OBSERVATIONS ON

LIVING GASTEROPODS OF NEW ENGLAND

By EDWARD S. MORSE

PEABODY MUSEUM
Salem, Massachusetts
1921

OBSERVATIONS ON

LIVING GASTEROPODS OF NEW ENGLAND

By EDWARD S. MORSE

PEABODY MUSEUM
Salem, Massachusetts
1921

PRINTED BY
The Nichols Press
113 MARKET STREET, LYNN, MASS.

OBSERVATIONS ON LIVING GASTEROPODS OF NEW ENGLAND

By Edward S. Morse

In 1919 I published my "Observations on Living Lamellibranchs of New England," in the "Proceedings of the Boston Society of Natural History," (Vol. XXXV, No. 5). Forty-eight species were described and figured, the protoconchs of nineteen species were also given and a number of the expanded animals were portrayed for the first time. Other species that had been very inadequately figured were drawn; among these were *Turtonia minuta, Liocardium mortoni, Gemma gemma, Cumingia tellinoides, Mactra lateralis, Ceronia arctica* and *Pholas truncata;* still other species had been figured by Forbes and Hanley but, as stated in my "Lamellibranchs," on so small a scale and so imperfectly drawn as to be of little value. *Liocardium mortoni* had also been figured but it bore no resemblance to the expanded animal. At this point I must call attention to the exquisite drawings in color by Mr. J. Henry Blake, of twenty-three species of New England mollusks made to illustrate the beautiful collection of New England shells brought together by Mr. C. W. Johnson, Custodian of the Boston Society of Natural History, and exhibited in its Museum. Mr. Dwight Blaney has made a number of drawings with notes and descriptions of mollusca dredged in Frenchman's Bay, Maine. These drawings are very fine and many of them are of species I have not seen alive. It is hoped that he will prepare this material for publication.

It should have been stated in my "Lamellibranchs" as an excuse for the imperfection of many figures and paucity of description that

some of the work might properly be regarded as bi-products as during my studies of the *Brachiopoda* in Eastport, Maine, a number of species of *mollusks* came under my vision and I could not refrain from drawing them. In this communication some of the descriptions were made under the same conditions.

In the "Lamellibranch" paper a few introductory pages were devoted to a protest against the recent multiplication of generic names and abandonment of many generic names that had been familiar to students for nearly a century. I quoted a number of authorities who had uttered emphatic protests against this growing evil. Many others might have been quoted. PROF. F. B. SUMNER, in "Science," June 18, 1915, in an article entitled, "Some Reasons for Saving the Genus," vigorously attacks the taxonomists. His illustrations are cogent and convincing. He says, "Returning to the subject of generic names, it must not be supposed that the only evil resulting from this progressive 'splitting' is the mere inconvenience of our having to learn new names as fast as the old ones are displaced by accredited authorities. This, indeed, is bad enough, but there is an even more harmful result which, I think, deserves further emphasis. I have spoken above of generic names as verbal clues to the nearer kinships between species. These clues lose their value in proportion as genera are made less and less inclusive." DR. HAROLD S. COLTON, in "Science," September 3, 1915, not only heartily approves of PROF. SUMNER'S article but gives another reason for saving the genus. He says, "I am sure he has the sympathy of the great mass of workers in non-taxonomic biology." He further says, "This whole discussion hangs on the question, is it necessary to change generic names to advance our knowledge? The writer believes that to change generic names without an overwhelming amount of evidence in favor of the change is hindering instead of advancing science." That the feeling is bitter among zoologists is indicated by the following extract from a letter of a professor of zoology in Harvard. "I fervently add an Amen to your sermon at the beginning of the 'Lamellibranchs' and I can't tell you what a delight it was to open its pages and meet the good old names: *Modiola modiolus, M.*

plicatula, Solen ensis, Machera costata and *Mya arenaria;* all the old girls as I first knew them around Nahant when I got introduced to them. The new names make me think of the divorce court. They seem to all have been swapping partners."

Unless we return to a sane method of using names, going back to the Linnaean conception of generic distinctions when it does not conflict with obvious inaccuracies there will continue three catagories of nomenclature. First, and by far the most ancient are the vulgar or vernacular names when they exist; though formerly considered the most unreliable, in the present debauch of names, they are regarded by many workers as more reliable. Second, the names founded on generic principles as they have existed for nearly a century, familiar to all students and the only names known to geologists, paleontologists and other students of cognate subjects and third, the modern incubus of names which have been imposed by taxonomists, — a bewildering accession that paleontologists cannot keep up with and do not. In my "Lamellibranchs" I gave my reasons for adopting the names given in the second edition of GOULD'S "Invertebrata" and generally in the three great standard works of FORBES and HANLEY'S "British Mollusca," 4 Vols., JEFFREYS' "British Conchology," 6 Vols., and WOODWARD'S "Manual". In this same paper some errors crept in. I made some mistakes in the *Mytilidæ*. My attention was also called to *Pandora trilineata* which should have been indicated as *P. gouldiana,* of DALL. This distinguished malacologist has shown that the true *P. trilineata,* of SAY, is clearly distinct from the northern species to which DALL gave the name *gouldiana.* An examination of the southern species show that in form, size, shape of shell, and particularly of the hinge it is quite distinct, so different, indeed, that one wonders why a new generic name was not immediately established for it!

ENTALIS STRIOLATA Stimpson

Pl. I. Fig. 1. Length 48 mm.

A figure is given of this creature with body extended. I have watched it in this expanded condition and have never seen the tentacles

as figured by LACAZE-DUTHIERS nor the slightest signs of movement. LACAZE-DUTHIERS, in his remarkable "Memoir of Dentalium," in the "Annals des Sciences Naturelle," has given an exhaustive description of the organization and development of *Dentalium*. Relations are pointed out showing that its affinities are with the lamellibranchs, gasteropods and other larger and smaller groups of mollusks and annilids. Some years ago in the "Proceedings of the Boston Society of Natural History" I called attention to some curious resemblances that *Dentalium* held to the *Tetrabranchiate cephalopods*, namely the long retractile, thread-like tentacles, the curious cartilagenous body surrounding the œsophagus and the fact that the long shelly tube curves dorsally as in *Nautilus*, *Ammonite* and other members of the class.

ACMÆA TESTUDINALIS Muller

Pl. I. Fig. 2. Length 20mm.

Head broad, tentacles long, wide apart, eyes at base of tentacles which are slightly thickened, mouth large, encircled by a membrane which is very mobile and strongly foliated. In the "Proceedings of the Boston Society of Natural History," (Vol. XXXIV, No. 8) I have described the early stages of this species. I found no trace in the embryonic form of a helicoid shell. Fig. 2 (A) shows attitude of the head; (B), highly enlarged view of tentacle; (C), mouth showing radula within.

ACMÆA ALVEUS Conrad

Pl. I. Fig. 3. Length 14 mm.

In motion the head swings freely to the right and left, protruding beyond the edge of the shell, as in Fig. 3, (A). Tentacles long and wide apart. Fig. 3, (B) another view of head.

CREPIDULA FORNICATA Linn

Pl. II. Fig. 4. Length 38 mm.

Head bi-lobed, deeply cleft, lobes long and oval; tentacles thick, not pointed, eyes on thickened base; foot oval, anterior face rounded

and auricular. The protoconch (Fig. 4, A, Pl. VIII) shows very clearly its conversion from a coiled shell to the broad, pan-like shell of the adult. At this early stage the shell resembles that of an adult *Sigaretus*. Then the mantle pours out from its entire margin lines of accretion, the columella of the early shell forming the base of the so-called seat of the adult form.

CREPIDULA PLANA Say

Pl. II. Fig. 5. Length 32 mm.

Head bi-lobed, lobes slightly rounded; foot square in front, sides parallel, rounded behind; tentacles pointed, eyes on prominent bases.

CREPIDULA CONVEXA Say

Pl. II. Fig. 6. Length 10 mm.

Head bi-lobed, lobes long; foot rounded, sharply auriculate; tentacles long and blunt. The resemblance of the soft parts of the three species of *Crepidula* to *Crucibulum striatum* is very marked. In the latter species the lobes of the bifurcated head are larger than in *Crepidula*. Figs. 5 (A) and 6 (A) Pl. 8, are believed to be the early stages of *C. plana* and *convexa*. A curious wedge shaped process comes in between the first coil of the shell and the upper part of the body whorl in *C. fornicata* and *plana;* I did not observe it in *C. convexa*.

CRUCIBULUM STRIATUM Say

Pl. II. Fig. 7. Length 22 mm.

This genus known as *Calyptrea* in FORBES and HANLEY, JEFFREYS, and in the first edition of GOULD'S "Invertebrata," is not an uncommon shell along the coast. Our shell is closely related to the English species though the figure given of the English form of the animal differs from the one here represented. The head is strongly bi-lobed, the tentacles are thick and stout with enlargements at their bases on the outside of which are the eyes. The foot varies in form, rounded

anteriorly (Fig. 7 B) and, at times, elongate with rounded anterior margin and sharply expanded sides (Fig. 7 C). On the right side a collar arises surrounding the head, on the left a hood from which the eggs arise. The eggs are in clusters numbering seven. (Fig. 7 B). These clusters surround the head. The young shell (Fig. 7 A) resembles the shell of *Velutina lævigata* as noted by JEFFREYS. The creature devoured greedily fragments of *Yoldia limatula* and when teased with a scalpel snapped at it in a vicious manner.

CEMORIA NOACHINA Linn

Pl. II. Fig. 8. Length 5 mm.

The figure of this species in FORBES and HANLEY under the name of *Puncturella noachina* shows some differences from our species. The shell is represented as standing much lower, the foot hardly clears the lower margin of the shell. The head tentacles are represented as much longer and pointed, the lateral tentacles are seven in number increasing slightly in length to the last one, while in our species the next to the last one is twice the length of the others. The foot is much narrower in our species and the edge is sharply indented and irregular. (Pl. II. Fig. 8 A). JEFFREYS figures the English species with ten lateral tentacles on a side, the penultimate one larger than the rest. These differences may be regarded as varietal only.

In the early stage of *Cemoria* (Pl. VIII Fig. 8,) the shell resembles a *Sigaretus* and then suddenly appears the close rib-like growth of the adult form. The growth is much more rapid anteriorly so that the nepionic shell stands almost vertical in relation to the marginal line.

MARGARITA UNDULATA Sowerby

Pl. II. Fig. 9. Diameter 11 mm.

This species is undoubtedly the *Trochus groenlandica* of Chemnitz, as given by JOHNSON in his list of the Mollusca of New England, but, following GOULD, I retain the old name. FORBES and HANLEY quoting ALDER, say that the animal is white or yellowish white, also,

that in the English species there are five lateral tentacles arranged in two series, three in the region of the operculum, two anteriorly placed with a distinct interspace between. In our species the lateral tentacles are six in number equidistant, the anterior ones slightly longer, diminishing in length posteriorly. (Pl. II, Fig. 9 A) marginal tentacles enlarged.

MARGARITA HELICINA Phipps

Pl. II. Fig. 10. Diameter 6 mm.

This exquisite shell is usually found on the large lamanaria in March. Its perfect symmetry and beautiful purple iridescent surface easily render it one of our most attractive shells. It is a common shell in Iceland, Spitzbergen, Scandinavia and Northern regions of Great Britain. In collecting numbers of specimens one quickly recognizes two forms; a large globular form and a smaller depressed shell with flaring aperture. This form I described many years ago under the name of *Margarita campanulata*, supposing it to be a new species. In studying large numbers collected at Ironbound Island, Maine, I am convinced that the campanulate form represents the male of the species. FORBES and HANLEY detected this form among specimens of *Margarita helicina*. In their classical work they say "There are two forms of this shell so apparently distinct at the first glance that we hesitate to regard them as belonging to the same species. The one is peculiarly oblique and depressed, a very expanded outer lip and the rest of its features modified to correspond with the general contour; the other is far more globular." In our species the muzzle is deeply crenated, the ends strongly ciliated (Fig. 10 A). The eyes are pedunculated and on the inside, at the base of each tentacle, is a small tubercle. The tentacles are long and larger than the lateral tentacles, these are five in number becoming shorter towards the tail except the middle one which is markedly shorter than the others. In FORBES and HANLEY the lateral tentacles are described as being in two groups, three in the forward group, with quite an interspace and two behind. The animal of the English species is described as orange color, while

in our form the female is orange color while the male is Naples yellow. In the male the lateral tentacles are shorter than those of the female. At Ironbound Island I collected all the specimens in a restricted locality and found 220 females and 164 males. JEFFREYS, in his "British Conchology," describes the creature as having six tentacles on a side. Despite these slight differences they may be regarded as geographical variations. The early stages of the shell resemble so strongly *Vitrinella* that some of the species described as *Vitrinella* from the West Coast and other regions may turn out to be the young of some species of *Margarita* (P. VIII. Fig. 10 B.)

TROCHUS OCCIDENTALIS Migh-Adams

Pl. II. Fig. 11. Diameter 12 mm.

This beautiful species is a rare form on our coast, it is also very rare in England, according to FORBES and HANLEY, through JEFFREYS says it is not uncommon in some places. FORBES and HANLEY identify this shell as the *T. alabastrum*, and places *occidentalis* among the synonyms, adding, however, that "should it prove the *Trochus occidentalis* of North America, as judging from the description, we think likely enough, that name must be substituted for Beck's." JEFFREYS (1865) recognizes *T. alabastrum* as *T. occidentalis*, and DR. G. O. SARS, in his fine work entitled "Mollusca Regionis Arcticæ Norvegiæ," published in 1878, recognizes *T. alabastrum*, of BECK, as *T. occidentalis*, of MIGHELS. The English form as described by FORBES and HANLEY differs somewhat from our form. The animal is described as "entirely pure white," while our species is yellowish white, mottled with brownish granules, the creeping disk orange. *T. alabastrum*, according to FORBES and HANLEY, has three lateral tentacles on a side. JEFFREYS says, "appendages three (sometimes four) on each side, resembling the tentacles in every respect except in being smaller." The few specimens of *T. occidentalis* that I was able to observe had four tentacles on a side.

The shell of *T. alabastrum* of England and Norway very closely resembles the *T. occidentalis* of our coast. The revolving ribs are

much larger and sharper in the English species. If these variations with the differences in color and the three lateral tentacles instead of four constitute good specific differences, then the name *alabastrum* should be retained. I think, however, these differences should be considered geographical variations.

SKENEA PLANORBIS Fabricius

Pl. III. Fig. 12. Diameter 2 mm.

This is next to the smallest gasteropod on our coast, the smallest being *Homalogyra atomus*, which I discovered at Hampton beach and which afterwards was found in Rhode Island, by MISS M. W. BROOKS, recorded in the "Nautilus," (Vol. XXIII, No. 6). The animal of *Skenea* is very active and bold. It is found under stones between high and low water mark and also on sea weeds. Accustomed as it is to the thrashing about of the weeds by the dashing waves it becomes hardened to buffiting and hence its bold behavior. It is found on both sides the Atlantic. The animal is brownish in color. FORBES and HANLEY describe the English species as hyaline white. The shell figured by them is certainly larger than that of the American species. In our species the shell is carried erect as in the figure and not resting flatways as described by JEFFREYS. Further comparisons may show that our species is different from the European one.

RISSOA MINUTA Totten

Pl. III. Fig. 13. Length 4 mm.

PROFESSOR CLEVELAND, of Cornell, long since dead, collected this species in the Charles River estuary in great numbers and soon detected a form somewhat more globose which he considered another species and intended to describe it under the name of *Rissoa pigmenta*. When he told me that he noticed a marked difference in the odor of the two forms I realized that the difference was sexual, and the form was probably that of the female of the species. It is strongly pigmented, the pigmentation being the result of some minute algæ growing on the

shell. The foot is oval, dilated into wings in front; the muzzle is long, narrow and bifurcated. The animal is brown or blackish and is very active.

LACUNA VINCTA Montagu

Pl. III. Fig. 14. Length 12 mm.

To get an idea of the great number of names that this creature is burdened with one must consult FORBES and HANLEY who include these names in their great work. Especially must the student refer to JEFFREYS, (Vol. III) who records *L. vincta* as a synonym of *L. divaricata* of *Fabricius*. SARS also recognizes it under the name *divaricata* and gives an excellent figure of it which certainly closely resembles our form. Our species has a brown variety, known as *L. fusca*. The animal of *L. vincta* is nearly black above, the foot light gray, the head very broad, the tentacles long, the eyes far apart on their outer bases. The black of the head terminates abruptly at the base of the tentacles just below the eyes, the tentacles are very light colored. The creature is very active; the shell is held vertically and ossilates continually when the creature is crawling. The young shell has a very short spire. (Pl. VIII. Fig. 14 A).

LACUNA NERITOIDEA Gould

Pl. III. Fig. 15. Length 5 mm.

This species is regarded as a variety of the English species *L. pallidula* by JEFFREYS and SARS. The animal is yellowish, the eyes prominent on thickened bases from which spring the rather long tentacles, the muzzle is short and truncate with angular process above. The opercular appendages are very short. In Portland, Maine, the species was ovulating in March and individuals were very abundant. The drawing here given was made sixty-five years ago. I am amazed that a new generic name has not been given to the species. The shell closely resembles a short spiral *Litorina*, the animal, however, with its opercular tentacles, and the shell with its lacunal columella is unmistakable.

SCALARIA GROENLANDICA Chemn

Pl. III. Fig. 16. Length 25 mm.

The animal is white and somewhat translucent, mottled with opaque white. The foot is long, rounded behind and broad and truncate in front. JEFFREYS says of the English species, *S. clathratus*, "the body is clear white and thickly interspersed with opaque white flakes, foot often carried considerably in advance of the head and tentacles." resembling in these respects *S. groenlandica*. The operculum of the English species is described as white by CLARK while JEFFREYS says it is yellowish brown. In the other English species of *Scalaria* the operculum is described in two of them as dark horn color, in another species light horn color. In our species the operculum is quite black forming a striking contrast to the white shell and white soft parts. MR. BLANEY says that a deep purple fluid is secreted by the animal on its removal from the shell.

The early stage of this species shows for nearly four whorls a smooth shell resembling a full grown *Rissoa minuta*, then abruptly begins a series of costæ so characteristic of *Scalaria*. (Pl. VIII. Fig. 16 A).

TURRITELLA EROSA Couthouy

Pl. III. Fig. 17. Length 20 mm.

The foot is white, the proboscis lemon-yellow, the end is deeply cleft and each lobe moves alternately as in *Aporrhais*. The crawling disk appeared nearly circular in outline about the size of the aperture of the shell, deeply wrinkled with the anterior portion widely rounded and shouldered at sides. I did not see it fully expanded. The creature was very sensitive, it protruded with extreme caution. The tentacles were rather short and delicate, the eyes on slight prominences.

JEFFREYS regards the English representative of this species as *Turritella polaris* of BECK. FORBES and HANLEY describe the foot as very short in proportion to the body, truncate in front, rounded behind. FORBES and HANLEY figures the animal of *T. terebra* in an expanded condition. In England *T. erosa* is found fossil in the glacial deposits.

APORRHAIS OCCIDENTALIS Beck

Pl. III. Fig. 18. Length 57 mm.

This curious shell with its long turrited spire and expanded outer lip like *Strombus*, combines a number of diverse characters that have puzzled systematists. It has a long, cylindrical body, a prominent head with long, thick muzzle, bifurcated, (Fig. 18, A) a strong, sturdy foot stalk terminating in a rather short, narrow creeping disk which throws itself into curious contortions. At its extreme end it supports a long, narrow slightly curved operculum which overhangs both sides of the foot. The creeping disk is irregular in shape, deeply wrinkled, wider in front and tapering to a point behind. Near the end beneath is a thick blunt process (Fig. 18 B) springing from the left side and extending obliquely across the foot, an appendage, so far as I know, unique in gasteropods; its function is enigmatical. The foot is pure white, the rest of the body is tinged with yellow. The mantle extends to the margin of the aperture. The tentacles are long and very thick at the base, the eyes are prominent and supported on a thickened projection at the base of the tentacles (Fig. 18, C). The tentacles are brownish in color on the dorsal surface, in life they were incessantly swinging aimlessly, the long proboscis is strongly bifurcated and the movements which were constant were alternating. (Fig. 18, D). *Turritella erosa* has an identical form of proboscis moving also in the same alternating manner. There is a resemblance to *Aporrhais pespelicani* in the lingual dentition of *T. erosa.*

The specimen studied was sent to me by DR. HAROLD S. COLTON from the coast of Maine. DR. COLTON had had it in captivity for four days. He said it had been very active in confinement, crawling about the pan and up its sides and dropping off with a thud to the bottom. It proved a very interesting captive. Despite its transportation in wet sea weed by mail for over three hundred miles it had lost none of its vitality, and in its contortions the claw-shaped operculum functioned evidently as an organ of locomotion, recalling the behavior of *Strombus* to which genus *Linnaeus* first assigned it.

The English species, *Aporrhais pes-pelicani*, has the outer lip expanded in two pointed projections and the shell is strongly tuberculated. The animal in shape is not unlike that of *A. occidentalis*, the color, however, is quite different. FORBES and HANLEY, quoting JOHNSON, state that "It is of a general yellowish-white hue, the tentacula mingled yellow and scarlet; the snout and head thickly speckled with scarlet, markings of which color are more sparingly distributed on the paler body and sides of the foot; sometimes they are not present. We have always found it very sluggish and unwilling to display itself when captured." JEFFREYS says "It is shy, slow and awkward in its movements." In these habits it is very different from the American species, which is extremely active, as above described. As no mention is made, in the English species, of the curious appendage on the ventral side of the foot posteriorly, which had it occurred would certainly have been observed indicates that the two forms are widely different.

TURBONILLA NIVEA Stimpson
Pl. III. Fig. 19. Length 7 mm.

The muzzle is rather long, narrow at its base and roundly bifurcated in front. The tentacles are short and round at their tips. The eyes are on the inner base of the tentacles and rather close together.

MENESTHO ALBULA Moller
Pl. III. Fig. 20. Length 14 mm.

The animal is uniformly white, mottled with opaque white granules, the foot broad and square in front, extending some way beyond the muzzle which is broad and short. Tentacles with eyes at their outer bases on slight swellings. On the upper anterior surface of the foot are two rounded areas of white granules closely crowded.

VELUTINA LÆVIGATA Lin
Pl. IV. Fig. 21. Length 8 mm.

The eyes are much closer together than in *V. zonata*, short and obtuse, head with marked projection between the tentacles. The

genitalia projecting from the right side is globular in shape with a curious claw-like process on one side (Fig. 21, A).

VELUTINA ZONATA Gould

Pl. IV. Fig. 22. Length 12 mm.

Head broad, tentacles wide apart, not pointed, eyes on distinct shoulders. Body translucent white, mottled with opaque white spots, tentacles strongly mottled. MR. DWIGHT BLANEY has figured a specimen of this species with a double eye on the right side.

LAMELLARIA PERSPICUA Lin

Pl. IV. Fig. 23. Length 12 mm.

The only sketch I had of this creature shows it from below. The foot has an irregular indented margin. MR. DWIGHT BLANEY has some remarkable drawings of this species which, I trust, he will soon publish.

NATICA HEROS Say

Pl. IV. Fig. 24. Length 60 mm.

The animal is more elongate than that of *N. duplicata*. Its color is light gray, the tentacles are light grayish in front, darker behind, very broad and flattened at the base and tapering to a point; a sharp angular depression is seen at the base of the tentacles. The foot below is yellowish. The propodium forms a sloping shield resting against the shell, it is closely wrinkled and a beautiful mouse-gray. The left side of the propodium is developed into a large, round ear-like opening into which the water may be seen pouring constantly, a veritable syphon, in fact. This syphon may be directed forward or backward. When the proboscis is extended the propodium is sharply cleft to make room for it, as shown in Fig. 24, (A). The protoconch is shown in Fig. 24, (B), Pl. IX. The protoconch presents in general outline that of the adult, the proportions, however, are widely differ-

ent, as shown in figure 24, (C), Pl. IX. This drawing is reduced, from a *Natica heros*, 80 mm in length, to correspond in size to that of the protoconch which is only ½mm. in length.

NATICA TRISERIATA Say

Pl. IV. Fig. 25. Length 16 mm.

This creature moves rapidly and has the power of crawling on the under surface of the water. The tentacles are wide apart, flattened transversely, broad at their bases, long and pointed, bordered with black on each side with a light interspace in the middle. (Fig. 25 A) tentacles enlarged.

NATICA CLAUSA Brod and Sow

Pl. IV. Fig. 26. Length 15 mm.

The animal differs in no important respect from the other species of *Natica*. The propodium assumes in form an irregular rhomboidal shield in front. The foot does not reach quite so far back as in *Natica triseriata*. A sketch of a young *Natica heros* resembles that of *Natica clausa* except that the tentacles do not appear so wide apart. The color of the entire animal is a delicate purplish tint.

NATICA IMMACULATA Totten

Pl. IV. Fig. 27. Length 8 mm.

The animal is white; elements of the foot expanded as in other *Naticas*. The only observation that I made was that the syphonal fold was large.

NATICA DUPLICATA Say

Pl. IV. Fig. 28. Length 50 mm.

The extraordinary character of the foot with its three divisions of propodium, mesopodium and metapodium fully developed and these lobes absorbing sea water like a sponge renders it extremely difficult to secure a normal outline of the parts. I have many sketches

of this species and *Natica heros* and they all vary in their outlines. Living almost completely immersed in the sand they plough ahead leaving a long, sinuous track on the beach. The individual shows no timidity and if one places his finger in the track of the animal the creature pushes strongly against it; accustomed as it is to push against pebbles and other objects buried in the sand it does this without alarm. The creature is very sluggish in its movements and three hours were consumed in attaining full expansion. The anterior portion of the foot formed a broad, sloping shield, in color and wrinkles closely resembling the pileus of the common edible mushroom. The creature is yellowish fawn, the propodium darker and the outside edge very dark colored. The tentacles are widely separated, short, broad, at base, flattened and curved outward, they are usually closely appressed against the shell and partially concealed by the propodium, as in all *Naticas* thus far examined; rarely are the tentacles seen free. The curious fold of the foot on the left side as seen in *Natica heros* was not seen in *Natica duplicata*. This fold represents a rudimentary syphon.

BELA DECUSSATA Couthouy

Pl. IV. Fig. 29. Length 10 mm.

The animal is nearly transparent with minute white dots marking its surface. The foot is long, narrow, truncate in front, its anterior margin finely wrinkled; tentacles capable of considerable expansion, wide apart; eyes third way down from tip of tentacles. JEFFREYS' figure of this species shows shorter tentacles with eyes half way up. He says "American specimens are much smaller than ours as is also the case with *Purpura lapillus* and *Buccinum undatum*."

COLUMBELLA LUNATA Say

Pl. V. Fig. 30. Length 5 mm.

Foot long, narrow, tapering behind; tentacles short, blunt, thickened, meeting at their bases, eyes at thickened base. Foot pro-

jecting far beyond the head; head black; body marked with blotches of grayish black. Syphon, long, encircled with black blotches. In crawling the syphon extends anteriorly.

COLUMBELLA AVARA Say

Pl. V. Fig. 31. Length 15 mm.

The soft parts resemble *C. lunata* in color and markings. Fig. 31 (A), and (B), head. (*C.*) *operculum.*

NASSA OBSOLETA Say

Pl. V. Fig. 32. Length 18 mm.

Body nearly white, mottled with soot-colored spots. Foot broad in front, diverging at each corner in sharply defined processes, recurved, distinctly indented in median line. Syphon long, recurved. Tentacles short, wide apart, eyes on prominent thickening at base of tentacles. The proboscis can be greatly extended and in figure 32 (A), the proboscis is shown widely extended, recurved and feeding on the surface of the shell.

NASSA TRIVITTATA Say

Pl. V. Fig. 33. Length 18 mm.

An extremely active creature in confinement leaping by a series of rapid somersaults, jumping at least four inches in a snapping way using the shell as a fulcrum. The foot becomes very long and narrow in jumping; the front of the foot is expanded on each side into long, narrow recurved points. The tentacles are long and sharp and at times stretched out in a straight line transverse to the longitudinal axis of the body, as in figure 33 (A). The two caudal appendages are long and wide apart.

BUCCINUM UNDATUM Lin

Pl. V. Fig. 34. Length 75 mm.

Foot broad, its anterior portion thrown into a number of folds in crawling. Body and syphon marked by irregular blotches of black;

head slightly notched in front; tentacles wide apart; eyes at base of tentacles on thickened shoulder; syphon long and recurved.

BUCCINUM CINEREUM Say

Pl. V. Fig. 35. Length 25 mm.

This shell is found along the entire coast. It is more abundant south of Cape Cod; north of the Cape it is found in restricted localities. A colony has been found in the Gulf of St. Lawrence. The northern form has a shorter shell. The tentacles are very long, nearly meeting at their bases, they are thickened half way up where the eyes are placed, beyond this the tentacles become attenuated and pointed. The body is cream-colored, dotted with light drab above, the creeping disk is yellow. The creature is sluggish in movement.

FUSUS ISLANDICUS Gemlin

Pl. V. Fig. 36. Length 70 mm.

Foot very wide, squared in front, rounded at sides, slightly rounded behind; yellowish white, head broad, tentacles wide apart, eyes on prominent thickenings near base. In crawling the head and neck are freely separated and project beyond the foot.

FUSUS PYGMÆUS Gould

Pl. VI. Fig. 37. Length 24 mm.

The shell follows the outline of *F. islandicus* but is diminutive in size, a full-grown specimen measuring 7-8 of an inch in length. There are minor differences between it and its giant relative, as pointed out by GOULD. The animal is pure white with black mottlings as in *B. undatum*. The foot is long and narrow, truncate in front, rounded behind. FORBES and HANLEY figure the animal of *Fusus propinquus* and compare it with *F. pygmæus*. In *F. propinquus* the tentacles are shown united at their bases whereas in *F. pygmæus* they are wide apart. JEFFREYS regards *F. pygmæus* as a variety of *F. islandicus* and says "It seems to bear the same relation to *F. propinquus* as

F. islandicus does to *F. gracilis.*" FORBES and HANLEY describe the egg capsules of *F. norvegicus* as being found in odd valves of *Cardium echinatum.* JEFFREYS describes the egg capsules of *F. norvegicus* as compressed hemispheres each holding from two to four embryos. Capsules of *F. propinquus* are attached to odd bivalves. I have found the capsules of *F. pygmæus* attached to the inside of a shell of *Cardita borealis.* Each capsule contained five embryos.

FUSUS DECEMCOSTATUS Say

Pl. VI. Fig. 38. Length 75 mm.

Body whitish, slightly mottled with black, mottling thicker near opercular lobe; tentacles very short and wide apart, base of tentacles thickened, supporting eyes.

TROPHON CLATHRATUS Lin

Pl. VI. Fig. 39. Length 14 mm.

The tentacles are long, united at their bases and for 2-3 their length are thickened supporting the eyes, beyond attenuated. The animal is uniformly white. The creature is active but not timid.

BUSYCON CANALICULATUM Say

Pl. VI. Fig. 40 Length 150 mm.

Body deeply maculated with black and slate colored blotches, tentacles wide apart, long and stout, pointed at their ends, maculated like the body, tips black, eyes on thickened base at lower third of tentacles. Foot broad, rounded in front, strongly auriculated. Ovulating September 7. In ovulating the creature was retracted within the shell, the egg capsules issuing between the edge of the operculum and the outer edge of the aperture (Fig. 40, A, Pl. VII). Figure 40, (B), Pl. VII, shows the appearance of the proximal end of the string of capsules. The creature first secretes in the mud a broad firm base and rough irregular beginning of the string as an anchor, these strings float vertically and mixed with the forest of eel grass

would easily be mistaken for some kind of weed. The protoconch (Fig. 40, C, Pl. IX) from the bulbous nucleus rapidly assumes the shouldered body whorl, the syphonal tube is very short as compared with the adult.

RANELLA CAUDATA Say

Pl. VII. Fig. 41. Length 24 mm.

This shell recognized by THOMAS SAY, in 1822, as belonging to the genus *Ranella* was very properly recognized by VERRILL as coming under the genus *Eupleura* of H. and A. ADAMS. A comparison of the animal with that of *Murex erinaceus*, of England, as given by JEFFREYS shows similar features of color, small tentacles, etc. The color of the foot is light yellow, the head and tentacles are white. The foot has great powers of extention anteriorly (Fig. 41, A).

The species has never effected a lodgment north of Cape Cod. It extends from the southern shores of Cape Cod along the entire coast to the Gulf of Mexico.

TRICHOTROPIS BOREALIS Sowerby

Pl. VII. Fig. 42. Length 15 mm.

The animal is whitish in color, muzzle deeply notched, tentacles rather short and blunt, the lower third slightly enlarged and thickened, supporting the eyes. The English representative is described as having rather long and tapering tentacles and muzzle elongate, pointed at the end and deeply split. My drawing was made from a specimen only partially expanded.

The nucleus for one whorl is smooth with slight revolving striations and then appear fine revolving ribs. The outer margin of the aperture was broken, as shown in the figure, 42 (A), Pl. IX.

ADMETE VIRIDULA Fabricius

Pl. VII. Fig. 43. Length 13 mm.

The tentacles are rather short and blunt, slightly apart at their bases, eyes on slight elevations at outer base of tentacles. Foot

square in front. The creature is an Arctic form; it is extinct in the English seas, though formerly existing there as it occurs fossil in the Red and Coralline crag at Sutton, England, as stated by JEFFREYS. Further comparison should be made between the English fossil and the New England form.

The following species, *Melampus bidentatus* and *Alexia myosotis* though belonging to the *Pulmonates*, inhabit the sea shore and though having no relation to the marine species of Gasteropods already described are included here.

ALEXIA MYOSOTIS Drap

Pl. VII. Fig. 44. Length 7 mm.

The body is white, short blunt tentacles with grayish axis, eyes at the inner base of tentacles, head lobe sharply separated from creeping disk. The creature is very sluggish in its movements.

CARYCHIUM EXIGUUM Say

Pl. VII. Fig. 45. Length 2 mm.

This creature, a land snail though living in wet places, is grouped with *Alexia* and *Melampus* and is therefore included here. The animal is white, tentacles very short and thick, rounded at tip, transparent, a line marks the junction with the body. The eyes are rhomboidal in shape and are situated at the median base of the tentacles in no respect bearing any relation to *Melampus* and *Alexia*. Its habits are apparently the same as those of the English species, *C. minimum*. JEFFREYS figures the English species with bulbous tentacles, like *Helix*, eyes on rounded supports and inside the base of the tentacles. The shells of the English and American species are so closely identical that the drawing in JEFFREYS' must be entirely wrong.

MELAMPUS BIDENTATUS Say

Pl. VII. Fig. 46. Length 14 mm.

The animal is mouse-colored, tips of tentacles brown. The tentacles are round, thick and retractile; eyes at inner base of tenta-

ales. The foot is divided into three portions, the anterior portion slightly wider than the other sections, rounded in front and strongly auriculated, the middle section slightly larger than the other sections, rounded in front and sides, the last division longer and narrower than the others and rounded posteriorly. Whether these divisions represent the propodium, mesopodium and metopodium respectively I do not know. FORBES and HANLEY say in regard to the English species, "The foot is sulcated across the centre so as to form two creeping disks." These authors describe the animal as creamy white. It has been stated that in the *Melampidæ* the protoconch is reversed. Plate IX, Figure 46 shows the young shell of *Melampus bidentatus* and the nucleus while somewhat oblique has a dextral turn of the spire at the outset, as shown in Pl. IX, Fig. 46 A.

On Plates VIII and IX are collected together the figures of the shells of the early stages of thirteen species referred to in the text. On the lower part of Plate IX are figured the young of three species of which the soft parts of the adult form I have not secured. Figure 47, Plate IX is probably that of *Diaphana debilis*. It illustrates very clearly the transference of the sinistral nucleus into the final dextral form of the shell. The planorbular reversed nucleus is also clearly shown in Figure 47 (A). In Figure 48, Plate IX is given the early stage of some species of *Philine*. The reversed nucleus is nearly upside down, the lines of growth shows its methods of transference into the dextral shell. *Vermetus lumbricalis*, (Figure 49, Plate IX) shows two whorls of the protoconch perfectly smooth and then begins the sharply carinated ribs which mark the adult shell.

APPENDIX

In my paper on "Living Lamellibranchs of New England" I protested strongly against the multiplication of generic names and quoted eminent authorities to show that my attitude was justified. Among these authorities quoted were DR. CHARLES SEDGWICK MINOT, FRANCIS N. BALCH, Esq., PROFESSOR HERBERT OSBORN, PROFESSOR EDWARD L. RICE, DR. A. A. GOULD, DR. WOODWARD and PROFESSOR KEITH of England, and a Professor of Zoology, at Harvard, all vigorously protesting against the evil and the uselessness of multiplying names. PROFESSOR RICE, president of the Ohio Academy of Science, says: "Within recent years the estimate of the number of known species of animals has reached 522,400 and with this enormous complex each tyro has been at liberty to trifle: it is like turning a child loose in the card catalogue of the library across the street. No wonder that a friend should exclaim in cynical disgust that he has given up the scientific nomenclature in favor of popular names on the ground that the latter are more definite and less confused." This complaint, as every zoologist knows, is not a new one. WOODWARD, in his incomparable "Manual of Mollusca," published seventy years ago, in a footnote on synonyms, says: "In PFEIFFER'S Monograph of Helicidæ, a family containing seventeen genera, no less than three hundred and thirty generic synonyms are noted; to this list DR. ALBERS, of Berlin, has lately added another hundred of his own invention!" I regret to say that I added ten more in my "Pulmonifera of Maine", in 1864, though half of these were promptly relegated to the synonomy column, the other half were finally recognized, namely: *Pallifera, Strobila, Helicodiscus, Striatura* and *Punctum.* These genera were based on structural peculiarities, the lingual membrane, the mandible and shell even to its microscopic markings. BINNEY threw doubt on my

observations on *Punctum* until DR. SCHACKO, of Berlin, in a study of the allied European species, *pygmæa*, established the correctness of my work.

The multiplication of generic terms has not been confined to students of mollusca; ornithologists, entomologists, botanists and doubtless students of other divisions are uttering their anathemas against this ruthless destruction of the Linnæan idea. So far and so rapidly has it gone in botany that a distinguished botanist at Harvard averred sarcastically that you had to consult the morning paper for the latest name! The distinguished zoologist, DR. CHARLES SEDGWICK MINOT, in a paper on "Zoological Problems" in speaking of the Linnæan system of nomenclature, says: "We have retained the form, while we have rejected the principle of nomenclature introduced by LINNAEUS, who used a generic name in a wide sense to indicate the kind. . . . . At present genera are also special groups and approximate to a single species so far has the subdivision gone. It results that the name we call generic is no longer generic in value. Of the two extremes the Linnæan is, I believe, preferable. I expect to see a large number of genera set aside hereafter." The evil of the whole matter is that while we respect the work of our leaders in malacology a rigid attitude insists that priority must be recognized despite the man who gives the name. "An original" as AUDUBON calls him = RAFINESQUE; a curious character who conceived a ridiculous method of classification = BOLTEN, or one who never saw or figured the soft parts stands in the same catagory with the masters. MR. JUKES BROWNE, in the Journal of the Malacological Society of London, (Vol. XI, p. 59,) in his synopsis of the family *Veneridæ*, in discussing nomenclature says, "Again if BOLTEN'S Museum Catalogue is recognized as a scientific publication, and is not excluded from the law of priority, his names would supplant those of LAMARCK, which have been in general use for a century and more. Moreover BOLTEN'S Catalogue gives no definitions of genera or sub-genera and is absolutely devoid of any scientific value; while LAMARCK'S genera were properly discriminated and defined. I hold, therefore, that such a displace-

ment of names is unjust, unnecessary and inconvenient, and as the Zoological Congress has now resolved that exceptions may be made in the rule of priority I hope that BOLTEN'S Catalogue may soon be declared an exception. Meantime I refuse to be bound by the trammels of this rule in the light fashion which some still advocate, I shall, therefore, retain the name *Callista*. . . . I shall not accept the revived use of the names *Cytherea* and *Paphia*, as proposed by DR. DALL, who adopts and adapts them from BOLTEN."

DR. SAMUEL H. SCUDDER in his great work on the Butterflies of Eastern United States and Canada, says: "Call things by what names one will, I only ask that the facts of nature be rightly interpreted; and where differences are found, that they be given their proper values as nearly as we can determine them, absolutely regardless of the effect it is to have upon the paltry question of names. Names can never have absolute fixity until we have absolute knowledge of all the facts regarding the features they represent, and the sooner this truth is recognized the better for all concerned."

In the light of this dictum, is the flood of new generic names based upon a study of the soft parts, the embryology, the early stages of the shell, etc.? With the exception of ORTMANN on the *Unionidæ* and BAKER on the *Limniadæ* I do not recall any systematist who has proposed a new genus based on the soft parts. PROFESSOR PAUL BARTSCH, in acknowledging my paper, writes as follows: "Your paper which you so kindly sent me, 'Observations on Living Lamellibranchs of New England,' has come to hand, and I have enjoyed very much looking it over. I am particularly pleased with your introduction.

"I think we are all ready to cry out when it comes to nomenclature and yet I do not see that there is any chance whatsoever of checking the tendency to split up until this will have been done to the limit. I believe when we will know all there is to be known about 'critters' we will begin to regroup and bring likes and likes together and will then probably be able to understand a little more fully where the knots in the meshes of our web should be placed. When I look at

IREDALE and his efforts in *Rissoidæ*, etc., I feel like shrieking; and yet I can see some excuse for what he is driving at. Only I wonder if it would not be possible to say in words what he is trying to express in generic terms and achieve the same ends. However, the trend seems to be toward the multiplication of terms. I remember well seeing a manuscript a little while ago in which someone was monographing the pelicans of the world. I think there are twenty-two recognized forms which he split up into twelve genera. At the time I thought what a blessing that we still have popular names by which we may recognize our birds. After all, in the ornithological field, the popular names have been the most stable of all. I might say the same is true of botany, because when I take up a modern systematic treatise, after having allowed my botanical studies to lie dormant for fifteen years or more, I find it necessary to look for popular terms to re-identify my subjects. So you see it is the trend all around.

"May the Lord have mercy on the man who lays aside a subject for as long a period as you have, and then takes it up again with fresh enthusiasm and vigor, because he will find himself a stranger in a strange land; that is, in such a tangle of changed nomenclature that it will seem as though he has never really known his subject. One thing, however remains, and that is, truth will always come to the surface and basic facts such as you are giving us regardless of the nomenclatorial vicissitudes to which the species may be subjected will always stand to receive full merit. Therefore, let me congratulate you and let me wish you ever so many years of activity as fruitful and forceful as your present effort."

PROFESSOR BARTSCH fully realized my dilemma as to names. It was hopeless for me to do more than to refer to the second edition of GOULD'S "Invertebrata" so that the student could instantly refer to a reliable figure of the species indicated. These figures to the number of 357 I drew on wood and they have been widely copied though rarely acknowledged. PROFESSORS VERRILL and SMITH in their "Invertebrate Animals of Vineyard Sound and Adjacent Waters" used many of them giving me full credit for the same. It is true I

might have copied C. W. JOHNSON'S names from his valuable catalogue published by the Boston Society of Natural History, six years ago, but these will soon be antiquated. That one may fully realize the ridiculous absurdity of the situation let me take for example *Fusus islandicus*. This animal is a good illustration of the unstable character of nomenclature. It is not a *Fusus* but has been known as one for over a century. Had I published these notes in 1859 a reference to the latest and highest authority at that time would have compelled me to use the generic name *Tritonium;* if published in 1870 it would have appeared as *Sypho*, while its diminutive companion, looked upon by some as a variety only of *islandicus*, would have been regarded as belonging to a different sub-family with the generic name *Chrysodomus;* had I waited until 1874, when I might have published most of my notes, it would have been regarded as *Neptunea*. In 1889 it would have been called *Chrysodomus*, and now the latest systematic catalogue, (JOHNSON) published only six years ago, recognizes it a *Colus*, and even its specific name changed too. Now the authorities for the above mentioned changes are among the leading ones on the subject in America: STIMPSON, DALL, VERRILL and JOHNSON. Is it fair to call me antiquated when I wish simply to indicate the shell of which the soft parts are drawn? A distinguished authority of *Jurassic ammonites*, QUENSTEDT, I believe, actually suggested using numbers to indicate the successive species found in the various deposits of the *Jura*. If we were to use numbers for species and *islandicus* were 224, for example, that number would hold no matter whether it were *Buccinoid, Fusoid*, or some other family. So in using the name *Fusus islandicus* it is a name found associated with all the above names as a synonym, and the leading name used by FORBES and HANLEY, JEFFREYS, GOULD and other authorities.

The taxonomist should become familiar with LOUIS AGASSIZ'S "Essay on Classification," first published as an introductory chapter in his great work "Contribution to the Natural History of the United States," afterwards published separately by LONGMAN. It was most unfortunate that his definition of the catagories of classification could

not have been established, but, nevertheless, there were many features that could have been adopted. He often reminded us in his lectures that species of a genus varied but little in size, that is you could not have under the same generic term one species the size of a mouse and another the size of a bear. With families no great departure in size would be shown, yet W. G. BINNEY, in commenting on my discovery that *Helix minutissima*, the smallest land shell in the world, had a mandible composed of sixteen separate plates and understanding that the jaw of *Orthaliscus undatus* was composed of separate plates would include both species in the same family! — one a turreted shell from 45 to 50 mm. in height, the other a discoidal *Helix* less than one half a mm. in height; or including under the same generic name *Helix alternata*, 20 mm. in diameter and *Helix asteriscus*, 2 mm. in diameter.

The rational binomial terms of LINNEAUS that have endured for over a century have now been encumbered by inserting the names of varieties into the major names of the species, such as *Pyramidula cronkhitei catskillensis* or *Modiolus* (*Brachydontes*) *demissus plicatulus!*

The bitterness which many students feel against the work of systematists in flooding nomenclature with a mass of generic names is little understood by those who defend the practice. PROFESSOR J. S. KINGSLEY, of the University of Illinois, writes me; "I have read with the greatest interest your remarks upon the vagaries of nomenclature and say Amen to all of them. This constant changing of names is anathema to me, and I refuse to allow the 'latest' name in many cases to appear in the Journal of Morphology. I loathe *Amblystoma*, I spurn *Amiatus* and I adhere to *Acanthias*, *Natica* is good enough for me, I still talk occasionally of *Amœba*, of *Limulus* and of *Crangdon*. But you and I are old fashioned and we do not appreciate the great advance in science which results in re-naming something already well named!"

PROFESSOR HAROLD S. COLTON, of the University of Pennsylvania, in a letter to me says: "My sympathies are with you on the matter of the names of animals. I wonder if I ever sent you my tirade against systematists of a few years ago in "Science." The names of animals now

mean nothing. I have to teach my students the 'binomial' system of nomenclature and after they have worked with animals a short time, I am forced to admit that the system is not binomial and the so-called scientific name is not as permanent as the common name. The whole situation is so outrageous, that I feel like annihilating certain offending systematists."

The Royal Academy of Belgium has just issued a volume of over 800 pages entitled *Les variations et leur hérédité chez les mollusques*, by DR. PAUL PELSENEER. The author is one of the world's leading authorities on mollusca. He is the author of mollusca in LANKASTER'S "Treatise on Zoology." In glancing through PELSENEER'S ponderous work one finds the general use of old generic names. *Helix* is the leading term with twenty-two modern generic names in brackets and many others whose modern generic names are suppressed. *Lamellibranchs* is good enough for him, the awkward name *Pelecypoda* does not appear. A glance at the exhaustive indices indicates the conservative attitude of this distinguished malacologist.

PLATE I

Figure 1. *Entalis striolata.*

2. *Acmæa testudinalis.*

(A), showing head, branchia, branchial arteries, mantle, papillæ.

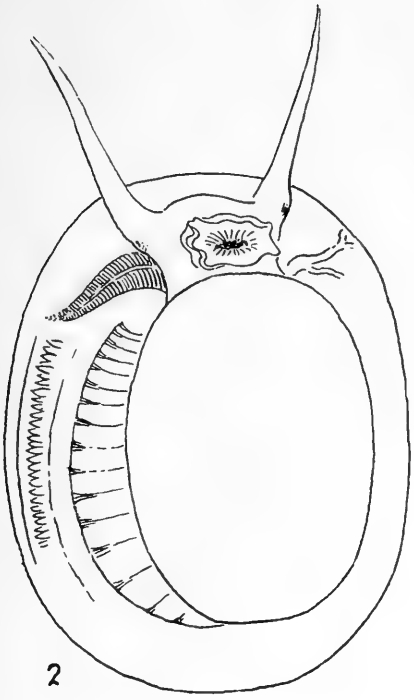
(B), tentacle greatly enlarged.

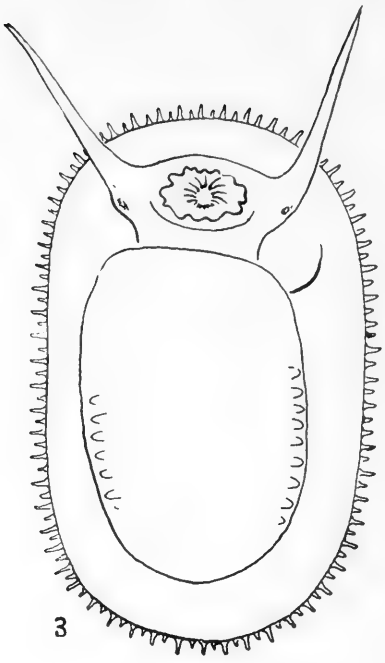
(C), mouth showing radula within.

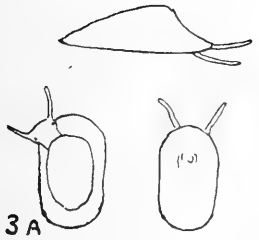
3. *Acmæa alveus.*

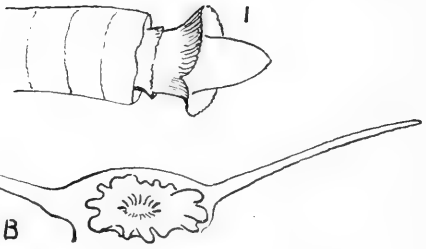
(A), head thrown to one side.

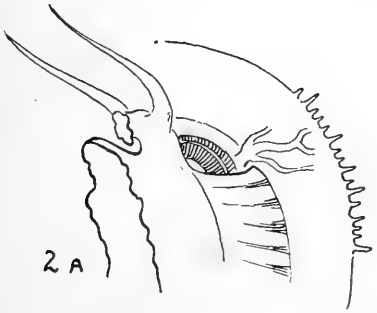
(B), enlarged view of head with tentacles and mouth from below.

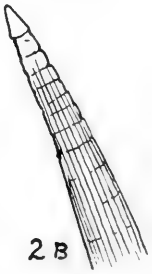

2


3


3A


1
3 B


2 A


2 B

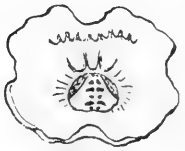

2 C

PLATE II

Figure 4. *Crepidula fornicata.*

5. *Crepidula plana.*

6. *Crepidula convexa.*

7. *Crucibulum striatum.*

   (A), young shell.

   (B), showing egg clusters.

   (C), in act of crawling.

8. *Cemoria noachina.*

   (A), ventral view.

9. *Margarita undulata.*

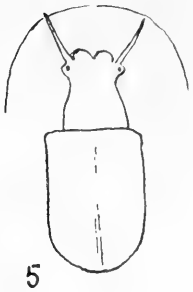
   (A), greatly enlarged view of marginal tentacles.

10. *Margarita helicina.*

    (A), enlarged view of snout, with enlarged papillæ at end of snout.

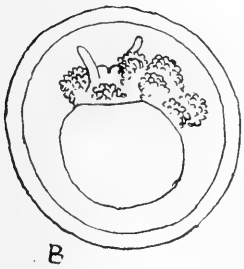
11. *Trochus occidentalis.*

4



5

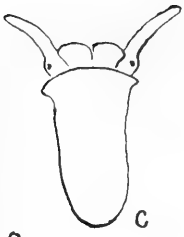
6



B

A

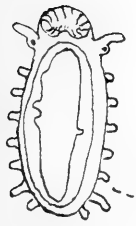
7



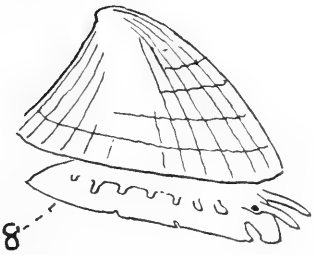
C

10

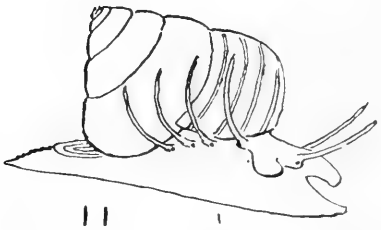
A



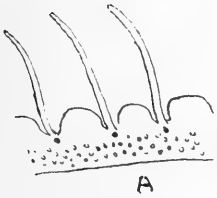
A



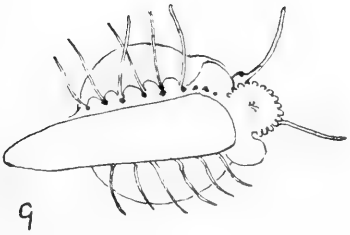
8



11



A



9

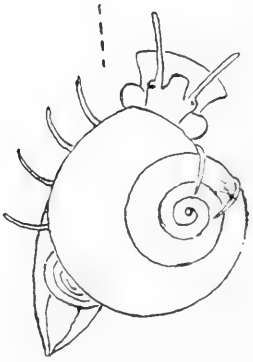


PLATE III

Figure 12. *Skenea planorbis.*

13. *Rissoa minuta.*

14. *Lacuna vincta.*

15. *Lacuna neritoidea.*

16. *Scalaria groenlandica.*

17. *Turritella erosa.*

18. *Aporrhais occidentalis.*

(A), immature specimen from below.

(B), enlarged view of foot showing caudal appendage.

(C), enlarged view of eye.

(D), bifurcated end of proboscis.

19. *Turbonilla nivea.*

20. *Menestho albula.*

PLATE III.

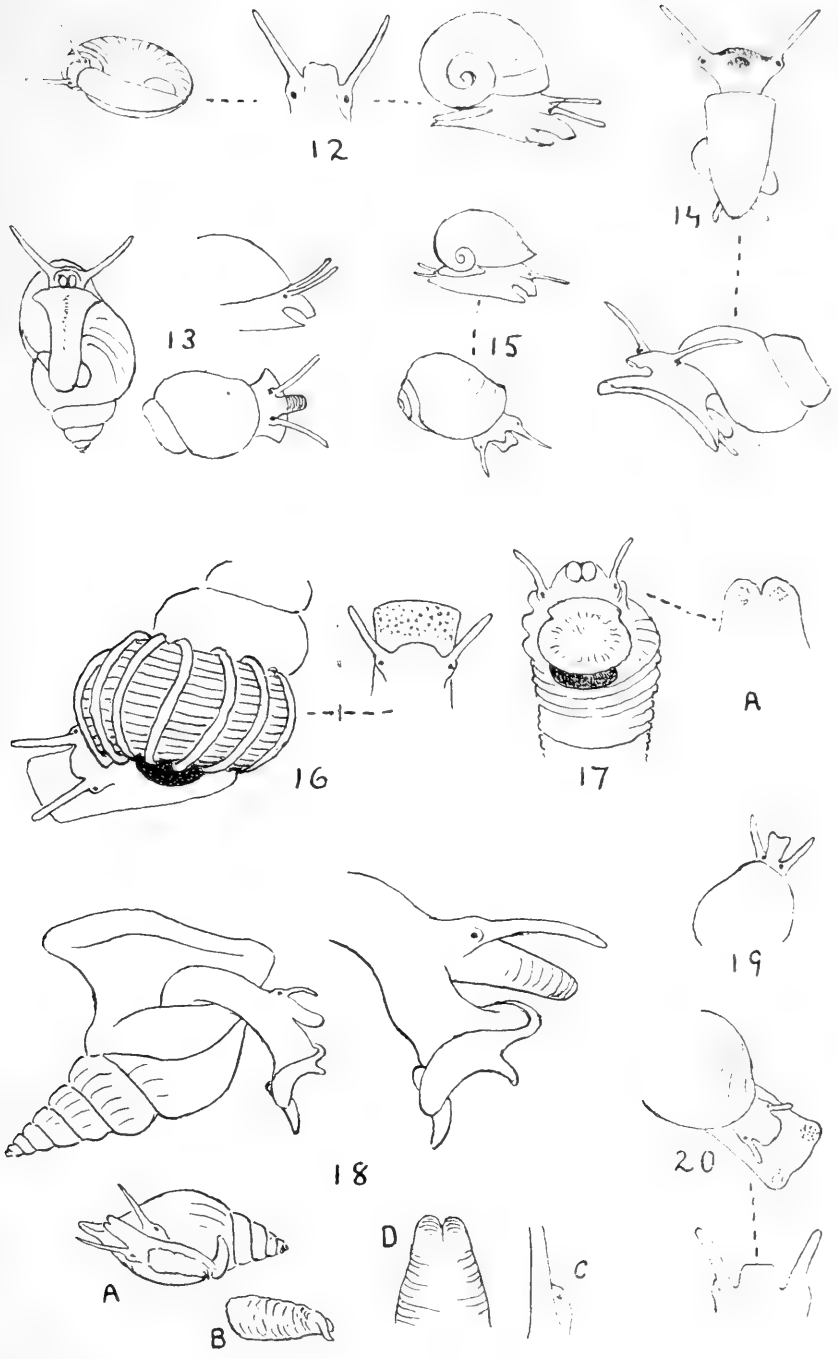


PLATE IV

21. *Velutina lævigata.*
    (A), genital organ.
22. *Velutina zonata.*
23. *Lamellaria perspicua.*
24. *Natica heros.*
    (A), foot cleft with proboscis extended.
25. *Natica triseriata.*
    (A), tentacles turned back on shell, greatly enlarged.
26. *Natica clausa.*
27. *Natica immaculata.*
28. *Natica duplicata.*
29. *Bela decussata.*

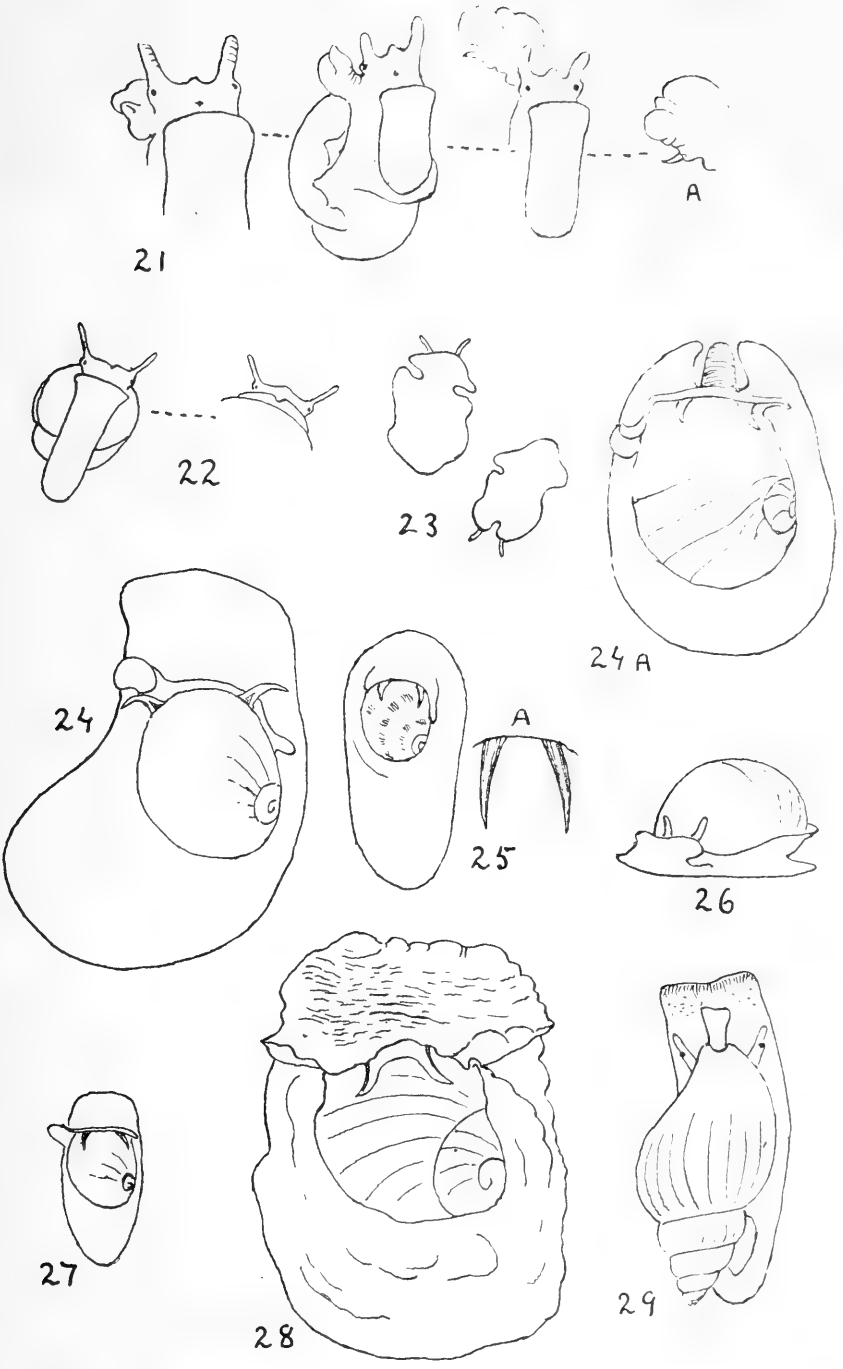

A
21
22
23
24 A
24
A
25
26
G
27
28
29

PLATE V

Figure 30. *Columbella lunata.*

31. *Columbella avara.*

(A) and (B), head, (C), operculum.

32. *Nassa obsoleta.*

(A), proboscis extended and feeding on shell.

33. *Nassa trivittata.*

(A), tentacles expanded in a straight line.

34. *Buccinum undatum.*

35. *Buccinum cinereum.*

36. *Fusus islandicus.*

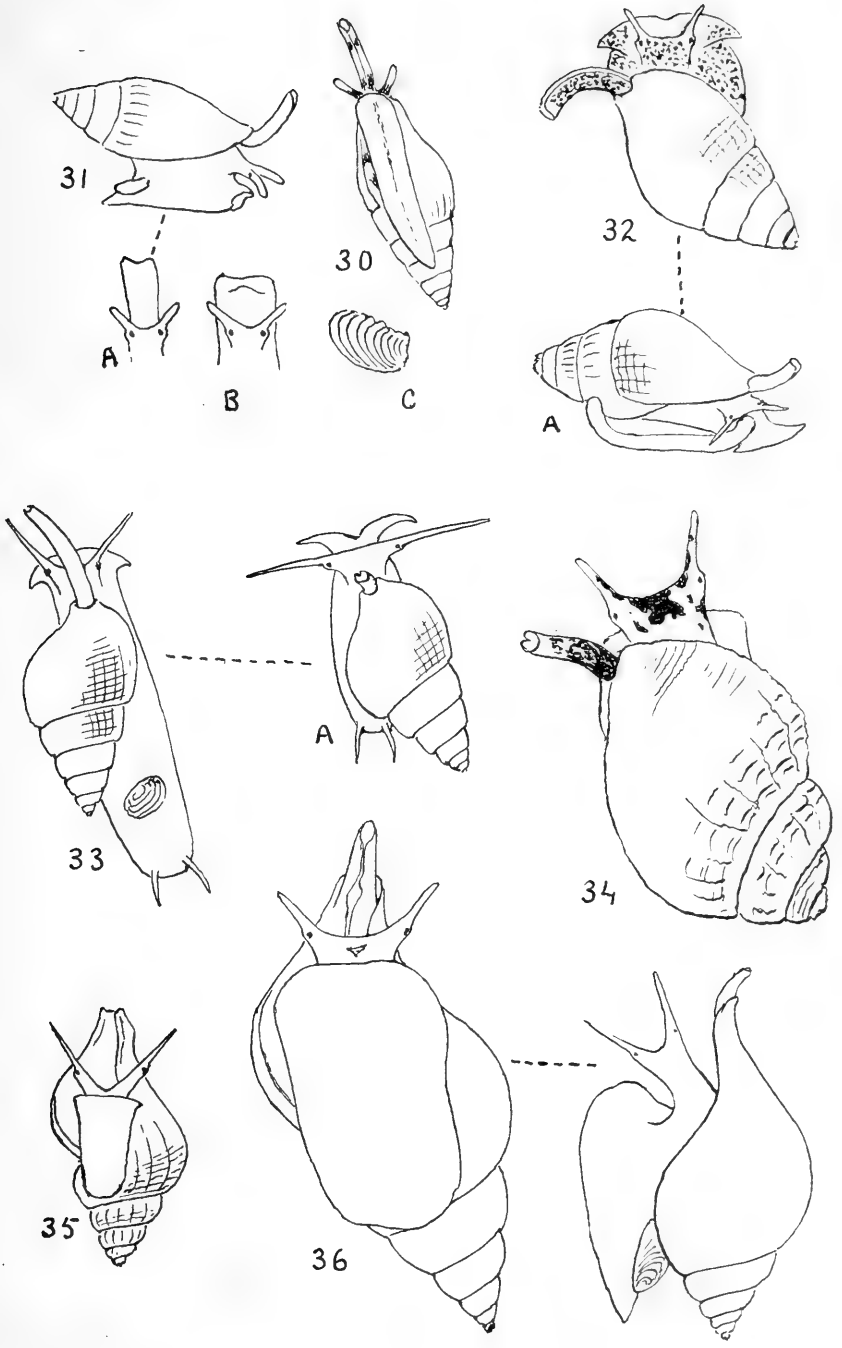

31
A
B
30
C
32
A
33
A
34
35
36

PLATE VI

Figure 37. *Fusus pygmæus.*

38. *Fusus decemcostatus.*

39. *Trophon clathratus.*

40. *Busycon canaliculatum.*

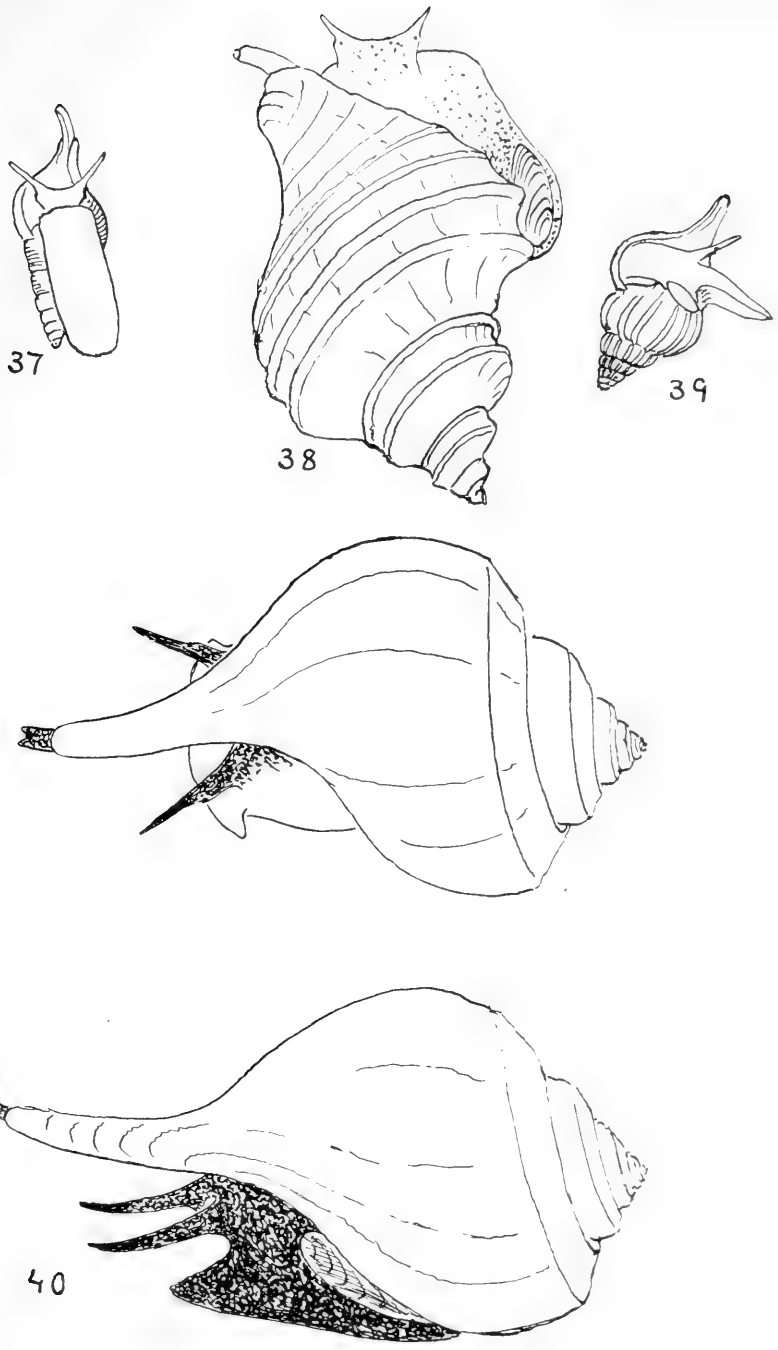

37
38
39
40

PLATE VII

Figure 40. (A) *Busycon canaliculatum*, egg chain issuing from shell.

(B) *Busycon canaliculatum*, egg chain showing proximal end.

41. *Ranella caudata.*

(A), showing great elongation of foot.

42. *Trichotropis borealis.*

(A), another attitude of head.

43. *Admete viridula.*

(A), enlarged view of tentacle.

44. *Alexia myosotis.*

45. *Carychium exiguum.*

46. *Melampus bidentatus.*

PLATE VII

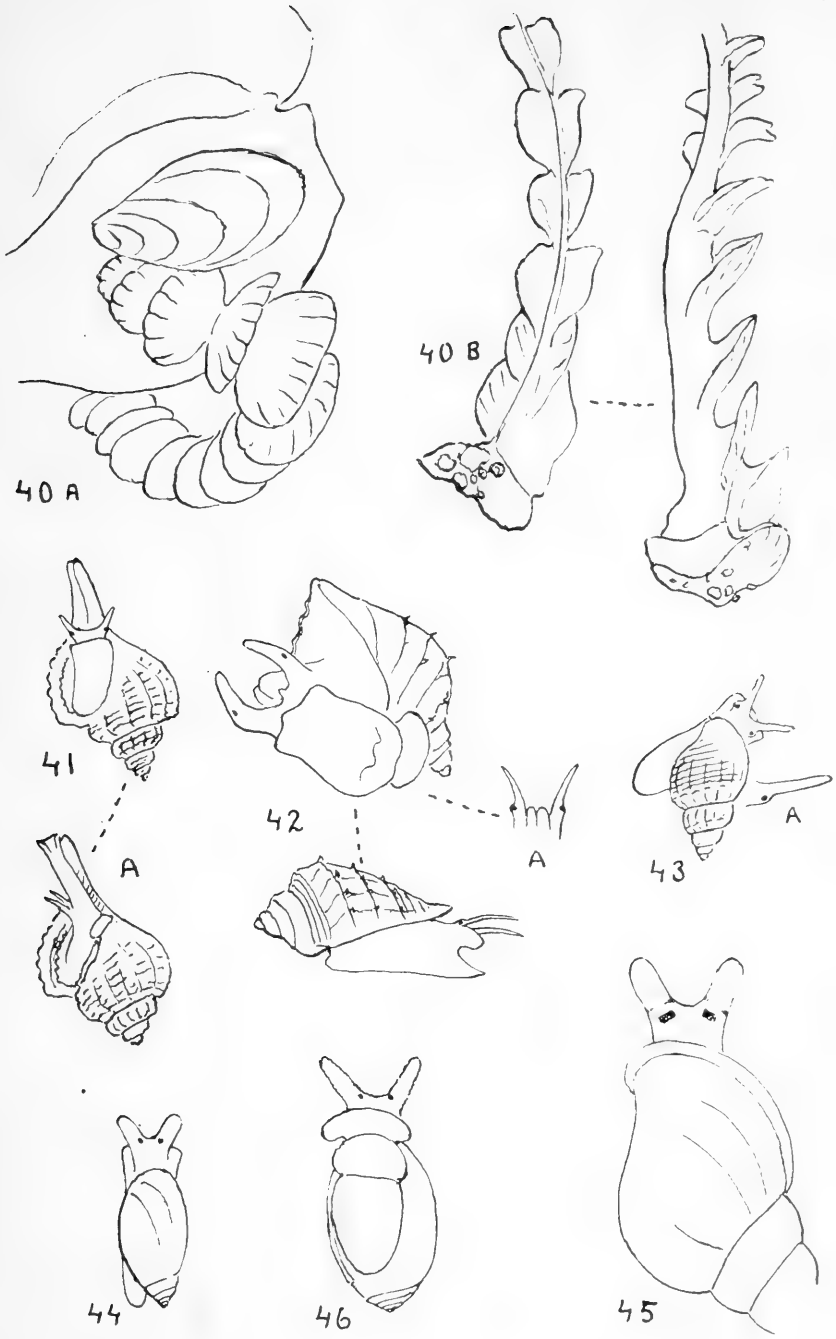


PLATE VIII

Figure 4. (A), *Crepidula fornicata.*

5. (A), *Crepidula plana.*

6. (A), *Crepidula convexa.*

8. *Cemoria noachina.*

10. (B), *Margarita helicina.*

14. (A), *Lacuna vincta.*

16. (A), *Scalaria groenlandica.*

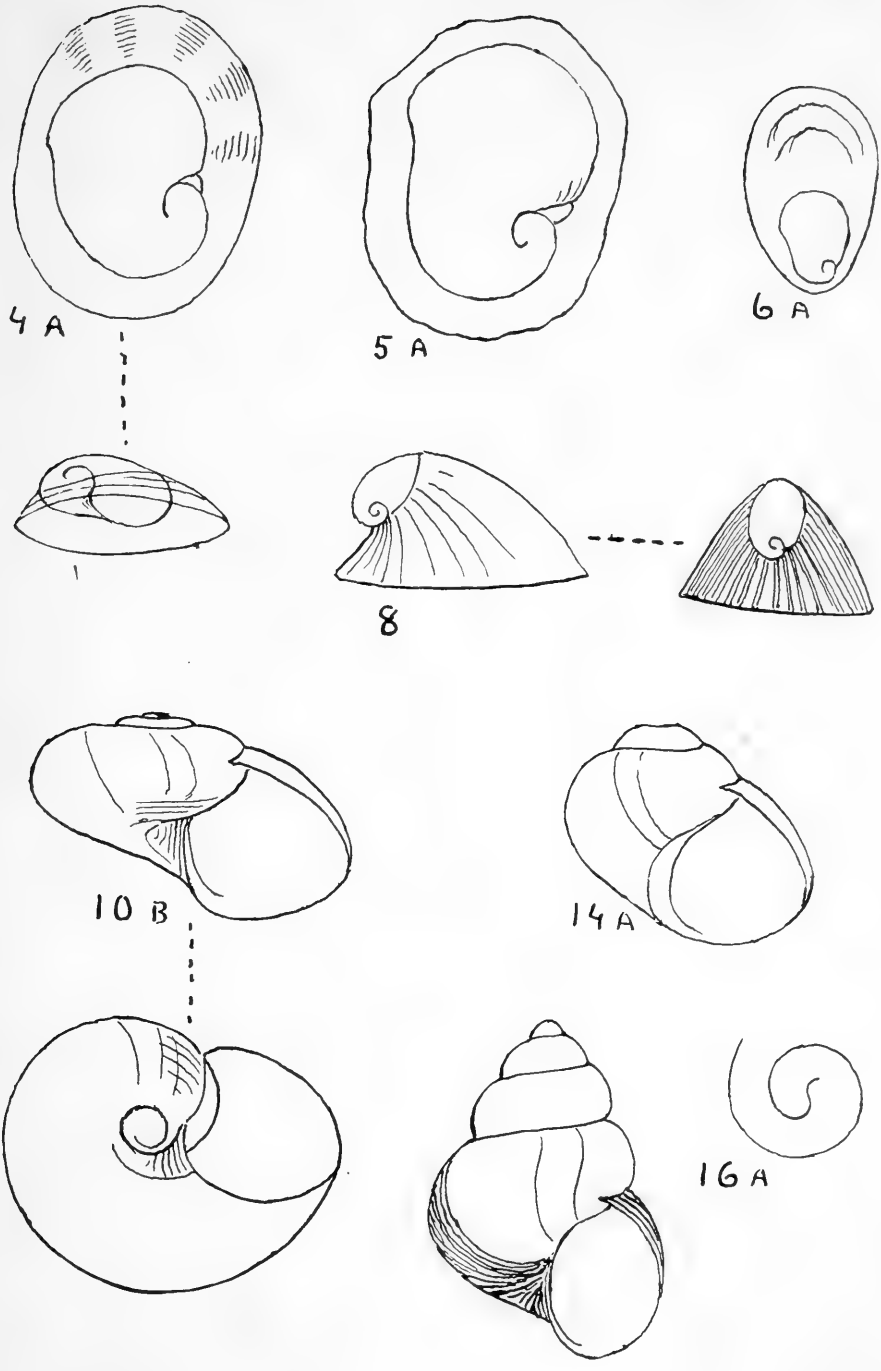

4 A
5 A
6 A
8
10 B
14 A
16 A

PLATE IX

Figure 21. *Velutina lævigata.*

24. (B), *Natica heros.*

(C), outline of adult shell reduced to size of early stage showing difference of form.

40. (C), *Busycon canaliculatum.*

42. (A), *Trichotropis borealis.*

46. *Melampus bidentatus.*

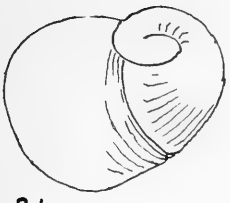
(A), top view of nucleus.

47. *Diaphana debilis.*

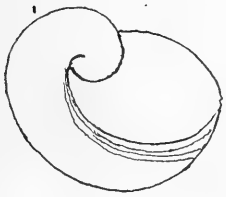
(A), shows the reversed nucleus.

48. *Philine sp?*

49. *Vermetus lumbricalis.*



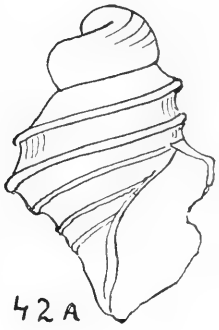
21



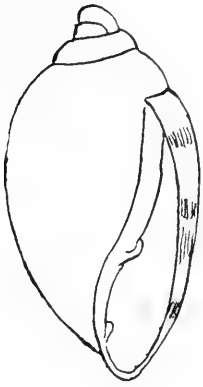
24 B

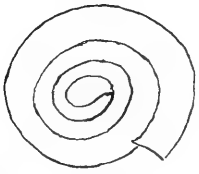
40 C

24 C



42 A

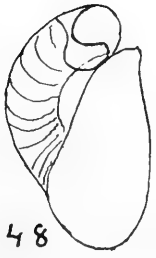




46 A

A

47



48

49