one side by a little patch of woods.

Here are found:

Polygyra albolabris (Say), a reddish form characteristic of marshy woods on the Lake Erie islands; *Polygyra multilineata* (Say); *Polygyra monodon* (Rack.).

Vallonia pulchella (Müll.); *Vallonia excentrica* Sterki; *Vallonia parvula* Sterki.

Bifidaria armifera (Say); *Bifidaria contracta* (Say); *Bifidaria pentodon* (Say); *Bifidaria holzingeri* Sterki.

Vitrea hammonis (Ström); *Vitrea indentata* (Say).

Zonitoides arborea (Say); *Zonitoides minuscula* (Binn.).

Agriolimax campestris (Binn.)

Succinea retusa Lea var. *higginsi* Bland.

In 1914 a monument to Commodore Perry was set up at one corner of the pool, and incidentally this interesting shell station was ruined. It was doubtless the type locality of *Succinea retusa higginsi* Bland. However, the same *Succinea* was found, though less copiously, beside a little bay west of the village.

Still farther west a considerable piece of dry, rocky woods extends along the shore, and contains:

Polygyra albolabris (Say), ordinary light-colored form; *Polygyra zaleta* (Binn.); *Polygyra thyroidus* (Say); *Polygyra profunda* (Say); *Polygyra fraudulenta* Pils.; *Polygyra inflecta* (Say).

Philomycus carolinensis (Bosc.).

Pyramidula solitaria (Say).

Succinea ovalis Say?

(This *Succinea*, of which only fragmentary dead shells were seen, and also the two slugs enumerated, are given from memory.)

Elsewhere on Put-in-Bay Island were found:

Pyramidula cronkhitei anthonyi Pils.

Helicodiscus parallelus (Say).

Carychium exiguum (Say).

While *Pyramidula alternata* (Say) is generally distributed.

A single shell of *Lymnaea dalli* (Baker) was found in a meadow just east of the isthmus, clinging like a land shell to the under side of a piece of wood. The pool of the isthmus has been ruined for shell life by the application of oil, and probably no fresh-water shells now inhabit any enclosed water on Put-in-Bay Island.

Kelley's Island, about five miles southeast of Put-in-Bay, was partially explored. It yielded:

Polygyra albolabris (Say), ordinary light-colored form; *Polygyra albolabris* (Say), reddish form in marshy woods. *Polygyra zaleta* (Binn.); *Polygyra thyroidus* (Say); *Polygyra profunda* (Say); *Polygyra fraudulenta* Pils.; *Polygyra inflecta* (Say); *Polygyra multilineata* (Say); *Polygyra monodon* (Rack.).

Vallonia pulchella (Müll.).

Bifidaria armifera (Say); *Bifidaria contructa* (Say); *Bifidaria holzingeri* Sterki.

Zonitoides arborea (Say).

Pyramidula solitaria (Say); *Pyramidula alternata* (Say).

Helicodiscus parallelus (Say).

Succinea avara Say; *Succinea retusa* Lea.

ON THE CLASSIFICATION OF THE LYMNÆIDS.

BY FRANK C. BAKER.

Recently several interesting contributions have appeared which contain valuable data bearing on the classification of the family *Lymnæidæ*. These treat somewhat critically of the previous classifications which have been attempted. Roszkowski[1] presents a handsomely illustrated paper full of data on the structural and biological aspects of the Lymnæas of Lac Léman. This lake has already provided material for the pens of several distinguished malacologists; among them Forel and Brot. Roszkowski's researches add greatly to what we already know concerning the deep-water and littoral fauna of this interesting lake.

[1] Contribution à l'étude des Limnées du Lac Léman. Revue Suisse de Zoologie, xxii, No. 15, July, 1914, pages 457–539, plates 14–17.

In the first part of this paper (anatomical and systematic) the author describes the anatomy, radula and genitalia of *Lymnæa stagnalis*, *Radix auricularia* and *ovata*, and *Galba palustris*. It is apparent that there is great variability in the radula of many of the species of Lymnæids. In the paper in question, *auricularia* is described and figured with both bicuspid and tricuspid laterals, the first lateral being invariably tricuspid. In the individuals of the American form (introduced) which have been examined, the first lateral was always tricuspid, but the balance were bicuspid or with a small entoconic swelling. *Palustris* in Roszkowski's paper has both bicuspid and tricuspid laterals, while in the American form examined the laterals have in all cases been bicuspid. This is true also of *reflexa*, *emarginata*, *catascopium* and others of this group. As remarked elsewhere, the writer has not been able to observe a normal central tooth of Lymnæa which was other than unicuspid, though several pathological examples have been seen in which there were one or more side cusps. Very high powers have been used and great care has been exercised in making examinations.

In order to verify the form of teeth of American Lymnaeas published by the writer, several species, among them *palustris*, *reflexa*, *mighelsi*, *danielsi*, *stagnalis*, *auricularia*, *obrussa*, and *columella*, were reexamined, and no deviation from the published figures was observed. All of the lateral teeth of the palustris group were bicuspid. *Stagnalis* has a slight endoconic swelling which might be taken for a typical cusp. If the difference pointed out by Roszkowski for both *stagnalis* and *palustris* would prove stable there might be grounds for separating the European and American species, in which cases the latter species would become *appressa* Say and *nuttalliana* Lea. In *auricularia* the lateral teeth vary as shown by Roszkowski (plate 16, figs. 183-186) being, according to this author normally tricuspid though sometimes with the first lateral tricuspid and the balance bicuspid, as figured by the present writer. Upon reexamination, the laterals of the Lincoln Park specimens were found to be as figured by the writer and by Roszkowski on plate 16 figure 183.

Additional comparative studies are needed in which many individual radulae are observed to ascertain the amount of variation and whether this variation increases with wear and age. Biometric studies upon hundreds of radulae would be of great service. A variable radula renders tooth formulas of little value as has been stated by Roszkowski. In the American species examined this variability has been of such small percentage as to cause little or no difficulty in placing species in their appropriate groups.

The genitalia seem to provide characters of greater stability than do the radulae. The genitalia of the European and American species agree in all essential details and it seems true that these organs offer characters sufficiently stable for the separation of groups of species as has already been done in the writer's monograph of this family. Some years ago the opinion was expressed in a letter to Roszkowski, that the short, pyriform receptaclum seminis without long canal which is found in *ovata* Drap and *profunda* Clessin would seem to provide a character of group importance (see Roszkowski, plate 17, figs. 196-197). The length of the epiphallus allies these species with *auricularia* in the genus *Radix.* The writer hesitates to add another name to this already overburdened family, and simply suggests that this character may be found of value in a future classification should it occur in other species. This form of receptaculum seminis has not been observed in any American species of Lymnaea. Roszkowski's paper is a valuable contribution to our knowledge of the Lymnaeas and similar studies on other species (American as well as European) would greatly aid in providing reliable data for a satisfactory classification of this family. We wish that some American post-graduate student would elect such a theme for his doctorate dissertation.

In a recent paper,[1] Mr. Harold S. Colton publishes some valuable suggestions on the classification of the Lymnæids. While the writer would not for a moment claim that he has said the last word on the classification of this family, he does not believe that anything would be gained by a return to the old use of the name *Lymnæa.* While the differences proposed for the separation of the names admitted to generic rank in the

[1] NAUTILUS XXVIII, pages 116–120, Feb., 1915.

writer's monograph are slight, they have thus far proven reasonably stable. In any classification it must be the sum-total of characters that provide diagnostic features of value, and even if these be small they are sufficient if they include certain groups to the exclusion of others. No single character, as the radula or the genitalia, will prove satisfactory. A case in point is *Radix*, in which the lateral teeth of the radula are now known to be either bi- or tricuspid. As the writer stated in his monograph diagnostic features must be based on the sum of the characters presented by the shell, radula, genitalia, or other organs. Colton says "our present knowledge will not allow us to make a comprehensive classification of the Lymnaeids based on the anatomy of the snail." This result cannot be attained by recasting the data now available, but rather by the addition of new data on old species or on species now unknown anatomically.

The writer can by no means agree with the statement made twice in this paper that generic names should not be added unless based on undebatable grounds because of the inconvenience to the cataloger. If this criticism should be recognized we would revert to the use of many of the older names in the Pulmonata as well as in the Naiades. It is recognized, of course, that generic subdivision can be overdone, but in the advancement of science the convenience of the cataloger or teacher is not considered. Generic or other divisional names are simply for the purpose of bringing together groups of similar organisms which we designate as genera, subgenera or sections. In some cases the criteria for the separation of these genera will be of a distinct and decided character; while in others, where there are many species of similar characteristics, these distinctions will necessarily be founded on data of a less decided character. Such a condition obtains in the family under discussion and whatever the criteria used for the separation of genera or other groups, they can apparently be of only quantitative character. The relative value of these criteria will vary with the importance ascribed to them by different authors.

We welcome all additions to knowledge and we know full well that the work of yesterday is rendered obsolete by the work of to-morrow, but the writer cannot see how the reduction to subgenera and sections of the names used as genera and subgenera in the monograph in question advances our knowledge of the family any more than the raising of a number of subgenera and sections to generic rank, as Colton believes the writer to have done in his monograph. This rather resembles a game of see-saw!

The provisional key of Colton (page 119) is good, and the writer would also be interested to know how useful it may prove to the workers in this family. We would suggest that there is a vast fund of useful information to be acquired from a biometric study of both the radula and the genitalia of the Lymnaeas. If we knew the range and the relative amount of variation of these organs we could more intelligently use these criteria for purposes of classification. An abundance of time is needed for this work but the results would compensate for the time expended. The studies which have thus far been made upon this family serve to emphasize the one fact which stands out clearly, the great variability of the shells and organs of the fresh-water pulmonates, a condition in strong contrast with the terrestrial pulmonata where the radulæ and genitalia are much more stable in character and hence more satisfactory for purposes of classification.

PUBLICATIONS RECEIVED.

An Index to the Museum Boltenianum. By Wm. H. Dall. Smithsonian Institution Publication No. 2360. The republication of Bolten's work by Messrs. Sherborn and Sykes (1906) made it accessible to conchologists generally, but its use has been difficult on account of the absence of any index to the great number of names, combined with the unfamiliar nomenclature, which often made even well-known Linnæan species hard to find. Dr. Dall has very appreciably lightened this labor by a full and cross-referenced index. It is prefaced by a historical account of the work, a discussion of its nomenclature, and translations of the Latin Preface and the German Introductions. The Institution desires to give the widest usefulness to this Index, and will supply copies to all who may be interested.—H. A. P.

THE NAUTILUS.

VOL. XXIX. JULY, 1915. No. 3

VITREA CRYPTOMPHALA N. SP., WITH NOTES ON THE INDENTATA GROUP.

BY GEORGE H. CLAPP.

VITREA CRYPTOMPHALA n. sp. Fig. 1.

Shell thin, polished, very light horn-color to white, generally white, translucent; whorls 5 to 5½, those of the spire regularly increasing, the last widening very rapidly and doubling the diameter of the shell. Aperture broadly lunate, sutures well impressed, all whorls showing through the shell. Surface sculptured with rather evenly spaced, radiating grooves continued to the base as in *V. indentata* and *carolinensis*, there being from 23 to 34 on the body whorl. Micro-sculpture of even, close, clear-cut spiral engraved lines like those of *carolinensis*, best seen with a magnification of 25 diameters or over. Spire much depressed, almost flat, the termination of the last whorl slightly raised at the lip which is straight on the lower edge and well curved forward above, projecting about 1 mm. beyond the lower lip; at the columellar end the lip is thickened and joined to a *tongue-like callus which completely covers the umbilicus at all stages of growth.* There is a thin, microscopically granular parietal callus, as in *V. indentata.* Base of shell well rounded and less impressed in the umbilical region than *indentata* or *carolinensis.*

Shell figured (Knox Co.,) 5.1x4.2x2.1mm., whorls 5, 23 grooves on body whorl.

Largest, Knox Co., 5.7x4.8x2.7mm., whorls 5, 26 grooves on body whorl.

Largest, Knoxville, 5.9x5.0x2.8mm., whorls 5, 34 grooves on body whorl.

Smallest, Knox Co., 2.1x1.9x1.1mm., whorls 3, umbilicus completely covered.

The largest shell seen is from "along Coosa River, 2 miles N. of Wetumpka, Ala.," it is 8.0x6.8x3.3mm. whorls 5½, 28 grooves on body whorl.

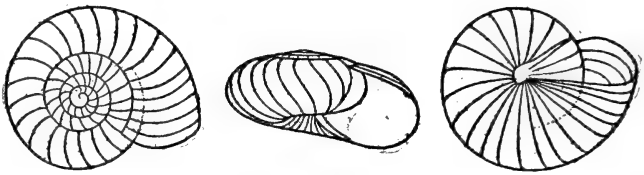


FIG. 1.—VITREA CRYPTOMPHALA.

Types from a lot of over 400 shells collected by the late Mrs. George Andrews and labeled "Knox Co., Tenn." A lot of 18 shells in her cabinet series are labeled "Knoxville, Tenn.": they all probably came from near Knoxville, perhaps from a favorite "hunting ground" of hers, "The Cliffs" on the south side of the river. Type No. 7365 of my collection. Cotypes in Acad. Nat. Sci. Phila. (No. 112421), U. S. Nat. Mus., and collection of Dr. Bryant Walker.

At first I was inclined to consider this a variety of *V. carolinensis*, but the flatter spire, the umbilicus covered *at all stages of growth*, the less excavated umbilical region and the wider aperture indicate a good species. I examined 250 *V. indentata* from 41 localities and 110 *carolinensis* and *var. wetherbyi* from 15 localities and found no intermediates.

In addition to the Knox Co. shells I have *cryptomphala* from 14 localities in Alabama, San Antonio, Tex., McComb City, Miss., Fayetteville, Tenn., and Albion, Ill., nearly 600 shells in all. A sectioned shell shows the thickening of the columella, caused by the callus, clear to the apex.

In the box with the Knox Co. *cryptomphala* were over 70 shells which from the sculpture should be *V. carolinensis wetherbyi*, but if they were found in the North would be called *indentata*, and a single example of *V. rhoadsi.* I am indebted to Mr. Walker for the suggestion of the very appropriate name.

Some notes on *Vitrea indentata* (Say) and allies may be given here.

In the Journ. Acad., 11, 372 (1822) Say described *Helix indentata* as imperforate, stating: "umbilicus none, but the umbilical region is deeply indented". Pilsbry, in The Nautilus, xii, p. 102, shows that this was an error:—"In Say's types the perforation may be seen with a good lens, though it was not noticed by Say, who probably worked with what would now be thought an inferior glass".

The Texas form of *indentata* is generally larger than the typical eastern form and was at one time identified by W. G. Binney as *sculptilis* Bld. In the British Naturalist, April 1893, p. 81, Cockerell speaks of the Texas form as "*Z. indentatus* var. *umbilicatus* Singley" (See also Nautilus, xii, p. 120). This variety has a *very distinct* umbilicus.

"*Zonites carolinensis*" Ckll., is very inadequately described in Binney's Supplement iv, p. 167, pl. III, fig. 7, and it will be noticed that the figure shows a distinct perforation. In the Nautilus, xii, p. 120, Cockerell gives his "original description", although I have been unable to find it in any other place. In this he says: "Umbilicus small, narrow".

In Proc. Acad. Nat. Sci., 1900, p. 130, Pilsbry describes the microsculpture of *carolinensis* as a character which separates it from *indentata* and calls all of the Great Smoky shells *carolinensis.* In a review of this paper, "Mollusca of the Great Smoky Mountains", published in the Nautilus, vol. xiv, p. 45, Cockerell says: "Thus in place of *Vitrea indentata* there is an abundance of *V. carolinensis* of a small type (var. *wetherbyi* Ckll. ined.) intermediate between *indentata* and *carolinensis* proper, the exact locality of which is unfortunately unknown". This is the only "description" of var. *wetherbyi* that I have been able to find, except that in Proc. A. N. S., 1902, p. 430, "The Mollusca of the Mt. Mitchell Region, No. Car.," Pilsbry says: "The type specimens (*V. carolinensis*) have 5 whorls with a maximum diameter of 10 mm". Under *V. carolinensis wetherbyi* Ckll., he says :—"In the report of the expedition of 1899 the specimens of *V. carolinensis* were found to belong to a small race, ranging from 5½ to 7 mm. in diameter. Cockerell has since distinguished it under the above varietal name". . . . "It is intermediate between typical *V. carolinensis* and *V. indentata.*" From this it would seem that shells from say 7½ mm. up to 10 mm. diameter are *carolinensis* and under 7 mm. diameter are var. *wetherbyi*, and as there is nothing said to the contrary it is safe to assume that the variety is umbilicate.

Under the above differentiation by size the only *carolinensis* in my collection are 5 specimens collected by the late Mrs. Geo. Andrews at Cranberry, Avery Co., N. C.; they are narrowly umbilicate. All of the balance are either "Var. *wetherbyi*" or the new species described above.

Cockerell says that *carolinensis* has about 26 grooved lines on the body whorl, my three largest Cranberry shells have 38, 34 and 32 respectively, while a 6½ mm. diameter shell from Mitchell Co., N. C., (labeled *carolinensis* by A. G. Wetherby) has 35 and a 6¼ mm. shell from Paint Rock, N. C. has 32 lines.

THE NATIVE OYSTERS OF OYSTER RIVER, DURHAM, N. H.

BY C. H. BATCHELDER.

A natural bed of native oysters has persisted in Oyster river, Durham, New Hampshire, ever since the settlement of the town in 1635. This persistence of the oysters is interesting in view of the fact that they have been fished almost constantly. A superficial survey of the beds reveals the following very general information.

The beds are found in from six to fifteen feet of water at low tide, in the channel of the stream, which varies from five to about twenty yards in width, and the bed extends along this channel for a half mile, in such quantities that one can rake a bushel easily in less than an hour. I am confident however, that the bed extends into deeper water for half a mile beyond this. Wild oysters are also found on ledges and boulders at the half-tide mark along the entire river bank for a distance of two miles. A few of these fail to survive the exposure in winter but where Fucus fronds cover them completely and they are not molested they often grow to six inches in length. In these situations they are subjected to protracted low temperatures during the winter months and a short season for the growth of the "spat". The water temperature in the month of September drops to the vicinity of 15° C. by the 30th. In the middle of October the temperature is down to 12° C. and by the middle of November down to 8° C. The density of the water varies between 1.015 and 1.0225. The "spat" first appeared, or perhaps more correctly, were first discovered on the twelfth of October. At this time they were about 6.5 mm. in diameter. On November 23 they were again measured and were about 11.5 mm. Notes and specimens taken at this time were only for idle curiosity and are not absolutely reliable.

The only enemies beside man that I know of are the boring sponge and *Urosalpinx cinerea*. Inquiry and repeated examination have failed to discover the presence of the starfish or any of the commensal crabs and I believe they fail to ascend the river as far as the Durham beds. The beds are entirely self-propagating. No attention is ever paid to the need of the "spat"; and clean shells or stones for their attachment have never been placed in the river. I have never heard of the oysters having been taken for commercial purposes, but many are gathered for "home consumption".

THE NEW MEXICAN EXPEDITION OF 1914—ASHMUNELLA.

BY H. A. PILSBRY AND JAS. H. FERRISS.

[*Continued from p.* 16.]

Ashmunella tetrodon P. & F.

In the type lot the diameter varies from 12.8 mm. with $5\frac{1}{4}$ whorls to 15 mm. with $5\frac{1}{2}$ whorls. This is the usual range of variation in size. In stations 75 and 71 all are rather small, in the former from 12 to 14 mm.—mostly about 13 mm., and at

71 from 11.3 to 13 mm. The smallest have barely 5 whorls. Probably some local condition dwarfs all the individuals in these stations.

In several stations, 70, 71, 72, 73, there are very beautiful albino specimens of a transparent marguerite-yellow tint among the dark ones. See first two figures within second row, representing an albino and one of the darkest examples, from station 72.

Compared with *A. proxima* Pils. of the Chiricahua range, this species differs as follows : It is less depressed. The peripheral angle becomes weak and then nearly or quite disappears at the last part of the whorl where it is more swollen above. There is a furrow behind the lip up to the suture, and the *upper lip is reflexed*, while in *A. proxima* the upper lip is straight, not expanded, and there is a whitish triangular patch and no gutter above the end of the outer lip. *A. proxima* has one more whorl. The aperture is larger in *A. tetrodon* when specimens of the same diameter are compared. *A. tetrodon* is less depressed and less angular than *A. pilsbryi*, which further differs by its papillose surface.

All of these colonies in the box of Dry Creek Canyon were found in company with *Oreohelix barbata* Pils. The colonies farther up the stream had also *A. mogollonensis* for company.

In color and teeth, *A. tetrodon* is much the same as the Cave Spring *A. danielsi*, with the addition in this of a parietal lamella.

Dry Creek is dry at the crossing of the Silver City and Mogollon road. Six miles above it becomes a large and beautiful trout stream, boxed in for two miles so closely and roughly that the banks are not used for grazing purposes, and are never disturbed. Twenty snail colonies were found in the rock slides during a hasty search of these, two or three more miles above. Above the box shells were found in the grass and weeds also. In nearly every instance the colonies differed in size and in the character of the teeth. Some had no teeth (var. *inermis*); others, as with *A. heterodon* Pils., of the Huachucas, ran from no teeth to four, with all the variations between (var. *mutator*).

In the colony at Station 60 there are some individuals differing from typical *tetrodon* by having the parietal tooth reduced (pl. 1, figs. 3, 3a). These are partly transitional to var. *mutator*.

The following two are named as sub-species in order that we may have a convenient means of referring to them. They intergrade, but their modification has been as great as that usually distinguishing species of *Helicidæ*.

Ashmunella tetrodon mutator n. subsp. Pl. 1, figs. 3 to 6.

In color, shape and sculpture this subspecies is like *A. tetrodon*. As in that species, the upper lip is well reflected from the insertion out; former resting stages are often marked by an opaque light streak on the base. In the typical colony there is no parietal tooth and the lip-teeth are much reduced; there are vestiges of the long tooth within the outer margin, and of the two teeth of the basal margin, but in many individuals of the typical colony these vestiges are exceedingly weak, hardly noticeable. There are about $5\frac{1}{3}$ whorls.

Height 6.25,	diam. 14 mm.	Station 60.
Height 6.9,	diam. 13.8 mm.	
Height 6,	diam. 12.5 mm.	
Height 7,	diam. 14 mm., whorls $5\frac{1}{3}$	Station 61.
Height 8,	diam. 15 mm., whorls $5\frac{2}{3}$	

Locality.—Station 80 (1914), in Dry Creek Canyon, Socorro Co., N. M. Also Stations 60, 61, 62, 68, in the same canyon. 6,000–7,000 feet elevation.

This is very abundant in some places, where large series of fresh "bones" were taken, but living ones were rare. It is one of those lawless species, such as we have described from the Huachucas—a species which has been caught in the act of losing its teeth. Its affinities are clearly with *A. tetrodon* of the same canyon, and there seems to be no decided break between the most fully toothed *mutator* and the *tetrodon* with smallest teeth.

The specimen described as type of *mutator* is from a colony in which no specimens have a parietal tooth. Varying forms from this colony (Station 80) are represented in Fig. 5, all being perfectly adult shells. Similar are those from Stations 61, 62, 68.

In the lot from Station 60 all the shells are rather distinctly striate. The most fully toothed example (pl. 1, figs. 3, 3a) agree with *A. tetrodon*, except that the parietal tooth is smaller. There are other examples, with all of the teeth smaller than in *tetrodon*, and still others, found with them (No. 60 A) have the lip-teeth very small, partly wanting, the parietal tooth either wanting or minute (pl. 1, figs. 4). This is the only instance where almost fully toothed *tetrodon* and *mutator* occur in the same colony; but without transitional individuals.

Lots from Stations 67 (pl. 1, figs. 6, four *adult* shells) and 78 vary from shells having four small teeth (like the *tetrodon* from Station 60) to shells having only weak rudiments of teeth. The lots from these stations therefore connect *tetrodon* and *mutator*, and cause us to rank the latter as a variety of the former. The varying condition of the teeth in different colonies may be briefly indicated in a few, to give an idea of this variation.

Station 78. In nineteen examples, 10 were toothless; 2 had a full set of teeth and a lamella; 3 had a lamella and thickened in both lip positions; 1 had a lamella only; 4 had three "pimples" upon the lip in place of teeth, no lamella; 1 had a "pimple" at the basal position. Diameter 12 to 14.5 mm.

Station 61. Eight had a full set of teeth and lamella; 13 had teeth upon the lip in different degrees of development. 1 had a lamella only, 6 were toothless. Diameter 13.4 to 15.2 mm.

Station 62. In 75 shells 12 had a lamella and a full set of teeth, varying from mere "pimples" to fully developed teeth, 28 had a full set of teeth on the lip only, also varying as much in development, 19 with one or two basal teeth, only 12 without teeth. Nearly all were dead or broken shells. Diameter 14.6 to 11.4 mm.

Station 67. Coarser growth-lines and striations more distinct; not guttered deeply back of the lip; angulation more pronounced, umbilicus enlarged in the last half of last whorl. Spire more elevated than the two preceding colonies. Diameter $12\frac{1}{2}$ to 14 mm.

In a lot of 125 (dead and broken) 34 had a lamella and the full set of teeth, 54 had three teeth upon the lip, 6 had a basal tooth only, and 11 were toothless.

Station 68. Same as the preceding, but smaller and smoother. Nine were collected alive. These measured 7 mm. in alt. and

12.6 in diameter. Two or three were toothless, the other had 3 teeth upon the lip.

ASHMUNELLA TETRODON INERMIS n. subsp. Pl. 1, fig. 7.

Larger than the other forms, biconvex, indistinctly angular above the middle in front, the periphery becoming rounded on the last third of a whorl. There are 5½ to 6 convex, closely-coiled whorls, the last descending a little in front, guttered behind the lip, swollen behind the gutter. Surface lightly marked with growth-lines, without spiral striæ. The aperture has no teeth, or in some specimens shows extremely weak traces of them. The lip is reflexed, the edge recurved, but it is very narrow.

Height 8, diam. 17.5 mm.

Height 7.3, diam. 15 mm.

Locality.—Station 69, Dry Creek. Also Station 63, where it is rare.

This is a smaller and especially more depressed shell than *A. mogollonensis*, differing, moreover, by the noticeable peripheral angle in front and the absence of spiral incised lines. While it seems at first rather absurd to connect this form with *A. tetrodon*, yet except by its greater size it does not differ in any important respect from the least toothed of the variety *mutator*. We regard it as a final stage in the degeneration of teeth, like *Ashmunella esuritor* in the Chiricahuas.

At first glance it seems to be without teeth, but it carries a suggestion of teeth in the slight thickening of the lip in the outer margin and a mere pimple at the basal position. Two in twenty-four had two "pimples" at the basal position. Seven had none. One with a "pimple" also had the mere suggestion of a parietal lamella. Parietal callus thin and colorless. One or two varix-streaks in every specimen, usually at or near the end of the penultimate whorl.

This colony and the next seem farthest removed from the typical *tetrodon*. At this station also were found a few of the full-toothed form of *tetrodon*, but without transitional specimens.

Station 63. Growth-lines deeper than in Station 69. Shell more depressed, larger. Three in six had the suggestion of a basal tooth.

Two largest—Height 8, diam. 19 mm.
Height $8\frac{1}{2}$, diam. 16.5 mm.
Two smallest—Height 7, diam. 16.4 mm.
Height 8, diam. 15.6 mm.

ASHMUNELLA DANIELSI n. sp. Pl. 2, figs. 1.

The shell is similar to *A. tetrodon* in shape, luster and color; but it differs in the following characters. The fine spiral lines, when the surface is perfectly preserved, are numerous and distinct. *There is never any trace of a parietal tooth.* The two teeth of the basal margin are closer together, and the inner one is much smaller than the outer, the umbilicus is a trifle smaller. Finally, the callous rim strengthening the lip of the young, in resting stages, is not absorbed, but remains visible as an internal varix, producing an opaque streak in the adult, visible externally on the base, or if the surface is dulled, it may be seen by holding the shell up to the light.

Height 7, diam. 14.5 mm.; $5\frac{1}{2}$ whorls.

Height 7, diam. 13.3 mm.; $5\frac{1}{2}$ whorls.

Locality.—Cave Spring Canyon (near the south fork of Whitewater Creek, Range 19 West on the parallel of 33° 20′, U. S. G. S. Topographic Map, Mogollon Quadangle). Socorro Co., New Mexico.

This species is remarkable for retaining large lip-teeth while the parietal tooth has totally disappeared, showing that these teeth are not connected in inheritance, though from the diminution of all together in *A. t. mutator* a connection would be supposed to exist. The large series taken at stations 57, 58, 59 show very little variation. As in *A. tetrodon*, the basal teeth are yoked together, by a callus resembling the letter U.

About seventy of these were collected in the lower station (56) of Cave Spring Canyon, a large number broken by the mice. Elevation about 7,000 feet. This canyon is about two miles north, running parallel with the Little Whitewater. No other large shells were found there.

Station 57. About two miles farther up the canyon on large slides, one-half mile below Kitt's new mine and cabin, were *Ashmunellas* in unlimited numbers, in company with *Oreohelix* *barbata* Pils. A stiff shower during the night brought them out upon the rocks, and with sycamore shade in plenty they remained active during the following forenoon. The teeth upon the lower margin were smaller than at Station 56, lip more rounded, but no other difference of importance was noted. Compared with the former station, one example measured 7.4 mm. alt., 15 diam. Smaller examples were found than in the former colony. Two of these measured, alt. 6.2, diam. 13.5 mm.; alt. 6.4, diam. 13.4 mm.

Sections 58, 59. Above the cabin, in a branch of the canyon north of east, and in the rocks around and above Cave Spring, were found shells smaller in diameter but otherwise unchanged. Three of this colony measured:

Height 6.6, diam. 13.6 mm.
Height 6.8, diam. 12.6 mm.
Height 6.8, diam. 12.4 mm.

These stations were at an altitude above 8,000 feet, the high point of the range. The upper two miles of this canyon was left unexplored.

(To be continued.)

NOTES

Mr. Frank C. Baker announces that he has resigned his position as Curator and Acting Director of the Chicago Academy of Sciences. His address for the summer will be 1555 Highland Avenue, Rochester, N. Y.

VIVIPARUS MALLEATUS REEVE IN MASSACHUSETTS :—In April, 1914, Mr. William J. Clench brought in two specimens of the above species for determination, collected in Muddy River, a small stream dividing Boston from Brookline. Shortly afterwards a third specimen was found by Mr. Kendall Foster. At the time I was inclined to consider it a recent introduction from some aquarium, as the animals were dead when found and probably killed by the cold, being unable to stand the winter. On Nov. 2, 1914 a fourth specimen was found by Mr. P. S. Remington. On April 1, of this year four specimens were again found by Mr. Foster, the largest measuring 47 mm., the smallest 11 mm., the other specimens found showing all gradations in size between these two. The length of time between the finding of the first and last specimens and the presence of both young and adult, would indicate that the species is probably established. They may have been introduced when goldfish were placed in the stream, which, I have been told, was done to destroy mosquito larvae. In THE NAUTILUS, vol. 25, p. 31, 1911, Mr. Harold Hannibal records this species in California.

C. W. JOHNSON.

CAMPELOMA LEWISII WALKER IN ILLINOIS.—This characteristic *Campeloma* extends into Illinois, as suggested by Dr. Walker.[1] Specimens are in the collection of the Chicago Academy of Sciences from Cache Creek, Pulaski County and Clear Creek, Union County. These conform closely to the published figure (Nautilus, plate v, fig. 3). As Dr. Walker remarks, they are much thinner than *subsolidum* and the whorls are not as convex. Union and Pulaski counties are in the extreme southern part of the state and probably mark the northern limit of the range of this species. The specimens were collected by Dr. Howard N. Lyon, a Chicago physician, who has long been interested in the study of the Mollusca.—FRANK C. BAKER.

A banquet was given for Mr. James H. Ferriss by his friends in Joliet, on the occasion of his retirement from newspaper activity as editor of the Joliet Daily News. Incidents of the struggle for good government and social betterment of Joliet were recounted in the toasts by business men, professional men and clergymen of Joliet, most of whom had been associated with the editor of the *News* at one time or another during the thirty-eight years of Ferriss's control of that newspaper. The high ideals of the editor of the *News* and their influence on the civic development of Joliet were alluded to. Mr. E. E. Hand of Chicago spoke of Mr. Ferriss's attainments as a conchologist. His scientific tastes were further recognized by the gift of a microscope, the presentation speech being made by Professor Willard N. Clute, the well-known writer on ferns.

[1] Nautilus, XXVIII, page 127.

THE NAUTILUS.

VOL. XXIX. AUGUST, 1915. No. 4

APICAL CHARACTERS IN SOMATOGYRUS, WITH DESCRIPTIONS OF THREE NEW SPECIES.

BY BRYANT WALKER

In his description of *Somatogyrus walkerianus*, (NAUT., xviii, p. 140), Aldrich stated that "the nucleus is obliquely placed and projects markedly beyond the outline of the spire on the left side." This is the only observation that has been published with reference to any special apical characters in this genus.

Recently, while studying several lots of *Somatogyrus* collected by Messrs. Hinkley and Wheeler in Arkansas, I noticed, while examining an uneroded specimen with an ordinary glass, that not only was the apical whorl decidedly everted, but that it was apparently punctate. On putting it under a compound lens the spirally punctate sculpture was clearly developed. This led to a careful study of all of the described species with some very interesting results.

The irregular coiling of the apical whorl, or partial eversion, as it were, is very common in *Somatogyrus* and is found, to a greater or less extent in all of the species in which the spire is more or less conically elevated and acute. In species having the apical whorls flattened, of which *S. strengii* is a conspicuous example, no eversion is found.

The amount of apical eversion varies not only in the different species, but also in individuals of the same species. But when it does occur in any species, it is, apparently, always present to some degree. As a specific character, therefore, the presence or absence of eversion can be relied upon, but the amount of eversion, when present, would seem to be an individual, rather than a racial or specific peculiarity.

The amount of eversion is usually coincident with the height and acuteness of the spire. In species having a comparatively high, acute spire, the apical whorls are more closely coiled and the apical whorl, itself, is very convex and separated from the succeeding whorl by a deep, constrictive suture. In species with a blunter apex the apical whorl is less convex, being well rounded above, but less constricted below by the suture. In all of these forms, the apex itself, when viewed laterally, is not acutely pointed. It is more or less obliquely flattened on top and the tip, or what would be the tip if it were everted, is below the level of the surrounding whorl and often is, as it were, immersed in the axis.

In species with flat or planorboid apices, there is no eversion of the apical whorl, which is not constricted by the suture, but is flatly rounded above and separated from the succeeding whorl by a well defined, but vertical suture.

In nearly all of the species that have been examined, there is a well defined apical sculpture. In *Somatogyrus*, apparently, the embryonic shell has only a single whorl and the apical sculpture, when present, is confined to that whorl. It is wholly epidermal in character. The epidermis being very thin and delicate, it is extremely subject to erosion and frequently has entirely disappeared in specimens, which, so far as the shape of the whorl is concerned, are substantially uneroded. For this reason, in several of the described species none of the specimens on hand were sufficiently perfect to afford any information as to their apical sculpture and in others the apices of all of the specimens were entirely eroded.

The apical sculpture, when present, is exceedingly fine and delicate and, even in perfect specimens, usually requires a lens of 100 diameters to develop it fully. It is, apparently, quite constant in its character in each species and, when different in detail, would seem to be a good specific character.

The apical sculpture begins with the earliest formation of the shell covering and, so far as I have observed, does not extend beyond the embryonic portion. Usually, at first, it consists of irregular wrinkles, which are, often, quite regularly transverse in position. After about the first half of the apical whorl, these develop into small punctations and become regularly spiral in arrangement. In some species these spiral lines of punctations extend back to the very tip of the shell. In the next stage of development, these rows of spiral pits become fused into a continuous, more or less, perfect groove and the divisions between them become fine, spiral liræ. The tendency to become lirate is stronger on the lower part of the apical whorl and, perhaps, the most usual form of sculpture is punctate-lirate above and lirate below. But not unfrequently the lirate sculpture covers the whole of the last half of the whorl.

With the exception of the species with a planorbiform apex, I have not been able, as yet, to discover any sufficient differences in the apical characters that would serve to differentiate the characteristic species of the Alabama drainage, having a flattened, very heavily calloused columella, from those of the Ohio system with a relatively thin, rounded columellar lip.

In the following species I have not been able to ascertain the apical characters on account of the eroded condition of all of the specimens on hand: *S. aldrichi*, *biangulatus*, *constrictus*, *crassus*, *pumilus*, *pygmæus*, *tennesseensis* and *umbilicatus*.

The following notes give briefly the results of my examination of the rest of the described species:

S. amnicoloides Walker. Apex blunt, flatly rounded. Apical whorl scarcely at all everted, not constricted by the suture, which is well impressed, but vertical. Sculpture practically obsolete under 100 diameters.

S. aureus Tryon. Apex prominent. Apical whorl everted, sometimes very much so, convex, constricted by a deep suture, which varies as the whorl is more or less everted. Sculptured, at first, with strong, irregular wrinkles, then regularly, spirally punctate, becoming obsoletely lirate on the second half of the whorl. The tendency to liration is stronger on the lower part of the whorl towards the suture.

S. coosaensis Walker. Quite different from any other species. Apex not prominent nor much elevated. Apical whorl flatly rounded, very rapidly enlarging, scarcely everted, not constricted by the suture, which is deep, but vertical. Apical tip not turned down, but up. Sculpture, wrinkled and punctate above, lirate below.

S. crassilabris Walker. Apex subelevated. Apical whorl rounded, constricted by a rather deep suture, everted and obliquely flattened above. Sculpture, strongly and regularly spirally punctate above from the tip, lirate below.

S. currierianus Lea. Apex rather prominent. Apical whorl rather low, nearly flat above, convexly rounded, but not constricted by the suture and not everted. Sculpture, spirally punctate-lirate above, lirate below.

S. decipiens Walker. Apical whorl very slightly everted, obliquely flattened above, low, not constricted by the suture. Sculpture, wrinkled at first, then spirally punctate above, lirate below.

S. depressus Tryon. Apex rather blunt, but higher and more rounded than in *integer*. Apical whorl slightly everted, obliquely flattened above, but not constricted by the suture. Sculpture, punctate or malleated, more decidedly than in *integer*; no trace of liræ.

S. excavatus Walker. Only a single specimen sufficiently perfect to show any trace of the sculpture. In this, the erosion is not sufficient to destroy the shape of the apical whorl, but the sculpture is very indistinct. Apparently, it is irregularly, transversely wrinkled, but no distinct punctations are visible. The apical whorl is flatly rounded above, but not constricted by the suture. The apical tip is not immersed, but projects above the surrounding whorl.

S. georgianus Walker. Apical whorl prominent, elevated, not much constricted by the suture, much everted and obliquely flattened above. The second whorl is shouldered. Sculpture spirally punctate.

S. hendersoni Walker. No specimens with perfect apices. Apical whorl much elevated, though variable in this particular, more or less everted, usually much so, and constricted by the suture. Sculpture, evidently irregularly punctate, no signs of liræ.

S. hinkleyi Walker. Apical whorls more or less elevated, bluntly rounded. Apical whorl flatly rounded, not constricted by the suture, apex immersed. Sculpture, very finely and irregularly punctate above and more or less lirate below.

S. humerosus Walker. Apical whorl much elevated, everted, rounded and constricted by the suture. Sculpture, punctate above and lirate below.

S. integer Say. Apical whorl not everted, flatter than in *subglobosus*. Sculpture, scarcely more than wrinkled, no liræ.

S. mexicanus Pilsbry. Apical whorls elevated, rather pyramidal, more so than in any other species, closely coiled, rather acutely pointed. Apical whorl only slightly everted, not constricted by the suture. Sculpture, closely, finely and irregularly punctate, no liræ.

(*To be continued.*)

THE NEW MEXICAN EXPEDITION OF 1914—ASHMUNELLA.

BY H. A. PILSBRY AND JAS. H. FERRISS.

(*Concluded from page* 35).

ASHMUNELLA DANIELSI DISPAR n. subsp. Pl. 2, fig. 2.

Smaller than *A. danielsi*, composed of 5 whorls, and like that in having no trace of a parietal tooth. The long tooth in the outer lip is strongly developed. The two basal teeth are *nearer together*, and *more or less completely united* or sometimes fused into one. The umbilicus enlarges very little at the last whorl.

Height 5.8, diam. 11.2 mm.

Smallest adult, diam. 9.8, largest 11.25 mm.

Locality.—Station 55 (1914), Little Whitewater Canyon, Mogollon Mountains.

One of the smallest *Ashmunellas*. It runs parallel to *A. duplicidens* of the Chiricahua range in structure of the basal teeth.

One hundred examples were collected. No other shells were found at this station except a few of the smaller families.

The locality is at an elevation of about 7,500 feet, six miles east of Glenwood, Socorro Co., N. M. The canyon was explored only to Kitt's mining cabin.

Ashmunella pilsbryana Ferriss. Pl. 2, figs. 3.

Ashmunella pilsbryana Ferriss, Nautilus Vol. 27, p. 109 (1914).

Distinguished from other species of this region by its acutely angular periphery and granulose surface.

Ashmunella pilsbryana has not been taken in the Mogollon range, but in the region westward. It has been found only in a small territory along the San Francisco river, and in company with no other large shell except *Sonorella*. A mile or so back in the hills from the Harper ranch, and four miles above Clifton, Arizona, a few dead shells were found in the rock slides. The removal of timber had apparently killed the snails. Only a couple of living *Sonorellas* were found here in half a day, but no living Ashmunellas.

Two miles above the mouth of the Blue river colonies of *A. pilsbryana* and a small *Sonorella* were found in a thrifty condition, and a couple of smaller colonies were located in between this station and the Harper ranch. All of these are within some twenty miles of river front. These colonies were in shaded talus that ran down to the flood plain. *A. pilsbryana* will probably be found farther up the San Francisco river, but none were found in the vicinity of Alma, New Mexico. The rock in that stretch of river may have held mineral qualities distasteful to all snails.

Ashmunella mogollonensis Pils.

This fine species is rather widely spread in the Mogollons. It was found in 24 colonies in Silver Creek canyon, in the village along the Bursam road (a trail running east from Mogollon across the crest of the range) to Willow Creek, and again in Big Dry Creek Canyon. The latter were large and bright-colored, distinctly striated with incised spiral lines on all but the embryo whorls. One measures 10.8 mm. alt. by 22 mm. diameter.

Shells from the colonies upon Silver and Willow Creeks varied much in size, though some colonies had large and small. The smallest on these streams was 7.6 mm. alt. by 15 diameter; the largest was 20 mm. in diameter. One colony had fine albinos.

MIGRATION OF ILYANASSA OBSOLETA, LITORINA LITOREA AND LITORINA RUDIS.

BY C. H. BATCHELDER.

The migration of a species is an important event in the history of a brackish water stream. It marks at once, the departure of somebody's food and the passing of *somebody else's* enemy; it means that the biological relations of the remaining species will be upset and that readjustment must take place. With the passing of an enemy, a species that has lived in seclusion prospers, multiplies and assumes other abodes previously inacessible. In new situations new foods become available,—and so things change. The snails of a brackish-water stream are as subject to annual migrations as the other inhabitants and some of them are extremely interesting to observe. Migrations of *Nassa obsoleta, L. litorea and L. rudis* were observed on Oyster river, Durham, N. H. in 1914–15 and the following is an account of the movements.

The most notable molluscan migrations that I have observed are the annual movements of *Ilyanassa obsoleta.* During late spring, summer and early fall it inhabits the mud flats exposed at low-tide. This environment becomes impossible, however, during the colder months when ground-ice may form and this forces the snail to migrate to the deeper waters for the winter.

Migration of Ilyanassa downstream was first observed on the 18th of October in 1914 and it had probably proceeded then during five or six days. Migration continued during the next two weeks but the greater number of healthier individuals moved down-stream in the week ending October 25. The rate of their movement appeared to depend somewhat on the temperature but no measurements were taken in support of this. The healthy individuals moved out into the deep water of the channel to depths varying from ten to fifteen feet at low tide.

This meant a journey of from five to fifty yards and some of them may have gone farther. After deep water is reached the operculum is not drawn entirely over the foot but just sufficiently so to permit the gray, wrinkled flesh to protrude all around the operculum and just level with the aperture of the shell. This is the condition of hibernation for the winter. This was evidenced by examination of all stations in February 1915 when the dormant condition was found to be characteristic even for the older and weaker individuals who had completely lost their opercula. Some of the feebler individuals were unable to reach the deeper water and stopped where the water always runs in a swift current. Here, they bedded in pockets to the number of several hundreds. A few were discovered in the mud-flat channel where there is an inch of water at the lowest tides but these always present the appearance of extreme old age.

Migration of Ilyanassa upstream began on either April 6th or 7th and continued during the following two weeks, the more vigorous of the migrants proceeding upstream in the interval between April 8 and 15. Showers fell during the 5th and 6th which warmed the water and reduced its density. Crawling steadily they reached their summer habitat in four days. At this time their distribution on low-tide flats was very characteristic. A dozen snails picked up at random would include smaller, older and more eroded individuals than would be the case if the lot had come from the channel. Evidently, these snails were the last to migrate in the fall. They were followed by a larger lot with spires worn very little, opercula unbroken and with a more brilliant cuticle. These spread out over the flats and intermingled with the cripples already in possession. This difference in the general average was quite perceptible in the first stages of the migration but was soon obliterated. An economic distribution of the species is probably never accomplished and adjustment is probably not attained before the summer. Even in summer Ilyanassa roves about a great deal on the mud flats and they may always be found in the channels in small numbers.

The migrating Ilyanassa are very interesting to watch. At times the channel bottom is purple with the migrating snails. Each one will be seen to be poking his siphon out an inch ahead of him testing the water to the right and to the left and always moving along with a characteristic persistency. He only stops where the current has swept everything else away and then only until the tide favors him again. I have seen, him crawling along where the crabs were hanging on to the sea weeds for dear life, and even while stopped for a while one sees him still testing the water ahead of him. He eats his lunch on the march, troubles himself not at all about his shelter for the night but ploughs his way along even though the water in his path be fresh, opaque with sediment or a briny salt pool. It matters nothing to him : over the obstacles in his path he crawls, reaches the channel bank and then seeks out a new environment in the water below or if it be in spring on the mud flats above.

One more interesting habit of Ilyanassa and we shall be done with him. He is not always submarine in his habits. While traveling over the surface he must have water running over him. He stops wherever the tide uncovers him. When the tide comes in again it may find him perched on a rock. This approach of the water may loosen his hold and he may tip backward curling in his foot as he tumbles. Many times he simply rolls over and is submerged ; but as often the current catches him and bears him along upside down with his inturned foot preserving the buoyancy of the mass. I have seen dozens floating along in just this manner, but whether it is an accident or purposeful activity, I have been unable to find out. Sometimes he steals a ride on the back of his neighbor, or on a floating weed or stick and quite often on the shell of *L. litorea.*

Litorina litorea migrates with Ilyanassa but is far less active. They move very slowly, rest frequently and often explore the rocks and ledges that line the channel. They follow Ilyanassa down stream in the fall part way, winter with them in the shallower, ice-free basins and return with them in the spring. During the winter *L. litorea* may be found clinging fast to the rocks in the channel bed or may go no farther than the lowest of the shore bowlders where they hibernate with *L. rudis* under the Fucus hovers. They migrate at most 25 or 30 feet.

Litorina rudis and *L. palliata* are two other inhabitants of the brackish waters which must migrate annually to escape the ground ice of winter. These forms inhabit the Fucus fronds and rocks along the shore between tides. They do not leave these situations until driven out by the cold. Hence, they do not leave their stations until the middle of November and then move very slowly down over the Fucus and rocks to some point below the level of ice formation. In February they are most frequently discovered beneath the lowest living fronds of Fucus which hang down over the lowest line of exposed bowlders forming a hover for the snails. They may also be found packed into the crevices between the rocks and under the over-hanging ledges. The larger snails apparently lead an active life during the severest winter weather, for I have found them still feeding at 12° C. I have also discovered them in active copulation in every month of the winter. The younger individuals are less fortunate in their migration. Apparently they become exhausted and crawl beneath the stones of the upper tide limits where they hibernate during the winter months. They are the first of the snails to appear, however, coming forth this year during the week of March 1st. Active migration of the larger snail did not begin until the fourteenth of the month and the upper limits were reached on the twenty-first of March. The migration continued for some time later though less perceptibly and less actively.

I have not observed any one cause for the migration of these snails except temperature. The Ilyanassa offers a perplexing problem indeed. If it isn't absolutely necessary, why do they go into very deep water? They leave the flats and return when the water at low tide is at or near 13.5° C. *L. litorea* apparently wanders about until by pure accident he stumbles onto a place favorable for hibernation. *L. rudis* and *palliata* migrated most actively when the temperature of the water at high tide was 11.5° C. Density changes in the water were so slight that they cannot be held responsible for the migrations. A shortage of food material may be important; but the causes, whatever they are, seem complex enough for a special study of the subject.

MOLLUSKS FROM BERRIEN COUNTY, MICHIGAN.

BY FRANK C. BAKER.

Some time ago a day was spent in the virgin woods known as the Warren Woods, situated near Three Oaks. The woodland borders the Galien River and is in the southwestern part of Berrien County, only a few miles from Lake Michigan. The forest is untouched by man and is a veritable paradise for the botanist and nature-lover. It is probable that systematic search would greatly increase the number of species listed, which were gathered while engaged in general nature work. The Sphaeriidae were identified by Dr. V. Sterki.

Pisidium scutellatum Sterki. Galien River.

Sphærium occidentale amphibium St. Galien River.

Symphynota costata (Raf.). Galien River.

Pomatiopsis lapidaria (Say). Galien River.

Pomatiopsis cincinnatiensis (Lea). Galien River.

Physa gyrina Say. Small stream flowing into Galien River.

Physa walkeri Crandall. Small stream flowing into Galien River.

Galba parva (Lea). Small stream flowing into Galien River.

Galba humilis modicella (Say). Small stream flowing into Galien River.

Succinea ovalis Say. Warren Woods.

Succinea avara Say. Warren Woods.

Succinea retusa Lea. Warren Woods.

Pyramidula alternata (Say). Warren Woods.

Pyramidula perspectiva (Say). Warren Woods.

Pyramidula cronkhitei anthonyi Pilsbry. Warren Woods.

Agriolimax campestris (Say). Warren Woods.

Zonitoides nitida (Muller). Warren Woods.

Vitrea hammonis (Strom). Warren Woods.

Circinaria concava (Say). Warren Woods.

Polygyra albolabris (Say). Warren Woods.

Polygyra thyroides (Say). Warren Woods.

Polygyra palliata (Say). Warren Woods.

Polygyra fraudulenta (Say). Warren Woods.

Polygyra tridentata (Say). Warren Woods.

A NEW SUBSPECIES OF OREOHELIX COOPERI.

BY HENRY A. PILSBRY.

Mr. S. S. Berry has recently sent me specimens of a pygmy race of *O. cooperi*, which he found on July 4th, in the snowy mountains, Fergus Co., Montana, at an elevation of somewhat over 5000 feet. "The dead shells" he writes, "were abundant among loose rocks on the mountain slope forming the east wall of Swimming Woman Creek canyon, about half a mile above the mouth, and I found no spot free of them in the area searched, either at the foot of the slope or higher up. The living ones were harder to find because not only less abundant, but distinctly harder to see. Over the entire slope, all the shells were remarkably uniform in size, those sent you being an average lot. I noted that the young lenticular shells are ornamented more or less conspicuously with epidermal projections and fringes, some being quite hirsute."

Oreohelix cooperi berryi, n. subsp.

The shell has the shape characteristic of *O. cooperi* except that the last whorl is distinctly angular in front, the angle disappearing on the last half or third, leaving the periphery rounded. Color cinnamon to snuff brown, from the third whorl on profusely marked with white patches and narrow streaks; last whorl having a chocolate band below the periphery (frequently also a narrower or paler band in the middle of the upper surface, and several dilute brownish bands on the base, interrupting the white markings). The surface is irregularly striate and shows traces of spiral striation in places. Whorls $4\frac{1}{3}$, all convex: embryonic shell of nearly two whorls, which are finely striate and covered with very fine spirals, the last half of the second whorl having more distinct spiral striæ. Umbilicus narrow, contained $5\frac{1}{2}$ times in the diameter of shell.

Alt. 6.3, diam. 9.4 mm. (type, No. 112489 A. N. S. P.).

Alt. 6.1, diam. 9.3 mm. (paratype, coll. S. S. Berry).

In some examples the striæ are distinctly granose in spiral series on the base. This shell is much smaller and less depressed than *O. cooperi minor* Ckll. *O. alpina* Elrod is more depressed with a wider umbilicus.

THE NAUTILUS.

VOL. XXIX. SEPTEMBER, 1915. No. 5

APICAL CHARACTERS IN SOMATOGYRUS, WITH DESCRIPTIONS OF THREE NEW SPECIES.

BY BRYANT WALKER

(*Continued from page 41*)

S. nanus Walker. Apical whorl prominent, blunt, flatly rounded, only slightly everted, not constricted by the suture, very rapidly enlarging, a peculiarity apparently confined to a few species. Sculpture punctate above and lirate below.

S. obtusus Walker. Apical whorl obtuse, flatly rounded, not everted, not constricted by the suture, which is well impressed, but vertical. Sculpture, very delicately wrinkled, in some scarcely visible under 100 diameters, practically smooth, no liræ.

S. parvulus Tryon. Apical whorl prominent, decidedly everted and obliquely flattened above. Sculpture, strongly punctate-lirate, the liræ extending well up on the whorl.

S. pennsylvanicus Walker. Apical whorl rather small, elevated, very much everted and obliquely flattened above, well rounded and constricted by the suture. Apex immersed. Sculpture, strongly spirally punctate on the first half of the apical whorl, running into punctate liræ on the second half, lirate below.

S. pilsbryanus Walker. Quite variable in the elevation of the apical whorl, which may be prominent, everted, and obliquely flattened above, rounded and constricted by the suture below or blunt, scarcely everted and less constricted by the suture. Sculpture, spirally punctate above, obsoletely lirate below.

S. quadratus Walker. Only a single example shows any trace of the sculpture, which though eroded above, is distinctly lirate below. Apical whorl not everted, rounded and shouldered above, not constricted by the suture.

S. sargenti Pilsbry. Variable as to the elevation of the apical whorl, (which is usually rather blunt) ; some amount of eversion and constriction by the suture. Sculpture, distinctly spirally punctate above, lirate below.

S. strengii P. and W. This species is remarkable free from erosion, probably on account of the depressed apical whorls, which are planorboid, flattened above, with a well impressed vertical suture. Apical whorl flatly rounded, not everted, quite rapidly increasing. Apex somewhat immersed. Sculpture very minutely wrinkled and spirally punctate, hardly discernible with 100 diameters, no liræ.

S. subglobosus Say. Apical whorl prominent, rather small, slightly everted, rounded, but not greatly constricted by the suture, obliquely flattened above. Sculpture, at first wrinkled or malleated, then more or less punctate on the upper surface, which rapidly becomes punctate-lirate, lirate below.

S. substriatus Walker. Apical whorl prominent, elevated, somewhat everted and obliquely flattened above, rounded, but not greatly constricted by the suture below. Sculpture, more or less irregularly wrinkled and malleated on the first half of the whorl, but becoming obsolete on the second half, no liræ.

S. trothis Doherty. Apical whorl bluntly elevated, everted and obliquely flattened above, not greatly constricted by the well impressed suture, rapidly enlarging. Apex not depressed below the surrounding whorl. Sculpture, quite well wrinkled at first, then spirally punctate above and obsoletely lirate below.

S. virginicus Walker. Quite similar to *pennsylvanicus*, to which it is allied, but the apical whorl is rather higher, rounded and more constricted by the suture, being more closely coiled. Sculpture, substantially the same in both.

S. walkerianus Aldrich. Apical whorl much elevated, more so than in any other species, except *wheeleri*, closely coiled, very convex and greatly constricted by the suture, everted and obliquely flattened above. Sculpture, strongly wrinkled at the tip, then spirally punctate-lirate.

S. wheeleri Walker. Apical whorl small, very much elevated, more so than in any other species, closely coiled, very convex, greatly constricted by the suture, much everted and obliquely flattened above. Sculpture, very strongly spirally punctate on the first half of the whorl, becoming punctate-lirate above on the second half, lirate below.

The examination of the material from Arkansas collected by Messrs. Hinkley and Wheeler furnished the following forms, which seem to be new.

SOMATOGYRUS WHEELERI, n. sp. Figs. 1 and 2.

Shell turbinate, umbilicate, rather thick and solid, greenish-horn color, smooth, with fine, regular, distinct lines of growth. Spire prominent, elevated, subturreted and rapidly acuminating to the apex. Apical whorl small, much elevated, closely coiled,

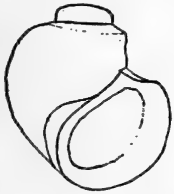


FIG. 1.—SOMATOGYRUS WHEELERI.

FIG. 2.—APEX OF SAME.

very convex and much constricted by the suture, much everted and obliquely flattened above, tip immersed: the first half of the whorl is very strongly spirally punctate, becoming punctate-lirate on the second half and lirate below. The second whorl is less convex and the suture below it is less impressed; as it passes into the third whorl it tends to become more or less shouldered. The third whorl is roundly shouldered above and distinctly flattened below the shoulder. The body-whorl is large, strongly shouldered, obliquely flattened above the shoulder with a distinct groove between it and the suture, distinctly flattened peripherally and rather rapidly rounding into the umbilicus. Aperture large, outer lip obliquely flattened and somewhat concave above the angle formed by the shoulder, from which it curves regularly to the columella. Columella narrow and oblique, adnate for only a short distance on the parietal wall, the entire aperture is quite heavily calloused within Umbilicus quite large.

Alt. (apex eroded) 4, diam. 4 mm.

Types (33900 Coll. Walker), from the Ouachita River, Arkadelphia, Ark. Cotypes in the collection of Rev. H. E. Wheeler.

This species, named after its discoverer, while related to the shouldered species of *Somatogyrus* from Alabama, is quite distinct by reason of its larger umbilicus, flatly shouldered body whorl and elevated apical whorls.

SOMATOGYRUS AMNICOLOIDES n. sp. Fig. 3.

Shell small, subglobose, narrowly umbilicate, rather thin, pale horn-color, smooth, with very fine, regular lines of growth. Spire obtusely elevated, flatly rounded. Apical whorl scarcely at all everted, only slightly elevated above the second whorl, not constricted by the suture, which is well impressed, but vertical, sculpture practically obsolete. The second whorl is convexly rounded, but not high. The third whorl is proportionately higher, rounded above and less so below. Body-whorl globosely rounded. Aperture angled above, wider and

FIG. 3. SOMATOGYRUS AMNICOLOIDES. FIG. 4. SOMATOGYRUS CRASSILABRIS.

obliquely rounded below. Lip sharp, but callously thickened within, meeting the columella in a projecting, broadly rounded angle. Columella nearly straight, scarcely at all thickened, inner lip adnate to the body-whorl on the parietal wall. Umbilicus rather narrow, but conspicuous.

Alt. 3.5, diam. 2.75 mm.

Types (No. 40012 Coll. Walker), from the Ouachita River, Arkadelphia, Ark., collected by the Rev. H. E. Wheeler. Cotypes in his collection.

This small species is about the size and shape of an *Amnicola* as suggested by the specific name. But, although the columella is scarcely at all calloused, the distinct thickening of the outer lip and the projecting angle at the junction of the outer lip and the columella forbid its reference to that genus. It is entirely unlike any of the other species known from Arkansas and quite different from any of the eastern forms.

SOMATOGYRUS CRASSILABRIS n. sp. Fig. 4.

Shell subglobose, scarcely perforate, very thick and solid, greenish horn-color, smooth with very fine lines of growth. Spire short, subacute and small in comparison with the body-whorl. Whorls 4. Apical whorl small, rounded, constricted by a rather deep suture, everted, obliquely flattened above, strongly and regularly spirally punctate above from the tip, lirate below. The second and third whorls rather rapidly increase in size, are rounded above, but less below, the suture being well impressed. Body-whorl large, obtusely shouldered, obliquely flattened above the shoulder, distinctly flattened between the shoulder and the periphery, below which it is rounded. Aperture rather large, narrower, but scarcely angled above, and obliquely rounded below. The outer lip is scarcely modified by the shoulder, very thick and heavy, rounded and distinctly everted below. Columella very thick and heavy, rounded. Inner lip adnate to the parietal wall and heavily calloused. The whole aperture is surrounded by an excessively thick deposit of callus. Umbilicus small, scarcely perforate, with a distinct groove below.

Alt. 4.33, diam. 4 mm.

Types (No. 38823 Coll. Walker), from rocks on muddy bank of the North Fork, Norfolk, Ark., collected by A. A. Hinkley. Cotypes in his collection.

This species, though evidently related to *wheeleri* by reason of its shouldered body-whorl, differs decidedly in the characters of the apical whorls, the less pronounced shouldering of the body-whorl, the smaller umbilicus and, especially, in the remarkable thickening of the aperture. In this particular it is quite distinct from any of the other described species.

NOTES ON THE WEST AMERICAN SPECIES OF FUSINUS.

BY WILLIAM H. DALL.

The genus *Fusinus*, better known by its preoccupied name of *Fusus* Lamarck, is fairly well represented by species on the Pacific coast.

The largest, most conspicuous, and best known of these is *F. dupetitthouarsi* Kiener, 1840, originally described from a Galapagos Island specimen and which has since been collected at a point as far north of Panama on the mainland as Cerros Island in latitude 28°. It undergoes no great variation in this wide area of distribution.

F. kobelti Dall, 1877, has been collected from the vicinity of Monterey and south to Catalina Island.

F. sulcatus Lamarck, 1822, is found at Panama, and appears to be distinct from *F. fontainei* Orbigny, 1841, which is a native of Peru and Chile, and of which *F. alternatus* Philippi, 1847, is a synonym.

F. colpoicus new species, is found off Guaymas, Gulf of California, and resembles *F. barbarensis* Trask, when the latter is about 60 mm. long, but differs by having 13 instead of 11 axial ribs, which are narrower and with wider interspaces while the revolving threads are sharper and more conspicuously alternated. At a length of 66 mm. it has eight whorls without counting the eroded nucleus; three of the spirals near the periphery are more conspicuous than the rest; at the end of the penultimate whorl there are 6 major and 6 minor spirals which pass over the ribs without becoming nodulous. The aperture and canal together measure 36 mm. in the length, and the canal is conspicuously tortuous. The maximum diameter of the shell is 18 mm. (U. S. N. Mus. No. 111,111).

The peculiar *F.* (*Roperia*) *roperia* Dall, 1898, is still only known by the type specimen from San Pedro; *F. cancellarioides* Reeve, 1848, only from the Chilean coast. An unidentified worn shell sent from La Paz by Kantus, seems distinct from the others but is not fit to serve as a basis for a name.

There is a group of species found in the central Californian region which were described by Trask in 1855. *F. traski* Dall, (new name for *F. rugosus* Trask, not of Lamarck, 1804) is recognized by its abruptly shouldered whorls, and ranges from San Pedro to San Diego.

F. monksæ Dall (new name for *F. robustus* Trask, 1855, not of Beyrich, 1853) is very similar to the next species, but generally heavier and with a shorter canal. It ranges from Banks Island, British Columbia to Pequena Bay on the west side of Lower California.

F. barbarensis Trask, ranges from the Oregon coast to San Diego. For a long time it was known only by adolescent specimens, but I have received a pair 135 mm. long by 38 in diameter, dredged off Newport, by Doctor Tremper.

F. ambustus Gould, 1851, ranges from the Gulf of California to Topolobampo, Mexico. The burnt-sienna blotches on the axial ribs from which the species derived its name, though conspicuous on fresh specimens, gradually fade out after some years in the cabinet.

F. harfordi Stearns, from Mendocino County, California, may belong with *Chrysodomus* but the sculpture recalls that of *Fusinus*.

F. panamensis Dall, 1908, is still only known by the original specimens from Panama Bay. There is a small mottled species belonging to the same group (*Aptyxis?*) as *F. pulchellus* Philippi, Mediterranean, which ranges from the Gulf of California to Panama. It has been labeled by some error *F. cinereus* Reeve, (which is Say's *Urosalpinx*) in the collection. It agrees very well with the figure of Reeve's *F. taylorianus* in the Iconica, and until further data are received about Reeve's type which was of unknown habitat, may best retain that name. A specimen has been received as from San Pedro, but I doubt the accuracy of this attribution.

F. luteopictus Dall, 1877, ranges from Monterey to the Gulf of California. The yellow color of the ribs fades in time, leaving the prominences nearly or quite white.

A little brownish species has been received from San Pedro Bay from several collectors, which seems to be undescribed. It has five whorls without the nucleus, four or five strong spiral threads between the sutures on the spire and 13–15 on the last whorl, with a few minute and irregular intercalary threads ; the interspaces are crossed by minute axial lamellae and the last whorl has eight rather ill-defined wide axial ribs, most distinct near the periphery. The shell is about 11 mm. long by 5.5 mm. wide, and 5 mm. of the length is included in the spire. It may take the name of *F. diminutus*.

F. porticus n. sp. This is a small purple-brown form which may perhaps prove not to be a *Fusinus*, yet seems difficult to refer elsewhere, so I adopt the term provisionally. It has three conic, wine-colored, polished, nuclear whorls followed by a little more than four sculptured whorls, having the general profile of a slender *Alectrion;* it has on the last whorl ten axial ribs with wider interspaces; the spiral sculpture consists of fine rather sharp threads, two of which near the periphery are slightly larger, and prominent where they cross the axial ribs, with a single fine thread in the space between them; on each side of this pair between the sutures are three or four finer threads; the spire is longer than the aperture; the outer lip sharp, plain within, no callus on the inner lip, the canal short, twisted and slightly recurved. Height of shell 11.0; of spire 7.0; maximum diameter 5.0 mm. It is an inhabitant of Panama. (U. S. N. M. No. 76275).

F. centrifugus n. sp. Shell with three smooth conoid nuclear whorls, followed by six and a half strongly sculptured whorls; suture appressed; axial sculpture of numerous sharp thin elevated lamellae, raised into a retractively looped frill in front of the suture and similarly but less prominently looped between its intersections with the spiral threads: on the last whorl are eight prominent rounded ribs with subequal interspaces, which extend from the suture to the base; between the sutural frill and the shoulder of the whorl are three inconspicuous spiral threads; on the shoulder one very prominent cord flattened and produced at the summit of each axial rib into a spade-shaped, not pointed, horizontal spine; between this cord and another less prominent cord in front, are one to three small spiral threads; a third still less prominent cord forms the margin of the base in front of which are about a dozen spiral threads which are more prominent on the canal. The color of the shell is brownish, more livid inside the aperture; the canal produced and straight, the outer lip sharp but probably immature. Height of shell 22 ; of spire 12 ; maximum diameter 10 mm. It was collected at the Galapagos Island in 33 fathoms, sandy bottom. Though evidently not full grown, the sculpture of this shell would identify it at any age. (U. S. N. M, 96370).

F. (?) *orcutti* n. sp. Nuclear whorls lost, the remaining five whorls solid, with appressed suture ; axial sculpture of rude lines of growth and (on the last whorl eight) obscure low ribs ; spiral sculpture of broad, somewhat irregular, straplike spirals and much smaller spiral threads ; of the former there is one at the suture followed by three or four threads ; two at the shoulder closely adjacent, followed by two threads ; and four or five in front of the periphery alternated by single threads ; the color of the shell is light yellow brown with axial rows of dark brown spots on the ribs, the aperture white : the outer lip is sharp, with three or four obscure nodules within the aperture : a thin white callus on the inner lip, the canal short and slightly recurved. Height of shell 17 ; of spire (without the nucleus) 10 ; maximum diameter 8 mm.

It was collected at Mazatlan by C. R. Orcutt and resembles a *Latirus* except that the pillar is without plaits. (U. S. N. Mus. No. 252697).

LASMIGONA SUBVIRIDIS CONRAD, REDIVIVUS.

BY L. S. FRIERSON.

Lasmigona subviridis, Conrad. Probably few conchologists are aware of the validity of this name, since it occurs in no synoptical list of *Unionidæ* known to the writer.

Rafinesque published a species, *Unio viridis*, in his Monograph of 1820, a work virtually introduced to American conchologists by Mr. Poulson's translation in 1831.

In the autumn of 1835, Mr. Hyde gave specimens of a *Unio* from the Juniata River to both Dr. Lea, and Mr. Conrad. The latter published the shell, with an excellent figure, on plate 9, of his new fresh-water shell, under the name of *Unio viridis?* Mr. Conrad stated that he was uncertain whether this identification was correct, since Rafinesque's shell came from the Ohio drainage, and these Hyde shells from the Atlantic drainage. In case these latter should prove distinct Conrad proposed the name—*Unio subviridis.* In the following year Dr. Lea published the same shell under the name of *tappanianus*, but in the meantime Conrad had published the shell a second time (Monography of Unionidæ, 1836) as *viridis* (Rafinesque). Dr. Lea up to his death, claimed the shell, on the ground that it was not *viridis* Rafinesque, and that Conrad's name *viridis* was a synonym.

Conrad, on his part, persisted that his identification was correct, because a single valve of this shell in Mr. Poulson's collection had been labeled *viridis* by Rafinesque. The confusion thus wrought, is now eighty years old.

Rafinesque, in 1820, described very clearly a shell from the Ohio drainage, under the name of *viridis*, which Dr. Lea (*as he freguently did*) redescribed several years later, under the name of *compressa.* In 1831, Rafinesque labeled for Mr. Poulson, a single valve of a shell under the name *viridis* which valve Conrad stated was identical with the Hyde shells. It is worthy of note, that if this valve was not correctly named by Rafinesque, it was an *exceedingly close guess*, as the two species are so close that they are often confounded yet. That Dr. Lea was so positive that this label was incorrect, proves conclusively that Lea was fully aware that the true *viridis* of Rafinesque was the *compressa*, (*or pressus*) of Lea. Of course, Lea was too "cute" to call attention to this fact, since he would then lose this name also, nor did he have generosity enough to give the Hyde shells to Conrad under the name *subviridis*, of which he was fully cognizant.

Subviridis Conrad was elegantly figured on plate 9, in an appendix to "New Fresh Water Shells." The appendix is dated 1835, and was only bound in a few copies of the book, and this accounts for the total omission of the name, or plate, by Mr. C. T. Simpson, and other authors. The correct synonymy of these two species therefore (omitting some unimportant names) is as follows—

LASMIGONA SUBVIRIDIS (Conrad).

Unio viridis? Conrad, 1835, New Fresh Water Shells, appendix, plate 9, Fig. 1, *or subviridis* Conrad, if new.

Unio viridis Conrad (as of Rafinesque), Monography, 1836: Synopsis 1853.

Unio tappanianus Lea, 1836.

Symphynota viridis Simson, 1900, (*as of Conrad!*); also in Catalog, 1914.

LASMIGONA VIRIDIS (Rafinesque).

Unio viridis Rafinesque, Monograph, 1820.

Symphynota compressa, Lea, 1829.

Complanaria alasmodontina, Stimpson, 1851.

Margaron pressus Lea, 1852.

Symphynota compressa Lea, Simpson, 1900 and 1914.

Because of the *Symphynota* of Lea being an exact synonym for Rafinesque's genus *Proptera*, and the earlier use (in *Unio*) of the name *compressus*, neither the name *compressa* nor *pressus*, can be used, and if Rafinesque's name be disallowed by the weak-kneed, *Stimpson's* name takes precedence.

PUBLICATIONS RECEIVED.

THE NAIADES OF MISSOURI. By William I. Utterback, published in the American Midland Naturalist, Notre Dame, Ind. Vol. iv, 1915. In the May number the first part of this paper appeared. It consisted of 13 pages, containing an introduction with a general key to the families and genera. The July number contains part ii, comprising 56 pages covering the Margaritanidae, genus *Cumberlandia* and the Unionidae, genera *Fusconaia*, *Amblema*, *Megalonaias* N. gen. Type, *Unio heros* Say, *Quadrula* and *Rotundaria*. With the July number was a supplement containing 28 plates illustrating the species, collecting grounds etc. The paper is to be continued. C. W. J.

THE PHILIPPINE LAND SHELLS OF THE GENUS CHISTOLOMA. By Paul Bartsch, (Proc. U. S. Nat. Mus., Vol. 49, pages 195–204, pl. 15.) A new subgenus *Hololoma*, type *Megalomastoma quadrasi* Hidalgo, and seven new sub-species are described.

THE RECENT AND FOSSIL MOLLUSKS OF THE GENUS RISSOINA FROM THE WEST COAST OF AMERICA. By Paul Bartsch, (Proc.

U. S. Nat. Mus., vol. 49, pages 33–62, with plates 28–33). An interesting introduction giving a history of the work done in this genus, with a key to the species, followed by the descriptions of 38 species of which 22 represent new species. *R. signæ* is proposed for *R. insignis* De Folin, 1867, not *R. insignis* Adams and Reeve 1850. Only one of the number is fossil. The figures are excellent.

ETUDE SUR LE LITTORINA OBTUSATA ET SES VARIATIONS. Par. Ph. Dautzenberg et H. Fischer. (Journ. de Conch., vol. 62, pages 87–128, plates 2–4). A most interesting study of the variations of this species. A complete bibliography is followed by notes and descriptions of the varieties or form, which are grouped under the typical *obtusata* and the sub-species *littoralis.* The former is divided on form into *typica, elatior* and *palliata* and 9 vars. on color, and the latter into 5 vars. on form and 12 on color. Only *palliata* is recorded from the mainland of N. America. *L. littoralis* is recorded from Greenland. That *L. palliata* was only a var. of *obtusata* has long been the opinion of the writer, from the large series before me, representing 18 localities, cover the area from Eastport, Me., to Narragansett, Pier, R. I. A large percentage have the obtuse shoulder on the body whorl and cannot be separated from European specimens of *littoralis.* The color vars. *typica, lutea, castanea, balteata, ornata lineolata* and *tessellata* are also represented.

C. W. J.

NOTES.

LYMNAEA (PSEUDOSUCCINEA) COLUMELLA SAY IN OREGON : Mr. John A. Allen has found this species in Oswego Lake and Duck Pond, Oswego, Clackamas Co., Oregon. They were collected during April and May, 1913 and in February 1914. This is new to the west coast, I believe, and probably was introduced from the eastern United States. E. G. VANATTA.

Dr. H. A. Pilsbry left on August 4th for New Mexico (via San Francisco). He expects to return about the end of September.

THE NAUTILUS.

VOL. XXIX. OCTOBER, 1915. No. 6

NOTES ON AMERICAN SPECIES OF MACTRELLA.

BY WILLIAM H. DALL.

The species of *Mactrella* are extremely elegant shells, especially those with concentric undulations. There are but few of them altogether, and usually not more than two species in any given fauna, of which one is usually smooth and the other undulated, as in the case of the genus *Labiosa*. They are so fragile that they are generally broken by the waves when cast on the beach, and, being burrowers, are rarely obtained by the dredge, hence are rare in collections. They are confined to the warmer waters of the globe and perhaps most numerous, though not of largest size, among the islands off the coast of southern Asia.

There is but one species in the American Atlantic tropics, the *Mactra alata* Spengler, 1802. Gmelin confounded it with the *M. striatula* Linné, and Lamarck gave to the same combination of the hinge elements, Gray in January, 1853, founded his genus *Mactrella*, while in April of the same year Mörch proposed for it the genus *Papyrina*.

The only other East American species known to date is the *Mactrella iheringi* Dall (Nautilus, Mar. 1897; figured in Proc. U. S. Nat. Museum, 1902, pl. 32, fig. 8) from the coast of southern Brazil, which approaches more nearly to the typical Mactras in general form than any other species of the genus.

The West American analogue of *M. alata* is the *M. exoleta* Gray (1838) which differs by having the margin of the escutcheon angular instead of keeled, and which was named *Lutraria ventricosa* by Gould in 1851. The radial ridges on the escutcheon are individually variable and the worn valve for which Mörch (Nal. Blatt. 1861) proposed the name of *subalata* was a specimen of *alata* either derived from ballast or otherwise transported from the Atlantic coast of Costa Rica.

A new species from the west coast of Mexico and belonging to the group of *M. alata* is described below.

The *Mactrella* (*Harvella*) *elegans* Sowb,. is one the most beautiful and fragile bivalves of the family. Confounded with *Ræta canaliculata* by early writers, it was referred to the Florida fauna in the Conchologia Iconica. This error, and a certain variability of outline common to most Mactridæ, led Conrad in 1867 to propose the name of *pacifica* for the supposed Pacific coast form. But there is at present no evidence that such a shell occurs in Atlantic waters.

The known distribution of the American species of the group is as follows:

ATLANTIC WATERS.

MACTRELLA ALATA Spengler.

Porto Rico, Jamaica, Nicaragua, Costa Rica, the north coast of South America and south to Ceara, Brazil.

MACTRELLA IHERINGI Dall.

Santos and Sao Paulo, Brazil.

PACIFIC WATERS.

MACTRELLA EXOLETA Gray.

Mazatlan, West Mexico, to Panama and Guayaquil.

MACTRELLA CLISIA n. sp.

Manzanillo, West Mexico, to Santa Elena, Ecuador.

MACTRELLA (HARVELLA) ELEGANS Sowerby.

Panama.

MACTRELLA CLISIA n. sp.

Shell white, extremely arcuate, with the silky periostracum varying from pale strawcolor to blackish brown ; anterior slope longer than the posterior, rather conspicuously compressed and attenuate, with no circumscribed lunule ; posterior slope flattened, externally bordered by a sharp angle surmounted, as in *M. alata*, by an elevated thin keel ; the inner margins pout a little near the beaks, the middle of the flattened space has in each valve a single conspicuous rib ; the cordate space between these ribs are somewhat concave ; the spaces between the ribs and the keels are flat and from the distal ends of the ribs to these of the keels the valve margin show a wide lanceolate gap ; there is also a narrow anterior basal gap ; the hinge is normal ; the surface of the valve smooth except for lines of growth ; the pallial sinus short and angular ; the basal margin prominently arcuate and the middle of the shell inflated. Length 78, height 66, diameter 34 mm.

There is a constriction in front of the keel which varies in strength in different specimens. The shell is divided from *M. exoleta* by the presence of the keel, the latter possessing only an angle ; it differs from *M. alata* in its exaggerated arcuation, much higher beaks and anterior attenuation.

STUDIES IN NAJADES.

BY A. E. ORTMANN.

(*Continued from page 143, Vol. 28.*)

EURYNIA (MICROMYA) PERPURPUREA (Lea) (See *Lampsilis perp.* Simpson, 1900, p. 558).

I collected, on Sept. 20, 1912, a number of males in Clinch River, at Richland, Tazewell Co., Va., and on Sept. 21, 1912, a single gravid female, with glochidia, at Raven, Tazewell Co., Va.

Anal separated from the supraanal by a rather short mantle connection, which is shorter than the anal. Inner edge of anal with very distinct crenulations. Branchial with papillae. In front of the branchical, the female has about 10 subcylindrica or subconical papillæ of medium size, which are rather distant from each other, and of slightly variable size, and do not extend quite to the middle of the mantle margin. In the male, these papillæ are also indicated, but very small and indistinct.

Palpi connected on the posterior margin at base only. Inner lamina of inner gills entirely connected with abdominal sac. Gills typically Lampsiline: the marsupium of the female is kid. ney-shaped, and located in the posterior half of the outer gill- with a small non-marsupial part at the posterior end of the gill- The number of ovisacs in my specimen is 12.

Glochidia nearly subspatulate, considerably higher than long. Length: 0.21, Height: 0.27 mm.

Color of soft parts whitish. Mantle-margin blackish in the region of the anal and branchial, the blackish pigment extend, ing forward along the base of the papillæ. Edge of marsupium broadly black.

Simpson places this species by the side of *E. trabalis* (Conrad). According to the anatomy this affinity is correct. Also the glochidia are similar. Although I have called them in *trabalis*, (l. c. p. 340) "subovate," they are almost subspatulate, as is clearly seen in the figure (pl. 20, f. 4).

EURYNIA (MICROMYA) NEBULOSA (Conrad) (See: *Lampsilis n.* Simpson, 1900, p. 553).

I collected a large number in North Fork Holston River, Saltville, Smyth Co., Va. (Sept. 17, 1912), and in Clinch River, at Cedar Bluff, Richland, and Raven, Tazewell Co., Va. (Sept. 20 and 21, 1912). The preserved gravid females all had glochidia.

Anal separated from the supraanal by a moderate mantel-connection, which is shorter than the anal. Inner edge of anal crenulated. Branchial with papillae. In front of the branchial, in the female, there are 6 to 10 rather large, conical papillae, somewhat irregular in size, and remote from each other: the largest are forward. These papillae do not quite reach the middle of the mantle margin. In the male, these papillae are also indicated, but very small.

Palpi connected at the posterior margins at base only.

Inner lamina of inner gills connected with abdominal sac. Gills lampsiline: the marsupium of the female is kidney-shaped, and occupies the posterior half (or more) of the outer gill, with a small non-marsupial section at the posterior end. Ovisacs 10 to 17.

Glochidia almost subspatulate, higher than long; 4, length 0.22, height 0.29.

Color of soft parts whitish. Anal and branchial opening with black pigment, and this black color runs forward along the outer mantle edge in front of the branchial; on the inside of the inner edge there is a reddish-brown streak, and also the papillæ are reddish-brown. The marsupium has a broad black edge.

This species resembles much *E. iris* (Lea) in shell characters, and also the anatomy and the glochidia are very similar. The papillæ of the mantle edge are not quite as large as those of *E. iris*, and they are more variable in number and position. In *nebulosa* the largest and most distinct papillæ are in the anterior part, where three or four sometimes stand a little closer together.

The shell of some of my females is undistinguishable from *U. amoenus* Lea (Simpson, p. 555), and I think that *amoenus* is an additional synonym of *nebulosus* (Conrad).

Eurynia (Micromya) vanuxemensis (Lea) (See: Ortmann, 1912 pp. 342).

I collected a number of specimens on Sept. 17, 1912 in North Fork Holston River, Saltville, Smyth Co., Va. Among them were gravid females with glochidia.

Mantle connection between anal and supraanal moderately long, but shorter than the anal. And with distinct crenulations. Branchial with papillae.

Papillae in front of the branchial of the female as described previously. The largest papillae are well forward. In the male, the papillae are represented by mere crenulations. Palpi connected only at base of posterior margin.

Inner lamina of inner gills entirely connected with abdominal sac. Marsupium as described previously, minimum number of ovisacs 7, maximum 14. Edge of marsupium with brown or black pigment.

Shape of glochidia as figured (1. c. pl. 20, f. 6), but they should be called subspatulate. Length: 0.23, height: 0.30 mm;

my former measurements, 0.22+0.28, do not differ much from this.

This species has a very characteristic shape, chiefly in the female, with the postbasal part greatly expanded and obliquely truncated. In old specimens, there is a more or less distinct "constriction" in the middle of this truncation, making the boundary between the branchial opening and the papillar part of the mantle edge in front of it. This constriction corresponds to that seen in the following species (*E. constricta*), and shows the close affinity of these two species. *E. vanuxemensis*, in its external aspect, is very similar to *E. constricta*, and when I found these specimens at Saltville, I recognized them at once as the representative form of *E. constricta* of the Roanoke and James Rivers, with which I was quite familiar. However, the character of the constriction, found rather regularly in old females of *constricta*, is not so well developed in *vanuxemensis*, and I have only a few old females of the latter, which show it distinctly.

Eurynia (Micromya) constricta (Conrad) (See: *Lampsilis c.* Simpson, 1900, p. 551).

Numerous specimens are at hand from the following localities: Calf Pasture River, Goshen (May 11, 1912), North River, Lexington and Buena Vista (June 7 and 8, 1912), all in Rockbridge Co., Va.; Jackson River, Covington, Allegheny Co. Va. (Aug. 11, 1911); Tinker Creek, Roanoke (June 10, 1912), Roanoke River (June 10, 1912) and Mason Creek, Salem (Aug. 13 ,1911); these in the Roanoke drainage in Roanoke Co., Va. The specimens collected on August 13 were gravid with eggs and one had young glochidia; those collected in May and June had all glochidia, when gravid, and on all dates discharging individuals were found. Thus the breeding season begins in August and ends in June.

Supraanal separated from the anal by a moderately long mantle-connection, which is slightly shorter than either opening. Anal finely crenulated. Branchial with papillae. In the female, the inner mantle-edge in front of the branchial is very much like that of *vanuxemensis* and *arkansasensis*: it is somewhat lamellar and carries a number (10 to 12) of small, somewhat distant and irregular papillae, of which the largest are placed more anteriorly, while the posterior ones are indistinct. A black streak of pigment is present. Also the male has this black pigment, but the papillae are obsolete.

Posterior margins of palpi connected at base. Inner lamina of inner gills entirely connected with abdominal sac. Marsupium with from 12 to 20 ovisacs. Edge of marsupium with black pigment. Holes at the edge were observed in discharging females.

Glochidia subspatulate, higher than long. Length: 0.21, height: 0.27 mm.

Except the black pigment on mantle edge in the posterior region, and on the edge of the marsupium, the color of the soft parts is whitish.

This species is closely allied to *E. vanuxemensis*. The papillae in front of the branchial are smaller and less crowded, and the black pigment is not so intense.

(*To be concluded*)

NOTES ON OLIVA.

BY E. G. VANATTA.

The Academy of Natural Sciences of Philadelphia having purchased the John Ford Collection of *Oliva*, the following notes may be useful to those interested in the genus.

OLIVA PERUNIANA Lam.

The typical form is illustrated in Reeve's Conch. Icon. vol. vi, pl. 9, f. 14 *d;* Tryon's Man. Conch. vol. v, pl. 18, f. 58.

Var. *fulgurata* Mart., Rve. Conch. Icon. pl. 9, f. 14 *b.;* Tryon M. C. pl. 18, f. 56.

Var *livida* Johns.

The types are pale lilac with ivory-yellow streaks, A. N. S. P. Coll. No. 111726. Alt. 40, diam. 20 mm.

Habitat—unknown.

NAUTILUS vol. 24, p. 122; Tryon M. C. pl. 18, f. 55; Rve. C. I. pl. 9, f. 14 *a.*

Var. *castanea* "Ford" Johns.

The types are in the A. N. S. P. Coll. No. 111603 from Peru. Alt. 43.5, diam. 22 mm.

Nautilus vol. 24, p. 122 ; Rve. C. I. pl. 9, f. 14 *c;* Tryon M. C. pl. 18, f. 57.

Var. *subcastanea* n. var.

This form is brown with zigzag darker brown lines. It is similar to *castanea* in color but with streaks somewhat like *fulgurata.* Alt. 41.5, diam. 21.5 mm.

The types are A. N. S. P. Coll. No. 111688 from Peru. This seems to be the form figured by Reeve. C. I. pl. 9, f. 14 *e.*

Oliva annulata Gmel.

Chenu Ill. Conch. pl. 16, f. 6 ; Sby. Thes. Conch. 5 (332), fig. 60.

Var. *amethystina* Bolt. Tryon M. C. pl. 19, f. 64, 66.

Var. *mantichora* Ducl. Tryon M. C. pl. 19, f. 65.

Oliva bulbosa Bolt.

Tryon, M. C. pl. 20, f. 71, 74.

Var. *tuberosa* Bolt. Tryon M. C. pl. 19, f. 68, 69.

Var. *inflata* Lam. Tryon M. C. pl. 20, f. 73.

The types of *ovum-ralli* Ford were not found, but A. N. S. P. Coll. No. 14709 is part of the original lot presented by Mr. J. Ford.

Var. *fabagina* Lam. Tryon. M. C. pl. 19, f. 70, pl. 20, f. 72.

Var. *immaculata* n. n.

Shell pure white. Alt. 45.5, diam. 25 mm. the types are A. N. S. P. Coll. No. 111630 from the Indo-Pacific. It is *Oliva bulbosa alba* Johns. (not Lam.) Nautilus vol. 28, p. 101 ; Thes. Conch. vol. IV, pl. 13 (340), f. 191.

Oliva tigrina Lam.

Tryon. M. C. pl. 20, f. 77, 80.

Var. *fallax* Johns. The types are A. N. S. P. Coll. No. 111575 from Ceylon. Alt. 44.5, diam. 24 mm. Nautilus vol. 24, p. 65 ; t. c. vol. 28, p. 100 ; Tryon M. C. pl. 20, f. 78.

Oliva tricolor Lam.

Tryon M. C. pl. 21, f. 86.

Var. *philantha* Ducl. Tryon. M. C. pl. 21, f. 87.

OLIVA VARIEGATA Bolt.

Tryon. M. C. pl. 23, f. 27.

Var. *reticulata* Bolt. Tryon. M. C. pl. 23, f. 28.

OLIVA OLIVA L.

Tryon M. C. pl. 1, f. 5 ; pl. 23, f. 24.

Var. *fenestrata* Bolt., Tryon M. C. pl. 23, f. 23.

Var. *fulminans* Lam., Tryon M. C. pl. 23, f. 22.

Var. *sepulturalis* Lam., Tryon M. C. pl. 23, f. 21.

Var. *macleaya* Ducl., Tryon M. C. pl. 13, f. 26.

OLIVA SERICEA Bolt.

Tryon M. C. pl. 27, f. 59, 60.

Var. *tremulina* Lam., Tryon M. C. pl. 25, f. 48.

Var. *pica* Lam. Tryon M. C. pl. 26, f. 51.

Var. *tenebrosa* Marr., Tryon M. C. pl. 25, f. 49.

Var. *porphyritica* Marr., Tryon M. C. pl. 26, f. 53.

Var. *sylvia* Ducl., Tryon M. C. pl. 27, f. 57.

Var. *zeilanica* Lam., Tryon M. C. pl. 24, f. 32.

Var. *ornata* Marr., Tryon M. C. pl. 24, f. 31 ; pl. 25, f. 45.

Form *lignaria* Marr., Tryon M. C. pl. 25, f. 44.

Var. *marrati* Johns.

The types are A. N. S. P. Coll. No. 111862, from the Indo-Pacific. Alt. 71.5, diam. 30 mm. NAUTILUS vol. 24, p.51 : t. c. vol. 28, p. 99 ; Sby. Thes. Conch. pl. 7 (334), f. 109.

Var. *cryptospira* Ford.

The type is A. N. S. P. Coll. No. 111611 from Mauritius. Alt. 55.5, diam. 24 mm., P. A. N. S 1891 p. 99.; NAUTILUS vol. 28, p. 99 ; Chenu. Ill. Conch. pl. 30, f. 11.

Var. *fordi* Johns.

The type is A. N. S. P. Coll. No. 111612 from (Mauritius). Alt. 44, diam. 17 mm., NAUTILUS vol. 24, p. 51 ; t. c. vol. 28, p. 98 : Sby. Thes. Conch. pl. 9 (336), f. 126 ; Chenu. Ill. Conch. pl. 30, f. 12.

Var. *albescens* Johns.

The type is A. N. S. P. Coll. No. 111753 from Baker Island, S. Pacific. Alt. 42, diam. 14.3 mm. Nautilus vol. 28, p. 99.

OLIVA SPICATA Bolt.

Tryon M. C. pl. 27, f. 62.

Var. *hemphilli* "Ford" Johns.

The types are A. N. S. Coll. No. 111697 from San Ignacio Lagoon, Lower California. Alt. 53.5, diam. 23 mm. Nautilus vol. 24, p. 122 ; t. c. vol. 28, p. 115.

Var. *subangulata* Phil. Tryon M. C. pl. 28, f. 65.

Var. *oniska* Ducl.

The types of *O. perfecta* Johns. are A. N. S. P. Coll. No. 111729 from West Coast Central America. Alt. 58.5, diam. 25 mm. Nautilus vol. 24, p. 122 ; t. c. vol. 28, p. 116 ; Rve. C. I. pl. 10, f. 16 *g* ; Tryon M. C. pl. 27, f. 61 ; Chenu Ill. Conch. pl. 32, f. 9.

Var. *pindarina* Ducl. Tryon, M. C. pl. 28, f. 64.

Var. *maria* Ducr. This is the very light colored form much like var. *venulata*. Tryon M. C. pl. 29, f. 78 ; Chenu. Ill. Conch. pl. 33, f. 11.

Var. *ustulata* Lam. Tryon M. C. pl. 28, f. 66.

Var. *graphica* Marr. Tryon M. C. pl. 28, f. 63.

Var. *violacea* Marr. Tryon M. C. pl. 28, f. 70.

OLIVA RETICULARIS Lam.

Tryon M. C. pl. 30, f. 90, 91, 94, 95 ; pl. 34, 57.

Var. *formosa* Marr. the small brown form. Tryon M. C. pl. 31, f. 100.

Var. *nivosa* Tryon Marr. Tryon M. C. pl. 31, f. 1.

Var. *bifasciata* Küster. The large brown form. Tryon M. C. pl. 31, f. 99.

var. *olorinella* Ducl.

Tryon. M. C. pl. 31, f. 2.

var. *tisiphona* Ducl.

This is the globose, grayish form of Northern S. America.

Tryon. M. C. pl. 30, f. 93.

OLIVA SAYANA Ravenel.

Tryon. M. C. pl. 31, f. 5.

var. *citrina* Johns.

The types are A. N. S. P. Coll. No. 111642 from Long Key, Florida.

Alt. 48. 5, diam. 19 mm.

NAUTILUS, vol. 24, p. 123 ; t. c. vol. 28, p. 114.

OLIVA ISPIDULA L.

var. *candida* Lam. White form.

Tryon. M. C. pl. 33, f. 32, 36.

var. *flaveola* Lam. Yellow form.

Tryon. M. C. pl. 33, f. 40.

var. *tigridella* Ducl. The form with small dark spots.

Tryon. M. C. pl. 33, f. 35.

var. *taeniata* Link. The form with a broad subsutural dark band.

Tryon. M. C. pl. 33, f. 37, 39.

var. *stellata* Ducl. The form with broad brown markings.

Tryon. M. C. pl. 33, f. 42.

var. *gratiosa* n. var.

Shell slender, dark brown, spire elevated, columellar callus cream-white.

Alt. 32.5, diam. 12.5 mm.

The type is A. N. S. P. Coll. No. 111869 from the Philippines. This form may be Chenu Ill. Conch. pl. 8, f. 13 ; Sby. Thes. Conch. pl. 16 (343), f. 252.

var. *algida* n. var.

Shell oblong, bluish white with longitudinal light brown streaks, lip yellowish brown, spire short, columellar callus white, posterior angle of the aperture provided with a brown and white callus.

Alt. 36.5, diam. 18 mm.

The type is A. N. S. P. Coll. No. 14986, habitat unknown, gift of J. S. Phillips. This is probably Reeve's Conch. Icon. pl. 17, f. 34 *i*.

var. *samarensis* Johns.

The types are A. N. S. P. Coll. No. 111759 from Samar Island, Philippine Is. collected by E. L. Moseley.

Alt. 37.5, diam. 14 mm.

OLIVELLA BIPLICATA LAPILLUS n. var.

Shell globose, white, spire short, interior of the aperture cream-colored.

Alt. 24, diam. 14 mm.

The type is A. N. S. P. Coll. No. 111977 from San Pedro, California, collected by Mrs. E. M. Gaylord.

It is the *Olivella biplicata alba* Wlms. (not Marr.). It is figured in Sby. Thes. Conch. IV, pl. 18 (345), f. 290. Some specimens have lilac on the columella.

Olivella gracilis gaylordi Ford.

The types are A. N. S. P. Coll. No. 111804 from the Gulf of California.

Nautilus, vol. 8, p. 104.

Olivella blanesi Ford.

The types are A. N. S. P. Coll. No. 111788 from Cardenas, Cuba. Nautilus vol. 12, p. 66.

Var. *albata* nn.

Shell globose, white, spire elevated. Alt. 7, diam. 3.5 mm.

This is *Olivella blanesi alba* Ford (not Marr.), Nautilus vol. 12, p. 67, from Cardenas, Cuba, collected by Francisco Blanes. The types are A. N. S. P. Coll. No. 111789.

Agaronia gibbosa Born.

Tryon M. C. pl. 36, f. 85, 87.

Var. *aurantia* Johns.

The types are A. N. S. P. Coll. No. 111739 from the Indian Ocean. Alt. 55.5, diam. 28.5 mm. Nautilus vol. 28, p. 103; Tryon M. C. pl. 36, f. 86; Chenu. Ill. Conch. pl. 18, f. b.

NOTES.

Helix pisana Mull., in California.—While in San Diego in July 1914 Mrs. Kate Stephens, Curator of the San Diego Society of Natural History, showed me 4 specimens of a snail that had been found in the garden of Miss Scripp's home at La Jolla. These shells were not like any local snails and she believed them to be European, as some of the plants or bushes in the garden had been imported from Belgium.

This summer Mr. Allyn G. Smith of Redlands informed me that there was colony of *Helix pisana* Mull., at La Jolla and he gave me a set of shells which he had collected in December 1914. Mr. D. L. Emery of National City, has also collected from the same colony and reports them quite plentiful even though he went after them in August and had to dig them out. —E. P. Chace.

THE NAUTILUS.

VOL. XXIX. NOVEMBER, 1915. No. 7

A NEW INDIAN SPECIES OF PUPILLIDÆ.

BY H. A. PILSBRY.

BIFIDARIA (BENSONELLA) LANDURENSIS n. sp.

Shell rimate, the rimation like a reversed comma, conical, brownish corneous, glossy and smooth except for faint growth-striæ; the apex obtuse, whorls 5, convex, the latter part of the last whorl straightened, slowly ascending. Aperture heart-shaped, vertical, obstructed by three lamellæ upon the parietal wall, two on the columella, and four acute folds or plicæ within the outer and basal margins. Angular lamella not quite marginal, simple continuous and deeply entering; parietal lamella higher and thicker, not emerging quite so far, and also very deeply entering; infraparietal lamella quite small and short, more immersed. Columellar lamella deeply immersed, smaller than the parietal. Infracolumellar lamella small, tubercular, deep within. Plicæ all remote from the margin, the lower palatal largest, the basal, upper palatal and suprapalatal somewhat smaller, all lamellar. Peristome very narrowly expanded, having a perceptibly thickened rim within the basal and outer margins, terminating in a white tubercle above the middle of the outer lip. Above this tubercle the lip is thin and strongly arcuate. Length 2.2, diam. 1.5 mm.

Landour, India, with *B. plicidens* Bens. Type no. 16721 A. N. S. P. This species is perceptibly smaller than *B. plicidens*, and differs from that species in the following respects: the angular lamella does not emerge quite to the edge of the peristome, and *it is continuous*, not interrupted, within. The parietal lamella is less remote from the lip-edge, emerging nearly as far as the angular. The lower palatal plica is somewhat stronger.

The only specimen seen was among specimens of *B. plicidens* (*Pupa plicidens*) received from Benson.

Bifidaria plicidens will probably prove to be one of the most widely distributed of Asiatic *Pupillidæ*. Described originally from Landour and Mussoorie, and subsequently reported from Cherra Poonjee, Assam (Godwin-Austen), it has been found by Mr. Y. Hirase at three Japanese localities—Yōrō, Mino; Riozen, Omi; and Suimura, Awa (Shikoku). I cannot see that the specimens show any divergence from Indian examples. I do not know that the species has been reported from China, but there cannot be much doubt that it occurs there. Dr. von Moellendorff has shown that another Japanese *Bifidaria*, *B. armigerella*, has a wide range on the Chinese mainland.

UNIO VIRIDIS CONRAD.

BY BRYANT WALKER.

The recent rediscovery by Mr. Frierson of the Appendix to Conrad's New Fresh Water Shells is a very interesting one. And in connection with it, it is also of interest to note that the "hit or miss" method in naming a species adopted by Conrad in reference to his *subviridis* has been explicitly approved by the International Commission on Zoological Nomenclature. (See Opinion 49). It seems clear that, barring the possible reference of Rafinesque's *viridis* to this species, it must be known as *subviridis* Con., with *tappanianus* Lea as a synonym.

But the identification of Rafinesque's *viridis* with the *compressa* of Lea is by no means so sure as Mr. Frierson assumes, and I desire to file an "interference", as the patent lawyers say, for the purpose of suspending the general adoption of the change proposed until such time as certain important and probably conclusive facts can be obtained.

The recent tendency to revive the long buried names of Rafinesque without argument or explanation seems to me to be a rather regrettable one. I am quite willing to "give the devil his due", when it has been made to conclusively appear that it is his due. But to upset the accepted nomenclature of over half a century, based upon recognizable descriptions and figures, without any attempt to explain why it is done is very unfortunate and almost an abuse of bibliographic research. It is too much, at this late day, to ask the busy modern student to put aside his own work and to wallow in the Rafinesquean "Slough of Despond" in an attempt to work out for himself the reasons, which have influenced the rehabilitation of his species. While it is probably quite likely that there are some of Rafinesque's species that can be recognized, (and if they can, they should be), it is certainly not asking too much that those advocating so radical a change should in every instance give in detail the process of reasoning that has brought them to the conclusions that they have adopted. It is only in this way that those, who are willing to give a careful and candid consideration to the question and who are ready to be convinced, if the facts adduced justify the conclusion, can be expected to give any serious attention to the questions involved. There was altogether too much of the "*ipse dixit*" seventy years ago, when Say and Conrad were disagreeing with themselves and each other in their attempts to secure the recognition of Rafinesque's species, to incline any one at the present time to reopen the old controversy without having a clear, impartial and impersonal statement of facts and arguments bearing upon each species.

So far as the *viridis* of Rafinesque is concerned, I have had occasion to go over the questions involved with some care.

I have had considerable correspondence with Mr. Frierson on the subject. He has favored me with detailed statements of his reasons for identifying that species with Lea's *compressa*. I have imposed on him my reasons for questioning his conclusions. As neither of us has succeeded in convincing the other, it would seem to be a fair inference that the subject is not entirely free from doubt.

My reasons for asking a suspension of judgment in this case are, briefly, these:

1. Rafinesque states explicitly that his *viridis* was "rare in the Ohio, more common in the Kentucky and the small rivers adjacent". So far as I have been able to ascertain, no species approximating in any way to *viridis*, *compressa* or *tappanianus* has been recorded from the Ohio, the Kentucky or the small rivers adjacent. As a matter of fact, we know practically nothing of the Naiad fauna of the Kentucky, where, if anywhere, the genuine *viridis* should be rediscovered. And until the fauna of that river has been carefully investigated and it is definitely determined what species, if any, of this group is found there, it would certainly seem the "better part of wisdom" to suspend hypothetical identifications of the species.

2. The *compressa* of Lea is most emphatically a creek or small river species, ranging from western New York and Pennsylvania west to Iowa and north to the Missinaibe River in the Hudson Bay region. I have not been able to find any definite record of its occurrence in the Ohio. Dr. Ortmann, (Ann. Car. Mus., V, 1909, p. 196), states that in western Pennsylvania, it is "entirely absent in the Ohio", and, (Pr. Am. Phil. Soc., LII, 1913, p. 296), that it is "a peculiar form restricted to the tributaries of the upper Alleghany and also in French Creek and Beaver River drainage". If not found in the upper reaches of the Ohio, it is not likely that it occurs in the deeper waters of the lower pertions of the river.

The only record of its occurrence in any of the southern tributaries of the Ohio is that of Dr. Ortmann, (Pr. Am. Phil. Soc., LII, 1913, p. 372), from the little Kanawha River, which empties into the Ohio at Parkersburg.

So far as I have been able to ascertain, it has never been listed from any of the tributaries of the Ohio in Kentucky or Tennessee. Apparently, with the exception above noted, so far as our present knowledge goes, the Ohio has been a barrier to any extension of this species into its southern tributaries.

If Rafinesque's statement as to the locality of his species is to be relied upon, in view of these facts it does not seem too much to ask that the actual occurrence of *compressa* in the Kentucky and small adjacent rivers be proved before any approximation of the two species be accepted.

3. The *tappanianus* of Lea, until recently, has always been considered to be restricted to the Atlantic drainage. But Dr. Ortmann, (Pr. Am. Phil. Soc., LII, 1913, p. 371), has very lately discovered it in abundance in the Greenbrier and New rivers in the upper Kanawha system. Its occurrence in the Ohio drainage system is, therefore, established.

As the habits of *compressa* and *tappanianus* are alike, both being creek species, in view of what we now know, it would seem quite as probable that *tappanianus* might be found in the Kentucky as *compressa.* At any rate, it would suggest the desirability of getting the facts as to what the fauna of the Kentucky is, before jumping at conclusions.

4. So far as I know the single valve in the Poulson collection, said to be from the Kentucky and identified by Rafinesque as his *viridis,* is not now in existence. If it is, the question as to which of the later described species it belongs, can be easily settled by an inspection of the shell. Conrad, who saw the specimen, said that it was identical with the Juniata shell described by himself as *subviridis* and by Lea as *tappanianus.* Say, who also saw the shell, said that it was an entirely different species. In the light of the then existing knowledge of the distribution of *tappanianus*, and, indeed, of our own until 1913, Dr. Lea was quite justified in his remark "that there is an error in the habitat or the name". Mr. Frierson, who has not seen the specimen, assumes that the habitat was right, but that Conrad was wrong in identifying it with the Juniata species. It would be quite as reasonable either to assume that Conrad was right and the locality wrong or that both Conrad and the locality were right. At any rate, in the absence of the specimen itself, great caution should be exercised in making any assumptions about it.

5. If Rafinesque had stated that his *viridis* came from the Atlantic drainage, there is scarcely any one, who would attempt to make any identification based on his description alone, who would not say that it was quite surely the *tappanianus* of Lea.

If the question of locality could be eliminated, I feel assured, from a very careful study of the original description in comparison with quite a large series of both *compressa* and *tappanianus*, that a strong argument could be made tending to show that, on the whole, as between these two forms, *viridis* should be approximated to *tappanianus* rather than to *compressa*. But the burden of proof is upon those, who advocate the change and until a *prima facie* case has been presented in favor of the change, there is no occasion to go into that question.

6. In view of the fact that nothing is known of the fauna of the Kentucky so far as this group is concerned, it would seem quite within the bounds of possibility that there may be a form of this group in the Kentucky, which is neither *compressa* nor *tappanianus*, but allied to the *quadrata* Lea or *diversus* Con., and which may be the real type of *viridis*. This may be a mere possibility, but even so, it emphasizes the importance of ascertaining what the fauna of that river really is.

Taking all these elements of doubt into consideration, it would seem to me that so far as the *compressa* of Lea is concerned, no change in the accepted nomenclature should be made until it can be based upon facts so conclusive as to put an end to discussion.

For the benefit of the "weak-kneed", who, like myself, hesitate to accept Mr. Frierson's conclusions, it may be well to call attention to the fact that Mr. Frierson is in error in his statement that if Rafinesque's name be not accepted, Lea's name of *compressa* must give way to the *alasmodontina* of Stimpson. Lea originally described his species as *Symphynota compressa*. The fact that an author errs in the generic reference of a new species does not prevent the use of his specific name in the genus to which the species properly belongs, provided, of course, that his name has not already been used for an earlier described species in that genus. Mr. Frierson assigns the species to *Lasmigona*, in which there is no other species described as *compressa*. It follows, therefore that the "weak-kneed" will still continue to use Lea's name for this species until it is *proved* to be a synonym of some earlier name.

MOLLUSCA OF SOUTH DAKOTA.

BY W. H. OVER.

Inasmuch as practically nothing has been published regarding the Mollusca of this State, I deem it proper to submit a list, prefaced with a few remarks in explanation of the environic conditions for shell-life as they exist today, and to some extent in the past.

During the last decade I have collected quite generally over the State, yet I realize there is much study and work to be done and in time the following list will be greatly increased. However from this locality, one would hardly expect a long list of species.

The surface of South Dakota is usually spoken of as a rolling plain, destitute of timber, except in the Black Hills and the Forest Reserves in the northwest part of the State. There is, however, considerable timber along streams locally over the State, and the eastern part is dotted over with large groves and is really in the humid district; however, strictly speaking, only the southeastern corner is considered so. Nearly one-half of the State that lies west of the Missouri River, except the Black Hills, is considered semi-arid, and owing to the nature of the soil the surface has been eroded into deep-cut creeks and steppes, and merges into a large area of "badlands".

The average rainfall is about 14 inches in the northwestern part of the State and increases to 30 inches in the southeastern part.

The altitude in the southeastern part is about 1240 feet above sea level and increases toward the west, where at Harney Peak in the Black Hills, it is 7200 feet. However the lowest is 960 feet in the northeastern part around Bigstone Lake where a small area was probably scooped out by the glacier, and drains into the Minnesota River Valley. The balance of the State is drained by the Missouri River which nearly divides the State east and west. The eastern half is drained from north to south by the Big Sioux, Vermillion and James rivers. The western half is drained from west to east by the White, Cheyenne, Moreau and Grand rivers. A very small portion in the northwestern part is drained by the Little Missouri River which flows north into the Missouri.

There are no lakes or ponds in the western half of the State, and the small creeks are dry most of the year. There are number of small lakes and ponds in the eastern part, formed by the glacier scooping out depressions and damming up small valleys.

The lakes, ponds and rivers east of the Missouri River abound with shell-life characteristic of the northern region. Owing to the velocity of the current and the rapid deposition of sediment, no shell-life exists in the Missouri River. For the same reason, and the presence of alkaline substances, the same is true of most of the rivers flowing into it from the west. In the north fork of the Grand River, well up toward the head in Perkins County and in the "Ft. Benton loam", I found *Anodonta grandis* and *Sphærium striatinum* var. *acuminatum.* Just east of the Black Hills, in Washabaugh County, in the Yellow Medicine Creek, I collected *Anodontoides ferussacianus* and *Sphærium sulcatum.* I think that the former may be found in several creeks in the Pine Ridge Reservation where the creek-bed is still in the "Pine Ridge loam". In fact they were reported from two other creeks by Indians whom I talked with last August, and who said they "had roasted and eaten 'em". I have found several species of very old "recent" clam shells along terraces of the first floodplain of a number of these "badland" creeks and rivers, which proves that, before the streams eroded down into the Tertiary or Cretaceous clays, they were inhabited by mussels.

The Black Hills, in the southwestern part of the State, is a dome-shaped mountain 100 miles long and 50 wide, from 5000 to 7200 feet above sea level. The higher elevations are covered with pine timber and lower down along the spring-fed creeks are deciduous trees and thickets. The rainfall is one-third more than on the surrounding plains. There are no lakes, and most of the streams are not congenial for shell-life on account of the extremely rapid current. From a collector's standpoint the Black Hills were a disappointment to me. Perhaps I expected too much. But there is a field for more work and especially among the limestone ridges on the western slope. In the northern part of the Black Hills in Lawrence County, in Spearfish Canyon and about on the dividing line between the deciduous and pine woods, I found *Oreohelix cooperi* very abundant on Sept. 29, 1912. A light snow covered the higher elevations and the snails had hibernated; however I soon located them under leaves, brush-heaps and logs. I think this is the most eastern locality that they have been found. You will notice several species listed from the Black Hills that are identical with those found in the Rocky Mountain region. Mr. Vanatta writes that "it seems that some of the shells found in New Mexico run up the mountains into Colorado, and to the Black Hills in South Dakota." Of course the environments would be very similar.

In the eastern part of the State, the lakes or rather the natural ponds, or "sloughs" as they are locally called, seem to be the natural habitat for some of the species of *Lymnaea* and *Planorbis*. In Deuel County in the "Cotteau Hills" where these "sloughs" are numerous and shallow and practically grown up with vegetation, I have found them exceedingly abundant and of large size. Many wildducks nest here, and during migration others stop to feed, so that in season, hunting is good. I remember one small "slough" in particular, in the fall of 1916, that seemed literally full of *Lymnaea stagnalis* and *Planorbis trivolvis*, that we called "Spoonbill Slough" from the fact that this variety of duck was always to be found there. We seldom shot them, as better ducks were plentiful; but now I often regret that I did not think enough of it at the time to take a few and examine their "crops" to see if they were feeding on the young of *L. stagnalis*, which were abundant. It was also in this locality in 1908 that I found the dead specimens of *Segmentina christyi*. No live ones were there at the time, as the "slough" had been dry a year or two previous. Nor could I find them at any other pond. This was the first record for the United States, and as Mr. Bryant Walker says, "They probably came from Canada by the duck route".

(*To be concluded.*)

NOTES.

On the Genus Harmandia.—The genus *Harmandia* was proposed by Rochebrune for a couple of nearly related species of fresh-water mussels said to be from the Mekong River, Indo-China. His types were figured by Dr. F. Haas, and their resemblance to some young *Hyria* from South America was striking as the writer stated in Nautilus. Dr. Haas has critically re-examined the types, and the following excerpt from a letter from him to the writer will be of interest. "I am convinced that the genus *Harmandia* will have to disappear, being founded upon young *Hyria*. Rochebrune found the shells in the collections of Count Harmand, and Count Castelnani, both of whom were in Cochin China, as well as in Brazil." Hence the error as to the habitat.—L. S. Frierson.

Habits of Eupera.—Mr. L. S. Frierson has recently sent to me a fine set of *Eupera singleyi* (Pils.), which he collected in the Bayou Pierre, DeSoto Parish, La., with the following note :—"The willow trees send out their roots into the water and there grow about a foot long. Their rootlets convert the whole into a mat of moss-like stuff, in which these Euperas grow. They are tied to their habitat by some thread-like byssus." This is, I believe, the first record of *Eupera* in Louisiana. —Bryant Walker.

Venezuela Shells.—The following species of shells were collected by Mr. Stewardson Brown while on the Bond Venezuela Expedition in March, 1911. All the small forms were picked out of several bags of leaf mould. At Cariaquita, Venezuela he found, *Thysanophora plagioptycha* Sh., *T. bactricola* Guppy., *Strophocheilus oblongus* Müll., *Bulimulus cacticolus* Rve., *B. erectus* Rve., *Drymœus flavidus debilis* "Bk" Mart., *Opeas micra* Orb., *O. beckianus* Pfr., *O. octogyra plicatellum* Gupp, *Leptinaria lamellata* P. & M., *L. simplex* Guppy, *Streptaxis deformis* Fer., *Polita implicans* Guppy, *Ernstia ernsti* Jouss., *Guppya gundlachi* Pfr., *G. semenlini* Moric, *Radiodiscus millecostata* Pils., *Succinea tamsiana* Pfr., *Aperostoma rugatus* Guppy, *Diplommatina huttoni occidentale* Guppy, *Helicina nemoralis* Guppy, *H. dysoni* Pfr. and *Lucidella lirata* Pfr.

On a hillside on the East side of the Bay near Cariaquita on the North shore of the Gulf of Paria, Venezuela, Mr. Brown collected *Auris distortus sublaevis* Pils, *Bulimulus cacticolus* Rve., *Drymæus flavidus debilis* "Bk." Mart., *Subulina octona strebeli* v. Mart., *Caecilioides consobrina minutissima* Guppy, *Leptinaria lamellata* P. & M., *Streptaxis deformis* Per., *Guppya gundlachi* Pfr., *Aperostoma translucidum* Sby., *Helicina dysoni* Pfr. and *Lucidella lirata* Pfr. *Oxystyla varia* v. Mart. was taken at Pedernales, *Ampullaria glauca* L., *A. columbiensis* "Sby." Phil. & *A. metcalfei* Rve. were collected in the Manimo River and *Ampullaria glauca* L. and *A. urceus* Müll., in the Rio Vagre.—E. G. VANATTA.

HELIX HORTENSIS, NEAR EDGARTOWN, MARTHA'S VINEYARD, MASS.—This species has recently been found by Mr. Edward Wigglesworth, on Snow's Point, Chappaquiddic Island, near Edgartown. The species was recorded from near Gay Head, by John H. Thomson in 1885, (Journ. Conch. [Brit.] IV, p. 373), but I have been unable to obtain a record of the species from Martha's Vineyard since that time. Thomson's specimens were all of the bright lemon-yellow variety, while this colony contains practically only the five-banded form. In only four specimens out of 97 was the third band wanting and of these two were young (under 7mm.), in 12 other young specimens however the third band was the first to appear. In about six specimens there was a tendency for the first and second and the fourth and fifth bands to fuse on the outer portion of the body-whorl.—C. W. JOHNSON.

SLUGS IN CALIFORNIA.—While in California last August I made a few notes on two species of introduced slugs, as follows:

Limax flavus L. Abundant on dry rocks, Sunset Boulevard, Los Angeles. Tentacles grey-blue; mantle and body very dark brown, the usual pale markings *white* (no yellow); sole pale grey with a slight yellowish tint. All were alike. In the colorless slime this agrees with var. *grisea* Roebuck, but the color and markings of the skin are those of var. *umbrosa* Philippi. Is the loss of the yellow color due to the peculiar environment?

Limax maximus L. At Berkeley, I obtained a very fine spotted form; mantle with many black spots; body pale grey, slightly reddish laterally, with four rows of black spots, and at sides irregular small black spots. The dorsal spots are elongated, and the animal is referable to the variety *cellaria*.

T. D. A. Cockerell.

Tethys (*Neaplysia*) *californica* (Cooper).—Last August, when my wife and I were at La Jolla, California, we obtained six living specimens of this species. The largest was ten inches long, and four high, counting the parapodial lobes. The animals exuded a deep purple substance, which soon turned brown. The following description of the color is from life: body rather coffee brown, marbled with dull crimson and thickly sprinkled with large, mostly circular, dark brown or almost black spots, irregularly placed and of different sizes; there is also a fine dark reticulation. Inner side of parapodial lobes heavily barred with brown-black and whitish, the dark color much more extensive than the pale. Sole dark purplish brown, much wrinkled. There is variation in the size of the dark spots and the distinctness of the crimson markings, which may be very obscure. This appears to be quite distinct from *T. ritteri* Ckll., and I was informed that the biologists of the Scripps Institution were familiar with a second, less-marked, species, which doubtless is *T. ritteri.*—T. D. A. Cockerell.

The Solenopsidae. The extinct family Solenopsidæ has for its type genus *Solenopsis* McCoy, the name of which, being preoccupied, was altered to *Solenomorpha* in 1903 (Nature, April 16, p. 559). The family name has however continued in use, so it may be well to point out that it must be altered to *Solenomorphidæ.*—T. D. A. Cockerell.

THE NAUTILUS.

VOL. XXIX. DECEMBER, 1915. No. 8

AN OCCURRENCE OF PALUDESTRINA SALSA IN NEW JERSEY.

BY BAYARD LONG.

The rapid extermination of the native flora along the New Jersey coast, through the so-called "improvements" in real estate, has led me during a period of some years to endeavor, as opportunity arose, to make as complete a survey as possible of the plants of Long Beach. (This is a long narrow island lying midway in the ocean boundary of New Jersey. Beach Haven, its best known summer resort, is probably the most familiar name associated with this twenty miles of coast.) When grading was accomplished mostly by the destruction and leveling of the sand dunes, much of the brackish marsh area escaped serious disturbance, but with the introduction of the suction-dredge even the salt marshes, with their flora and fauna, soon disappear under the flooding sand.

With this thought in mind, whenever I am collecting plants in the vicinity of Tucker's, I make a point of visiting a certain deep brackish pond-hole in the midst of the salt marshes. My interest lies in the endeavor to find fruit on the *Ruppia* which fills this pool. The several forms of this water-plant are distinguished mainly upon fruit characters, and the present colony seems to consistently spend its energies vegetatively.

In the autumn of 1914 in picking over handfuls of this *Ruppia* in hopes of finding a fruiting strand or old fruit entangled among the leaves, I found a small Amnicoloid snail (the size of a *Ruppia* fruit). On hasty examination it somewhat resembled *Lyogyrus granum*, with which I had become familiar in the Delaware River tidal marshes, living upon water-plants of the same group. Suspecting it might be of some interest, it was submitted to Mr. E. G. Vanatta, and though the shell was deformed, he pronounced it to be *Paludestrina salsa* Pilsbry.

As this formed a rather considerable southerly extension of range of this little-known shell, a more satisfactory basis for the new record was established August 5, 1915, when a good series was obtained. The snail proved to be much more common upon floating algal vegetation than upon the *Ruppia*, and the amount of material obtained depended only upon the quantity of algae picked over. This appears to be a thriving colony as individuals in all stages of development were equally common. Some slight variation seems to occur, as seen in mature examples, but this is apparently no greater, nor of any more significance, than previously noted in this species.[1]

The pond-hole where this colony of *Paludestrina salsa* occurs is rather unique among the physical features of Long Beach. Most of the pieces of brackish water on the salt marshes here are merely shallow, muddy depressions of irregular outline, but the present one is a deep round pool of no great area with precipitous sides. If it occurred in rocky country it would probably be referred to as a pot-hole or a sink-hole.

In looking up the literature of the described localities where this snail has been observed, I find in the interesting accounts which Rev. H. W. Winkley gives of the various habitats known to him, that there are references which very closely suggest the Long Beach station. In Branford, Connecticut, the snail is described as abundant on vegetable matter floating in a ditch in the brackish marsh (to combine information from two notes).[2] In the later paper there is also reference to the station in Wareham, Massachusetts where a colony occurs "in a pot hole in the marsh." I have no doubt that in physical features the Long Beach locality much resembles the one in Wareham. If

[1] Winkley, Nautilus, xix, 107 (1906).

[2] Winkley, Nautilus, xix, 107 (1906) and xxii. 53 (1908).

the snail here also occurs on floating vegetation the similarity would be very striking.

This colony near Tucker's, Long Beach Island, Ocean County New Jersey extends the range of *Paludestrina salsa* southward, to the best of my knowledge, from Branford, Connecticut, which is near New Haven—an extension of considerably over a hundred miles.

My material, critically examined by Mr. E. G. Vanatta, is deposited at the Academy of Natural Science of Philadelphia.

PLEISTOCENE MOLLUSKS FROM ILLINOIS.

BY FRANK C. BAKER.

Early in the year the Page Engineering Company of Chicago submitted to the writer some specimens of mollusks and moss obtained from a cutting near the Fox River, one mile east of Cary Station. The sequence of deposits is as follows :

1. Black earth . . .	2 feet 6 inches
2. Brown earth . . .	2 " 6 inches
3. Marl.	4 "
4. Moss	2 "
5. Marl.	2 "
Height of section . .	13 "

Eight species of mollusks were picked from the marl, No. 3.

Valvata tricarinata Say.
Valvata lewisii Currier.
Amnicola lustrica Pilsbry.
Amnicola limosa Say.
Planorbis parvus Say.
Planorbis exacutus Say.
Galba galbana Say.
Physa species (fragments).

The moss was submitted to Doctor Edward W. Berry, Johns Hopkins University, who determined it to be "*Plagiothecium denticulatum* (Linné) B. and S., probably near the subspecies *rosaceum* (Hampe) B. and S." Occurring as this thick moss bed does between two strata of marl, it arouses considerable interest as to the method of its formation and also that of the bed of marl above and below the moss. Professor Berry says of this species "this moss is very common and wide-spread in middle latitudes and may possibly be a composite form. It grows in various moist (not necessarily swamp) situations from the Atlantic to the Pacific."

The deposits are all post-glacial and probably represent fluctuations in a water body, possibly connected with the Fox River Valley. The thickness of the moss (two feet) suggests a comparatively long period of swampy condition between two pond formations. The mollusks are indicative of a water body four to eight feet in depth. Samples were not secured of the marl beneath the moss, which probably also contained mollusks.

The whole Fox River Valley is worthy of study, the lower part of the river bank bearing strata belonging to the Sangamon or Post-Illinoian interglacial interval, which are fossil-bearing. In view of the rich beds of molluscan fossils found near Chicago, it would seem that these Fox River strata should be investigated, as they may also contain remains of life indicating something of the migration of life during this interesting interval, when the great shell beds of Toronto were formed.

The New York State College of Forestry.
Syracuse University.

THE GASTROPODA OF PAYNE COUNTY, OKLAHOMA.

BY DARLING K. GREGER, COLUMBIA, MISSOURI.

The collection upon which the list of species given below is based was made in the month of May, during a season of abnormally wet weather. While we covered practically the whole of Payne county, the region between Wild Horse and Stillwater creeks and from the Cimarron River north to the town of Stillwater was studied quite thoroughly during the period of our stay.

Of the nine families represented in the region, the *Helicidæ* and *Pupillidæ* are the most prolific of the land forms. The *Pupillidæ* represented by five species, are by far the most abundant of the land forms, *Bifidaria procera* and *cristata* occurring in colonies of hundreds. *Bifidaria contracta* Say, however is quite rare, being known only from a few specimens taken from the stomach of a lizard.

Among the specimens of the *Zonitidæ*, *Vitrea indentata* Say and *Zonitoides aborea* Say are very plentiful in suitable spots, while *Euconulus fulvus* Drap. is rare, although the latter is adapted to like environment in other regions. *Succinea avara* Say is very abundant along the margins of small streams and ponds where the soil is damp and well shaded.

Following each species we have given measurements of the average sized, mature shells from the various stations in which we collected in the county. These measurements may be accepted as representing the size acquired by each species in this particular region of Oklahoma.

Helicidæ.

Polygyra monodon Rack. Alt. 5.2 mm., diam. 8.5 mm.
Polygyra texasiana Moric. Alt. 4.3 mm., diam. 9.3 mm.
Polygyra texasiana var. Alt. 5.2 mm., diam. 11.7 mm.

Pupillidæ.

Bifidaria armifera Say. Alt. 4.6 mm., diam. 2.8 mm.
Bifidaria contracta Say. Alt. 2.6 mm., diam. 1.4 mm.
Bifidaria procera Gld.
Bifidaria p. cristata P. & V. Alt. 2.8 mm., diam. 1.2 mm.
Pupoides marginatus Say. Alt. 4.8 mm., diam. 2.0 mm.
Strobilops labyrinthica Say. Alt. 2.2 mm., diam. 2.4 mm.
Vertigo ovata Say.

Zonitidæ.

Euconulus fulvus Drap. Alt. 2.9 mm., diam. 2.8 mm.
Vitrea indentata Say. Alt. 2.1 mm., diam. 6.0 mm.
Zonitoides arborea Say. Alt. 1.9 mm., diam. 4.5 mm.
Zonitoides minuscula Binn. Alt. 0.9 mm., diam. 2.1 mm.

Limacidæ.

Agriolimax agrestis Linn.

Endodontidæ.

Helicodiscus parallelus Say. Alt. 1.4 mm., diam. 4.7 mm.

Succinidæ.

Succinea avara Say. Alt. 12.1 mm., diam. 6.4 mm.

Succinea grosvenor Lea.

Limnæidæ.

Lymnæa cubensis Pfr. Alt. 11.8 mm., diam 6.6 mm.

Planorbis antrosus Conr. (*bicarinatus* Say). Alt. 4.9 mm., diam. 9.9 mm.

Planorbis parvus Say. Alt. 1.0 mm., diam. 4.0 mm.

Planorbis trivolvis Say. Alt. 7.3 mm., diam. 19.5 mm.

Physidæ.

Physa gyrina Say. Alt. 14.7 mm. diam. 7.6 mm.

Amnicolidæ.

Amnicola cincinnatiensis Anth. Alt. 4.7 mm., diam. 3.2 mm.

In this connection it may be mentioned that while gastropods are abundant in the ponds, small creeks and the larger streams tributary to the Cimarron, not a single form of molluscan life was found in the Cimarron River, in Payne county, although the dredge was used at frequent intervals along a stretch of fifteen miles.

MOLLUSCA OF SOUTH DAKOTA.

BY W. H. OVER.

(*Concluded from page* 81).

All species listed were collected by me and are in my private collection of land and freshwater Mollusca now on exhibition in the Museum of the University of South Dakota.

For the determination of species I am grateful to Messrs H. A. Pilsbry, E. G. Vanatta, Bryant Walker, Dr. Sterki, L. S. Frierson, F. C. Baker and A. A. Hinkley. But for the latter I probably never would have become interested in the study and collecting of shells.

Vallonia costata Müll. Deuel Co.

Vallonia pulchella Müll. Deuel Co.

Vallonia parvula Sterki. Clay, Deuel and Brule Counties.

Vallonia gracilicosta Reinh. Common over the State.

Vallonia perspectiva Sterki. Deuel Co.

Oreohelix cooperi W. G. B. Spearfish Canyon, Lawrence Co.

Polygyra monodon Rack. Woods along Vermilion River, Clay Co.

Pupoides marginatus Say. Common in the semi-arid districts. Also Clay Co.

Pupoides inornatus Vanatta. Type lot from drift along White River, Washington Co. Also collected along Indian Creek, eastern Pennington Co.

Bifidaria tappaniana Ads. Clay and Deuel Counties.

Bifidaria clappi Sterki. Pennington Co.

Bifidaria holzingeri Sterki. One specimen taken in woods along Spearfish Creek in Lawrence Co.

Bifidaria agna Pils. and Van. Quite general over the State.

Bifidaria contracta Say. Clay Co.

Bifidaria procera Gld. All through the southern part of State.

Bifidaria armifera Say. Common over the State.

Bifidaria armifera abbreviata Sterki. Perkins Co.

Bifidaria pentodon Say. Over the State.

Pupilla muscorum L. Washington Co.

Pupilla blandi Morse. Pennington and Brule Counties.

Vertigo ovata Say. Deuel and Clay Counties. Probably common in eastern part of State.

Vertigo milium Gld. Found in drift along Missouri River at Chamberlain, Brule Co.

Cochlicopa lubrica Müll. Clay, Lawrence and Deuel Counties.

Vitrina alaskana Dall. Lawrence Co.

Polita hammonis Ström. Clay, Deuel and Pennington Counties.

Euconulus fulvus Müll. Pennington, Lawrence, Harding and Deuel Counties.

Zonitoides arborea Say. Locally over the State.

Zonitoides minuscula Binn. Common over the State.

Zonitoides nitida Müll. Clay, Deuel and Washabaugh Counties.

Zonitoides singleyana Pils. Brule, Clay and Custer Counties.

Agriolimax campestris Binn. Harding Co. Probably in eastern part of State.

Pyramidula alternata Say. Clay Co.

Pyramidula cronkhitei Newc. Deuel Co.

Pyramidula cronkhitei anthonyi Pils. Clay, Pennington and Lawrence Counties.

Helicodiscus parallelus Say. Clay, Washington, Deuel and Brule Counties.

Punctum pygmæum Drap. Deuel and Lawrence Counties.

Punctum californicum Pils. Clay Co.

Succinea nuttalliana Say. Deuel Co.

Succinea higginsi Gld. Deuel Co.

Succinea avara Say. Common over the State.

Succinea grosvenorii Lea. Common over the plains and prairies.

Carychium exile H. C. Lea. Stanley Co.

Carychium exiguum Say. Clay and Deuel Counties.

Lymnæa elodes Say. Clay Co.

Lymnæa tryoni Lea. Deuel Co.

Lymnæa obrussa Say. Black Hills.

Lymnæa palustris Mull. Generally distributed over the State.

Lymnæa palustris michiganensis Walker. Deuel Co.

Lymnæa parva Lea. Perkins and Deuel Counties.

Lymnæa caperata Say. Common over the State.

Lymnæa humilis modicella Say. Deuel, Clay, Butte, Perkins and Harding Counties.

Lymnæa stagnalis appressa Say. Deuel Co. Probably over eastern part of State.

Lymnæa cockerelli Pils. and Ferr. Over the State.

Lymnæa techella Hald. Harding Co.

Physa sayi Tapp. Perkins, Deuel and Harding Counties.

Physa ancillaria Say. Codington Co.

Physa humerosa Gld. Spink Co.

Physa crandalli Baker. Fish ponds at hatchery, Lawrence Co.

Physa walkeri Crandall (?) Spink Co. Turtle River.

Physa integra Hald. Rare over the State.

Physa gyrina Say. Abundant over the State.

Aplexa hypnorum L. Deuel Co.

Planorbis umbilicatellus Ckll. Perkins Co.

Planorbis antrosus Conrad. Locally found over the State. Reported by Audubon in 1840 from Missouri River. Probably at mouth of some creek flowing in from the east.

Planorbis parvus Say. Deuel, Pennington, Clap and Harding Counties.

Planorbis exacuus Say. Deuel Co. near Altimont.

Planorbis trivolvis Say. Quite common over the State. Also collected in Beadle Co. in 1895 by S. F. Adams.

Planorbis deflectus Say. Clay, Perkins, Deuel, Washington and Washabaugh Counties.

Planorbis tumidus Pfr. Perkins and Deuel Counties.

Segmentina armigera Say. Clay and Deuel Counties.

Segmentina christyi Dall. Dead shells were abundant at a small pond in Deuel Co. in 1908.

Ancylus parallelus Hald. Deuel Co.

Valvata tricarinata Say. Codington, Clay and Deuel Counties.

Campeloma integrum Say. Clay Co. Vermilion River. One sinistral.

Somatogyrus subglobosus Say. Deuel Co.

Somatogyrus integer Say. Deuel Co.

Amnicola cincinnatiensis Anth. Spink Co. Turtle River.

Amnicola limosa Say. Codington and Clay Counties.

Amnicola emarginata Küst. Codington and Clay Counties.

Lampsilis luteolus Lam. Clay, Deuel, Codington and Spink Counties. One "dead" specimen was found in the Little Missouri River in Harding Co. It is doubtful if it exists there at present, but may be found in the same river at higher elevation and in a sandy loam formation in Montana.

Lampsilis ventricosus Barnes.

Lampsilis lævissimus Lea.

Lampsilis alatus Say.

Lampsilis parvus Barnes. Vermillion River, Clay Co.

Lampsilis gracilis Barnes. The above five species are no doubt more or less common in the Big Sioux, Vermilion and James Rivers.

Lampsilis anodontoides Lea. Clay Co.

Lampsilis subrostratus Say. Rare in Brule Creek, Union County.

Lampsilis rectus Lamk. Brule Creek, Union Co.

Plagiola elegans Lea. Clay Co.

Strophitus edentulus Say. Lake Kampeska, Codington Co.

Strophitus edentulus pavonius Lea. Hidewood Creek, Deuel Co.

Anodonta dakota Frierson. Clear Lake, Deuel Co.

Anodonta grandis Say. Perkins, Deuel, Spink, Clay and Codington Counties.

Anodonta grandis footiana Lea. Deuel and Codington Counties.

Anodonta grandis gigantea Lea. Deuel Co.

Anodontoides ferussacianus Lea. Washabaugh and Deuel Counties.

Anodontoides ferussacianus subcylindraceus Lea. Deuel Co.

Symphynota compressa Lea. Deuel Co.

Symphynota complanata Barnes. Clay and Deuel Counties.

Symphynota complanata katherina Lea. Lake Kampeska, Codington Co.

Arcidens confragosus Say. Clay Co.

Quadrula lachrymosa Lea. Clay Co.

Quadrula pustulosa Lea.

Quadrula undulata Barnes. Deuel, Clay and Spink Counties.

Sphærium sulcatum Lam. Washabaugh and Deuel Counties.

Sphærium rhomboideum Say. Hidewood Creek, Deuel Co.

Sphærium simile Say. Deuel Co.

Sphærium stramineum Conr. Lake Kampeska, Codington Co.

Sphærium striatinum Lam. Deuel Co.

Sphærium striatinum acuminatum Prime. Ziebach, Harding, Perkins and Butte Counties.

Musculium partumeium Say. Deuel Co.

Musculium secure Prime. Pennington and Perkins Counties.

Musculium jayense Prime. Ziebach, Perkins and Deuel Counties.

Pisidium contortum Prime. Harding Co.

Pisidium mainense Sterki. (or near) Deuel Co.

Pisidium affine Sterki. Deuel Co.

Pisidium subrotundum Sterki. Pennington Co.

Pisidium abditum Hald. Pennington and Washington Counties.

Pisidium variabile Prime. Washabaugh Co.

Pisidium kirklandi Sterki. Deuel Co.

Pisidium compressum Prime. Deuel Co.

Pisidium compressum lævigatum Sterki. Deuel Co.

Pisidium sargentii Sterki. Deuel Co.

Pisidium overi Sterki. Deep waterhole in creek one half mile south of Clear Lake, Deuel Co.

Pisidium walkeri Sterki. Hidewood Creek, Deuel Co.

Pisidium pauperculum crystalense Sterki. Deuel Co.

The following post-glacial fossils, Wisconsin drift, were taken from a well 20 feet beneath the surface, 3 miles north of Grandview, Douglas Co., in 1883 by Prof. J. E. Todd, at that time State Geologist. The specimens were identified by Frank C. Baker.

Pisidium compressum Prime.
Pisidium variabile Prime.
Pisidium medianum Sterki (?)
Valvata tricarinata Say.
Valvata lewisii Currier.
Succinea avara Say.
Physa sp. (immature)
Lymnaea (*Galba*) *palustris* Mull.
Lymnaea stagnalis appressa Say.
Planorbis trivolvis Say.
Planorbis bicarinatus Say. (*antrosus* Conrad)
Planorbis antrosus striatus Baker.
Planorbis deflectus Say.
Planorbis parvus Say.
Planorbis exacutus Say.

PUPOIDES INORNATUS N. SP.

E. G. VANATTA.

Shell small, cylindrical, rimate; apex obtusely rounded, white; the lower part of the shell opaque flesh colored; surface with a few irregular growth striæ; suture impressed, ascending at the aperture; whorls $5\frac{1}{4}$, convex, slightly shouldered below the suture; base obtusely angular. Aperture more than one-third the height of the shell; oval, truncate, without lamellæ or plicæ; parietal callus transparent; lip and columella opaque, white, thick, broadly reflexed. Alt. 3.61, diam. 1.37, apert. alt. 1.30, diam. 1.07 mm.

Type in the collection of the Academy of Natural Sciences, number 110977, in drift of White River, central Washington Co., S. Dakota, collected by Mr. W. H. Over, August, 1914. Associated with *Pupilla muscorum* L., *P. blandi* Mse., *Bifidaria procera* Gld., *B. agna* P. & V., *B. pentodon* Say, *B. armifera* Say, *Vallonia gracilicosta* Reinh. and *Succinea avara* Say. Also in the Academy's collection from drift along Indian Creek, Pennington Co., S. D. (W. H. Over, viii, 24, 1914); Pike's Peak, Colo. (E. Hall); Trinidad, Colo. (Dr. H. A. Pilsbry, 1906); ant hills, near Four Mile Hill, and charcoal zone near Arroyo Pecos, Las Vegas, New Mexico (T. D. A. Cockerell, 1900).

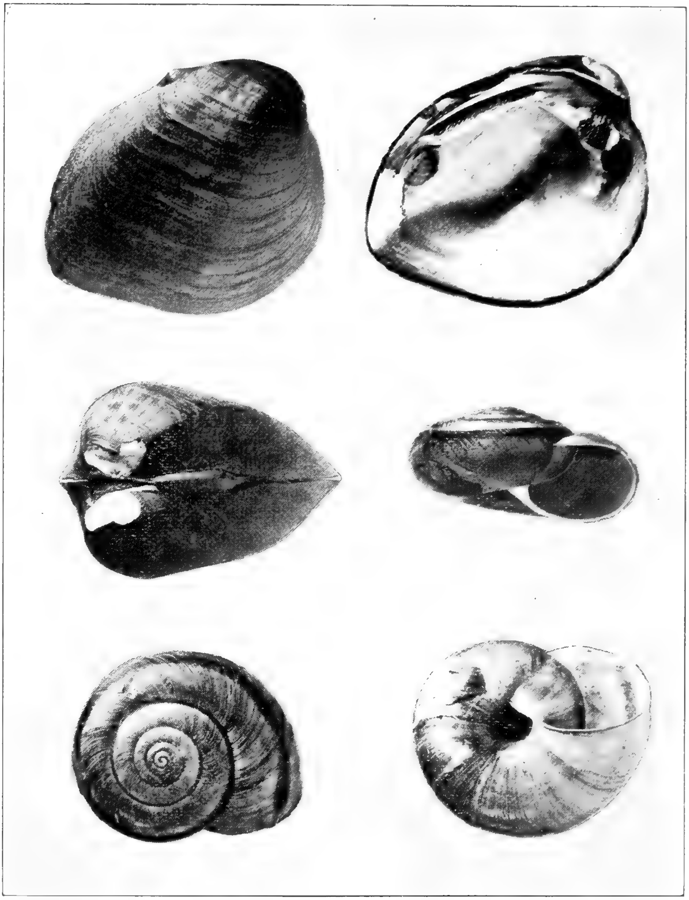
This species differs from *P. hordaceus* Gabb by its smooth surface; *P. chordatus* Pfr. is narrower, thinner, and has a tooth at angle of aperture; *P. paradesii* Orb. is costate and more tapering.

NOTES.

LITTORINA LITTOREA A FISH.—In the case Leavitt *vs.* Clarke in the Divisional Court, in London, Eng., on May 7th, 1915, the question arose as to whether a winkle is a fish. The appeal was brought from a sentence under the Larceny Act, 1861, which makes it illegal for a person to take or destroy fish from private water.

The Lord Chief Justice, Lord Reading, confessed he was puzzled as to whether a winkle could be called a fish, but, following the decision in Caygill *vs.* Thwaite (1885) that cray fish were fish, he considered that the appeal must be dismissed. Mr. Justice Avory agreed on the ground that for thirty years the law had been thought to be laid down in the case cited. Mr. Justice Low said that he saw no reason why a winkle should not be called a fish!—F. R. LATCHFORD.

Mr. Frank C. Baker, formerly Acting Director of the Chicago Academy of Science, is at present engaged on ecological work in the School of Forestry, Syracuse University.



FRIERSON: UNIO COR CONRAD.
PILSBRY: EPIPHRAGMOPHORA ZECHÆ.

THE NAUTILUS.

VOL. XXIX. JANUARY, 1916. No. 9

HELICES OF LOWER CALIFORNIA AND SINALOA.

BY H. A. PILSBRY.

In my "Notes upon some Lower Californian Helices," Proc. Acad. Nat. Sci. Phila. 1913, descriptions and figures were given of the Helices of the west coast and coastal islands of the peninsula. The inland group remains to be considered here.[1]

While it seems likely that some or all of the Lower Californian mountain Helices will prove to belong to the section *Eremarionta* of the genus *Micrarionta*, yet none are known anatomically, and we have as yet no way to tell them by the shells alone from *Sonorella*. It seems best therefore to refer all *Sonorella*-like shells of the Southwest to that genus until they are proved to belong elsewhere by dissection of the animal.

Group of Sonorella lohrii.

Helices of this group are much depressed, with a broadly open umbilicus, more or less overhung by the dilated columellar lip. They have the color and texture of *Sonorella*.

[1] In the paper just mentioned, I ranked *Helix canescens* Adams and Reeve as a subspecies of *Micrarionta veatchii* (p. 386). This was of course an oversight, since *H. canescens* was described first. It will probably be best to leave both stand as species until their intergradation is demonstrated; but if they *do* intergrade, then *veatchii* will take the trinomial.

Sonorella lohrii (Gabb). Pl. 2, fig. 8.

Helix lohrii Gabb. American Journal of Conchology, III, p. 236, pl. 16, fig. 2 (1867); IV, p. 235 (1868).

Sonorella lohrii Gabb, Pilsbry, Proc. A. N. S. Phila. 1900, p. 560 (1901). Bartsch, Smiths. Misc. Coll., vol. 47, p. 197, pl. 32, fig. 1 (1904).

Helix steganella Mabille, 1895. See below.

The prominent features of this species are the very minutely granulated surface, the large nuclear whorl and small number of whorls, the position of the periphery, which is above the middle, very obtusely angular in front, the surface below it being rather flattened and sloping inward. The peristome is somewhat bell-shaped, flaring, reflexed outwardly and below. The type (No. 58106 A. N. S. P.) measures, height 10, diam. 22.1 mm.; width of umbilicus 4 mm.; width of aperture 13, height 11.1 mm.

Dr. Bartsch has given excellent figures of this species, but for ready comparison with the others I have figured the type specimen here.

S. lohrii comes "from the higher table lands near Moleje."

Sonorella lioderma Pilsbry. Pl. 2, fig. 7.

Sonorella lohrii lioderma Pils., Nautilus XVIII, p. 59 (1904).

The shell is depressed with very low spire and broadly open umbilicus, contained about five times in the diameter of the shell; very glossy, smooth except for fine growth-lines; whorls 4½, convex, slowly increasing to the last which widens rapidly, is rounded at the periphery, and descends rather deeply in front. The aperture is strongly oblique, transversely ovate. Peristome expanded and reflexed throughout, the margins strongly converging and joined by a thin, short parietal callous, the columellar margin dilated, overhanging a small part of the umbilicus. Height 10, diam. 21.8 mm.; width of umbilicus 4.2 mm.; aperture 13.3 mm. wide, 11.1 high (including peristome).

This shell was originally described as a subspecies of *S. lohrii*, but it is evidently distinct. It differs by the entire absence of granulation, the equally rounded periphery, less deeply impressed suture, by having a much smaller embryonic whorl, a more transversely lengthened aperture with shorter parietal callus; and by the more arched and more reflexed upper margin of the peristome. As the original description was rather brief and unillustrated, figures of the type are now given.

S. lioderma was collected by Gabb. It was one of the specimens formerly in the tray with his type of *H. lohrii*, and presumably was found in the same district. The type is No. 58107 A. N. S. P. I cannot identify it with any of the species described by Mabille.

The following species evidently belong to the group of *S. lohrii*, since all are described as "*broadly and perviously umbilicate*". Their other chief characters are given below, abbreviated from Mabille's descriptions, as the original publication is probably not accessible to many West Coast conchologists. None of them were figured, and no comparisons with other species are given.

Helix indigena J. Mabille. Depressed-subdiscoidal, solid, subpellucid, somewhat glossy, above planulate, reddish-corneous with a brown zone bordered by white zones, white beneath; beautifully rib-striate; apex obtuse, minute, striate; whorls 5, the last rounded, descending a little to the aperture; base a little inflated, especially around the umbilicus. Peristome a little dilated, scarcely reflexed, the margins converging, joined by a scarcely noticeable callus. Diam. 19 to 21, alt. 7 to 8 mm. Only found above 800 meters on the peaks of the Sierra, throughout most of the central part of the Peninsula of California (Bulletin de la Société Philomathique de Paris, 8th Ser., vii, 1895, p. 64).

This seems from the description to be a distinct species, differing from *S. lioderma* by the sculpture and the less developed peristome.

Helix steganella J. Mabille. Depressed, destitute of color and cuticle but with a reddish zone, rather thick, solid; irregularly striate, and densely covered with many minute granules arranged in oblique series. Spire slightly prominent, the apex costulate, obtuse. Whorls 4, the last strongly dilated and shortly descending at the aperture, a little excavated above at the suture, obscurely angular at the periphery, slopingly compressed below the periphery, inflated around the umbilicus. Peristome thickened, spreading, a little reflexed, the converging margins joined by a very thin callus ; the outer margin at first rather straight, scarcely reflexed, then carved, basal margin nearly straight, reflexed. Umbilical margin dilated, thickened, slightly covering the umbilicus. Diam. 21 to 29, alt. 7½ to 8 mm. Same localities (Same reference).

The description of this species applies very well to *H. lohrii* Gabb. I think it a synonym of that species.

Helix invecta J. Mabille. Depressed-orbiculate, without cuticle or color, but with traces of a brownish line above ; solid, rather thick, coarsely striatulate and under a lens beautifully striatulate. Whorls 4, the last angular at periphery, rather swollen below, at the aperture dilated and slightly descending. Peristome expanded, slightly thickened, the approaching margins joined by a rather thick callus ; columellar margin dilated in a triangular plate over the umbilicus. Diam. 21, alt. 7 mm. Lower California (same reference, p. 65).

Seems nearer *S. lohrii* than any other species I have seen.

Helix digueti J. Mabille. Subdepressed, without color or cuticle, solid, subopaque, irregularly and densely costulate-striate, apex nearly smooth, whorls 4, the last slightly dilated and shortly descending to the aperture. Peristome reflexed, margins joined by a very thin callous, columellar margin dilated, nearly covering the umbilicus. Diam. 20 to 20½, alt. 8 to 9 mm. No locality mentioned (same reference, p. 65).

I have seen no species answering to the description of this.

Group of S. hachitana.

Sonorella merrilli Bartsch (1904). Below San Quentin, L. Cal.

The surface has "very dense, exceedingly minute granulations, both on the upper and the lower surface." Height 12.5, diam. 22, umbilicus about 4 mm.

Sonorella peninsularis n. sp. Pl. 2, figs. 4.

The shell is umbilicate (the width of umbilicus contained between eight and nine times in the diameter of the shell), moderately depressed, the spire low-conic ; pale cinnamon with a few white streaks, having a chestnut-brown band above the periphery, margined narrowly with whitish above, more widely below ; whitish around the umbilicus. The surface is glossy, lightly marked with growth-lines, and in some places above the periphery of the last whorl some excessively faint spiral lines may be seen under a hand-lens. The first whorl begins with irregular radial ripples, then is very minutely rugose with inconspicuous rounded papillæ, widely spaced, and arranged in forwardly descending, curved series. Whorls 5, rather convex, those of the spire rather narrowly coiled, the last rapidly enlarging, descending somewhat to the aperture. The aperture is large and decidedly oblique. The peristome is thin, the upper and outer margins narrowly expanding, basal margin narrowly reflexed ; the columellar margin runs rather far forward, and is much dilated at the insertion, the external edge straightened.

Height 15, diam. 22 mm. ; umbilicus 2.6 mm.

Locality.— Trinidad, on the west coast, near San Borga. Wm. M. Gabb. Type no. 58127 A. N. S. P.

I have not been able to locate Trinidad on the map. San Borgia is a mission in the interior, below the 29th parallel. There are several other specimens in the collection, all taken by Gabb.

This is one of several forms which W. M. Gabb determined as *Helix carpenteri* Newc.—a Californian species which differs by its "numerous very minute spiral striations". *Sonorella merrilli* Bartsch is more depressed, with a smaller aperture and larger umbilicus. The several species described from the peninsula by M. Jules Mabille differ in proportions from this one.

SONORELLA ULTIMA n. sp. Pl. 2, fig. 5.

The shell is narrowly umbilicate (the width of the umbilicus contained about twelve times in the diameter of shell); rather thin ; depressed-globose, with very low conic spire ; pale cinnamon, fading to opaque white on the base, having a chestnut-brown band above the periphery. The surface is glossy, weakly marked with growth-lines, without spiral striation. Whorls 4½, moderately convex, those of the spire slowly increasing, the last whorl very wide, deflexed in front. The aperture is large, oblique. Peristome thin at the edge, but having a rather wide low white callous rim within, the terminations strongly converging ; the upper margin is unexpanded, outer and basal margins narrowly expanded ; columellar margin carried forward, straightened outwardly, broadly dilated at the insertion, partly covering the umbilicus; parietal film transparent but not very thin.

Height 12.7, diam. 20 mm. Aperture with peristome 12.7 mm. wide; umbilicus 1.7 mm. wide.

Locality.—Sinaloa, Mexico, Wm. M. Gabb. Type No. 58124 A. N. S. P.

The special features of this species are its narrow umbilicus, very wide last whorl, large aperture and surface free from any trace of spiral incised lines. The apex is slightly worn, but I think I see traces of the same sculpture described for the first whorl of *S. peninsularis.* It is one of the specimens Gabb identified as *Helix rémondi* Tryon—which is quite a different thing. Gabb was a really notable geological explorer, but sometimes he was not fussy over identifications of shells.

Epiphragmophora ellipsostoma Pilsbry. Pl. 2, figs. 6.

Described in Nautilus VIII, p. 81 (1894), but not figured before. The locality given by Gabb, San Juan del Norte, is rather ambiguous. It would be taken for the place so named in Nicaragua were it not that the specimen was stuck on a label with a shell of *Sonorella peninsularis*, suggesting a Lower Californian habitat. The malleation and epidermis recall Californian and Peruvian Helices, but no similar species has been taken in Nicaragua. The figures represent the type-specimen, no. 10745 A. N. S. P.

OBSERVATIONS ON THE UNIO COR, OF CONRAD.

BY L. S. FRIERSON.

T. A. Conrad published in 1834, his "New Fresh Water Shells" describing and figuring a number of species. His figures were not very good, and some confusion ever since has been the result. For instance, his figure of *U. prasinus* is so unlike the fignre given by Dr. Lea for his *U. schoolcrafti* that the two have been placed as different sub-species in our lists; yet both figures were drawn from the same identical specimen! Mr. Conrad figured a shell, (presumably his *Unio stramineus*) on plate 7, but he omitted it altogether from the text!

But above all, the confusion concerning his *Unio cor* is the greatest, for there is not the slightest doubt that Mr. Conrad described one species, and figured an entirely different one under this name !

Through the kindness of Mr. E. C. Vanatta, of the Academy of Natural Sciences, this confusion has been cleared up.

Mr. Conrad published, in January 1834, a shell he called *Unio mytilloides* (Am. Jl. Sci. xxv, pl. 1, fig. 7), and his figure of *Unio cor* (New Fresh Water Shells, plate iii, fig. 3) in May, 1834. These figures were assumed by Mr. C. T. Simpson, to represent the same species. There is little doubt but that the "Mytilloides" figured is a *Unio ebenus* Lea, and the figure of *cor*, is much like it, yet not identical.

No shell exactly like Conrad's *cor* has yet been obtainable, and if the figure is accurate, the species is probably yet undescribed.

The true *Cor*, however, is well characterized, and the type, in the collection of the Academy of Natural Sciences, is figured herewith (pl. iii, figs. 1, 2, 3) through the courtesy of Dr. Pilsbry.[1]

U. cor Conrad is a native of the Elk and Flint Rivers. These are tributaries of the Tennessee River. The *Unio lewisi*, and *U. crapulus*, of Lea, with which *U. cor* has hitherto been identified, come from a different drainage system.

The true *Unio cor* is characterized by Mr. Conrad, as having rays,—the young, beautifully rayed, and having a sulcus from the beak to base. Neither of which are ever exhibited by *lewisi*, nor are indicated upon the psendo-figure of *cor*. Mr. Conrad says the young shells resemble the *undatus*, Barnes, (Mr. Conrad's conception of *undatus*, was the *obliquus* of *Lamark*).

The true *U. cor* is to be found in many collections, under other names, among which the writer has noted *U. edgarianus*, *tuscumbiensis*, *andersonensis*, and others. The figure of *andersonensis* Lea represents an old, much inflated specimen, rather short behind, but otherwise quite characteristic.

[1] Dr. Pilsbry believes that Conrad's figure, pl. 3, fig. 3, represents the shell he described as *Unio cor*, and that it was a slightly older specimen than that now figured, but of the same species.

Mr. Conrad also observes that mature specimens of *U. cor* are sometimes *produced and cuneiform behind*, "like some varieties of *triangularis* of Raf.," (a species, in Mr. Conrad's estimation at that time, embracing the *group of pyramidatus etc.*

A NEW CALIFORNIAN LAND SNAIL.

BY HENRY A. PILSBRY.

EPIPHRAGMOPHORA ZECHÆ n. sp. Pl. III, lower figs.

The shell is strongly depressed, umbilicate (width of umbilicus contained nearly eight times in greatest diameter of the shell), rather thin. The whorls of the spire and as far as the front of the last whorl are dilute cinnamon, then changing to ecru-olive or dark olive-buff ; there is a chestnut-brown band at the shoulder (about 2 mm. wide), bordered with inconspicuous, hardly noticeable bands paler than the ground-color. Surface is glossy, distinctly, irregularly striate, and immediately behind the lip it is closely and minutely granulose. The spire is a little convex, whorls $5\frac{3}{4}$, moderately convex, slowly increasing to the last, which is about double the width of the preceding, and decends a little in front. The aperture is broadly lunate, decidedly wider than high. Lip thin, the upper margin scarcely expanded, outer very slightly, basal very narrowly reflexed, the columeller margin broadly dilated.

Alt. 15.2, diam. 31 mm. ; aperture, alt. 14.3, width 17.8 mm.

Habitat, San Antonio Canyon, in the San Gabriel Mts., western edge of San Bernardino Co., California, at about 5000 ft. elevation (Miss Lilian Zech).

This fine species will probably prove to belong to the *Helminthoglypta* group, in which it most resembles *H. sequoicola* (Cooper); yet the absence of malleation on the last whorl and of granules on the spire are features more like *Sonorella.*

Miss Zech gives the following account of the locality.

The specimen was found in a narrow, winding canyon branching from the main San Antonio canyon at 4700 feet and at this point, some two or three hundred feet higher as near as I can guess,—only wide enough for the creek bed, then full of rushing water, and the trail. It is a cool, moist, deep canyon,—with columbine, lilies, and ferns—and on the slopes much bay laurel. The trees were incense cedar and big-cone spruce. The snail lay on a pile of rock artificially heaped up at the creek's mouth, and contained the dead animal when found."

DESCRIPTION OF A NEW BIFIDARIA.

BY DR. V. STERKI.

BIFIDARIA MINUTA, n. sp.

Shell minute, ovate-conical with the apex nearly pointed, narrowly umbilicate and short-rimate, colorless whitish ; whorls four to four and a half, well rounded with deep suture, the last large, rounded at the base ; surface with very slight irregular striæ, apex without striæ, microscopically rugulose ; aperture rather large, well rounded, peristome sharp, not everted, with the ends somewhat approximate, palate with a very slight crest close to and parallel with the margin, inside with a very slight callus or none ; lamellæ and folds : parietal rather large, nearly simple, columellar medium, an inferior columellar near the base, or wanting ; the two principal palatals. Soft parts not examined. Alt. 1.2, diam. 1 mm. (other exs. 1.0 : 0.9).

Hab.: Woods, north of Geneva, Ashtabula Co., Ohio. Type : No. 1990, collection of North Am. Pupidæ.

This *Bifidaria* is near *tappaniana* Adams, but differs from that species as follows : it is much smaller, more conical, the whorls are less in number, more rapidly increasing, more convex, the last is comparatively larger ; there is no callus in the palate or a very slight one, the palatal folds are longer and there are no secondary ones (as supra- and interpalatal).

It was a surprise to find a new *Bifidaria* in this part of the country, and it appears that the (three) specimens on hand represent a distinct species. If not closely examined, they have the appearance of young or half grown of some other species, and probably were overlooked, partly due to the habit of most Bifidarias of this group of covering their shells with dirt.

PUBLICATIONS RECEIVED.

Report on the Turton Collection of South African Marine Mollusks, with additional notes on other South African shells contained in the United States Museum. By Paul Bartsch. U. S. Nat. Mus. Bull. 91 Pp. xii + 305, 54 plates. The basis of this report was a collection made by Lieut. Col. W. H. Turton, late Royal Engineers, at Port Alfred. This collection, made on the beach within 10 miles of the village, without dredging, contained 721 species. Other South African materials, notably the shells collected by William Stimpson on the North Pacific Exploring Expedition, in 1853, have also been studied. Although Mr. E. A. Smith, Mr. Geo. B. Sowerby and others have described many species from this fauna in the past few years, Dr. Bartsch found over 200 new species to define. All are well figured. New descriptions and figures are given of many briefly described species of Gould, from the type-specimens.

A list is given of nearly 1500 species reported from South Africa, not contained in the National Museum, with the suggestion that the specimens should be compared with material from the type localities of the several species, as he has found, in many instances, that South African shells which have been identified with species of other regions, are not specifically the same, though superficially similar.

A full bibliography is given, references to literature being omitted in the text.

The large number of new forms described and figured, with the full census of previous records, give this work a high value for those concerned with the South African marine fauna. It must become their book for constant reference, as Krauss's classic, "Die Südafrikanischen Mollusken" was for a former generation of mollusk students.

H. A. P.

Molluscan World. Compiled by C. R. Orcutt. 208+62 pp., 8vo, San Diego, 1915. This is a collection of records, descriptions and notes from a multitude of sources. With the exception of a list of shells found by the author around Hartland, Vermont (pp. 1–6), it is confined to species of California, Baja

California and the Rocky Mountain States, and may be regarded as a supplement to Carpenter's collection of papers on West American Mollusks. It is not arranged systematically but an index enables one to find any species.

H. A. P.

NOTES

A Stain for Radulae.—In many of the small mollusks it is difficult to make out the exact shape of the teeth on the radula because of their transparency. Moreover, a radula mounted in balsam becomes almost invisible in a short time. I have found that the radula may be readily stained without injuring the teeth of even the most delicate forms and without loosening them from the lingual ribbon.

For the marine forms, place the radula in a saturate aqueous solution of potassium bichromate for from five to fifteen minutes. However, the radula may remain in the stain without injury for an indefinite period. One radula left in this solution for three months was not harmed in the least. After staining, wash well in water and mount in balsam.

Land and freshwater forms cannot be handled in this way. For these a five per cent. solution of chromic acid works admirably. Place the radula on a slide, cover with four or five drops of the acid, and heat until the acid precipitates at the edge of the drop. If heated too long, the teeth may become detached from the lingual ribbon. Wash in water and mount in balsam.

These stains seem permanent in balsam, specimens so prepared having kept for eight months without fading, while specimens in glycerine jelly fade in a month or two. Though I presume other stains for radulae are known, these appear to be practical both in the simplicity of the process and the permanency of the stain.—Shields Warren.

A New Variety of Cypræa.—*Cypræa undata buttoni, n. v.* White, ornamented with three zigzag zones of chestnut, showing fine hair lines of chestnut between the zones ; sides and base white ; anterior extremity edged dark chestnut. Length, .50 to .75 inch.

Fiji Islands. It is named in honor of Mr. F. L. Button of Oakland, who has made a study of *Cypræa* and *Trivia*. The type is in the Stanford Collection.—IDA S. OLDROYD.

THE DATES OF PUBLICATION OF THE AMERICAN MARINE CONCHOLOGY, BY TIMOTHY A. CONRAD.—In the library of the Boston Society of Natural History are parts 1 to 3 of this work in their original dull yellow (probably somewhat faded) covers. Part one or No. 1, was published April, 1831. With this part was issued the title-page, with precisely the same wording and type except that on the cover the date, April, 1831, and No. 1, appear in the upper left and right hand corners, while on the title page the date (1831) only is at the bottom of the page. No. 1 contains pages 1 to 12 and plates 1 and 2. No. 2 was published September, 1831 (date at the bottom of the cover page) ; it contains pages 13 to 28 and plates 3 to 5. No 3 was published in May, 1832 (also dated at the bottom of the cover page) ; it contains pages 29 to 40 and plates 6 to 8. The entire work contains 72 pages and 17 colored plates. It would be of interest to know just when pages 41 to 72 appeared : if in two parts with the same interval between, the last part would have appeared in 1833. The above makes the date of publication for *Cardita borealis* 1832, while *Lyonsia hyalina* and *Lepton fabagella* would probably have the same date.—C. W. JOHNSON.

THE CONCHOLOGICAL MUSEUM.—Mr. Y. Hirase has recently published another interesting album of his Conchological Museum. The 30 excellent illustrations show clearly the enormous amount of work he has accomplished and its great diversity in order to make the exhibit both popular and instructive. Nowhere in the world are the economic and artistic applications of the Mollusca so fully exhibited.

With the Album is sent an "Application for aid." For those in sympathy with his work and who wish to support his Museum, "The Supporting Club of the Hirase Conchological Museum has been formed, the dues per year are : Supporting member \$2.50. Special supporting member \$5.00. Life membership \$30.00."

THE NAUTILUS.

VOL. XXIX. FEBRUARY, 1916. No. 10

COLLECTING AT NANTUCKET AND MARTHA'S VINEYARD.

BY REV. HENRY W. WINKLEY.

Helix hortensis has been recorded from both of these islands. My visit gave these results—At the town of Nantucket the species occurs sparingly in gardens, and abundant in the older cemeteries. It has a fondness for marble grave stones, especially in shady places. No banded forms occur in the town, but both white and yellow colors occur. In one cemetery I found white in one colony, and yellow a few rods away. The specimens from this island are all small, about ¾ the diameter of those from the coast of Maine.

Knowing there was a colony at Siasconset, seven miles away, at the eastern shore of the island, we drove over to examine a farm where I was told they occurred. I searched the place with negative results. Knowing their propensity for grave stones I asked the farmer's daughter if there was a cemetery at "Sconset". She didn't know the meaning of the word so I said burying ground. Oh yes! she said, half a mile down that road is where we pick blackberries. So I depended on my instinct and eventually located plain and five-banded forms near the shore. At Marthas Vineyard we lodged at Edgartown, but *H. hortensis* was not there, so we took an auto trip and examined cemeteries, woods, bushes etc., at Oak Bluffs, Vineyard Haven, Tisbury, Chilmark and Gay Head. I found no trace of it, but did get *Succinea ovalis* in one spot. I have in my cabinet a few specimens from Indian shell-heaps at Edgartown gathered some years ago by Rev. Geo. D. Reed; but that spot is now covered with cottages. Diligent inquiry of the natives failed to reveal the hiding place of *H. hortensis.* Though two men assured me they had seen it, when they gave their descriptions I concluded one had found hermit crabs and the other fiddler crabs. Some people lacks "eddication."

Dredging and dip-net work revealed a few interesting facts. In Nantucket harbor *Odostomia seminuda* is large and abundant, while other Odostomias are scarce. The opposite is the rule at Woods Hole. *Crepidula fornicata* is exceedingly abundant. Every haul of the dredge brings up many clusters of from ten to twenty specimens clinging to each other.

Katama Bay, near Edgartown, is an interesting dredging ground. Results there were similar to Nantucket. The species found at Nantucket are:

Crepidula fornicata,
Crepidula plana,
Busycon canaliculatus,
Busycon carica,
Venus mercenaria,
Arca transversa,
Anomia simplex,
Odostomia seminuda,
Odostomia bartschi,
Odostomia bisuturalis,
P. (Syrnola) producta,
Nucula proxima,
Montacuta planulata,
Chaetopleura apiculata,
Nassa trivittata,
Astyris lunata,
Anachis avara,
Bittium nigrum,
Melampus lineatus,
Tornatina canaliculata,
Bela plicata,
Cingula minuta,
Cerithiopsis terebralis,
Lacuna vincta,
Turbonilla winkleyi,
Turbonilla nivea,
Turbonilla vinae,
Turbonilla elegantula.

At Katama Bay, Martha's Vineyard:

Crepidula fornicata,
Callocardia morrhuana,
Venus mercenaria,
Anomia simplex,
Laevicardium mortoni,
Tagelus gibbus,
Odostomia seminuda,
P. (Syrnola) producta,
Nucula proxima,
Nucula lateralis,
Tellina tenera,
Chaetopleura apiculata,
Nassa trivittata,
Astyris lunata,
Bittium nigrum,
Tornatina canaliculata,
Bela plicata,
Cerithiopsis terebralis,
Eupleura caudata,
Busycon carica,
Haminea solitaria,
Turbonilla winkleyi,
Turbonilla elegantula.

NEW SPECIES OF AMNICOLA FROM NEW MEXICO AND UTAH.

BY HENRY A. PILSBRY.

Amnicola neomexicana n. sp.

The shell is very small, minutely perforate, globose, corneous, rather solid. Surface smooth, not glossy. Whorls 3, moderately convex, the suture not deeply impressed. Aperture ovate, strongly oblique, angular above. Peristome continuous, the outer margin regularly arched, inner margin straight, slightly thickened. Length 1.6, diam. 1.3 mm.; longest axis of aperture about 1 mm.

Socorro, New Mexico, in warm springs. Types no. 121,113 in the Wheatley collection, deposited in Mus. A. N. S. P.

This species, known by many specimens, is smaller than *Amnicola micrococcus*, with a narrow aperture, straight inner lip and less impressed suture. Nearly all of the shells are eroded, the spire being deeply corroded in fully adult individuals. This gives an abrupt outline of the suture, in front view.

Amnicola deserta n. sp.

The shell is very small, perforate, broadly ovate, corneous, translucent, thin; surface glossy, very minutely marked with delicate growth-lines. The outlines of the spire are convex, the apex somewhat pointed. Whorls 3½, strongly convex, the last more rapidly descending close to the aperture. The aperture is ovate, somewhat oblique, angular above. Peristome continuous and free from the preceding whorl. Length 2.4, diam. 1.7 mm.; longest axis of aperture 1.25 mm. Length 2.2, diam. 1.6 mm.

Washington Co., Utah. Types no. 121,112, Wheatley collection, in coll. A. N. S. P.

This little shell resembles the larger *Bythinella palomasensis*, from Lake Palomas in northern Chihuahua (Nautilus IX, 68, Oct., 1895; Dall, Proc. U. S. Nat. Mus. XIX, 1897, p. 369, pl. 31, fig. 9). The present species is broader, and evidently old individuals are smaller. The generic position is uncertain. As between a short *Paludestrina* and a long *Amnicola* there is little choice.

Washington county is in the southwestern angle of Utah, drained by the Virgin river, flowing into the Colorado. The specimens are "dead" shells, but not fossil, I think. According to the label, *Oreohelix strigosa* was found in the same place. The collector was not given for this or the preceding.

All of the adult specimens of *A. deserta* have the last whorl shortly free at the aperture. It is a senile form, probably extinct or on the verge of extinction. *Amnicolidæ* lead a precarious existence in the arid states. The rivers do not afford suitable stations. They have apparently never gained access to the small perennial streams of the higher mountains; and permanent springs and streams are so rare on the lower levels that the colonies are small, few and widely separated. The large proportion of extremely diminutive species in the arid region is remarkable. It may, perhaps, be looked upon as a permanent dwarfing due to unfavorable conditions.

Figures of both species have been prepared, to be published on a future plate.

TWO NEW BIVALVE SHELLS FROM URUGUAY.

BY WM. H. DALL.

In a small collection of shells from Uruguay recently received, among the marine bivalves were the following species which appear to be undescribed.

GLYCYMERIS DIAPHORUS n. sp.

Shell subcircular when young, in the adult higher than wide; the outer surface nearly smooth, with faint indications of obsolete radial ribs; the color whitish with reddish brown spots or small maculations; beaks small, not prominent, prosocoelus; the subumbonal area inequilaterally triangular, the anterior portion very short in proportion to the posterior, about 1 to 3, crossed by seven or eight diverging grooves and ridges; height of the area about one-fifth its length in the adult; hinge with ten or twelve teeth on each side, separated by a striated space; in the adult a large part of the posterior series may be obsolete or absent; anterior dorsal slope long and nearly straight, the posterior short and rounded; interior smooth, the muscular scars prominent, the anterior more rounded than the other; basal margin with ten or twelve crenulations in the adult, more in the young; lateral margins smooth. Height of adult 38; breadth 35; diameter 18 mm.

Shell heap near Montevideo, Uruguay. U. S. N. Museum, No. 215083. Coll. Felippone No. 556.

Though the valves received are not fresh, they show the color markings. The most characteristic features of the species are the narrow umbonal angle (100°) and unusually inequilateral umbonal area, recalling the conditions in some species of *Limopsis.*

CALLOCARDIA (AGRIODESMA) FELIPPONEI n. sp.

Shell most closely resembling *C. morrhuana* Linsley (+ *C. convexa* Say) of the New England coast, and best described by a differential diagnosis from that well-known species. Surface of the present species similar in color, texture, and concentric sculpture; form more triangular, the umbones smaller, the anterior dorsal slope more depressed, the lunule somewhat longer; the posterior slope longer and less roundly arcuated into the less arcuated basal margin; the ligament markedly shorter, the hinge teeth larger and heavier; the pallial sinus similar in form and length but somewhat wider; the beaks appear more prominent, and the posterior cardinal tooth in both valves is relatively much larger and stronger.

Height of typical specimen 40; length 50; diameter 27 mm.

Maldonado, Uruguay; U. S. N. Mus. No. 215082. Coll. Felippone, No. 582.

Young specimens of this species were collected by the U. S. Fish Commission Steamer Albatross in 59 fathoms, mud, off Rio de Janeiro; the bottom temperature 57° F. These were referred to *C. aresta* Dall, of my Porto Rico report, not being old enough to display the differential characters. There is a thin, dirty grey, dehiscent periostracum on the present species.

The species is named in honor of Dr. Florentine Felippone of Montevideo, who has devoted much time to the study of the Natural History of Uruguay.

PLEUROBEMA LEWISII (LEA).

BY BRYANT WALKER.

As the result of some recent correspondence between Mr. L. S. Frierson and the writer, it has become evident that the synonymy, in which this species was included by Simpson in his Synopsis and Descriptive Catalogue, will have to be revised. We are both of the opinion that this species is entitled to specific recognition for the following reasons.

The synonymy given by Simpson is briefly this :

1834. *Unio mytilloides* var. Conrad. Type locality, Alabama River.

1834. *Unio cor* Conrad. From the Elk and Flint rivers, Ala.

1861. *Unio crapulus* Lea. Type locality, Etowah River, Ga.

1861. *Unio lewisii* Lea. Type locality, Coosa River, Ala.

Just what Conrad's *mytilloides* var. was, is not certain. If it was not a *Pleurobema*, it is entirely immaterial what it was so far as the species under consideration is concerned. But it was apparently a *Pleurobema* from the Alabama River. If so, it is equally immaterial what it was, so far as nomenclatorial purposes are concerned. In 1820 Rafinesque described a species from the Wabash as *Pleurobema mytilloides*. As in the case of so many of the species described by this author, there has always been an element of uncertainty as to what his species really was. By a general concensus of opinion among the earlier students of American *Unionidæ*, it was considered to be the same as the species subsequently described by Lea as *Unio pyramidatus*. Dr. Lea, himself, gave it doubtful recognition as a valid species and placed it near *pyramidatus* in his Synopsis. Simpson states that, in his opinion, the shells under this name in the Lea collection are an elongated form of *pyramidatus*. Conrad in his Synopsis of 1853 considered it a synonym of Lamarck's *clava*. It is quite probable that he was entirely correct in this disposition of this species, which would be a very satisfactory solution of the problem. It seems to be reasonably certain, however, that it was either *clava* Lam. or *pyramidatus* Lea. According to Dr. Ortmann, *pyramidatus* Lea is a *Pleurobema* and not a *Quadrula*. But even this is immaterial, if Rafinesque's species can be satisfactorily identified as either of those species. If *mytilloides* Raf. is the same as *clava* Lam., it disappears in the synonymy. If it is the *pyramidatus* Lea, it would take precedence of that species. But in either event, and that is the important point here, the specific name *mytilloides* can not be used again for a different species of *Pleurobema*. So that, although Conrad's *mytilloides* was described as an *Unio*, his name, even if the species is clearly identified, can not be used if his type was a *Pleurobema*.

The shells, on which Conrad based his *Unio cor*, came from the Elk and Flint rivers, Ala. Both of these streams are tributaries of the Tennessee River. It is probable that the form described by Conrad as *cor* represents some species also described by Lea. Mr. Frierson has investigated that question (NAUTILUS, Jan., 1916, p. 102). But whatever *U. cor* is, it is quite clear that it is not the same as either of Lea's species, *crapulus* or *lewisii*. With the great increase in recent years of our knowledge of the faunas of the Alabama and Tennessee drainage systems, it has become more and more evident that there are very few species of *Pleurobema* that are common to both systems. The fauna of the Tennessee has been very thoroughly worked over and there can be no doubt that there is no species in that fauna that can by any approximation be referred to either of Lea's species.

The elimination of *cor* from further consideration leaves the two species from the Alabama system to be dealt with. Assuming, for the purposes of the argument, that they are synonymous, what name shall be used? Both were described in the same paper, but *crapulus* has page precedence. This, however, under the Code (see NAUT. xxviii, p. 125), is immaterial. I am of the opinion that precedence should be given to the name of *lewisii* for the following reasons:

1. The *lewisii* Lea is a well-defined and well-known species of the Coosa, and there can be no doubt as to what it is.

2. Lea's *crapulus* came from the Etowah River, Ga., and was described from a single specimen. It does not seem to have been found by any of the recent collectors. While it may be

an absolute synonym of *lewisii*, on the other hand, in view of the well-known variation of the species of this genus in the different rivers of the Alabama system, it is quite possible that it may be varietally or even specifically distinct. Its final position in the system must necessarily await its re-discovery in sufficient quantity to enable its standing to be definitely determined. If its accidental page priority were to be recognized, it would leave the specific type a matter of uncertainty for an indefinite period.

3. By adopting *lewisii* as the specific name, Dr. Lea's intention to perpetuate the memory of one of the leading conchologists of his time will be effective.

In view of these considerations and assuming the two forms to be synonymous, I select *Unio lewisii* Lea as the specific type.

The synonym, therefore, would be as follows:

PLEUROBEMA LEWISII (Lea).

1861. *Unio lewisii* Lea, Pr. Ac. Nat. Sci. Phila., p. 40.

1862. *Unio lewisii* Lea, Jl. Ac. Nat. Sci. Phila., v, p. 71, pl. vii, fig. 220; Obs., viii, p. 75, pl. viii, fig. 220.

1861. ? *Unio crapulus* Lea, Pr. Ac. Nat. Sci. Phila., p. 39.

1866. ? *Unio crapulus* Lea, Jl. Ac. Nat. Sci. vi, p. 42, pl. xv, fig. 40.

1867. ? *Unio crapulus* Lea, Obs., xi, p. 46, pl. xv, fig. 40.

1900. *Pleurobema cor* Simpson, Syn., p. 754 (not of Conrad).

1914. *Pleurobema cor* Simpson, Desc. Cat., p. 765 (not of Conrad).

NOTE.—The foregoing article was received before the publication of that on *U. cor* in the January number. Most of the matter relating to *cor* has therefore been eliminated.—EDS.

ANODONTA DANIELSI LEA IN COLORADO.

BY MAX M. ELLIS.

While collecting fishes during October in Black Wolf Creek, a tributary of the Arikaree River in eastern Colorado, a large, isolated colony of bivalves was discovered, specimens from which have been identified by Mr. Bryant Walker as *Anodonta danielsi* Lea. This collection constitutes the first record of this species from Colorado. The only other species of *Anodonta* known to occur in Colorado is *Anodonta grandis*, listed from two localities, Lodgepole Creek in the extreme northeastern corner of the state and a reservoir about 30 miles north of Denver. (Henderson, Mollusca Colo. 1912).

The stream, Black Wolf Creek, is a small, rapid, spring-fed brook, about seven miles long and averaging two feet wide during low water. It joins the Arikaree River about eight miles from the Colorado-Nebraska line. As the Arikaree River frequently goes dry in Colorado during the summer months, Black Wolf Creek which carries water throughout the year from its small springs, is left an isolated unit during these dry seasons. The bottom of this stream is coarse sand or fine gravel except in the backwaters upstream from the two artificial dams which have been placed across the stream to deflect water for irrigation purposes. Back of each of these dams the stream widens to 20 feet or more for a distance of several hundred yards, in which portions of the stream the water averages four feet in depth. In this quiet water the fine blue clay carried by the stream has been deposited on the bottom in a compact layer about 20 inches thick.

The colony *Anodonta danielsi* was found in the deep water back of the upper dam on Black Wolf Creek, which is located about two and one-half miles north and a little west of the Indian battleground known as Beecher's Island. This dam is little more than a low mud wall and it has not increased materially the depth of the water in a naturally deeper portion of the stream. This fact together with the finding of large numbers of broken shells on and in the banks of the stream where they had been carried by mammals, and the absence of shells in the deep water back of the lower dam (a more elaborate wall which has changed the water-level back of it) suggests that the colony found has been established for a long time. The individuals were very abundant, often six or more large adults occurring in a space a foot square. Each shell was securely buried in the dense blue clay so that a rather strong pull was required to loosen it, and the projecting siphonal portion was usually covered with soft silt.

The one hundred specimens collected at random from this colony were very uniform in size. A typical shell has the following measurements: length, 140 mm.; height from margin to hinge, 80 mm.; diameter, 55 mm.; thickness of the individual valve, 2 mm. A comparison of these measurements with those given by Simpson (Cat. p. 428, 1914) for this species shows the average Colorado specimen to be almost one-half longer than specimens from the type locality, Topeka, Kansas. Moreover, a few shells from Black Wolf Creek are 180 mm. long. Only a few juvenile specimens were found, the smallest of these measuring 70 mm. in length. These small specimens are of a brilliant green color and have a more or less definite pattern of rays. The adult shells were a rich, pitchy black when first taken from the water and as dried and cleaned specimens they have a polished or varnished appearance. The umbonal half of each valve is black or greenish black, and the marginal half a bistre brown, the color transition between the two portions of the shell being rather abrupt. The soft parts of the adults were also highly colored, among the individuals collected two forms not correlated with sex, were evident: a bright salmon-pink type and a dull chocolate-brown type.

While cleaning the shells it was noted that most of the females were distended with eggs. Many shells contained large irregular pearls, several of which were at least 15 mm. in length. These pearls were invariably irregular and more or less attached to the shell. Although their lustre was excellent, showing a good deposit of lime, they were very frail. Several were opened and found to contain masses of blue clay like that in which the mussels themselves were found. Ranchers living along Black Wolf Creek told of several freshets during the past three years which swept out numbers of shells from the deep water back of dam. It is possible that these mud pearls may have been caused by the sudden introduction of mud into the shells during these floods.

It may be added that there is a large specimen of *Anodonta* in the Museum of the University of Colorado marked *Anodonta* *grandis*, which is one of a few collected about 30 miles north of Denver. This shell, which is 160 mm. long and 100 mm. high, and the specimens from Black Wolf Creek were compared, as *Anodonta danielsi* is a member of the *Anodonta grandis* group. The oral end of this *Anodonta grandis* is rather abruptly truncated, the same portion of the eastern Colorado shells being broadly rounded; the umbonal region is reddish brown shading to almost black along the margin of the valve, the shell as a whole lacking the greenish cast so evident in the specimens from Black Wolf Creek; and the *Anodonta grandis* shell is more inflated and broader than the others. The umbonal sculpture of this *Anodonta grandis* and of the *Anodonta danielsi* from Black Wolf Creek seemed identical, and the contour of the siphonal end of each valve is the same for both species.

Department of Biology,
University of Colorado.

NOTES.

Appetite of Euglandina.—M. L. Vignal gives an interesting account of the behavior of *Glandina guttata* C. & F. from Mexico kept alive and under observation for some time (Bull. Soc. Nat. d'Acclimatation, Nov. 1915, pp. 344-349). Ordinarily a large *Glandina* ate an adult *Helix aspersa* every 2 or 3 days. Between June 6 and Aug. 28 (1911) it devoured 28 *Helix aspersa*, weighing, without the shell 121 grams (about 65½ ozs.) Five Glandinas ate 102 *Helix variabilis* and 7 *H. nemoralis* in 17 days, an average of over 6 per day for the five.

Note on Cæcilioides.—In 1907 the writer proposed a group *Cæcilianopsis* to include the very small *Cæcilioides* of tropical America, *C. iota* (C. B. Ad.), *C. consobrina* (Orb.) and their varieties (See Manual of Conchology XX, p. 38). Not expecting to find a land snail in a book dealing with marines, I overlooked the publication by De Folin of *Karolus primus*, a minute shell found at Vera Cruz (Les Fonds de la Mer I, p. 182, 189, pl. 26, fig. 7, 8; 1870). This is evidently identical with *C. consobrina veracruzensis* (Crosse & Fischer), 1877. As the name is prior, the eastern Mexican race will be called *Cæcilioides consobrina prima* (De Folin); and the subgenus *Cæcilianopsis* will be replaced by *Karolus* De Folin. So far as I know, *Karolus* has not been noticed by any author since its publication. In Scudder's Nomenclator and the Zool. Record Index it is referred to as a genus of Hym [enoptera].—H. A. Pilsbry.

PUBLICATIONS RECEIVED.

Fauna of New England, 13, List of the Mollusca, by Charles W. Johnson (Occ. Pap. Boston Soc. Nat. Hist., Vol. VII). 231 pp., Dec., 1915. The 200-fathom line has been taken as defining the seaward limit of the New England area, as the 100-fathom contour would exclude part of the Gulf of Maine. 710 species and subspecies are listed, of which 450 are marine. Probably about 80 per cent. of these are deep-water species. There are 80 species and subspecies of land shells, 83 fresh water gastropods, and 6 *Auriculidæ*. The *Unionidæ* number 26, Sphaeriidæ 65. References are given to the original descriptions, and to New England records. Type-locality is given, and the New England distribution in detail. The nomenclature has been brought up to date, a valuable feature, which will be appreciated by many naturalists beyond the limits of New England, since the information could only be obtained elsewhere by consulting a great number of books and papers, abounding in conflicting use of names. The localities given include all published records, and many not before in print, from the collections of the author and his associates.

Mr. Johnson's List is a valuable addition to the catalogues of New England animals which the Boston Society is publishing. It should be in the library of every working conchologist. It may be obtained from the Society, price $1.00.—H. A. P.

THE NAUTILUS.

VOL. XXIX. MARCH, 1916. No. 11

MOLLUSKS OF GENEVA, OHIO.

BY V. STERKI.

About a mile and a half north of Geneva, Ashtabula county, Ohio, in the northeast corner of the state, and about three miles from Lake Erie, there are some low woods, an ancient lake-bottom land. The soil is a sandy clay, and at some places mucky. During spring, the lower parts are more or less covered with water; in summer, the soil often becomes dry as a bone, for weeks and even months.

From 1909 to 1915, I had chances to do more or less collecting there every year, and at various seasons. The following list may be of some interest, for being approximately complete, and for some notes on ecology, etc. Some species found on the open land near those woods, and originally part of them, are added and marked with a *. The species are numbered for easy reference.

1. *Gastrodonta intertexta* Binney, common especially at low places where *Sphærium occidentale* and *Succinea ovalis* are living, and on which probably they are principally feeding.
2. *Zonitoides arboreus* Say, common.
3. *Z. minusculus* Binney, frequent.
4. *Z. exiguus* Stimpson, common at some places.
5. *Z. milium* Morse, scarce.
6. *Omphalina fuliginosa* Griffith, not common, and apparently quite scarce in the last years.

7. *O. inornata* Say, frequent.—Some years ago I found a specimen of *Polygyra thyroides* in the body whorl of which there were two *O. inornata*, on opposite sides, entered through holes made in the shell; inside of the apical whorls of the same was one *Gastrod. intertexta*; all had been feeding there, and of the victim's body only a few scant remnants were left.

8. *Hyalina* [*Vitrea*] *indentata* Say, not common.

9. *H. radiatula* Alder (*hammonis Ström.*), not rare.

10. *H. wheatleyi* Bland, not rare.

11. *H. ferrea* Morse, not rare.

12. *H. multidentata* Binney, rather common.

13. *Euconulus chersinus*, common.

14. *E. sterkii* Dall, scarce.

15. *Agriolimax campestris*, common.

16. **A. agrestis* Linné, in a brick yard near by.

17. *Circinaria concava* Say, common.

18. *Helicodiscus lineatus* Say, not rare.

19. *Patula* [*Pyramidula*] *alternata* Say, common.

20. *P. perspectiva* Say, rather common.

21. **P. cronkhitei anthonyi* Pilsbry, not in the woods, but outside.

22. *Punctum pygm um* Draparnaud, common.

23. *Sphyradium edentulum* Drap., rare.

24. *Polygyra albolabris* Say, rather scarce.

25. *P. zaleta* Binney, very rare; only one living specimen and a dead shell were found, of a form much larger than the one generally known.

26. *P. thyroides* Say, common, large, with thin shell and lip, and of brownish color, rather different from those found on limestone soil. Repeatedly they were found gathered on and around old ash heaps from brush fires.

27. *P. palliata* Say, not common.

28. *P. tridentata* Say, common.

29. *P. monodon fraterna* Say, scarce.

30. *P. hirsuta* Say, rather common.

31. *Philomycus carolinensis* Bosc., rather common.

32. *Ph. ohioensis* St., MS., a single specimen.

NOTE : In 1900, I found two specimens of this near Chippewa

Lake, Medina Co., O., and then looked for others in vain, for over a dozen years. It is evidently none of the described species; the jaw and radula are different from those of both *carolinensis* and *dorsalis*, but the jaw is more like that of the former, without strong ribs. The other parts of the anatomy have not been examined, and so it remained unpublished. The body, when extended, is about 28 mm. long, slender; the dorsum is tan-colored, without any markings.

33. *Ph. dorsalis* Binney, not scarce.

34. *Strobilops labyrinthicus* Say, rare.

35.* *Vallonia pulchella* Müller, not in the woods, common around a barn near by.

36.* *V. excentrica* Sterki, with the preceding.

37. *Bifidaria contracta* Say, common.

38. *B. pentodon* Say, common; variable with respect to the apertural lamellæ and folds.

39. *B. minuta* Sterki; for description see page 105.

40. *B. corticaria* Say, scarce.

41. *Vertigo gouldii* Binney, not rare.

42. *V. ovata* Say, scarce.

43. *V. elatior* Sterkii, scarce. Appears to be distinct from *ventricosa*, to judge by material from a number of States.

44. *V. tridentata* Wolf, rare.

45. *V. milium* Gould, rather scarce.

46. *Cionella lubrica* Müller, rather scarce.

47. *Succinea ovalis* Say, common.

48. *S. retusa* Lea, scarce.

49. *S. avara* Say, scarce.

50. *Carychium exiguum* Say, scarce.

51. *C. exile* H. C. Lea, common.

52. *Lymnæa parva* Lea, scarce.

a. * *L. parva sterkii* F. C. Baker (probably, according to F. C. Baker); ditch, outside.

53. *L.*——? (small, slender, probably immature), two specimens in siftings, with land snails.

54. *Planorbis trivolvis* Say, in a permanent pool, or small pond.

55. *P. exacutus* Say, pools (with 61), not rare.

56. *Segmentina armigera* Say, rather scarce, but found living, under dead leaves, even after prolonged drought.

57. *Physa gyrina* Say, rather scarce, a small form, under the same conditions as 56 and 60; a larger form is common in a drainage ditch, outside, which is usually dry in summer except after heavy rains.

58. *Aplexa hypnorum* Linné, with 61, scarce, small; one specimen was found with 53.

59. *Amnicola cincinnatiensis* Lea, one dead shell was found in a small ditch (with 52 a), far away from a creek.

60. *Sphærium occidentale amphibium* St., common at lower places in the woods; even after the ground has been dry for weeks, these mussels are found living, at all stages of growth; not found with 61!

61. *Musculium truncatum* Linsley, frequent in pools where water lasts longer, but which are usually dry during summer.

62. * *Pisidium abditum* Haldeman, not rare in the ditch mentioned under 57.

It appears to be worth noting that some species have not been found, which should be expected at such a place rather than many of those listed, e. g. *Zonitoides nitidus*, *Enconulus fulvus*, *Polygyra multilineata*, *Bifidaria tappaniana*.

NOTES ON MOLLUSCA OF CENTRAL MONTANA.

BY S. STILLMAN BERRY,

Redlands, California.

Some two years ago I published in the NAUTILUS (vol. 26, pp. 130-131) a short list of mollusks taken at Winnecook, Meagher County, Montana. Having had occasion to visit the same locality, and hence the opportunity to make further collections, every summer since, it now seems worth while not only to record the additional species which have been found, but to revise the first list in its entirety. A fairly good idea may be gained of the way the various species run by the numbers of specimens taken, recorded in parentheses after each species. In 1914 I kept a fairly accurate census of the living specimens collected (first number in parenthesis), and in 1915 did the same for the drift specimens, and these figures indicate fairly well the relative abundance of the different forms. All this drift material (listed in the second number in parenthesis) was taken from three quarts, gross measure, or one and a half pounds of fine flotsam, scooped up from one little pocket on the bank of the Musselshell River.

Mollusca of Winnecook, Montana.

Vallonia costata montana Sterki (88 ; 390).
Pyramidula cronkhitei (Newc.) (68 ; 98).
Vitrea hammonis (Ström.) (5 ; 22).
Zonitoides arborea (Say) (70 ; 15).
Zonitoides minuscula (Binn.) (0 ; 41).
Euconulus fulvus (Müll.) (12 ; 4).
Agriolimax campestris (Binn.) (7 ; 0).
Pupilla blandi (Morse) (0 ; 4).
Vertigo binneyana Sterki (7 ; 81).
Vertigo ovata (Say) (0 ; 1).
Cochlicopa lubrica (Müll.) (8 ; 14).
Succinea avara Say (1 ; 9).
Succinea oregonensis Lea (1 ; 0).
Succinea retusa Lea (21 ; 0).
Lymnaea caperata Say (unrecorded ; 12).
Lymnaea palustris Müll. (unrecorded ; 1).
Lymnaea parva Lea (0 ; 19).
Planorbis antrosus Conrad (taken in 1914).
Planorbis parvus Say (0 ; 11).
Planorbis umbilicatellus Ckll. (0 ; 10).
Physa gyrina Say (taken 1914).
Aplexa hypnorum (Linn.) (taken 1914).

The list brings out a somewhat curious mingling of eastern and western forms at a point which is well to the eastward of the Continental Divide. The intimate association of apparently typical *Succinea oregonensis* (a characteristic western species) with equally representative *S. avara* in the self-same *swale* is very interesting.

The *Euconulus* are *E. fulvus* all right, but a few of the specimens furnish at least an approach to the *alaskensis* of Pilsbry.

Vallonia costata montana has been by all odds the most abundant species taken. Mr. Vanatta kindly compared some of the Winnecook shells with Sterki's types of this form in the collection of the Philadelphia Academy, so that the identification seems a comfortably certain one. He writes that "the smallest-sized Vallonia are just about the size of the types," so that it would appear that Sterki's specimens were not characteristic in size or represented a somewhat smaller race.

The single *Planorbis*, previously reported with considerable doubt as *P. callioglyptus* Vanatta, was also sent to Mr. Vanatta. He was unable to confirm the identification, so that the species is here rejected from the list. The specimen is probably too young for safe determination.

Despite diligent search I have as yet discovered not a single mussel shell in the Musselshell River. I one day picked up a single worn and minute fragment on the shore, and that is all.

Mollusca of Oxford, Montana:

In a small stream called Elk Creek at a point about one mile south of Oxford Station, Meagher County, the following species were taken in the month of June, 1914 and 1915.

Pisidium compressum Prime.
Pisidium compressum laevigatum Sterki.
Planorbis parvus Say.
Physa gyrina Say (very large).
Lymnaea caperata Say.
Lymnaea obrussa Say.
Lymnaea palustris Müller.
Lymnaea parva Lea.
Vallonia costata montana Sterki (dead).

Swimming Woman Creek Canyon.

On July 4, 1914, a very brief visit to Swimming Woman Creek Canyon in the Big Snowy Mountains resulted in the following collection:

	East wall	Canyon floor
Vallonia costata montana Sterki	30	5
Thysanophora ingersolli convexior Ancey (dead)	14	—
Oreohelix cooperi berryi Pilsbry. . . .	55	—
Pyramidula cronkhitei (Newcomb) . . .	2	2
Zonitoides arborea (Say) (very large) . .	6	1
Euconulus fulvus (Müller)	7	3
Vitrina alaskana Dall (dead)	2	2
Pupilla muscorum (Linn.) (dead) . . .	1	—
Vertigo modesta parietalis Ancey (dead) . .	4	—

The *Euconulus* seem to me for the most part intermediate between typical *fulvus* and *alaskensis*. They could perhaps be classified with equal exactitude either way.

The *Oreohelices* listed are members of a very small race described in a recent number of this periodical by Pilsbry (NAUTILUS vol. 29, p. 48), but it is so much the most conspicuous snail of the region that such figures of population as those given in the above columns indicate the relative abundance of all the smaller forms in a very unsatisfactory way. I doubt very much whether *Oreohelix* actually does replace *Vallonia* as the most abundant snail, even at this altitude. Live shells of both were fairly common, and dead ones abundant all over the eastern wall of the canyon at the spot visited, occurring at or near the surface among the mass of small loose rock and shrubbery which covered the slope. The other species, where so noted, were in the same situation, while those taken on the floor of the canyon were found under sticks and small logs in rather moist situations along the creek.

The locality for both slope and floor is jnst within the mouth of the canyon, and is probably just south of the present county line. If so, this would bring it into Musselshell County and not Fergus, as stated in the original description of *O. c. berryi.*

I am unable to find that any previous collecting has been done either in the Big Snowies or the neighboring ranges, but Mr. Robert Wellington brought me a few specimens of a larger and more typical race of *Oreohelix cooperi* from near the head of Neil Canyon, on the same side of the range as the present locality, but some miles to the westward.

It might be added that I have taken *Planorbis antrosus*, *Physa gyrina*, and *Lymnaea caperata* in some abundance in the pools and ditches along the river bottom at Harlowton, Montana.

I am indebted to Mr. Frank C. Baker for determinations of the *Lymnaeidae* mentioned in this article : to Mr. E. G. Vanatta for various help in verifying and comparing specimens ; and likewise to Dr. H. A. Pilsbry and Mr. George H. Clapp.

REVERSED OR SINISTRAL SHELLS.

BY F. A. SAMPSON.

In NAUTILUS, vol. ix., 1895, p. 94, Prof. Wetherby told of three reversed shells which had belonged to him. A *P. thyroides* and a *P. multilineata* he had given to John G. Anthony for the Cambridge collection, and at that time he had another *thyroides* in his collection. He did not give the locality of the shells, but as he had formerly lived at Cincinnati, it is probable that the shells were from that neighborhood. He knew of a third *thyroides* collected near Cincinnati by Mr. Stannage, and of a *mitchelliana* collected by Prof. F. W. Bryant near the same place. Dr. Lewis had an *albolabris* in his collection.

In NAUTILUS, vol. x, January, 1897, p. 104, C. F. Ancey gave a list of 21 sinistral specimens of shells that were normally dextral. Only two of them were American—*Polygyra thyroides* from Connecticut, and *Campeloma decisum* from New York.

In the February number of the same volume Pilsbry reported that he had a collection of *Campeloma decisum* made by W. W. Jefferis, of Philadelphia, collected at Fort Edward on the Hudson River, New York, examined for sinistral shells, and among

681 specimens from one-fourth to full size there was no sinistral shell, but of 410 uterine young three were sinistral.

A note from Jennie E. Letson in NAUTILUS, vol. xi, July, 1897, page 33, stated that the collection of about a hundred species of *Ampullaria* in the Philadelphia Academy of Natural Sciences had only one sinstral shell, and that was *A. conica* Wood, but she did not state the locality of it.

In NAUTILUS, vol. v, page 83, Leslie M. Cockerell of Norwood, San Miguel County, Colorado, reported a sinistral *Patula cooperi*. Pilsbry added a note that while this was a rare malformation in America, it occurred more frequently with this than in most species, and that several cases were on record.

F. C. Baker in "The Lymnæidæ of North and Middle America," says that a sinistral Lymnæa is rarely found. A *Galba obrussa* was found in the collection of Henry Hemphill, and a *Galba palustris* in the collection of Dr. W. A. Nason.

I have in my collection two sinistral shells of *Campeloma subsolidum*, from Flat creek, in Pettis County, Missouri, and a *Pyramidula alternata* Say, from near Columbia, Mo. This is the first sinistral land shell I have ever found.

In the neighborhood of this town I have found more abnormal crinoids, than in all other localities combined ; but whatever the causes may have been to produce these malformations, they have not noticeably operated to produce abnormal shells.

Columbia, Mo.

MOLLUSKS OF ANAHEIM BAY, CALIFORNIA.

BY E. P. CHACE.

I am enclosing a list of shells that were collected at Anaheim Landing by myself and wife with a little help at times, the shells being all in my collection. I have done no dredging and think that if I did I would add several species to the list. The total length of shore included in the collecting is less than $3\frac{1}{2}$ miles, about $\frac{1}{2}$ being in the bay and the rest ocean beach, and no rocks in sight within 4 to 5 miles.

Collected at Anaheim Bay.

Acanthina spirata, Blainville
Alectrion fossata, Gld.
Alectrion mendica cooperi, Fbs.,
Alectrion perpinguis, Gld.
Arcularia tegula, Rve.
Bullaria gouldiana, Pils.
Calliostoma gemmulatum, Cpr.
Calliostoma tricolor, Gabb.
Cerithidea californica, Hald.
Cerithiopsis carpenteri, Bartsch.
Cerithiopsis pedroana, Bartsch.
Columbella gausapata, Gld.
Columbella gausapata carinata, Hds.
Conus californicus Hds.
Crepidula onyx rugosa, Nutt.
Crucibulum spinosum, Sby.
Haminea vesicula, Gld.
Littorina scutulata, Gld.
Lucapina crenulata, Sby.
Lucapinella calliomarginata, Cpr.
Melampus olivaceus, Cpr.
Olivella biplicata, Sby.
Olivella pedroana, Cpr.
Phasianella compta, Gld.
Polynices lewisii, Gld.
Polynices recluziana, Desh.

In the vicinity of the Bay:

Cardium quadragenarum, Conr.
Cardium substriatum, Conr.
Chione fluctifraga, Sby.
Chione succincta, Val.
Chione undatella, Sby.
Cooperella subdiaphana, Cpr.
Diplodonta orbella, Gld.
Donax californica, Conr.
Heterodonax bimaculatus, D'Orb.
Macoma indentata, Cpr.
Macoma nasuta, Conr.
Mactra californica, Conr.
Modiolus capax, Conr.
Ostraea lurida rufoides, Cpr.
Paphia staminea, Conr.
Paphia staminea laciniata, Cpr.
Pecten circularis aequisulcatus, Cpr.
Petricola denticulata, Sby.
Pholas pacifica, Stearns.
Platyodon cancellatus, Conr.
Psammobia californica.
Sanguinolaria nuttallii, Conr.
Saxidomas nuttallii, Conr.
Schizothaerus nuttallii, Conr.
Tagelus californianus, Conr.
Tagelus californianus subteres, Conr.
Tellina carpenteri, Dall.
Zirfaea gabbi, Tryon.

Collected alive, on the sandbars and beach near the entrance of the Bay.

Bursa californica.
Donax levigata, Desh.
Murex festivus, Hds.
Tivela crassatelloides, Conr.
Turris ophioderma, Dall.

Washed up on the beach after storms, alive or very fresh.

Amiantis callosa, Conr.
Chama exogyra, Conr.
Chama pellucida, Sby.
Cryptomya californica, Conr.
Glottidea albida, Hds.
Macoma secta, Conr.
Mactra hemphilli, Dall.
Mactra planulata.
Metis alta, Conr.
Modiolus flabellatus, Gld.
Modiolus rectus, Conr.
Paphia tenerrima, Cpr.
Periploma discus, Stearns.
Periploma planiuscula, Sby.
Siliqua lucida, Conr.
Solen rosaceus, Cpr.

Dead shells collected on the beach.

Bathytoma tryoniana.
Dentalium neohexagonum, S&P.
Epitonium hindsii, Cpr.
Sinum debilis, Gld.
Turritella cooperi, Cpr.
Epitonium bellastriatum, Cpr. (fragment).
Anomia peruviana (upper valves).
Labiosa undulata, Gld. (broken valves).
Mactra catilliformis, Conr.
Panopea generosa, Gld.
Pecten giganteus, Gray.
Thracia plicata.
Yoldia cooperi, Gabb. (valves only).

Collected on the piles of the bridge across the entrance of the Bay.

Acmaea patina, Esch.
Acmaea persona, Esch.
Littorina planaxis, Nutt.
Littorina scutulata, Gld.
Cypraea spadicea, Gray. (1 only)
Lasaea rubra, Mont.
Myrina diegensis, Dall.
Mytilus californianus, Conr.

Occasionally a rock washes in on the beach containing some Lithophagus plumula, Cpr. and Kellia laperousii, Desh. and the kelp brings in Acmaea incessa, Hds. Eulima (species undetermined) has been found in a kelp holdfast and a dead Polynices lewis with 7 Crepidula excavata, Brod. on it washed in after a storm.

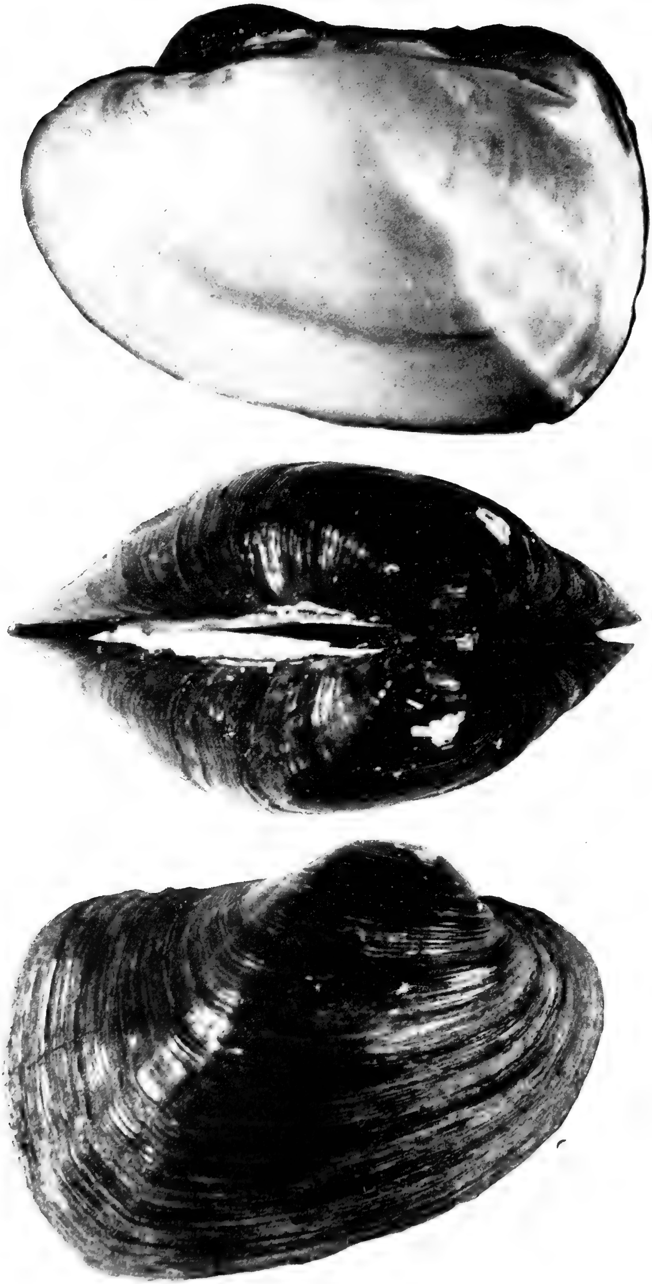
Most of the shells listed above were collected by Mr. and Mrs. E. P. Chace within the last three years. The others were collected by Mrs. J. E. Herbst, Valentine Herbst and Otto Keim, and were collected during the same period of time.

NOTES.

Oliva peruviana vadi, new name.—This is the brown variety of *Oliva peruviana* Lamarck, described in The Nautilus volume 24 (1911), p. 122 and also referred to in The Nautilus volume 29 (1915), p. 67 as *Oliva peruviana castanea* 'Ford' Johnson, from Peru; but it is not *Oliva flammulata castanea* Dautzenberg from West Africa, described in the Actes de la Société Linneenne de Bordeaux volume 64 (1910), p. 79. The name *castanea* 'Ford' Johnson being preoccupied by *castanea* Dautzenberg, I propose the name *vadi* for the Peruvian shell. The types are tray number 111703, in the collection of the Academy of Natural Sciences from Peru. This variety is figured in Reeve's Conchologia Iconica volume 6 (1850), Monograph of the genus *Oliva* plate 9 figure 14*c*., and also in Tryon's Manual of Conchology volume 5, plate 18, figure 57.—E. G. Vanatta.

PUBLICATIONS RECEIVED.

The Mollusca of Georgian Bay. By A. D. Robertson, B. A., University of Toronto. Contrib. to Canadian Biology, Fasciculus II, Ottawa, 1815, pp. 95–111 ; 3 plates. An interesting study of the forms of a restricted area. 37 species are listed from Go Home Bay, with notes on their stations and characters, especially such as seem correlated with the conditions of life. "In general the species of Mollusca exhibit great flexibility in their environmental relations. In many cases ecological selection is operative within broad limits, while in a few the environmental type is more or less specific. The chief factors in this selection appear to be (a) exposed or protected situation, (b) depth of water, (c) degree of aeration, (d) character of the bottom, and (e) food conditions. In the genus Lymnaea, the long-spired forms occur in the stagnant bays, while the short-spired ones inhabit rocky shores." Most of the species are illustrated on three excellent plates.



COKERIA SOUTHALLI MARSHALL.

THE NAUTILUS.

VOL. XXIX. APRIL, 1916. No. 12

A NEW GENUS AND SPECIES OF NAIAD FROM THE JAMES RIVER AT HURON, SOUTH DAKOTA.

BY WILLIAM B. MARSHALL.

COKERIA, new genus.

Characters those of the new species described below.

COKERIA SOUTHALLI, new species. Plate IV.

Shell gaping anteriorly, moderately thin, subquadrangular tending to subtriangular; abruptly rounded anteriorly, posterior margin nearly straight and perpendicular, dorsal margin straight, ventral margin gently curving throughout its entire length. Valves widest just in front of the posterior ventral angle. Umbones at about the anterior third of the dorsal margin, high and incurved, the second growth line nearly horizontal. Posterior dorsal ridge very high, obtusely angular. Posterior area descending abruptly from the ridge and somewhat wing-like. Greatest inflation is along the umbonal ridge. A pronounced furrow extends from the umbo to the lower third of the posterior margin. Seven rest-periods distinctly marked by concentric dark lines. Anteriorly from the middle portion a bold rounded rib occurs just below each rest-period. Dorsal area faintly radiately striate. Color, varying shades of chestnut, lighter (nearly straw color) anteriorly, darker posteriorly, rest stages sharply defined by blackish lines. Umbonal region faintly tinged with greenish. Periostracum thin, slightly glossy, closely adhering.

Nacre anteriorly lustrous white and thickened, posteriorly thin, violaceous and brilliantly iridescent. Pallial line not sharply defined and with several concentric striae above it, its anterior portion radiately striated. Anterior adductor and retractor scars separated, deep and rough, posterior scars superficial. Dorsal muscle scars concealed by the incurving of the upper portion of the valve.

Lateral tooth of right valve thin, very high, wing-like, striated longitudinally. Laterals of left valve similar to that of right valve, but smaller, the groove between them being very narrow. Pseudocardinals of right valve two, thin, opposite, the upper one being the stronger. Pseudocardinals of right valve coalescing, standing in the same straight line, the anterior one high, slightly curved, the posterior low, its summit irregularly crenulated. The sculpture of each umbo consists of four concentric ridges, highest (almost a nodule) at their posterior ends, and numerous concentric striæ.

The type U. S. National Museum, Cat. No. 215130 comes from the James River at Huron, South Dakota, and was collected by the U. S. Bureau of Fisheries. It measures : Length, 81 mm. ; Height 53 mm. ; Diameter 44 mm.

Robert E. Coker and John B. Southall, both of the U. S. Bureau of Fisheries, first called attention to this shell in their "Description of Shell found in the James River at Huron, S. Dak., July 27, 1913,"[1] in which the shell is described and figured, with the following statement :—"Characteristic features of the shell are its triangular or pyramidal form and its remarkable inflation, which are strongly suggestive of the inflated types of *L. luteola ;* its compressed sharp teeth which are of the *Lampsilis* type to an extreme ; the color of epidermis and characteristic color of nacre, which find correspondence only in species of *Quadrula*, especially in *Quadrula undulata.* The pyramidal shape of the shell is also suggestive of *Q. undulata.* It is not

[1] "Mussel resources in tributaries of the Upper Missouri River" in Rep. U. S. Commissioner of Fisheries for 1914 (1915).

possible at the present time to place the specimen in any described genus.''

The resemblance to *L. luteolus* is remote and is confined to the character of the teeth. The resemblance to *Quadrula undulata* is more intimate. The undulations of the umbones are of the *Quadrula* type and of course entirely different from the double-looped, fine, wavy undulations of *luteolus.* The teeth are as different from those of *Quadrula* as the undulations of the umbones are different from *Lampsilis*, and consequently the shell cannot belong to either of those genera. There seems to be no possibility that the shell can be a smooth *Q. undulata* nor a hybrid of *L. luteolus* and *Q. undulata* and consequently it requires a new generic name.

LAND-SHELLS FROM ANAFE HILL IN THE HAVANA PROVINCE, CUBA.

JOHN B. HENDERSON.

The Havana province has been so much exploited by naturalists it could hardly be expected to offer any more novelties to a conchologist. On the contrary it appears to yield almost as much in the way of new species as does any other and larger province of the island,—and this, too, despite a denser population, a minimum of forest, a greater relative area under cultivation and an insignificant mountain system. So rich is this state in numbers of species, the many Cuban naturalists who have lived in or near Havana and three generations of visiting collectors who have ransacked the province, have not yet exhausted it of its treasures. Doctor Torre has quite a formidable collection of novelties from Madruga and its neighboring hills, and what is even more remarkable, a new sinistral Urocoptis from the golf-course of the country club scarcely more than without the city limits of Havana. Upon my return to Havana after roughing it in the wilds of remote Cuba I always detect a twinkle in Dr. Torre's eye as he matches my hard-won discoveries with equally interesting ones from, as it would seem, his very back yard.

The reason for all this is obvious. Havana province is all limestone and the mountain system that once occupied it and developed its rich fauna is now reduced to a number of isolated hills,—large, small and tiny, each standing alone and harboring a little faunula of its own of more or less modified species. One of the larger of these hills is in the northwest corner of the province (near Guanajay) and hardly an hour's ride by trolley from the city of Havana. It is about five hundred feet high, about a mile long, of limestone and well wooded. Its name is "Loma de Anafe,"—the word "loma" meaning *hill.* Barring a few dead shells gathered there recently and sent to Dr. Torre by a friend, I know of no mollusk records from it. Out of curiosity, and in a holiday spirit, I visited it last fall. The morning was given to the south side and the base; the afternoon to the top and to a deep gorge that fairly splits the hill on the north side,—called *La Barranca.* Within the deep gorge, with its precipitous walls and lush tropic vegetation and its generally wild aspect, it is hard to realize that the smoke of Havana is in sight above the eastern horizon.

The following list of land-shells from Anafe show a very typical Havana province assembage of names with just a suggestion of Pinar del Rio in the *Chondropoma ottonis.* Those with a "B" indicate the Barranca, or gorge, of the north side, while "S" indicates the south front :

Thysanophora boothiana Pfr. (S).
Thysanophora selenina Gld. (S).
Thysanophora saxicola Pfr. (S).
Thysanophora stigmatica Pfr. (B).
Pleurodonte (Thel.) auricoma Fer (S).
Cepolis (Jeann.) multistriata Desh (S, B).
Cepolis (Cyst.) cubensis Pfr. (S).
Liguus fasciatus Müll (western form of the Organ Mts. (S).
Urocoptis cyclostoma anafensis, n. subsp. (B).
Urocoptis poeyana Orb (S).
Microceramus perconicus anafensis, n. f. (S).

Oleacina o. straminea Desh. (S, B).
Oleacina solidula Pfr. (S, B).
Oleacina incisa Pfr. (B).
Rectoleacina suturalis Pfr. (S).
Varicella (Pich.) gracillima Pfr. (S)
Varicella (Pich.) acuticostata horrida Pils. (B).
Helicina adspersa Pfr. (S, B).
Emoda submarginata Gray (B).
Alcadia minima Pfr. (S).
Alcadia rotunda Orb. (var.) (B).
Eutrochatella sloanei Orb. (S, B).
Eutrochatella rupestris Pfr. (S).
Eutrochatella conica Pfr. (S, B).
Proserpina depressa Orb. (B).
Megalomastoma apertum Poey (B).
Chondropoma poeyanum Orb. (S).
Chondropoma (?) n. sp.? (B).
Chondropoma ottonis Pfr. (S, B).
Ctenopoma rugulosum Pfr. (S, B).
Ctenopoma nodulatum Poey (B).

Had I gathered some dirt in proper places several minute species could no doubt have been added.

The subspecies *anafensis* of *Urocoptis cyclostoma* differs from type only in the riblets. The number of these is about the same, but instead of "threadlike" they resemble little knife-blades projecting up from the whorl and with their sharp edges more or less bent forwards in the direction of the shell growth. They are oblique as in the type but describe a double curve from suture to suture.

The form *anafensis* of Pilsbry's *Microceramus perconicus* is smaller, with narrower, more convex whorls, and somewhat flatter base.

The *Chondropoma* left without a specific name is a puzzle. It belongs to the *peoyanum-pfeifferianum-pictum* complex with certain peculiar characters of each, the facies of all, but is not any one of the lot—or all of them. The reflected peristome is the trouble. I dare not name it.

NOTE ON THE MARGINELLA VARIA OF SOWERBY.

BY J. R. LE B. TOMLIN.

This species was originally described in the Proc. Zool. Soc. Lond. 1846, p. 97 (not p. 47 as stated by[1] Redfield) and figured the same year in the *Thesaurus* vol. I, p. 390, pl. 76, figs. 137–141. Sowerby gives the W. Indies and Belieze (*sic*) as localities, but there is no clue as to his types.

There can be no doubt, however, that, of his four figures, 138, 139 and 140 represent three color varieties of the ubiquitous West Indian *M. avena* Kiener (ex Valenciennes MS.), while fig. 141 as obviously depicts *M. albolineata* Orb. This has been generally recognized, as for example by Redfield, Jousseaume and Tryon.

The name *varia* Sow., has, however, for many years—probably on Carpenter's initiative—been[2] applied to a well-known Californian shell.

Tryon[3] indeed considers that this West Coast species is identical with *albolineata* Orb. from the West Indies, but I have no hesitation in rejecting this identification, and I do not think that it has ever found much evidence. The specimen which he figures is the true *albolineata* Orb.

I wondered at one time whether[4] *M. fasciata* Sow. could be the west-coast shell, but a careful study of the description and figure leads me unhesitatingly to endorse Tryon's surmise and to refer it to *M. mustelina* Angas. *M. fasciata* Sow. (*rubrifasciata* Jouss.[5]) was described from unknown locality on "specimens in the British Museum," but the types are no longer there and are presumably lost.

I propose, therefore, to give the name of *M. californica* to the Californian species which has so long passed as *varia* Sow.

The type specimen, which is in my own collection, may be

[1] Amer. Journ. Conch. VI, p. 214.

[2] Cf. Keep's West Coast Shells, p. 43.

[3] Manual, vol. V, p. 55, pl. 13, f. 37.

[4] Thesaurus, vol. I, p. 389, pl. 76, f. 142.

[5] Rev. et Mag. de Zool., 1875, p. 221.

briefly described as follows: Shell subcylindrical, smooth, vitreous and polished, yellowish white, variously banded with chestnut; spire short and completely glazed over; whorls 4½; aperture narrow, dilated, below; columella sinuous, obliquely truncate, with 4 fairly strong oblique plaits; outer lip thickened without; suture marked by a narrow white line.

Length 9 mm.; diam. max. 4.5 mm.; length of aperture 7 mm. I have selected as type the form with 3 broad chestnut bands on body whorl—the uppermost band being rather narrower than the other two—as this corresponds most nearly with the usual coloration of *Marg. albolineata* Orb.

M. varia Sow., quoted by Deshayes from Réunion, must of course have been a misidentification. According to von Martens it was in reality *M. lienardi* Jouss., but I should be inclined to suggest *M. sordida* Reeve. In Reeve's description of this last "triplicata" is an error for "quadriplicata," judging from the presumable type in the Brit. Mus.

ON SOME ILL-UNDERSTOOD OREOHELICES.

BY HENRY A. PILSBRY.

OREOHELIX HAYDENI UTAHENSIS (Hemphill).

This form has a somewhat complicated history. The first notice is contained in a letter from Mr. Henry Hemphill, quoted by Mr. Binney in "A Second Supplement to the fifth volume of the Terrestrial Air-breathing Mollusks of the United States," Bull. Mus. Comp. Zool. XIII, No. 2, p. 30 (Dec., 1886). The account reads:

"I then returned to Salt Lake City, and crossed the valley to the west, camping on the west side of a range called the Oquirrh Mountains. Here commenced a series of finds that was quite exciting and very interesting to me. At the foot of the mountain my attention was attracted to a pile of detached rock, usually a good place for snails. After a few moments' work among these stones I was rewarded by finding quite a number

[1] Conchyl. de l'Ile de Réunion, p. 136.

[2] Beiträge zur Meeresfauna....Mauritius, p. 258.

of specimens of the variety I call *Utahensis.* (See p. 33.) This has the form of *Hemphilli*, but is destitute of the revolving ridges of *Haydeni.* The specimens were all constant in sculpturing, but varied very much in size and somewhat in form."

According to labels sent out with specimens at the time, Mr. Hemphill considered *utahensis* to be a variety of *hemphilli* Nc., but this does not appear in the printed account.

On page 33 of the same work (Second Supplement to Vol. V, T. M.), Binney gives the following account:

"Var. UTAHENSIS, Hemphill.

"For locality, see *ante* p. 30. This is a rough, coarse, carinated *strigosa*, figured in Terr. Moll., V, p. 158, fig. 66. The peristome is sometimes continuous by a heavy raised callus, connecting its terminations. It is sometimes smaller and more elevated."

It appears from both of these extracts that the *type locality* of var. *utahensis* is the Oquirrh Mountains, in Utah, west of Salt Lake City. The diagnosis of the form given in Hemphill's letter leaves much to be desired. Even with the type locality, the form could hardly be recognized with certainty without specimens from the author. Yet in the absence of any competing name for the same form, we may accept Hemphill's notes as a description, since they are accurate as far as they go.

Binney, while reiterating Hemphill's locality, introduced confusion by referring to fig. 66 of Terr. Moll. V (same cut was reprinted as fig. 154, in Man. Amer. Land Shells), and adding characters from the shell that cut represents. This fig. 66 was originally published in Land and Fresh-Water Shells of N. A., part I, p. 78, figs. 135, 137, with the note, "It is sometimes strongly carinated, and the peristome is sometimes made continuous by the heavy, raised callus connecting its extremities." At this time (1869) no shells were known from the Oquirrh Mountains. The figures in question were drawn from a shell from the Big Horn Mts., in northern central Wyoming, collected by the geologist F. V. Hayden. This shell was collected in quantity, and there are specimens from the same source (and also received through Binney) in the collections of the Academy of Natural Sciences, the National Museum, and the American

Museum of Natural History. While resembling the smoothest examples of var. *utahensis*, this shell from the Big Horn Mountains is certainly a distinct species from the Oquirrh shell. It is the species to be described below as *Oreohelix strigosa magnicornu.*

Var. *utahensis* Hemph. should stand, I believe, as *O. haydeni utahensis.* It has very much the shape of *O. hemphilli*, but differs by the *much less convex* whorls of the embryonic shell. It is typically without spiral sculpture on the last whorl, but some of Hemphill's specimens show widely spaced spiral beaded lines, making a transition to var. *gabbiana* Hemph. A typical specimen, without spirals on the last whorl, measures, alt. 10, diam. 16.5 mm. (No. 23051 A. N. S. P. collected by Hemphill).

On account of the variability of the Oquirrh shells, I have some doubt whether, with larger collections, it will be possible to recognize more than one subspecies of *O. haydeni* in that range, in which case I would select the name *O. h. oquirrhensis* to cover all. Mr. Hemphill recognized in the Oquirrh varieties *utahensis*, *oquirrhensis*, and *gabbiana*, also "typical *haydeni*," and on his labels he called some *H. hemphilli.* Until we have adequate collections it may be possible to define three races in the Oquirrh range, but certainly not five.

The synonymy of *Oreohelix haydeni utahensis* will stand thus:
[*Patula strigosa* var.] *Utahensis* HEMPHILL, in Binney, Second Suppl. Terr. Moll. V., p. 30.

[*Patula strigosa*] var. *Utahensis* Hemphill BINNEY, t. c., p. 33 (locality, but not figure cited or description given); see Man. Conch. viii, p. 118, pl. 42, figs. 10, 11.

Binney's paragraph under "*Patula strigosa*, var. *Utahensis*, Hemphill" in the fourth Supplement, 1892, p. 173, is largely a repetition, and excepting for his reference to the Second Supplement, it belongs to *O. s. magnicornu.*

OREOHELIX STRIGOSA MAGNICORNU, n. subsp.

The shell is solid, the first $3\frac{1}{2}$ whorls but slightly convex, pale brown with a faint darker spiral band (or none), the later whorls nearly white (the shell being more or less bleached).

Last whorl carinate in front, the carina weakening to an angle on the last ⅔ whorl, very weak near the outer lip; deeply descending in front. Sculpture of fine, low growth-lines on the early whorls, the last 1½ having coarse, irregular but low growth-lines. Aperture shortly oval, the peristome continuous as a short, raised ledge across the parietal wall.

Alt. 11, diam. 18 mm.; width of umbilicus 3.5 mm.

Big Horn Canyon, Big Horn Mts., Wyoming. Type and cotypes no. 1907 A. N. S. P., from the A. D. Brown collection.

Three lots of this species have been in the collection for many years, one of them collected by F. V. Hayden, the others probably from the same source, though the labels do not state the collector. They are certainly distinct from any of the named subspecies and forms.

Although now fully described for the first time, this form has been figured and noticed in several publications. The synonymy will stand thus :

Helix cooperi W. G. Binney, Land and Fresh-water Shells of N. A., I, 1869, p. 78, figs. 135, 137.

Patula cooperi W. G. B., Terr. Moll. Vol. V, 1878, p. 158, fig. 66.

Patula strigosa Gould, W. G. B., Man. Amer. Land Shells, 1885, p. 166, fig. 154.

[*Patula strigosa*] Var. *Utahensis* Hemphill, W. G. Binney, Second Suppl. Terr. Moll. Vol. V, 1886, p. 33 (exclusive of reference to p. 30).

Patula strigosa var. *Utahensis* Hemphill, W. G. Binney, Fourth Suppl. T. M. Vol. V, 1892, p. 173 (exclusive of reference to Second Suppl., p. 30).

These references all contain substantially the same descriptive matter, and the same figures. Both originated in the wo k of 1869, and were afterwards reprinted with a change of the specific name.

Oreohelix cooperi (W. G. B.)

It may be noted that the basal views in figs. 152 and 153, on page 166 of Manual Amer. Land Shells, were tranposed. The umbilical view of *O. cooperi*, fig. 152, was placed under fig. 153, which is a form of *O. strigosa depressa*, and vice versa. The same mistake appeared in Terr. Moll. V, p. 158, figs. 64, 65.

NOTES.

EDIBILITY OF POLYGYRA AND ARIOLIMAX.—A native New-Englander told me that he and others ate *Polygyra albolabris* (Say) at Plymouth, Massachusetts. He likened the taste to lobster.

I have learned of *Ariolimax columbianus* (Gld.) being eaten in Polk County, Oregon, by a German, and in Clark County, Washington, by a family from Artois in France. The latter washed these slugs in water containing vinegar to remove the slime, which they said was bitter, then cleaned them like fish, and fried them in butter. They found the flavor good.

Snakes eat *Ariolimax columbianus.* Large, conspicuous and often very abundant, it must need some protection from birds. This is probably afforded by its copious and sticky slime. Domestic ducks attack this slug; but the slime inconveniences them and is said sometimes to cause their death by accumulating in their bills.—JOHN A. ALLEN, Manzanita, Oregon.

FLORIDA SHELLS.—Mr. Morgan Hebard collected a small quantity of leaf-mould at Brickell's Hammock, Miami, Florida, on March 2 and 4, 1916, from which I picked *Euconulus sterkii* Dall. This is an addition to the list of Miami shells published by Mr. S. N. Rhoads in the NAUTILUS, xiii, p. 43 (1899).

The following species were picked from the leaf-mould which Mr. Hebard collected on February 29 and March 2, 1916, at Snapper Creek, about 15 miles south of Cocoanut Grove, Dade County, Florida:

Helicina orbiculata Say.
Thysanophora selenina Gld.
Thysanophora plagioptycha Shutt.
Thysanophora diosocricola Ad.
Praticolella jejuna Say.
Drymæus dominicus Rve.
Bifidaria contracta Say.
Vertigo milium Gld.
Opeas micra Orb.
Varicella gracillima floridana Pils.
Polita dalliana "Simps." Pils.
Polita indentata Say.
Euconulus sterkii Dall.
Guppya gundlachi Pfr. (The typical form.)
Zonitoides arborea Say.
Zonitoides minuscula Binn.
Zonitoides singleyana Pils.
Carychium exiguum Say.

All these shells are in the collection of the Academy of Natural Sciences of Philadelphia.—E. G. VANATTA.

The table of Winnecook, Montana, Mollusca, which was offered in my paper in the March *Nautilus* (p. 125), suffered editorial deletion of two of its original columns of data.[1] From the list as printed it would appear that my subsequent note on the coincident occurrence of *Succinea oregonensis* and *S. avara* was based on the discovery of but a single specimen of each. It should be stated that in 1913 both species were found living together in some numbers. The specimens differed with absolute uniformity in both animal and shell and there were no intergrades.

On p. 127 occurs a *lapsus calami* of my own: July 4, *1915* is the correct date for the collection in Swimming Woman Creek Canyon.—S. S. BERRY.

CYPRAEA VENUSTA var. BAKERI, Western Australia, and C. MILIARIS var. GABRIELI, Northern Territory, Australia, are new cowries described and figured by Mr. J. H. Gatliff, in The Victorian Naturalist for February, pp. 147-149.

Mr. Frank C. Baker, Zoological Investigator for the New York State College of Forestry at Syracuse University, addressed the Syracuse Chapter of the Society of Sigma Xi on February 25; his subject was "The Relation of Mollusks to Fish in Oneida Lake." The address embodied an outline of the biological survey carried on during the fall of 1915 by Doctor C. C. Adams, Professor T. L. Hankinson and Mr. Baker, the object sought being to ascertain the fitness of this largest of New York's inland lakes for the maintenance of fish fauna. At this meeting of the Society, Mr. Baker was installed as an active member of the Syracuse Chapter of Sigma Xi.

[1] The two columns deleted merely recorded the species taken in two years preceding those in the printed record, without indication as to abundance, association or any other data. As all appeared also in the subsequent records the Editors failed to see their importance.

THE

NAUTILUS

A MONTHLY JOURNAL
DEVOTED TO THE INTERESTS OF
CONCHOLOGISTS

VOL. XXX

MAY, 1916, to APRIL, 1917

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INDEX

TO

THE NAUTILUS, XXX

INDEX TO TITLES, GENERA AND SPECIES.

INDEX TO AUTHORS.

THE NAUTILUS.

VOL. XXX. MAY, 1916. NO. 1

NOTES ON THE CALIFORNIAN SPECIES OF ADULA.

BY WILLIAM HEALEY DALL.

The genus *Botula* was proposed by Mörch. in 1853, in the second part of the Yoldi catalogue, page 55, for *Modiola vagina* Lamarck and *M. fusca* Gmelin, the latter better known as *M. cinamomea* Lamarck.

The former seems not to differ materially from the typical Modioli except in its less arcuate form, and the latter by its small size, incurved umbones and boring habit must be relied on to carry the genus if it is valid. The group now under consideration differs but little from *Botula* so typified, the species grading from one to another so as to nearly bridge the gap between *Botula* and *Lithophaga*. It can hardly rank higher than a subgenus at most.

The subgenus *Adula* was proposed by the brothers Adams in December, 1857, in their "Genera of Recent Mollusca," for the single species *Mytilus soleniformis* of Orbigny, 1846, from Payta, Peru.

The generic name was used again in 1861, by Henry Adams for a *Planorbis*, probably by inadvertence.

The typical species of *Adula* differs from those of the California coast by having more nearly central umbones, if Orbigny's figure can be relied upon.

The earliest of the Californian species to be noticed was :

ADULA CALIFORNIENSIS Philippi.

Modiola californiensis (Esch. ms.) Philippi, Zeitschr. Mal. for 1847, p. 113. California, Eschscholtz.

Adula stylina Carpenter, Rep. Brit. Assoc. for 1863, p. 644, 1864; Ann. Mag. Nat. Hist., 3rd ser., vol. 14, p. 425, Dec. 1864; Smithsonian reprint, p. 237, 1872. Neeah Bay, Wash.

Modiola (Lithophagus) schmidtii Schrenck, Amurl. Moll., p. 500, pl. 21, figs. 4–7, Oct. 1867. West coast of Sakhalin Island, Sea of Tartary.

Adula californiensis Dunker, Conch. Cab., neue Ausg., viii, pt. 3, *Lithophaga*, p. 22, pl. 5, fig. 19, 1882; Index Moll. Mar. Japan, 1882, p. 227.

Distribution. Neeah Bay, Wash. to San Diego, Cal., Northern Japan and the Sea of Tartary.

This species is shorter than *A. falcata*, and destitute of the of fine transverse surface sculpture which in the latter recalls that of some species of *Lithophaga*. It is slender, with the radial ridges rather emphasized and the shell substance has usually more or less dark bluish coloration.

The posterior dorsal area (where it has not been cleaned off by a collector or dealer) has a more or less velvety pile, such as is often found on Modiolas, underneath which the periostracum has a brilliant polish. The umbones in the adult are invariably eroded. The Japanese specimens, received from Hirasé, are quite identical with those from California.

ADULA DIEGENSIS Dall.

Modiolus diegensis Dall, NAUTILUS, xxiv, No. 10, Feb. 1911, p. 110. San Diego, Cal. (young shells).

Distribution. San Francisco Bay to San Diego, and Cape St. Lucas.

The young specimens of this species are apparently free-living and have less of the arcuation found in the last species, which is a borer.

The adult shell has the posterior portion much more capacious than in *A. californiensis*, nearly twice as wide and high as in specimens of the latter of the same length. The color seems variable. The young shells described by me were dark bluish, the adults later received from Mrs. E. P. Chace were brownish. The relations of this group to *Myrina* remain to be cleared up.

ADULA FALCATA Gould.

Lithodomus falcatus Gould, Proc. Boston Soc. N. Hist. iv, p. 92, Nov. 1851; Monterey, Cal.; Gulf of Cal. Shells, Apr. 1852, p. 30, pl. 6, fig. 9.

Lithodomus grüneri Reeve, Conch. Icon. *Lithodomus*, 1857, pl. iii, fig. 12. "New Zealand" in error.

Lithodomus (*Lithophaga*) *falcatus* Gould, Otia. Conch., p. 213, 1862.

Adula falcata Dunker, Conch. Cab. neue Ausg., viii, pt. 3, *Lithophaga*, p. 22, pl. 4, figs. 1, 2, 1882.

Distribution. Straits of Fuca to San Diego, Cal., and southward, boring in indurated clay and soft sandstone.

This is the largest of the genus and distinguished from either of the other Californian species by its much greater length and the sculpture of the periostracum.

POLYGYRA BREVIPILA CHEROKEENSIS, NEW SUBSPECIES.

BY GEO. H. CLAPP.

Differs from typical *brevipila* (NAUTILUS, xx, p. 110) by its uniformly smaller size and darker color. In both these respects it resembles *cohuttensis*, for which it might be taken at first sight; but the form and details of apertural structures are almost exact reproductions, in miniature, of *brevipila*. At present, it seems better to regard the new form as a sub-species of *brevipila*, though a well marked one. The fact that it has been found in two localities, twenty miles apart, shows that it is not merely a dwarfed local variety. It should be remembered that nearly all the species of *Stenotremes* are markedly constant in size, even when they have a wide geographic range.

Diam. 7 mm. alt. 5 mm. whorls 5.

Type locality: near Pleasant Gap, Cherokee Co, Ala., "in a shady but dry ravine on the mountain side, about 1200 ft. generally under stones." Collected by Herbert H. Smith, Aug.

1915. A single specimen was found near Cave Spring, Floyd Co. Ga. about 20 miles N. E. of the Alabama locality. Types no. 7871 of my collection. Paratypes in collections of Academy of Nat. Sci., Philadelphia, Alabama Museum of Natural Hist., and cabinet of Dr. Bryant Walker.

Polygyra brevipila, *cherokeensis* and *cohuttensis* form an interesting and very natural group, differing from *stenotrema*, *hirsuta* and their allies by the continuous free lip and the shape of the lip notch. Other common characters are the fine, closely-set hairs and very convex, rounded body whorl. The fulcrum is long. The known localities are all in the southern extension of the Allegheny mountain range, from N. W. Georgia to central Alabama. All the species occur in wooded but rather dry ravines on mountain sides, and they commonly conceal themselves by clinging to the lower sides of stones. *Polygyra brevipila* was collected in such a ravine, about 2000 ft. above sea level ; *cohuttensis* at about 1500 ft. ; and *cherokeensis* at 1200 ft.

GONIOBASIS IN WESTERN PENNSYLVANIA.

BY H. A. PILSBRY.

Goniobasis pennsylvanica n. sp.

The shell is oblong-conic, rather solid, smooth ; periostracum strong and persistent, of a buffy citrine color. The spire is conic, with straight or slightly convex outlines, and is more or less eroded, the erosion beginning at an early age. The young up to a length of about 6 or 7 mm. are acutely carinate peripherally, the carina appearing as a welt or seam immediately above the suture on the spire ; after which the periphery becomes merely convex or somewhat flattened. The last whorl is large, tapering downward. Aperture more than half the total length, ovate ; outer lip very slightly sinuous, almost straight in profile view. Parietal callus rather thin.

Length 16.5, diam. 10, length aperture 10 mm.

Length 16, diam. 8.3, length aperture 9 mm.

Operculum with the nucleus at about the lower sixth of the total length.

Distribution.—Ohio river system in western Pennsylvania. Ohio River at Coraopolis (type locality; S. N. Rhoads, Sept. 1898); Neville Island, Allegheny Co.; Beaver River below Wampum (Rhoads); Allegheny River (E. A. Randall, 1868); Pittsburgh (H. S. Stupakoff, 1895). Type and cotypes No. 73954 A. N. S. P.

While related to *G. depygis* (Say) and *G. livescens* (Mke.), this species is readily known by its short spire, bright olivaceous yellow color and the strong, persistent cuticle. It was found in abundance by Mr. Rhoads, and was listed by him as *Goniobasis depygis* (NAUTILUS XII, April, 1899, p. 137). Though I have not seen the specimens, it is apparently what Dr. Ortmann catalogued as *Goniobasis translucens* Anth. (Proc. Amer. Philos. Soc., Vol. 52, 1913, p. 328). If so, it occurs as far upstream as Warren Co., Pa.

Some individuals have two rather wide carob-brown bands, occupying the middle of the spaces above and below the periphery. Sometimes there are narrow bands very near the suture and columella, the latter visible inside.

THE FRESH-WATER MOLLUSCA OF ONEIDA LAKE, NEW YORK.

BY FRANK C. BAKER.

Oneida Lake lies near the center of New York State in latitude 43° north and longitude 75° west. Oswego and Oneida counties border the lake on the north and Onondaga and Madison counties on the south. It is 27 miles southeast of Lake Ontario. The lake is oriented almost directly east and west, which is the longer axis, and is 21 miles in length by 5.50 miles in greatest width. The level of the lake is 369 feet above the sea or 124 feet above Lake Ontario. The greatest depth recorded is 55 feet, which occurs about one and a half miles southeast of Cleveland. The shores are relatively very low, as the lake is in the bed of an ancient glacial lake, lacking the bold character of the land in the vicinity of the Finger Lake region farther south, where lakes Cayuga, Seneca, etc., lie in preglacial rock-cut valleys. The general depression of the country immediately surrounding the lake produces low, swampy shores on many parts of the lake, especially at the east and west ends. Large swamp areas occur in Big Bay, Maple Bay, west of Constantia, and at the east end where Fish Creek enters the lake.

Oneida Lake is the largest inland body of water in the State, having an approximate area of 80 square miles and a shore line of approximately 65 miles. The areas bordering the shores are always shallow and usually deepen rather abruptly, forming in many places submerged terraces of greater or less width. These terraces are either sandy or bouldery in character, usually the latter, the rough water washing out the fine particles and removing them to the quieter bays and protected areas near the points. For this reason the points are always stony and bouldery and the bays sandy. A notable fact is the almost total absence of mud on the shores of the west end of the lake, mud areas being confined to a few small spots, principally at the mouth of small creeks. The shallow zones bordering the shores, 6 feet or less in depth, are from 200 to 1600 feet in width, and the approximate area of shallow water within the 6-foot contour is estimated to be upwards of $6\frac{4}{5}$ square miles or 8 per cent. of the entire area. This is significant when it is remembered that this shallow zone is nearly all covered with vegetation and is the area which supports all of the animal life and affords breeding grounds for the majority of the fishes in the lake. If we include the bottom area enclosed by the 12-foot contour, below which little or no vegetation lives, we find the total approximate area to be 8366 square acres (13 square miles), which afford feeding grounds for fish and other aquatic animals. The west end of the lake, which is the only part at present investigated, is very shallow, scarcely exceeding 20 feet in depth beyond Frenchman Island.

The noteworthy species are *Physa ancillaria warreniana*, *Planorbis binneyi*, and *Lymnæa stagnalis lillianæ*, which appear to be new records for the State. These species are common in Tomahawk Lake, Wisconsin, where they occupy habitats similar to those in Oneida Lake. This is an interesting case of distribution. *Acella haldemani*, *Bythinia tentaculata* and *Vivipara contectoides* add new localities to the State. The 10 species of Pisidia, 4 of which are still undetermined, is noteworthy. *Margaritana* had previously been reported from Oneida Lake and the record is now substantiated. A number of common species are reported for the first time from this general region. No list of Oneida Lake mollusks is known to the writer. Beauchamp, however, published an excellent list of the Mollusca of Onondaga County, some years ago, and this is the only paper on the mollusks of this region known to the writer. Further studies will doubtless raise the list to upwards of 100 species and races. Additions are to be expected in *Pisidium*, *Sphærium*, *Musculium*, *Amnicolidæ*, *Valvata*, *Physa*, and *Galba*.

The studies from which this list has been compiled have been carried on by the writer for the New York State College of Forestry at Syracuse University under the direction of Professor C. C. Adams, Forest Zoologist, for the purpose of ascertaining the relation of the molluscan fauna to the feeding habits and breeding grounds of the fish fauna of the lake, especially the food and game fish. Full information concerning the ecological associations and economic value of the mollusks recorded may be found in Technical Bulletin No. 4, now in press, published by the College of Forestry. The author is indebted to Dr. H. A. Pilsbry, Dr. V. Sterki, and Dr. Bryant Walker for assistance in determining critical molluscan material.

Class Pelecypoda

Family Unionidæ.

Lampsilis luteola (Lam.)
Lampsilis radiata (Gmelin)
Lampsilis borealis (Gray)
Lampsilis iris (Lea)
Nephronajas ligamentina (Lam.)
Strophitus edentulus (Say)
Strophitus undulatus (Say)
Anodonta cataracta Say.
Anodonta marginata Say.
Anodonta implicata Say.
Anodonta grandis Say.
Anodonta grandis footiana Lea.
Alasmidonta undulata (Say)
Elliptio complanatus (Dillwyn)

Family Margaritanidæ

Margaritana margaritifera (Linné)

Family Sphaeriidæ.

Sphærium striatinum (Lamarck)
Sphærium vermontanum Prime.
Musculium securis (Prime)
Musculium rosaceum (Prime)
Pisidium ferrugineum Prime.
Pisidium æquilaterale Prime.
Pisidium variabile Prime.
Pisidium compressum Prime.
Pisidium compressum lævigatum Sterki.
Pisidium henslowanum (Sheppard)
Pisidium, 4 undet. spp.

CLASS GASTROPODA.

Family Viviparidæ.

Vivipara contectoides W. G. Binney.
Campeloma decisum (Say)
Campeloma integrum (DeKay)

Family Amnicolidæ.

Amnicola limosa (Say)
Amnicola lustrica Pilsbry
Amnicola lustrica Pilsbry, variety
Somatogyrus subglobosus (Say)
Gillia altilis (Say)
Bythinia tentaculata (Linné)

Family Valvatidæ.

Valvata tricarinata (Say)
Valvata bicarinata normalis Walker

Family Pleuroceridæ.

Goniobasis livescens (Menke)

Family Physidæ.

Physa ancillaria warreniana (Lea)
Physa integra Haldeman.
Physa gyrina Say

Family Ancylidæ.

Ancylus tardus Say
Ancylus fuscus C. B. Adams.
Ancylus parallelus Haldeman.

Family Planorbidæ.

Planorbis trivolvis Say
Planorbis trivolvis Say, variety
Planorbis binneyi Tryon.
Planorbis antrosus Conrad.
Planorbis campanulatus Say.
Planorbis parvus Say.
Planorbis hirsutus Gould.
Planorbis exacuous Say.

Family Lymnaeidæ.

Lymnæa stagnalis lillianæ Baker.
Pseudosuccinea columella (Say)
Pseudosuccinea chalybea (Gould)
Acella haldemani (Deshayes)
Galba palustris (Mueller)
Galba catascopium (Say)
Galba emarginata (Say)

Family Succineidæ.

Succinea retusa Lea.
Succinea avara Say.

New York State College of Forestry,
Syracuse University.

PUBLICATIONS RECEIVED.

THE CRUISE OF THE TOMAS BARRERA: THE NARRATIVE OF A SCIENTIFIC EXPEDITION TO WESTERN CUBA AND THE COLORADOS REEFS, WITH OBSERVATIONS ON THE GEOLOGY, FAUNA AND FLORA OF THE REGION. By John B. Henderson.[1]—This is the narrative of a six weeks cruise during May and June, 1914, planned by the author with the advice of Dr. Carlos de la Torre of Havana. Other naturalists invited to join the party were Mr. George H. Clapp, Dr. Paul Bartsch, Mr. C. T. Simpson, Sr. Manuel Lesmes and Victor J. Rodriguez. Preparators and assistants, an amphibious *Patron* (Captain) and a crew of seven completed the party. The *Tomas Barrera* was 65-foot fishing schooner, and the route was to Cape San Antonio and return to Havana. Inland trips were made to Pan de Azucar, the Sierra de Viñales, Pan de Guajaibon and other places.

[1] Pp. 320; G. P. Putnam's Sons.

Several of the classics of natural history were inspired by tropical America, but so far as we remember, no nature book of interest to the general reader has taken Cuba, our nearest tropical neighbor, for its subject.

Although the author has special knowledge of mollusks, it is quite evident that he is first of all a lover of nature. Now it is the little Cuban tody which appeals to him, and again, a big luminous beetle or a marvelous palm. His description of the reef pools with their strange and beautiful families, of the wierd land crabs and their ways, and of collecting marine animals with a submarine electric light, stick in one's memory. What naturalist can read about the "Cove of delight" in the Viñales Sierra without longing to visit that wonderful region. The human interest which even the most vivid nature-book needs, is supplied by the adventures and misadventures of the party from day by day, and the contact with Cubans, for whom the author evidently has a sympathetic liking.

Thirty-seven full-page illustrations, charming Cuban views, and characteristic animals and plants, add much to the interest of the volume. The bird plates, by Fuertes, and those of coral-pool fishes, are in color.

Those who have been in the tropics will renew their thrills in Mr. Henderson's pages, while naturalists who have not had that experience as yet, may realize the conditions a naturalist finds among the sierras, "mogotes" and on the coral reefs of Cuba.—H. A. P.

Review of some Bivalve Shells of the group Anatinacea from the West Coast of America. By William Healey Dall (Proc. U. S. Nat. Mus. Vol. 49, Nov. 1915). Pending the appearance of a comprehensive work on the West American marine shells, the series of descriptive and revisionary papers by Doctor Dall is indispensable to working conchologists. The present one deals with a group which has been little studied on the West Coast. Six new species of *Thracia*, six of *Cyathodonta*, three *Kennerlyia*, one each of *Coelodon*, *Foveadens* and *Lyonsia* are described, several being from such well-known localities as Santa Barbara and San Diego Bay. Others are from points between Alaska and the Strait of Magellan, and one, *Cyathodonta cruziana*, from Santa Cruz, West Indies.

PRODROME OF A REVISION OF THE CHRYSODOMOID WHELKS OF THE BOREAL AND ARCTIC REGIONS. By W. H. Dall. (Proc. Biol. Soc. Washington, pp. 7, 8, Jan, 25. 1916). An extended and intricate subject is presented here in tabloid form. A few changes affecting well-known American species may be noted.

Chrysodomus dirus becomes *Searlesia dira* (Rve.).

Chrysodomus or *Sipho islandicus* and related species belong to the genus *Colus*.

Chrysodomus kelseyi becomes *Exilia kelseyi* (Dall).

REDISCOVERY OF POURTALES' HALIOTIS. By John B. Henderson. (Proc. U. S. Nat. Mus. Vol. 48, 1915). In 1869 Count Pourtales dredged a *Haliotis* in the Straits of Florida, which was subsequently destroyed in the Chicago fire. It was described from memory by Dr. Dall in 1881, as *Haliotis pourtalesii*. In 1911 Mr. Henderson, dredging on the "Pourtales Plateau" off Key West, in 90 fathoms, had the good fortune to secure another specimen, which is described and figured in this paper. It was first announced in THE NAUTILUS, vol. 25, p. 81. As *Haliotis* on the Eastern American coasts had become almost mythical, this was one of the most interesting finds of recent years in those waters. A species from the Galapagos, which Dr. Dall had subsequently identified as *H. pourtalesii*, is renamed *Haliotis dalli* Henderson. Both are figured.

THREE NEW SPECIES OF ANODONTITES FROM BRAZIL. By Wm. B. Marshall. (Proc. U. S. Nat. Mus., vol. 49, Dec. 1915). *A salmonea*, *A. darochai* are *A. aurora* are new species from Ceara, Brazil.

A LIST OF SHELLS COLLECTED IN ARIZONA, NEW MEXICO, TEXAS AND OKLAHOMA BY DR. E. C. CASE. By Bryant Walker. (Occ. Papers Mus. of Zool., Univ. of Michigan, No. 15. Dec., 1915). These lists record shells taken from stream debris in many localities, often remote from places which have been visited by conchologists. It is a valuable addition to our knowledge of these arid-region faunas.

NEW FRESH-WATER SHELLS FROM THE OZARK MOUNTAINS. By Anson A. Hinkley (Proc. U. S. Nat. Mus. vol. 49, Dec. 1915). The following new species are described: *Anculosa arkansensis*, *Pyrgulopsis ozarkensis* and *Somatogyrus crassilabris*[1] all from the North Fork of White River, near Norfolk, Arkansas.

THREE NEW HELICES FROM CALIFORNIA. By S. S. Berry. (Univ. of California Publications in Zoology, Vol. 16, No. 9. January 5, 1916). *Epiphragmophora petricola, E. tudiculata rufiterrae*, and *Polygyra pinicola* are described as new from the San Bernandino Mts., near Redlands and back of Pacific Grove, Monterey Co., respectively.——H. A. P.

NOTES.

OPEAS MAURITIANUM (Pfr.)—*Subulina octona* (Brug.) was reported from green-houses at Philadelphia, Pa. in THE NAUTILUS volume vi, p. 107, (1893) and volume xi, p. 120 (1898). Upon examining one of these sets collected by Mr. Robert Walton, I found one specimen of *Opeas mauritianum* (Pfr.) This is an addition to the "Mollusk Fauna of Philadelphia" published by Mr. Morris Schick in THE NAUTILUS, volume viii, p. 133 (1895). The specimen is in the collection of The Academy of Natural Sciences of Philadelphia, tray No. 113421. We also have *Opeas mauritianum* in the the collection from a green-house at Garfield Park, Chicago, Illinois, being A. N. S. P. No. 91237, collected by Mr. F. C. Baker in 1906; also No. 11748 collected at Washington, D. C., by Mr. E. Lehnert many years ago.—E. G. VANATTA.

WE have learned with deep regret of the death, on the 26th of March, of DR. WILHELM KOBELT, the distinguished German conchologist, at the age of 76.

[1] This species was first defined by Walker, in NAUTILUS vol. 29, p. 53.

THE NAUTILUS.

VOL. XXX. JUNE, 1916. No. 2

BREEDING RECORD OF MISSOURI MUSSELS.

BY W. I. UTTERBACK.

The following record includes twenty-six of the most representative species of the different subfamilies of *Naiades* for Missouri. Actual numbers of mussels are recorded for those collected in north and northwest Missouri but no definite record *of numbers* of sterile and gravid individuals could be kept by the author in his survey of the Osage River from the latter part of June to the middle of August while under the direction of the U. S. Fisheries Biological Station, Fairport, Iowa.[1] The *revised nomenclature* for the *Naiades* is followed in this report since the *revival of Rafinesque*[2] has been accepted by the leading students, and since, too, it has been found that *the glochidial and marsupial characters are the best bases for classification*;[3] however, for the sake of clearness, the more familiar names appear as synonyms in parentheses after the revised names.

In the following tables the kinds of glochidia are indicated thus:

Lamp. = *Lampsilis* type (i. e., suboval-subelliptic, spineless glochidia).

An.=*Anodonta* type (i. e., subtriangular, spined glochidia).

Prop.=*Proptera* type (i. e., axe-shaped, spined-spineless glochidia).

[1] U. S. Bu. Fish., Econ. Cir., No. 10, 1914.

[2] L. S. Frierson, 1914 a, (NAUTILUS, xxviii, pp. 6–8; E. G. Vanatta, 1915 a, (Proc. Acad. Nat. Sci. Phila., pp. 549–559).

[3] Dr. A. E. Ortmann, 1911 b, (Mem. Carnegie Mus., iv, pp. 279–339; 1912 b, (An. Car. Mus., viii, pp. 222–365).

TABLE I

BREEDING RECORD OF SHORT (OR "SUMMER") PERIOD BREEDERS (BRADYTICTIC SPECIES)

Mussel Species	Months when Bearing Glochidia												Kind of Glo-chidia
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1. FUSCONAIA UNDATA (Barnes) *Quadrula trigona* (Lea)	......	......	......	......	......	x	......	x	......	......	......	......	Lamp.
2. AMBLEMA PLICATA (Say) *Quadrula plicata*	......	......	......	......	......	x	......	......	......	......	......	......	"
3. MEGALONAIAS HEROS (Say) *Quadrula heros*	x	x	......	......	......	......	......	......	......	......	......	x	"
4. QUADRULA PUSTULOSA (Lea)	......	......	......	......	......	x	......	......	......	......	......	......	"
5. QUADRULA QUADRULA (Raf.) *Quadrula lachrymosa* (Lea)	......	......	......	......	......	x	......	......	......	......	......	......	"
6. QUADRULA VERRUCOSA (Raf.) *Tritogonia tuberculata* (Simp.)	......	......	......	......	......	x	......	......	......	......	......	......	"
7. ROTUNDARIA TUBERCULATA (Raf.) *Quadrula tuberculata* (Simp.)	......	......	......	......	......	......	x	x	......	......	......	......	"
8. ELLIPTIO DILATATA (Raf.) *Unio gibbosa* (Barnes)	......	......	......	......	......	......	x	x	......	......	......	......	"
9. UNIOMERUS TETRALASMA (Say) *Unio tetralasma* (Say)	......	......	......	......	x	......	......	x	......	......	......	......	"
10. OBLIQUARIA REFLEXA (Raf.)	......	......	......	......	......	x	x	x	......	......	......	......	"

TABLE II.—Breeding Record of Long (or "Winter") Period Breeders (Bradytictic Species)

Mussel Species	Months when Bearing Glochidia												Kind of Glochidia
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1. Lasmigona complanata (Barnes)	x	......	x	......	......	......	......	......	......	......	x	x	An.
Symphynota complanata													
2. Arcidens confragosus (Say)	x	......	......	......	......	......	......	......	......	......	......	......	"
3. Lastena suborbiculata (Say)	x	x	......	......	......	......	......	......	......	......	......	x	"
Anodonta suborbiculata (Say)													
4. Lastena ohiensis (Raf.)	x	x	......	......	......	x	x	......	......	......	......	......	"
Anodonta imbecillis (Say)													
5. Anodonta grandis (Say)	x	x	x	......	......	......	......	......	......	......	......	x	"
6. Strophitus edentulus (Say)	......	......	......	......	x	......	x	......	......	......	......	......	"
7. Amygdalonaias donaciformis (Lea)	......	......	......	......	x	......	......	......	......	......	......	......	Lamp.
Plagiola donaciformis (Lea)													
8. Lasmonos fragilis (Barnes)	x	x	......	x	x	x	x	......	x	x	x	x	"
Lampsilis gracilis (Barnes)													
9. Proptera alata (Say)	x	x	......	......	......	x	......	x	x	x	x	......	Prop.
Lampsilis alata (Say)													
10. Proptera laevissima (Lea)	x	......	x	......	......	x	x	x	x	......	x	......	"
Lampsilis laevissima													
11. Proptera capax (Green)	......	......	......	......	......	x	......	......	......	......	......	......	"
Lampsilis capax													
12. Carunculina parva (Barnes)	......	......	......	......	......	x	......	......	......	......	......	......	Lamp.
Lampsilis parva													
13. Eurynia subrostrata (Say)	......	......	......	......	......	x	......	......	......	......	......	......	"
Lampsilis subrostrata													
14. Lampsilis anodontoides (Lea)	x	x	......	......	......	x	......	......	......	x	......	......	"
15. Lampsilis luteola (Lamarck)	......	......	......	......	......	x	......	......	......	......	......	......	"
16. Lampsilis cardia (Raf.)	......	......	......	......	......	x	x	x	......	......	......	......	"
Lampsilis ventricosa (Barnes)													

Special attention would be directed to the fact that this record includes four instances of the male discharging sperm, one in case of *Lasmigona complanata* (Say), two instances of *Lastena suborbiculata* (Say) and one of *Lampsilis cardia* (Raf.), all observed in the laboratory aquarium. In case of both *complanata* and *suborbiculata* this physiologic fact disproves the report that, like their nearest allies, *Lasmigona compressa* (Lea) and *Lastena ohiensis* (Raf.), are hermaphroditic. Another instance of sperm discharge for *Lampsilis cardia* was observed in nature. This discharge was observed as a tiny stream of milky white cysts. Upon examination with a lens, magnifying 385 diameters, these cysts were observed to be hollow globular masses of sperm, each cyst revolving through the water by means of the flagella of hundreds of sperm cells thrust out through the matrix. It was the pleasure of the author to verify the observations of Dr. A. E. Ortmann, (1911a, p. 319), in discovering on several instances the female of this same species, (*cardia*), buried in the gravel with only the siphons, mantle flaps and two blackish ovisacs exposed. The ribbon-like flaps waved to and fro in an undulating manner and occassionally a white leaf-like conglutinate would be discharged. It was noted that the marsupia of this species were sterile and receptive on occasion of the sperm discharge.

Another physiologic observation, made in the laboratory, should be mentioned here in connection with the reproductive functions of the *Naiades* and that was in case of the rotary motion of the late embryos of *Pleurobema obliquum coccineum* (Conrad) and of *Lastena ohiensis* (Raf.). These are noted to be revolving clock-wise around one axis at the rate of about fifty times per minute. This phenomenon may be common with all species of *Naiades* and the reason why only seldom seen may be because of the short duration of this embryonic activity which may be necessary in the final development into the glochidial stage, for it was only in this structural stage that this rotary motion was seen.

The most prolific and continuous breeder, found by the writer, is *Lasmonos fragilis*. This mussel, being the predominant form in northwest Missouri and thus being the most accessible, ample opportunity was given to obtain the most complete record and has been found gravid with ripe glochidia every month of the year except for March and August. However, high water prevented the keeping of a complete record for any species during March. In all probability *fragilis* bears glochidia throughout this month also as more individuals of this species were found in glochidial gravidity during the month immediately preceding than at any other time of the year. Hence, we would conclude that this species is bradytictic (i. e., a long-period breeder) with an overlapping breeding season. *Lastena ohiensis* and *Strophitus edentulus* may be classed likewise because of the same character in that they also overlap in their breeding season. The fact of non-parasitism as the normal habit of these last mentioned may account for their eccentricities of breeding season. We may also account for the very peculiar marsupial structures of *S. edentulus* because of this independent metamorphosis of its larva. As far as now known all species of *Naiades*, except the last named, are dependent upon fish-hosts as their natural distributors ; however, the wide distribution of both *S. edentulus* and *L. ohiensis* has been considered to be due to the buoyancy of the *placentulae*, (gelatinous cords holding glochidia), discharged by the former and also to the very light papery shells of both juvenile and adult of the latter.

Probably this account will show the *smallest gravid individual* on record. On March 3, 1913, a gravid *Proptera laevissima*, bearing mature glochidia, was collected by the writer in Lake Contrary, St. Joseph, Mo., *measuring 39 mm. in length*, and on September 10, 1914, 61 *laevissima* were collected, 32 of which were found gravid with ripe glochidia. Strange to say, these *female shells were all smaller* than the other 29 males ; however, none in this collection exceeded 43 mm. in length, two being only 39 mm. long. Upon further study it may be found that these so-called *laevissima* are really distinct species and that the occurrence of smaller shells may be found to be normal, as seen in case of *Obliquaria reflexa* and of *Plagiola lineolata* (Raf.) (=*P. securis* [Lea]).

The Breeding Record kept herein corresponds with those of

Ortmann, Sterki,[1] Surber,[2] Howard,[3] Lefevre and Curtis[4] in the exceptions which these authors make for the general rule that the species of the sub-family *Unioninae* are short-period breeders (tachytictic) and those of the sub-families *Anodontinae* and *Lampsilinae* are long-period breeders (bradytictic). The writer agrees with Surber[2] and Howard[3] that *Megalonaias heros* should be classed as doubtfully bradytictic. Probably it would be more nearly correct to consider *heros* as *tachytictic with the latest breeding season* known. Another case of eccentricity of breeding season is that of *Obliquaria reflexa.* Although this species belongs to the sub-family possessing long period of gravidity as the rule, yet the writer has only found it sterile during every month of the winter season. *Amygdalonaias donaciformis* has also been found to be sterile in a few instances throughout the winter months, yet this knowledge may be too meagre to establish it as a short-period breeder. However, being found gravid with mature glochidia the early part of June may be partial evidence that this species is bradytictic. The writer is able to verify Surber's discovery that *donaciformis* produces the *smallest glochidium* (0.060x0.063 mm.) on record,[2] and also that, in its metamorphosis, the encysted young shows the unusual growth of adult shell beyond the margin of the glochidial shell.

In keeping this record it was occasionally noted that in a few cases, especially as found in *Lasmigona complanata* and *Lasmonos fragilis*, that the marsupia would contain early and late embryos, and even mature glochidia, at the same time. However, this irregularity is doubtless abnormal since uniformity of development and maturity is the rule for all species.

It may be of interest here to state how the author has been enabled to distinguish sterile females from males of those species which have no sexual dimorphism of shell and no definite differentiation of marsupium and of post-ventral mantel margin as seen in the *Unioninae* and *Anodontinae.* In most cases, as

[1] 1903a (American Nat., xxvii, pp. 103–113).

[2] 1912a (U. S. Bu. Fish., Doc. 771).

[3] 1915 (Nautilus, xxix, pp. 4–11).

[4] 1912 (U. S. Bu. Fish., xxx, Doc. No. 756).

pointed out by Dr. Ortmann, even a macrospic examination will enable one to note that the septa (vertical partitions for the ovisacs) of the sterile marsupium are distinctly more crowded than those that separate the gill chambers of the male gills. A histologic study shows five or ten gill filaments between the septa of the sterile marsupium or brood pouch.

Tables 2 and 3 are summarized accounts made out from complete individual records kept on the regular form issued by the U. S. Bureau of Fisheries for Biological Stations. These individual accounts of the different species comprehended the sterile females as well as those gravid with early-late embryos and mature-immature glochidia. As proof of this record the author still holds in his possession the preserved anatomical material, gravid with glochidia and also much that is gravid with early and late embryos. The soft parts have been preserved with the shells, the latter having been cleaned in a solution of sodium carbonate (Na_2CO_3) made by dissolving five pounds of this chemical in five gallons of water. Then the soft parts were preserved in the marked shells after the right valves were cut loose and temporarily examined afield when the best studies can be made before the tissues are contracted or discolored by the preservative. The best preservative for the whole specimens has been found by the author to be 70 or 80 per cent. alcohol, since such preserving fluids as formaldehyde contain so much free acid that the shell is deteriorated by the chemical reaction upon the limy composition.

While the writer was engaged for over three years in procuring data for his illustrated and descriptive catalogue of the *Naiades* of Missouri [1] it was his good fortune to discover a few glochidia, which follow in the descriptive table here, as the first on actual record. The author is indebted to Dr. T. Surber for his acknowledgement of the novelty and also for his verification of measurements of these glochidia.

The author is confident that fertilization of the ova takes place in the suprabranchial canals and when more data is at hand this determination may be set forth as a well-proven phe-

[1] American Midland Naturalist, Vol. iv, 1915-1916, Plates I–XXVIII.

TABLE III

New Glochidia

Mussel Species	Description of Glochidia						Locality in Missouri
	Kinds	Mm. Long	Mm. Wide	General Outline	Ventral Margin	Hinge Line	
1. *Amblema perplicata quintardii* (Cragin).	Lamp.	.205	.215	Suboval	Spineless	Straight	Osage R, Warsaw.
2. *Rotundaria tuberculata* (Rafinesque).	"	.267	.325	Subelliptic	Spineless	Straight	Osage R., Osceola.
3. *Pleurobema obliquum solidum* (Lea)	"	.170	.180	Suboval	Spineless	Straight	Osage R., Schell City.
4. *Uniomerus tetralasma* (Say)................	"	.160	.210	Subelliptic	Spineless	Straight	Lost Cr., Maysville.
5. *Lastena suborbiculata* (Say).............	An.	.325	.320	Subtriangular	Spined	Undulate	Lake Contrary, St. Joseph.
6. *Caruncutina parva* (Bar.)..................	Lamp.	.175	.200	Semi-circular	Spineless	Evenly curved	Flat Cr., Sedalia.
7. *Eurynia brevicula brittsii* (Simp.).........	"	.250	.305	Semi-elliptic	Spineless	Undulate	Niangua R., Hahatonka.

nomenon. The physiologic preliminaries for ovulation have been noted by the writer on many instances in his detailed studies of two most accessible species of this State. It was found that the ovisacs were frequently distended with water before being filled with eggs, a reproductive function that may be necessary in all species in order that the ova may not be injured, that greater numbers may be admitted and that the laminae may be stretched to a thinness more suitable for the aëration of the embryos.

A NEW OVULA FROM CALIFORNIA.

BY S. STILLMAN BERRY.

Neosimnia catalinensis, new species.

Shell very thin, fusiform, swollen above the middle, maximum diameter contained about $2\frac{1}{2}$ times in the length ; color a nearly pure porcelain or pearly white, the extreme ends tinted with brownish yellow for a distance of 2 to 3 mm. Surface polished and glossy ; closely and finely longitudinally striate, the striae readily visible to the eye and rather irregular, a few being somewhat coarser than the remainder. Spiral sculpture comprising some 20–25 low cords at each end, becoming minutely wavy as they are intersected by the longitudinal striae ; indications of an extremely faint wavy spiral striation over the rest of the shell are discovered by a strong lens. Shell pointed at both ends, but distinctly more produced at the apex than the base. Outer lip not greatly thickened, bordered by a narrow white callus ; retracted at both ends, in each instance with an obscure angle. Columella sinuous ; a low spiral fold and channel at the summit obliquely encircling the axis.

Length 23 mm. ; maximum diameter $8\frac{1}{2}$ mm.

Type : Cat. No. 1224 of the writer's collection.

Type Locality : 50 fathoms, off Avalon, Santa Catalina Island, California (Avalon Aquarium, August 1906).

Remarks : The type and a young specimen from the same locality taken by J. H. Paine in 1903 are before me. *N. catalinensis* does not seem to be very similar to any of the related forms which I can find to have been described from this region. It is a more delicate and inflated species than either *variabilis* C. B. Adams or *vidleri* Sowerby, if I am correct in my determination of these forms, and not at all close to either. It seems to be nearest to the *O. barbarensis* Dall, but the latter is much more compact, more solid, and more highly tinted, as well as usually of considerably smaller size. While it is possible that the relatively thin callus on the lip is indicative of immaturity, another large specimen which has come to my notice from the San Pedro Channel agrees in this as in every other particular.

A figure will appear on a plate of this volume.

THE CONJUGATION OF ARIOLIMAX CALIFORNICUS.

BY HAROLD HEATH.

The newly hatched young of *Ariolimax californicus* measure approximately five eighths of an inch in length, and under favorable conditions become from three to three and a half inches long at end of four months. Full-sized adults, measuring in the neighborhood of eight inches, probably reach such dimensions in not over ten months. A three-inch individual possesses all of the essential features of the adult, though the constitutent organs of the reproductive system are of small size.

For several years the specimens of this species that are used for class dissection at Stanford University have been collected from a nearby and comparatively circumscribed area along the San Francisquito creek where the conditions throughout are uniform. It was therefore surprising to find that annually fully five per cent of the large-sized animals dissected in the classroom lacked the penis entirely, while in an equal number it was abnormally undeveloped when compared with that of smaller individuals which had not yet reached sexual maturity. As the years went by the conviction became stronger that at some previous time the penis in all such specimens had been cast off, and that its diminutive proportions in otherwise fully formed animals represented a regenerative stage.

To test the correctness of the hypothesis fully two hundred animals were placed in an enclosure, and were fed for several weeks. Preliminary steps in the reproductive process (the so-called Liebspiel) were noted on several occasions, but evidently complete union never took place since no young were produced. More definite information, therefore, was sought in the field, but conjugation evidently takes place at night since on two days only—and those dark and gloomy in the early morning—was the act witnessed.

Prior to the act of conjugation each individual viciously bites the side of its mate (faced in the opposite direction), then violently retracts the head which gradually is protruded before the next onslaught. The intensity of this first phase gradually lessens as the bodies become curved about each other, thus finally bringing the genital papillae in contact. The penis of one individual only is then inserted, and after a period of several hours the two animals commence to draw apart. In both of the observed cases, when the penis had become exposed to the extent of about half an inch, one of the animals turned its head and commenced to gnaw upon the walls of the organ. These biting movements were unusually vigorous, and therefore in marked contrast to those witnessed during the feeding process but practically identical with those in the initial stages of conjugation, and within ten minutes had so scotched the penial walls that the exposed portion had stretched to an inch in length. The other animal (subsequent dissection in one case showed it to be the possessor of the intromittent organ concerned) now took part in the process, and within a very few minutes the penis was entirely severed.

All four of the animals were subsequently killed and dissected. In two of the individuals the gnawed-off penis extended from the genital pore through the proximal section of the oviduct to the distal, blind end of the seminal receptacle. The walls of the oviduct were in a high state of contraction, and only with the greatest care was it possible to dissect out the penis without destroying the surrounding tissue. In the other two specimens the penis was wholly absent, and the vas-deferens extended to to the genital pore—a condition of affairs exactly duplicated in some of the other animals examined on previous occasions in the laboratory. As no other cases of conjugation were encountered it has not been possible to determine whether the penis regenerates or not, though I am firmly convinced that it does.

Whether this act of mutilation invariably takes place is not known, and the significance of the process is far more obscure. It is possible the amputated penis may act as a plug to retain the spermatozoa in the seminal receptacle, or on the other hand it may be that the presence of a human observer or some natural enemy brings with it unusual conditions, such as jarring the earth or some specific scent, and that the severing of the intromittent organ is a provision whereby the animals are enabled to separate more rapidly than usual. The fate of the penis is likewise unknown ; it evidently is either absorbed or, what is more likely, is cast out before the eggs pass to the exterior.

NOTES.

POLYGYRA ALBOLABRIS MAJOR AND P. A. FUSCOLABRIS.—Clapp mentioned that you wanted to examine the animal of *Polygyra albolabris major* Binn. I happened to have one. So send it. The form ranges through Southern Alabama and I have found it as far north as Wetumpka. In Central and Northern Alabama the common large southern form of *albolabris* is pretty generally distributed, though not very common : some specimens approach *major* in size.

"The form which you called *P. albolabris fuscolabris* is as far as I know confined to the Cumberland Plateau and outlying masses (Monte Sano etc.) in Madison and part of Jackson Cos. Judging by the shells alone, I should be very much inclined to call this a distinct species. Ordinarily it is flatter than *albolabris* and always it can be easily distinguished by its peculiar luster as if varnished lightly : this is due to microscopic sculpture. Some of our specimens are larger than the average *major*. By the way, you must have had a specimen which was not quite mature : in full-grown shells the lip is white and the body of the shell is rather dark brown."—HERBERT H. SMITH.

Having dissected the specimen of *P. a. major* sent, I find it identical with *P. albolabris* anatomically, and its status as a subspecies rather than a distinct species is therefore confirmed.—

H. A. PILSBRY.

THE NAUTILUS.

VOL. XXX. JULY, 1916. No. 3

NOTES ON THE WEST AMERICAN COLUMBELLIDAE.

BY WILLIAM HEALEY DALL.

During the arrangement of the Columbellidae from the West Coast of America in the collection of the National Museum it was found that a number of the names needed revision, and several other notes were made which may be useful to students pending the preparation of a general manual of the mollusks of this region.

The genus usually known as *Meta* Reeve, or *Conella* of H. and A. Adams (but not of Swainson), is in need of a new name, for Reeve's *Meta* of 1859 is preoccupied by Koch for a well-known genus of spiders since 1835. I propose for it the new name *Parametaria*.

The large series at my disposal shows that the differences used by Reeve to split up these shells into species are not of specific value, some specimens having a rounded, others an angulate or keeled shoulder; &c, &c. It is not improbable that there is really but one species. For it the earliest name is "*Conus*" *dupontii* Kiener, 1850, which will supersede Reeve's name of *cedonulli* given in 1859. It is positively known only from the Gulf of California and adjacent regions.

Columbella festiva Kiener, 1841 (not of De Laborde, 1830) from the vicinity of Cape St. Lucas and south to Panama, may take the name of *C. lucasana*.

Columbella terpsichore Sowerby, 1822, and *C. lyrata* Sowerby, 1832, are identical.

Columbella (*Anachis*) *parva* Sowerby, 1844, being preoccupied by "*Buccinum*" *parvum* H. C. Lea, 1841, may take the specific name of *C. milium.*

Columbella (*Anachis*) *minima* Arnold, 1903; not of Tenison Woods, 1878, nor of Sacco, 1890, may be renamed *arnoldi.*

Columbella (*Anachis*) *guatemalensis* Reeve, 1859, and *tessellata* C. B. Adams, 1852 (not of Dunker, 1871) should be united with *C. lentiginosa* of Hinds, 1844.

Columbella gaskoini Carpenter, 1857, is identical with *C.* (*Anachis*) *taeniata* Philippi, 1846.

Anachis petravis Dall, 1908, proves to be identical with *A. subturrita* Carpenter, 1866.

Nitidella cribraria Lamarck, 1822, is preoccupied by Gmelin under the name of *ocellata*, 1792. *N. lævigata* Linné, 1758, and *N. dichroa* Sowerby, 1844, have been received by the Museum as from Panama, which I believe to be an error. Both are known to be Antillean. The latter is also *N. elegans* Dall, 1871, not of Adams, 1850.

Nitidella incerta Stearns, 1892, is probably to be referred to the subgenus *Alia.* *N. cervinetta* Carpenter, 1857, is identical with *N. baccata* Gaskoin, 1851.

Nitidella dalli E. A. Smith, 1880, is a synonym of *N. gouldi* Carpenter, 1857; but not of *Columbella gouldi* Reeve, 1858.

In 1870 I segregated from the heterogeneous species listed by H. and A. Adams under the name of *Astyris*, 1853, a group of three or four species to carry the name, of which *A. rosacea* Gould, 1840, was later selected by Fischer as the type. *C. clausiliformis* Kiener, 1834, proposed as type by Tryon, 1883, belongs to the older genus *Aesopus* Gould, 1860, and cannot serve as type of *Astyris.*

The characteristic Californian group of bright-colored shells, which have been by the writer and others carried under the name of *Astyris*, should be included under the subgenus *Alia*, H. and A. Adams, 1853. *C. unifasciata* Sowerby, from Peru and Chile, is the type of *Alia.*

C. gausapata Gould, may be considered a good species, which ranges from Port Etches, Alaska, to San Diego, California. Under *carinata* Hinds, 1844, may be included as varieties *californiana* Gaskoin, 1852, and *hindsii* Reeve, 1858. These forms are represented nearly over the range of the species which extends from San Francisco Bay, south to Salina Cruz, Mexico, and perhaps even farther.

C. (*Astyris*) *variegata* Stearns, 1873, is preoccupied by *C. variegata* Menke, 1828, and may take the specific name of *hypodra.*

Nitidella filosa Stearns, being preoccupied was called *Columbella stearnsi* by Tryon, 1883 ; it is referable to the genus *Aesopus.* A minute species four millimeters long, of a whitish color more or less tinged or spotted with brown, almost duplicates *Aesopus stearnsi* in form and sculpture, though so much smaller than the Florida species. I have named it *Aesopus myrmecoon.* It ranges from San Pedro, California, to Point Abreojos, Lower California. (U. S. Nat. Museum Cat. No. 105498).

The genus *Amphissa* H. and A. Adams, 1853, is characteristic of the Northwest Coast, and is typified by "*Buccinum*" *corrugatum* Reeve, 1846. But this is not the *Buccinum corrugatum* of Brocchi, 1814, and, since it is very abundant on the coast of British Columbia and in Puget Sound, it may take the name *columbiana.* It ranges from the Alaska Peninsula to San Pedro, California.

The *Amphissa bicolor* Dall, 1892, was unfortunately named. When fresh it presented distinct brown spiral bands on a pale olivaceous ground, but, as in many of the deep-water species, the coloration has not proved permanent and the banding is now hardly perceptible, the whole shell being of a light olive tint.

Amphissa versicolor Dall, 1871, ranges from Oregon to San Diego, with its metropolis apparently in the Bay of Monterey. There are several marked varieties: *cymata* Dall, with distinct brown axially waved lines on a white ground; *lineata* Stearns, 1872; *incisa* Dall, with sharply cut regular sculpture and beautifully mottled coloration (U. S. Nat. Mus. Cat. No. 223-294); and *reticulata* Dall, of a uniform whitish color, very acute spire, and fine regular corded spiral sculpture crossed by about 17 nearly straight axial narrow ribs. This form is usually in rather deep water, and ranges from Port Althorp, Alaska, to off San Diego, California in 62 to 183 fathoms. It is about the same size as *A. versicolor* but has a much more acute spire and straighter axial ribs, and may prove on further study to be specifically distinct. (U. S. Nat. Mus. Cat. No. 210004).

Columbella fusiformis Hinds, 1844, is not the species so named by Anton, 1839, or Orbigny, 1844. It is a *Strombina* and may take the name of *fusinoidea*. It is a Panama species.

Columbella subulata Sowerby, 1847, is not *C. subulata* Duclos, 1840. It is a *Strombina* and may be hereafter called *S. colpoica*. It ranges from the Gulf of California to Panama.

Strombina lilacina Dall, is a short stumpy white species with an acute spire, the latter with a lilac flush in perfect specimens; the axial riblets are inconspicuous, but the spiral sculpture is of regular strong channeled grooves with wider flat interspaces, about nine on the last whorl; the distal end of the pillar projects beyond the outer lip, with a very deep recurved short siphonal sulcus; there is no dorsal hump, and the shell is about an inch long. (U. S. Nat. Mus. Cat. No. 219764). It has been received from the Gulf of California and Manzanillo.

Another species which seems to be undescribed, I propose to call *Strombina paceana*, as a tribute to the author of the excellent bibliography of the *Columbellidæ* in the fifth volume of the Proceedings of the Malacological Society, London. It is 37 mm. long. of which the spire takes 20, and the maximum diameter is 10.5 mm. There are more than ten whorls (nucleus lost); the spire is acute, with a narrow turriculation at the suture: the upper whorls are flattish and smooth, the last whorl and a half coronated in front of the suture by about nine small pustules. The shell is mostly dark brown with a silky periostracum. The aperture is narrow and edentulous, 15 mm. long. It has been obtained from Scammon Lagoon, L. Cal., and the Gulf of California. (U. S. Nat. Mus. Cat. No. 130616).

The word *Strombina* was used by Bronn in 1849 in a large sense to include *Aporrhaidæ*, *Strombidæ*, &c. According to the best usage this does not affect its use as a generic name. I have therefore not adopted the clumsy *Strombocolumbus* proposed by Cossmann in 1901 to replace *Strombina*. This author was probably misled by the brief entry in Scudder's nomenclator given to Bronn's *Strombina*. It may be added that the type of *Alia* is *C. unifasciata* Sowerby, selected by Chenu in 1859, not

C. carinata Hinds, as given by M. Cossmann; the type of *Amphissa* is *corrugata* Reeve, not *A. versicolor*; the type of *Meta* is *dupontii* Kiener, not *philippinarum* Reeve; Fischer's name for *Strombina bicanalifera* is *Bifurcium*, not *Bifurcina*, as per Cossmann; *Conidea* Swainson, 1840, is a synonym of *Pyrene* Bolten, 1798, but its type is *Buccinum punctatum* Bruguière, 1789, not *Columbella punctata* of Lamarck, Sowerby and others; the type of *Anachis* H. & A. Adams, 1853, is *scalarina* Sowerby, which is quite distinct from *rugosa* Sowerby, cited by Cossman; the type of *Atilia* is *suffusa* Sowerby, not *minor* Scacchi; these corrections have already been indicated by Mr. Pace, for the most part, and point clearly to the advisability of consulting original sources rather than relying on quotations by other authors.

FRESHWATER SHELLS FROM CENTRAL AND WESTERN NEW YORK.

BY CARLOTTA JOAQUINA MAURY, PH.D.

Some years ago the writer made extensive collections of molluscs from the lakes of Central and Western New York. The preliminary determinations of the species were verified by comparisons with specimens in the Say and Lea collections at Philadelphia and Washington ; and doubtful cases were referred to Dr. Pilsbry, Dr. Dall, or Mr. Charles T. Simpson, who kindly passed judgment upon them. Thus every effort was made to make the identifications correct. Large numbers of individuals were obtained to observe the ranges of variation among the different species.

The writer presented the collection to the Museum of Cornell University where it is on exhibition.

From many of these lakes the mollusca have never been before recorded, nor have dredgings for deep-water forms been made except ours in Cayuga Lake.

It is also interesting historically that Say obtained several types from this region.

The mollusca were found to be most abundant in sheltered coves where the water is shallow and sun-warmed ; and in the inlets and outlets of the lakes.

The following is a list of the species and the lakes in which they were found :—

Lampsilis cariosa Say. Cayuga Lake.

Lampsilis iris Lea. Cayuga Lake.

Lampsilis luteola Lam. Cayuga, Little York, Canandaigua, Chautauqua Lakes, Genesee River.

Lampsilis luteola var. *rosacea* DeKay. Cayuga Lake.

Lampsilis radiata Gmelin. Cayuga, Cayuta, Little York Lakes.

Obovaria ellipsis Lea. Niagara River (From Dr. Sager).

Ptychobranchus phaseolus Hild. Chautauqua Lake.

Strophitus edentulus Say. Cayuga, Canandaigua, Green, Chautauqua Lakes.

Anodonta cataracta Say. Cayuga, Cayuta, Little York Lakes.

Anodonta fluviatilis Lea. Cayuga, Cayuta, Little York Lakes.

Anodonta grandis Say. Cayuga, Cayuta, Chautauqua Lakes.

Anodonta grandis Say var. *footiana* Lea. Canandaigua, Hemlock, Chautauqua Lakes.

Anodonta grandis Say var. *decora* Lea. Chautauqua Lake.

Anodonta fragilis Lam. Cayuga Lake.

Anodonta implicata Say. Cayuga Lake.

Anodontoides ferussacianus var. *buchanensis* Lea. (*Anodonta subcylindracea* Lea). Cayuga, Little York Lakes.

Symphynota costata Raf. (*Alasmodonta rugosa* Barnes). Cayuga Lake.

Alasmidonta marginata Say. (*Alasmidonta truncata* Wright). Tioughnioga River.

Unio complanatus Sol. Cayuga, Canandaigua, Little York Lakes.

Unio gibbosus Barnes. Chautauqua Lake.

Sphaerium partumeium Say. Fall Creek, Ithaca.

Sphaerium simile Say. Cayuga, Cayuta, Hemlock, Conesus, Chautauqua, Silver Lakes.

Sphaerium striatinum Lam. var. Chautauqua Lake.

Sphaerium transversum Say. Fair Grounds, Ithaca.

Pisidium compressum Prime. Cayuga Lake.

Pisidium virginicum Bourg. Hemlock Lake.

Pisidium scutellatum Sterki. Chautauqua Lake.

Limnaea catascopium, Say. Cayuga, Canandaigua, Chautauqua Lakes.

Limnaea catascopium white variety. Chautauqua Lake.

Limnaea columella Say. Cayuga, Conesus, Cayuta, Silver Lakes.

Limnaea elodes Say. Fall Creek and Cayuga Lake (Say's type locality).

Limnaea elodes var. *umbrosa*, Say. Conesus Lake.

Limnaea emarginata Say. Cayuga, Chautauqua Lakes.

Limnaea humilis Say. Dwyer's Pond, Ithaca.

Limnaea stagnalis Linn. var. *appressa*, Say. Fall Creek at Ithaca and Canandaigua Lake.

Planorbis bicarinatus Say. Cayuga, Cayuta, Canandaigua, Chatauqua Lakes.

Planorbis bicarinatus var. *major*. Fall Creek, Ithaca.

Planorbis campanulatus Say. Silver, Cayuta, Chautauqua, Conesus Lakes.

Planorbis deflectus Say. Fall Creek, Ithaca, Cayuga, Cayuta, Hemlock, Chautauqua Lakes.

Planorbis exacutus Say. Cayuga, Chautauqua Lakes.

Planorbis hirsutus Gould. Chautauqua Lake.

Planorbis lentus Say. Fair Grounds, Ithaca and Cayuga Lake.

Planorbis parvus Say. Cayuga, Chautauqua Lakes.

Planorbis trivolvis Say. Chautauqua, Canandaigua, Conesus Lakes and Glacial Kettle near Ithaca.

Planorbis trivolvis var. *corpulentus* Say.

Segmentina armigera Say. Cayuga Lake.

Ancylus diaphanus Hald. Cayuta Lake.

Ancylus parallelus Hald. Fall Creek, Ithaca and Cayuga Lakes.

Ancylus rivularis Say. Cayuga, Chautauqua Lakes.

Physa ancillaria Say. Owasco, Chautauqua Lakes.

Physa gyrina Say. Fall Creek, Ithaca.

Physa heterostropha Say. Chautauqua Lake, Fall Creek at Ithaca, Courtland Pond.

Pleurocera subulare Lea. Cayuga Lake.

Elimia virginica Say. Cayuga, Conesus Lakes.

Elimia virginica var. *multilineata* Say. Cayuga Lake.

Bythinia tentaculata Linn. Cayuga Lake, Seneca River at Waterloo.

Bythinella attenuata Hald. Chautauqua Lake.

Bythinella nickliniana, Lea. Chautauqua Lake.

Amnicola granum Say. Chautauqua Lake.

Amnicola limosa Say. Cayuga, Chautauqua, Cayuta Lakes.

Amnicola lustrica Pilsbry. Cayuta Lake.

Amnicola pallida Hald. Chautauqua Lake.

Valvata sincera Say. Cayuga Lake.

Valvata tricarinata Say. Cayuta, Chautauqua, Owasco Lakes.

Vivipara contectoides Binney. Cayuga Lake.

Campeloma decisa Say. Cayuga, Canandaigua, Conesus, Chautauqua Lakes.

After making this collection from the shallow waters of the lakes, the question naturally arose whether a deep-water molluscan fauna exists in Cayuga Lake.

To determine this, Professor G. D. Harris and the writer aided by Dr. Pilsbury, now of Ann Arbor University, made three dredgings from east to west across the lake between the Ithaca Lighthouse and Estey's Glen. A United States Fish Commission dredge, weighting about fifty pounds, with a net attached was employed. As the dredge was worked by hand power with a windlass, it was not feasible to go below about 200 feet. The maximum depth of Cayuga Lake is about 450 feet. This deep is in the middle of the lake at a point north-east of Toughannock Point (formerly known as Goodwin's Point), some miles north of our furthest section.

These dredgings proved very conclusively that molluscs are abundant from the shore line to about ten feet, after twenty-five feet they become very scarce, the dredge yielding only a few Amnicolas and broken fragments of shells, the occupants having apparently been preyed upon by fishes.

In the greater depths no signs of mollusca or of plants were found. There was only a very fine grey mud entirely barren of life.

We believe this to be due partly to the great depth of the Finger Lakes; but much more to the extremely low temperature of the water of Cayuga Lake, which even in midsummer is very cold except in sun-warmed shallows.

It is interesting to compare the present molluscan fauna of Cayuga Valley with its Pleistocene ancestry of which fossil remains[1] occur in a delta terrace between Toughannock Falls and Frontenac Beach, about twenty feet above the present lake level. These Pleistocene forms include:

Lampsilis luteola Say.
Lampsilis ventricosa Barnes.
Anodonta fragilis Lam., (*marginata* Say).
Anodonta grandis Say.
Anodonta grandis var. *footiana* Lea.
Sphærium simile Say.
Pisidium compressum Prime.
Pisidium virginicum Bourg.
Limnæa palustris Mull.
Limnæa elodes Say.
Physa heterostropha Say.
Planorbis bicarinatus Say.
Planorbis deflectus Say.
Planorbis lentus Say.
Planorbis parvus Say.
Amnicola limosa Say.
Valvata tricarinata Say.
Campeloma decisa Say.

These mollusca were approximately synchronous with the Pleistocene forms of the Don Valley beds of the Toronto formation, one-hundred and seventy miles northwest of Ithaca. They apparently lived during the Peorian, or Fourth Interglacial Period. The colony was established by Mississippian and St. Lawrence molluscs coming in from the West. After the annihilation of the colony by the advance of the ice, everyone of the interglacial species re-established itself when the ice finally retreated, and all are now living in the waters of Cayuga.

[1] See C. J. Maury, Interglacial Fauna in Cayuga Valley. Journ. of Geology, 1908, vol. xvi, no. 6, pp. 565–567.

ON MONSTROSITIES IN CYPRÆA.

BY ST. G. BYNE, M. SC., F. L. S.

It will doubtless interest those who make a special study of the genus *Cypræa* if I enumerate some of the monstrosities which occur in the collections of myself, friends and museums. It is very remarkable that so many species inhabiting the Islands of New Caledonia should have their extremities pinched, and abnormally prolonged or rostrated. Many of these have had definite varietal names assigned to them by Dautzenberg and others. I have included dwarf adult specimens which seem to be especially abundant in the Andaman Islands judging by a large consignment which I have examined from that locality. One sometimes meets with shells which have been damaged and repaired by the animal.

C. tigris L. (a) A few examples from Sarawak abnormally flattened and gibbous. (b) Having a strong ridge running longitudinally over the dorsal surface. This seems to be due to one half being more thickly coated with calcium carbonate than the other. (c) Miss A. Foster of Bournemouth possesses two small unusually heavy examples. The dorsal surface is coated with a thick greyish-green enamel. The anterior extremities are pinched up and strongly rostrated.

C. caputserpentis L. Having a small dark brown protuberance upon the base.

C. lurida L. Two specimens from Naples whose extremities are curiously pinched and flattened out, and resembling New Caledonian forms.

C. arabica L. *var. niger* Roberts. This rare black variety from New Caledonia is well known to collectors.

C. arabica L. Mr. C. P. Richards of St. Anstell possesses in his collection a remarkable adult example, with greatly produced spire, the mouth reduced one third its normal length by some hard foreign substance being wedged in and coated over with enamel by the animal, thus altering the shape of the shell evidently to accommodate itself to the new conditions.

C. histrio L. Although many consider this to be a variety of *C. arabica*, yet I am of opinion that it should be raised to specific rank in future lists, as its differences in form and color are more than varietal. (a) very conical. Indian Ocean.

C. moneta L. *var. barthelymi* Bernardi. Having the extremities constricted and prolonged. A rare variety from New Caledonia.

C. annulus L. I cannot agree with those who consider this to be merely a variety of *C. moneta*, as the average specimen of each is so different in character. One can easily separate the varieties of *annulus* and *moneta* by the aid of the excellent descriptions by S. Raymond Roberts in Tryon's Manual Conch. vol. vii, pp. 177–8.

(a). A dwarf specimen in the Manchester Museum measuring 11 mm.

(b). var. *noumeensis*, Marie. Dautzenberg mentions a specimen from New Caledonia, in the Bordeaux Museum, 30 mm. long.

C. caurica L. This varies greatly in form from being long and narrow, to almost circular. A friend informs me that he has two hundred specimens all differing in shape and color. I have a specimen whose dorsal surface is decorticated so as to resemble that of a *C. tabescens*.

C. caurica L. *var. concava* Sowb. described in 1870, by Sowerby (from H. Owen's MSS) in his "Thesaurus Conchyliorum." Said to be from the R. Gambia, W. Africa. Is the locality correct for this Indian and Pacific Ocean species.

C. caurica L. *var. nana* Melvill. A dwarf form of var *oblongata*, Melv.

C. erosa L. *var. chlorizans*. An olive-green dwarf form (18 mm. long—Richards).

C. erosa L. Dwarf type specimen measuring 17 mm.

C. lynx L. *var. caledonica* Crosse. This well-known variety has the extremities pinched and extended, making the shell much narrower than the type.

C. lynx L. Having the aperture curiously widened out on one side.

C. mauritiana, L. (a). Frequently occurs extremely conical in shape. (b). Somewhat resembling *C. mus*, *v. bicornis* in having a distinct lump above posterior extremity. (c). A dwarf shell in my collection from the Andaman Islands measuring 48.5 x 32 mm. This is absolutely adult in every particular, and is probably unique.

C. mus L. *var. bicornis* Sow. In my experience there seem to be many intermediate forms between a good pronounced specimen of this variety and the type.

C. stercoraria L. (a) I have two dwarf specimens of the type measuring 33.5 and 35 mm. (b) Mottled with patches of a paler colour, the whole having a gangrenous appearance, caused by a disease of the mantle.

C. stercoraria L. *var. gibba* Gmel. More conical than the type and having the sides heavily flounced as in *C. arabica*, var. *reticulata.*

C. arabicula Lamarck. A fine example with the outer lip much extended beyond the posterior extremity.

C. algoensis Gray. A very pinched-up humped shell, quite an abnormality.

C. umbilicata Sow. A fine example in Mr. Richard's collection, 103 mm. long, with the outer lip extended into a curious flange on the anterior extremity.

C. pantherina Sol. (a) The outer lip so extended that the animal has contracted it into the shape of a letter V at the posterior extremity. (b) Having a proboscis-like protuberance projecting a quarter of an inch from the posterior end of the dorsal surface at an angle of forty-five degrees, probably caused by a barnacle. (c) Variety *theriaca* Melv. Having a large whitish callosity on the posterior end of the dorsal surface giving the shell a very remarkable appearance. (d) The base markedly convex, giving the shell a rocking-horse-like motion when the ends are pressed against a smooth surface. (e) The dorsal surface strongly corroded by a disease of mantle. Red Sea and Philippines. Some specimens of *C. tigris* collected by Mr. Stanley Gardiner in the Seychelle Islands are similarly attacked.

C. exanthema L. Abnormally flattened on dorsal surface. (Miss Foster).

C. onyx L. var. *adusta* Chemn. A specimen in the Manchester Museum has a barnacle attached, partly enameled over and colored like the rest of the shell.

Dautzenberg in his paper "Sur quelques deformations chez des Cypræa de la Nouvelle-Caledonie" in the Journal de Conchyliologie, vol. liv, has enumerated the following varieties, many of which are subject to melanism :

neglecta, L., var. *marteli*, Dautz.
stolida, L., var. *crossei*, Marie.
mappa, L., var. *montrouzieri*, Dautz.
vitellus, L. var. *subrostrata*, Dautz.
errones, L., var. *compressa*, Dautz.
asellus, L., var. *bougei*, Dautz. 31 mm. long !
clandestina, L., var. *marteli*, Dautz.
punctata, L., var. *rostrata*, Dautz.
cribraria, L., var. *rostrata*, Dautz.
erosa, L., var. *protracta*, Dautz.

THE NAUTILUS.

VOL. XXX. AUGUST, 1916. No. 4

ADDITIONAL RECORDS OF MOLLUSCA FROM SAN BERNARDINO COUNTY, CALIFORNIA.

BY S. S. BERRY.

Deferring for the present any attempt to revise the list published some years ago (NAUTILUS, vol. 23, pp. 73-79, Nov., 1909), it may be desirable to record the following additional species from my rapidly-accumulating notes on the mollusks of San Bernardino County. A few of these are new to California, while one or two are reported for the first time from the Pacific drainage as distinguished from that of the Gulf of California.

VALLONIA CYCLOPHORELLA Ancey.

Mill Creek Canyon, alt. 4600-5000 feet (S. S. B., July, 1910).

HELIX ASPERSA Müller.

I have not seen this European garden pest in Redlands until the present season, when some specimens were handed me by W. F. Chance. It is already abundant in certain parts of the city, notably in gardens on Olive and Palm Avenues.

VITREA ALLIARIA (Miller).

Walnut Avenue, Redlands (A. G. Smith and S. S. B., Jan., 1914, etc.), abundant.

VITREA MILIUM PUGETENSIS (Dall).

Waterman Canyon (A. G. Smith, Jan., 1914). Probably identical with the Redlands specimen previously reported as *milium*. The specimens agree with the description of *V. m. meridionalis* Pilsbry and Ferriss, but except for their slightly larger size do not seem very different from Seattle specimens of *pugetensis.*

Bifidaria pentodon (Say).

Mill Creek Canyon, alt. 4600 feet (1 specimen, S. S. B., July, 1910).

Bifidaria hemphilli Sterki.

Waterman Canyon (S. S. B., Nov., 1913). This species does not seem to have been reported previously north of San Diego. It is a common form in this canyon.

Vertigo modesta parietalis Ancey.

Common in Bluff Lake Meadow, alt. 7550 feet (S. S. B., July, 1910), and other alpine cienagas.

Vertigo modesta castanea Sterki.

Holcomb Meadows, east of Sugarloaf Peak, at altitude of 8300 feet (S. S. B., Aug. 18, 1913).

Vertigo ovata (Say) var.

Mill Creek Canyon, alt. 4600 feet (S. S. B., July, 1910).

Punctum conspectum pasadenæ Pilsbry.

Walnut Avenue, Redlands (S. S. B., Jan. 21, 1916).

Agriolimax campestris occidentalis Cooper.

Cienagas above Bear Lake, alt. about 7000 feet (S. S. B., Aug., 1910). Determined by Mr. Vanatta.

Succinea stretchiana Bland.

Should replace the name *S. oregonensis* in my former lists.

Ancylus sp.

Prospect Park, Redlands (A. G. Smith, Dec., 1910); roadside pool, near San Bernardino (S. S. B., Aug., 1911). A small species which it is not yet possible to identify satisfactorily with any of the named forms. I have not chanced upon any previous records of this genus for the entire southern sector of California.

Planorbis opercularis Gould var.

Marsh at Knight's Ranch, Bear Valley, alt. 6750 feet (Mrs. Kate Stephens, Aug., 1903). The specimens are not typical. According to Dall's synopsis of the races of *opercularis* in his Land and Fresh Water Mollusks of the Harriman Alaska Expedition, they would possibly come under *centervillensis* Tryon.

GONIDEA ANGULATA Lea var.

Chino Creek, near Ontario (R. H. Tremper, April, 1911). The specimens are somewhat like a small form of *G. a. haroldiana* Dall, but are more produced in front.

PISIDIUM ROPERI Sterki.

Abundant in Dry Lake, north slope of San Gorgonio Mountain, alt. 9050 feet (S. S. B., Aug., 1913). The specimens were determined by Mr. Vanatta. Those from lower altitudes previously reported as *P. californicum* Newcomb MS. are perhaps the same.

THE ANATOMY OF LEMIOX RIMOSUS (RAF.).

BY A. E. ORTMANN.

LEMIOX RIMOSUS (Rafinesque) 1831 = MICROMYA CÆLATA (Conrad) 1834. See: Simpson, Synops. Nai., 1900, p. 525, and Descr. Catal. Nai., 1914, p. 34.

Lemiox rimosus Frierson, NAUTILUS, 28, 1914, p. 7.

I collected this species at the following localities: Holston River, Turley Mill, Grainger Co., and Mascot, Knox Co., Tenn.; North Fork Holston River, Hilton, Scott Co., Va., and Rotherwood, Hawkins Co., Tenn.; Clinch River, St. Paul, Wise Co., Va., and Clinton, Anderson Co., Tenn.; Powell River, Combs, Claiborne Co., Tenn. At the latter locality, a gravid female was found on Sept. 12, 1913 (with glochidia).

Anal and supraanal openings separated by a moderately long mantle connection, which is somewhat shorter than the anal, and considerably shorter than the supraanal. Anal with fine papillæ, branchial with large papillæ. Palpi with the posterior margins connected at base only. Gills of the usual Lampsiline structure; inner lamina of inner gills entirely connected with abdominal sac, but often there is a short slit posteriorly (not more than one-fourth of the length of the abdominal sac).

Marsupium of the Lampsiline type, located in the posterior section (less than one-half) of the outer gills, kidney-shaped;

leaving a small posterior part of the gill non-marsupial. There are about 12 ovisacs on each side in my gravid female.

In the female, the mantle margin in front of the branchial opening has the inner edge nearly parallel to the outer. The outer edge is denticulate posteriorly (corresponding to the denticulate margin of the shell). The inner edge has, just in front of the branchial, a few small papillæ, and then it is lamellate and elevated, and rather smooth. Farther in front, there are again a few small papillæ. This differentiated part of the inner edge reaches nearly to the middle of the lower margin. The lamellar elevation is very distinct, and sharply defined from the anterior and posterior papillate part, and is slightly longer than either of them, and, in the specimen at hand, somewhat thickened, with a blunt edge (of course, the specimen is contracted by the action of the alcohol; it is probable that this edge was capable of some sort of expansion). In the region of the lamella, the inner edge of the mantle is farthest remote from the outer, but not much so, and there is no sudden drawing apart of the mantle edges (as in the genus *Truncilla*).

In the male, the female structure of the inner mantle is indicated in a rudimentary condition: the papillæ are extremely small, and the smooth lamellar part is present, but thin and hardly elevated.

Color of the soft parts whitish. Edges of mantle brownish, blackish in the region of the anal and branchial, and the outer edge is spotted black and brown in this region, chiefly in the female. A black streak runs along the inside of the inner edge in front of the branchial, extending, in the female, upon the lamellar elevation, which is entirely black. Edge of marsupium pale (without black pigment).

Glochidia subovate, higher than long. L. 0.21, H. 0.26 mm.

The genus *Lemiox* is a Lampsiline form with very peculiar shell characters, the most remarkable of which is the sculpture of the posterior part of the shell by rugose wrinkles, which produce, in the female, a distinctly, but irregularly, denticulate or scalloped margin of the shell. The postbasal expansion of the female shell is rather small, but distinct, and corresponds, in its location, to the lamellar expansion of the inner mantle edge.

Beak sculpture distinctly double-looped, consisting of three to four bars, the first one or two bars subconcentric. According to the soft parts, this genus belongs in the group of *Lampsilinae* which have a differentiated mantle edge in front of the branchial; but with regard to the particular structure of this edge, it is unique, in having papillæ as well as a short, elevated lamella. It is not very closely allied to *Lampsilis*, which has a large and long mantle flap, but stands nearer to the *Eurynia*-type, and possibly most closely to *Carunculina* (recte: *Toxolasma* Raf.), and we might regard the short lamella of *Lemiox* as analogous (or possibly even homologous) to the "caruncle" of *Carunculina*. But it cannot be united with the latter on account of the shape of the lamella, and the sculpture of shell and beaks (it differs also by the nearly complete connection of the inner lamina of the inner gills).

Simpson placed the species with *Micromya* (now a subgenus of *Eurynia*), but the structure of the mantle edge as well as the shell is distinctly different.

There is no question that this form should be regarded as the representative of a distinct generic type, *Lemiox*, and that it should be placed in the vicinity of *Eurynia* and *Toxolasma* (= *Carunculina*).

In the denticulations of the edge of the shell, there is some resemblance to the genus *Truncilla*, but there is no considerable space between the edges of the mantle, as in that genus, and also in other characters, *Lemiox* is entirely different from *Truncilla*.

NEW SUBSPECIES OF VIVIPARUS AND CAMPELOMA.

BY H. A. PILSBRY.

VIVIPARUS CONTECTOIDES IMPOLITUS n. subsp.

The shell is heavier than *contectoides*, rough and with irregular growth-lines and wrinkles, and often somewhat malleated; shoulder more conspicuous; and on the last whorl the bands are obsolete. The umbilical perforation is very narrow or closed. Length 39, diam. 31.5 mm. Type no. 66701 A. N.

S. P., collected by H. E. Sargent in a marsh on the Paint Rock River, Jackson Co., Alabama.

VIVIPARUS CONTECTOIDES COMPACTUS n. subsp.

The shell is compactly coiled, imperforate; whorls a little less inflated than in *contectoides.* Length 27.5, diam. 20.5 mm. Type no. 27731 A. N. S. P., from Dougherty, Georgia. Also from Chetachee creek, Ala., both lots from the Wheatley collection.

CAMPELOMA RUFUM MERIDIONALE n. subsp.

The shell is short, solid, dull citrine, paler at the shoulder; surface having fine growth-lines as usual, crossed by many weak, minute and crowded spiral striæ. *Spire shortly conic,* the summit eroded. Last whorl strongly shouldered, the shoulder narrow; *very convex in the peripheral part.* Aperture large, brown within in the upper two-thirds. Lip slightly sinuous. Columellar callus moderate.

Length 29.3, diam. 20.3, length of aperture 17.8 mm.

Length 29, diam. 21.3, length of aperture 18.2 mm.

North Carolina: Little Sugar Creek; Crozier's Branch, Cabarrus Co. (type loc.), also Georgia. Type 122781 A. N. S. P.

Distinguished by its short, obese shape and distinct striation.

CAMPELOMA RUFUM GENICULIFORME n. subsp.

This race is like the preceding in color and sculpture, but differs in outline. The spire is elevated, and the whorls have a broad, horizontal shoulder, below which the wall is nearly vertical, as in typical *C. genicula* (Conrad). It differs from *genicula* by the brown color in the mouth and on the eroded summit.

Length 31.5, diam. 20.4 mm., length of aperture 16.8 mm.

Dooley Co., Georgia. Type 122782 A. N. S. P.

CAMPELOMA FLORIDENSE (Call).

"*Campeloma floridense* Call MS." (as synonym of *C. limum*), Call, Bull. Washburn College Laboratory of Natural History, vol. 1, No. 5, p. 159, 160, pl. 6, fig. 7 (May, 1886).

This species was mentioned as a MS. name under *Campeloma limum* by Mr. Call, who apparently had not seen the true

Paludina lima Anth., as his description does not fit it, being partly drawn from the Florida species, partly compiled from Anthony.

The shell has a rather short spire and large aperture, it varies on different parts of the same specimen, and in different specimens from dark citrine to blackish brown. *The interior is chocolate, chestnut-brown or dark indian-red;* the invariably dark color being highly characteristic. The surface has unequal, minute, spiral striæ. The last whorl is somewhat compressed below the narrow subsutural shoulder. Columella rather heavy, nearly white. A large specimen measures, length 34.6, diam. 22.3, aperture 19.8 mm., 4 whorls remaining.

So far as known, this species is restricted to the St. Johns River and tributary creeks, in Florida. Mr. Johnson and the writer dredged it in Lake County. It is one of the most distinct species, owing to its color.

Campeloma limum (Anth.) is a more slender, green species with a smaller mouth, bluish within, and a more or less distinctly subangular periphery. *Melantho decampi* W. G. Binney is a synonym of *C. limum.*

THE RAFINESQUE-POULSON UNIOS.

BY BRYANT WALKER.

In publishing the complete list of the Rafinesquean Unios in the Poulson collection with their modern equivalents, Mr. Vanatta has rendered a distinct service to all students of the American Naiades. Now, for the first time, we, to whom the specimens are inaccessible, are informed exactly as to which of the species familiar to us under Simpsonian designations are represented in that famous collection and their names as identified by Rafinesque himself.

While, with a single exception, it is not claimed that these are the original types of Rafinesque's species, and it is explicitly stated that the ultimate recognition of any of Rafinesque's species "depends upon whether it could be identified by descriptions published prior to any other recognizable name for the same species," nevertheless it is a distinct advantage to know exactly what Rafinesque in 1831 understood or claimed to be the species that he had described in 1820.

The author has presented a tentative synonymy of the species represented in the Poulson collection, "if they were recognized and the names dated from 1820." In this suggested arrangement, Rafinesque's genera and subgenera are ignored and all of his species are treated as Unios and synonymy is based entirely on the supposition that they were described as Unios.

In this, the author seems to have overlooked Rafinesque's explicit statement, (p. 298), as to his method of compiling his Monograph.

In 1819, Rafinesque had proposed to divide the North American Unios, "provisionally," into eight subgenera. In 1820, in his "Monographie," after referring to this fact he says:

"Since then, having increased my species and verified their characters, it appears to me to be proper to make from them many genera and subgenera, but to humor ("*pour complaire*") naturalists, who might hesitate to adopt the changes in nomenclature that the discoveries necessitate, I will give the name of *Unio* in the second place to all new species, observing to those, who would assign them all to the genus *Unio*, which thereby would contain more than seventy species, that it would be necessary in the description of the specific characters to repeat those of my new genera, this would render the definitions of the species long and prolix."

In accordance with this statement, throughout the Monographie he first prints *his* name for the species in italics and then, "*pour complaire*," adds in parenthesis and in Roman type the popular or conventional name.

If, instead of adopting this system, he had in every instance stated in his explanatory remarks that for those who did not adopt his new genera the species would be an *Unio*, there could be no possible doubt of his intention to use his new generic terms. And, in view of his explicit statement, I do not see how any other inference can be properly drawn from the method that he did adopt. There is not to be found anywhere in the Monographie the slightest intimation that he had ever any doubt as to the correctness of his new classification or that in any degree he intended to impugn its validity.

If I am right in this contention, much of the tentative synonymy proposed by Mr. Vanatta will have to be reviewed.

In view of the fact that the adequacy of Rafinesque's original descriptions is expressly left in abeyance, it would seem to be better to retain the Simpsonian names until all of those questions can be definitely determined.

Expressly reserving, therefore, all questions relating to the adequacy of Rafinesque's original descriptions and simply to determine "the effect on nomenclature if they were recognized and the names dated from 1820," taking the species in the order given by Vanatta, it would appear to be necessary to make the following changes:

Truncilla brevidens Lea.

Described by Rafinesque as *Obliquaria interrupta.* It is not, therefore, preoccupied by *Unio solenoides interrupta* and, if identifiable, would take precedence over Lea's name.

Truncilla sulcata (Lea).

Unio sulcatus Lea (1830) is not preoccupied by *Pleurobema mytiloides sulcata* Raf. (1820). But *Obliquaria obliquata* Raf., if identifiable, would have priority.

Plagiola securis (Lea).

Obliquaria depressa Raf. (1820) is not preoccupied by the *Unio depressa* Lam. (1819). But both Say (1834) and Conrad (1834) have given preference to *lineolata* Raf. over *depressa* Raf., although the latter has page precedence. This they had the right to do under the Code and, if identifiable, Rafinesque's name will take precedence over Lea's.

Plagiola elegans (Lea).

Truncilla truncata Raf. (1820) is not preoccupied by *Unio truncata* Spengl. (1793). If identifiable, Rafinesque's name has priority over Lea's. *Metaplata* Raf. is subsequent to both.

Tritogonia tuberculata Bar.

Unio tuberculata Bar. (1823) is not preoccupied by either *Obliquaria tuberculata* Raf. or *Obovaria striata tuberculata* Raf. (1820). But *Obliquaria verrucosa* Raf., if identifiable, has priority for the species.

Cyprogenia irrorata (Lea).

Obovaria stegaria tuberculata Raf. is not preoccupied by *Obliquaria tuberculata* Raf. But *Obovaria striata tuberculata* has page precedence. If identifiable, *stegaria* Raf. (1820) has priority over *irrorata* Lea (1830) as the specific name.

Unio gibbosus Bar.

Barnes' name (1823) is not preoccupied by *Amblema gibbosa* Raf. (1820). But *Unio dilatata* Raf. (1820), if identifiable, has priority.

Unio pusillus Lea.

Obliquaria pusilla Raf. (1820) did not prevent the use of of *pusillus* for a *Unio* by Lea in 1840. Lea's name will, therefore, stand.

Quadrula lachrymosa (Lea).

Simpson did not separate *asperrima* Lea varietally from *lachrymosa* as Vanatta's remark would indicate. If identifiable, Rafinesque's name, *quadrula*, has priority and would become the specific name and, if separable varietally, *lachrymosa* Lea would become a variety.

Quadrula pustulosa (Lea).

Obliquaria retusa Raf. (1820) is not preoccupied by *Unio retusa* Lam. (1819). If identifiable, Rafinesque's name would have priority over Lea's.

Quadrula subrotunda (Lea).

Unio subrotunda Lea (1831) is not preoccupied by *Obliquaria subrotunda* Raf. (1820). However, *sintoxia* Raf. (1820), if identifiable, has precedence over *subrotunda* Lea.

The statement that "many of Rafinesque's species have been credited to Conrad by Mr. C. T. Simpson" is hardly fair to the latter. Conrad did sufficiently describe and figure a considerable number of species in his "Monography" of 1836, which he credited to Rafinesque. At least one of these, *U. cordatus*, does not agree with the specimen under that name in the Poulson collection as identified by Vanatta. Simpson states expressly that he had made careful and repeated attempts to identify Rafinesque's species and that, while he found quite a number that should be recognized and which he did recognize, as to the remainder he was "utterly unable to make anything out of them." Having reached this conclusion, the only thing that he could do was to credit the species described in the Monography under these indeterminable names to Conrad.

The list of names proposed by Rafinesque and not mentioned in Simpson's Synopsis is also misleading. Of the twenty-three "Unios" listed, only three were described as distinct species of *Unio* by Rafinesque: eight are varieties of certain species of *Unio*, while the remaining twelve are made up of one species and eleven varieties described under various different generic names. It would certainly have been better if Simpson had given a complete list of all of the species named by Rafinesque as long as he attempted to compile such a list at all. But the value of quoting indeterminable species is questionable and so far as nomenclatoral purposes are concerned, they are practically *nomina nuda*.

In conclusion, Mr. Vanatta proposes new names for three species described by Lea and Conrad under names supposed to be preoccupied by Rafinesque.

One of them, *Pleurobema simpsoni*, proposed for *Unio striatus* Lea seems unnecessary as Rafinesque's *striata* was described as an *Obovaria* and not as an *Unio*.

If Rafinesque's *Unio nigra* and *Unio viridis* are identifiable, the other two changes proposed are proper under the Code.

These changes are but a foretaste of what is likely to happen to very many of the familiar names used for our American species, when the thankless and interminable task of collating all of the varietal names used for the *Unionidae* from the beginning has been completed and the unnecessary and vicious provisions of the Code in regard to the standing of varietal names is enforced according to the letter of the law.

A NEW TEREDO FROM THE WEST COAST OF AMERICA.

BY PAUL BARTSCH.

In looking over the West American Teredinidae in the collection of the U. S. National Museum, I find an undescribed species from the San Diego region which may be called :

TEREDO DIEGENSIS new species.

Expanded portion of pallets ovate, tipped at the distal end, which is the smaller, by a thick black distally truncated corneous cap. A complete description and illustration of the shell, which is like typical *Teredo*, will follow shortly in a monograph on the American species of this family.

There are six lots of this species in the collection of the U. S. National Museum from San Diego, California. The type is registered under Cat. No. 74219 U. S. N. M.

NOTES.

BIFIDARIA CLEMENTINA OLDROYDAE, N. VAR.—Shell similar to *B. clementina* St., but it lacks the basal fold. The angular lamella has a transverse depression, which gives it a double appearance in the face view. Length 1.9., diam. .9 mm. From Santa Barbara Island collected by H. Hemphill in October 1902. The type is No. 113848 Acad. Nat. Sci. Phila., donated by Mrs. Ida S. Oldroyd, in whose honor it is named.—E. G. VANATTA.

VIVIPARUS MALLEATUS Reeve.—In the NAUTILUS, Vol. 19, p. 35, July 1915 I published a note on the occurrence of this species in Massachusetts. That the colony is still thriving is shown by Messrs. Wm. J. Clench and Kendall Foster who obtained over 50 specimens this spring, varying from 10 to 45 mm. In cleaning one of the larger specimens I obtained from the oviduct a specimen measuring 6 mm.—C. W. JOHNSON.

PUBLICATIONS RECEIVED.

THE PLIOCENE MOLLUSCA OF GREAT BRITAIN. By F. W. Harmer F. G. S. Part II, pgs. 201–302. (Palaeontographical Society 1914). This part contains the Pleurotomidae. A number of new species are described and all of the species are figured on seven plates.

PLEURODONTE TORREI HENDERSON.

THE NAUTILUS.

VOL. XXX. SEPTEMBER, 1916. No. 5

A NEW CUBAN ZACHRYSIA.

BY JOHN B. HENDERSON.

PLEURODONTE (ZACHRYSIA) TORREI n. sp. Pl. I.

Imperforate, depressed, solid, straw color with russet streaks strongly arched forward, darker just behind the aperture. Four whorls, first ½ subtly spirally lirate and then malleated; the rest finely costulate striate, the striae arching forward and becoming wavy and complicated on the last whorl, and especially in the peripheral region, by two sets of revolving striae, one microscopically fine, giving under the lens a wrinkled appearance. There is a smooth shining area about the base. Last whorl abruptly descending in front, strongly carinated, the carina directed upward, so that the whorl is concave above and convex below except in the last ¼ whorl, where the carina is less obvious and the whorl becomes swollen and convex above. The outline of the final ¼ whorl is nearly straight, and bulges out into a gibbous ring about the aperture. Aperture small, very oblique, truncate oval. Peristome thickened, slightly expanded, white; basal margin horizontal, nearly straight, forming an obtuse angle with the curved outer lip; obsoletely toothed near the insertion of the columella.

Major diam. 31; min. diam. 25; height 17; ap. (inside) 11 by 8½ mm.

Locality: Farallones de Canipu, "Cayo del Rey" in the Mayari hills of Oriente Province, Cuba.

The shell has a lop-sided appearance, attenuated on the left, and swollen on the right side. The peculiar shape suggests a deformity; but many specimens taken without other forms or variation preclude such conclusion. The species is more closely comparable with *P. guantanamensis* and *P. proboscidea* than with any other of the group; but from these it is separable by the revolving sculpture and the up-tilted carina. It is the only carinated *Zachrysia* yet observed.

THE ANATOMICAL STRUCTURE OF GONIDEA ANGULATA (LEA).

BY A. E. ORTMANN.

The specimens at hand belong to the var. *haroldiana* Dall (Smithson. Misc. Coll. 50, 1908, p. 499; Hannibal, Proc. Malacol. Soc. London 10, 1912, p. 127, pl. 6, f. 10; Simpson, Descript. Cat. Nai., 1914, p. 466). They have been collected by H. Hannibal in Coyote Creek, Milpitas, Sta. Clara Co., California, partly on March 31, 1913, and partly in June, 1913. Over two dozen were received, among them males, sterile and gravid females.

Anal and *supraanal openings* separated by a well-developed mantle-connection, which is about ⅔ as long as the anal, and about half as long as the supra-anal. Inner edge of anal with fine papillae. *Branchial opening* separated from the anal by the gill-diaphragm, its inner edge with large papillae; branchial well defined anteriorly by the sudden disappearance of the papillae.

Palpi subfalciform, their posterior margins connected for about the half of their length.

Gills long and broad, the inner the broader. Outer gill gradually narrowing in front, its anterior end at the highest point of the line of attachment of the mantle, quite distant from the palpi. Inner gill narrowing more suddenly, and its anterior end about midway between palpi and anterior end of outer gill or at two thirds of this distance, but there is always a space behind the palpi. Outer lamina of outer gills entirely connected with mantle. Inner lamina of inner gills free from abdominal sac, except at its anterior end. Behind the foot, the two inner laminae of the inner gills are connected. Thus the gill-diaphragm is complete.

Gills with *well-developed septa*, running parallel to the gill filaments and forming water tubes. However, the septa are not all continuous, *but are often interrupted*, chiefly so toward the proximal (basal) part of the gill, and, toward the edge, frequently shorter septa are intercalated. In the female, *all four gills have marsupial structure* : the septa are much heavier and more closely set than in the male ; this structure is most evident in the central parts of the gills, while at the anterior and posterior ends it resembles more that of the male. The heavy septa in the middle of the gills of the female are frequently *perforated by subcircular holes*, so that here the interruptions of the septa assume a rather regular arrangement.

When gravid, all four gills of the female are charged. The gills, when fully charged, are only slightly swollen, with edges remaining sharp, and often there are no ova at the ends of the gills, chiefly the anterior end. The outer gills are charged first, and thus there are some individuals in which the inner gills have *not yet* received ova. The ova only incompletely stick together in the shape of placentae, and easily fall apart.

Glochidia moderately large, subovate or nearly subcircular : they represent, in outline, a segment of a circle cut off by the hinge line ; but the circle is not regular, being more narrowly rounded in the middle of the ventral margin. There is no trace of hooks. Valves of the glochidium rather strongly convex. Length and height about equal, 0.19 mm.

None of the gravid females collected on March 31 had glochidia, but such were present in some specimens collected in June. This, and the additional facts that in some females the gills were not yet fully charged in March, and that some were discharged in June, demonstrate that the beginning of the breeding season falls at the end of the month of March and that it lasts at least till June : a rather unusual time in North-American Nayades.

Color of soft parts grayish or brownish white, without any marked or characteristic tints.

This species originally was described as an *Anodonta*, and Simpson (1900 and 1914) placed it in his group of *Homogenae*, which largely (with the exception of the last three genera) corresponds to my subfamily *Anodontinae* (Ortmannn, Naut. 23, 1920, p. 117 and Ann. Carn. Mus. 8, 1912, pp. 224 and 278). However, *it does not belong here at all.* It is true, the rudimentary condition of the hinge suggests its affinity with the *Anodontinae*, and what Simpson knew about the anatomy did not conflict with this. But the material at hand proves conclusively that none of the characters of the *Anodontinae* are present. It is, indeed, a member of the family *Unionidae* (as defined by myself l. c.), for it has a complete diaphragm formed only by the gills; it has a supraanal opening; the gills have septa and water tubes running parallel to the gill filaments. However, the facts, that all four gills are marsupial; that the charged gills are only moderately swollen, with sharp edges; that no system of secondary water canals is developed within the gills; and that the glochidia are not triangular and have no hooks, *place Gonidea with the subfamily Unioninae.*

Within this subfamily, the genus has quite an isolated position, offering a curious mixture of primitive and advanced characters. The most primitive features are, that *all four gills are marsupial* in the female, and the *interrupted character of the septa.* This latter character is quite unique, suggesting even the ancient family of the *Margaritanidae.* The rather long mantle-connection between anal and supraanal openings does not agree with the more primitive types of the *Unioninae* (*Fusconaia* etc.), but rather with the more advanced ones (*Unio*, *Elliptio*), while the rudimentary condition of the hinge again is unique in the subfamily, exhibiting an advanced condition, which is not known, except in the genus *Lastena* (see Naut. 28, 1915, p. 106). The simple beak sculpture (4 to 5 subconcentric bars) appears as primitive. The glochidia are also of a primitive shape, agreeing with the shape generally found in *Unioninae.*

Hannibal (Science, 36, Dec. 20, 1912, p. 865) has suggested an amended division of the Nayades into families and subfamilies. I am not prepared to accept this as proposed, but I believe we shall be finally compelled, chiefly for the sake of convention, to follow his fundamental idea, namely that my subfamilies (*Unioninae*, *Anodontinae*, *Lampsilinae*) should rank as families. Then my *Unioninae* would become *Unionidae* (not

Quadrulinae, as Hannibal proposes, for I emphatically want to retain the European *Unio* in this group), and certain groups of my "*Unioninae*" should be elevated to the rank of subfamilies. Of the genera treated by myself in 1912 (l. c. p. 239, 240), eight (*Fusconaia* to *Uniomerus*) should form the subfamily *Quadrulinae*; the European *Unio* should form the subfamily *Unioninae*, and *Parreysia* and *Lamellidens* probably should form a third subfamily. In addition, another new subfamily should be erected for the present genus, that of the *Gonideinae*, with the characters of shell and soft parts as indicated above.

However, I refrain at present from working this out in detail, since there are yet many, chiefly exotic (Asiatic) genera, which require further study.

A NEW LANDSHELL FROM BRAZIL.

BY PAUL BARTSCH.

Among a lot of shells collected by Mr. H. M. Curran on the Rio Grungugy, Bahia, Brazil, is an *Oxychona* which differs from any of the described forms, and which I take pleasure in naming after the discoverer:

OXYCHONA PYRAMIDELLA CURRANI. New subspecies.

The shell strongly suggests *Oxychona pyramidella* (Wagner) described in his *Testacea Fluviatilia Brasiliana*, page 22, plate 16, figures 1 and 2, 1827, but differs from it by having the spire entirely white. The lip of our shell is of old-rose color while the broad basal band, which terminates a little before reaching the aperture, is liver-brown with a glaucous suffusion. The basal band is about one-third of the width of the base and is separated from the peripheral angle by a narrow white zone about one-fourth the width of the brown band. Our shell has seven whorls and measures: height 18.4 mm., greater diameter 22 mm., lesser diameter 18.6 mm.; the aperture measures from the columella to the outer angle of the keel 12.5 mm., from the columella to the posterior angle 6 mm. The type is Cat. No. 322281 U. S. N. M.

I am greatly indebted to Dr. H. A. Pilsbry for comparing our specimen with material in the collection of the Academy of Natural Sciences of Philadelphia.

STUDIES IN NAJADES.

BY A. E. ORTMANN.

(Concluded from Vol. 29, page 67.)

EURYNIA (MICROMYA) ARKANSASENSIS (Lea). (See: *Lampsilis ark.* Simpson, 1900, p. 557).

Three males and three sterile females from Saline River, Benton, Saline Co., Ark., collected by H. E. Wheeler, July 13, 1911.

Mantle-connection between anal and supraanal moderately long, but shorter than either opening. Anal with distinct or indistinct crenulations. Branchial with papillae. In front of branchial, the inner edge of the mantle is slightly lamellar in the female, with a series of about a dozen very small, rather distant, and somewhat irregular papillae, accompanied by a streak of black pigment. These papillae are smaller than those of the branchial opening, and are most distinct anteriorly. They are smaller than those of *vanuxemensis,* but agree very nearly with those of *constricta.* In the male, the streak of black pigment is present, but the papillae are represented by mere crenulations.

Posterior margins of palpi connected at base. Inner lamina of inner gills entirely connected with abdominal sac. Marsupium of the sterile female with 20 to 25 ovisacs, its edge pale brownish.

This species also in the shell resembles *E. vanuxemensis* and *constricta,* but it is more swollen and has more anterior beaks. The female has the characteristic shape of these species, but the enlarged and truncated posterior part is more evenly rounded, and the posterior end not so much produced. At least one of my females (the largest) has an indication of the "constriction" seen in old specimens of the two other species.

EURYNIA (MICROMYA) LIENOSA (Conrad). (See: Ortmann, 1912, p. 340).

In addition to the specimens investigated previously (from Mississippi), I received a gravid and discharging female from H. E. Wheeler, collected May 19, 1911, in the Ouachita River, Arkadelphia, and several gravid females collected in September, 1911, in Big Deceiper Creek, Gum Springs, Clark Co., Arkansas.

The glochidia agree with those decribed previously, but their general shape should be called subspatulate, with almost straight anterior and posterior margins. Length, 0.20; Height, 0.27 mm.

EURYNIA (EURYNIA) SUBROSTRATA (Say). (See: *Lampsilis s.* Simpson, 1900, p. 546).

Specimens from Big Deceiper Creek, Gum Springs, Clark Co., Ark., collected by H. E. Wheeler, September, 1911. Two were gravid females, one with eggs, the other with glochidia.

Mantle connection between anal and supraanal long, over twice as long as the short anal, and somewhat longer than the supraanal. Inner edge of anal crenulated, that of branchial with papillae. In the female, the inner edge of the mantle, in front of the branchial, carries a row of numerous, small, but distinct papillae, which are subcylindrical or subconical, of rather uniform size (the largest in the posterior part), and are somewhat distant from each other. A black streak extends from the branchial to a certain distance forward. In the male, the black streak is short, and the papillae are rudimentary and very distant from each other.

Palpi with one-third of the posterior margins connected. Inner lamina of inner gills entirely connected with abdominal sac, but sometimes a small hole is present at the posterior end of the foot.

Marsupium in the posterior half of the outer gills, in my specimens, with 18 to 25 ovisacs. Edge with some blackish-brown pigment.

Glochidia subovate (not subspatulate), higher than long. Length, 0.21; height, 0.26 mm. They are closely allied to those of *E. nasuta*, but are distinctly smaller (0.25 × 0.29 mm. in *nasuta*).

The glochidia have been figured by Lefevre and Curtis (Bull. Bur. Fish., 30 [1910], 1912, pl. 8 f. 13, 14, 15), and the fig. 13 gives the shape correctly, but measurements have not been published. Lefevre and Curtis (Journ. Exper. Zool., 9, 1910, p. 95), point to the glochidia of this species as having a shape, which might be regarded as transitional toward the "axe-head" (or "celt") glochidia of *Proptera.* This is quite right; but the glochidia found in the subgenus *Micromya* of *Eurynia* are yet closer to the axe-head type.

The same authors have published (1910, pl. 1, f. 2; 1912, pl. 6, f. 2), a general figure of the soft parts of the gravid female.

In shell characters, this species is near *E. nasuta* (Say), but the papillae of the mantle edge are somewhat larger, and not as closely set. This makes it, to a degree, transitional between typical *Eurynia* and the subgenus *Micromya.* With regard to the glochidia, *E. subrostrata* is more closely allied to *E. nasuta.* Also *E. recta* (Lamarck) has subovate, and not subspatulate glochidia.

Lampsilis ventricosa satur (Lea). (See: Simpson, 1900, p. 527).

A number of specimens from the Old River of the Ouachita River, Arkadelphia, Clark Co., Ark., collected by H. E. Wheeler, on May 19 and June 26, 1911, among them gravid females with glochidia, discharging on the latter date.

Soft parts entirely like those of *L. ventricosa* (Barnes).

Glochidia like those of *L. ventricosa* in shape, subovate, but distinctly smaller. Length, 0.22: height, 0.25 mm. (0.25 × 0.29 in *ventricosa*).

This form, according to Simpson, is "a rather delicate, dark colored variety of *ventricosus.*" There is nothing "delicate" about my specimens. The form *satur* was founded upon a female, and the male has never been figured. I have males. Both sexes differ from *ventricosa* by greater convexity of the valves, more prominent umbones, and by dark color. The peculiar emargination of the posterior margin of the female is an individual character, restricted to old specimens. Some of my younger specimens are lighter in color, dark olive-green, and have rays. A very similar form is *L. excavata* (Lea)

(Mississippi to Georgia), but this has a rather sharp posterior ridge. Eastern *excavata* are also much lighter in color, but I have specimens from Jackson, Miss., which are as dark as *satur*.

On account of the glochidia, I have the suspicion, that *satur* might be a good species. Intergrading specimens are not known.

NOTES.

Recently the Boston Society of Natural History received from Prof. Edward S. Morse a pamphlet with the following title on its cover—"PUBLICATIONS OF THE O. G. B. III. MOLLUSCA OF CINCINNATI. CINCINNATI: L. A. BURDSAL, PRINTER. 1876." Wishing to know the origin of this publication, our Librarian wrote to the Cincinnati Society of Natural History and the following information was received from Mr. Lester D. Collier, through the kindness of Mr. Charles Dury. "The pamphlet described was published by some Woodward High School boys and the Burdsal mentioned was one of them. The letters O. G. B. stands for "Our Geological Boys". Wm. Doherty was one. I was well acquainted with these boys, who were much interested in geology. The list of shells was made by them from specimens collected here and mostly by them. Some of them are dead and most (if not all) of them, gone from here. This is my recollection of it". The paper contains twelve pages, including the title page, "List of the mollusca existing in the neighborhood of Cincinnati, Ohio". The preface is dated August 6, 1876. The list contains 103 species.—C. W. JOHNSON.

SHELLS OF MT. MONADNOCK, N. H.—Mt. Monadnock, where I am staying (for the last seven summers) being mostly spruce-clad and often very dry during the late summer, is a very poor collecting ground for snails. However the excessively wet last July has started them out and by the energetic collecting of Miss Rebecca Kite and myself we have succeeded in getting representatives of the following species from between 2,000 and 3,000 feet altitude, all rare.

Polygyra albolabris Say.

Polygyra palliata Say. (2 specimens).
Polygyra thyroides Say. (1 dead and broken shell).
Pyramidula alternata Say. (2 specimens).
Pyramidula cronkhitei catskillensis Pils.
Strobilops virgo Pils. (1 specimen).
Succinea obliqua Say. (2 specimens).
Zonitoides arboreus Say. (The least rare species).
Vitrea radiatula Alder. (1 specimen).
Agriolimax agrestis L.
Philomycus pennsylvanicus Pils.
Limax sp. indet. (1 specimen).

—Wm. H. Dall.

PUBLICATIONS RECEIVED.

Mesozoic and Cenozoic Mactrinae of the Pacific Coast of North America. By Earl L. Packard (Univ. of California Publ., Bull. Dept. of Geology, Vol. 9, No. 15, pp. 261–360, pls. 12–35, May, 1916).

This thorough and interesting account of the fossil Mactrinae of that region has also considerable bearing on the recent forms. *Spisula voyi* Gabb, described as a *Callista* (1869) is found to be the same as *S. alaskana* Dall 1894. Eight new species and one new variety are described. The illustrations are excellent.

New Miocene Fossils. By Axel Olsson (Bull. Amer. Paleontology, Vol. 5, No. 27, 32 pp., 3 pls., July, 1916).

In this paper are described and figured 34 new species and 3 new varieties of mollusca from the Yorktown, Duplin and Choptank formations of Virginia, North Carolina and Maryland, and one species from Alum Bluff, Fla., also a new subgenus *Heterocerithiopsis*.

A Preliminary Catalog of the North American Sphaeriidæ. By Victor Sterki, M. D. (Annals of the Carnegie Museum, X, 1916).

The last general work on our species of this family was that of Prime published in 1865. The growth of collections of freshwater shells since that time has been enormous, and large areas entirely or quite imperfectly unrepresented in the older collections have been explored. More intensive work and better methods of collecting have resulted also in a great increase of species known from the older States. Most of the material collected in recent years has been studied by Dr. Sterki, who has now given us a systematic catalogue, with distribution, synonymy and descriptions of new forms. The recent species admitted by Sterki and by Prime number as follows:

		Sphaerium	*Musculium*	*Eupera*	*Pisidium*
Sterki	Species . .	31	23	2	88
	Subspecies .	8	9	0	49
Prime.	Species . . .	17	13	1	17

While there has been great increase in all the genera, during the past 50 years, *Pisidium* has been enlarged far more than the genera of Sphaeria, in which specific characters are more obvious. To conchologists *Pisidium* is much what *Crataegus* is to the botanists.

A classification into subgenera is given on pages 472–4. The subgenera *Lacustrina* (type *Pisidium idahoense*) and *Fontinalina* (type *P. fontinale*) are new. We may inquire whether authors who give preference to the principle of tautonymy in type selection (International Rules, Art. 30, I, *d*) would consider *Cyclas cornea* the type of *Corneocyclas* Fér., which in that case would replace the subgenus *Corneola* Clessin. Dr. Sterki has a monograph of the American Sphæriidæ under way. Until this is published, conchologists will find the present catalogue indispensable.—H. A. P.

Some Directions and Suggestions for collecting the Sphaeriidæ and Aquatic Gastropods. By Victor Sterki, M. D. This paper, following the preceding, will be found useful by all conchologists collecting freshwater shells, as it gives the methods which have proved most effective.

A Trip to Islands in Lake Erie. By Calvin Goodrich (Annals Carnegie Mus. X, 1916, pp. 527-531).

The record of a collecting excursion made by Dr. Clapp, Dr. Bryant Walker, Mr. Lucas Beecher and the author in July, 1915, to the group of islands belonging to Ohio and Ontario, of which only two, Put-in-Bay and Green (formerly Strontian) have appeared in previous conchological literature. Lists of the land shells of seven islands are given with a résumé of the geological history of the islands during successive stages of glacial time. The exceptional interest of these faunas as indices of the rate of evolutionary change, giving definite data on the question of the age of well-marked insular races, is alluded to. The paper forms an introduction to the following one.

NOTES ON THE LAND-SHELLS OF THE ISLANDS AT THE WESTERN END OF LAKE ERIE AND DESCRIPTIONS OF NEW VARIETIES. By George H. Clapp, (Annals Carnegie Mus. X, 1916). The new forms are as follows:

Pyramidula solitaria strontiana, Green Island.

Pyramidula solitaria roseoapicata, North Harbor Island.

Pyramidula solitaria mynesites, Mouse Island.

Pyramidula alternata eriensis, Middle Sister and other Islands.

Polygyra profunda strontiana, Green, North Harbor, Middle Sister Island.

Polygyra albolabris goodrichi, Middle Sister Island.

"Many of the larger shells of these islands show distinct insular modification. . . . Others are indistinguishable from the mainland forms, and this is particularly true of the shells of Put-in-Bay island, where there seems to have been no change in the species we found." The divergence from mainland forms of the species is notably different on different islands, as in the cases of *Pyramidula solitaria strontiana*, and *roseoapicata*. Different species are diversely modified, so that the differentiation of the races does not appear directly related to the insular conditions, though such relations might become obvious on further investigation. It may be a case of isolation products, due to different mutations occurring in the several colonies. Important facts for evolution might follow further study of the physical, faunal and floral conditions of the islands. At all events, the little exploration by Messrs. Clapp, Goodrich and Walker has opened up an interesting field for research.

A form similar to *P. alternata eriensis* is found in some of the islands off the New England coast. An excellent plate of shell-figures and diagrams showing variation curves illustrate the paper.

H. A. P. & C. W. J.

THE NAUTILUS.

VOL. XXX. OCTOBER, 1916. No. 6

A NEW SUBEMARGINULA FROM CALIFORNIA.

BY WILLIAM HEALEY DALL.

Among some specimens sent for examination from California I find a new *Subemarginula* collected by Mrs. W. H. Golisch of Los Angeles at San Nicolas island of the Santa Barbara group.

SUBEMARGINULA GOLISCHÆ n. sp.

Shell of moderate size, radiately ribbed, concentrically zoned and radiately striped with dark rose color, the worn apex greenish, the interior whitish, the extreme edge of the slightly crenulated interior margin with the external coloration showing through. Sculpture of rather strong radial ribs, corrugated more or less by strong incremental rugosities, alternated in front and behind with a single feebler rib, on the sides there are two or three minor riblets between the major ribs; apex rather acute, somewhat anterior; marginal notch shallow, its groove distinct on the internal face of the shell; the number of major ribs in the type specimen is about twenty. Length 20; apex behind the notch 7; width 13; height 7.5 mm.

In a general way this shell looks like one of the varieties of *Fissurella volcano* Reeve, except for the entire apex.

OBSERVATIONS ON UNIO GIGANTEUS BARNES.

BY L. S. FRIERSON.

Although the common and striking plicated shells were among the first of the Western Unios to receive names, their nomenclature is still considerably confused.

The first species to be named was the *plicatus.* Although that Thomas Say described it in Nicholson's Encyclopedia, was an easily ascertainable fact, Dr. Lea persisted throughout his life in denying this, and he credited the species to LeSueur ; an error in which he has been largely followed.

Say's type came from Lake Erie, and it has been claimed therefore that his species is really the flattened form widely known as *undulatus.* But in 1830 Mr. Say wrote the "*plicatus* is a species with very prominent umboes." Therefore the *plicatus* (*s. s.*) is that form which, as Barnes wrote, "can stand on end." The more common form of the same species which has flattened umboes, is very generally called *undulatus* Barnes. This is an error of nomenclature for two distinct reasons. The earliest name for this form is *costata* Rafinesque. The description of *costata* has been said to be inadequate, but without good reason, for Rafinesque's figure is unquestionably that of a plicate shell. His statement that its "disc is flattened" precludes the *plicata*, (*s. s.*) and the statement that the "animal is yellow" excludes the *multiplicatus.*

The two forms above named constitute a single species, connected by myriad links. The third form is readily distinguished by its umboes being covered with literations. It is widely but erroneously called *heros* Say, or *multiplicatus* Lea, neither of which names should be used, since either of them have been preceded by at least two (if not three!) names. The earliest name is almost certainly *peruviana* Lamarck. But because of ambiguity this name cannot be used.[1] Another name is the *undulatus* Barnes, almost universally applied to the *costata*, but is without doubt the *heros* Say! Barnes' statement among others, that its "disc is tuberculate below the beaks" almost alone proves this contention. As in the case of *peruviana*, the identity of *undulatus* has been thoroughly confused by authors, about half identifying it with *heros*, the others with *costata.*

Luckily there can be no doubt concerning the identity of the

[1] Lea stated that Lamarck's *Unio peruviana* was what has commonly been known as *U. plicatus.* This identification is entirely borne out by the figure n *Encyclopedie Methodique*, cited by Lamarck—Eds.

name which we now adopt for this magnificent Naiad, *Unio giganteus* Barnes 1823.

This very appropriate name has been totally overlooked by systematists. Simpson, it is true, mentions it; but he credited it to Lea, saying, "*Dr. Lea does not describe this but only states that it is in Dr. Mitchell's collection. Probably it has never been described.*" (Synopsis, 1900, page 767, note 4.)

Unio giganteus was, however, described as a named variety of his *crassus* which, as is well known, embraced the plicate shells. (His *Variety* "*K*," is typical Lake Erie *plicata!*)

Following the general description of *crassus*, Barnes writes—"Variety (i) Unio giganteus. Mississippi. Dr. *Mitchell's* collection." The variety (i) deserves particular notice. A single valve sent by *Professor Douglass* to *Dr. Mitchell* weighs fifteen ounces. It is in every respect a gigantic shell. The distance between the points of the two lobes of the cardinal tooth is one inch; the length of the lateral tooth, three inches; diameter of the posterior cicatrix, one inch, and its depth, one-fourth of an inch.

This species, of which four specimens were obtained by the N. W. Expedition, might perhaps constitute a separate species under the designation of *Unio giganteus.* It is *three times* the size of the largest *Unio crassus* mentioned by Mr. Say and M. Lamarck.

Three specimens—

Diameter 2.9,	Length 4.8,	Breadth 7.2,
" 3.0,	" 4.6,	" 7.0,
" 3.1,	" 4.7,	" 7.1, are pre-

served in *Dr. Mitchell's* collection.

Another specimen—

Diameter 2.9, Length 4.9, Breadth 7.0, and weighing fourteen ounces, is preserved in Gov. Cass's collection, Detroit.

Habitat. The Mississippi, near Prairie du Chien. *Prof. Douglass.*

These specimens labeled "giganteus," in Dr. Mitchell's collection, were mentioned by Mr. Lea, who (in Obs., vol I, page 31, footnote) writes—"The giganteus of Dr. Mitchell's collection is also a peruviana which occurs in our western waters of a larger size and more ponderous than any species we know of."

The reader will note that Lea identified the *giganteus* as *peruviana*. At this time (1829) he regarded all the plicate shells as being one species. He never mentioned *giganteus* again! Can it be that this omission arose because of his very evident wish to protect his name of *multiplicatus?*

With the possible exception of *peruviana*, the *giganteus* is the earliest name given to the species, as well as the most appropriate. Following Lea, Simpson placed "giganteus" (Lea) under *plicatus*. The *giganteus* of Barnes however can be nothing else than *heros*. No other Naiad attains the dimensions given by him.

This species has recently been erected into a separate genus by Utterback, whence its proper name is now *Megalonaias giganteus* Barnes, 1823.

PLEISTOCENE MOLLUSCA FROM CALLAWAY COUNTY, MISSOURI.

BY DARLING K. GREGER, COLUMBIA, MISSOURI.

During the past season, engineers in charge of river improvement being carried on near Mokane, Mo., called my attention to two localities where an abundance of fossil or semi-fossil shells were being unearthed, and upon their invitation to conduct me to the localities, both were examined, and collections made.

The first place visited was an excavation on the east bank of Middle River, a short distance below the point of its entrance into the gorge of the Missouri. At a depth of twenty-six feet below the level of the flood-plain of the Missouri River, in a black, sticky clay the following species were gathered:

Polygyra profunda,	*Succinea ovalis ?,*
Polygyra albolabris,	*Gastrodonta ligera,*
Polygyra thyroides,	*Helicina occulta,*
Polygyra elevata,	*Pyramidula solitaria.*
Polygyra clausa,	*Pyramidula alternata,*
Polygyra appressa,	*Pyramidula perspectiva,*

Polygyra inflecta,	*Helicodiscus parallelus,*
Polygera fraterna,	*Campeloma subsolidum,*
Polygyra monodon,	*Pleurocera sp.?,*
Polygyra hirsuta,	*Sphaerium transversum.*

The second locality examined was an exposure of typical loess in the government quarry a short distance above the town of Mokane on the M. K. & T. R. R. The full section of strata exposed in the quarry face measures approximately seventy feet; rising abruptly from the flood-plain of the river, the Jefferson City formation (Ordovician) presents a precipitous face of sixty feet followed by a layer of tough, bluish clay, interspersed with worn fragments of limestone; upon this bed of clay is deposited a layer of loess that varies in thickness but having probably an average of nine feet. The loess is capped with a layer of soil rich in humus and supports a flora typical of the Missouri Bluff region.

While occasional specimens of the species listed were found throughout the entire thickness of the loess, it was only in a thin zone, about sixteen inches from the base, that they were collected in abundance, in fact they are so abundant in this zone as to attract attention from the highway below, by the white line they present at the top of the quarry, being even more pronounced than the Ordovician–Pleistocene contact.

Of the entire series collected from this exposure, all have lost their color markings and uniformly present the usual chalky appearance common to the fossils of the loess.

A few are filled with a heavy iron-stained deposit; others are filled with the surrounding loess mass and occasionally specimens are unfilled and crumble to dust upon their removal from the matrix.

Careful examination of all fragmentary as well as the better preserved shells in the collection gathered at this place fails to detect a single aquatic species, the fauna being composed wholly of land forms, and their being massed together in a single layer can be readily explained as an accumulation left in a depression after a torrential rain. However, a misinterpretation of conditions, such as presented in this locality, combined with a lack of knowledge of the habits of the forms found, has led a number of writers to use just such evidence to advocate the theory of a fluviatile origin for the widely distributed beds of loess in the Missouri Valley region.

By passing a quantity of the material from the shell zone over a set of sieves of different mesh, I was enabled to recover a number of very minute species, some of them, notably *Carychium exile* Lea, being quite abundant.

List of species from the government quarry near Mokane, Mo.:

Polygyra albolabris, (a)
Polygyra appressa, (a)
Polygyra appressa, small var., (c)
Polygyra elevata, (a)
Polygyra multilineata, (r)
Polygyra thyroides, (c)
Polygyra zaleta ?, (c)
Polygyra fraterna, (c)
Polygyra monodon, (c)
Polygyra hirsuta, (c)
Zonitoides arborea, (r)
Zonitoides minuscula, (c)
Pyramidula solitaria, (c)
Pyramidula alternata, (a)
Pyramidula alternata, small var., (c)
Gastrodonta ligera, (r)
Helicodiscus parallelus, (c)
Vallonia pulchella, (a)
Vallonia sp. indet., (r)
Bifidaria contracta, (c)
Bifidaria armifera, (c)
Bifidaria procera ?, (r)
Carychium exile, (a)
Helicina occulta, (c)

(a) = abundant, (c) = common, (r) = rare.

THE FEEDING HABITS OF BUSYCON.

BY SHIELDS WARREN.

Last September I made a series of observations on the feeding habits of Busycon at Hyannisport, Massachusetts. This place was well suited for the work, since both *B. canaliculata* and *B. carica* occur plentifully, and oysters and quahaugs are fairly numerous. All these observations were made under natural conditions.

There are two distinct stages in the feeding habits, the first when the animal is small and the shell weak, the second when the animal is grown and the shell strong. In the first stage they are incapable of attacking a large lamellibranch, and eat carrion and small univalves, such as Nassa, which occur abundantly on the flats. To get at the Nassa, they envelop the shell in the foot until it is asphyxiated, and then clean out the animal with the radula. In the second stage the quahaug and oyster are the chief articles of food, and, contrary to the general opinion, the radula is not used to bore through the shells, but the edges of the valves are chipped away against the lip of the Busycon's shell.

I was led to take up these investigations by the following facts : in examining radulae of the Busycons I noticed that they were not so worn as in the borers Polinices and Urosalpinx ; the lips of their shells are almost invariably chipped : and the dead quahaug shells on the flats were not bored but chipped.

Subsequently I found that Mr. Harold S. Colton had described (Proc. Acad. Nat. Sci., Phila ; 1908) the feeding of *B. canaliculata* as observed in the aquarium of the University of Pennsylvania. The following statements are quoted from his summary.

"They (*canaliculata* and *carica*) open the shells of oysters by wedging their own shell between the valves and tear out the flesh with their radula. They probably treat quahaugs in the same way.

"Sycotypus will attack any except Venus."

He also states that the whelk waits until the bivalve opens and then inserts its shells between the valves.

Mr. C. W. Johnson suggested to me that the bivalves might have been weakened by life in the aquarium, and this is probably the explanation of the shells' opening their valves while gripped in the Busycon's foot. Also while *B. canaliculata* will not attack quahaugs as early in life as *B. carica*, since the lip of its shell remains almost paper-like until the animal is well grown, I found two large specimens eating quahaugs.

The Busycons I observed ate in the following manner. An oyster is held in the foot with the hinge toward the canal, while a quahaug is grasped in such a way that the hinge is toward the columella, but in both cases the edges of the bivalve are left free. In the majority of cases the Busycon rests on its foot with the canal pointing upwards at an angle of about 30°. The foot is slowly contracted, about six times a minute, and the edge of the oyster is brought against the inner edge of the lip with considerable pressure and then drawn inward and toward the canal. A small piece is chipped from the edge of the oyster and the process repeated until a gap is made large enough to to admit the radula, which then tears out the flesh. This method of getting at the animal explains not only the roughened and chipped condition of the lip of the Busycon, but also the chipped oyster and quahaug shells. Occasionally I have found a live quahaug with its edge much chipped but still intact, so the whelk does not always succeed. Usually, however, it encounters but little difficulty.

DESCRIPTIONS OF NEW SPECIES FROM THE CRETACEOUS AND TERTIARY OF THE TESLA, PLEASANTON, SAN JOSE, AND MT. HAMILTON QUADRANGLES, CALIFORNIA.

BY E. B. HALL AND A. W. AMBROSE.

INTRODUCTION.

During the paleontological work at Stanford University, for a folio covering the Tesla, Pleasanton, San Jose and Mt. Hamilton Quadrangles, several new forms were found. In order that the names of these might be established, the writers decided to publish the descriptions of the same. The writers' thanks are due Dr. James Perrin Smith for his assistance to the writers in this work.

HORSETOWN—MIDDLE CRETACEOUS.

PECTEN CLARKENSIS n. s. Hall and Ambrose.

Description. Shell small, two specimens found averaging 17 mm. in altitude, little higher than long, compressed, thin, subcircular, equivalve and equilateral; ears equal, moderately small, base regularly rounded, margins smooth. Surface marked by 20 or 21 radiating nearly equal ribs, being two or three times the width of interspaces that terminate abruptly a little way from margin, also by obscure lines of growth.

Dimensions. Alt., 16 mm.; latitude, 16 mm.; longitude, 18 mm.; hinge line (restored and approximate) 9 mm.; diameter, 11 mm.

Notes. Characterized by definite number and character of ribs, and easily distinguished from *P. operculiformis*, *P. californicus*, *P. complexcosta*, and *P. interradiatus*. Named in honor of W. O. Clark.

Type. Museum, Stanford University, Calif.

Locality. Found by W. O. Clark on the San Jose Quadrangle, two and a half miles Northeast of Milpitos, just at beginning of foothills and a little north of serpentine outcrop.

Horizon. Horsetown, middle Cretaceous.

AVICULA GREGORYI, n. s. Hall and Ambrose.

Description. Shell oblique, subcompressed; ears very unequal; beaks moderate, anterior; cardinal line straight; anterior ear short and angular with small byssal notch; posterior ear broad; anterior margin regularly rounded from near umbo to base, posterior margin straight and sharply rounded to base, basal margin forms an excentric curve, most produced behind. Ears gradually round into body of shell. Surface marked by numerous faint, but distinct, radiating ribs.

Dimensions. Altitude 7 mm.; longitude 9 mm.; hinge line 5 mm.; diameter.

Notes. Distinguished from *A. pellucida* by ribs, byssal notch and lack of acuminate posterior ear. Named in honor of A. E. Gregory, Stanford University, Calif.

Type. Museum, Stanford University, Calif.

Locality. One and one-half miles S. 10 W. of Carnegie, Tesla Quadrangle.

Horizon. Horsetown, middle Cretaceous.

SONNERATIA ROGERSI, n. s. Hall and Ambrose.

Description. Shell small, not often above a diameter of 4.5 mm.; discoidal, laterally compressed and flattened; umbilicus not large, about one-quarter total diameter, funnel form due to sloping sides and gradual increasing thickness of shell; sides converge gently toward periphery; ventral surface subquadrate; surface ornamented with about sixty transverse flexuous ribs which usually cross the ventral surface and terminate in about one-quarter as many distinct tubercules upon the shoulder of the umbilicus. The ribs show a tendency to bifurcate from these ridge-like tubercules, and become less distinct on the sides of the shell, curving gently backward, and becoming very distinct and wider near the outer margin where they turn decidedly forward. The suture line is simple, consisting of a few broadly rounded saddles and wide lobes having very short branches. Saddles little indented, and are bifid with rounded denticles and incisions. Lobes unequally tripartite.

Notes. This form easily distinguished from *S. stantoni*, as it has nearly twice as many ribs, a lack of fine lines, striations on ribs and interspaces, and a greater size. Named in honor of Professor A. F. Rogers, Stanford University, Calif.

Type. Museum, Stanford University, Calif.

Locality. Three-quarters of a mile South of Carnegie, Corral Hollow, Tesla Quadrangle.

Horizon. Horsetown, middle Cretaceous.

Chico—Upper Cretaceous.

Ataphrus pembertoni, n. s. Hall and Ambrose.

Description. Shell medium, thick, rather flattened, spire low; whorls four, rounded, enlarging rapidly anteriorly, and revolving a little obliquely; whole body being about twice as large as penultimate. Aperture oblique, subcircular, columellar lip thick and rather straight. Surface smooth, marked only by occasional very faint lines of growth; umbilical region covered by a smooth callus, which merges insensibly into general surface.

Dimensions. Alt., 12 mm.; lat., 18 mm.; alt. of body whorl, 7 mm.; alt. of aperture, 9 mm.

Notes. Distinguished from *A. crassa* by its size, higher spire, and non-rounding of columellar lip. Named in honor of J. R. Pemberton.

Type. Museum, Stanford University, California.

Locality. Jordan Ranch, Arroyo del Valle, Tesla Quadrangle, Alameda County, California.

Horizon. Lower Chico, upper Cretaceous.

Cerithium branneri, n. s. Hall and Ambrose.

Description. Shell elongate, slender; whorls numerous, probably eight, two apical whorls being lost, rounded on sides; suture linear, impressed. Surface marked by numerous, slightly curved longitudinal ribs, about twenty-six to a volution; these are more prominent near upper suture of the whorl and become very indistinct at the lower suture; very fine striae cover both ribs and interspaces, running parallel with ribs; ribs and interspaces crossed alike by numerous shapely elevated revolving threads, running parallel to suture. These produce a small node at each crossing of the longitudinal rib one-quarter of the way down on the lowest whorl, one-third down on the second, one-half down on the third, and the entire way down on the remaining whorls. Aperture, sub-circular; inner margin somewhat thickened and curved.

Dimensions (less several apical whorls). Alt., 16 mm.; lat., 7 mm.; alt. of body whorl, 13 mm.; alt. of aperture, $4\frac{1}{2}$ mm.

Notes. Named in honor of Dr. John C. Branner.

Type. Museum, Stanford University, California.

Locality. One mile north, 20° west of Tesla and Corral Hollow, Tesla Quadrangle.

Horizon. Middle Chico, upper Cretaceous.

(*To be continued*)

NOTES.

Fossil Chitons. In working over some fossil shells from the Pleistocene strata of Deadman's Island, San Pedro, California, I find that I have three species which are not listed by Arnold in his "Paleontology and Stratigraphy of the Pliocene and Pleistocene of San Pedro."

Katherina tunicata Sby. One perfect anterior valve.

Ischnochiton conspicuus Cpr. One perfect posterior valve.

Mopalia hindsii (Sby.) Rve. One central valve in good condition.

These were identified by comparing with recent specimens. *Ischnochiton conspicuus* is found living in this vicinity and has been reported fossil from the Pleistocene at Signal Hill, Long Beach, by Mr. T. S. Oldroyd. (Nautilus, vol. 28, page 80.)

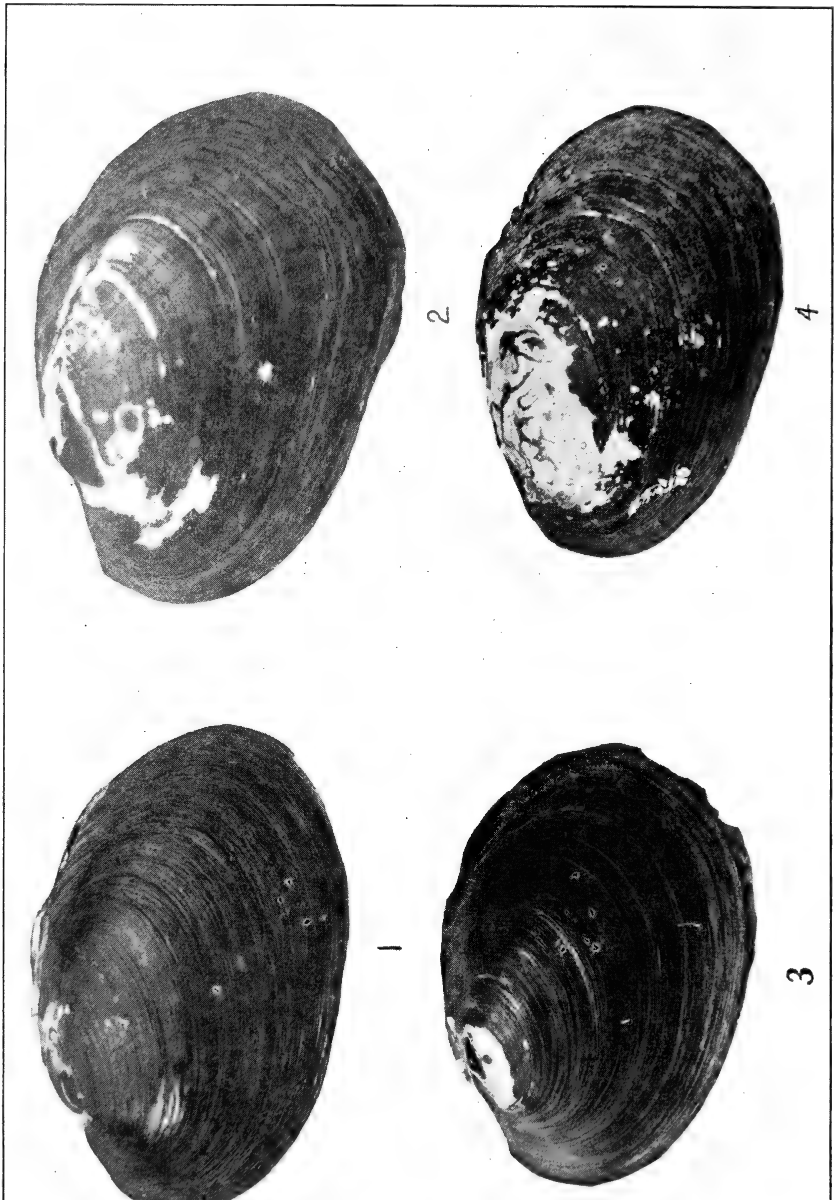
Katherina tunicata and *Mopalia hindsii* are found living at Monterey and farther north but are not found living in this locality. —E. P. Chace.

Viriparus contectoides Binn. in Boston, Mass. This species has recently appeared in great numbers in the Lake in the Public Garden. Adults measuring 23 mm. (slightly eroded) are comparatively scarce, but specimens measuring from 9 to 13 mm. are abundant. Mr. E. G. Vanatta has recorded it from the lily pond, Fairmount Park, Philadelphia (Naut. vol. 26, p. 84, 1912). As this species is frequently kept in aquaria, it has probably been introduced in the Lake with goldfish which are annually placed there.—C. W. Johnson.

Melanella iotoides.—When I published *Melanella iota* in my "Report on the Turton Collection of South African Marine Mollusks," Bulletin 91, U. S. National Museum, page 67, plate 19, fig. 2, 1915, I overlooked the existence of a previously described *Melanella* bearing this name; namely, *Eulima iota* C. B. Adams, Ann. Lyc. Nat. Hist. N. Y., p. 422, 1852.

My shell therefore requires a new name, and may be known as *Melanella iotoides*.—Paul Bartsch.

New Jersey Shells.—The following species of shells were picked from leaf-mould collected by Mr. Bayard Long on April 7th and May 19th, 1916, near Garden Lake Station, west of Clementon, Camden county, New Jersey. The *Euconulus* and *Strobilops* are southern species new to the state: *Polygyra albolabris* Say, *P. thyroidus* Say, *P. fallax* Say, *Pupoides marginatus* Say, *Bifidaria armifera* Say, *B. contracta* Say, *B. pentodon* Say, *Vertigo tridentata* Wolf, *V. milium* Gld., *Strobilops floridana* Pils., *Vallonia excentrica* St., *Columella edentula* Drap., *Polita hammonis* Ström., *P. indentata* Say, *Striatura milium* Mrse., *Zonitoides arborea* Say, *Z. minuscula* Binn., *Agriolimax campestris* Binn., shell only, *Euconulus chersinus trochulus* Reinh., *Helicodiscus parallelus* Say, *Punctum pygmæum* Drap., *Succinea avara* Say, and *Carychium exiguum* Say.—E. G. Vanatta.



UNIO RADIATUS ONEIDENSIS BAKER.

THE NAUTILUS.

VOL. XXX. NOVEMBER, 1916. No. 7

EULIMASTOMA, A NEW SUBGENUS OF PYRAMIDELLIDS AND REMARKS ON THE GENUS SCALENOSTOMA.

BY PAUL BARTSCH.

Additional material received by the United States National Museum makes it necessary to create a new subgenus for the Pyramidellids typified by *Odostomia* (*Scalenostoma*) *dotella* Dall and Bartsch (Bull. 68, U. S. N. M., p. 230, 1909). *Scalenostoma* must be referred to the family *Melanellidae* (=*Eulimidae*).

There is a wonderful resemblance between *Eulimastoma* and *Scalenostoma* as far as texture of shell and sculpture are concerned, and it was this resemblance and the absence of representatives of the genus *Scalenostoma* that caused me to consider this a Pyramidellid in the past. Material now at hand shows that *Odostomia* (*Eulimastoma*) *dotella* Dall and Bartsch has an obliquely tilted, deeply immersed nucleus, a Pyramidellid character, while *Scalenostoma* has the usual attenuated, acute, non-sinistral tip.

The following synonymy should be noted :

Scalenostoma Deshayes, Cat. Moll. Ile de la Reunion, pp. 58–60, Pl. vii, figs. 26–8, 1863. Type *Scalenostoma carinatum* Deshayes=*Subeulima* Souverbie, Journ. de Conch. xxiii, p. 296, 1875. Type *Subeulima lamberti* Souverbie.

The west American members of the genus *Scalenostoma* are:

SCALENOSTOMA RANGII (de Folin).

Chemnitzia rangii de Folin, Les Meleagrinicoles p. 61, Pl. 6, fig. 1, 1867. *Odostomia* (*Scalenostoma*) *rangii*, Dall and Bartsch Bull. 68, U. S. N. M., p. 230, Pl. 30, fig. 2, 1909. *Odostomia*

(*Scalenostoma*) *rangii*, Bartsch, Proc. U. S. N. M., No. 1906, p. 307, 344, 1912.

Scalenostoma babylonia (Bartsch).

Odostomia (*Scalenostoma*) *babylonia* Bartsch, Proc. U. S. N. M., No. 1903, pp. 287–8, Pl. 38, fig. 3, 1912, *Odostomia* (*Scalenostoma*) *babylonia* Bartsch, Proc., U. S. N. M., No. 1906, p. 307, 344, 1912.

The South African species of this genus which I described in the Report on the Turton Collection of South African Marine Mollusks, Bull. 91, U. S. N. M., p. 70, Pl. 19, fig. 6, 1915, as *Subeulima magnifica* must now be called *Scalenostoma magnifica* (Bartsch).

DESCRIPTION OF A NEW VARIETY OF LAMPSILIS FROM ONEIDA LAKE WITH NOTES ON THE L. LUTEOLA GROUP.

BY FRANK C. BAKER.

Lampsilis radiata oneidensis F. C. Baker. Plate II.

Shell elliptical in outline, rounded at both ends, somewhat compressed; dorsal margin slightly curved, ventral margin rounded, notably so in the male shell; female shell produced postbasally; surface usually roughened by growth lines, rarely smooth; epidermis olive-green, the posterior half usually black or brown, obscuring the markings; a few dark green rays of the *radiata* type are present on some shells; umbones prominent, inflated, but little elevated above the contour of the dorsal margin; unbonal slopes rounded; cardinal teeth of the left valve double, rather heavy, serrated, the anterior cardinal higher than the posterior and pyramidal in shape, the posterior cardinal rectangular somewhat compressed; the pit between the cardinal teeth is deep and wide; there is a small, narrow pit at the base of the anterior cardinal tooth; cardinal teeth of right valve two in number, triangular, the anterior small, compressed, the posterior large, elevated above the anterior, forming a truncated pyramid; the pit between the teeth is narrow and deep; the anterior cardinal of this valve is reduced to a mere remnant in some individuals; the ridge joining the cardinal and lateral teeth is heavy and bears one or more tubercles ; lateral teeth as in *radiata;* anterior adductor muscle scar, posterior adductor muscle scar, and dorsal muscle scars more heavily impressed than in *radiata* ; nacre bluish-white, slightly iridescent.

All of the specimens seen have their umbones eroded.

Length	56,	height	36,	breadth	21	mm.	♂.
"	53,	"	35,	"	20	mm.	♀.
"	51,	"	37,	"	20	mm.	♂.
"	60,	"	40,	"	24	mm.	♀.
"	66,	"	41,	"	27	mm.	♂.
"	63,	"	41,	"	27	mm.	♀.

Types in collection of the New York State College of Forestry at Syracuse University ; cotypes in collection of the Academy of Natural Sciences of Philadelphia and Dr. Bryant Walker, Detroit, Mich.

This race of Lampsilis is related to both *radiata* and *luteola.* From the latter it differs in the more elliptical sometimes orbicular outline of the male shell, the olive green and brown epidermis and in the cardinal teeth which are heavier and broader, not so deeply serrated, and of different shape. From *radiata* it differs in its outline, in its epidermis, which is not as rough, and in the cardinal teeth, which are not as heavy, and are more elevated, triangular and pyramidal. The pits at the base of the cardinal teeth are deeper.

This race is common in Oneida Lake and is very uniform in the characteristics noted. It was previously listed[1] as *Lampsilis borealis* but specimens of *borealis*[2] from the type locality, Duck Island, Ottawa River, Ontario, Canada, received from Dr. Walker, show that it is not that species, true *borealis* having a heavier, more inflated shell, heavier and differently shaped cardinal teeth and an epidermis like that of *radiata.* Small females of *oneidensis* have a superficial resemblance to *Lampsilis*

[1] The Fresh-water Mollusca of Oneida Lake, New York. NAUTILUS, xxx, page 7, 1916 ; The Relation of Mollusks to Fish in Oneida Lake. Tech. Bull. No. 4, New York State College of Forestry at Syracuse University, page 257, fig. 44, 1916. The references to *borealis* in the latter publication should be changed to *oneidensis.*

[2] Trans. Ottawa Field Nat. Club, No. 3, page 53, 1882.

luteola rosacea but differ in the form of the cardinal teeth as well as in the outline of the shell and in the color and texture of the epidermis.

Oneidensis apparently bears the same relation to *radiata* that *rosacea* does to *luteola.* It is not a depauperate or sporadic form of *radiata,* for it occurs plentifully and is always recognizable at a glance when mixed with *luteola* and *radiata.* A lot of shells from Lower South Bay contained these three mussels in the ratios indicated: *oneidensis,* 28; *radiata,* 15; *luteola,* 16. Individuals occur with a pink shell and nacre like that of the race *rosacea.* How widely distributed this race of *radiata* may be is not known but it should be found in other parts of New York State.

The *luteola* group of *Lampsilis* living in Oneida Lake is of unusual interest from the standpoint of variation. Here the two species have apparently interbred, causing a mixture of the characters of both species. Thus, individuals of *radiata* occur with a normal hinge but with a polished surface like *luteola.* Also, *luteola* individuals occur with a rough surface and the crowded rays of *radiata.* The breadth of shell in both species varies nearly fifty per cent. All specimens of *luteola* are more numerously rayed than are those from the West and also those from Western New York, showing apparently a tendency to vary toward the *radiata* type of surface. A tinge of red is found in individuals of all species, though not as strikingly as in the typical *rosacea* of DeKay.

A form of *luteola* occurs in the lake which is much compressed (resembling in this respect *radiata*) the epidermis is smooth and the bright green rays are widely spaced. These individuals are noteworthy for the marked elliptical outline of the shell and the acute V-shape formed by the ventral half of the shell. Measurements are given below of these specimens together with typical forms of *radiata* and *luteola.* All are males.

Length	80,	width	47,	breadth	27 mm.	*Luteola,* compressed.
"	58,	"	34,	"	19 mm.	*Luteola,* compressed.
"	64,	"	40,	"	35.5 mm.	*Luteola,* typical.
"	62,	"	38,	"	35.5 mm.	*Radiata.*
"	80,	"	25,	"	25 mm.	*Radiata,* Mohawk river.

The *radiata* of Oneida Lake are not typical ,being more inflated, quadrate in outline rather than elliptical, the rays are not as even or as numerous and the color of the shell is usually yellowish rather than greenish, in this respect approaching *luteola.* The *radiata* type in the lake shows a decided variance toward the form of the shell herein described as *oneidensis.*

The only safe criterion for separating the Oneida Lake *radiata* from *luteola* is by the form of the cardinal teeth. Many years ago F. R. Latchford[1] tersely characterized these differences as follows: "In *U. radiatus* these are short, erect, and triangular. In *U. luteolus* they are long, curved, compressed, and oblique." The dull, rough epidermis is characteristic of *radiata* but, as noted in Oneida Lake specimens this may not be present or typically developed. It seems evident that in Oneida Lake evolutionary forces have been at work upon this group of the Naiades and that the form herein described as *oneidensis* is the result.

Figures 1 and 3 represent male, 2 and 4 female individuals.

My thanks are due Dr. Bryant Walker for assistance in working out the relationships of this race and also Dr. C. C. Adams, of the New York State College of Forestry, for the loan of the plate upon which the race is figured.

New York State College of Forestry,
Syracuse University.

DESCRIPTIONS OF NEW SPECIES FROM THE CRETACEOUS AND TERTIARY OF THE TESLA, PLEASANTON, SAN JOSE, AND MT. HAMILTON QUADRANGLES, CALIFORNIA.

BY E. B. HALL AND A. W. AMBROSE.

(*Concluded from page 71*)

PHOLADOMYA HARRIGANI, n. s. Hall and Ambrose.

Description. Shell, right angle, thick; beaks low, anterior, in-curved, nearly touching. Buccal end abruptly truncated at

[1] Notes on the Ottawa Unionidae. Trans. Ottawa Field Nat. Club, No. 3, page 51, 1882.

right angles to cardinal and basal margins. Cardinal margin regularly rounded anteriorly from beaks; anterior end rounded into straight basal margin; posterior end, anterior end and basal margin closed. Surface marked by prominent irregular lines of growth following curvature of shell and extending continuously along sides and on posterior end to umbones, also marked by 17 to 19 less prominent radiating, regularly spaced ribs that cover entire surface of sides and do not extend on to posterior end as in the case of the lines of growth. The radiating ribs become more prominent proceeding from the anterior to the posterior end.

Dimensions. Length, 50 mm. Posterior width, 40 mm. Posterior thickness, 35 mm. Greatest width and thickness at posterior end.

Notes. Named in honor of P. F. Harrigan, Los Angeles, Calif.

Type. Museum, Stanford University, Calif.

Locality. Black shale, Western Pacific Railroad cut near Altamont, Tesla Quadrangle.

Horizon. Upper Chico, upper Cretaceous.

SCHLOENBACHIA TEMPLETONI, n. s. Hall and Ambrose.

Description. Shell discoidal and compressed, slightly inflated on the last whorl, attains a diameter of 16 cm. Keel slight and broken into nodes. Surface ornamented with about 45 (counted along ventral margin) rounded, slightly curved, forward pointing ribs, that begin in narrow elongated nodes (slightly diverging from plane of keel) on the ventral margin and end on the umbilical margin in about a third as many pointed nodes as ribs, from which the umbilical walls make a perpendicular descent. Some of the ribs bifurcate on the surface of the shell in nodes without any apparent regularity of system and from three series of costal nodes on the surface—not counting the umbilical and ventral margin nodes—and run nearly regularly with the curvature of the whorl. The nodes on the ventral margin are opposite each other. The tubercules of the keel stand a little forward of the marginal nodes in a position to exactly meet the forward curving of the ribs.

Notes. Named in honor of E. C. Templeton, Stanford University, California.

Type. Museum, Stanford University, California.

Locality. Western Pacific Railroad cut between Altamount and Greenway, Tesla Quadrangle.

Horizon. Upper Chico shale, upper Cretaceous.

Tejon—Upper Eocene.

Panopea smithii, n. s. Hall and Ambrose.

Description. Shell subquadrate, about twice as long as wide; beaks small, nearly central but a little toward the posterior end. Cardinal margin nearly straight anteriorly with end regularly rounded, slightly sloping posteriorly with end abruptly truncated, basal margin slightly concave. Posterior end gaping, anterior end and basal margin closed. An angulated furrow runs from the umbones to posterior end of basal margin. A gently curved furrow runs from umbones to center of basal margin, giving a bulging appearance to both dorsal and ventral ends. Surface marked by coarse, rather regular ribs.

Dimensions. Length, 72 mm.; width, 37 mm., apparently from others found, this form represents the adult form.

Notes. Named in honor of Professor James Perrin Smith, to whom the authors are deeply indebted.

Type. Museum, Stanford University, California.

Locality. Creek cut opposite where Livermore road crosses the Western Pacific Railroad, Corral Hollow, Tesla Quadrangle.

Horizon. Tejon, Upper Eocene.

Monterey—Lower Miocene.

Mesodesma pacifica, n. s. Hall and Ambrose.

Description. Right valve. Cast. Shell subtrigonal, inequilateral. Beak small. Posterior end truncate, at extremity making angle of 133° at beak between posterior dorsal margin and anterior dorsal margin, anterior margin straight, abruptly truncated at end, deep furrow cutting at angle of 25° to anterior dorsal margin from beak, gradually disappearing until obscure at center of valve.

Dimensions. Long. 40 mm.; alt. 22 mm.; diameter 4 mm.

Notes. This form is easily recognized by its shape and posterior truncation. Harold Hannibal has collected this form on Vancouver Island in the Sooke Formation (Oligocene). The writers had the opportunity of comparing the material with a specimen collected by Mr. Hannibal. It showed a strong hinge, a large resiliary pit, rather deep, and a thick shell, with concentric striation.

Type. Museum, Stanford University, Calif.

Localities. Monterey Sandstone, P. 282, on the Pleasanton Quadrangle, in Alameda Creek, 1½ miles south of Mouth of Welch Creek, and one-fifth mile south of Calaveras Fault, Sunol, Calif.

Horizon. Monterey Sandstone, Lower Miocene.

MACTRA BEALI, n. s. Hall and Ambrose.

Description. Left valve. Shell trigonal, thin, slightly ventricose, inequilateral; umboes prominent; beaks not prominent, situated slightly posterior to middle of shell; anterior margin slightly curved upward, running to anterior extremity where it is sharply rounded; posterior margin practically straight, running to posterior extremity where it is angularly truncated; basal margin regularly curved; posterior and anterior margin make an angle of 105° at the beak; surface smooth.

Dimensions. Long. 44 mm.; lat. 34 mm.; diameter 9 mm.

Notes. It is very similar to an unnamed form found by Harold Hannibal in the Sooke formation (Oligocene) of the North Pacific coast. Named in honor of C. H. Beal, Stanford University, Calif.

Type. Museum, Stanford University, Calif.

Locality. Monterey Sandstones of Pleasanton Quadrangle. This particular valve came from locality P. 227.

Horizon. Monterey Sandstone, Lower Miocene.

BRIONES—MIDDLE MIOCENE.

OSTREA TITAN Conrad. VAR. PERRINI, n. var. Hall and Ambrose.

Description. Lower valve. Shell irregularly elliptical, contracted at beak; beak curved toward right when viewed from exterior ; right valve very ventricose ; extremely laminated, giving rough plaited surface ; left valve almost flat, laminated ; muscle-scars distinct ; hinge long, narrowing at beak, viewed from interior curves to left ; cavity of hinge deep, coarsely wrinkled, with wrinkles running up onto either side of hinge ; interior of hinge ends abruptly, cutting at right angles toward interior of shell, although not characteristic of all forms.

Dimensions. Alt. 155 mm. ; long. maximum at base, 85 mm., minimum near beak 56 mm. ; diameter lower valve 61 mm.

Notes. This species greatly resembles *O. titan* Conrad, the main difference between the two being in the hinge. This variety has a long curved pointed hinge, while the *O. titan* has a much shorter hinge, about as wide as long. Also the summit of this variety does not rise above the beak of the opposite valve. All forms do not have as curved a hinge as this one figured. It is generally elongate, and seldom, if ever, has the subcircular shape the *O. titan* often has.

It is very abundant in the Briones, and may generally be found any place in the Briones on the Tesla, Pleasanton, Mt. Hamilton or San Jose Quadrangles. This particular specimen is slightly smaller than the ordinary *O. titan* var. *perrini.*

It is named in honor of Professor James Perrin Smith.

Type. Museum, Stanford University, Calif.

Locality. Briones of the Tesla, Pleasanton, San Jose and Mt. Hamilton Quadrangles, Calif.

Horizon. Briones, Middle Miocene.

MACOMA WILCOXI. Hall and Ambrose.

Description. Right valve ; shell thin, elongate, inequilateral ; surface smooth ; beaks, small, low, pointed, nearly medial, curved slightly toward posterior end ; anterior extremely regularly rounded ; posterior dorsal margin straight, sloping more steeply from beak than anterior dorsal margin toward extremity which is angulated at a point somewhat below the horizontal medial line of the valve ; base curved. Hinge unknown, interior inaccessible.

Dimensions. Long., 31 mm. ; lat., 18 mm. ; diameter, 5 mm.

Notes. The angular posterior extremity gives it a distinctive shape. It is named in honor of R. W. Wilcox, Delta, Colorado.

Type. Museum, Stanford University, California.

Locality. This specimen was found in Briones reef sandstones on the north limb of the Haywards Pass syncline. It is also found on the anticline northwest of Dublin, California. It is also found on the Tesla Quadrangle in the clays at the mouth of the small gulch joining Arroyo Seco from south, one-half mile above 963 Mark, Livermore, California.

Horizon. Briones, Middle Miocene.

Pecten tolmani, n. s. Hall and Ambrose.

Description. Both valves convex, left more convex of two, inequilateral, base regularly rounded ; margins smooth. Right valve with 16 to 18 prominent rounded ribs, separated by rounded interspaces, narrower than the ribs; ribs on left valve more prominent and irregularly spaced; surface sculptured by numerous, fine, imbricating, regular lines of growth; hinge line less than one-half length of disk; ears subequal; anterior ear of other specimens show 5 or 6 sharp radial lines emanating from beak, crossed by fine, faint, concentric lines; sculpture of posterior ear less distinct but truncated at right angles.

Dimensions. Alt. 67 mm.; long. 71 mm.; diameter 9 mm.; umbonal angle 130°.

Notes. This species resembles an enlarged *P. andersoni* but is undoubtedly a new form. This form is much larger than *P. andersoni*, the hinge (proportional to size) much shorter, and the umbonal angle much larger.

It is possible this form is a descendant of *P. andersoni*, of Monterey times. The young are very similar to *P. andersoni*, and it is not certain that the forms classified as *P. andersoni* in the Briones are not the young of *P. tolmani*. Named in honor of Prof. Cyrus Fisher Tolman, Jr.

Type. Museum, Stanford University, Calif.

Locality. Briones of Tesla, Pleasanton, San Jose and Mt. Hamilton Quadrangles.

Horizon. Brionet, Middle Miocene ; probably Monterey, Lower Miocene.

NOTES.

San Diego Drift Shells.—A small bag of drift taken on the shore of False Bay, near Asher Station, San Diego, California, March 28, 1916, contained the following interesting assemblage of molluscan shells, Mr. E. G. Vanatta being responsible for certain of the determinations.

Pisidium species.

Assiminea californica Cooper, one specimen (E. G. V.).

Lymnaea bulimoides Lea, young.

Physa nuttalli Lea, young (E. G. V.).

Planorbis deflectus Say, two young specimens (E. G. V.). This species seem to be new to Southern California.

Succinea stretchiana Bland, young (E. G. V.).

Vitrea shepardi (Hemphill), one specimen (E. G. V.). Recorded heretofore from Santa Catalina Island.

Striatura milium pugetensis (Dall).

Striatura milium meridionalis (Pilsbry and Ferriss), one specimen (E. G. V.).

Punctum conspectum (Bland), the most common species.

Vertigo diegensis Sterki, one specimen.

Bifidaria hemphilli Sterki. — S. S. Berry.

Antiquity of the Helices.—*Helix* (*Epiphragmophora*) *tudiculata* is a land snail peculiar to Central and Southern California, ranging from the Sierras southward to San Diego. It is very common, and even abundant in some localities.

A few years ago the writer found a fossil specimen of this species in Silverado Canyon, Santa Ana Mountains, Orange County, California, which cannot be assigned to a later period that the Miocene, and may be even older, as the Eocene and Cretaceous are also known to occur in Silverado Canyon.

The shell was found *in situ*, being embedded in a ledge of rather soft limestone, which contained numerous fossil leaves and stems. It was remarkably well preserved, retaining much of its original color, and the dark band encircling the larger whorl was still very distinct.

The writer is not aware that the species *tudiculata* has ever before been reported as being identified with any geologic period.—E. E. Hadley.

Note on Valvata micra Pils. and Ferr.—When this species was described[1] I doubted its pertinence to *Valvata*, suggesting that it might be a *Horatia* or *Daudebardiella*. I have recently seen an article by C. Pollonera,[2] in which he described a sub-

[1] Proc. A. N. S. Phila. 1906, p. 172. New Braunfels, Texas.

[2] Bolletino dei Musei de Zoologia ed Anatomia Comparata della R. Univ. di Torino, Vol. xiii, No. 334, p. 3, Dec., 1898.

genus *Hauffenia* of the genus *Horatia*, with two new species from the valley of the Natisone, in Italy. These shells are very small, diam. 1½ to 2 mm., and almost exactly the shape of *V. micra* and its variety *nugax* which measure 1.2 and 1.5 mm. The resemblance is so close that I have no doubt that the Texas shell belongs to the same genus, and should be called *Horatia* (*Hauffenia*) *micra* (P. and F.).

Horatia seems to belong to the subfamily *Lyogyrinae*. The operculum resembles that of *Lyogyrus*. I would be less disposed to admit that our shell belongs to this Dalmatian and Italian genus if it were not that two Dalmatian freshwater genera, *Emmericia* and *Lanzaia*, have very close relatives in the Panuco River, northeastern Mexico; also the terrestrial genus *Coilostele*, elsewhere known only in Mediterranean countries, has a species in northeastern Mexico.—H. A. Pilsbry.

Note on Bifidaria minuta St.—The name given to this species, Nautilus, Jan. 1916, p. 105, was used by Pfeiffer in 1842, his "*Pupa minuta* Say" being a *Bifidaria*. I propose therefore to change the name of my species to *Bifidaria carnegiei*. —V. Sterki.

Mt. Monadnock Shells.—After sending you the Monadnock list (p. 57) we got a specimen of *Polygyra monodon* Say, the very young of which, in the first list, had been identified at the museum as *P. palliata*.—W. H. Dall.

EDGAR A. SMITH.

Edgar Albert Smith F. L. S., keeper of mollusks in the British Museum, died on July 22, at the age of 68. He was the son of Frederick Smith, the entomologist. Smith joined the British Museum in 1867, the year after the acquisition of the important collection made by Hugh Cuming, with the arrangement of which he was occupied for many years. On the removal to South Kensington it fell to him to install the large collection in the shell-gallery, which he carried out to the great benefit of the many collectors and students of shells who continuously visit the Museum. On this collection he published over 300 papers and monographs. He became assistant-keeper in 1895, received the I. S. O. in 1903, and retired in 1913. He was Past-president of the Conchological and of the Malacological Societies. His extensive knowledge of conchology and of the collections under his charge, and the friendly help he was always ready to give will cause his loss to be regretted by a wide circle.—*Museum Journal*.

THE NAUTILUS.

VOL. XXX. DECEMBER, 1916. No. 8

THE ANATOMY OF THE NAYAD HYRIOPSIS MYERSIANA (LEA).

BY DR. A. E. ORTMANN.

Hyriopsis myersiana (Lea). Simpson, Descript. Catal. 1914, p. 212.

The Carnegie Museum of Pittsburg has received, from Dr. B. H. Bailey (Cedar Rapids, Ia.) two shells with the soft parts, and the soft parts of a third one. One of these with shell is a a female, the others are males. They were collected by Dr. E. B. McDaniel at Petchaburi, Siam.

The genus *Hyriopsis* Conard, 1853, has been defined only by shell characters, and the anatomy was unknown hitherto. Simpson (l. c. p. 207) has placed it in the vicinity of *Lampsilis*, apparently relying on the similarity of the shell to that of *Lampsilis* (*Proptera*) *alata* (Say), which is a *Lampsilis* shell.

The soft parts at hand exhibit the following characters :

Branchial opening separated from the *anal* by a complete gill-diaphragm, but not by a mantle-connection. *Anal* and *Supra-anal* openings of about the same length, separated from each other by a well developed mantle-connection of moderate length, shorter than either. *Anal* opening with inner edge nearly smooth ; *Branchial* opening longer than the *anal*, with strong, irregular papillae on inner edge. In front of the *Branchial*, the inner edge of the mantle becomes smooth. *Palpi* subfalciform, long, posterior margins connected for about half their length, and connected with the inner face of the mantle for about one third of their length.

Gills long and wide, the inner the wider, chiefly so anteriorly. Outer gill narrowing gradually toward its anterior end, the latter near the highest point of attachment line of mantle. Inner gill narrowing anteriorly very suddenly, with its anterior end about midway between the posterior base of palpi and anterior end of outer gill. Outer lamina of outer gill entirely connected with mantle; inner lamina of inner gills free from abdominal sac, except at anterior end. Behind the foot, the two inner laminae of the inner gills are connected.

The male has in both gills weak *septa*, distant from each other, and incomplete (interrupted), and in the female, they are of the same character in the inner gill. *The whole outer gill of the female is marsupial*, and has distinct, heavy, and crowded *septa*, running parallel to the gill-filaments, forming water-tubes. But these septa are somewhat irregular and *interrupted*, chiefly toward the margin, and in the posterior half of the gill, they are rather regularly *interrupted by transverse holes.* The anterior section of the gill has the most continuous septa. No heavy mass of tissue is seen at the edge of this gill, which is sharp.

Charged marsupium, embryos, and glochidia unknown.

Color of soft parts (in alcohol) whitish, with black-brown pigment on the edges of anal and branchial openings.

That this species should belong in the affinity of *Lampsilis* (or the subfamily *Lampsilinae*), is out of the question. The whole anatomy is truly that of the subfamily *Unioninae* of the family *Unionidae* (NAUT. 23, 1910, p. 116, and Ann. Carn. Mus. 8, 1912 p. 223, 224). The *Anodontinae* are excluded, since no trace of a thickening of the edge of the marsupial gills is observed.

However, a remarkable character of the septa of the marsupium is that they are interrupted. This is an unusual character in the family *Unionidae*, and more regularly found among the subfamily *Hyriinae* of the *Mutelidae* (l. c. p. 225). Yet there is a *Unionine* form known, which has interrupted septa in the marsupium, and this is *Gonidea* from the Pacific slope of North America (see: Ortmann, NAUTIL. 30, 1916, p. 50). In *Gonidea* all four gills are marsupial, while in *Hyriopsis* only the outer ones are marsupial: but in their structure they are very closely alike.

Disregarding the interrupted character of the septa, *Hyriopsis* stands rather close to the European *Unio*, but, of course, we do not know whether there is any relation in the glochidia. Altogether, *Hyriopsis represents a type, probably most closely related to Gonidea, and undoubtedly belonging to the subfamily Unioninae. It surely does not belong to the Lampsilinae.*

CONSISTENCY IN POPULAR NAMES OF SHELLS.

BY CHARLES W. JOHNSON.

I have recently rearranged the exhibition of New England mollusks in the museum of the Boston Society of Natural History, the object being to make it more attractive and of general interest to the public. Trays were abandoned and the specimens placed on three large white tablets which cover the entire surface of each of the horizontal cases ($2\frac{1}{2}$ ft. × 5 ft.). Of these cases there are twelve, with drawers below for the large study series. Specimens preserved in fluid are removed from exhibition and replaced by colored drawings of the animals, either natural size or enlarged according to the size of the species. These beautiful drawings were made from the living animal by Mr. J. Henry Blake. The Society also possesses a series of the glass models of the Nudibranches made years ago by the Blaschkas. Small maps of New England, both land and marine areas, on which are marked the localities or areas covered by those species having a limited or restricted distribution, are placed with the species.

This brings us to a question of popular interest, that is, the common names for the more conspicuous shells. The many changes in nomenclature affecting the old, classic, scientific names are a serious handicap towards popularizing conchology; and to attempt to explain why these changes are necessary is not the most enjoyable theme in conchological circles. It therefore seems expedient that some fixed, appropriate, popular name should be applied to the more common species. There have been some excellent names proposed by Dr. Alfred G.

Mayer (Sea-Shore Life, N. Y. Aquarium, Nature Ser. No. 1, 1905); Julia E. Rogers (The Shell Book 1908); Josiah Keep (West Coast Shells 1911). Professor Keep gave a somewhat popular name to every shell; but I cannot agree with him in some cases. Why *Polinices* (not Polynices) should be called "moon shell" while Natica is made a part of a common name of one species, I cannot see. This name is also used in the Shell Book where the inconsistency in the use of common names greatly mars the value of the work in this respect.

There is one thing we should take into consideration, and that is, there are English names in general use, which may be found in the various dictionaries. Turning to the Century Dictionary under sea-snail, we find the following:—In *conch.* a marine gastropod whose shell resembles a helix, as those of the family *Littorinidae*, *Naticidae* and *Neritidae*. Periwinkle is generally applied to the former, and as the latter has a restricted distribution and is confined to the more tropical waters, it seems therefore that the term sea-snail would be more appropriately restricted to the *Naticidae*. Dr. Mayer gives a pertinent name which combines their nest or "sand-collar" with the shell; for *Polinices heros* (*Natica* or *Lunatia heros* of authors) the Northern Sand-collar Snail, and for *P. duplicata* the Southern Sand-collar Snail. Local or provincial names that are misleading should not be considered in adapting fixed common names, for example, among the New England fishermen the name "cockles" is applied to the sea-snails (Polinices), but in all dictionaries the name cockle usually applies to the various species of *Cardium*.

The name Periwinkle is almost universally used for the species of *Litorina* (generally written *Littorina* the original spelling of the genus being *Litorina*) although Keep uses the term "*Littorine.*" The name "Common Periwinkle" should be applied to the original and widely distributed species *L. littorea* and not to *L. irrorata* as in the Shell Book; to the latter, the name Dotted Periwinkle might be applied. The name Red Periwinkle seems better than "Rough Winkle," for *L. rudis*, for the shell, although usually more or less reddish, varies from a grayish white to a dark brown (var. *tenebrosa*). The Seaweed Periwinkle for *L. obtusata palliata* suggested by Dr.

Mayer is very appropriate from its habit of living among Fucus or rock-weed. These are often called simply winkles, although the latter term is often locally applied to a number of gastropods more property included under Whelks.

The Century Dictionary says: A Whelk is a gastropod of the family *Buccinidae*, in a broad sense, a buccinoid or similar univalve with a spiral gibbous shell, whose aperture forms a kind of spout and whose whorls are more or less varicose or whelked." Illustrations, *Nassa reticulata* and *Nassa obsoleta*. Keep restricts the whelk to the genus Buccinum using "Chrysodome" etc. for other buccinoids, "Nassa" for the species of Nassidae and "Purple" for the species of *Thais* (Purpura). With the passing of the genus as used by Lamarck and the preoccupation of the genus *Nassa*, it seems therefore best to adopt the name whelk as defined in the dictionary and apply it to all the buccinoid and muricoid shells. *Buccinum undatum*, the Common Whelk; *B. cyaneum* the Blue Whelk, *Neptunea decemcostata*, the Ten-ribbed Whelk; *Colus stimpsoni* (*Tritonofusus* or *Sipho stimpsoni* of authors), Stimpson's Whelk; *Colus pygmaeus*, the Pygmy Whelk. To the genus *Busycon* (*Fulgur*) has been applied the term Giant Whelks. The most suitable names proposed for the species are Nodose Whelk (*B. carica*), although the var. *eliceans* becomes spinose when adult; Reversed Whelk (*B. perversum*); Channelled Whelk (*B. canaliculatum*) and Pear Whelk (*B. pyrum*). Locally the oystermen call them winkles or wrinkles, while in other localities they are referred to as conchs. The species of *Alectrion* (Nassa) might bear the following names based on their habits, Mud Whelk (*A. obsoleta*); Sandy-mud Whelk (*A. vibex*) and Sand Whelk (*A. trivittata*). For the common *Thais lapillus* (*Purpura lapillus*) the name Rock Whelk seems more appropriate than "Rock Purple," and the western *T. saxicola* might be called the Western Rock Whelk, *Urosalpinx cinerea* is popularly known as the Oyster Drill.

For the species of *Crepidula* I prefer the term Slipper Shells, as the name implies, to that of boat-shells, quarter-decks or deckers, and the names proposed in the Shell Book seem appropriate. The Arched Slipper Shell for *C. fornicata*, the Flat

Slipper Shell for *C. plana*, and the Cup and Saucer Limpet for *Crucibulum striatum*, also the Tortoise Shell Limpet for *Acmaea testudinalis*.

Among the bivalves there is also much confusion in the popular names, due to the restricted use of the names clam, mussel etc. In New England the Clam is *Mya arenaria* and *Venus mercenaria* is known as the Quahaug. In the New York market the former is called the Soft Shell Clam and the latter the Clam or Hard Shell Clam. The Little-neck Clam is the young of *Venus mercenaria*. The terms Long Clam and Round Clam are also used for the two species. To avoid confusion it seems best therefore to adapt a double name applicable to the entire coast, the Long Clam or Soft Shell Clam for *M. arenaria* and the Round Clam or Quahaug for *V. mercenaria*. To the other species, *Mya truncata*, the name Truncate Clam might be applied. *Spissula solidissima* (*Mactra solidissima*) is usually referred to as the Surf Clam, also locally as the Beach or Hen Clam. *Arca campechiensis* and its Var. *pexata* are called the Bloody Clam from the color of its gills and circulatory fluids. To *Venericardia borealis* (*Cardita borealis*) Dr. Mayer has given the name Cod Clam, as it constitutes one of the foods of the cod. To the *Astartidae* the term Little Brown Clams seems appropriate and to the species *Astarte castanea* the Chestnut Clam and to *A. undata* the Wavy Clam. *Cyprina islandica* known on the New England coast as the Black Quahaug might also be known as the Round Black Clam. *Solemya velum* has been called by Dr. Mayer the Swimming Clam, from the ability of the animal to move through the water for a considerable distance without touching the bottom. This habit is more fully elaborated by Professor Edward S. Morse in connection with the large Northern Swimming Clam, *S. borealis* (Biol. Bull., xxv, 261, 1913). To the long narrow species the term clam is usually replaced by the word shell, thus *Ensis directus* Conr. (*E. americanus* Gld.) is known as the Razor Shell. The fisherman of New England call it the "Skate rock." To *Siliqua costata* have been applied various names such as Sand-bar Clam, Flat Razor etc. I prefer the name Ribbed Pod-shell. For *Cyrtodaria siliqua* (*Glycymeris siliqua*) the name Northern Pod-shell. *Tagelus* *gibbus* (*Solecurtus gibbus*) has been called the Short Razor Shell. The fishermen at St. Augustine, Fla., call it the "Longarone," probably a Spanish term referring to its length.

The term Mussels usually applies to the family Mytilidae, but is also used in connection with the fresh-water clams (Unionidae). *Mytilus edulis* is universally known as the Edible Mussel; *Modiolus modiolus* as the Horse Mussel and *M. demissus* and var. *plicatulus* as the Ribbed Mussel. The scallops are somewhat unfortunate in their scientific names. The Common Scallop (*Pecten irradians* of authors) is now known as *P. gibbus* var. *borealis* Say. If we have to call our large species *P. magellanicus*, we need not emphasize the fact by calling it the "Magellan Scallop." It is known by our fisherman as the Big or Deep-water Scallop; the latter seems quite appropriate. *P. islandicus* has been called by Dr. Mayer the Arctic Scallop.

Piddock is a well-established English name for the species of the family *Pholadidae*, but it has not been generally adopted in this country, although used in most of the popular works. The name Rough Piddock is applied to *Zirfaea crispata* (*Zirphaea crispata*), the Truncated Piddock to *Barnea truncata* (*Pholas truncata*) and "Angel's Wings" to *B. costata*. For uniformity the name Ribbed Piddock seems more suitable for the latter. The Wood-eating Piddock figured in the Shell Book is a *Martesia*, probably *M. cuneiformis* Say.

It seems hardly worth while at present to attempt more than to give popular names to the common or conspicuous species. It also seems inexpedient to make it general. The idea is to create a greater local interest in the subject; therefore a provincial or faunal list of the common names of the species of the Atlantic coast of the United States seems all that is necessary, leaving the west-coast conchologists to improve their list of common names if they think it desirable. With no national association to take it up, this will have to be done by those interested in the matter, and I shall be very glad to confer with any one taking up the subject.

THE MISSOURI RIVER AS A FAUNAL BARRIER.

BY PAUL BARTSCH.

Several years ago I published a note in "Science" on this topic. It seems that this has not come to the attention of most of the workers who are dealing with fresh-water pearly mussels, and I therefore deem it wise to again call attention to it.

In our work during the Mississippi Valley Pearl Mussel Inquiry, we found that the enormous amount of sediment carried by the Missouri River formed an effectual barrier to the distribution of the *Unionidae.* There, while the Mississippi and its tributaries to the north of the Missouri River teemed with aquatic life, careful search in the Mississippi below the mouth of the Missouri, and the mouth of the Ohio, did not reveal a single living *Unionid.* Dead specimens were also absent on the sand bars south of St. Louis. The heavy load of mud carried by the waters of the Missouri, yielding ¾ inches of sediment in a three-inch tube, probably strangles these and other organisms.

We have, therefore, the curious condition of a river forming a barrier to aquatic animals.

SHELL COLLECTING IN THE SIERRA NEVADAS.

BY HERBERT N. LOWE.

To see the Yosemite and the groves of Giant Sequoias had been a dream long cherished during my thirty years residence in California. Some dreams come true; and this summer my mother and I drove there, with our "Buick Six" well stocked with camp outfit.

The early part of September is rather a dry and unpropitious time for collecting mollusks in the mountains. Rock piles and moist meadows were the most favorable stations. These lovely Sierra meadows, filled with brilliant wild-flowers and surrounded by noble forests of pine, cedar and fir, are the most charming spots imaginable. One vainly hunts for words to give an idea of the wonderful scenery of the Sierra Nevadas. Each day was simply perfect, with clear warm sunshine and air sweet with odors of pine and fir; an experience never to be forgotten by the lover of nature.

Leaving the State Highway at Madera, we struck off through the foothills on the Yosemite Road. About five miles west of Raymond I made my first find of *Epiphragmophora tudiculata* var. *cypreophila* in rock piles near the road. By the amount of effort it takes to find these it seems to be rather a rare species.

At the old mining camp of "Coarse Gold" we stopped for lunch and a few *Physa diaphana* Tryon were found in the near-by stream. Our stop for the night was at "Fish Camp," a most beautiful spot, situated in one of the many Sierra meadows, and headquarters for a large logging camp near by. A diligent search was unrewarded by any molluscan species whatever. However at Wawona, our next stop, I had better luck.

About half a mile south of the hotel is a small springy meadow on a gently sloping hillside. Here under sticks were five live *Vertigo ovata* Say; *Succinea stretchiana* Bld. and *Pisidium*, all "side by each;" a few of the very rare *Vitrea* or *Euconulus chersinella* Dall were also found here with *Euconulus fulvus* var. *alaskensis* Pils. A search of the upper end of the north meadow resulted in some fine large *Polygyra loricata* Gld. and *Vitrina alaskana* Dall, also a single specimen each of *Vertigo modesta* var. *castanea* Sterki and *Striatura milium* var. *meridionalis* P. & F.

While in the Yosemite, a hike was taken to Vernal Falls, and on exploring rock slides near there a few specimens of *Epi. tudiculata* var. *tularensis* Hemp. were found in company with a flattened form of *Epi. hillebrandi* which Dr. Pilsbry considers new. In the thick moss near the Falls a few *Vitrina alaskana* Dall had their happy homes. In a small meadow about twenty miles from Yosemite on the Big Oak Flat Road, some fine *Pyramidula cronkheiti* Newc. were living under small logs in company with two *Pisidium* and a *Sphaerium*.

After our two delightful days at Wawona and the Mariposa Grove of giant Sequoias, and four more in the Yosemite, we took the Big Oak Flat Road out of the Valley as far as Crockers, where the Tioga road leads over the pass into the Mono Lake country and Western Nevada. One crosses the pass at an elevation of ten thousand feet where the snows never melt, and only a half mile from the road is a real live glacier. From the sudden change in scenery on the easterly side of the Sierras one might fancy he was in the Swiss Alps. Mono Lake, over ten miles across, with two volcanic islands in its center, is fair to look upon; but the bitter waters are so charged with alkali that no living creature can exist in it. Surrounded as it is by snow-capped mountains, whose melting snows pour in on all sides, its waters remain absolutely undrinkable. From Lake Mono one travels through sand and sage brush to the lovely pine-forested shores of Lake Tahoe. Here we struck the fine Lincoln Highway leading to San Francisco. We crossed several times the old emigrant trail. One pictured the days of the hardy pioneers of the gold rush of '49, the long trains of oxen toiling up these terrible mountain trails, and contrast the ease of our modern automobile transportation over good roads and comparatively easy grades.

A stop was made by a spring on the Lincoln Highway about twenty-three miles east of Placerville. The *Epi. mormonum* var. *cala* Pils. was found here. Under boards and sticks were *Polygyra columbiana*, *Goniobasis nigrina* (the most southerly locality reported) and a form of *Polygyra loricata*. This makes the third instance on this trip where I noted land and fresh-water species living side by side. On the return south from San Francisco we stopped at Old Monterey to collect a few *Epi. californiensis* in the sand-hills at Point Pinos and *Epi. dupetithouarsi* at Cypress Point. The latter species seems to be getting quite scarce owing to the attentions of the squirrels and the cleaning-up of Cypress Point for picnic parties. All logs and sticks carefully burned up leaves no place for Madam Snail to rear her family. However, after diligent search some very fine specimens of this handsome species were added to my plunder.

For convenient reference a list follows of the species found on this trip.

Epiphragmophora tudiculata cypreophila Newc. Rock piles five miles west of Raymond.

E. tudiculata tularensis Hemp. Rock slides near Vernal Falls.

E. hillebrandi yosemitensis, new subspecies. Rock slides near Vernal Falls.

Darker in color than typical *hillebrandi;* more depressed in form, and with a much wider umbilicus. The three specimens found measure as follows :

Altitude	11	diameter	26	mm.
"	10.2	"	23.5	"
"	10	"	25	"

E. mormonum cala Pils. Near Spring on Lincoln Highway.

Polygyra columbiana Lea. Near Spring on Lincoln Highway.

Polygyra loricata Gld. New variety? on Lincoln Highway.

Polygyra loricata Gld. (typical). Under sticks on edge of Wawona Forest.

Succinea stretchiana Bld. Wawona meadow.

Vertigo ovata Say. Wawona meadow.

Vertigo modesta castanea Sterki. Wawona meadow.

Striatura milium meridionalis Pils. and Ferriss. Edge of Wawona Forest.

Zonitoides arborea Say. Meadow south of Wawona, also Big Oak Flat Road.

Pyramidula cronkhitei Newc. Edge of Wawona Forest; also Big Oak Flat Road.

Euconulus fulvus alaskensis Pils. Edge of Wawona Forest.

Vitrea chersinella Dall. Meadow south of Wawona.

Vitrina alaskana Dall. Big Oak Flat Road and Moss near Vernal Falls.

Physa diaphana Tryon. Stream at "Coarse Gold."

Planorbis umbilicatellus Ckll. Big Oak Flat Road.

Goniobasis nigrina Lea. Spring on Placerville Road.

Pisidium abditum Hald. Big Oak Flat Road.

Pisidium occidentale Newc. Big Oak Flat Road.

Sphaerium occidentale Prime. Big Oak Flat Road.

NOTES.

PLANORBIS DILATATUS AND P. SAMPSONI. Besides its greater size, *P. sampsoni* differs from typical *dilatatus* by its very much more widely open umbilicus. The two species seem to be fairly distinct. Various forms which in collections are often referred to *dilatatus* are still of uncertain status. Among these are some shells hardly distinguishable from *multilineatus* Van., occurring as far east as Ohio and Pennsylvania. There is in eastern Pennsylvania a form more depressed than *dilatatus*, with the periphery sharply angular and central, the lip thin, umbilicus wider than in *dilatatus*; this form may be called *P. d. pennsylvanica* (types 67477, spring near Glenolden, Delaware Co., Pa., coll. by E. G. Vanatta).—H. A. P.

PUBLICATIONS RECEIVED.

A List of the Land and Fresh-water Shells of the Isle of Pines, by John B. Henderson. Annals of the Carnegie Museum, vol. 10, 1916. 35 species are recorded, 28 being land shells. 16 species are special to the island, the two species of *Priotrochatella* and two of *Pineria* being isolated types, not related to the Cuban fauna. The rest are Cuban species, or most nearly related to those of Cuba.

Hunting Mollusca in Utah and Idaho, by Junius Henderson and L. E. Daniels. Proc. Acad. Nat. Sciences Phila., 1916, pp. 315–339, 4 plates. This important paper is devoted chiefly to the genus *Oreohelix*. The field chosen is in northeastern Utah and the adjacent part of Idaho, the scene of Henry Hemphill's remarkable finds, which excited the attention of conchologists over twenty-five years ago. Hemphill's localities were rather indefinite, and his material was assorted in such a way as to make the distinction between individual and racial variations uncertain. The expedition of 1915 was therefore devoted to search for his localities and to collecting in the same stations so far as they could be determined. Nearly all of the Hemphill species and other forms were rediscovered, and a large part of the paper is devoted to the consideration of their characters and values, the several forms being illustrated. New forms found were: *Oreohelix hemphilli eurekensis*, *O. strigosa* form *toolensis*, *O. haydeni corrugata* and *O. tenuistriata*. The discussion of *Oreohelix peripherica* (including numerous Hemphillian varieties) may be mentioned as particularly valuable. In the Oquirrh Mountain but little good material could be found, as the range has suffered severely from fires, and the Hemphill colonies have probably been burned over.

To everyone studying *Oreohelix* this paper is indispensable; but the discussion of variation in its relation to taxonomy, pp. 317–320, will interest all who deal with such problems.—H. A. P.

THE NAUTILUS.

VOL. XXX. JANUARY, 1917. No. 9

NOTES ON OPERCULUM EVOLUTION.

BY CHARLES HEDLEY.

Australian Museum, Sydney, N. S. W.

Conchological text books describe various styles of opercula such as the concentric, lamellar, unguiculate, multispiral, paucispiral, or articulate. Yet little, if anything, has been said on the inter-relation of these various forms. Woodward and Fischer even warn their readers against trusting to opercula for guidance in classification.

Dr. J. E. Gray had a clearer idea of the homologies and taxonomic value of the operculum than many of his successors. In 1833 he showed that spiral opercula can only grow by rotating backwards on their axes, just as a spiral gasteropod shell rotates backwards with regard to the columellar muscle. He maintained that shell and operculum were morphological twins representing the right and left valves of a pelecypod shell. This hypothesis he supported by the correspondence in the appearance of the operculum early in embryonic life, by the right-hand spiral of the shell reflected in the left spiral of the operculum, or vice versa, by structural resemblance and by the frequent mutual gain or loss in solidity or complexity. The muscle between the columella and operculum may be compared to the adductor muscle of a bivalve, while the operculigerous lobe answers to the mantle.

Among recent writers Thiele supported this view ; on the contrary, Huxley disputed Gray's homology and asserted that the gasteropod operculum was equivalent to the bivalve byssus.

But Houssay in 1884 showed that it would be more correct to compare the byssal gland of the bivalve foot to the mucous gland of the gasteropod foot than to its operculum.

In molluscan ancestry the operculum should be of high antiquity, for not only was it possessed by ammonites, but it exists in the tubicolous worms. Perhaps the valves of a chiton indicate metameric repetition of what in the gasteropod developed as shell and operculum. A detailed history of the growth of the gasteropod operculum is lost in records of geological time. Gray erred in considering the annular operculum to be the simplest pattern. It is here advanced that its apparent simplicity is that of degeneracy. The round, multispiral, horny operculum worn by *Pleurotomaria* and *Trochus*, though actually far advanced, is yet the most primitive operculum found among recent gasteropoda.

From a gland that secretes new matter on its growing edge, this multispiral operculum must be carried backwards rapidly. By "rapidly" is meant that it describes many revolutions in a lifetime. Let rotation be slowed down, and the product will be the paucispiral operculum. To maintain this kind of operculum with on area equivalent to that of the multispiral type, each spiral has to be greatly broadened. The shape has now changed from round to oblong. So starting from a round, quickly-turning operculum, the first stage in evolution, or retrogression, produces an oblong, slowly-turning operculum. It is suggested that this type of operculum is associated with forms like *Littorina*, *Cerithium* or *Natica*, in which other organs, such as the gill plume, radula or nervous system have not attained extremes of differentiation.

Again, let rotation continue to slow down, till the operculum ceases to revolve upon its muscle. The product, an operculum without axial movement, may now proceed along different lines of development. In one direction it adds fresh growth upon all sides and becomes concentric as in *Vivipara*, *Vermetus*, or *Charonia*. In another direction the increase is confined to one side and may result in a lamellar operculum like that of *Thais*, or an unguiculate one like those of *Strombus* or *Pyrene*. I expect that when traced to early stages, both the lamellar and unguiculate types will be found to arise from paucispiral nuclei. These extremes of operculum development are seen to be correlated generally with advanced development of other organs. A final stage is here apt to occur in which the operculum is altogether lost.

The course of evolution here sketched has not marched regularly through the gasteropod phylum. On the contrary it is suggested that in several different groups the operculum has strayed independently along this road of degeneracy.

A SHELL HUNT IN THE BLACK RANGE, WITH DESCRIPTION OF A NEW OREOHELIX.

BY JAS. H. FERRISS.

A stop-over at Deming in the summer of 1915, to shake hands with Dr. Swope, deflected the firm of Pilsbry & Ferriss in their snail explorations from the Mogollon Mountains, via Silver City, to the Black Range, via Cook's Peak. Samuel D. Swope, M. D., promoter of civic prosperity, friend of conservation and science, knew the unexplored snail country, and with bake ovens and tactful advice sent us to the biggest mountain range in New Mexico.

Cook's Peak, one of the earliest land-marks of California overland emigrants, interesting botanically and historically, had no encouragement for us in conchology. At the post office of Swarts, on the Mimbres river, we transferred from a heavy wagon and its mule team to a pack train of horses, sufficient for two ladies, two men and a camp outfit. In that exchange we got Teodoro Solis, formerly of Chihuahua, the best packer and camper alive.

A large colony of Ashmunellas was found in the foot hills. The next day at Mitchell Gray's mining cabin on Silver Creek, well up the side of Sawyer's Peak, both Ashmunellas and Oreohelix came out to meet us a few feet from camp. We reveled here a week or so with the snails of Sawyer and then followed the continental divide northward, Sierra county on the right, Grant county on the left.

At the Reed ranch, head of Black Canyon, I was left to finish the Black Range alone. The Doctor had made engagements in California and the ladies had schools and conventions calling them to Joliet. Teodoro safely loaded my companions into an auto at the Hot Springs resort and upon his return the work was continued for another month by way of Black Canyon, Diamond Creek (where we were detained briefly by enormous speckled trout), then over the range eastward, making our first camp at the ranch of Teodoro's brother near Chloride.

This was the forest primeval. The trail ran about nine to ten thousand feet in elevation and the yellow pine, Douglas fir, spruces and quaking asps were large and thick. It was our highest and wildest range to date. The cattle, wild and keen of scent, are trapped for slaughter in corrals with swinging gates, something like monster turkey-traps. Black and silver-tipped bears, and mountain lions were plentiful. A couple of untamed, off-the-reservation Apaches also were hiding in what seemed to be our best snail coves. We saw one a few seconds but did not catch him. Deer and turkey were fairly abundant, and the whole country is marked by interesting historical events. Near here Dr. Fewkes had dug some of his most valued specimens of prehistoric pottery. At one point a train of pack burros had rolled down into the Las Animas country. During our short stay two saddle horses also rolled down into that cavern of lost souls. In one of the gulches the bones of an unknown soldier had lain so long his clothing and a roll of money were destroyed by the weather. On the Kingston trail a bear dropped out of a tree upon a packer and killed him. Here Apache Kid had robbed and burned a miner's cabin, and at another point, lying in wait behind a rock, he shot a miner in the back; and when we dropped down into Chloride we met the men who followed this same Apache Kid into the San Mateo range and killed him—saw the mule that packed their dunnage, and located the men in Chicago who sent Kid's head to the Yale skull and bone fraternity. Also saw the carcass of a bull that killed a ranch-owner's saddle horse, and was killed and pried off the angry and pompous owner by an efficient cowboy.

I soon found myself in the whirl of Black Range society. Off upon an independent excursion of my own a mad cow obstructed the right of way. The law was upon my side but I knew the peculiarities of Spanish half-breed cattle well enough to get behind a tree, and did my best. Going around the tree rapidly, I kept behind it all but once and then in a fleeting second was fairly introduced. Grasping her heartily by the horns, I shook them; but the impulsive creature was really overwhelming in her attention, and upon her knees walked all over me. This spot is now marked, and it is quite a large one. Luckily the same cowboy with his 45 that killed the bull, came up the trail and with a bang released me from further embarassment. Pride only received a jolt. My horsehide coat was cow-proof.

Again when alone, and my thoughts were far away, just at dusk, a robust mountaineer from the Great Smokies came into camp to show me the mummied right hand of the last man who climbed the trail to take him back to Tennessee. As a stranger, and a little timid, it was my part to show that I had no particular interest in the specimen; but those mountaineers possess keen insight into the minds of the tender-feet and I presume the camp site is marked also. However, the dwellers of the high and lonesome will never find the spot where I lay out the rest of the night watching to see if that uncanny naturalist was coming back with any more fragments of his specimen.

After leaving the limestone gulches of Sawyer Peak, shells were rare. Sonorellas take kindly to granite; but there are no Sonorellas in this range. Ashmunellas are also friendly to granite; but the Oreohelix split. *Ore. cooperi*, the quaking-asp fiend, and *Ore. depressa*, are found in all rocks and under down timber; but *Ore. metcalfi* and *Ore. chiricahuana* never leave the limestone, neither do any of the Holospiras. Very seldom also have any two of the same genus been found in the same colony. Never with Holospiras, and with Ashmunellas only when a toothed and a toothless form come together. In the Black Canyon region I found a very few individuals of *Ore. cooperi* in with colonies of *Ore. depressa* and we also found this great rambler occasionally in the limestone with colonies of *Ore. metcalfi* on Sawyer. In Southern Arizona we have found two and three species of Sonorellas in large slides. As a rule it is one species at a time in the south-west, and it is a surprise, great luck, if more than one genus of those noted above turn up in any one colony. With the little fellows it is different. They have some peculiarities, but as a rule go it as they please, hit or miss.

In the limestone foothills, while mining, Teodoro had seen shells. We went to the exact spots, both at Chloride and Hermosa, but no traces of shells were there. The fumes of the smelters, blasting, chickens, loss of timber, disease, starvation or something, had removed them from that vicinity. In a hill on the Little Palomas I found two bones of Oreohelix, but two hours of hard digging did not find any more signs. Of Holospiras there were plenty.

At Chloride the proprietor of the Oliver mines told us he had seen fossil shells deep in the dirt at his camp. Here seemed to be a good place to get at least well-preserved bones, and after our return from a side trip to the Cuchillo range, Monticello, Animosa Canada and the San Mateo range, we visited Mr. Oliver's camp. This happy spot is located on Mineral Creek, five miles above Chloride, in a narrow belt of limestone. Under the limestone spawls and fallen timber live shells were abundant. We ate our lunch at a maiden-hair spring, picking shells and water cress during the process. The fern (*Adiantum capillus-veneris*) had pinnae an inch wide, a form that has been wrongfully catalogued from the Grand Canyon of Arizona as *A. tenerum*, the Florida species. A branch of the stream southward, with hard limestone and a dry hillside, had no shells. The belt northward was not examined.

I returned to Deming via Hermosa, Las Animas Canyon, Hillsboro, and Kingston. The story of the findings will be told jointly in another article, but I desired to name this ribbed, gaudy and hard-to-find species of Chloride all by myself, in honor of one who has encouraged me so much to spend more than thirty of my vacations in bear, cow and catamount countries :—

Oreohelix pilsbryi, n. sp.—With numerous spiral beaded cords, this belongs to the *haydeni* school of sculpturing. In color it is unevenly blotched white and horn color, a few examples opaquely white. When blotched or mottled, the cords and growth wrinkles are often white, thus intensifying the contrast between the two colors. Spire elevated, whorls depressed and sharply carinated. Spiral cords from 5 to 9, with two strong cords or one strong cord between two smaller cords, above the periphery. Fine spiral striae between cords, strongest on the under surface. Growth wrinkles strong, 2 to 6 per mm., a large wrinkle about every one and one-half mm. gives the under surface a checkered effect. Whorls $4\frac{1}{2}$, umbilicus small, funnel-shaped, not cylindrical, all whorls visible to the apex. Embryo whorls $2\frac{1}{2}$, darker-colored, smoother than later whorls but plainly marked by spiral cords and oblique growth wrinkles. Mouth oblique, and in older individuals lip sometimes stained yellow. In the aged the last whorl often drops half below the periphery.

Alt. 10, diam. 17.5 mm. (No. 112918*a*, A. N. S. P.)
" 11, " 18 mm.

Type specimens in my own collection and in the Academy of Natural Sciences of Philadelphia.

These shells had an enemy which broke an irregular hole in the upper surface of the shell, about 2 mm. in diameter. I have not noticed this form of destruction in other colonies of land shells.

THE NATURE OF THE CONICAL BODIES ON THE MANTLE OF CERTAIN NUDIBRANCHS.

BY W. J. CROZIER.

Contributions from the Bermuda Biological Station for Research, No. 57.

A study of the supposed "warning" coloration of brilliantly pigmented nudibranchs as represented by *Chromodoris zebra* Heilprin, has incidentally made clear the previously unknown significance of the "white conical bodies" which occur on the posterior ventral surface of the mantle of this species and give it a beaded appearance. Since white nodular structures of a presumably similar character have been noted upon the mantle edge of other tropical nudibranchs, the function of these organs as worked out in *C. zebra* is probably identical among all the species in which they occur.

The bodies in question are in fact glands, which store a special secretion concerned in protecting the nudibranchs from the attacks of preying enemies. They are, in a functional sense, comparable to the repugnatorial glands of the littoral pulmonate Onchidium, although their mode of action is different. They occur, usually 5, 6 or 7 in number, immediately over the "tail." In some instances 10, 12, and even as many as 19, of these organs have been noted. The manner of their distribution strongly suggests that 5, and in some cases 7, specialized regions exist which give rise each to one of the conical bodies. The central gland of the 5 or 7 is situated in the median plane of the body. It is significant that the increased number of the organs, when they exceed 7, is usually (if not invariably) associated with some injury, such as would be occasioned by the bite of a fish, which has removed a portion of the gland-forming area of the mantle.

Not all the bodies on a single animal are of the same size, one or more being sometimes quite minute. The definite pattern according to which they are arranged is preserved even in cases where one or more of the glands is totally suppressed.

Each of the glands is provided with a pore. In rare cases two pores have been found upon a single gland. The pores are surrounded by a sphincter. When Chromodoris is violently disturbed in any way, its consistent reaction is to withdraw the gills and rhinophores, to erect the lateral edge of the mantle, and to turn under, ventrally, the posterior part of the mantle bearing the glandular organs. At the same time the glands become turgid, through the contraction of their muscular investment, the pores being then more prominent. If the irritating stimulation is continued, there issues from the pores of one or more of the glands a white creamy secretion, which is not dissolved by sea water. It is composed mainly of globules of an oily substance. The secretion is not acid, but is neutral to litmus.

When the glands are stimulated individually with induction shocks, they respond by pouring out their secretion, and the same reaction occurs, on stimulation, when the portion of the mantle which bears them is detached from the rest of the animal.

Chromodoris behaves with reference to these organs in such a way as to point to their importance in the animal's economy. The characteristic ventralward inbending of this portion of the mantle, so different from the boldness with which its lateral borders are thrown into prominence when the creature is disturbed, inevitably suggests a reflex of a protective kind. The nature of the conditions which determine their discharge leads one to regard the glands as repugnatorial in function. Careful study of the results of feeding these mollusks to fishes and various invertebrates has demonstrated that these bodies cannot, however, represent the sole source of offensive secretions. A repulsive material, histologically and microchemically resembling that found in the conical glands, constitutes in fact part of the secretion which proceeds from the whole integument of Chromodoris, but particularly from the lateral portions of the mantle. It is noteworthy that in many individuals there are to be observed, especially over the region of the mouth and tentacles, minute white bodies occurring on portions of the ventral mantle surface remote from the conspicuous white papillae. These bodies also give rise to the white secretion. Such facts lead one to consider that the glands at the posterior end of the animal are merely the expression of a specialized development of the repugnatorial function which is the common property of the whole dorsal and lateral integument. The exposed location of the papillae also negatives the supposition that the glands may be the primary seats for the elaboration of the repugnatorial material, to be secondarily transported to other regions of the animal's surface. As a matter of experimental test, these nudibranchs when totally deprived of the beaded area of the mantle remain unimpaired in their ability to develop a protective distastefulness for fishes and invertebrates.

The repulsive character of the contents of the glands is readily established by controlled feeding tests in which food fragments are smeared with the secretion. Such morsels are invariably rejected. It remains doubtful, however, if this emulsion of substances represents the only repugnatorial material possessed by Chromodoris. It seems possible that the oily element of the secretion is particularly involved in the production of the curiously penetrating odor which the nudibranch emits, and that some other substance is also concerned in determining the general distasteful quality.

Incidentally, the glands cannot be implicated in any mutual attraction between individuals at the time of pairing, for animals from which the glandular equipment has been completely removed, are found to mate readily and deposit normal egg masses.

I have commented above on the suggestive appearance of protection evidenced by the inturning of the posterior beaded border of the mantle. A closer analysis shows, however, that any protection which is in this way afforded to the conical glands is purely incidental. For if the projecting "tail" of the nudibranch is stimulated (as with induction shocks), the beaded portion of the mantle is not rolled under upon itself, but is spread out so that the openings of the glands point in the general direction of the irritated area. Their discharge under these circumstances may occasionally be seen. I therefore believe that the ventralward inflection of the gland-bearing portion of the mantle is primarily a reaction having to do with the normal discharge of the glands. When the nudibranch is attacked at the side, or anteriorly, the glands are thus given an opportunity to discharge a part of their contents in an appropriate direction.

A full account of these observations will be published later.

Agar's Island, Bermuda.

THE ANATOMY OF CONTRADENS CAMBOJENSIS (SOW.) (NAYADES).

BY DR. A. E. ORTMANN.

Two specimens, male and gravid female, from Petchaburi, Siam, are at hand, received from B. H. Bailey, and collected by Dr. E. B. McDaniel.

These specimens agree very well with *Unio cambojensis* Sowerby (Conch. Icon. 18. Unio. 1866, pl. 42, f. 231), in general shape, color of inside (rose color), and sculpture of outside. Frierson, who has seen these shells, also thinks that they belong to this species.

Simpson (Descript. Catal., 1914, p. 1013) makes this a synonym of *U. rusticus* Lea (1856), and places it in the genus *Nodularia.* But Lea's shell is larger, heavier, has more elevated beaks, and coarser and more obscure sculpture. This is also evident from the figures of *rusticus* given by Haas (Syst. Conch. Cab. 9. Heft 44, 1911, pl. 21, f. 2–5), where the species is placed in the genus *Contradens* Haas.

Haas (l. c. Heft 48, 1913, p. 173) defines this genus by the sculpture of the shell, and chiefly by the character of the hinge teeth, and describes the anatomy of two species (*C. hageni* Strub. and *verbecki* Bttgr.), which agrees fully with that of the European *Unio.* However, the glochidia are peculiar in not having a spinulose, triangular hook, but a swelling of the lower margin covered with fine spinules arranged in vertical rows. (This undoubtedly is a primitive structure, which, in its further development, leads to the hook of *Unio* and of the *Anodontinae* . Of the septa, Haas says that they are " well developed."

Anatomy of my specimens of Contradens cambojensis:

Anal opening separated from the *supraanal* opening by a moderate mantle connection ; supraanal very short, anal with inner edge nearly smooth ; *branchial* opening with papillae on inner edge. Anal and branchial openings separated by a gill-diaphragm, of the normal *Unionid*-type. No special structures on mantle edge in front of the branchial opening. *Palpi* subfalciform, large, their posterior margins united for two-thirds or almost three-fourths of their length.

Structure of gills Unionine, but in the male and in the inner gill of the female, the septa are extremely weak and scarce, almost absent.

The outer gill of the female is marsupial in its whole length, and when charged, moderately swollen, with sharp edge. *Septa* are present, and stand close, forming water tubes, *but the septa are incomplete, interrupted*, so that the water-tubes (ovisacs) communicate with each other. In the charged and distended marsupium, the septa practically are replaced by rows of somewhat irregular, subcylindrical, transverse pillars between the two laminae. This interrupted character extends through the whole gill, and by the arrangement of these pillars in rows, parallel to the gill-filaments, their homology with the septa of the *Unionidae* is indicated. There are no secondary water-tubes.

The *glochidia* (pl. 4, fig. 10) fill the whole interior reticulate space in the gill, and they do not stick together so as to form distinct placentae. *Their shape is very peculiar:* transversely elliptical, nearly kidney-shaped, *i. e.*, the outline is subelliptical, with one long side of the ellipse slightly cut away by the hinge margin. Thus they are much longer than high : L., .025, H., .021 mm. In addition, on the posterior end (the end nearer the adductor muscle), there is a gentle emargination, but only on one valve (right or left?), thus producing a slight gap on the margin. The ventral margin does not show any indications of a thickening or of the presence of spinules (such as figured by Haas in *Contr. verbecki*, pl. 22, f. 4).

There is no question that, according to shell characters, this species ought to be placed in Haas' genus *Contradens*. Also the anatomy agrees up to a certain point, with the exception, that here we have not "well developed" septa in the marsupium, *but the septa are perforated or interrupted.* This is a condition previously observed in the *Unioninae: Hyriopsis* and *Gonidea* (see Ortmann, NAUTILUS, 30, 1916, p. 86 and p. 50). It is possible that Haas has overlooked this character, and that a similar structure is more often found in Asiatic Nayades. At any rate, Haas' figures of horizontal cross sections of the gills of *Rectidens prolongatus* Drouët (pl. 26, f. 4) and of *Acuticosta chinensis* Lea (pl. 30, f. 7) suggest this (text not yet published). And further, the glochidia of *Contr. verbecki* (Haas, pl. 22, f. 4) are entirely different, as mentioned above.

For the present it is well to leave this species in Haas' genus *Contradens*, but for the final arrangement of these and the allied forms, the following facts are paramount :

1. *According to its general anatomy, it belongs to the subfamily Unioninae of the family Unionidae.*

2. The perforated or interrupted character of the septa of the marsupial gills is a peculiar feature, which has been observed in this subfamily, only in the West American genus *Gonidea*, and in the Asiatic genus *Hyriopsis*, but which is a general character in the subfamily *Hyriinae* of the family *Mutelidae* (South America and Australia).

3. The glochidia are quite peculiar, differing from those described for *Contr. verbecki*, and being dissimilar to any known Nayad glochidium.

THE NAUTILUS.

VOL. XXX. FEBRUARY 1917. No. 10

RAFINESQUE'S GENERA OF FRESH-WATER SNAILS.

BY HENRY A. PILSBRY.

The rules of nomenclature now in force allow the resurrection of some generic names which were formerly thought to be dead and buried, among them several of those of Rafinesque. It seems desirable, therefore, to fix the types of all of them, so that inevitable changes, however unwelcome, may be made, once for all.

Rafinesque has the reputation of having been a misunderstood and neglected genius. It is lucky that we had few such geniuses. One or two others would have practically scrapped the nomenclature of our fresh-water shells. But science is democratic. Fool, lunatic and savant have the same consideration in nomenclature. This is not the fault of the rules; it is inherent in democratic institutions.

Returning to Rafinesque, we may fairly claim that he was versatile, an all-around zoologist and botanist, besides several other things. In common with Lamarck and others of his school, he saw clearly that the vast increase in the knowledge of nature in the half-century since Linnaeus demanded an expansion of the Linnaean generic system.

His best work was apparently in ichthyology. In writing of mollusks he seemed unable to express himself clearly, either in English or French. His generic descriptions are often mere words. One gains an idea of what he was driving at with the greatest difficulty. Each diagnosis is a cryptogram. What wonder that really scientific zoologists of the time, such as Say, Lea, Barnes, turned from his writings bewildered and contemptuous.

Enthusiastic lover of Nature, indefatigable explorer of wild and sparcely peopled regions, in advance of his time in taxonomic instinct, Rafinesque missed being a zoological genius by his obscurity of expression, his careless haste and his incurable confusion of ideas.

This seems a heartless estimate of a life devoted to science; but for the time being, I speak impersonally, and merely of his relation to molluscan nomenclature. His high spirit under crushing misfortune, that is beyond praise.

MELANIDIA Raf., Analyse de la Nature, 1815, p. 144. Substitute for *Melania* Lamarck, therefore taking the same type, *M. amarula* (L.).[1]

PHYSINA Raf., loc. cit., substitute for *Physa* Drap., type *Physa fontinalis* (L.).

LAPHROSTOMA Raf., loc. cit., substitute for *Neritina* Lam., type *N. meleagris* Lam.

VIVIPARELLA Raf., loc. cit., substitute for "*Vivipara* Lam.," type *Helix vivipara* Linn. = *Viviparus vivipara* (L.).

PLEUROCERA Raf., Amer. Monthly Mag. etc., III, 1819, p. 355. No species described in the original publication. Subsequently Rafinesque described *Pleurocera verucosa* (Annals of Nature, 1820, p. 11) which has been selected as type by Hannibal (Proc. Malac. Soc. Lond., X, 1912, p. 169). This is *Angitrema verrucosa* of Tryon.

ELLIPSTOMA Rafinesque, American Monthly Magazine, etc., IV, p. 42, 1818; Journ. de Physique, etc., Bruxelles, vol. 88, p. 424, 1819. Type *E. gibbosa* Raf., selected by Hannibal, 1912; Proc. Malac. Soc. Lond., X, p. 168. The prior name *Ellipsostoma* de Blainville was not a generic but a family name, hence does not affect the status of *Ellipstoma*.

The description of this genus recalls *Angitrema* of Tryon's monograph (*Strepomatidae*). Mr. Hannibal has identified *E. gibbosa* Raf. with *Angitrema geniculata* (Hald.), a species not

[1] Types of this and the following three names fixed according to Art. 30, sect. IIf of the International Code.

known to occur within about 200 miles of the localities assigned by Rafinesque for *E. gibbosa* (Ohio and Wabash), and in a different drainage. Tryon thought *Ellipstoma* was *Anculosa*. Other guesses (we did not call them identifications) made independently by Dr. Bryant Walker and the writer did not agree, and Dr. Dall declined to make a specific identification. It may be that others, with keener discernment, may arrive at a result satisfactory to themselves; but it seems to me unwise to base nomenclature upon a diagnosis of such doubtful application.

Ambloxis Rafinesque, Amer. Monthly Mag., III, p. 355, 1818. The diagnosis of this genus agrees better with the group usually known as *Melantho* or *Campeloma* than with any other of the region, and no doubt it had the species *subsolida* Anth. or a related form as a basis. Rafinesque mentioned, but did not describe, *A. eburnea* and *A. ventricosa*. Mr. Binney, in Land and Fresh-water Shells II, p. 45, figured *Lymnula ventricosa* and *Lymnea eburnea* from Rafinesque's MS. work Conchologia Ohioensis, both being placed in the synonymy of *Melantho decisa*. Binney mentions also, that *L. eburnea* was figured under the names *Ambloxis*, *Amblostoma*, or *Lymnulus major*, or *Lymnea eburnea*, by Rafinesque, in the MS. work mentioned.

I select, therefore, the species *eburnea* Raf. as type of the genera *Ambloxis* (Raf., 1818) *Amblostoma* (Raf. MS. in Binney, 1865) and *Lymnulus* (Raf. MS. in Binney, 1865). *Ambloxis eburnea* Raf. appears to be *Paludina subsolida* Anth., or possibly some closely related form. As the *species* was in no way defined by Rafinesque, remaining a nude name until Binney figured it in 1865, it will become a synonym of Anthony's species.

Dr. Theodore Gill (Proc. A. N. S. Phila. 1864, p. 152) recognized *Ambloxis* as identical with *Campeloma*, but said that the "insufficiency of the generic diagnosis as well as the want of connection with any *described* species will prevent its adoption." This was before Binney's publication.[1] Tryon (Amer.

[1] Dr. Walker suggests that Gill had seen Binney's advance proofs, and did not make an independent identification. Binney, however, only mentioned *Ambloxis* incidentally.

Journ. Conch., I, 1865, p. 82) identified *Ambloxis* with *Melantho* (of American authors).

As *Ambloxis* has been recognized as "*Melantho*" by three thoroughly competent authorities, Gill, Tryon and Binney, and the latter author has figured a species to serve as its type, it appears that we will be obliged to adopt *Ambloxis* as a generic term to replace *Melantho* and *Campeloma.*

AMBLOXUS Raf., Enum. and Account, etc., 1831, p. 3. Following the description of *Melania rugosa* Raf., and preceding that of *Melania viridis* Raf., Rafinesque wrote :

"I leave the name of Melania to the shells with opening obtuse at the end, or they may form the S. G. Ambloxus."

In an earlier paper he had mentioned "*Melania* Lam." In the sentence quoted, he defined *Melania* and *Ambloxus* in one and the same phrase, so that they are necessarily identical. The type of *Melania*, *M. amarula* (L.), becomes automatically the type of the subgenus *Ambloxus* Raf., and it is here designated as such.

Neither of the two species of "Melania" which Rafinesque defined by diagnoses of less than two lines length, has been recognized. *M. rugosa* is probably one of several plicate species of the region indicated by him, and it will never be possible to say which, as his type-specimen is not known to exist, and no exact locality was given for it. When a complete collection of the shells of Licking River is available, it may be possible to guess at the specific identity of *M. viridis*, which is described thus :

"Suboval, smooth, five spires, end obtuse, opening oblong. Fine shell, one inch, green, from Licking River."

This is clearly a species of *Campeloma* (*Melantho*), a genus which Rafinesque had named *Ambloxis* in 1818. From this, it seems likely that *Ambloxus* was merely a *lapsus mentis* for *Ambloxis.*

In case it be ruled that *Ambloxus* is *not* equivalent to *Melania* Lamarck, but must be restricted to one of Rafinesque's species, then the type will be *Melania viridis* Raf. ; and *Ambloxus* (1831) will become a synonym of *Ambloxis* (1818).

Melania virginica (Gmel.), nominated as type of *Ambloxus* by Mr. Hannibal, was not mentioned or implied by Rafinesque, is certainly distinct from both of his species, and therefore can not be considered in this connection.

Oxytrema Raf., Journ. de Physique, etc., vol. 88, 1819, p. 423. No species mentioned. Not identifiable. The description of aperture suggests *Angitrema armigera*, but the shape assigned excludes that species, and also *Io*, which has been suggested by Mr. Hannibal.

Campeloma Raf., loc. cit., p. 423. Monotype *C. crassula* Raf. This species has been synonymized with *Paludina ponderosa* Say, but on wholly insufficient grounds. It is more like *P. subsolida* Anth. which often has the "summit acute." It is not so in *ponderosa*. Moreover, *subsolida* is often sinistral. This condition must be very rare in *ponderosa*. I have never seen a sinistral one, and none is on record. However, nobody could pretend to identify such a specific description positively. *Campeloma* becomes a synonym of the earlier *Ambloxis*.

Omphiscola Raf., loc. cit. p. 423. No species mentioned. Under Opinion 46 of the International Commission, no type can be selected for this genus, since no species "can be recognized from the original generic publication." Beck, 1837, selected *Lymnaea glabra* (O. Müll), a species outside of Rafinesque's assigned territory. Dall (1905) suggests that it may have had *Lymnaea reflexa*, Say, as a basis, but does not assign that as type. In my opinion, it cannot be positively identified.

Lymnula Raf., l. c., p. 423. New name for "*Lymnea* Auct." Type therefore *L. stagnalis*.

Espiphylla Raf., Jour. de Physique, vol. 88, 1819, p. 423. Monotype *E. nympheola* Raf. Probably imaginary, but suggests *Succinea* slightly.

Leptoxis Raf., loc. cit., p. 424. No species was mentioned by Rafinesque, but the terms of the diagnosis can hardly be applied to anything but *Anculosa* or *Somatogyrus*. In his monograph of 1848, Haldeman used *Leptoxis* in place of *Anculosa*; this identification being supported by figures in Rafinesque's unpublished MS., *Conchologia Ohioensis*, possessed by him.

Desiring to retain the name *Anculosa*, I laid the case before several persons, expert in questions of nomenclature, whose verdict was in favor of *Leptoxis*. The type of *Leptoxis* will be *Anculosa praerosa* Say.

CYCLEMIS Raf., loc. cit. Species *C. minutissima* and *C. olivacea*, undescribed. *C. olivacea* here selected as type. Undeterminable, but the type *may* be *Viviparus intertextus* Say.

OMPHEMIS Raf., loc. cit. Species *O. lacustris* and *O. phaioxis* Raf., undescribed. Type *O. lacustris* here selected ; not determinable, but provisionally it might be identified with *Viviparus contectoides* W. G. B. I think that *Cyclemis* and *Omphemis* were based, at least partly, on *Viviparus*.

LOMASTOMA Raf., loc. cit. Monotype *L. terebrina* Raf. Not determinable. Imaginary ?

EUTREMA Raf., loc. cit. Monotype *E. terebroides* Raf. Mythical ?

DUPLICARIA Raf., Atlantic Journal etc., No. 5, p. 165, 1833. Monotype *D. bonariensis* Raf.=*Chilina fluminea* (Maton).

SUMMARY.

AMBLOXIS will have to be used for the genus commonly known as *Melantho* or *Campeloma* ; *Campeloma*, and in part, *Ambloxus*, becoming synonyms.

PLEUROCERA replaces *Angitrema* (of Tryon's monograph), at least for species congeneric with *verrucosa*. (*Pleurocera* of Tryon will become CERIPHASIA Swainson).

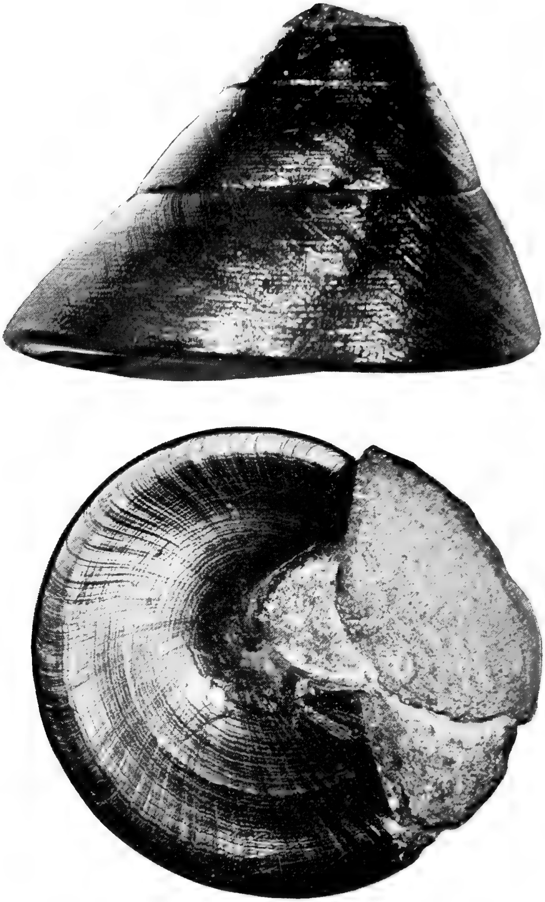
LEPTOXIS will replace *Anculosa*.

All of the other names which I have been able to identify become synonyms of genera of earlier dates.

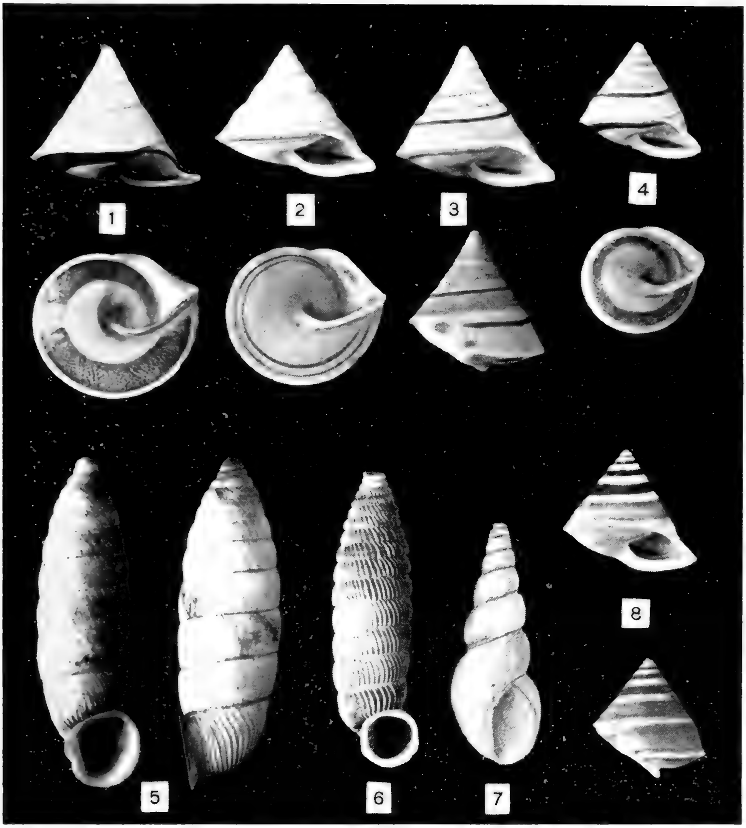
A COLOR-MARKED EUCONOSPIRA FROM THE PENNSYLVANIAN OF MISSOURI, AND A LIST OF REFERENCES TO COLORATION IN FOSSIL SHELLS.

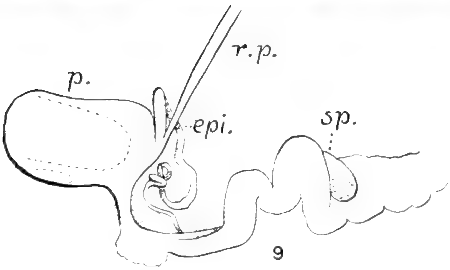
BY DARLING K. GREGER, COLUMBIA, MO.

An examination of the extensive series of Pennsylvanian fossils from the vicinity of Kansas City, Missouri, in the University of Missouri collection, brings to light two specimens of gastropods retaining traces of coloration. The material comes from the oölitic layer of the Drum member. The oölite is light buff or gray and the greater number of its many fossils are of the same light color. The shell which I figure on the accom-



GREGER: EUCONOSPIRA MISSOURIENSIS (SWALLOW).





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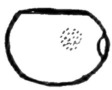

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1-4, 8, OXYCHONA.
5, 6, HOLOSPIRA.
7, LOBOA BRUNOI V. IHER.
9, HEMPHILLIA MALONEI.
10, GLOCHIDIUM OF CONTRADENS CAMBOJENSIS.

panying plate is probably one of the best preserved examples of Swallow's "*Trochus*" *missouriensis* yet collected, and the ornamental color pattern consists of revolving bands, the outer or peripheric band dark, and the inner (upper) one light. On the base of the shell the color is still better preserved; a central umbilical space is light, followed by a dark band. This in turn is followed by another light band, and the outside, or peripheric, band is dark, as on the upper surface. The ornamentation of this species is further increased by a series of still darker curved bands that follow the gracefully curved growth-lines of the shell.

In his description of this species Professor Swallow states that "the surface is highly polished and beautifully cancellated" and that "it still retains its pristine luster." The shell of which he thus wrote is preserved in the University collection (Type No. 928, paleontological collection, University of Missouri) and while its surface is highly polished and exquisitely cancellated only a slight trace of the bands of color that originally adorned it are present.

After removing a mass of oölite by which the base and part of the spire of the figured specimen were concealed, and its beautifully polished surface was revealed, I could well appreciate the feeling of the great English paleontologist, Davidson, who in describing a color-marked Brachiopod says: "When we reflect how vivid, beautiful and varied must have been the tints which once adorned the now black and dingy fossils, we are delighted when by some fortunate accident, some remains of that color is faintly preserved upon a shell which has for almost countless ages been concealed from the sight of man." I will not attempt to suggest what the original tints were that adorned this species; however, the colors as preserved upon the specimen are a light pearl gray and chestnut brown, in the revolving bands, and in the curved rays following the growth lines a dark chocolate brown to black.

In the list of references to coloration which follows, the writer has not in any sense attempted a complete bibliography of the subject. Further search through the German and Italian literature, to little of which he has had access, will undoubtedly bring to light other references.

1836. Phillips, J.—Illustrations of the Geology of Yorkshire, Pt. 2, pp. 226, 229, 230, Pl. 15, fig. 2, Pl. 16, figs. 6, 10.
1842. Archiac, E. J. A. D. de St. S. d' and Verneuil, E. de—Trans. Geol. Soc., London, Vol. 6, p. 346, Pl. 27, fig. 6.
1844. Koninck, L. G. de—Description des Animaux Fossiles, pp. 329, 395–396, 397–398, 406, Pl. 23, figs. 4 a–b, 31, figs. 1 a–c, 36, fig. 5.
1851. Davidson, T.—On the classification of the Brachiopoda, British Fossil Brachiopoda, Vol. 1, p. 53.
1855. Davidson, T.—Oolitic and Liasic Brachiopoda, British Fossil Brachiopoda, Vol. 1, p. 6.
1858. Davidson, T.—The Carboniferous Brachiopoda, British Fossil Brachiopoda, Vol. 2, p. 13, Pl. 1, figs. 6, 9, 16.
1859. Davidson, T.—The Carboniferous System in Scotland characterized by its Brachiopoda, The Geologist, Vol. 2, p. 473, Pl. 12, fig. 2, Dec., 1859.
1860. Davidson, T.—The Carboniferous System in Scotland characterized by its Brachiopoda, The Geologist, Vol. 3, p. 238, June, 1860.
1860. Swallow, G. C.—Descriptions of new fossils from the Carboniferous and Devonian rocks of Missouri, Trans. of the Acad. of Sci. of St. Louis, Vol. 1, pp. 657–658.
1862. Deslongchamps, E. Eudes—Etudes Critiques sur des Brachiopodes nouveaux ou peu connus, Fascicule 1st, pp. 23, 25, 27, 28, 30, 37.
1869. Marsh, O. C.—On the preservation of color in fossils from Paleozoic formations, Proc. Amer. Assoc., Vol. 17, for 1868, pp. 325–326.
1871. Kayser, L.—Notiz uber Rhynchonella pugnus mit Farbenspuren aus dem Eifler Kalk, Zeitschrift der Deutschen geologischen Gesell, Bd. 23, pp. 257–265.
1880. Davidson, T.—Supp. to the Permian and Carboniferous Species, British Fossil Brachiopoda, Vol. 4, Pt. 3, p. 268, Pl. 30, figs. 12 a, b, c.
1887. Oehlert, D. P.—Fischer's Manuel de Conchyliologie, Appendice Brachiopodes, p. 1196.
1887. Waagan, W.—Palaeontologica Indica, Series 13, Salt Range Fossils, Vol. 2, pp. 699, 701, Pl. 74, figs. 1, 4, 8.
1890. Keyes, C. R.—Preservation of color in fossil shells, The Nautilus, Vol. 4, July, 1890, pp. 30–31.
1892. Hall, J., and Clarke, J. M.—An introduction to the study of Brachiopoda, Eleventh Annual Report, New York State Geologist, p. 150.
1896. Ruedemann, R.—Note on the discovery of a sessile Conularia, American Geologist, Vol. 17, pp. 158–165.
1896. White, T. G.—The faunas of the Upper Ordovician

strata at Trenton Falls, New York, Transactions New York Academy of Science, Vol. 15, p. 85.
1906. Raymond, P. E.—An Ordovician Gastropod retaining color markings, The Nautilus, Vol. 19, pp. 101–102, text figs.
1908. Greger, D. K.—A new Devonian Brachiopod retaining the original color markings, American Journal of Science, Vol. 25, pp. 313–314, text figs. 1, 3, 4, 5, 7.
1908. Raymond, P. E.—The Gastropoda of the Chazy Formation. Annals of the Carnegie Museum, Vol. 4, pp. 212–213, Pl. 55, figs. 16, 17.
1911. Cleland, H. F.—The fossils and stratigraphy of the Middle Devonian of Wisconsin, Wisconsin Geol. and Nat. Hist. Survey, Bull. No. 21, pp. 69, 73, Pl. 12, figs. 3, 4, 5; Pl. 13, figs. 8, 9.
1912. Girty, G. H.—Notice of a Mississippian Gasteropod retaining coloration, American Journal of Science, Vol. 34, pp. 339–340, Pl. 1, figs. 9, 10, 11.
1913. Zittel, Karl A. von—Text Book of Paleontology, 2nd Edition, p. 367.
1914. Weller, S.—Mississippian Brachiopoda, Monograph No. 1, Illinois Geol. Survey, pp. 477–478.
1914. Roundy, P. V.—Original color markings of two species of Carboniferous Gastropods, American Journal of Science, Vol. 38, pp. 446–450, Pl. 3, figs. 1–13.
1914. Greger, D. K.—On the retention of the original color in fossil Brachiopods, The Nautilus, Vol. 28, pp. 93-95.

A NEW HEMPHILLIA AND OTHER SNAILS FROM NEAR MT. HOOD, OREGON.

BY H. A. PILSBRY.

During an outing at Tawney's Hotel, on the Salmon River, 12 miles from Mt. Hood, elevation 1600 ft., Mr. J. G. Malone found a number of snails, among them a new slug, which may be described as follows.

Hemphillia malonei n. sp. Pl. IV, fig. 9.

Most like *H. camelus* externally. The general color is dusky drab, becoming blackish brown on the tail. There are a few small black spots along the sides of the mantle, which has a very large opening exposing the shell. Pneumostome is about midway of the mantle. Behind the mantle there is a short median impressed line, flanked by obliquely decurrent lines; followed posteriorly by irregular, coarse granulation, the end of the tail then becoming carinate. The pedal furrows rise behind, as in *H. camelus*, and there is no horn above their junction, and no specialized caudal mucous pore. The shell consists wholly of yellow periostracum, whatever lime it contained having been dissolved by the preserving fluid (formaldehyde). The mantle is smooth. Total length preserved in formaldehyde 33 mm.; length of mantle about 16 mm.; width of the sole 4.3 mm. Length of the shell about 10.5 mm.

The short penis (pl. 4, fig. 9) is produced laterally in an ample pocket which contains a large "papilla" attached distally, as shown by dotted line in the figure. There are also some smaller fleshy processes. The penial retractor (*r. p.*) is inserted at the origin of the epiphallus (*epi.*), as in *H. camelus*. The duct of the spermatheca (*sp.*) is narrow, as in *H. glandulosa*. *H. danielsi* Vanatta (Proc. A. N. S., Phila. 1914, p. 367) from Montana differs externally by having a smaller shell pore, and internally by the entirely different shape of the penis, with the penial retactor inserted on the epiphallus. The duct of the spermatheca is wide. The organ figured as a penial gland, in Mr. Vanatta's fig. 2, is apparently homologous with the large lateral penial pocket or sack of *H. malonei*.

Locality, Tawney's Hotel, on the Salmon River, 12 miles from Mt. Hood. Collected by J. G. Malone, August, 1916. Collection Acad. Nat. Sci., Phila., No. 115577.

This species resembles *H. camelus* in external appearance and by having the penial retractor inserted at the apex of the penis. It is more like *H. glandulosa* in the shape of the penis and the slender duct of the spermatheca.

One of the specimens had been extensively gnawed, evidently by the type specimen. Another, which had been confined in the same box, disappeared. Probably the survivors knew where their companion went.

Mr. Malone found the following snails in the same neighborhood:

Ariolimax sp. (common, but not collected).

Epiphragmophora fidelis Gray.
Polygyra columbiana Lea.
Pristiloma sp., fragment.
Circinaria vancouverensis Lea.
Circinaria sportella hybrida Ancey.
Goniobasis plicifera silicula Gld.

PHILOMYCUS IN ARIZONA.

BY H. A. PILSBRY.

In the course of our desert journey of 1910, the Santa Rita Mountains, in southern Arizona, were visited. The party (Messrs. Ferriss, Daniels, and the writer) camped at the head of Agua Caliente canyon, somewhat above the 7000-foot contour. A two-day trip was made eastward across Madera canyon, and over the saddle north of Old Baldy, dropping down the eastern slope of the range to about the 6800-foot line. Some slugs picked up here (our Station 17), were thought to be all *Agriolimax*, but on closer inspection, three *Philomycus* were found in the lot. It is a new genus for Arizona ; in fact, the place is over a thousand miles southwest of any record in this country. The species may be called *Philomycus* (*Pallifera*) *arizonensis*, n. sp. It is 20 mm. long, the sole 1.8 mm. wide. Color: above bister, below snuff brown (in alcohol). Jaw with few ribs. Type and two smaller specimens are No. 115575, A. N. S. P.

HENRY MELVILL GWATKIN.

Professor H. M. Gwatkin, widely known as a special student of molluscan radulæ, died during the first half of November. He was born at Barrow-on-Soar, Leicestershire, England, July 30, 1844, and was educated at Shrewsbury School and St. John's College, Cambridge. He took his B. A. at Cambridge in 1867, and was a Fellow of St. John's College from 1868 to 1874, Theological Lecturer from 1874 to 1891, and Dixie Professor of Ecclesiastical History from 1891 to the time of his death. He was Gifford Lecturer at Edinburgh, 1903–05, and in 1897 received the honorary D.D. degree from Edinburgh. In 1882 he published "Studies of Arianism." It is very interesting to find that a man who thus gave his life to theological studies, should have chosen for his hobby such a subject as the radulæ of the mollusca. His collection, which I was permitted to examine when in Cambridge some years ago, is amazingly rich, doubtless far exceeding any other. He was indefatigable in securing material from all over the world, and was able to prepare good mounts from animals long dried in the shell. Unfortunately the shells themselves were not usually preserved, so in case of doubtful identifications there will be no ready means of confirming the assigned names. It is understood that the whole collection has gone to the British Museum.—T. D. A. Cockerell.

NOTES.

Common Names : Speaking of common names reminds me of the time I lived in Branford, Connecticut. I used to hear the name "Squaw Clam" frequently. I found the name originated from the fact that in the duck season the old squaws fed on these forms. So I made up my mind to find out what a squaw clam was. I tried *Mulinia lateralis* with one man: I got "yes, that's it." *Tellina tenera* with another, "yes, that's it," *Macoma* with another, "yes, that's it." I don't know how many species I tried, but I found that squaw clam embraced so many that no genus would hold them.—H. W. Winkley.

Limax arborum in a Colorado Greenhouse.—In a greenhouse at Boulder, devoted principally to the growing of tropical orchids, numerous slugs have recently appeared, and have proved extremely destructive to the plants. I have before me a *Cattleya* flower absolutely ruined by them. There is every reason to believe that the slugs came with a consignment of orchids from Denver, but how they reached Colorado remains unknown. The species is *Limax arborum*, as I was able to confirm from an examination of the penis-sheath, which shows the so-called flagellum very well. The specimens are very uniform, all belonging to the variety *subrufa* LeComte, having the body a rather pale and translucent reddish, mantle with the usual black bands and a nebulous or evanescent median one, back with two grey bands, lateral bands not developed. It seems that this particular form is common in Belgium, and it may be supposed that it reached America with garden plants from that country.—T. D. A. Cockerell.

THE NAUTILUS.

VOL. XXX. MARCH, 1917. No. 11

LOBOA BRUNOI N. G., N. SP., A LAND SHELL FROM THE BRAZILIAN ISLAND OF TRINITY.

BY DR. HERMANN VON IHERING.

The present Director of the Brazilian National Museum at Rio de Janeiro, Dr. Bruno Lobo, has rendered to science an excellent service in accompanying, with some employees of that museum, the expedition which in the present year was undertaken by the Admiralty for political and military reasons. It will be a matter of great interest to know the geological and biological results of the expedition.

Dr. Bruno Lobo has kindly charged me with the study of the Mollusca which have been collected by the expedition. I shall give information on the matter in the official publication, but there is one point which I desire to communicate immediately to my competent friend, Mr. H. A. Pilsbry, hoping to hear his opinion. Among the marine shells I have found also a small land shell, which evidently inhabits this island. The shell is quite intact and not worn in its sculpture, but of a chalky white aspect not rare in shells exposed to an arid environment. The shell is of a stenogyroid habitus and seems to me the representative of a new genus of the family Achatinidae. I give here the description accompanied by a figure.

LOBOA BRUNOI n. g., n. sp. Pl. IV, fig. 7.

The shell has a conic-turreted form and is of rather solid texture, perforate, of a dirty chalky-white color. The whorls, in number 7½, are convex and separated by a deep suture. The last whorl is a little longer than the spire, descending only at its end. The apex is obtuse, first ascending then descending, smooth, shining. The two embryonic whorls are sculptured with irregular longitudinal wrinkles and numerous very fine pores, which exist also in some of the following whorls. The whorls of the spire are ornamented with feeble longitudinal ribs which are somewhat irregular and sometimes bifid and with numerous impressed spiral lines. The aperture is small, somewhat oblique, occupying one-third of the total length of the shell. The peristome is sharp, simple, the columellar lip dilated above, reflected, somewhat thickened and covering the umbilical chink. The parietal callus is broad, white, and forms a straight line connecting the outer lip with the columella, with which it forms an obtuse angle.

The length of the shell is 19.5, the diameter 7.3, the alt. of the aperture 6.5, the diameter of the aperture 4 mm.

The unique specimen, found at the Brazilian Island of Trinity, is kept in the National Museum of Rio de Janeiro. The species is dedicated to my distinguished colleague, Prof. Dr. Bruno Lobo, Director of the National Museum of Natural History and Anthropology at Rio de Janeiro.

House de Joinville, Est. de St. Catharine, Brazil,
20th of September, 1916.

PLEUROCERA SUBULARE LEA.

BY CALVIN GOODRICH.

Lea's *Melania subularis*[1] came from the Niagara river. It is a shell common to the waters of Lake Erie, especially the northern and western shallows. A form, recognizable superficially as different, occurs in the lake tributaries. These river shells, as a rule, are lighter of structure, less polished and, whorl for whorl, somewhat larger than lake shells. The percentage of dark shells in the streams is, I would say offhand, lower than in

[1] Philos. Trans. IV., p. 100; 1831.

the lake. But the differences are so slight that they do not warrant distinction even as a sub-species.

I believe it was this stream form that Anthony had before him when he described his *Melania neglecta*,[1] from the Great Miami river, "near Dayton, Ohio." The descriptions of *subularis* and *neglecta* might be interchanged and cause little or no perplexity to the student. In September, 1916, I collected in the Great Miami at Tadmor, about ten miles north of Dayton, and in January last, collected over exposed gravel bars of the river at Dayton itself. Save that there seem to be an unusual number of distorted specimens among these shells, I cannot see any marked differences between them, and recognized *subulare* of the lake drainage. Anthony mentioned two varieties, one banded, the other "plain, horn-color, or with bands but faintly indicated by an almost imperceptible difference of color in the interior of the mouth." Heavy specimens of this latter variety, with "remarkably expanded outer lip," were separated by Lea under the name *Trypanostoma labiatum*.[2] In the Tadmor lot, I have specimens running from thin attenuated forms to the robust *labiatum* of expanded lip, banded and unbanded, all of the same colony. In a family so variable as the *Pleuroceridae*, there can be little justification for Lea's action, if only because the dignifying of one form with a name makes it a duty to name the other forms—a business that would pile up the nomenclature like ore-heaps around a blast furnace.

Melania intensa Anthony[3] is simply a "purple-black" variety of *subulare*. Such shells occur more or less commonly in localities where *subulare* flourishes. I collected nearly a handful in the Wabash river at Logansport, Ind., last year. One can get black and partly black shells. In a sending by A. J. Brown from Spring river, Fulton county, Ark., was a specimen black from apex to a little beyond the beginning of the last whorl. At that point the animal seems to have run out of coloring matter, finishing the shell in pale yellow.

[1] Ann. Lyc. N. Y., p. 128; March, 1854.

[2] Proc. Acad. Nat. Sci., p. 174; 1862.

[3] Reeve, Monog., sp. 371.

In the synonymy of *subulare* may be included *Trypanostoma pallidum* Lea.[1] This is merely an extreme form, such as occurs somewhat rarely among fresh-water Gastropoda. It represents an old-age development, denied to all except a few animals of unusual vitality or unusual good luck in escaping hardships and enemies. Judging by the figure in Tryon[2] (the description suggests difficulties) *Melania tracta* Anthony, placed by Tryon in the synonymy of *Pleurocera elevatum* Say, is the *pallidum* stage of *subulare* growth.

Pleurocera subulare is probably the most widely distributed member of its genus, inhabiting from easternmost Ontario to Minnesota, Kansas and Arkansas. East of the Mississippi it does not appear to go below the line of the Ohio river. Considering the variableness of the family, the characteristics of this species are remarkably constant. There is slight difference between the *subulare* of the Great Lakes region and that of streams of northern Arkansas.

The synonymy of this species may be set down as:

Melania subularis Lea, 1831.
Melania tracta Anthony, 1850.
Melania neglecta Anthony, 1854.
Melania intensa Anthony mss., Reeve, 1860.
Trypanostoma pallidum Lea, 1862.
Trypanostoma labiatum Lea, 1862.

A NEW HOLOSPIRA FROM CHIHUAHUA.

BY HENRY A. PILSBRY.

HOLOSPIRA BRYANTWALKERI n. sp. Pl. 4, fig. 6.

A species of the subgenus *Haplocion*. The shell is rimate, cylindric, the upper third tapering, summit mucronate. Very pale flesh-colored. Sculpture of closely set riblets, narrower than their intervals, very straight and retractive on the upper,

[1] Proc. Acad. Nat. Sci., p. 173; 1862.

[2] Monograph of *Strepomatidae*, Washington, p. 96; 1873.

arcuate on the lower whorls. There are 43 riblets on the penult whorl. In the conical part of the spire the riblets are partly hollow, and broken down in places. The whorls are quite convex, and in the lower part of the conical portion they overhang a little. The last whorl is well rounded below, and carries the aperture forward shortly in advance of the ventral outline of the shell. Aperture is small, almost circular, a little oblique, with a quite flat, reflected and continuous lip. The internal axis is simple.

Length 19.5, greatest diam. 5.3 mm.; $14\frac{3}{4}$ whorls remain, the embryonic whorls being broken off. Aperture 4 mm. long, measured outside peristome.

Rio Conchos, Chihuahua, Mexico, not far above its confluence with the Rio Grande, collected by Mr. B. H. King, 1912.

This species is larger than any similarly sculptured *Haplocion.* An entire specimen would have about 17 whorls, with a length of slightly over 20 mm. The holotype is in coll. Bryant Walker, no. 36935.

With the preceding there were two specimens figured in pl. 4, fig. 5, which appear referable to *H. pasonis* Dall. The riblets in the last whorl are slightly closer than in a specimen of the original lot of *pasonis,* but I can find no material difference. They measure:

Length 21.6, diameter in the middle 6.6 mm.; $11\frac{1}{2}$ whorls.
Length 21.4, diameter in the middle 6.1 mm.; $11\frac{2}{3}$ whorls.

NOTES ON THE BIFASCIATA GROUP OF OXYCHONA.

BY H. A. PILSBRY.

The genus *Oxychona* contains conic, acutely carinate, thin and light-colored snails of eastern Brazil, evidently arboreal, distributed from the Province of Rio to that of Bahia. Although very similar in shape to the Helicid genus *Papuina,* I was led to place the group in the *Bulimulidæ,* near *Drymæus* and *Zaplagius,* by the characters of the teeth and embryonic shell.

Dr. von Ihering, who considered the group in a valuable paper[1] has confirmed this classification.

Having occasion lately to go over the specimens in the Academy collection, it became evident that the synonymy of *O. bifasciata*, the most widely known of them, had been made too comprehensive by Pfeiffer, who has been followed by subsequent authors. Certainly two, probably three species seem to have been lumped; though closely related they appear to be distinct. References to the literature may be found in Manual of Conchology V, p. 128; XI, p. 181; XIV, p. xxxvii, 154.

Partial Key to species of Oxychona.

a Last whorl descending deeply below the keel in front; shell pitted above the keel and suture; aperture with a rather long "spout," the lip but slightly expanded above it, white; alt. 15, diam. 22 mm., between Rio and Campos, State of Rio de Janeiro. *O. lonchostoma* (Mke.).

a′ Last whorl not descending in front.

- *b.* Shell higher than wide. *O. gyrina.*
- *b′.* Shell wider than high.
  - *c.* Lip above the angle well expanded and calloused within; outlines of spire nearly straight; peritome white or pale pink. *O. bifasciata* (Burr).
  - *c′.* Lip scarcely or not expanded above the angle, sinuous.
    - *d.* Peristome white or pale pink, basal margin rather wide; "spout" moderately developed. *O. bosciana* (Fér.).
    - *d′.* Peristome rose-colored throughout, basal margin narrow. Spout longer. *O. pyramidella* (Wagn.).

I have not seen *lonchostoma*, *gyrina* or typical *pyramidella*, all of them described nearly a century ago, and not recorded by any subsequent collector. *O. mimarum* is not sufficiently known to contrast with the figured species. Notes on the other species and their subspecies follow.

[1] Analyse der Süd-Amerikanischen Heliceen. Journ. Acad. Nat. Sci., Phila., XV, 1912.

Oxychona bifasciata (Burrow, 1815). Pl. IV, figs. 4, 8.

This is described by Burrow as "white with two purplish brown transverse bands and a dark brown apex. Inhabits Pernambuco." The figure, shows the outer lip to be expanded and thickened within ; it measures, length 18, diam. 18 mm.

Specimens in collection of the Academy are variously banded (pl. IV, figs. 4, 8), and have two very small dark spots behind the upper lip in two specimens, none in two others. *The upper lip is well expanded, calloused within*, the callous thicker near the periphery, giving the inner edge a sinuous contour. The basal lip is wider than in *blanchetiana*, and the last whorl is barely concave above the keel, not pinched out as in *blanchetiana.* The outlines of the spire are almost straight. In one of the four examples the tip of the apex is dark. In one of the specimens the lip has the faintest roseate tint, which becomes distinct at the columellar insertion. The others have a white lip ; and this was no doubt the typical color, as a colored lip would have been mentioned by Burrow.

Length 15, diam. 16.4 mm.; $6\frac{1}{2}$ whorls.

Length 15.4, diam. 17 mm.; $6\frac{1}{2}$ whorls.

Oxychona bosciana (Férussac).

Férussac's figured type shows dark bands a short distance below and above the periphery, another below the suture ; the upper two bands spreading into blotches behind the lip ; spire slightly concave, and the latter part of the last whorl strongly so near the periphery, causing the aperture to be conspicuously produced, spout-like. The upper lip is sinuous, and *not at all expanded.* Length about $16\frac{1}{2}$, diam. about 21 mm. Lip white.

Helix bosciana was mentioned in the *Prodrome*, but first defined by three figures in the *Histoire naturelle*, pl. 64, fig. 1. This is one of the old plates, drawn by Bessa and engraved by Coutant. I do not know the date of issue, but it was probably not long after 1820.

Oxychona bosciana blanchetiana (Moricand, 1833). Pl. IV, figs. 2, 3.

Mem. Soc. de Phys. et d' Hist. Nat. de Genève, vi, p. 539, pl. 1, f. 3.

This is the best known form. Typically it is white above, with two dark blotches behind the lip, but as often there is also a narrow dark band a short distance below the suture, and sometimes an interrupted one above the carina. The base has a band, often split, near the periphery. Upper lip *not expanded.* Lower lip reflected, white or faintly pinkish. Outlines of spire concave. Length 17.4, diam. 19.5, or somewhat smaller.

This form was collected by Blanchet in the environs of Bahia. It appears to differ from typical *bosciana* only in color, and its status as a subspecies is very dubious. It is probably a mere color-form of *bosciana.*

Hidalgo has figured another variety of *bosciana*, collected by the Spanish Expedition around Rio Janeiro, which seems rather out of the range of the species (Viaje al Pacifico, Moluscos, pl. 1). It is evident that the species has various local color-races, about which we know very little at present.

OXYCHONA PYRAMIDELLA (Wagner, 1827).

This is a form having the general shape of *bosciana*, with two bands above, one below the periphery of the last whorl. The aperture seems to be produced outward in a narrower spout than in *bosciana*, upper lip apparently not expanding, and the whole lip rose-colored. The habitat given is the province of Bahia, "in sylvis mediterraneis inter montem sanctum et flumen S. Francisci." The figures are rather poor, and series of specimens are needed to determine whether it is to be ranked as a subspecies of *bosciana* or as a distinct species.

OXYCHONA PYRAMIDELLA CURRANI Bartsch. Pl. IV, fig. 1.

See NAUTILUS for September, 1916, p. 53. Rio Grungugy, Province of Bahia. Figures of the type of this handsome race are now given. It differs conspicuously from *blanchetiana* by the more pinched keel, the longer external spout of the aperture, more sinuous, broadly rose-bordered lip, and other features fully described by Dr. Bartsch. The microscopic sculpture is the same. It appears to be more elevated than *O. pyramidella*, with somewhat diverse color-pattern.

OXYCHONA MIMARUM Ancey.

Oxychona bifasciata var. *mimarum* Anc., Le Nat., 1901, p. 93. Pilsbry, Man. Conch. XIV, p. 154. This unfigured form from Minas Geraes is probably specifically distinct. Not seen by the writer.

A LIST OF MOLLUSKS COLLECTED AT CASTLE ISLAND, BOSTON.

BY SHIELDS WARREN.

Castle Island, Boston Harbor, is an interesting collecting ground owing to the number of mollusks that flourish there under the adverse conditions necessarily present in a great seaport. The main channel to the inner harbor passes the island, and every ebb-tide strands much of the water-front debris on its shores. Although the island would seem an unfavorable habitat for even hardy mollusks, it is one of the best collecting places for nudibranchs in the vicinity of Boston. In the early spring considerable numbers come there to breed, particularly *Acanthodoris pilosa* and *Lamellidoris bilamellata*, and I have found scattered specimens of these and other species from October to June.

The shore of the island on the east and south is sand and gravel with scattered boulders, and is sand and mud, with patches of eel-grass, elsewhere. Between Castle Island and City Point are extensive mussel flats; and clay, dredged from the neighboring channel and dumped beside the bridge, contains numerous valves of oysters and quahaugs similar to those found in the excavations for the Boylston Street Subway. *Litorina littorea* is very plentiful on the rocks and is gathered by the Italians for food. The imbricated form of *Thais lapillus* is fairly abundant.

Below is a list of the mollusks I have collected on the island, and which seems to be fairly representative of the whole of Boston harbor. Species marked with an asterisk have not been obtained living.

*Ostrea virginica.**
*Pecten magellanicus.**
Anomia aculeata.
Anomia simplex.
Mytilus edulis.
Modiolus modiolus.
*Modiolus demissus plicatulus.**
Clidiophora gouldiana.
*Venus mercenaria.**
Ensis directus.
Mesodesma arctatum.
Mya arenaria.
Saxicava arctica.
Acmaea testudinalis.
Polinices heros.
*Polinices triseriata.**
Crepidula fornicata.
Crepidula glauca.
Crepidula plana.
Cingula aculeus.
Litorina littorea.
Litorina obtusata palliata.
Litorina rudis.
Lacuna vincta.
*Urosalpinx cinereus.**
Thais lapillus.
Alectrion obsoleta.
Alectrion trivittata.
Colus stimpsonii.
Aeolidia papillosa.
Coryphella rufibranchialis mananensis.
Palio lessonii.
Acanthodoris pilosa.
Lamellidoris bilamellata.
Lamellidoris muricata.

MARTYN'S UNIVERSAL CONCHOLOGIST.

A copy of this rare work has recently been obtained by the Boston Society of Natural History. Bernard Quaritch, in describing this copy in his catalogue, says—"4 vols. atlas 4to, with colored frontispiece, 2 engraved plates of medals and 160 plates containing 322 colored figures. Contemporary tree-calf, neatly rebacked. With the [John] Townly book plate.

"The copy agrees with that in the British Museum (Natural History) and is quite complete. The complete work in four volumes is very rare although the first two are comparatively common. Even Sir Joseph Banks was unsuccessful when endeavoring to obtain the entire work. Evidently Martyn only completed copies by order. Other than the copy offered, only one example has occurred for sale by auction in London since 1895 and I have been able to trace the sale of only eight copies for upwards of 50 years prior to that date. The Roscoe copy sold for £32 2 s. 6d. and the Fonthill example for £52.10 s." The Society's copy cost £21.

Dr. Wm. H. Dall in the Proc. U. S. National Museum, 1905, vol. 29, pages 415–432, gives a very interesting account of Thomas Martyn and an exhaustive description of the first two volumes, containing 80 plates, based on a copy in the U. S. National Museum and a similar copy in the Academy of Natural Sciences, Philadelphia. In the publication, 1907, vol. 33, pages 185–192, Dr. Dall gives some supplementary notes, based on a copy in the library of Mr. John B. Henderson of Washington, also consisting of 80 plates, together with some notes received from Mr. Charles Hedley referring to a four-volume copy in the Australian Museum, Sidney.

The size of the copy in the U. S. National Museum is 11 x $12\frac{7}{8}$ inches and the one in the Academy of Natural Sciences is $12\frac{7}{8}$ x $10\frac{7}{8}$ inches, while Mr. Henderson's copy is $16\frac{1}{8}$ x $16\frac{1}{8}$ which is the size of the copy obtained by the Society. The latter copy has in Vol. I, the first and second engraved title pages both dated 1784, the engraved dedication to the King, introduction preface and letter including 39 pages, two plates of medals, and explanatory table of the 40 plates. Vol. II has only the second title-pages same as in Vol. I, 1784, and explanatory table of the 40 plates. Vol. III has only the first title-page, same as in Vol. I, 1784, and explanatory table of the 40 plates. Vol. IV has only the first title-page, same as in Vol. I, 1784, and explanatory table of the 40 plates. Dr. Dall says the first two volumes were issued in 1784, Volume III in 1786 and the work completed probably in the spring of 1787.

In the Society's copy, in the explanatory table for Vol. IV, figure 135 is (*Cochlea*) *denrachates* not *dentrachates* and figure 137 is (*Cochlea*) *caelata* not *cretata* as given in the explanatory table of the copy in the Australian Museum. In the Henderson copy Dr. Dall says plate 59 has two views side by side. In the Society's copy only one view is given. All of the other plates agree with that copy.

In the NAUTILUS, vol. 22, p. 72, Mr. S. S. Berry refers to a copy comprising four volumes in the library of the Leland Stanford Junior University. This work lacks the explanatory table for the plates of the fourth volume. This is apparently the only other set of four volumes in America. In 1913 Mr. Berry obtained a copy of the first two volumes of this work (NAUTILUS, Vol. 27, p. 95). In the same volume of THE NAUTILUS, page 107, Mr. George H. Clapp, of Pittsburg, described a copy in his library. The two volumes are bound in one and trimmed to $10\frac{3}{4}$ x $13\frac{7}{16}$ inches. The sizes of the bound volumes apparently vary according to individual tastes. The size of the title pages in the Society's copy would not admit of trimming; the plates of medals are about 14 x 11 and the explanatory tables $11\frac{3}{4}$ x 11 inches; the actual size of the paper on which the plates are printed is 11 x $13\frac{1}{2}$ inches, but the ruling or "neat-line" surrounding the shells varies between 7 x $10\frac{1}{2}$. The plates are mounted on a heavy blue-gray paper.—C. W. JOHNSON.

NOTES.

ASTARTE QUADRANS AS FOOD FOR FLOUNDERS :—While walking along the beach on the ocean side, North of Provincetown, Cape Cod, I chanced to come upon a complete dried skeleton of the common flounder. The flesh had been removed by the beach crustacea etc, so that no muscle or entrails was visible, except the dried ligaments which held some of the bones together. In the space where the stomach had been, was a pile of *Astarte quadrans*, eighty-six valves in number, varying in size from the adult 9/20 inch to 3/20 inch, all in good condition and the majority having intact the ligament connecting the valves. Not a specimen of any other shell was present, although in the locality where the flounder lives are found several species of small shells.

This shows one of three things, viz :—that this fish had the ability to discriminate; or had found a spot where only this shell existed; or an epicurean fondness for "little-neck" Astarte.—J. HENRY BLAKE.

MR. HORACE F. CARPENTER began in September of 1916 to install his collection of shells in the upper south room of the main building of the Roger Williams Park Museum, Providence, R. I., and at this date upwards of 4,000 species have been placed on exhibition.

THE NAUTILUS.

VOL. XXX. APRIL, 1917. No. 12

THE STATUS OF THE GENUS SUBULARIA MONTEROSATO.

BY PAUL BARTSCH.

In 1853, H. & A. Adams published in vol. 1, pp. 237–238 of their work on the "Genera of Recent Mollusca" the genus *Leiostraca*, defining it in the following manner:

"Shell turreted, subulate, flattened, widest from side to side, polished, smooth, semipellucid; sides with a thin varix extending as far as the apex of the spire; aperture oblong, entire; inner lip distinct, callous, slightly sinuous in the middle; outer lip flexuous.

"Ex. *L. bilineata*, Alder, pl. 25, fig. 3. Shell, *L. Metcalfei*, A. Adams, fig. 3, a.

"The most curious circumstance about the type of this genus is the fact of its being compressed from before backwards, with a varix on each side, as in *Bursa* and *Pythia*.

"*Species of Leiostraca.*

acuta, Sow.
bilineata, Alder
bivittata, H. and A. Adams
(*bilineata*, Adams and Reeve)
fulvocincta, C. B. Adams
Metcalfei, A. Adams
Mindorensis, Adams and Reeve
solitaria, C. B. Adams.
subulata, Donov.
unilineata, Adams and Reeve
varians, Sow."

Since the characters of the genus are based upon the shell, and pl. 25, fig. 3 shows the head of an animal only, while fig. 3a, *Leiostraca metcalfei* A. Ad. shows the shell characters above defined, we may take *Leiostraca metcalfei* A. Ad. as the type of the genus. Even if we were to admit all the species listed by

H. & A. Adams as a possible field for type selection, *Leiostraca metcalfei* A. Adams is the only one that meets the full characterization of their genus, all the others being members of the genus *Strombiformis* Da Costa, 1778.

Unfortunately, Albers, in his *Die Heliceen*, p. 156, 1850, used the name *Leiostracus*, which was considered homonymous with H. & A. Adams' *Leiostraca* by Monterosato in his paper on Nomenclatura Generica e Specifica di alcune Conchiglie Mediterranee, p. 103, 1884, where he published the substitute name *Subularia* with the statement "(= *Leiostraca*, H. e A. Adams, 1853, non *Leiostracus* Albers, 1850)." *Subularia metcalfei* (A. Adams) therefore became the type of *Subularia* Monterosato.

The whole may be condensed into the following formula:

Subularia Monts., 1884, type *Subularia metcalfei* (A. Ads.)= *Leiostraca* H. & A. Adams 1853, type *Leiostraca metcalfei* A. Ads.; not *Leiostracus* Albers 1850.

Since *Subularia* and *Strombiformis* have been sadly confused in the past, I add a copy of a figure of the type of *Subularia* (pl. 5, fig. 2), and of a typical *Strombiformis* (pl. 5, fig. 1, *Strombiformis lapazana* Bartsch).

A NEW PLEISTOCENE MOLLUSK LOCALITY IN NEW MEXICO.

BY JUNIUS HENDERSON.

In the spring of 1916 Dr. Max M. Ellis, with Messrs. G. C. Roe and B. Jaffa as assistants, while collecting fishes in New Mexico, found a deposit containing many small land and fresh-water shells. It is in the bank of the North Spring River, about two and a half miles below (east of) Roswell. The valley was evidently at one time deeper than now, but had been partly filled by mud, sand and fine gravel. More recently the stream has cut into the deposit to a depth of fifteen feet. The thick fossiliferous stratum is at the base of the bluff, extending into the water and possibly far below, and is covered by about ten feet of soil, chiefly adobe. Twenty pounds of the weathered material yielded (in addition to abundant fragments of *Chara* and other plants, a few fragments of mammal bones and 400 caddis cases of the genus *Helicopsyche*) the following mullusks :

3500 *Pisidium* spp. (loose valves).
373 *Vallonia gracilicosta* Reinh.
2 *Carychium exiguum* Say.
23 *Pupoides marginatus* (Say).
20 *Bifidaria armifera* Say.
5 *Bifidaria contracta* Say.
5 *Bifidaria pellucida hordeacella* Pils.
136 *Bifidaria procera cristata* Pils. & Van.
2 *Pupilla muscorum* (L.).
5 *Vertigo* sp.
5 *Cochlicopa lubrica* (Müll.).
2 *Polita indentata* (Say).
400 *Zonitoides minusculus* (Binn.).
13 *Helicodiscus eigenmanni arizonensis* Pils. & Fer.
2 *Succinea* sp.
15 *Planorbis antrosus* Conrad.
100 *Planorbis parvus* Say.
100 *Physa virgata* Gld.
6 *Ancylus rivularis* Say.
4500 *Paludestrina seemani* (Ffld.).

There were also 75 seeds of "Snow-on-the-Mountain," *Dichrophyllum marginatum* (Pursh), but they may have been blown into the weathered material recently and hence may not be fossil. They are entirely unaltered.

The same collectors obtained 30 *Planorbis antrosus* Conrad and 5 *Physa* sp. about two miles below the head of the North Spring River west of Roswell, but did not bring in any of the weathered material or stop to examine the deposit thoroughly.

NOTES ON ACELLA HALDEMANI (DESH.) BINNEY.

BY FRANK C. BAKER.

Notes on the ecology of this the slenderest of our Lymnaeas are rare, and its whereabouts during a large part of the year has been a matter of conjecture. Dr. Reynold J. Kirkland of Grand Rapids, Michigan, has collected the species extensively and his observations are of interest in connection with the writer's notes which follow. Kirkland says,[1] "This is a deep water species, which migrates shoreward in the fall, doubtless for spawning purposes, as adults only have been captured, but this should be verified by dissection. September 25 is the earliest date they have been taken, and they remain until ice forms, how much longer is not known." Sargent[2] reports them in Heath Lake, Minnesota, in the fall, and adds, "Where do they keep themselves in the summer?".

This question can now in a measure be answered as the species has been found in July in Lower South Bay, Oneida Lake, in several localities. The specimens collected were all young, none exceeding 11 mm. in length, the greater number being 3 to 5 mm. long. They were invariably found on the leaves or stem of the pond-weed (*Potamogeton interruptus*). It is evident that they do not retire to very deep water but only to the zone where this pondweed, or perhaps other suitable vegetation grows. This may be in water from two to six feet deep. The shells are very difficult to find, as in life they are nearly the color of the plant and look exactly like a young leaf beginning growth. This plant is admirably adapted for the use of this snail, its leaves being very long and exceedingly narrow and flat. Five specimens gave the following measurements:

Whorls 2; length 3.0; breadth .6; aperture length 1.5; breadth .5 mm.

Whorls 2¼; length 4.0; breadth 1.0; aperture length 2.0; breadth .75 mm.

Whorls 2½; length 5.5; breadth 1.4; aperture length 2.0; breadth 1.0 mm.

Whorls 3; length 8.0; breadth 1.7; aperture length 3.5; breadth 1.0 mm.

Whorls 3¼; length 10.5; breadth 2.5; aperture length 5.0; breadth 1.5 mm.

The whorls are usually flat-sided as in the adult shell, but in two specimens they were somewhat rounded. Adult specimens from Nicholson's Bay, Oneida Lake, measure:

[1] Baker, Lymnaeidae of North and Middle America, page 197, 1911.

[2] NAUTILUS, IX, page 127, 1896.

Length 25.0 ; breadth 4.0 ; aperture length 10.0 ; breadth 2.25 mm.

Length 25.0 ; breadth 4.0 ; aperture length 10.0 ; breadth 2.0 mm.

Length 23.0 ; breadth 4.0 ; aperture length 10.0 ; breadth 2.5 mm.

Adults are said by Kirkland to appear in Reed's Lake, Michigan, about September 25 and to be common until Thanksgiving Day or later. They were observed in the west end of Oneida Lake, in several places, on September 10 and continued to be noted until the middle of October, when they were quite abundant. At this time work was discontinued by the writer.[1] No adults were seen in July, 1916, at which time several of the habitats were visited in which *Acella* was abundant in the fall of the previous year. It is evident, from the observations of Kirkland, Sargent, and the writer that *Acella* migrates to deeper water sometime in the late fall or early winter, probably when ice forms to such an extent that the surface vegetation upon which it rests and feeds is destroyed. That it will resist cold weather is shown by the observations of Kirkland who found it on Thanksgiving Day when the ice had formed, and by the writer who collected it in October when the water was so cold that it numbed the fingers, in fact ice had formed the morning of the same day.

Acella is purely an inhabitant of vegetation, at least as far as the recorded observations indicate, and as far as known has never been found on any other material. Kirkland and Sargent note it on the under side of lily leaves. In Oneida Lake it has been noted on the following vegetation :

Smith's bullrush (*Scirpus smithii*) on the stem.

Floating pond-weed (*Potamogeton natans*) on leaves and stem.

Pond-weed (*P. interruptus*) on leaves and stem.

White water-lily (*Castalia odorata*) on leaves and stem.

Yellow water-lily (*Nymphaea advena*) on leaves and stem.

The habitat in Oneida Lake is invaribly a sheltered cove, bay, or other spot protected from violent wave action.

[1] Baker, Technical Bulletin, N. Y. State College of Forestry, IV, pages 283–284, 1916. There are also other references to the ecology of the species in other parts of the volume.

Information concerning the breeding habits of *Acella* are still a desideratum. It occupies the surface in shallow water (one to three feet) in the fall; but where does it lay its eggs? None were observed in the fall of 1915 though adults sexually mature were collected. It may be that the animal descends to the pond-weed zones in the winter and lays its eggs on the *Potamogeton* and that they subsequently hatch out in the spring. Certainly, as young were found in July which had 3¼ whorls and were 10 mm. long, they must have been hatched at the latest in the spring. We are ignorant, also, of whether the maximum growth is completed in one or more years. There is much about this most characteristic Lymnaeid that is still to be learned.

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NEW LAND SHELLS FROM ALABAMA AND ARKANSAS, WITH NOTE ON POLYGYRA ALBOLABRIS AND P. ZALETA.

BY GEO. H. CLAPP.

VITREA (PARAVITREA) CONECUHENSIS n. sp. Pl. 5, figs. 5, 6, 7.

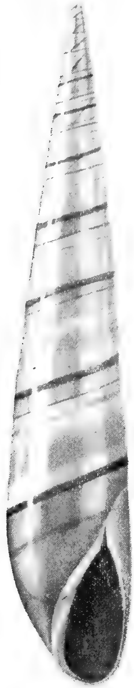
Shell thin, depressed, umbilicate, the umbilicus being about 1 mm. in diameter and showing all the whorls; color light horn, highly polished; whorls 6, the first five closely coiled, the last rapidly expanding. Surface sculptured with spaced, unequal, radial grooves stopping at the periphery, which is slightly subbasal. Aperture subtriangular, lower lip slightly flattened and reflected where it joins the columella. Adult shells are toothless, but a young shell of 4½ whorls, 2¾ mm. in diameter, shows a single pair of small tubercular teeth.

Diameter 4½, altitude 2¼ millimeters.

Evergreen, Conecuh Co., Alabama. Collected by Herbert H. Smith.

Types No. 8111 of my collection. Paratypes in collection of Bryant Walker, Detroit, Mich.

This species resembles *Vitrea simpsoni* Pils., but has about one more whorl in the same diameter; it is also less depressed, and the basal lip is less flattened.



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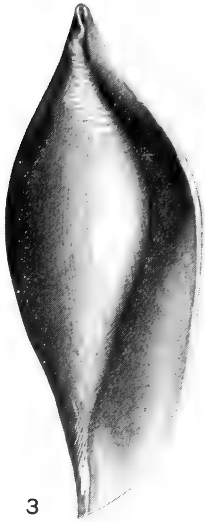

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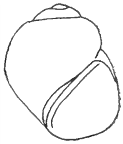

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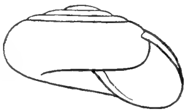

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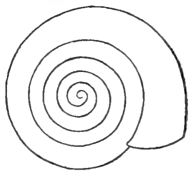

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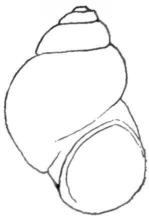

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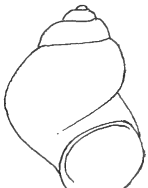

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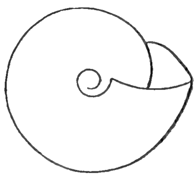
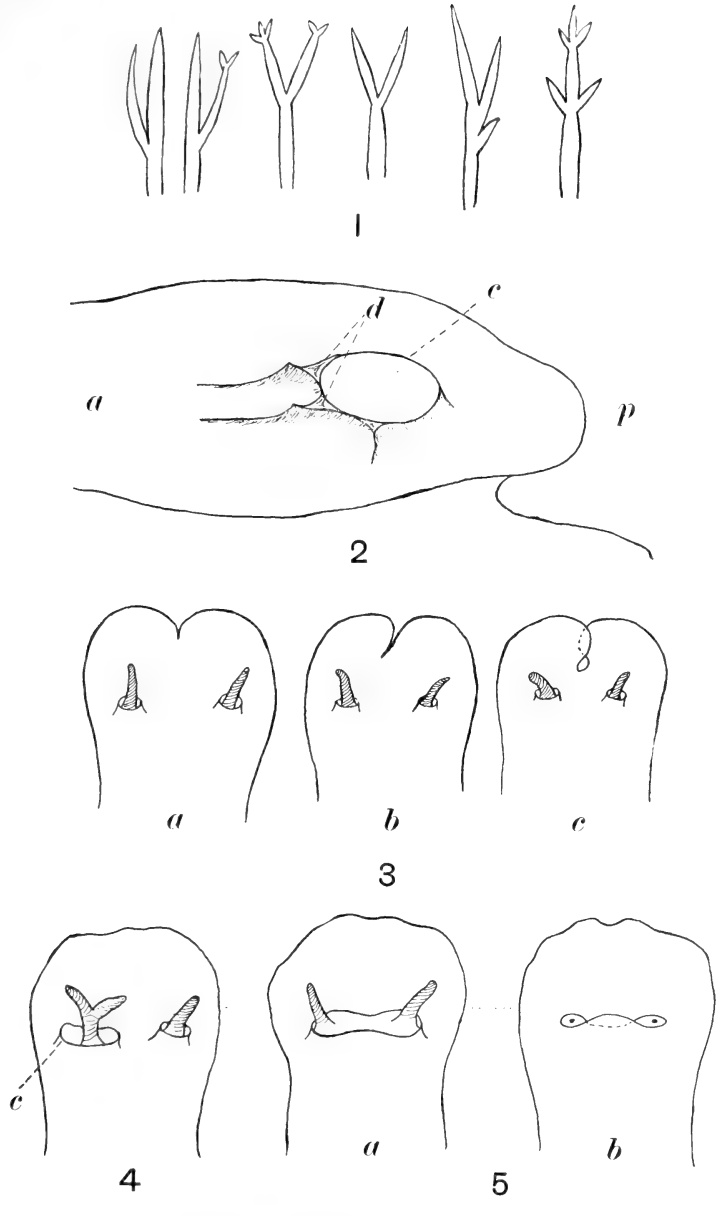


7

1. STROMBIFORMIS LAPAZANA BARTSCH.
2. SUBULARIA METCALFEI A. AD.
3. NEOSIMNIA CATALINENSIS BERRY (p. 21).
4. AMNICOLA NEOMEXICANA PILSBRY.

5-7. VITREA CONECUHENSIS CLAPP.

8, 9. AMNICOLA DESERTA PILSBRY.



CROZIER: CHROMODORIS ZEBRA HEILPRIN.

POLYGYRA LABROSA FIMBRIATA n. var.

Differs from the type in having a well-developed peripheral fringe of two or three rows of hairs about 0.25 mm. in length, the hairs also showing as a sutural fringe, and the "prostrate hairs," of Bland's original description, are much more elevated. On the base are spiral rows of short, erect bristles continuing to the umbilicus. Aperture typical.

Diameter 11, altitude 6 mm., whorls 5.

Sulphur City, Washington Co., Arkansas. Collected by A. J. Brown, Jan., 1917. Types No. 8112 of my collection. Paratypes in collection of A. J. Brown. Fifteen adults and as many young examined.

Over forty *labrosa* from seven localities in Arkansas and twenty from Galloway, Mo., including one from Bland and two others labeled "Identified by Bland," were examined. Three shells from Clinton, Ark., show traces of hairs and three fresh shells in the Galloway lot also show some hairs, but in neither case are they as prominent as in the Sulphur City shells.

In P. A. N. S., Feb. 1903, p. 202, Dr. Pilsbry says: "In all other Stenotremes except *P. barbigera* (Redf.) the cuticular hairs form a comparatively close pile. . . . In no other (except *pilsbryi*) do they form a series of circular, concentric fringes. *P. barbigera* has a single fringe of similar filaments, usually persisting at the suture only." This is true of the average cabinet specimen, but both *barbigera* and *spinosa* have a peripheral as well as a sutural fringe, and both have hairs arranged in spiral rows on the base when carefully prepared, as shown by hundreds of specimens collected by Herbert H. Smith in Alabama, and I have shown in the NAUTILUS, Vol. XXVII, p. 12, that *P. edwardsi* has well developed fringes when fresh. In the note on *edwardsi* there is a mistake in giving the length of the hairs as 1 mm., it should be ½ mm. When the note on *P. edwardsi* was written I had forgotten that A. G. Wetherby had called attention to this same fact in his very valuable paper "Some Notes on American Land Shells," No. 1, p. 2 of an undated "*separate.*" The paper was published in the Journal of the Cincinnati Society of Natural History.

NOTE ON *Polygyra albolabris* AND *P. zaleta*.

In some regions where *P. albolabris* and *zaleta* are found together occasional elevated specimens of the former or depressed ones of the latter occur and it is very difficult, at first glance, to say to which species they belong. If, however, the shells are examined under the microscope with a magnification of about 25 diameters they can be readily separated, as *zaleta* looks *polished* in the high light while *albolabris* is *dull*. This is due to the fact that between and on the ribs of *albolabris* are fine, vertical wrinkles in the epidermis which are absent in *zaleta*. As a rule *zaleta* is also much lighter in color than *albolabris*, or if dark specimens are found they are generally much lighter on the base, and just behind the aperture there is invariably a patch of much lighter color than the body of the shell.

SOME STRUCTURAL VARIATIONS IN CHROMODORIS ZEBRA.

W. J. CROZIER.

Contributions from the Bermuda Biological Station for Research, No. 64.

Abnormalities of a minor character are by no means uncommon in nudibranchs, and, while these features are usually not of any great morphological significance, some of them seem sufficiently curious to warrant description. I have noted several such deviations from the typical structure while examining a large number of specimens of *Chromodoris zebra* Heilprin.

Smallwood (1910) has described some of the variations in the coloration of this animal, and has also referred to the variability shown by the branchiæ, particularly in the manner in which one or several of these organs terminate by division of their free ends into several parts. I have elsewhere (Crozier, 1917) made note of the variation in the number of the glandular papillae which occur upon the ventral surface of the posterior border of the mantle.

Variation in the branchiæ is, in fact, somewhat more frequent and more extensive than Smallwood observed. Not unusually, branchiæ are to be seen which not only divide to a greater or less extent at their tips, but also show a branching at some distance from the tip (Fig. 1). In many instances the presence of an accessory branchia arising in this way is unaccompanied by duplication of the pointed tips.

The high sheath which surrounds the branchial rosette is normally quite smooth. In only one of the many hundreds of *Chromodoris* which I have handled was there noted any other condition. In this single specimen, however, there were three distinct ridges running from the dorsal surface to the external margin of the branchial collar; two of these ridges were extended in an anterior direction, their edges being sharp and prominent, while the third, less conspicuously developed than the other two, was on the left side of the collar. The appearance of these structures is shown in Figure 2, where may be seen the manner in which the ridges were united with the collar.

The edge of the mantle occasionally shows evidence of injury, and this may explain the origin of modifications found at the anterior end of the mantle in several specimens. These modifications consisted in a well-defined median indentation of the buccal veil, which was thus symmetrically bilobed. But this region of the mantle is almost always folded at the margin to some extent, and since the pigment pattern frequently shows no local disturbance at the region of the indentation, the feature which is shown in Figure 3 (particularly at *c*) may be merely an unusually strong expression of a tendency to wavy folding.

The "rhinophores" of *Chromodoris* (cf. Arey, 1917), which are usually straight, may appear somewhat bent near the tip, or may even assume a slightly corkscrew shape. In one individual there was found a bifurcating "rhinophore" on the left side; the one on the right side was normal. As shown in the accompanying sketch (Fig. 4), the rhinophoral collar (*c*) had grown in such a manner as to accommodate the additional structure.

One specimen occurring among a lot of 231 collected early in January, 1917, was found to possess a striking modification of the rhinophoral collars. Figure 5 depicts the condition referred to, which consists in the fusion of the two pockets, into which the "rhinophores" are respectively retracted, so that but a single depression provided with a single collar is present in this particular animal. The posterior edge of the collar was higher than the anterior one, and when both "rhinophores" were retracted this posterior border of the collar was folded over the anterior edge in such a way as to lead to the appearance of two minute openings into the single pocket.

Agar's Island, Bermuda.

References

Arey, L. B. 1917. The sensory potentialities of the nudibranch "rhinophore." (Proc. Amer. Soc. Zoöl., 14th Ann. Meet.) Anat. Record, Vol. 11, No. 6, p. 514–516.

Crozier, W. J. 1917. The nature of the conical bodies on the mantle of certain nudibranchs. Nautilus, Vol. 30, p. 103–106.

Smallwood, W. M. 1910. Notes on the hydroids and nudibranchs of Bermuda. Proc. Zoöl. Soc. London, 1910, Part I, p. 137–145.

Description of Figures, Plate VI.

Fig. 1. Branching gills.
Fig. 2. Ridges about the branchial collar; *a*, anterior; *b*, posterior; *c*, branchial collar (gills not shown); *d*, triangular depressions.
Fig. 3. Lobed condition of the buccal veil.
Fig. 4. A bifurcate rhinophore; *c*, collar of rhinophore.
Fig. 5. Fused rhinophoral pockets; *a*, rhinophores extended; *b*, retracted.

A METHOD OF PRESERVING LARGE NUDIBRANCHS.

W. J. CROZIER.

Contributions from the Bermuda Biological Station for Research, No. 65.

Those who have had occasion to study collections of nudibranchs, especially when they include specimens of the larger tropical species, have doubtless often wished that the organisms submitted for their examination had been so preserved as to exhibit in more natural fashion the appearance of these creatures when alive. After various attempts to secure good preparations, I find that the simple procedure herein outlined gives tolerably fair results. The method has been tried almost exclusively upon *Chromodoris zebra*, but it seems likely that other large forms will yield equally good preservations when treated in the same way.

A saturated solution of cocaine hydrochloride is made up in sea water, and 2–3 cc. of this solution is then injected into the heart (or into the region of the heart) of *Chromodoris* by means of a syringe and hollow needle. A "Record" syringe, such as is used by surgeons, is useful for this purpose. Within an hour or so—depending on the temperature, on the size of the animal, and on the exact amount of the narcotic that has been injected—the nudibranch will be fully anaesthetized, usually with the gills and rhinophores fully extended; frequently also the genital papilla will be protruded, and the pharynx everted. It is advantageous to add a few crystals of chloretone to a small volume of sea water containing the nudibranch; furthermore, several injections of the cocaine may sometimes yield a better result than a single dose.

When completely anaesthetized, the animal may be killed and fixed in 75 per cent. alcohol. Precipitated slime, on the surface of the body, can be subsequently removed with a camel's hair brush. In order to avoid the distortion which inevitably results if these large nudibranchs are fixed while they rest upon the bottom of a dish, it is well to suspend them vertically in the fixing fluid until they are killed and begin to harden. This may be done by gripping the caudal extremity of the foot between the jaws of a light "artery clamp" or some similar instrument; or a thread may be sewn through the foot for this purpose.

The injection of a relatively small amount of a narcotic usually gives much better results than does the attempt to anaesthetize these nudibranchs by adding magnesium sulphate, or chloretone, to the seawater containing them. In the latter method, not only does the surface frequently become covered with a number of vesicular blebs, edematous in appearance, but also the proper time for removal to the killing fluid must be selected with considerable care. A similar procedure, involving the injection of chloretone into the body-cavity, has been employed by Pearse[1] with holothurians.

The proper penetration of the fixative is of course important for the conservation of the internal organs. This result may be assured if a fair volume of the fixative is employed, and if in addition an incision several centimeters long is made along the edge of the mantle (preferably on the left side) previous to immersion in the fixative.

Frequently it is desirable that the normal integumentary

[1] Pearse, A. S., 1910. Eine Methode, um Holothurien in ausgedehntem Zustande zu konservieren. Zeits. f. biol. Tech. u. Method., Bd. 2, p. 94–95.

colors of the nudibranch should be preserved as faithfully as possible. Two fluids which I have found useful with *Chromodoris zebra* are Merkel's fluid and the sublimate-acetic mixture (saturated aqueous solution of sublimate plus 5 per cent glacial acetic acid). The sublimate mixture in particular gives a very fair preservation of the blue pigment of *Chromodoris*, which is permanent for six months at least, if not for a longer period. The sublimate precipitates the blue substance so that it is no longer soluble in aqueous alcohol, and at the same time renders it insensitive to the acetic acid, which otherwise would cause the substance to become pink. Possibly the platinic chloride in Merkel's fluid has a similar action, since I find that both mercurous salts and platinic chloride precipitate the blue pigment from aqueous solutions.

Agar's Island, Bermuda.

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Vol. XXX. APRIL, 1917. No. 12

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Entered as Second-Class matter at the Boston Post-Office.