

NOTES ON SOME FLORIDIAN LAND AND FRESH-WATER SHELLS
WITH A REVISION OF THE AURICULACEA OF THE EASTERN
UNITED STATES.

By W. H. DALL.

The shells upon which the following notes are based form part of the collection of the United States National Museum, and were obtained in Florida by myself and by Dr. R. E. C. Stearns, Mr. Henry Hemphill, Prof. A. G. Wetherby, Dr. Velie, and other friends and correspondents of the Museum. No completeness is claimed for them, but it is hoped that the publication of these notes may stimulate others to supplement and correct them, until a more nearly complete knowledge of the mollusk fauna of Florida shall be reached. Additions and corrections will be gratefully received and suitably acknowledged in future publications.

Ampullaria (Pomus) depressa Say. Plate 17, figs. 4, 5.

Ampullaria depressa Say, Long's Exp., p. 264, pl. xiv, fig. 2, 1824. Not of Lamarck.

Ampullaria paludosa Say, New. Harmony Diss., p. 260, 1840.

Ampullaria hopkintonensis Lea.

Pomus depressa Binney, L. & F. W. Sh. N. Am., iii, p. 3, 1865.

Silver Spring, Fla., General F. E. Spinner. Mound at Enterprise, Lake Mouroe, Dall.

This species is found abundantly in several of the mounds, and often much larger than any recent specimens which have been received so far. It is said that Lamarck's *A. depressa* is a *Natica*, but on the principle that "once a synonym always a synonym," it would perhaps have been better if Binney had not revived the old name, but had retained *paludosa*.

Ampullaria (Pomus) caliginosa Reeve.

Ampullaria caliginosa Rve. Conch. Icon. Mon. *Ampullaria*, fig. 118, pl. xxv, Dec., 1856.

Swamps near Cedar Keys, Hemphill.

This species is distinguished easily from the typical *depressa* by its stouter, higher, narrower shell, smaller aperture, larger umbilicus, thickened peristome, higher spire, much more roundly globose whorls, the posterior angle of the aperture not passing much behind the middle of the body whorl and often in front of it. The shell is much thicker and more solid with a salmon tinge on the margin of the aperture, the surface transversely wrinkled and malleated. The color is generally darker, the operculum is black, not brown, as in *A. depressa*. The species is probably common to Mexico and Nicaragua also, and may have been confounded with *depressa* by collectors. It has been received from Nicaragua, collected there by Bridges, Dall, and Sumichrast, and from Tehuantepec, collected by Dr. Spear, United States Navy.

The name *Pomus* Humphrey has no standing in nomenclature, never

having been described. If it had, it would supersede *Ampullaria* Lamarck, with which it was intended to be coextensive. As a subgenus of *Ampullaria*, for those species with a purely horny operculum, it might be retained, but in that case should be credited to H. and A. Adams, who first defined it.

Vivipara georgiana Lea. Plate 17, figs. 2, 3.

Paludina georgiana Lea, Trans. Am. Phil. Soc., v, p. 116, pl. xix, fig. 85, 1837.

Paludina wareana Shuttleworth.

Vivipara georgiana Binney, l. c., p. 27.

Abundant in the mounds of the Saint John's River region. Living in Lake Monroe, Milner; Lake Ware, Rugel; reaching north to South Carolina and west to Alabama, Binney.

It has been stated that this species is not viviparous, which is perhaps due to the confusion of the ova of some other mollusk with those of this species. The fact should be determined by some resident of Florida, if possible in an aquarium, which would settle the matter. I note considerable variation in the form of the mound specimens.

? **Campeloma lima** Anthony. Plate 17, fig. 1.

Paludina lima Anthony, Proc. Acad. Nat. Sci. Phila., 1860, p. 70; = *Melantho coarctata* Lea teste Binney.

A beautiful shell, strongly marked with revolving striæ, dark olive outside, dark and livid inside, with the whorl appressed toward, but not at, the suture, was sent to the Museum by Professor Wetherby from Indian River and Miami, Fla. It appears to resemble Anthony's *Paludina lima*, and is provisionally referred to that species. Binney's figure of *P. lima* does not agree well with the description given by Mr. Anthony, and the failure of eyesight with which the latter naturalist was afflicted may have led to some error in forwarding a type for figuring. This species is peculiar, as far as I have seen, in its depth of color and livid interior.

The name *Melantho* was applied by Bowdich to a marine fossil from the Paris basin, perhaps a *Lunatia* or *Amauropsis*. It has nothing to do with the group named by Rafinesque *Campeloma*. The identity of *C. lima* with *C. coarctata* Lea is suggested by Mr. Binney, but I prefer to leave that an open question for the present. My remarks apply only to Anthony's description.

Bythinella monroensis Dall. Plate 17, fig. 9.

? *Hydrobia monroënsis* Frauenfeld, Verh. K. K. Zool.-bot. ges. Wien, Apr., 1863, p. 1023.

Shell moderately strong, greenish or brownish, smooth and polished, but usually overlaid with a dull dark brown unpolished deposit; the interior of the mouth whitish; the margin of the aperture nearly black at the extreme edge, not sharp nor much thickened, not reflected; the peristome complete, just touching the body whorl in the adult, adherent in the young; whorls five or six, rounded, smooth or lightly transversely striate, anterior part of peristome slightly projecting, outer posterior

part a little flexuous, aperture rounded behind or not angular, inner lip somewhat arched; umbilicus small; apex rounded; operculum dark brown, subspiral, longitudinally spirally striate inside; animal whitish marbled with black or dark gray; eyes large, black; tentacles moderate, blunt at the tip; a whitish streak behind them; foot bluish white, muzzle dark, with an indentation in the median line; dentition much like that of *B. nickliniana* Lea, the rhachidian tooth proportionately wider and larger; the first denticle on the inner edge of the cusp of the first lateral tooth large and prominent, and the tips of the outer laterals with one or two well-marked denticulations. Lon. of shell 3.6 to 4.8^{mm}; max. lat. 2.0 to 3.0^{mm}; aperture from a little more than one-third to a little less than one-half as long as the shell.

Habitat.—Brook flowing from Benson's mineral spring into Lake Monroe, at Enterprise, Fla.

This shell resembles closely the stouter specimens of *Pomatiopsis lustrica* Say, but is less acutely pointed and has one whorl less; the soft parts, on the other hand, are like those of *Bythinella nickliniana* Lea. There is reason to believe that it is identical with the species described by Frauenfeld as above mentioned, probably from the same locality, in Mus. Cuming. It was also collected near Lake Monroe by Shuttleworth, whose specimens are in the Imperial Museum at Vienna. This and several other American species described from Shuttleworth's collections by Frauenfeld seem to have escaped the notice of American writers on the *Hydrobiinae*.* There is a noticeable difference in form, indicated in the measurements above, among the specimens collected by me, which seems to be sexual. Unlike Stimpson, I found the stout ones to be invariably females. Every grade, however, existed between the very stout and the most elongated. They were found on floating wood and leaves of plants in quiet places in the little shallow brook associated with *Limnaea columella*, *Ancylus* and *Planorbis*, exclusively under water.

Amnicola floridana Frauenfeld.

Amnicola floridana Frauenfeld, l. c., 1863, p. 1028 et 1865, p. 529, pl. x, fig. 4, *a-b*.
Bythinella obtusa Lea, Dall. Proc. U. S. Nat. Mus., 1883, p. 334.

Owing to misinformation, I was led, in my paper on Hemphill's shells in 1883, to place the above species (whose generic place is still unsettled)

* *Hydrobia corrigata* Frauenfeld, l. c., pp. 1021-2, received from Boston, Mass., under the name of *Cingula minuta* Totten, but according to Frauenfeld not that species. It is further referred to and figured, l. c., 1865, pp. 525-6, pl. viii, fig. 3, *a-b*.
Hydrobia Seemani Frauenfeld, l. c., p. 1025, 1863, p. 525, 1865, pl. viii, fig. 1, *a-b*, is recorded as collected in Northwest Mexico, Durango, by Seemann, and the types are in Mus. Cuming. *Amnicola Schrökingeri* Frauenfeld, l. c., 1863, p. 1030, and 1865, p. 528, pl. x, fig. 2, *a-b*, is described from Massachusetts specimens named "*Ustrica* Say," in Mus. Cuming. *Amnicola cincinnatiensis* Anthony, is mentioned as being the *Paludina truncatella* Ziegler MS. from New Orleans, in Mus. Cuming. Others are referred to elsewhere in the present paper.

under the name of *Lea*, to whose figure it bears a certain resemblance. My attention was called to the matter by Mr. R. Ellsworth Call, and on investigation I found that the species generally known as *B. obtusa* Lea, though nearly twice the size assigned it in Lea's description, is nevertheless probably correctly identified. The Florida species is more acute and much smaller. Frauenfeld records it from East Florida in Mus. Cuming. Hemphill obtained it living in the creek at Jacksonville and dead in the salt ponds at Key West, where it may have been drifted. Stearns collected it in a spring 1 mile from Tampa. The specimens are accurately represented by Frauenfeld's figure, though larger than he indicates. The present identification is therefore probably correct. It does not seem to have any American synonym. He also records *A. porata* Say (l. c., p. 1030) from Smyrna, East Florida.

Hydrobia? Wetherbyi, n. s. Plate 17, fig. 10.

? *Amnicola nutalliana* Frauenfeld, l. c., 1863, p. 1029.

Shell short, stout, obtuse, polished, greenish gray, with four and a half whorls, slightly striated in both directions, umbilicus reduced to a mere groove behind the lip; whorls rounded, the last much the largest; suture distinct; aperture ovoid, entire, bluish white within, with a dark margin outside, slightly thickened, not reflected; plane of the aperture somewhat oblique, not waved; aperture slightly smaller than the whorl immediately behind it. Lon. 7.0, max. lat. 5.0, max. lon. of aperture 3.5^{mm}. Operculum subspiral, light horn colored.

Habitat.—Lake Eustis, Florida, Wetherby. Mus. Cat. No. 32123.

This interesting shell was communicated to me by Mr. Wetherby, who has examined the soft parts, which appear to locate it in the genus *Hydrobia*, as understood by European authors. The notes made by him on his dissections of the soft parts have not reached me owing to his absence in Europe. It is not improbably the shell mentioned by Frauenfeld, under the name of *A. nutalliana* as collected by Shuttleworth at Silver Spring on the Oclawaha and at Fort King, East Florida. It bears, however, only a very slight resemblance to the true *Nuttalliana*, which is a species of the Pacific slope.

Goniobasis Etowahensis Lea. Plate 17, fig. 7.

Melania Etowahensis (Lea) Rve. Conch. Icon. *Melania* sp. 426, May, 1861. *Not of* Lea, Proc. Acad. Nat. Sci. Phil., 1862, p. 264.

Goniobasis Canbyi Lea, l. c., p. 271, 1862. *Not of* Tryon, L. and F. W. Sh. N. Am., part iv, p. 260, 1873 (= *Etowahensis* Lea non Rve.).

Goniobasis Etowahensis, Tryon, l. c., p. 148, 1873.

? *Melania papillosa* Anthony, Rve. Conch. Icon. Mon. *Melania*, sp. 467, 1861.

Abundant in the mound at Enterprise and on the beach washed from the mound. This was the original locality where it was obtained by Mr. Canby. I did not find it living, the season being perhaps too early. It has been found living in the Etowah River, Georgia, and the Tennessee River. Tryon suggests the identity of *G. papillosa* Anthony, with the present form, which, as shown by the mound specimens, is most vari-

able in sculpture. It was the only Melanian observed in Florida during my journey.

Neritina reclivata Say. Plate 17, fig. 8.

Neritina reclivata (Say), Reeve Conch. Icon. fig. 34, *a-b*, Oct. 1855.

Theodoxus reclivatus Say, Journ. Acad. Nat. Sci. Phila., ii, p. 257.

Neritina microstoma D'Orbigny, Moll. Cuba, ii, p. 48, pl. xvii, fig. 36, 1842.

Neritina floridana Shuttleworth, in Reeve Conch. Icon., fig. 85, Nov., 1855.

Neritella reclivata Binn. L. and F. W. Shells of N. Am., III, p. 103, 1865.

This shell was originally collected by Say from the Saint John's River, Florida, where it is still abundant. Specimens have been received from General F. E. Spinner and others. Further south they are smaller, darker, and less often eroded. They have been collected at the mouth of the Manatee River by Colonel Jewett; at Tampa by Stearns, Jewett, and Hemphill; in Cuba, by Arango; Jamaica, by Governor Rawson, and are reported from Martinique by D'Orbigny. Some quite small specimens from a brook near Palma Sola were obtained by Mr. I. Gregor, of Jacksonville, which at first sight appeared quite distinct, being black, with a cerous labrum, but the light zigzag lines, characteristic of some color varieties of *reclivata*, were beautifully clear by transmitted light. These shells attained a maximum length of 1 centimeter (0.4 inch), and were, except in color, identical with *N. reclivata*, of the same size. To distinguish them, if thought desirable, they might take the varietal name of *N. reclivata*, var. *Palma*. The Antillean *microstoma* is identical with *reclivata*, the colors being sometimes a little brighter, but there is no other difference of any sort. There are several other Antillean forms which are extremely close to our species, and may eventually prove mere local varieties of one species. The name *Neritella*, adopted by H. and A. Adams from Humphrey, and applied by Binney to the various American *Neritinae*, has no standing in nomenclature and was never described.

Neritina viridis Linné.

Nerita viridis L., Syst. Nat., ed. xii, p. 1254, 1767.

Neritina viridis Lamarck, An. s. Vert., vi, 2, p. 188.

Common throughout the Antilles in salt water. Rare among seagrass at low water, Key West, No Name Key, Hemphill. I believe this species has not before been reported living on the coast of the United States. It is, perhaps, the most unmistakable species of the group.

Neritina virginea Linné.

Nerita virginea Lin., Syst. Nat., ed. xii, p. 1254, 1767.

Neritina virginea Lam., An. s. Vert., vi, pt. ii, p. 187, 1822.

Habitat.—All the Antilles, D'Orbigny; among mangroves at high water, No Name Key, Florida, Hemphill.

Mentioned by D'Orbigny but not by Binney as Floridian.

Glandina truncata Gmelin.

Banks of the Saint John's River at Jacksonville and Palatka, Dall. A beautiful pink variety at Enterprise, on Lake Monroe; the variety *parallela* Binney, at Marco, H. Hemphill; & c.

The specimens found in April were all young, much smoother and more pellucid than the adult, and only about 25.0^{mm} long. I have never seen adult specimens 4 inches long, such as Mr. Binney describes, from the Everglades, and should be glad to have some for the collection. They are very rapacious and will swallow a good sized *Helix septemvoluta* without difficulty; a large number have been found packed into the stomach of one individual. None have been found in the Indian mounds, and perhaps they are not eatable. Those collected by me were always in moist places and exuded a very copious and adhesive mucus on being disturbed.

Melaniella gracillima Pfr.

Stenogyra (Melaniella) gracillima (Pfr.) Binney, L. and F. W. Shells of N. Am., i, p. 232, 1869.

Achatina gracillima Pfr., Wieg. Arch., 1839, p. 352.

Achatina striato-costata D'Orbigny, Moll. Cuba, i, p. 176, pl. xi, figs. 19-21.

Habitat.—Cuba; Bahamas; Saint Thomas, West Indies; Florida Keys and near Miami, Binney; Key West, No Name Key, Hemphill, 1884.

This species appears to be rather rare in Florida.

Bulimulus multilineatus (SAY).

Bulimulus multilineatus Say, Journ. Acad. Nat. Sci., v, p. 120, 1825.

Bulimus menkei Gruner, Wieg. Arch., 1841, p. 277, pl. xi, fig. 2.

Bulimus menkeanus Melvill, Journ. Conch. Leeds, 1881.

Bulimus venosus Rve., not of Ferussac, Conch. Icon. sp. 235, 1848.

Habitat.—New Granada; Venezuela; Marco Id., Florida, Dr. Velie; Florida Keys, Wurdeman; Key West, Melvill.

This beautiful species appears to be quite rare. Its geographical distribution is very remarkable, and any information as to its distribution in Florida would be very useful.

Bulimulus marielinus Poey.

Bulimulus marielinus Poey, Memorias, i, p. 212, 447; ii, pl. xii, figs. 32-3. Binney, l. c. i, p. 194.

Habitat.—South Florida, Cooper; St. Kitts, Rawson; Upper Matcumba Key, Hemphill (rare, on bushes).

The first definite locality, named for this species in Florida.

Pupa incana Binney.

Key West, Hemphill, and also Melvill (as *P. maritima*, Pfr.)

This species varies greatly in form, proportions, and even to some extent in color. A number of specimens lived in a tightly-corked tube for more than a year and are still alive.

Pupilla pentodon Say.

Vertigo pentodon Say, Journ. Acad. Nat. Sci. Phil., ii, p. 476, 1822.

Pupilla pentodon Tryon, Am. Journ. Conch., iii, p. 303, 1868.

Found under the bark of a prostrate oak tree in the vicinity of a pool at Archer, Alachua County, Florida, April, 1885, by W. H. Dall. About a dozen specimens were collected with other small species in about an hour.

It should be observed that in the sandy region of North Florida there

are absolutely no mollusks in the pine woods or away from water or moist earth. The clumps of hardwood around the "sinks" or natural wells of the region, called there "oak hamaks," are usually well populated with snails, though there may be only minute ones; but a few steps away among the pines the most ardent collector will find nothing. In the "sinks" *Planorbis trivolvis* and *Physa heterostropha* are always to be found, but nothing else, at least in any of those I visited. Those sinks in which the water stands near the level of the soil may have more mollusk inhabitants. On the moist soil around the sinks the *Polygyra* of the *auriculata* type find congenial surroundings. The *cereolus* type of *Polygyra* seems to prefer the shores of lakes or beaches near the sea, in general warmer spots than the others. The smaller forms, *Pupilla*, *Vertigo*, *Zonites*, *Strobila*, &c., are best found by carefully scanning the inner surface of loose bark on some prostrate hardwood tree, and that of the wood opposite. Here these small folk live and enjoy life after their fashion, finding coolness, moisture, and the mycelium on which they chiefly feed. By rolling over the log when the bark has been thoroughly scanned, some of the larger forms (as well as a snake or two) will probably be found. By gathering a large bagful of the moist dead leaves from near the hardwood trees, drying them and shaking them a handful at a time in a large paper bag, in the dust and debris which will accumulate in the bottom of said bag, the collector will usually find his reward.

The present species does not appear to have been recorded from Florida, though known from Northern Georgia and Mississippi.

Pupilla fallax Say.

Pupa fallax Say (1821), Binn. Terr. Pulm. of the U. S., v, p. 202, 1878.

Egmont Key, Fla., Col. E. Jewett.

Pupilla contracta Say.

Pupa contracta Say (1822), Binney, l. c., p. 207.

Habitat.—Eastern United States, Binney; Archer, Alachua County, Florida, Dall, in oak hamaks, under bark, April, 1885; Tampa, Stearns and Jewett; Samana Bay, Dominica, officers of the United States Navy.

Pupilla rupicola Say.

Pupa rupicola Say (1821), Binn., l. c., p. 208.

Abundant at Tampa, Stearns and Hemphill; Key West, Binney; Enterprise, Lake Monroe, Dall.

This species seems quite constant in its characters.

Pupilla floridana n. s. Plate 17, Fig. 11.

Shell greenish spermaceti-white; when living the tissues of the animal show with pale salmon color through the shell in the apical whorls; surface smooth or lightly striated, with a tendency to retain dirt upon itself; form subcylindrical, with a rather obtuse apex, the last whorl forming nearly half the shell; suture evident; whorls five, neatly rounded; aperture longer than wide; lip white, thin reflected; teeth,

about 9, of which there are generally 3 larger than the rest, their tips nearly meeting and their bases mutually nearly equidistant; one is on the pillar, one on the body whorl, and one on the anterior margin; on either side of the latter are two generally subequal much smaller denticles. Lon. 1.60, lat 0.75^{mm}.

Habitat.—Under loose oak bark, oak hamak, Archer, Alachua County, Florida, April, 1885, W. H. Dall, sixteen specimens.

This is one of our smallest species and is related to *P. pentodon* and *P. pellucida*. It is about half the size of the former and much more slender. Its teeth recall those of *P. curridens* Gould in their arrangement, but the shell is more cylindrical and smaller, as it is than in *P. pellucida (servilis)* as figured by Gould. The teeth are more numerous than in the latter shell, and set, as in *P. pentodon*, in one series; not, as in *pellucida*, partly deeper in the throat.

I describe this with some hesitation, for the condition in which the Pupidae and Vertigos of North America are is most unsatisfactory and offers an excellent field to some careful student who shall be able to examine and figure large series of authentic specimens. Still, as there is absolutely no other form with which I feel able to unite this one, it is better to give it a name than to leave it erroneously with some other species.

Vertigo ventricosa Morse.

Isthmia ventricosa Morse, Ann. N. Y. Lyc. Nat. Hist., viii, p. 1, figs. 1-3, 1865, Binney, l. c., p. 213.

Six specimens of a small Vertigo were found under the bark of a decaying oak log at Archer, Alachua County, Florida, and two others on dead leaves at Enterprise Lake, Monroe, Fla., which seem referable to this species. They have, however, six or seven teeth like *V. ovata* Say, while the dimensions are those of Morse's species. Two of them are so enrolled that only one whorl above the body whorl is visible except from above, as if the apex had been crowded vertically downward. Similar distortions are not very uncommon among these small shells. In this connection Mr. Binney's figure of *Pupa alticola* Ingersoll (l. c., p. 212, fig. 116) may be noticed. While it doubtless represents the specimen figured, there is equally no doubt that that specimen was abnormally distorted. Specimens marked typical by Mr. Ingersoll in the museum collection do not show any such disproportion in the last whorl, though there is visible a slight constriction of the last whorl but one, in many individuals of this species, as well as in many full grown specimens of *Vertigo simplex* Gould, with which it is probably synonymous.

Strobila labyrinthica Say.

Helix labyrinthica Say, Journ. Acad. Nat. Sci. Phil., vol. i, p. 124, 1817.

Strobila labyrinthica Morse, 1864, Binney, l. c., p. 259, 1878.

Helix Strebli Pfr., Mal. Bl., 1861, p. 71, pl. 1, figs. 5-8.

Habitat.—Mirador, Vera Cruz, Mexico, Pfr.; Eastern United States, Binney; Florida, Jewett, Stearns; Sarasota Bay, Florida, Hemphill;

Archer, Alachua County, Florida, Dall; Porto Cabello, Venezuela, Sumichrast [var. *Morsei*].

The species was very abundant at Archer, under the bark of decaying logs, the color was especially fine, the lip and lamella deep rose color, verging on claret color in some specimens; the costæ sharp, the last whorl subearinate with the ends of the costæ pointedly produced in many individuals. A comparison with a typical specimen of *S. strebeli* Pfr. establishes their identity. A form of this species has been sent to the museum by Professor Sumichrast, from Porto Cabello, Venezuela, which differs from the type in wanting the costæ, the whorls being only lightly transversely striate, rather flat and appressed, with the basal periphery particularly angular, and the umbilicus slightly smaller than in *S. labyrinthica*. This may take the varietal name of *S. Morsei* in honor of Prof. E. S. Morse, who established the genus. It is slightly larger than the Mexican specimens. In all other characters it agrees with American specimens from the Eastern United States.

***Strobila Hubbardi* Brown.**

Helix Hubbardi Brown, Proc. Acad. Nat. Sci. Phil., 1861, p. 333, Binney, l. c., p. 261, fig. 153, 1878 [as *Strobila*].

Helix Feudryesiana Gloyne, Journ. de Conchyl., vol. xix, p. 333, 1871.

Habitat.—Indianola, Tex.; Savannah, Ga.; Jamaica, West Indies (Gloyne); Archer, Alachua County, Florida, Dall. Two dead specimens were found under decaying bark in an "oak hamak," at Archer. This is the first time it has been reported from Florida, but it will doubtless be found eventually over the entire southern region.

***Helix (Polygyra) auriculata* Say.**

Polygyra auriculata Say (1818), Binn., l. c., p. 264.

Habitat.—Saint Augustine and the basin of the Saint John's River, Binney; Fort George Id., and the Keys, Jewett; Tampa, Stearns. Variety *microforis* Dall, Johnson's Sink, Alachua County, Dall.

This form is quite well marked and when fully adult shows as a rule little variation from the form figured by the Binneys and generally regarded as typical. A quite uniformly characterized variety was found, however, by me at Johnson's Sink, Alachua County, where it was abundant. Some twenty specimens were picked up in a few moments during a hurried visit made with other ends in view; and a quart could easily have been gathered in half an hour. This form is distinguished by its generally smaller size (max. diam. 12.0, min. diam. 10.0, alt. 6.0 ^{mm.}) as compared with the type (15.0, 12.0, and 7.9 ^{mm.}) and by being more closely rolled, thus having not only an actually smaller umbilicus, but one in which one-third less of the preceding whorl is visible. The specimens were uniform in this, and in all other respects were like the typical *auriculata*.

Helix (Polygyra) uvulifera Shuttleworth.

Helix uvulifera Shuttlew., Bern. Mitth., 1852, p. 199, Binney, l. c., p. 264-5.

Helix florulifera Reeve, Conch. Icon., *Helix*, No. 699.

Habitat.—Florida Keys, Binney, Stearns, Jewett, Hemphill, and others.

This is a much more variable form than the preceding, both in absolute size and in proportions; a small variety from Sanibel Key, collected by Hemphill, is less than half the size of ordinary specimens and has a smaller umbilicus in proportion, but the variations of this species are so numerous as to render it undesirable to apply names to them.

Helix (Polygyra) Postelliana Bland.

Helix Postelliana Bland (1858), Binney, l. c., p. 268.

Habitat.—Sea islands of South Carolina, and Georgia, main land of Georgia, Baldwin; Florida, Binney; Jacksonville, Stearns; South Florida, Jewett.

This species varies considerably in size like *uvulifera*, but its proportions seem more constant.

Helix (Polygyra) auriformis Bland.

Helix auriformis Bland (1858), Binney, l. c., p. 265.

Habitat.—Georgia to Texas, Binney; New Orleans, Hemphill; Indian Territory, Stearns.

The last is a new locality for this species.

Helix (Polygyra) avara Say.

Polygyra avara Say (1818), Binney, l. c., p. 268.

Habitat.—Basin of the Saint John's River, Florida, Remington Landing (Say); Jacksonville, Hemphill; bank of the river at Palatka, April 10th, Dall.

This is a rare species. Those found by me were partly immature owing to the early part of the season in which my visit was made; the specimens were found singly under chips or pieces of board on the river bank in very wet places. That it has been so rare in collections is due, probably, in part, to the fact that the shell hardly comes to maturity before most visitors have left Florida and occupies situations where the rains would wash dead shells into the river. Both animal and shell are very dark colored.

Helix (Polygyra) Jacksoni Bland.

Helix Jacksoni Bland (1866); Binney, l. c., p. 275.

Habitat.—Indian Territory (Cherokee Nation) near Fort Gibson, and Springfield, Mo., Binney, l. c.; Florida, Bland, in Stearns's collection now in United States National Museum.

The latter locality is new and far removed from those previously published. I do not know from whom Mr. Bland got it.

Helix (Polygyra) cereolus Muhlfeld.

Helix cereolus Muhlf., Berl. Mag., viii, p. 11, pl. 2, fig. 18, Jan., 1818.

Helix planorbula Lamareck, An. s. Vert., vi, part 2, p. 89, No. 86, 1822. Ed. Deshayes, vol. viii, p. 67, 1838.

Polygyra septemvoluta Say, Journ. Acad. Nat. Sci., I, p. 278, June, 1818.

Helix volvoaris Parreyss (MSS.), Pfr. Sym., iii, p. 80, 1846.

Helix microdonta Deshayes, in Fér. Hist. Nat. Moll. Ter., p. 6, pl. 72, fig. 13, 1839.

Helix plana Dunker, in Phil. Abb. und Besch., i, p. 51, pl. iii, figs. 11, a. b. c. Oct., 1843.

Helix Carpenteriana Bland, Ann. Lye. Nat. Hist. N. Y., viii, p. 137, 1858; Binney, l. c., p. 284 (*Polygyra*).

Helix Febigeri Bland, Am. Journ. Conch., II, p. 373, pl. xxi, fig. 10, 1866. Binney, l. c., p. 285 (*Polygyra*).

Helix delitescens Shuttleworth, Pfr. Nomencl. Hel., p. 109.

Helix polygyrata Pfr. (non Binn.), Mon. Hel. Viv., i, 409, 1848.

Helix cheilodou "Say," Pfr. Nomencl. Hel., p. 109. (Ubi ?)

Habitat.—Georgia, Florida, Alabama, Mississippi, Louisiana near the sea; Bermuda, Bahama Islands, but not in Cuba.

This protean species has received many names and presents many varieties, as well as individual variations, which, were they constant, would fairly be entitled to distinct names. After examining many specimens, most of them typically identified by Messrs. Binney, Bland, and Lewis, I have come to the conclusion that neither the soft parts nor the shell offer such distinctions as should entitle these variations to specific rank. All the various characters mentioned as distinctive in the diagnosis of various authors, when a sufficient number of specimens from a sufficient number of localities are compared, are seen to fade into one another and leave no line of demarkation. I do not wish to be understood as criticising the labors of those who have worked with insufficient material and have applied names to what seemed at the time to be distinguishable and definable forms. It is one of the stages in the progress of science which must be expected, and through which every branch of systematic zoology has passed or is passing. The revival of science under the new light which modern research has thrown upon it, the recognition that species are but terms of a more or less continuous and interlaced series, and not sharply characterized individualities, and the investigation of changes concurrent with differences of environment and geographical distribution have altered the whole basis of systematic zoology. The result at first seems chaotic, but the recognition of the state of things is the first step out of confusion. The so-called "new school" conchologists of France find their way out by naming every possible combination of variations, and, were the capacity of the human memory without limit, this would be one way out of the dilemma. Unfortunately this is not the case, and the probable result, were the process carried to its conclusion in the whole field of malacology, would be "confusion worse confounded." We should need endless indices to the index. Specific names must always resemble the

beads on a string, all forming part of one necklace. When, by study of the conditions with which we find certain characters associated, we shall come to understand why a certain shell in one place is coarsely striated, in another nearly smooth; here carinate and there rounded; here elevated and there depressed; then we shall begin to grasp the thread connecting the whole series and to have a scientific basis for our systematic arrangement which will replace that which is now disintegrating. That we shall reach such a basis there are strong reasons to hope, and with less delay than would at first sight seem possible.

The group of related forms for which *cereolus* Muhlfeld is the oldest name, exemplifies the law that where any character or organ exists in unusual duplication it is more liable to variation than where it is less numerously developed. The number of whorls is unusually large and also quite inconstant. The spire may be moderately elevated or even concave; the base may exhibit more or fewer whorls; the central umbilical pit be more or less funiculate; the striae above weaker or stronger; the periphery nearly circular or quite gibbous; the vertical diameter may vary 100 per cent.; the parietal lamina (as pointed out by Tryon) may be present or absent, and the angle of the aperture with the axis varies widely.

The shell generally has from five to seven well marked whorls; but, under especially favorable conditions, as near the walls of Fort Marion, at Saint Augustine, it may have ten or twelve. The number exhibited on the base is absolutely inconstant when specimens from various localities are compared. Only by breaking into the last whorl can it be determined whether the parietal lamina exists. In specimens labelled *septemvolva* by Mr. Binney I have found it, and it is often absent in what is otherwise typical *cereolus*. The soft parts in all are very uniform. The chief forms may be distinguished as follows:

1. *H. cereolus septemvolva*.
2. *H. cereolus laminifera*.
3. *H. cereolus microdonta*.
4. *H. cereolus cereolus*.

No. 1 is extremely depressed, thin, flat, with a carina on the upper edge of the last whorl; moderately strong sculpture above and the reflection of the tip narrow. Lamina usually absent. This is what Mr. Binney, in naming the Smithsonian shells, has considered to be the typical *septemvolva* of Say, though Say's diagnosis would not distinguish his shell from other varieties except the next one. It is more restricted in range than most of the varieties and has been reported chiefly from Florida. It does not exceed 10^{mm} in maximum breadth, except in very unusual instances, and generally averages less.

The large form figured and described by Binney (Terr. Airbr. Moll., p. 281) is not that described by Say in his original diagnosis, though the shell described by Say might perhaps have been closely related to it. His types were 0.3 and 0.4 inch in diameter, or 10^{mm} to the 15^{mm} form figured by Binney.

No. 2 is the form figured by Binney as *Polygyra cereolus*, large, high, with strong upper sculpture, broad lip, the base with the last three whorls obvious, the internal lamina strong. It was called *laminifera* by Binney in 1858. The type of Mühlfeld was like the ordinary small Georgian form about 8.5^{mm} in diameter. Inhabits East Florida and the Keys. Hemphill states that at Long Key these inhabit low moist ground covered with tall grass, so near the sea that unusually high tides sometimes kill them by thousands.

No. 3. This is the small common form with comparatively delicate upper sculpture, rather flat, horny looking, very smooth below, the lip narrow and delicate, the mouth small; the last two whorls most obvious below. It is often a little gibbous, and in most cases has a delicate internal lamina. It is *carpenteriana* Bland in part; *microdonta* Deshayes; *delitescens* Shuttleworth; and is very generally labelled *volviox* Parreyss. It is the form found at Bermuda and the Bahamas, is common on the Florida Keys, and reaches to the westward as *H. Febigeri* Bland.

No. 4. This is like the last but stronger, more shelly looking, coarser in sculpture, proportionally larger every way, and is the most common and widely distributed continental variety. It probably develops into No. 2 in favorable situations.

There are many intermediate stages between all these forms. The careful study which shall reveal the true relations of each to the other is only possible for a resident in the region itself. No more interesting and valuable contribution to our knowledge could be made than this. One such study, if it were only thorough and careful enough, and embraced a sufficient range of habitat, would be a Rosetta stone, affording a key to interpret the mysteries of many others. Shall not the South afford us a conchological Champollion? As for the subgeneric names used in this connection it is quite evident to every one who surveys the situation in the light of the changes made by authors from time to time, that such names as *Polygyra*, *Dædalocheila*, &c., are merely of sectional importance. They have a certain convenience in the literature, but correspond more to a general facies than to any clearly definable characters. This, of course, does not apply to groups formerly included in the genus *Helix* but now shown to differ structurally, such as *Zonites*, *Stenopus*, *Nanina*, &c. The distinctions, except in general facies, between *Mesodon*, *Triodopsis*, *Stenotrema*, *Dædalocheila*, *Polygyra*, &c., are impossible to formulate and do not exist in nature any more than distinctions between individual waves of the sea, which, nevertheless, are visible to all beholders. When these facts are fully recognized, a great step toward a scientific comprehension of genera and species will have been gained.

***Helix (Polygyra) pustula* Férussac.**

Helix pustula Fér., Hist., p. 50, pl. 1, fig. 1. Binney, l. c., p. 286. (*Polygyra*.)

Habitat.—South Carolina, Georgia, Florida to Texas, Binney; Cedar Keys, Stearns and Hemphill; Tampa City, Bland.

Helix (Triodopsis) inflecta Say.*Helix inflecta* Say (1821), Binney, l. c., p. 306. (*Triodopsis*.)? *Helix rugeli* Shuttleworth, 1852.*Habitat*.—Interior region, Texas to New York, sea islands of Georgia to the Northwestern States, Binney; Florida, Bland, in Stearns's coll.The three specimens received from Mr. Bland vary from 0.85 to 0.12^{mm} in maximum diameter, also in elevation and aperture. One has the tooth deep, as in *H. rugeli*; one medium; the third as in Binney's figure of *inflecta*. Not previously reported from Florida.**Helix (Triodopsis) vultuosa** Gould.*Helix vultuosa* Gld. (1848), Binney, l. c., p. 312.*Habitat*.—Arkansas and Texas, Binney; Florida, at Pensacola, Wetherby.

Not previously reported from Florida.

Helix (Triodopsis) Hopetonensis Shuttleworth.*Helix Hopetonensis* Shuttlew. (1852), Binney, l. c., p. 311.*Habitat*.—South Carolina to Fort George, Saint John's River, Florida, Binney; Fernandina and Cedar Keys, Hemphill.**Helix (Mesodon) jejuna** Say.*Helix jejuna* Say (1821), Binney, l. c., p. 151.*Habitat*.—Tampa, Hemphill; East Florida, Binney.This seems, on the whole, distinguishable from *Mobiliana*, which is also reported by Jewett from Jacksonville.**Helix (Microphysa) vortex** Pfr.*Helix vortex* Pfr. (1839), Binney, l. c., p. 171.*Helix selenina* Gould, 1848.*Habitat*.—Southern Florida, Binney; Marco, Fla., Hemphill; said to be viviparous, a fact worthy of verification.**Guppya gundlachi** (Pfr.), Tate.*Helix gundlachi* Pfr., Wieg. Arch., 1840, 1, p. 250.*Helix pusilla* Pfr., l. c., 1839; not of Lowe.*Conulus gundlachi* Tryon, Am. J. Conch., 1866, ii, p. 256.*Guppya gundlachi* Tate, Am. J. Conch., v, p. 155, 1870.*Zonites gundlachi* (Pfr.) Binney, Bull. M. Comp. Zool., iv, p. 127, pl. xxii A, fig. 3, 1878.*Habitat*.—Antilles (Cuba, Guadalupe, &c.); Nicaragua; Florida Keys; Archer, Alachua County, Florida.This remarkable little shell looks like a rather rude specimen of *Conulus chersina* Say, with inflated dome-like whorls and a well-defined perforate umbilicus. It lives in moss on trees and dead stumps (of hard, not resinous, wood), is viviparous, has the tip of the tail subtruncate with a large mucus pore and above the latter a projecting point of integument. The external features of the soft parts have been described by Tate; the dentition has been shown by Binney to resemble that of

Guppya vacans; the inner four or five true laterals having an accessory cusp on each side of the main point of the tooth while the uncini are bluntly bi- or tridentate as in *Nanina* and *Vitrinoconus*. The present station is the most northern recorded in Florida. The specimens collected happened to be all destitute of the soft parts, though mostly in fresh condition.

Zonites sculptilis Bland.

Helix sculptilis Bld. (1858), Binney, l. c., p. 110.

Habitat.—Cumberland Mountain region, Binney; Waco, Tex., Hemp-hill.

This species has not yet been found in Florida, but the above extension of its range is so important as to warrant a notice of it. It was collected by Mr. Hemphill while returning from his Florida trip.

Zonites (Hyalina) arboreus Say.

Helix arborea Say, 1817, Binney, l. c., p. 114.

Archer, Alachua County, Florida, and also at Enterprise on Lake Monroe, Dall; Cedar Keys, Fla., and New Orleans, La., Hemphill.

Zonites (Hyalina) indentatus Say.

Helix indentata Say (1822), Binney, l. c., p. 116.

Enterprise, Lake Monroe, Florida, Dall; Florida, Stearns, Jewett, and others.

Zonites (Hyalina) radiatulus Alder.

Helix radiatula Alder, Cat. North. and Durh., p. 12, No. 50, 1830.

Helix striatula Gray, non Linné, nec Muller; undescribed.

Helix nitidosa Férussac; undescribed.

Helix electrina Gould, Inv. Mass., p. 183, fig. 111, 1841.

Helix pura Pfeiffer, Binney, non Alder.

Helix viridula Pfeiffer *ex parte*, 1848; non 1881; Binney apud Pfeiffer, non Menke.

Helix hammonis Westerlund, Mörch, Pfeiffer (1881); doubtfully of Ström, 1795.

Habitat.—North America (except in the Californian region) in suitable localities; Florida, Stearns, Jewett; Enterprise, Lake Monroe, Florida, Dall.

A comparison with typical examples of Alder leaves no doubt that the American shell known as *Helix electrina* of Gould is identical with it. The *H. pura* of Alder is a different thing altogether. The *viridula* of Menke, if referable at all to *radiatula*, is a variety of it not found in America, and Menke's name was probably not prior to Alder's, being published almost simultaneously. The *H. hammonis* of Ström, described from Trondhjem, Norway, in 1795, has been referred to a number of small species, and cannot be said to be definitely identified with either. It seems about time that the American shell was called by a name which, without any doubt, belongs to it. It has a most extraordinary range; the Museum possesses specimens from Point Barrow, the extreme north-west point of the continent; from Florida, the southeast extreme, and

from Ungava nearly the extreme northeastern limit of America. All these, and many from intermediate points, preserve their characters with great uniformity.

Zonites (*Hyalina*) *minusculus* Binney.

Helix minuscula Binney, Bost Journ. Nat. Hist., iii, p. 435, pl. 22, fig. 4, Nov., 1840? W. G. Binn., l. c., p. 118.

Helix apex C. B., Ad. Contr. Conch., p. 36, Oct., 1849, fide Binney.

Helix Lavalleana D'Orbigny, Moll. Cuba, 1, p. 161, pl. viii, figs. 20-22, 1841.*

? *Helix saxicola* Pfr., Wiegman's Arch., i, p. 251, May, 1840.

Helix mauriniana Binney, Pfeiffer, *ex parte non* Orbigny.

Helix minutalis Morelet, Test. Nov. Cub., ii, p. 7, 1851, non Férussac.

Habitat.—North America, from the Red River of the North to Yucatan and Florida, Binney; Jamaica, C. B. Adams; Cuba, Pfeiffer and D'Orbigny; Japan, Bermuda, and Porto Rico (Binney, l. c.); Archer and Enterprise, Fla., Dall; Tampa, Fla., and New Orleans, La., Hempbill; Porto Cabello, Venezuela, Sumichrast, in U. S. Nat. Museum.

This widely-spread and well-known little species has been collected by Professor Sumichrast, much further south than previously reported with other Venezuelan species on the highlands near Porto Cabello. I found it in Florida abundantly in the same locality as other small species under the bark of decaying logs, &c. A form of it which, at first sight, looks different from *minuscula* is rather larger than usual and above shows no differences. On the base in the type the junction of the inner lip with the body whorl takes place, following the course of the whorl, inward from the middle line of the base of the whorl and generally about the inner third. This gives a peculiarly thimble-shaped umbilicus. In the variety under consideration the above-mentioned junction takes place outside of the middle line or even at the outer third, while the aperture is a little dilated. The result of this is to show a much larger portion of the base of the penultimate whorl and to alter the facies of the umbilicus. For this form, found in Alachua County, Florida, I would suggest the varietal name *alachuana*.

There is a curious tangle in regard to the name of this species. In the second number (May) of the descriptive, or first volume, of the *Archiv für Naturgeschichte*, Dr. Pfeiffer described, in 1840, a small *Helix* from Cuba under the name of *saxicola*. The year before he had described another under the name of *Helix Boothiana*, which afterward became the type of the subgenus *Microphysa*. Dr. Amos Binney read his description of *Helix minuscula* in November, 1840, but the part of the journal in which it was printed contains papers which were not read until February, 1841, and was probably published in that year. In 1841 the earlier signatures and plates of D'Orbigny's *Mollusques de Cuba* ap-

* The numbers of the figures of this species are exchanged on the plate with those of *H. Mauriniana*. This has caused some confusion in the work of Pfeiffer and Binney as regards synonymy. The text of this part of D'Orbigny's work was published in 1841.

peared, forming part of Ramon de la Sagra's *Historia de Cuba*. The whole work was not finished until 1853, but the earlier parts appeared at intervals. In this D'Orbigny described *Helix Lavalleana* and *H. Mauriniana*, but by an accident the numbers of the figures were transposed on the plate. Later Pfeiffer identified his *Helix saxicola* with *H. Lavalleana* D'Orbigny, and his *H. Boothiana* with *H. Mauriniana*, though the confusion of the numbers of the figures renders a little study necessary to make this clear. Still later W. G. Binney identified his father's *H. minuscula* with *H. Lavalleana* as correctly understood. Now, two things which are equal to the same thing being equal to each other, it follows that *H. minuscula*, if the above identifications be correct, is the same as *H. saxicola* and synonymous with it, as *saxicola* appears to be the older name. Until the identifications are a little more clearly established it will probably be better to retain Dr. Binney's widely known and accepted name.

Albers states that *H. apex* Adams cannot be united with *minuscula*, being distinguished by its size and by fine spiral sculpture. A nearer relative of *H. apex* is *H. hypolepta* Shuttleworth (1854).

The diagnosis of *Microphysa*, which, on the whole, seems poorly, if at all, distinguished from *Hyalina*, precludes the inclusion with it of such shells as *Conulus stearnsi* Bland and *Gastrodonta* (?) *Lansingi* Bland, as Mr. W. G. Binney has recently suggested. The more we learn about the characters of the soft parts, shell, and dentition of these land shells the more evident it becomes that many of these groups are unnecessary and might better be dispensed with. The series inosculate on every side.

Zonites (*Conulus*) *chersinus* Say.

Helix chersina Say (1821), Binney, l. c., p. 125 (as *fulvus*).

Habitat.—Alaska to Florida, Fort Churchill, Hudson Bay territory (Turner), to California and Texas. Typical, Fernandina, Hemphill; Archer, Alachua County, Dall; var. *egena*, Cedar Keys, Hemphill.

This species will probably be found identical with *Z. fulvus*, but as the name of *fulvus* is not incontestable, and there seems to be some discrepancy in observations of the soft parts, I prefer to retain Say's name. The shells are larger and finer when from the north. The finest I have seen are from Arctic America. The name *Fabricii* of Beck and Möller is doubtless synonymous.

Zonites (*Gastrodonta*) *suppressus* Say.

Helix suppressus Say (1829), Binney, l. c., p. 130.

Habitat.—Michigan and New England to Florida, Binney; Fernandina, Hemphill.

Genus SUCCINEA.

Of this genus, *S. campestris* Say is the most common and globose species of Florida. I have it from Key West, Palatka, and Fernandina.

S. aurea Lea is found at Fernandina, known by its narrow aperture and rich deep color. *S. obliqua* Say, or a form closely allied to it, was collected at Saint Augustine by Hemphill.

LIMNOPHILA.

Family PHYSIDÆ.

Physa heterostropha Say.

Physa heterostropha Say, 1817, Binney, L. and F. W. Sh. N. Am., ii, p. 84, 1865.

This universal species is so far the only one received by us from Florida, where it is widely distributed. This and *Planorbis trivolvis* are almost invariably found in the natural wells or sinks, but rarely any other species. The young ones are proportionally more elongated than the adults, but there is not much variation among Florida specimens, judged by those heretofore received. The Museum has it from Palatka, Enterprise, Johnson's Sink, Alachua County, the Sulphur and other springs at Tampa, and the marshes near Furguson's Pass, collected by Stearns, Hemphill, and Dall.

Family LIMNÆIDÆ.

Limnæa columella Say.

Limnæa columella Say (1818), Binney, l. c., p. 32.

This beautiful shell, distinguished by its delicately-sculptured surface, is widely distributed in Florida, and represented by several marked varieties. A delicate form resembling *L. casta* Lea, but narrower and almost exactly simulating a *Succinea*, was found in a ditch alongside the Florida Southern Railroad track at Gainesville, Fla. A stout, acutely-pointed, very calcareous form with a red tip, was collected by Mr. I. Greegor at the mouth of the Saint John's River. Another of similar form, but thin and delicate, also red-tipped, was obtained by Professor Wetherby at Pensacola. A smaller race, dark brown, with the spiral sculpture beautifully developed, was obtained by me at Palatka, on the banks of the Saint John's River, and in a brook at Enterprise, Lake Monroe.

Limnæa humilis Say.

Limnæa humilis Say (1822), Binn., l. c., p. 63.

Nearly typical specimens were obtained by Stearns near the saw-mill at Tampa. This is a more southern locality than it has yet been reported from.

Planorbis parvus Say.

Planorbis parvus Say (1817), Binney, l. c., p. 133.

Saint John's River at Palatka, Dall.

The figure of this species in the Land and Fresh-Water Shells of North America is poor; figure 224 is almost exactly like the same view of *P.*

albus, while the shell itself is well distinguished. The front view, while accurate for some individuals, has the aperture much too flat, and not nearly as round as in most specimens of this species.

Planorbis dilatatus Gould.

Planorbis dilatatus Gld. (1841), Binney, l. c., p. 131.

Habitat.—New England to Maryland, Binney; Saint Augustine, Fla., Hemphill; ditch at Gainesville, and brook near Enterprise, Lake Monroe, Dall.

This seems to be the commoner small species in Florida. I have something almost exactly similar from Northern Mexico.

Planorbis trivolvis Say.

Planorbis trivolvis Say (1817), Binney, l. c., p. 115.

Not quoted by Binney from Florida. Poey's identification of a Cuban species with it is denied by Arango, who considers it as not belonging to the Cuban fauna. The Florida specimens are not large, but it seems widely spread, and is one of the species common to the sinks or natural wells of the interior. Palatka, Johnson's Sink, Alachua County, brook at Enterprise, Dall; marsh near Furguson's Pass, Hemphill. Abundant and variable.

Ameria scalaris Jay.

Paludina scalaris Jay, Cat. Sh., 3d ed., p. 112, pl. 1, figs. 8, 9, 1839.

Physa scalaris Haldeman, Mon., p. 34, pl. iv, f. 9, 1842.

Ameria scalaris Dall, Ann. Lye. Nat. Hist. N. Y., p. 356, 1870.

Habitat.—Tampa Bay, Anthony; Everglades, Florida, Jay; Lake Eastis, Florida, Wetherby; Saint John's River at Satsuma, brook at Enterprise, Lake Monroe, Dall. Also in the marl of which the shell mounds are built.

This remarkable form, of which the largest number of relatives are found in the southern hemisphere, does not belong to the *Physida*, but to the *Limnæida*. The soft parts resemble those of *Planorbis*, according to Wetherby. It appears to be abundant at the proper season, which is, however, later than most visitors remain in Florida. It is common in the shell marl of the Indian mounds, and attains a considerable size (15^{mm}) and great solidity. Not all the species are carinated, and some of them much resemble a *Physa* in general outline, though wanting the polished surface of that genus.

Family ANCYLIDÆ.

Ancylus obscurus Haldeman.

Ancylus obscurus Hald., Mon., p. 9, pl. 1, f. 4, 1844.

Habitat.—Nolachucky River, Haldeman; ditch at Gainesville, Fla., brook at Enterprise, Lake Monroe, Dall; marsh near Furguson's Pass,

Florida, Hemphill; Jamaica, West Indies, Adams; Saint Thomas and Porto Rico, West Indies, Shuttleworth.

In concluding this notice of the *Limnophila* of Florida I would take this opportunity of stating that the *Limnæa Palmeri*, described by me from the mouth of the Yaqui River, Gulf of California (Am. Journ. Conch., vii, part 2, p. 135, 1871), proves to be a *Recluzia*, and should be called *R. Palmeri*.

AURICULACEA.

In attempting to identify and name the *Auriculacea* of the collection from Florida I was brought to a standstill by the condition of the nomenclature which has been far from correctly used for the American species. It was therefore necessary to attempt a revision of it, which it is to be hoped may pave the way for a definite and final arrangement. It is to be regretted that some of our naturalists have published, and continued to use, names which in the same work they stated to be inapplicable to the animals under consideration.

The suborder *Basommatophora* is divisible into four natural groups, characterized by the mode of life: *Limnophila*, including *Chilinidæ*, *Physidæ*, *Limnæidæ*, and *Ancylidæ*, (*Latia* being doubtful as yet); *Akteophila*, including *Auriculidæ* and *Otinidæ*; *Petrophila*, with *Siphonariidæ* and *Gadiniidæ*; and *Thalassophila* with *Amphibolidæ*. The value of these groups will be differently estimated, but I cannot see my way clear to giving them, or any of them, the subordinal value assigned to part of them (under other names) by my friend Dr. Paul Fischer in his admirable manual now publishing. Most of these names have been used in diverse senses by various authors, but in regard to these denominations applied to larger groups, which vary with the opinions of authors, it seems to me impracticable to enforce the law of priority except for groups wholly identical. As for families it would seem best always to name them after their most characteristic genus.

The *Akteophila* of the United States comprise the following species as far as yet known:

Family AURICULIDÆ.

Shell spiral, with reversed nucleus, with a twisted or plaited columella; usually with parietal or labial teeth or liræ; texture, calcareous or horny; inoperculated, furnished with an epidermis. Tentacles contractile; eyes sessile at their inner bases; oviparous, phytophagous; dermis rugose; living in moist earth (*Carychium*, *Pythia*) or near the margin of rivers and the sea; never in water, though often where they are daily moistened by the tide. Dentition in little curved, numerous transverse series—rhachidian, $\frac{1}{1-3}$; laterals, $\frac{x}{1-3}$; uncini, $\frac{x}{1-3}$.

Subfamily AURICULINÆ.

Foot not divided transversely.

Genus CARYCHIUM Müller.

Shell cylindro-conical, minute, one denticle and the usual plait on the columella; lip thickened, reflected, sometimes with one or two obtuse denticles; nucleus hemispherical, immersed; internal septa of the spire persistent or but slightly absorbed; tentacles short, obtuse; the eyes sessile at their inner bases; foot entire obtuse behind; muzzle bilobed, extending in advance of the foot. Type *C. minimum* Müller, of Europe.* (Zool. Dan. Prodr., p. 242, 1776.)

Genus AURICULA Lamarek.

Shell large, strong, with thick epidermis; aperture with a large parietal plication behind that belonging to the columella; a strong parietal callus; the outer lip and peristome thickened but not dentate or lirate; internal septa partly absorbed. Animal blind, with rather long tentacles swelled at the distal end; foot entire, simple. Type *Auricula auris-mida* Lamarek (Prodr., p. 71, 1799).

Subgenus AURICULASTRUM Fischer.

Shell smaller, thinner, and smoother; animal with eyes; tentacles rather short, subconic; foot simple.

Type *A. subula* Quoy. (Fischer. Man., p. 498, 1833.)

Auriculastrum pellucens Menke. Plate 18, fig. 8.

?*Auricula Dominicensis* Fér., Tabl., p. 103, 1822.

Auricula pellucens Menke, Syn. Meth. Moll., p. 131, 1830; Bland, Ann. Lye. Nat. Hist. N. Y., xi, p. 87, 1874. Not of Reeve.

?*Auricula ceylonica* Reeve, Conch. icon. *Auricula*, No. 5, pl. 2 (as of A. Adams, P. Z. S., 1854, p. 10).

Not *Auricula pallescens* Reeve, l. c., as of Petit, P. Z. S., 1854, p. 10.

Habitat.—Demerara, Menke; Guadalupe Island, West Indies, Beau; Cedar Keys, Fla, Calkins; Punta Rasa, Prime; Oyster Bay, Hemphill.

There seems to be some confusion in Reeve, which I have not the books and specimens to unravel. There is no likelihood of the Ceylon

* *Carychium exiguum* Say, the common form of the United States, has not yet been reported from Florida, but doubtless will be found there. The nucleus of this species is so little advanced toward a whorl when the regular spire begins that it at first seems as if this genus formed an exception to the family rule of having a sinistral nucleus. It is, however, only superficially so. In *C. minimum* the immersion is often very recognizable, and some specimens of our species show it better than others. The teeth in *C. exiguum* are often deficient, but the columellar plait always exists, though perhaps not visible without breaking the shell. In L. and F. W. Shells of N. Am., ii, p. 7, Mr. Binney has taken the bilobed prolongations of the muzzle for an anterior division of the foot. Fig. 7 on the same page is very poor, and even inaccurate. See Plate 18, fig. 14, this volume.

shell being transported to the West Indies, and the two may probably prove distinct with better material. The animal has an entire foot with short tentacles, well developed eyes, and rather short muzzle. It was found living by Hemphill and Calkins. In adolescent shells, it is clearly seen that the anterior fold is continuous with the inner, and the posterior fold with the outer edge of the columella, which edges are strongly twisted and respectively continuous with the peristome, the space between them being broadly excavated.

It is probable that this is identical with the species referred to as *A. Dominicensis* by Pérussac from Santo Domingo. As that species was not described in such a way as to be identifiable, it is probably better to retain the well-known name of Menke.

Genus TRALIA Gray.

Tralia Gray, *Turt. Man. Brit. Sh.*, 2d ed., p. 21, 1840; *P. Z. S.*, 1847, p. 179; *Pfr. Zeitschr. für Mal.*, 1853, p. 7.

Tralia, sp., H. & A. Adams, *P. Z. S.*, 1854, pp. 11-12; *Gen. Rec. Moll.*, ii, p. 244, 1855; W. G. Binney, *J. c.*, ii, p. 16, 1865.

Voluta, sp., Gmelin, Donovan, *Turton*.

Bulinus, sp., Brugière.

Auricula, sp., Pérussac, Lamarek, D'Orbigny.

Melampus, sp., *Pfr. Mon. Aur. Viv.* 1856, p. 46.

Shell elongated, with a plait on the column and two on the body whorl; out lip thickened, not lirate; foot entire, elongated, simple behind.

Several sections which were established by H. A. Adams, under this genus (*Pira*, *Signia*, *Persa*), according to Dr. Paul Fischer, should be united with *Melampus*. Neither that author nor Mr. Tryon seem to have noticed that *Tifata* H. & A. Adams and *Detraeiu* Gray were founded on the same type. I have seen no reference to observations by any one in this country on the living animal of the type of *Tralia*, which is apparently not rare in Southern Florida.

It is not known to what animal the figure of *Tralia* given by Binney in the *Laud and Fresh Water-Shells of North America* (part 2, p. 16) belongs. It is said to be drawn by Stimpson from a species found in Charleston Harbor, and may represent *Alexia denticulata*, especially as the genuine *Tralia pusilla* is not yet known from so far north.

Subgenus TRALIA s. s.

Peristome thickened, slightly reflected; anterior parietal lamina largest; outer lip sinuous, concavely impressed at the middle with a single strong ridge longitudinally revolving into the depths of the aperture. Type *Voluta pusilla* Gmelin.

Tralia pusilla Gmelin. Plate 18, fig. 5.

Voluta pusilla Gmelin, *Syst. Nat.*, p. 3436, 1789, fide Pfeiffer; Dillwyn, *Rec. Sh.*, 1, p. 507, 1817.

Voluta triplicata Donovan, *British Shells*, pl. 133, 1802.

Bulimus orulus Brugière, Ency. Meth., 1, p. 339, 1789.

Auricula nitens Lamarek, An. s. Vert., vi, pt. 2, p. 141, 1822.

Auricula orula Férussac, Prodr., p. 104, 1821.

Auricula orula D'Orbigny, Moll. Cuba, 1, p. 186, pl. xiii, figs. 1-3 (excl. leg. tab.).

Tralia pusilla Gray, Turt. Man., ed. ii, p. 21, 1840.

Auricula leucodonta Nuttall, MSS. teste Pfeiffer.

Melampus pusillus Pfr., Mon. Anr. Viv., p. 46, 1856.

Tralia pusilla H. & A. Ad., Gen. Rec. Moll., ii, p. 244, pl. 82, fig. 8, 1855; W. G. Binney, l. c., ii, p. 17, 1865.

Habitat.—Cuba, Martinique, Santa Lucia, D'Orbigny; Cuba, Jamaica, Guadalupe, and Porto Rico, Arango; Bermuda, C. B. Adams; Florida, Binney and Stearns; Sandwich Islands, Pfeiffer (?).

This species is easily recognized by its pure brown color, three plaits, and the single ridge on the inside of the impressed outer lip.

The names of Gmelin and Brugière appeared in the same year. Most naturalists have followed the former. The much more characteristic name of Donovan we are unfortunately obliged to reject as a synonym.

Auricula panamensis of C. B. Adams belongs to the restricted subgenus. It is smaller, more compressed, darker colored, and with a more sinuous outer lip than the Antillean shell, but is otherwise extremely similar.

Subgenus ALEXIA Gray.

Auricula Draparnaud, Tabl., p. 53, 1801; Gould, Inv. Mass., p. 199, 1841.

Alexia Gray (as of Leach MSS.), P. Z. S., 1847, p. 179.

Oratella Gray, Turt. Man., 2d ed., pp. 15, 225, 1840; P. Z. S., 1847, p. 179, olim; Moquin Tandon, Moll. Fr., ii, p. 415, 1855. Not *Oratella* Bivona, 1832.

Conorulus Gray, Turt. Man., 3d ed., p. 192, 1857.

Carychium Blainville, Mal., p. 453, 1825; Michaud, Compl. Drap., p. 73, 1832; ex parte.

Melampus, sp., Jeffreys, Brit. Conch., v, p. 106, 1869.

Voluta, sp., Montague, Turton, Berkeley.

Actæon, sp., Fleming.

Jamnia, sp., Brown.

Pythia, sp., Gray, 1821; Beck, 1839 (= *Phitia* Blainville as of Gray).

Monica H. & A. Adams, Gen. Rec. Moll., ii, p. 247, 1855.

Shell elevated; outer lip thickened by a ridge of callus within the edge; callus simple or denticulated; no liræ or longitudinal ridges; other characters as in *Tralia*. Type *Voluta denticulata* Montague.

Tralia (*Alexia*) *myosotis* Draparnaud.

Auricula myosotis Drap., Tabl., p. 53, 1801; Hist., p. 56, 1805; Jeffreys, Lin. Trans., xvi, p. 368.

Voluta denticulata Montague, Test. Brit., p. 234, pl. 20, fig. 5, 1802; Turton, Conch. Dict., p. 234, 1819.

Actæon denticulatus Fleming, Brit. An., p. 337, 1828.

Jamnia denticulata Brown, Conch. Gt. Brit., 1st ed., pl. 51, fig. 6, 1827; 2d ed., p. 22, pl. viii, f. 6, 1844.

Jamnia quinquedens Brown, 1st ed., l. c., pl. 51, fig. 11; 2d ed., p. 22, pl. viii, fig. 11, 1844.

Auricula (Carychium) myosotis Blainville, Mal., p. 453, 1825.

Carychium myosotis Michaud, Compl. Drap., p. 73, pl. 3, figs. 16, 17, 1832.

Pythia denticulata Beck, Index Moll., p. 103, 1838.

Voluta reflexa Turton, Conch. Dict., p. 250, 1819.

Carychium (Pythia) myosotis Moquin Tandon, Moll. Fr., ii, p. 417, pl. 29, fig. 33, 1855.

Carychium (Ovatella) denticulata Moquin Tandon, l. c., p. 415, pl. 29, figs. 27-29, 1855.

Conorulus (Ovatella) denticulatus Gray, Turton's Man., 2d ed., p. 225, fig. 144, 1840; 3d ed., p. 192, fig. 46, pl. 12, fig. 144, 1857.

Conorulus denticulatus var. *myosotis* Forbes and Hanley, Brit. Moll., iv, p. 194, pl. cxxv, figs. 4, 5.

Melampus myosotis Jeffreys, Brit. Conch., v, p. 106, pl. 98, fig. 2, 1869.

? *Melampus denticulatus* Stimpson Sh. of N. Eng., p. 52, 1851 (partly?).

Variety *ringens* Turton.

Voluta ringens Turton, Conch. Dict., p. 250, 1819.

Carychium personatum, Michaud, Compl. Drap., p. 73, pl. 15, figs. 42, 43, 1832.

Auricula tenella Menke, Syn., p. 131, 1830.

Forma junior.

Auricula ciliata Morelet, Moll. Portug., p. 77, pl. 7, fig. 4, 1845.

Alexia setifer Cooper, Proc. Acad. Nat. Sci. Phil., 1872, p. 143, pl. 3, figs. A1-A6.

Habitat.—Britain; European Seas; Mediterranean; Madeira; Jeffreys. Jamaica, West Indies (introduced), Barrett; east coast of the United States, probably; not yet clearly determined as distinguished from *Leuconia bidentata*. San Francisco Bay, California (introduced), Cooper.

The synonymy of this species might have been much enlarged, but to no particular purpose. Both the animal and its shell of *A. setifer* agree with British examples and not with the form described by Gould, which is a *Leuconia*. It is probable that when search is made, with the distinctions kept in view, this species will be found on the eastern coast of the United States wherever *Leuconia* exists, both being doubtless introduced species. I have not heard of either south from New York.

Subfamily MELAMPINÆ.

Foot transversely divided by a sulcus, generally at about the anterior third.

Genus PEDIPES Adanson.

Pedipes Adanson, Sénégal, p. 11, t. 1, figs. G, S, N.

Pedipes B, Blainville, Man. Mal., 1, p. 452, 1825.

Polydonta G. Fischer, Tabl. Syn., p. 127, 1808, *ex parte*.

Shell imperforate, solid, globular-conic, few whorled, the last whorl much the largest; columella broad, with two strong plications or revolving ridges; one strong parietal tooth, outer lip sharp with a callus within its borders usually denticulated or nodulus. Internal septa not absorbed. Foot short, simply rounded before and behind, divided by a deep sulcus; tentacles cylindrical, pointed. Type *P. afra* Gmelin.

This genus is ascribed to Adanson by courtesy, he being a non-binomial writer not entitled to be quoted in synonymy. It appears to have first been adopted by Blainville. It represents in this division of the family the *Marinula* of King, which belongs to the other subfamily. Fischer states that a section shows the axis to be hollowed throughout its length.

Pedipes liratus W. G. Binney. Plate 18, fig. 15.

Pedipes lirata W. G. Binney, Proc. Acad. Nat. Sci. Phil., 1860, p. 154; L. and F. W. Sh. N. Am., pt. ii, p. 20, fig. 21, 1865.

Habitat.—Cape Saint Lucas, Xantus; San Diego, Cal., Orcutt.

Pedipes unisulcatus Cooper. Plate 18, fig. 6.

Pedipes unisulcata Cooper, Proc. Cal. Acad. Sci., 1866, p. 294, p. 29.

Habitat.—San Pedro, Cal., Cooper; head of Gulf of California, near mouth of Yaqui River, Palmer.

Pedipes naticoides Stearns. Plate 18, fig. 17.

Pedipes naticoides Stearns, Proc. Bost. Soc. Nat. Hist., October, 1869, vol. xiii, p. 108.

Turbo mirabilis Muhlfeld, Mag. Ges. Fr. Nat. Berlin, viii, p. 8, t. 2, fig. 13 a-b, 1818; Pfr. Mon. Aur., p. 70 (*Pedipes*).

Pedipes quadridens Pfr., Wieg. Arch., 1839, I, p. 357.

Pedipes oralis C. B. Ad., Contr., to Conch., p. 41, Oct., 1849.

Pedipes globulosus C. B. Adams (Mss.).

Pedipes tridens Pfr., P. Z. S., 1854, p. 122; Mon. Aur., p. 72.

Habitat (naticoides).—Tampa, Stearns; Key West, Hemphill; (*mirabilis*) Cuba, Pfeiffer and Gundlach; (*oralis*) Jamaica, Bermudas, C. B. Adams; Guadalupe, Porto Rico, Arango.

Pfeiffer relegates his *P. quadridens* to *P. mirabilis* Muhlfeld. His *tridens* was shown by Gundlach to be a young stage of the same. *P. oralis* was stated by its describer to differ from Pfeiffer's species in being slightly more elongated, with the sulcations less marked and the surface smoother. A comparison of specimens of Adams's species with others of *P. naticoides*, shows that these are here also the points of difference. Hence it seems likely that *P. naticoides* is a synonym of *P. quadridens* (= *mirabilis*). However, as the latter has not been figured, and I have not been able to see specimens of the Cuban form, I prefer to retain Stearns's name while indicating its probable synonymy. *P. liratus* W. G. Binney (1860), from Cape Saint Lucas, Lower California, collected by Xantus, and San Diego, Cal., C. R. Orcutt, is very similar, but differs slightly in color and arrangement of the teeth. *P. unisulcatus* Cooper, from California, is quite different and much larger.

Pedipes elongatus, n. s. Plate 18, fig. 4.

Shell shaped like *Alexia myosotis*, but more obtuse; color pale straw-color or waxen, with opaquer streaks in the direction of the axis; whorls four and a half beside the inverted nucleus, smooth, not inflated, appressed against the suture; apex blunt, out of which rises the arch of

about one-third of the nucleus; a chink in front of the columellar reflection, but no umbilicus; aperture rather long, rounded in front, pointed behind, outer lip sharp, hardly thickened; columella reflected with a solid white callus extended, though thinner behind, across the body whorl to the posterior angle of the aperture; columella with two teeth, the posterior large, its plane at right angles to the axis, its crest extended forward in a curve forming a raised inner edge to the column, inside of which is the smaller anterior tooth, its plane parallel with that of the larger one; body whorl with a large, flattened, twisted tooth at right angles to the surface on which it stands and with its direction following the curve of the whorl inward; lon. of shell, 4., of aperture, 2; max. diam. of shell, 2^{mm}.

Habitat.—Marco, Fla., in the moss on a dried-up brackish marsh. Collected by H. Hemphill.

This species at first looks like a young smooth *Alexia*, but is at once distinguished by its columella and apex. It is possible that in older specimens the outer lip may be thickened or dentate. In those received there is no indication of anything of the kind, but neither is there on the specimens of the *P. naticoides*, which we know has a thickening and little tubercle on the outer lip when fully adult. The epidermis is very thin and smooth; there is no trace of sculpture; the appression of the whorls at the sutures gives them in some lights a marginate aspect. It is more elongate than any described recent species.

Genus MELAMPUS Montfort.

Melampus Montfort, Conchyl., vol. ii, p. 318, 1810.

Conovulus Lamarek, Extr. d'un Cours, 1812, *olim*; Bowdich, El. Conch., pp. 28, 63, 1822.

Type *Melampus coniformis* Brugière, = *Voluta coffea* Linné, Syst. Nat., ed. xii, p. 1187, Barbados.

Subgenus MELAMPUS s. s.

Shell oval conoid, the spire shorter than the last whorl; whorls narrow, the aperture correspondingly sublinear, columella strongly plicate; parietal border with from one to five teeth or ridges; outer lip thin, sharp, simple, within lirate to a thickened border behind the peristome; anterior margin rounded; the aperture widest anteriorly. Foot truncate in front, bifid or indented behind; tentacles contractile, subcylindrical, annulately wrinkled; muzzle long, emarginate in front; eyes at the inner bases of the tentacula.

Melampus coffeus Linné. Plate 18, fig. 3.

Bulla coffea Linné, Syst. Nat., ed. x, p. 729, 1758.

Voluta nungta Gmelin, Syst. Nat., 3436, 1789, *ex parte*.

Bulinus coniformis Brugière, Encycl. Meth., 1, p. 339.

Conovulus coniformis Lamarek, An. s. Vert., 2d ed. viii, p. 391.

Melampus fusca Moreh, Cat. Yoldi, p. 33, 1852, as of Martyn.

Auricula coniformis D'Orbigny, Moll. Cuba, 1, p. 187, pl. xii, figs. 4-7, 1841.*

Melampus coffeus H. & A. Ads., Gen., ii, p. 213, pl. 82, figs. 7, 7a, 1855.

* The legend on the plate has the numbers transposed with those of *A. ovula*.

Floridian localities: Bird Key, Jewett; Tampa, Conrad; Punta Rassa, Hemphill; Cedar Keys (?) Hemphill. It is quoted from Florida by D'Orbigny, Arango, and Binney; Cuba and Martinique, D'Orbigny; Bahamas, Rawson; Jamaica, Porto Rico, Guadalupe, Texas, Mexico, and Cayenne, by Arango, also by him, erroneously, from Labrador!

The figure in the Genera of recent Mollusca, by A. Adams, whether from the position of the animal or otherwise, does not show any bifurcation of the posterior end of the foot.

The young and adolescent shells are with difficulty separated from those of *M. flavus* of authors. The double parietal lamina is the best character, and this is sometimes double in *M. flavus*. There is no constant criterion, and I should not be surprised if a larger number of specimens would lead to the opinion that they should bear but one specific name. This is not the *Auricula ovula* of D'Orbigny, as supposed by Binney, who was apparently misled by the error in the lettering of the plate.

This species is frequently marked by fine revolving striae, especially on the spire, where one line is generally present and near the other extreme. The number of liræ varies; they are, however, usually more numerous and more evenly distributed than in *M. flavus*. A form somewhat more elongated, with more pointed spire and less regular and numerous liræ, and with the anterior parietal lamina more frequently obsolete or even absent, has been called *M. bermudensis*. The *M. Gundlachi* of Pfeiffer from Cardenas, Cuba, is considered distinct by Arango, but I have not seen any specimens of it.

Melampus floridanus Shuttleworth. Plate 18, fig. 2.

Melampus floridanus Pfeiffer, Mon. Anr. Viv., p. 36, 1856, as of Shuttleworth MSS.

Tralia floridiana H. & A. Adams, P. Z. S., 1854, p. 11, name only; W. G. Binney, l. c., p. 16, 1865.

Melampus floridanus Shuttleworth, Pfr. Mal. Blätt., 1854, p. 147. Name only.

Habitat.—Florida Keys, Binney; Clear Lake, Florida, Wetherby; near the town of Tampa, Fla., Stearns.

Nothing is known of the soft parts of this species which is placed here, because its conchological characters do not admit of its association with *Detracia bulloides*, as has been hitherto done by authors. The two sharp parietal laminae remove it from that group, and it is therefore remanded to *Melampus* until the soft parts are known.

Melampus flavus Gmelin. Plate 18, fig. 1.

Voluta flava Gmelin, Syst. Nat., p. 3436, No. 5, 1789.

Bulimus monile Brugière, Encycl. Meth. 1, p. 338, 1789.

Conorulus flavus Anton, Verz. Conchyl., p. 48, No. 1768, 1839.

Auricula monile Lamarek, An. s. Vert., vi, pt. 2, p. 141, 1822.

Melampus coronatus C. B. Adams, Contr. Conch., p. 41, 1849, testa jun.

Melampus torosa Mörch, Cat. Yoldi, p. 38, 1852; as of Martyn.

Melampus flavus C. B. Adams, Contr. Conch., pp. 42, 186, 1849.

Melampus coronulus H. & A. Adams, P. Z. S., 1854, p. 10.

Melampus flavus W. G. Binney, l. c., 2d part, p. 12, 1865.

Habitat.—In Florida, Tampa, Stearns; Key West and Cedar Keys, Hemphill; Bahamas, Rawson; Saint Thomas, West Indies, C. B. Adams; Cuba, Guadalupe, Porto Rico, Arango; Panama (as *Melampus Tabogensis* Ad.), C. B. Adams; Jamaica (as *M. coronatus*), C. B. Adams.

This species is best distinguished from *M. coffeus* by its generally single parietal lamina, its more irregular and fewer liræ, and in the young state, when fresh, by the epidermis rising in little tufts along the strong median sulcation or revolving groove, which usually marks the middle of each whorl on the spire. This state constitutes the *M. coronatus* C. B. Adams. The dark brown West Indian specimens are very distinct, and, taken by themselves, seem perfectly so, but Floridian specimens vary and are seldom dark brown. They approximate much more nearly to *M. coffeus*, and appear, from the variations in color and shape, to hybridize with *M. lineatus (bidentatus)* Say. *M. Tabogensis* seems undistinguishable from some West Indian varieties. The white bands vary from three to six in number. The revolving grooves or striæ are more constant and more conspicuous than in *M. coffeus*, and the shell on the whole is smaller.

Melampus lineatus Say. Plate 18, figs. 9, 12.

Melampus lineatus Beck, Ind. Moll., p. 107. 1838.

Melampus bidentatus var. *lineatus* Say, Journ. Acad. Nat. Sci. Phila., ii, p. 246, 1822.

Melampus bidentatus Say, l. c., p. 245, and most American authors. Not of Montague.

Auricula cornea Deshayes, Encyc. Méth., ii, p. 90, 1830.

Melampus corneus Stm., Sh. of N. Engl., p. 51, 1851.

Auricula biplicata Deshayes, l. c., p. 91, 1830.

Auricula jamei Mittré, Revue Zool., 1841, p. 66.

Melampus borealis Pfeiffer. Not of Courad.

Auricula bidentata Gould. Not of European authors.

Habitat.—Coast of the United States from New England to Texas; Saint Augustine, Cedar Keys, Tampa Bay, in Florida, Hemphill; Saint Thomas, West Indies, C. B. Adams, in Nat. Mus. coll.; Tortola, Kjaer. On salt marshes and generally near the sea.

This is a very distinct species in the north; the southern specimens frequently vary toward *M. flavus*, and perhaps hybridize, as they are found in the same localities.

The name by which this species is usually known to American authors is generally admitted to be objectionable by those who have looked into the synonymy. It has been retained rather because the name of *corneus* was considerably later and out of courtesy to the father of American conchology. It does not seem to have been noticed that Say's other name, which was applied to the northern variety and is of equal date, could advantageously be used.

The species is generally but not always provided with one parietal and one columella tooth. There are sometimes two parietal teeth. Say describes the southern form (his *bidentatus*) as having the posterior end

of the foot bifid. The northern form (his *lineatus*) is stated by Binney to have it obtusely pointed. There is here a discrepancy worthy of investigation. If the bifurcation of the foot is a merely individual variation or due to the influence of certain localities or temperatures on the specimens subjected to them and found in them only, it ought to be known.

The following species of *Melampus* are in the collection of the National Museum from the western coast of America, and seem to be distinct from each other and from the foregoing eastern species :

Melampus Bridgesi Carpenter, Panama.

Melampus trilineatus C. B. Adams, Panama.

Melampus olivaceus Cpr., San Pedro, Cal., to San Diego, and at Mazatlan. Plate 18, fig. 16.

This looks toward *M. lineatus* Say on the one hand, and toward *M. coffeus* on the other. It is, however, fairly well distinguished from either. There are sometimes four parietal folds beside that on the columella.

Subgenus LEUCONIA Gray.

Leuconia * Gray, Turton Man., 2d ed., p. 227, 1840, (no descr.); P. Z. S., 1847, p. 179; Turton Man., 3d ed., p. 195, 1857.

Voluta, sp., Montague, 1803. *Pedipes*, sp., Clark.

Jamnia, sp., Brown; not Risso, 1827.

Oratella, sp., Bivona, Nuove gen., pp. 9, 22, 1832.

Auricula, sp., Férussac, tab. Moil., p. 103; Gray, Jeffreys, &c.

Acteon and *Volvaria*, sp., Fleming, Brit. Anim., pp. 333, 337.

Melampus, sp., Jeffreys, Brit. Conch., v, p. 104, 1869.

Alexia, sp., Binney, L. and F. W. Shells of N. Am., pt. ii, p. 4, 1865.

Shell small, ovate; spire produced, pointed; smooth, with a thin epidermis; columella twisted with one or two parietal plates, the anterior much the stronger, outer lip thickened, sometimes with one denticle on the callus; foot subtruncate or rounded behind, transversely divided at about the anterior third below. Type *Voluta bidentata* Montague.

Melampus (*Leuconia*) *bidentatus* Montague. Plate 18, fig. 13.

Voluta bidentata Montague, Suppl. Test. Br., p. 100, pl. 30, f. 2, 1803.

Auricula micheli Mittré, Rev. Zool., 1841, p. 66.

Auricula dubia Cantraine, Bull. Brux., ii, p. 353.

Oratella bidentata Bivona, Nuove Gen., p. 22, 1832.

Auricula crosa Jeffreys, Linn. Trans., vol. xvi, p. 269.

Melampus borealis Conrad, Am. Journ. Sci., 2d series, xxiii, p. 345, 1833.

Auricula denticulata Gould, Invert. Mass., p. 129, fig. 129, 1841. Not of Montague.

Alexia myosotis Binney, L. and F. W. Shells N. Am., part ii, p. 4, 1865. Not of Draparnaud.

Auricula Sayii Kuster in Chemnitz, Conch. Cab., ed. 2, p. 49, pl. vi, figs. 14, 15.

Leuconia Sayii A. Adams, P. Z. S., 1854, p. 36, No. 2; Pfr. Mon. *Auriculacea*, p. 157.

? *Auricula Bivona* Philippi, Moll. Siciliæ, ii, p. 118, 1844.

Melampus bidentatus Jeffreys, Brit. Conch., v, p. 104, 1869. Not of Say.

*A genus *Leuconia* has been erected among sponges, I believe, by Hæckel. I would suggest for it the modified form *Leuconella*.

Habitat.—Western shores of British Islands from Shetland to Sark, and southward to Madeira, the Mediterranean and Adriatic Seas. Introduced on the coast of New England, North America.

This species differs from *Melampus* only in the form of the shell, which is more elongate, and in the absence of liræ on the outer lip. The posterior part of the foot shows a slight tendency to indentation, but not less than some species of *Melampus*, as it appears this character is somewhat variable. The shell, except in its smoother epidermis and obsolete posterior parietal denticle, is almost exactly like the lighter colored forms of *Alexia myosotis*, a fact which has led to much confusion. There is often a single projecting point on the thickened outer lip, more frequently in American than in European specimens. The posterior denticle, too, is more frequently developed in American examples. Mr. Binney, while recognizing that the description of the animal by Dr. Gould did not agree with that of the genus *Alexia*, nevertheless referred the species to *Alexia myosotis*.

I have very little doubt that Kuster's description was intended for this shell; his figure does not agree with his text, but, nevertheless, might have been badly drawn from a short stout specimen of this species.

It is probable that the true *Alexia myosotis* is found on the coast of New England with this shell and that they have been confounded with each other. This can only be determined by an examination of the living animal, but some specimens of the shells I have seen exactly agree with the *Alexia*. Both of them have probably been introduced on ballast or otherwise from Europe. It is very probable from Draparnaud's text that he may have confounded the shells of the two forms, but he carefully describes the animal of his *Auricula myosotis*, and this description says nothing of the division of the foot, which he certainly would have noticed had he examined living specimens of *Leuconia*. The dentate form (var. *ringens* Turton and Jeffreys) was not known to him and was described by Michaud, in his supplement to Draparnaud's work, issued in 1839, as *Carychium personatum*.

The name to be adopted for the group we have termed *Leuconia* is still somewhat doubtful. I have been unable to examine Bivona's pamphlet in which the genus *Oratella* is described. The only references to it which convey much information are those of Philippi and Gray. In Turton's Manual Dr. Gray refers to *Oratella* as the equivalent of *Alexia* as late as 1857, perhaps following Moquin Tandon, but ten years before he had referred to "*Oratilla Bivon*" as in part equivalent to *Leuconia*, and to *Alexia* as equal to "*Oratella* Gray, 1840, not Bivon" (P. Z. S., 1847, p. 179). Philippi quotes Bivona for *Oratella bidentata* Bivona non Montagne (= *O. Bivona* Phil.), which is Bivona's third species, his first being *O. polita* (= *Auricula (Melampus) conoidea* Fér. fide Philippi), his second being *O. punctata* Bivona (= *Auricula Firminii* Payr. fide Philippi, = *Monica* H. & A. Adams), while another of Bivona's species is

supposed to be an *Odostomia*. Under the circumstances it would seem probable that Bivona's genus was a heterogeneous assembly, and that he did not name any type, and that it were better to defer its adoption or rejection until its scope can be definitely ascertained. If his first species be taken as type *Oratella* would be synonymous with *Melampus*. There are two species of *Leuconia* described by Pfeiffer from Cuba, of which the collection contains no specimens.

Subgenus DETRACIA Gray.

Detracia Gray, *Tarnton's Man.*, ed. 2, p. 20, 1840.

Tifata H. & A. Adams, *Gen. Rec. Moll.*, ii, p. 245, Sept., 1855.

Toruatella, sp., Férussac. *Tralia*, sp., Binney after Adams.

Shell elongated, solid, rounded to a point at both ends; parietal region with a thin callus but no teeth or liræ; one strong plait on the columella; aperture very narrow; outer lip lirate within, simple and acute at the margin. Type *Voluta bullaoides* Montague.

Melampus (*Detracia*) *bullicides* Montague (em.). Plate 18, fig. 7.

Voluta bullaoides Montague, *Test. Brit.*, p. 339, pl. 30, f. 4, 1803.

Auricula multivolvis Jeffreys, *cf. Brit. Conch.*, v, p. 109, 1839.

Auricula cingulata Pfr., *Wieg. Arch.*, 1, p. 251, 1840.

Auricula olivu D'Orbigny, *Moll. Cuba*, i, p. 189, pl. xiii, figs. 8-10, 1841.

Melampus bulla Lowe, *Beck Ind. Moll.*, p. 108, 1838.

Auricula steuostoma Kuster, 2d ed., *Chemn. Conch. Cab.*, p. 40, pl. 6, figs. 4-6 (olim in index).

Melampus cingulatus Pfr., *Mon. Anr. Viv.*, p. 18, W. G. Binn., *Terr. Moll. U. S.*, vol. iv, p. 161, pl. lxxv, figs. 12, 13, 1859.

Tralia cingulata W. G. Binney, L. and F. W. Sh. N. Am., ii, p. 18, 1865.

Melampus variabilis Gassies, *fide Rve. Conch. Icon. Aur.*, pl. vi, f. 46.

Melampus Poeyi Pfr., *Zeitschr. für. Mal.*, p. 126, 1853; *Mon. Anr. Viv.*, p. 17, *fide Arango*, *Moll. Cubana*, p. 58.

Detracia bullaoides Gray, *Turt. Man. Brit. Sb.*, p. 20, 1840; *P. Z. S.*, 1847, p. 179.

Detracia cingulata Fischer, *Man.*, p. 501, 1883.

Tifata cingulata H. & A. Adams, *Gen. Rec. Moll.*, ii, p. 245, 1855.

Habitat.—Florida, Bartlett; Cedar Keys, Stearns; Key West, Hemp-hill, Captain Pickering; West Indies, various authors; Cuba, Arango; New Caledonia, Reeve (?).

I cannot discover any printed description of the soft parts of this species. It is put with the *Tralias*, which have the foot not transversely divided and not bifid behind, by the brothers Adams, and with *Melampus*, which has the opposite characters, by Fischer. As the latest authority, I follow the latter; but the facts should be determined by some one on the ground from the living animal, as alcoholic specimens are often so contracted as to be difficult to properly interpret. The nucleus is inverted; the microscopic revolving lines are often wanting over the greater part of the whorl.

Montague and Jeffreys described exotic specimens under the erroneous idea that they were British. It is believed to be confined to the Antillean region.

Subgenus SAYELLA Dall.

Shell small, thin, subfusiform; spire elevated, last whorl contracted; nucleus immersed; columella continuous with the anterior margin of the aperture, and twisted to form one strong spiral ridge entering the volutions; no parietal teeth or callus; outer lip thin, sharp, without internal liræ, thickening, or denticulations. Soft parts unknown. Type *Leuconia Hemphillii* Dall.

This section is distinguished by its characters from any other of either group of the family. It seems nearest *Blauneria* by the characters of the shell, but indicates a medium between that group and *Detracia*. It is named in honor of Thomas Say, the father of American malacology. The confused state of the manuals of American land shells on the subject of the *Auriculidae* is my excuse for placing it in a group where by subsequent investigation I find it cannot remain.

Sayella Hemphillii Dall. Plate 18, fig. 11.

Leuconia Hemphillii Dall, Proc. U. S. Nat. Mus., 1883, p. 323, plate x, fig. 6, Dec. 1883.

Habitat.—Cedar Keys, Fla., on mudflats, Hemphill.

Sayella Crosseana, n. s. Plate 18, fig. 10.

Shell minute, slender, ivory white, with longitudinal subtranslucent pencillings and a suffusion of dark brown on the columella, fading away toward the periphery of the base; whorls five and a half beside the immersed nucleus, which is glassy; surface polished, faint striae of growth evident; whorls flattened, the last about half the length of the shell, the aperture slightly contracted, or rather the coil of that part more compact than the antecedent whorl; suture very distinct, with the whorl behind it a little swelled and the whorl before it smoothly appressed; apical turns a little inflated; apex blunt, with the immersed nucleus half buried in it; aperture simple, smooth, not very sharp edged, the margin rounded into the twisted, thickened edge of the columella; base radiately striate imperforate. Lon. 2.5^{mm}; lat. 1.0^{mm}; aperture slightly oblique, 0.75^{mm}.

Habitat.—Florida, Col. E. Jewett, one specimen. This remarkable little shell is about one-fourth the size of *Oionella acicula* Binney, which name had been attached to it. Its relations are evident, the nucleus and the twisted columella, the diminished last whorl, general form and even the columellar coloration all repeat in miniature the characteristic features of *Sayella Hemphillii*. It may be thought absurd to put such a shell into a subgenus of *Melampus*, and it is possible that the subgenus proposed may eventually take higher rank, but in the absence of any knowledge of the soft parts, and of important characters in the shell, it seems better to take a conservative course. From *Ferussacia*, *Acicula* and *Geostilbia* and their allies this little shell is distinguished by its sinistral nucleus which places it in a widely different group. From *Blauneria* its dextral shell and conchological features appear to sufficiently distinguish it. It is named in honor of the distinguished French

conchologist and naturalist, M. Hippolyte Crosse, of Paris, whose labors have ameliorated every department of malacology.

The exact locality of this shell is not known, but it is probable that Colonel Jewett collected it with other minute shells on one of the Keys. It was presented by him to Dr. R. E. C. Stearns, and acquired by the U. S. National Museum with the Stearns collection.

Genus BLAUNERIA Shuttleworth.

Blauneria Shuttleworth, Berner Mitth. Diagn. Neue. Moll, p. 148, 1854.

Foot simple, pointed behind, transversely sulcated (?); tentacles short, cylindrical, eyes behind and above their bases; shell ovate elongate, sinistral, thin, aperture long, narrow; peristome slightly thickened, outer lip slightly incurved in the middle, continuous with the twisted subtruncate columella; one strong, parietal fold, with a thin callus on the body whorl; last whorl the largest, suture indistinct, appressed. Type *B. heteroclita* Montagne.

The sulcation of the foot in the typical species does not seem to have been recorded, though it is known to exist in *B. gracilis* Pease, according to Dr. Paul Fischer.

Blauneria heteroclita Montagne. Plate 17, fig. 6.

Voluta heteroclita Montagne, Test. Brit. Suppl., p. 469, 1808; Laskey, Wern.

Soc. Mem., 1, p. 398, pl. viii, fig. 12 (3 views), 1809.

Achatina? pellucida Pfr., Wieg. Arch., 1, 1840, p. 252.

Tornatellina cubensis Pfr., Symb. ad Hist., ii, p. 130.

Blauneria pellucida Shuttleworth, l. c., 1854; Pfr. Mal. Blätt., i, p. 152, 1854; Mon.

Aur., p. 153, Binney, L. and F. W. Sh. N. Am., ii, p. 21, f. 22, 1865.

Blauneria heteroclita Arango, Moll. Cubana, p. 60, 1878.

Odostomia? cubensis Poey, Mem., i, p. 394, fide Binney.

Habitat.—Cuba, Jamaica, Porto Rico, Arango; Tampa Bay, Florida, Jewett and Stearns; in damp moss of dried-up brackish swamp near Marco, Fla., Hemphill; introduced into England, Laskey.

I understand from Mr. Tryon that he suspects the Cuban shell to be different from the British and Floridian specimens, but all that I have seen seem to belong to one species, and the various figures seem to agree very well together.

PETROPHILA.

Family SIPHONARIIDÆ.

Siphonaria alternata Say.

Patella alternata Say, Journ. Acad. Nat. Sci. Phil., v, p. 215, Feb., 1826.

Siphonaria alternata Say, Am. Conch., pt. iv, pl. 38, 1832; Binney's ed., pp. 124,

192 pl. 38; Binney L. and F. W. Sh. of N. Am., ii, p. 153, fig. 254, 1865;

Dall, Am. Journ. Conch. vi, p. 32, pl. iv, fig. 10, 1870.

Variety **brunnea** Hanley.

Siphonaria brunnea Hanley, P. Z. S., 1858, pp. 24, 151.

Habitat.—Florida, Sarasota Bay and Islands., Hemphill and others; Bermuda (typical), C. B. Adams; Bermuda (variety) Rawson, in Stearns's collection.

This species does not seem to be common. The finest I have seen are from Bermuda. The variety shows more brown inside, but otherwise agrees with the type. Binney's figure is extremely bad.

Siphonaria lineolata D'Orbigny.

Siphonaria lineolata D'Orbigny, Moll. Cuba, i, p. 232, pl. xvii, figs. 13-15, 1842.

Siphonaria brasiliiana Reeve, Mon. Siph., pl. iv, fig. 17, Mar., 1856.

Siphonaria naufragum Stearns, Proc. Bost. Soc. Nat. Hist., xv, p. 23, Jan., 1872.

Patella leucopleura Arango (*ex parte?*), Moll. Cubana, p. 230, 1880.

Habitat.—Amelia Island, East Florida, Stearns; Cuba, D'Orbigny; Rio, Reeve; Saint Augustine, Fla., Hemphill. It is unfortunately too certain that this fine species first described from North America by my friend Dr. Stearns is identical with that described and figured from Cuba by D'Orbigny. Specimens marked *Brasiliiana* Reeve, by Mr. Cuming, in the National Museum collection, do not appear to differ specifically, and another form from the Cape Verde Islands also runs very close to this one. Why Arango should have referred this species to *Patella leucopleura* is not clear; probably he had not examined authentic specimens.

Siphonaria picta D'Orbigny.

S. picta D'Orbigny, Voy. dans l'Am. Méridionale, Moll., 1839; Moll. Cuba, 1, p. 231, 1842.

This species, reported from Rio and from Cuba by D'Orbigny, has not yet been reported from Florida, but will doubtless eventually be found on the southern Keys.

Siphonaria ferruginea Reeve.

Siphonaria ferruginea Reeve, Mon. Siphon., pl. v, fig. 26, 1856.

No habitat was given by Reeve for this species, but a specimen which seems to belong to it was received from Strebel by the U. S. National Museum, in 1866, as collected at Vera Cruz, Mexico. It doubtless will be found to occur elsewhere on the American coast.

Family GADINIIDÆ.

Gadina carinata Dall.

Gadina carinata Dall, Am. Journ. Conch., vi, p. 18, pl. iv, figs. 12, 13, 1870.

Habitat—Aspiuwall, Dr. Palmer; Barbados, U. S. Nat. Mus.; Cuba, Casey.

We may reasonably expect to find this rare and only Antillean species of the genus on the Florida Keys. At all events it should be carefully looked for.

Family ONCHIDIIDÆ.

Onchidium floridanum n. s.

To Mr. Hemphill is due the credit of adding this genus to the fauna of eastern North America. The specimens arrived as this paper is

going through the press and a detailed description must be deferred. The following notes, however, will indicate its external characters:

When living, the creature is of a uniform slaty blue, the under parts bluish white, with a greenish tinge to the veil. The surface appears beautifully smooth and velvety without dorsal tubercles; just within the slaty margin of the mantle is a single row of about (in all) one hundred whitish elongated tubercles. When crawling, it is of an oval shape about an inch long, and two tentacles extend forward beyond the mantle margin, resembling the oculiferous ones of *Vaginulus floridanus*. In spirits the surface is still smooth, but numerous circular hardly-elevated domelets cover the back, each appearing to contain one of the dorsal eyes described by Semper. The tentacles are entirely retracted; a narrow veil, with lightly escalloped edge, precedes the head; the muzzle is not prominent, is indented in the middle and puckered at the edges. The foot is about one-third wider than the mantle at each side of it. There is no jaw. The penis resembles that of *Siphonaria* in form and position. The animal exudes very little mucus. It was found on rocks between tides associated with *Chiton piceus*. Fifteen specimens were found at Knight's Key by Hemphill.

Onchidium indolens of Couthouy (Rio) and *O. armadillo* of Moreh differ from the above in coloring. The latter, described from St. Thomas, has a very different dorsal surface. No others are known from East America. It would seem as if the small northern species, possessing a jaw like *O. boreale* Dall and *O. celticum* Cuvier, might appropriately be separated from the agnathous tropical forms as a subgenus, for which the name of *Onchidella* might be revived in a restricted sense.

Family CORBICULIDÆ.

Sphaerium contractum Prime.

Sphaerium contractum Prime, Am. Corbicul., p. 48, fig. 46, 1865.

Habitat.—Brook near Enterprise, Lake Monroe, Florida, Dall; Alabama, Showalter.

Pisidium abditum Haldeman.

Pisidium abditum Haldeman, Proc. Acad. Nat. Sci. Phil., i, p. 53, 1841; Prime, l. c., p. 68, fig. 72.

Habitat.—In Florida, Pensacola, Hemphill; river near Palatka, Dall; spring near Tampa, Stearns; North America in general, from New England to Honduras, New Jersey to California, Prime.

This species seemed abundant, and was the only one of the genus observed by me in Florida.

WASHINGTON, July 1, 1885.

Proc. Nat. Mus. 85—19

EXPLANATION OF PLATES.

PLATE 17.

- FIG. 1. *Campeloma lima* Anthony. Florida.
FIG. 2. *Vivipara georgiana* Lea. Florida.
FIG. 3. *Vivipara georgiana* Lea. Florida.
FIG. 4. *Ampullaria depressa* Say. Florida.
FIG. 5. *Ampullaria depressa* Say, operculum.
FIG. 6. *Blauneria heteroclita* Montague. Florida.
FIG. 7. *Goniobasis Etowahensis* Lea. Florida.
FIG. 8. *Neritina reclinata* Say. Florida.
FIG. 9. *Bythinella monroensis* Dall. Florida.
FIG. 10. *Hydrobia wetherbyi* Dall. Florida.
FIG. 11. *Pupilla floridana* Dall. Florida.

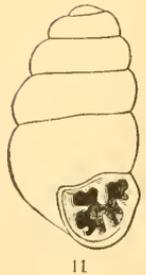
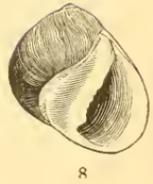
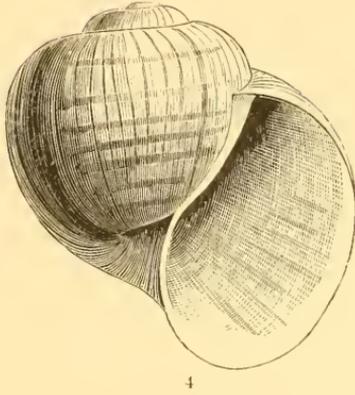
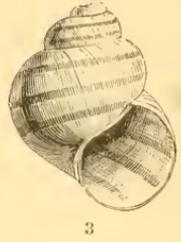
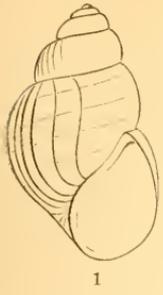


PLATE 18.

- FIG. 1. *Melampus flavus* Gmelin. Florida.
FIG. 2. *Melampus floridanus* Shuttleworth. Florida.
FIG. 3. *Melampus coffeus* Linné. Florida.
FIG. 4. *Pedipes elongatus* Dall. Florida.
FIG. 5. *Tralia pusilla* Gmelin. Florida.
FIG. 6. *Pedipes unisulcatus* Cooper. West America.
FIG. 7. *Detracia bulloides* Montague. Florida.
FIG. 8. *Auriculastrum pellucens* Mke. Florida.
FIG. 9. *Melampus lineatus* Say, var. Florida.
FIG. 10. *Sayella crosscana* Dall. Florida.
FIG. 11. *Sayella Hemphillii* Dall. Florida.
FIG. 12. *Melampus lineatus* Say. Florida.
FIG. 13. *Leuconia bidentata* Montagne. Florida.
FIG. 14. *Carychium exiguum* Say. United States.
FIG. 15. *Pedipes liratus* Binney. West America.
FIG. 16. *Melampus olivaceus* Carpenter. West America.
FIG. 17. *Pedipes naticoides*, Stearns, Florida.



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