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REPORT

ON THE

INVERTEBRATA OF MASSACHUSETTS,

COMPRISING THE

MOLLUSCA, CRUSTACEA, ANNELIDA, AND RADIATA.

PUBLISHED AGREEABLY TO AN ORDER OF

THE LEGISLATURE,

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OF THE STATE.

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TO GEORGE B. EMERSON, ESQ.,

*Chairman of the Commissioners
for the Zoological Survey of the State :*

DEAR SIR,

I AM happy to inform you that I have brought to a close my researches concerning those departments of the Zoology of the State, which were assigned to me ; and I herewith forward to you such portion of my Report as I have found time to copy. The preparation and engraving of the figures with which I have been instructed to illustrate the work, will, however, necessarily cause considerable delay before it can be issued from the press.

Appointed, as I suppose myself to have been, under that section of the Constitution, which enjoins it upon the Legislature to encourage the arts and sciences, and to promote, among other things, "*a natural history of the country,*" I have ventured to make my Report mainly of a scientific character. It was the only way in which my labors could prove of much practical value, inasmuch as very few of the objects, belonging to the portion of the animal kingdom to which my attention has been given, are of much general interest, or of much importance in an economical point of view. I could not but suppose, that an effort to contribute something towards that branch of science, which we have hitherto received entirely at the hands of other States and other lands, would be desired and approved ; and that Massachusetts, which first set the example in those investigations of territorial natural resources, which have since been undertaken by almost every State in the Union, would not desire to be behind any of the States in this respect. I have, therefore, undertaken to present something more than a mere array of names in the form of a catalogue.

As I could not extend my plan, fully, to all the objects assigned me, I have selected the SHELLS, on which to bestow my chief attention. These I have endeavoured to describe and figure in such a

manner, that the Report might be used as a school-manual for the study of the Conchology of New England. Such a work is greatly in demand, and nothing of the kind is in existence.

I have also given a Catalogue of the Crustacea and Radiata which have been noticed in the State ; and also such information as I have been able to obtain concerning their economical uses and value.

A few of the objects noticed in the Report, have been obtained from fishes, and, perhaps, do not strictly belong to the waters of Massachusetts.

In addition to the Report, I have made a collection of all the objects noticed in it. This collection is now deposited in the rooms of the Boston Society of Natural History. It is desirable that it should be preserved entire, for future reference. To this Collection and to the Cabinet of the Natural History Society, the numbers in the Report refer.

Very respectfully, yours, &c.,

AUGUSTUS A. GOULD.

Boston, March 16, 1840.

A
REPORT
ON THE
INVERTEBRATA OF MASSACHUSETTS,
COMPRISING THE
MOLLUSCA, CRUSTACEA, ANNELIDA, AND RADIATA.
BY
AUGUSTUS A. GOULD, M. D.



INTRODUCTION.

It seems requisite for a clear apprehension of the following pages, and for the forming of a just estimate of the authority to which they may be entitled, that a few expositions should be here given.

No attempt has hitherto been made to give an account of all the shells of any particular region on this continent. No book exists in which we may find descriptions of any considerable proportion of the whole number of the shells of the United States. They are scattered through many volumes and periodicals, such as travels, scientific journals, magazines, newspapers, &c. The works of Say and Conrad are beautiful and accurate, as far as they go; and the Journal of the Academy of Natural Sciences at Philadelphia does indeed contain descriptions of very many shells, scattered through its volumes; but being unaccompanied by figures, it is difficult oftentimes to identify the shell intended. Moreover, all these works are rare and expensive; and it is very difficult for any one to collect together all the books requisite for the study of the conchology of any one district of our country. Through public libraries, however, and the liberality of individuals, I have had access to every publication of which I have any knowledge, that would be likely to aid me in my undertaking. The references to descriptions and figures which I have made, will show to what an extent these works have been consulted. They are not simply quoted from some other authority, but almost every one of them has been actually inspected.

For the purpose of ascertaining the arrangement which recent important progress in the study of the Mollusca would indicate,

and for ascertaining also what shells are common to the two Atlantic shores, I opened a correspondence, for information and exchanges, with several distinguished European conchologists, among whom I may mention Mr. G. B. Sowerby, of London, and Dr. Lovèn, of Stockholm. The former is well known as one of the most distinguished conchologists now living. To him I sent every doubtful species, and such as I apprehended might be identical with European species. Upon these he remarked at length, and, whenever the species proved to be European also, sent me European specimens for comparison, as well as such other species as I had a particular desire to see. For the very obliging and courteous manner in which he has thus assisted me in solving my numerous doubts, I cannot express my obligations too fully.

With Dr. Lovèn, who has for many years been exploring the seas of the north of Europe, and has examined the standard cabinets of England, France, and Sweden, I have also exchanged specimens. Hence I have obtained additional evidence of the identity of many of the species inhabiting the American and European shores of the Northern Atlantic.

I have pursued the same course with American conchologists, in order to ascertain with certainty whether the shells of this State are identical with those described by authors as found in other and even very distant regions. I may here acknowledge my obligations in this respect to Dr. J. W. Mighels, of Portland, Prof. Adams, of Middlebury College, Prof. Benedict, of Vermont University, Dr. J. C. Jay, of New York, Mr. T. A. Conrad, of Philadelphia, Mr. S. S. Haldeman, of Marietta, Pa., Dr. E. Foreman, of Baltimore, Mr. J. G. Anthony, of Cincinnati, and the late Dr. Ward, of Roscoe, Ohio.

Wishing for every possible confirmation that the names I had used were applied to the same shells that Mr. Say applied them to, I visited the cabinet of the Academy of Natural Sciences, at Philadelphia, where authentic specimens of most of the species described by Mr. Say are deposited, and which is, in other respects, a most valuable cabinet to the American naturalist, as it is the most ancient.

Living in a maritime city, and pursuing a profession which admits of but the occasional absence of an hour or two, my opportunities for exploring and collecting have been very limited. I have been dependent upon others, less confined than myself, for specimens, and to them am I indebted for most of the new and rare species which I have examined. I have experienced a liberality and coöperation from them, without which I could have done little.

I would especially acknowledge the liberality of Col. J. G. Totten, U. S. Engineers, for a choice collection of shells dredged by him in the harbour of Provincetown, and for unlimited permission to select specimens from his extremely perfect cabinet of American shells. Dr. L. M. Yale, of Martha's Vineyard, has supplied me abundantly with the shells and crustacea found at that island, with much information concerning them. Prof. C. B. Adams has contributed the numerous new species found by him in the vicinity of New Bedford. From Dr. J. B. Forsyth, of Sandwich, I have received shells of that vicinity. Mr. J. P. Couthouy, besides contributing numerous species, directed attention to the examination of the entrails of fishes, especially of the haddock, as an effectual and easy mode of acquiring the deep-water shells, which the fishes swallow for nourishment. To the cabinets of Rev. F. W. P. Greenwood, Dr. Seth Bass, and Dr. D. H. Storer, Mr. T. J. Whittemore, G. B. Emerson, Esq., and Amos Binney, Esq., I have had free access, and the liberty of employing choice specimens for descriptions and figures. On the last-named gentleman I have been mainly dependent for books; and without the use of his extensive library of works on Natural History, I could not have proceeded with any degree of assurance or satisfaction.

Every species described, and indeed almost every species mentioned, has passed under my own eye. The descriptions of species previously known have been written anew; partly, that they might be more minute in particulars, and partly, with the hope of using language somewhat less technical than is ordinarily employed by scientific men. Technical terms cannot be wholly avoided; and wherever they are dispensed with for the sake of intelligibility, it is at the expense of precision.

A conviction that the value of the work would be greatly enhanced by figures of such objects as have not been represented, or only in works which can rarely be seen, has induced me to avail myself of the permission given to add the desirable plates. The figures have all been drawn by my own hand, from nature. The engravings are not highly finished, but are sufficiently characteristic.

Having often been embarrassed by an uncertainty as to the true pronunciation of scientific names, and finding a great diversity of modes practised among naturalists, I have attempted to remove the difficulty, and have affixed the proper accents to every name. In this labor I have been greatly aided by the classic accuracy of Mr. C. Folsom, the conductor of the University Press, Cambridge.

It is necessary to advert briefly, also, to the position in which a shell should be held when comparing it with a description. The shell is supposed to be examined in the same attitude which it assumes when its animal is in motion. In the bivalve shells the *beaks* are at the summit, usually over, and always near the hinge, and always directed inwards and forwards; opposite to the beaks is the *base*; the *height* of the shell will of course be a line perpendicular from the beaks to the base, or more properly, a line parallel to this, where the greatest altitude is found. The anterior end is usually shorter and more exactly rounded than the posterior or hinder end, which is also higher and more gaping than the anterior. When the palleal impression has a nook or *sinus*, this always opens backwards. The *breadth* will measure the greatest distance between the sides of the two valves. If we take a univalve shell and apply its aperture to the table, we shall have nearly the position in which the animal carries it. The point of the spire will then be directed backwards and upwards, and the opposite extremity will be the front. The terms *front*, *anterior*, and *posterior*, as now used, correspond to the terms *base*, *lower*, and *upper*, of most books. The latter terms I have occasionally employed, when I thought they would convey most definite ideas; but they are less proper, and are always to be considered as synonymous with the former. Imagining the shell, then, to be car-

ried forward in its true position by the animal, the terms *right* and *left* are to be applied as they would be to any other animal.

In addition to the usual measurements, I have adopted another, for the univalve shells, which I call "divergence." It was first employed by Professor Adams, under the name of "apical angle," that is, the angle which would embrace the spire lengthwise; in other words, it measures the tapering of the spire.

The extent and difficulty of this work have very far exceeded my expectations. The unsettled state of our nomenclature,—the scattered state of the materials of which it must be constructed, have raised almost interminable doubts and difficulties. It is the first work of the kind attempted in this country; and it were presumptuous to hope that it is free from error. It is not a difficult thing to settle, satisfactorily, the proper genera and species of nine tenths of the shells and other objects we may find. But when an attempt is made to give *the whole*, the other tithe will require an equal amount of study, and, after disposing of it in the best way we can, we must leave it, mortified that we have perhaps settled nothing, but have merely given an opinion. It is easy enough to see errors and difficulties in these cases, but it is not so easy to adjust them.

Corrections and remarks relating to the facts or opinions given in the Report are respectfully solicited.

INVERTEBRATA
OF
MASSACHUSETTS.

MOLLUSCA.

THE Mollusca* are animals of a gelatinous or semi-fibrous structure, having no solid frame-work or skeleton, and being without jointed limbs. They reside both on land and in fresh and salt water. The variety in their structure, to adapt them to this diversity of habit, is very great; and their digestive and generative organs are as much varied to constitute them carnivorous and herbivorous, oviparous and viviparous, as they are in the higher orders of animals.

Though none of the molluscous or soft animals have any thing like a skeleton, and some of them have nothing solid in any way attached to them, yet the great majority have the power of secreting a solid structure which serves them as a habitation and a protection. These last animals are called testaceous mollusca, or TESTACEA, and their habitations we call SHELLS.

The arrangement and study of these marble dwellings, so beautiful in their models, so inimitable in their external sculpture and coloring, and oftentimes having their interior lined with pearl, constitutes the science of CONCHOLOGY. This science is ordinarily understood to embrace the study of the shells only, without reference to the structure and habits of their occupants. This, it will be at once seen, is altogether unphilosophical, — as much so as it would be to characterize any people with whom we

* The term is here used in the broad sense in which Cuvier employed it, and includes the animals embraced by Blainville in his type MALACZOÏRIA.

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had no previous acquaintance, by the style of their architecture, instead of making our observations, directly, upon the people themselves.

The true way is to unite the study of the animal and its shell ; and, while we base the more general classification upon the structure of the former, we may characterize the species by their less destructible habitation, the shell. The science thus extended, has received the appropriate name, MALACOLOGY.

As our observations are to embrace only a limited district, in which many whole families of Mollusca are yet undiscovered, and, indeed, are not likely to be found, and as detailed descriptions of all the animals would be alike tedious and unprofitable to those for whose benefit this Commission was intended, I shall incline to the old plan, and confine myself principally to the shells. And while the arrangement will be such as is actually indicated by the structure of the animals, so far as it has been ascertained, no allusion will be made to them, unless materially to assist in the recognition of species, or when, from their economical importance, some knowledge of them is desirable.

The naked Mollusca, as I before observed, are not numerous, at least, they are not so with us. They are found both on land and in water, and seem to occupy analogous positions in the different elements. Those found on land resemble the animals of the snail-shell, and are ordinarily supposed to be those animals, taking a stroll from their domicils. They are commonly called *slugs* ; but their counterparts of the sea cannot with propriety be called *sea-slugs*, inasmuch as that appellation is given to a very different group of animals.

As the species of naked Mollusca which have as yet been found with us are few, it may be as well to enumerate them here, separate from the Testacea, though their position in a natural arrangement would be very different.

They all belong to that division of mollusks, which, in progression, glide along upon a lengthened foot extending under the body (*Gasterópoda*), and with which we are familiar in any of our snails, or the common periwinkles of our sea-coast.

Those which are terrestrial seem all of them to belong to the genus *LIMAX*. They have an elongated, tapering form, the head

presenting two long and two short tentacula, the surface somewhat granular or regularly wrinkled; and on the back is a shield-like mantle, on the right side of which we see a notch opening into the respiratory cavity. They are found under decaying logs, and under bits of wood or stones in damp places, where they feed upon the decaying vegetable matter to which they have direct access.

They can scarcely be said to be destitute of a shell; for they have a minute, thin, nail-like shell, concealed under the front part of the mantle.

I have observed two species, neither of which has been described, so far as I have been able to ascertain. One of them may be called

LIMAX togata. It is two inches or more in length, and the shield extends quite back to the extremity of the animal, enveloping the whole animal except the head; the respiratory notch is near the front; the surface of the shield is neither granulated nor folded, but exhibits a uniform, rough appearance, somewhat like deer-skin; its margin is light fawn-color, the back is a dark purplish slate-color, and the sides are mottled with the two colors; the foot is wrinkled across, and is of a darker tint than the sides. It is very commonly found in woods, on turning over prostrate logs.

It is very probable that the great development of the shield, and its peculiar surface, with other peculiarities, which the contracted state of my specimens will not allow me to perceive, may entitle this animal to be regarded as a new genus. The *L. Caroliniensis*, Bosc, is an allied species. Férussac coincides with the above opinion.

LIMAX tunicata. This is a smaller, sub-cylindrical species, about $\frac{7}{16}$ of an inch in length, when extended, and about $\frac{1}{16}$ in width. The color varies from dark drab to dusky brown, and almost to black. The shield is short, rounded behind, its surface with conspicuous, interrupted, concentric wrinkles, the respiratory notch rather behind its middle. The neck is smooth, with an elevated, central line. The back behind the shield is marked with broken wrinkles, arranged lengthwise. The upper tentacula are granulated and black at their tips. Foot very narrow.

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It is found in rich grounds under stones and pieces of wood, where it may be sheltered from the sun ; and I do not recollect ever to have found one except in company of what are vulgarly called *sow-bugs* (*Porcellio*). It is a true *Limax*, and may be the *L. agr stis* of Europe.

The aquatic species are much more numerous, and are found in every sea. They are all remarkable for the peculiar arrangement of their branchi e or respiratory organs. These are exposed on the exterior of the body (*Nudibranchi ta*, Cuv.) in the form of little tubercles, filaments, plumy tufts, or branched leafets ; and the great diversity of their shape, arrangement, and coloring, constitutes the principal ornaments and most obvious characteristics of the animals. They have four tentacula or feelers, two of which are in the neighbourhood of the mouth, and are not conspicuous, and the other two placed at some distance behind the head, capable of being withdrawn out of sight, and presenting a laminated structure when extended. They crawl upon the bottom of the sea, or the roots of marine plants on which they feed. They are arranged under different genera according to the disposition of their branchi e and tentacula.

In *DORIS*, the branchi e have an arborescent appearance, are capable of being retracted, are seated on the middle line of the back behind the centre, and are arranged about the anal orifice in a circular manner (*Cyclobranchi ta*, Blainv.). But one species has as yet been observed, and of this I have been unable to find any description. I have, therefore, ventured to describe it under the name of

DORIS illumin ta. Animal prismatic, somewhat four-sided, the back arched ; color a pearly white, or light dove-color, dotted with greenish ; front of the foot slightly dilated at angles ; upper lip full and strongly pursed ; a line of six tubercles on each side diverges from the front to each side of the tentacula, making the back, at this part, of a four-sided form ; between these and the branchial tuft are four more tubercles on each side, in parallel lines, and then follow two on each side much longer than the rest, of a somewhat club-shaped form, followed by a few smaller ones towards the tail ; sides and back dotted by several small tubercles ;

branchiæ fringed, arranged in a semicircle. All the tubercles, the tentacula, and the branchiæ are tipped with a bright sulphur-yellow color. Length $\frac{3}{4}$ and breadth $\frac{1}{4}$ of an inch. Found in the Bathing-house at Craigie's Bridge, Boston.

Another family of the Nudibranchiata have the branchiæ disposed in numerous tufts along the sides and back (*Polybranchiata*, Blainv.), and they are not capable of being entirely retracted. The anal orifice also is found on the right side.

Those which have the branchiæ arborescent, and the tentacula about the mouth somewhat fringed, constitute the genus TRITONIA. We have one species of this genus.

TRITONIA *arborescens*, CUV. ; *Mém. du Mus.*, vi. 28, pl. 1, f. 8-10. *Doris arborescens*, MÜLL. and FABR. *Tritonia Reynoldsii*, COUTHOUY ; *Bost. Journ. Nat. Hist.*, ii. 74, pl. 2, f. 1-4.

Mr. Couthouy found them about the bathing-houses and timber-docks in Charles River, of singular size and beauty ; and his description and the figures illustrating it, are such as to give us an idea of the animal to the life. He found that the specimens he observed differed in some respects from the details given by Cuvier of *T. arborescens* ; and therefore he instituted a new specific name. But, making allowances for the distortion of Cuvier's specimens, which had doubtless been immersed in spirits, and adding the assurance of Dr. Lovèn, that the living *T. arborescens* corresponds exactly with Couthouy's description and figures, we have reason to conclude, that the animal observed by the two naturalists is the same.

Nothing can be more singular than this slug-like animal, mottled with brown and white, overspread with numerous wart-like excrescences, and apparently bearing some fifteen or twenty widely and numerous branched plants, which are the branchiæ. There are six pairs of these, including the tentacula, besides the three pairs about the mouth.

Genus *ÈOLIS*, has two or three pairs of simple tentacula, one of which is in the vicinity of the mouth ; and the branchiæ, in the

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form of elongated papillæ, arranged in rows along the sides or on the back.

Mr. Couthouy ventures the conjecture, that these papillæ are not the real respiratory organs, because he has seen that the animal will voluntarily throw them off, from slight causes, or that it may be forcibly deprived of them without material injury; which, he justly remarks, would not be likely to be the case, were they organs of so much importance as the branchiæ. He is disposed to regard them as merely subsidiary to the function of respiration. He has described and figured the following species.

ÈOLIS Bostoniënsis. *Bost. Journ. Nat. Hist.*, ii. 67, pl. 1, f. 1. Body an inch or more in length, foot large, tapering to a point behind, color faint brownish-white; tentacula four, cylindrical, rather long; branchiæ numerous, purplish-brown tipped with white, disposed in four or five clusters of 12 or 15 filaments each, on each side.

This is probably *E. rufibranchiàlis*, JOHNSTON, *Mag. Nat. Hist.*, v. 428, f. 85, and *Annals of Nat. Hist.*, i. 121. He states the number of clusters in his species to be variable, and more or less definite, and that the color varies, being reddish-brown, rose-color, scarlet, &c.

ÈOLIS salmonàcea, COUTHOUY. *Bost. Journ. Nat. Hist.*, ii. 68, pl. 1, f. 2. Body oblong-ovate, an inch or more in length, pale straw-color; tentacula four, rather short and blunt, the upper ones minutely serrated at the sides; branchial filaments about 100, flattened at their sides, disposed in lines along the back, of a beautiful salmon-color.

ÈOLIS divërsa, COUTHOUY. *Bost. Journ. Nat. Hist.*, ii. 187, pl. 4, f. 14. Size and shape about the same as the preceding; color a pale yellow, tinted red; lower tentacula long and slender, upper ones short, smooth, rounded, somewhat behind the first; branchial appendages about 90, slender, color orange, disposed in double rows along the back, with intermediate shorter ones.

Differs from the last in the form and position of the tentacula, the color of the branchiæ, &c.; but it may possibly prove the same.

EOLIS gymnòta, COUTHOUY. *Bost. Journ. Nat. Hist.*, ii. 69, pl. 1, f. 3. Nearly an inch long, slender, whitish; tentacula four, the inferior pair smooth and round, the superior rather shorter, compressed and minutely serrated at their sides; branchial appendages reddish-brown, disposed in seven remote clusters of five each, along each side of the back, those of the second and third pairs longest; back otherwise naked.

There are also a few animals whose organization brings them into a different class (*Annélida*), which form for themselves a solid covering. As they are usually included in systems of Conchology, it may be well to introduce them here.

These coverings are sometimes composed of clay, sometimes of agglutinated particles of sand, and some are calcareous secretions, like the usual material of shells. They are all of a tubular form, tapering posteriorly, and hence the animals which construct them are called *Tubicolæ*.

PECTINARIA Belgica, LAM. (*Amphitrite auricoma*, MÜLL.), State Coll., No. 266, has a conical tube, a little curved, about two inches long, and a fourth of an inch in diameter at the larger end. It is composed entirely of grains of sand, cemented together by a glutinous secretion of the animal, in a single layer, and in regular order. Of course the tube is very fragile. The animal appears at its aperture, bearing on its head two tufts of short, golden plumes.

It is not unfrequently found thrown upon the sandy shores of Cape Cod and the neighbouring islands. (FIGURE 1.)

From the stomachs of fishes I have taken specimens of *Pectinaria* which may belong to a different species. They are composed of very fine grains of sand, are not easily crushed, not more than an inch in length, and quite as much curved as the horns of cattle usually are. State Coll., No. 270. (FIGURE 2.)

AMPHITRITE ventilàbrum, LAM. (*Sabèlla penicillus*, LIN.), State Coll., No. 259, has a long tube, more or less contorted, composed of clay. The animal, when protruded, exhibits two beautiful tufts of long, finely feathered branchiæ. It is very common on the under side of logs which have lain for some time in the timber-

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docks, and adheres by one side throughout nearly its whole length. It is also found upon stones drawn up from the bottom of the sea. It is well figured by Ellis, *Corallines*, pl. 34.

The family *Serpùlea*, Lam., have solid, calcareous tubes, more or less coiled, much in the manner of serpents ; thus approaching, in form, the regular shells.

GENUS SPIRÓRBIS, LAM.

Tube snail-like, flattened beneath and adhering.

These are minute tubes, coiled up spirally, found adhering, in large numbers, to marine plants, and sometimes shells, which are thrown up from deep water. They are usually white, so as to appear like dead and bleached shells. They adhere by their tips, and, as they are presented to the eye, most of them appear dextral ; but if we consider that we actually look at the base of the shell, we perceive that they are in truth reversed.

SPIRÓRBIS NAUTILÓIDES, Lam.

State Coll., No. 262. Soc. Cab., No. 2312.

Shell about one tenth of an inch in diameter, white and smooth, or slightly wrinkled, consisting of three or four whorls, each including the preceding one ; and, as each rises higher than the other, they form a tunnel-shaped umbilicus, exhibiting a portion of each volution ; the suture is indistinct, and the whorls seem consolidated ; the outer whorl is flattened out into a broad, spreading base, where it is attached, thus increasing the diameter of the shell at this part by nearly one half. Aperture circular.

Found on sea-weed, shells, crabs, &c. It is the *Serpula spirórbis* of Linnæus. (FIGURE 3.)

SPIRÓRBIS SPIRÍLLUM, Lam.

State Coll., No. 261. Soc. Cab., No. 2313.

This shell is of about the same size as the preceding ; and is distinguished from it by its more cylindrical structure, the much greater distinctness of the whorls in the umbilical concavity, a more

glossy surface, and above all, by the absence of any flattening of the outer whorl where it rests upon its residence. The whorls are so loosely connected as sometimes to be entirely distinct ; and the aperture frequently looks directly upward. Aperture circular.

This species is more common than the preceding, and is found grouped in a similar manner upon fuci, stones, &c. It is the *Serpula spirillum* of Linnæus.

SPIRÓRBIS SINISTRÓRSA.

State Coll., No. 263. Soc. Cab., No. 2314.

A third species, which I take to be the one above named, I have seen only upon stones and shells drawn up by fishing lines at St. George's Bank. It is a smooth, glistening, translucent shell, with three or four whorls, turning in opposition to the sun. The whorls are nearly distinct from each other, not always preserving a regular spiral, but occasionally stretching out for some distance in a straight direction ; one whorl generally lies upon another, so that the outer whorl seldom touches the object on which the shell rests. Diameter about $\frac{1}{4}$ inch. It was first described by Montagu, under the name of *Serpula sinistrórsa*. (FIGURE 4.)

GENUS SERPULA, LIN.

Tubes solid, calcareous, irregularly coiled, solitary or in groups, permanently adherent ; aperture terminal, rounded, simple.

It is probable that several species of this genus live on our coast. They attach themselves to stones, pieces of wood, and shells of the mollusca and crustacea ; and such of them as we meet with are generally thrown up from the deep by violent storms, or conveyed from warm climates on the bottoms of vessels. They grow to a much larger size than Spirórbis, and are chiefly distinguished by not observing any regularity in the arrangement of their convolutions. I am not certain that we have more than one species habitually living on our coast.

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SÉRPULA VERMICULÁRIS. Lin., &c.

State Coll., No. 260. Soc. Cab., No. 851.

Shell cylindric, the tube gradually enlarging, white, somewhat wrinkled circularly, usually adhering throughout its whole length, but observing no particular mode of convolution; when arrived at a large size, the aperture is of the magnitude of a goose's quill.

We may now proceed to describe the testaceous mollusca of this State, in their natural order, so far as that order is yet determined.

They may be arranged, in the first place, under three grand divisions, based principally upon their most conspicuous external organs, those which are employed in progression or in procuring their food.

A. Tentacular branchiæ fringed and coiled, used for prehension; shells multivalve, CIRRIPEDES, Lam.

B. Inhabiting bivalve shells, CONCHI'FERA,* Lam.

C. Having a foot beneath them adapted to creeping; shells mostly univalve, GASTERO'PODA, Cuv.

It will not be necessary to enter into an exposition of all the families and further sub-divisions which may, or might, have been instituted. The object is to render the matter as available as possible to beginners in science, or to the general reader.

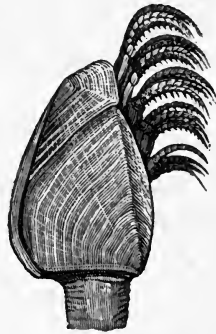
* The more comprehensive and more approved term ACÉPHALA is here avoided, in order to exclude the *Ascidians* of Lamarek, which are true headless mollusks, but without shells.

CLASS CIRRÍPEDES, LAM.

The Cirrípedes are so called from their arms or tentacles, which are curled up like a lock of hair, and with which they seize their prey. It is the group of animals which inhabit the shells commonly called *barnacles*.

These shells are all fixed, either directly or indirectly to some foreign body. To compensate for this relative immobility, they usually attach themselves to locomotive or floating objects, such as drift wood, vessels' bottoms, fishes, lobsters, &c. Many of them are, therefore, extensive voyagers, and hail from no particular sea. During the last summer, two vessels lay side by side at one of our wharves, one from India, the other from Sweden, and their bottoms were occupied by similar species of barnacles. In long voyages, especially in warm climates, and still more certainly where vessels are not sheathed with copper, the barnacles adhere in incredible numbers, and grow to such a size, as materially to impede the course of the vessel. Conveyed in this way, they are brought in contact with their food, and are seen in every port. Other barnacles adhere to stones, piles, and similar immovable objects, and are entirely dependent for their food upon such objects as the passing current brings within the reach of their arms.

They have several pairs of arms or tentacles, which they can coil up within their shell, or protrude, at pleasure. Each of the arms is double, and their edges are garnished with a kind of fringe, so that they appear somewhat like small feathers. When covered by water, for they are sometimes left by the tide, their arms are in constant motion, and remind one of the spread human hand grasping at something in space, a mosquito, for instance. This grasping motion is regular, at the rate of 80 or 100 times in a minute.



Nature has also provided that these sedentary animals may be widely diffused. Eggs are discharged by the parent in great numbers, which soon produce little animals very different in shape

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from their parents. These float about in the sea in countless numbers, until they come in contact with some substantial residence, to which they unceremoniously affix themselves, and then assume the shape and habit of the parent.

The obstruction they cause to vessels is the only material harm they do ; while, on the other hand, they afford no little protection to wharves, the piles of bridges, and other submerged wooden structures, by encasing them with a bony crust.

Only two or three species permanently inhabit our shores ; but as they are constantly seen and collected at all our wharves and ship-yards, I have thought proper to regard them as denizens.

The Cirripedes are naturally divided into two groups ; those which are sessile (*sessilia*), or seated firmly and directly upon their station, and those which are mounted upon a stem or stalk (*pedunculata*).

† SESSILIA. *Shells sessile.*

GENUS CORÓNULA, LAM.

Shell of five consolidated pieces, conoid, truncated at its extremity ; walls very thick, interiorly excavated into radiating cells ; operculum of four valves.

Shells belonging to this genus live attached to the skin or shell of some marine animal. Two or three species of them live, partially imbedded, in the skin of the whale. This monster of the deep is not unfrequently taken in the vicinity of Cape Cod and Cape Ann, and one species of barnacle has been found upon him.

CORÓNULA DIADE'MA.

Shell globose-conical, truncated at tip ; surface exhibiting six triangles, each of which has four ribs, marked across with beaded striæ.

State Coll., No. 255. Soc. Cab., No. 2075.

Lepas diadema, LIN., MONTAGU ; *Test. Brit.* 13. WOOD ; *Index*, pl. 1, f. 2. BORN ; *Mus.*, t. 1, f. 5, 6. GUALT. ; t. 106, f. A. *Phil. Trans.* 1758, t. 34, f. 1. CHEMN. ; *Conch.*, viii. t. 99, f. 843, 844. LISTER ; *Conch.*, t. 445, f. 288. DONOVAN ; *Brit. Shells*, ii. t. 56, f. 1, 2.

Bálanus diadéma, BRUG.; *Encyc. Méth.*, pl. 165, f. 13, 14.

Corónula diadéma, LAM.; *An. sans Vert.*, v. 652. LEACH; *Encyc. Brit. Suppl.*, iii.

171. BLAINV.; *Dict. des Sc. Nat.*, x. and xxxii. pl. 117, f. 4. SOWERBY; *Genera*, f. 1. BURMEISTER; *Naturgesch. der Rankenfüsse*, 34, pl. 2, f. 1-14.

Poly'lepas diadéma, GRAY; *Annals of Philos.*, x. 105.

Diadéma vulgàris, SCHUMACHER; *Nouv. Syst. des Vers*, 91.

Shell usually cylindrical, with a conical summit, truncated at tip, sometimes of an inflated or globose-conical form. The surface is divided into twelve triangular compartments, six with the apex downwards which are depressed, plain, and faintly striated across; and six with the apex upwards, each of which has four rounded ribs, marked across with beaded folds or wrinkles; orifice one third, or more, of the diameter of the base, mostly closed by a membrane, through a fissure in which, closed by two valves, the arms are protruded. Beneath, arranged in six compartments, each of which is excavated into three cells with a small, intermediate one at the circumference. Diameter $1\frac{1}{2}$ to 2 inches, height an inch or more.

It is distinguished from *C. balanàris* by its more erect and elongated form, its larger orifice, and the beaded wrinkles of the surface.

GENUS BÁLANUS, LAM.

The Bálanì or Sea-acorns are immovable in all their external parts, and attach themselves generally to inanimate bodies, either fixed or floating, though they are occasionally found attached to lobsters, shells, corals, &c.

BÁLANUS TINTINNÁBULUM.

Shell purplish, conical, the six triangles with irregular, unequal ribs, the intervening spaces sculptured across with distinct lines; operculum rostrated behind.

State Coll., No. 250. Soc. Cab., No. 2076.

Lepas tintinnábulum, LIN.; *Syst. Nat.*, 1108. CHEMN.; *Conch.*, viii. t. 97, f. 828, 829, 830. GUALT.; *Conch.*, t. 106, f. H. RUMPHIUS; *Mus.*, t. 41, f. A.

KNORR; *Vergn.* v. t. 30, f. 1. WOOD; *Index*, pl. 1, f. 5. *Gen. Conch.*, t. 6, f. 1. *Bálanus tintinnábulum*, LAM.; *An. sans Vert.*, v. 658. BRUG.; *Encyc. Méth.*, pl. 164, f. 5. SOWERBY; *Genera*, fig. 1. SCHUMACHER; *Essai, &c.*, 90. RANZANI; *Memorie, &c.*, 33, pl. 2, f. 2-4 GRAY; *Annals of Philos.*, x. 104.

Shell conical, the sides more or less inclined, and sometimes a little turgid; color violaceous. Surface having the raised tri-

angles grooved lengthwise, so as to form numerous unequal, irregular ribs; and these are crossed by distant, circular threads, which probably indicate the stages of growth; the depressed areas are plain and glistening, marked across by regular, deeply sculptured lines. Aperture sub-triangular. Two anterior valves of the operculum deeply grooved or plaited; the two posterior, on each side, rising considerably above them and curving forwards, resemble the beak of a bird of prey; at their sides slightly grooved. Diameter at base 1 inch; height $1\frac{1}{2}$ inches.

This species probably does not breed in our climate, but is one of the most common shells found on vessels arriving from warmer regions.

There are some other species, similar to this, which are occasionally, but less frequently, observed. *B. tulipa* is principally distinguished by its more rosy tint; the raised areas are distinctly marked across, but scarcely at all lengthwise, and the depressed areas are nearly smooth. *B. gigas* and *sulcata* are also closely allied.

BÁLANUS GENICULÁTUS.

Shell conical, white, the prominent triangles with 8 or 10 usually alternately larger and smaller ribs, rendered rough by coarse lines of growth; valves of operculum coarsely striated.

FIGURE 9.

State Coll., No. 254. Soc. Cab., No. 2310.

Bálanus geniculátus, CONRAD; *Journ. Acad. Nat. Sc.*, vi. 265, pl. 11, f. 16.

Shell regularly conical, dirty greenish-white; much like *B. tinnábulum* in its exterior, but broader at base in proportion to its height, and never inflated; the elevated triangles on each side of the posterior one are very small, with only two or three ribs; the others are sub-equal, and have 8 or 10 ribs; these are much raised, but usually alternately larger and smaller, somewhat compressed at the sides, and their edges rendered nodulous by the conspicuous, rather distant lines of growth, which cross them. The depressed areas are faintly marked with minute, crowded cross lines. Diameter of the aperture about half that of the base. Operculum having the anterior valves wrought into coarsely plaited ridges, which incline over each other, and which

are crossed by very fine radiating lines. Diameter at base 1 to $1\frac{1}{2}$ inches, height two thirds of the diameter.

Found almost invariably attached to *Pecten Magellanicus*, on which it is occasionally drawn up by our fishermen; and is abundant along the eastern coast of Maine, and at the Bank fishing-grounds.

This shell, like its co-species, is subject to many varieties; and some of them approach so nearly to some of the figures and descriptions of *B. Scoticus* and *B. communis* of the North of Europe, that it is really difficult to decide upon its title to a distinct appellation. In this case it seems proper, for the present, to retain the name which Mr. Conrad undoubtedly applied to this shell. The number of ribs varies, as do the elevations upon them; which last are usually two, however, as Mr. Conrad observes.

BALANUS EBURNEUS.

Shell white, smooth, obliquely conical, the raised triangles with lanceolate points, all inclined backwards, within regularly grooved; operculum with the two anterior valves decussated at base, not beaked.

FIGURE 6.

State Coll., No. 253. Soc. Cab., No. 3418.

Shell white, smooth, hinge obliquely conical, circular at base, inclining backwards; the raised portions are smooth, or very faintly wrinkled lengthwise; they all terminate in sharp, lance-pointed summits, all of which point backwards, and the last one curves over so much as to form a prominent beak. The intermediate, depressed spaces are small and usually plain, but in very old specimens they are crossed by crowded, rasp-like lines. Interior regularly and firmly grooved up and down, and the walls with a single series of pores, equal in number to the grooves. Aperture constantly ovate-triangular, rounded in front, acutely angular behind, moderately large. Operculum has the two anterior valves checked with transverse and longitudinal lines, which are well defined at base, but almost disappear at tip; they are coarsely toothed at their adjacent edges; the posterior valves very slightly grooved across. The tips of all four valves meet and form an accurate pyramidal summit. Diameter at base $\frac{4}{5}$ inch, height $\frac{3}{7}$ inch.

Adheres in clusters to floating wood, to shells, crustacea, &c. It may be obtained almost any time at a lobster-stand. It often attains a much larger size.

It differs from all other described species in having its surface entirely without ribs. In its earliest stages, *B. ovularis* is also smooth, and similar in shape to the young of this species; but even then, this shell exhibits its triangular aperture, while the other is diamond-shaped. *B. ovularis* and *B. laevis* of Lamarck, though both described as smooth, are both said to have delicate ribs. The first is also described as cylindrical; while the second is said to have a contracted aperture. Mr. Sowerby states that he is unacquainted with it. It appears not to be an uncommon or a local species, as I have taken it from the bottom of a ship of war from the West India station.

BALANUS RUGOSUS.

Shell white, sub-cylindrical, valves raised into angular points; without, coarsely and irregularly ribbed; aperture large, rhomboidal; operculum nearly smooth, with acute, curved, slightly diverging points.

FIGURE 10.

State Coll., No. 289. Soc. Cab., No. 2311.

Lepas borealis, DONOVAN; *Brit. Shells*, v. pl. 160.

Lepas rugosa, WOOD; *Gen. Conch.*, 41, pl. 6, f. 4.

Balanus rugosus, MONTAGU; *Test. Brit.*, 8. DILLWYN; *Catal.*, 17.

Shell white, erect, cylindrical, or somewhat conical, but usually as broad at summit as at base, and its height frequently exceeding its diameter. Summits of the valves rising into acute, spreading points, the posterior one folded and curved into a beak; exterior very rough, with coarse, unequal, flexuous folds or ribs; the depressed areas small, smooth, and shining. Interior slightly grooved at base, otherwise smooth. Aperture large, diamond-shaped; valves of the operculum rising into acute, diverging points; the separated portions distinctly striated from before backwards; surface smooth, or delicately wrinkled from side to side, margins direct. Diameter of base sometimes $\frac{3}{4}$ inch.

Of these I found fine specimens on a pine log lying upon the beach at East Boston. But they are usually obtained further northward, seated upon *Pecten Islandicus*, *Fusus Islandicus*, &c.

This, like the following species, may be only one of the Protean forms of *Lepas balanoides* of Linnæus. In a shell of so anomalous a character, I have chosen to abide by what is certain; and I think it is certain, that the shell before me is the same as the shells of Montagu and Donovan. It accords exactly with the description by the former, and the figures by the latter. It attains a much larger size than the next species, and may be easily distinguished from it, under any disguise, by its simple opercular valves, and their acute, diverging points. The exterior is more rugged than that of any other species I have seen.

BÁLANUS OVULÁRIS.

Shell small, white, variable in shape, more or less furrowed externally; aperture rhomboidal; opercular valves obsoletely striated, the anterior ones shortest and acute, the posterior ones deeply notched near the obtuse summit.

FIGURE 7.

State Coll., No. 252. Soc. Cab., No. 2080.

Bálanus ovuláris, LAM.; *An. sans Vert.*, v. 660.

Lepas balanoides, LIN.; *Syst. Nat.*, 1108.

Lepas bálanus, WOOD; *Gen. Conch.*, pl. 7, f. 3. *Index*, pl. 1, f. 11.

Under this name I would notice our most common barnacle. The few characters given to the species by Lamarck would apply to this shell with less reservation than any other description I have seen. It is found, of all shapes and ages, crowded together upon every rock or wooden fixture between high and low water mark; and it is for the most part confined to stations where it is half the time left by the tide, while the preceding species seems to frequent the deep water.

In shape it is very various. Sometimes it has a low, conical form, its height being less than half of its base; again, its height is three or four times as great as the diameter of its base, and its summit broader than its base. In its early stages it is smooth, so that the valves are always plain at their summits; but soon the base becomes scolloped by four or five grooves on each valve, and these grooves then continue on all the subsequent growth of the shell. The summit is usually even, as if all the points of the valves had been clipped off; but in an exuberant growth they are elevated in the form of thin, blunt plates. The aperture is dia-

mond-shaped, moderately large. In such a diversity of external character, we must look chiefly to the opercular valves for any constancy of form. These are smooth or faintly marked across with fine lines, that appear as if they were about to be effaced. The two front valves are regularly pointed by the junction of their boundary lines; they are united by a simple suture, and a profile view shows them to be a little gibbous or keeled at the suture, just before their summits. The other valves are blunt at tip, and are deeply grooved, each side, for the reception of the outer edge of the anterior valves, so as to exhibit a deep notch just below their summit. This notch is the most obvious distinctive character of the species, together with the circumstance, that the tips present no prominent points, and do not diverge. Interior smooth and plain, except that there is a fold answering to each external depressed area.

Compared with *B. rugosus*, its exterior is much less rugged, it never attains so large a size, its summit is more simple, and its shape more variable. From this, and from specimens of *B. balanoides* sent me from England, it differs especially in the summits of the valves. These are better indicated by figures than by description.

BALANUS ELONGATUS.

Shell white, very much elongated, increasing in width towards the summit; opercular valves as in B. ovularis.

Lepas elongata, LIN., GMEL.; 3213. CHEMN.; *Conch.*, viii. t. 98, f. 838. PENNANT; *Brit. Zool.*, iv. t. 37, f. A. 5.

Balanus clavatus, PULTENEY; *Dorset Catal.*, t. 1, f. 6. MONTAGU; *Test. Brit.*, 10. WOOD; *Index*, pl. 1, f. 13. *Gen. Conch.*, t. 7, f. 1.

Balanus fistulosus, BRUG.; *Encyc. Méth.*, 166, t. 164, f. 7, 8. LAM.; *An. sans Vert.*, v. 665.

FIGURE 8.

State Coll., No. 251. Soc. Cab., No. 2081.

The shells to which the above names have been applied, and which have attracted considerable attention, seem, after all, not to be entitled to the rank of species. They are now regarded as elongated varieties of other species, having assumed their peculiar shape from the circumstance of their being so crowded as to oblige them to make all their growth in one direction. That this

is in all cases the true explanation, I am not disposed to admit. The largest specimens I have seen were found in a protected situation, under a bridge on the Dorchester turnpike road, and they were so situated as to have full scope for growth in any direction. They were often solitary, and an examination of the space around them forbade the suspicion that they had ever been grouped. Under the wharves at Provincetown, I have noticed them so crowded as to justify the explanation. Certain it is, however, that the opercular valves, the most important and most constant portions, differ in no respect from the depressed conical specimens. All the elongated specimens of our coast have the valves of *B. ovularis*. The exterior of the shell is the same also, if we make allowance for the peculiarity of form. We should, therefore, consider it as an accidental, or rapidly developed, form of some other species.

† PEDUNCULATA. *Shells pedunculated.*

GENUS ANATIFA, LAMARCK.

Shell sub-triangular, compressed, composed of five unequal valves united by cartilage, and seated on a fleshy stalk.

The shells of this genus are the true *barnacles*. They do not seem to have a fixed abode anywhere on our coast; yet they are at all times found among us, either in the character of visitors or emigrants. The shells vary so much with age, that it is not always easy to define the limits of species, or to refer a shell to its true species. More species exist in books than in nature. The animal, when seen alive, in most cases, removes all uncertainty. These shells, though everywhere common, seem to be regarded everywhere as strangers. They are Jews among other shells. Hence they seem to have been but little studied.

ANATIFA LÆVIS.

Shell slightly wrinkled by the lines of growth, crossed by very faint, radiating lines; valve at the back broad, flat, and smooth; cartilages and stalk at base of shell orange; animal light-colored.

WOOD-CUT, (see p. 11.)

State Coll., No. 248. Soc. Cab., No. 2083.

Lepas anatifera, LIN.; *Syst.*, 1109. CHEMN.; *Conch.*, viii. 340, t. 100, f. 853. PENNANT; *Brit. Zool.*, pl. 38, f. 9. ELLIS; *Phil. Trans.* 1758, vol. 50, pl. 34,

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- f. 5. DONOVAN; *Brit. Shells*, pl. 7. WOOD; *Gen. Conch.*, pl. 11. CUVIER; *Règne Anim.*, iii. 176.
- Anátifa lævis, BRUG.; *Encyc. Méth.*, 166, f. 1. LAM.; *An. sans Vert.*, v. 675. SCHUMACHER; *Nouveau Syst.*, &c., 97.
- Anátifa vulgaris, GRAY; *Annals of Philos.*, x. 100.
- Pentelásmis anátífera, LEACH; *Encyc. Brit., Suppl.*, iii. 170. SOWERBY; *Genera*, f. 1, 2.
- Pentélepas lævis, BLAINVILLE; *Malacol.*, pl. 84, f. 3.
- Pollícipes lævis, GUÉRIN; *Iconog., Mollusques*, pl. 37, f. 1.
- Lepas anátífera, TURTON; *Conch. Dict.*, 71.

Shell bluish-white, the lower valves triangular, rather obtuse at summit, wrinkled by the lines of growth, and with very faint radiating lines from the anterior basal angle; upper valves triangular, narrow, pointing downwards, tip blunted, and leaving quite a large space occupied only by membrane; very near the apex is a distinct angle at the back; apex rounded; back valve rather broad, not much compressed, sometimes grooved lengthwise. Cartilage of the living shell of an orange-color, as is also a portion of the stalk adjoining the shell. Stalk of a light fawn-color. Cirri or arms light flesh-color. Length of shell about 1 inch, of the stalk from 1 to 6 inches.

Found on the bottoms of vessels, and on drift wood.

The orange ring at the base of the shell, and also the cartilages, the light-colored cirri, the large space following the lower point of the upper valves, the posterior angle of the upper valves being very near the summit, and the broad back, are the peculiar marks of this species.

ANÁTIFA STRIATA.

Valves with radiating striae; posterior angle of upper valves somewhat remote from apex; back valve compressed; animal dark slate-color.

State Coll., No. 249. Soc. Cab., No. 2084.

- Lepas anserífera, LIN.; *Syst.*, 1109. LISTER; *Conch.*, pl. 440, f. 283. DONOVAN; *Brit. Shells*, pl. 166, f. 2. WOOD; *Gen. Conch.*, pl. 10, f. 5. TURTON; *Conch. Dict.*, 72. GUALT.; *Test.*, t. 106, f. 2, 3. CHEMN.; *Conch.*, viii. t. 100, f. 856.
- Anátifa striata, BRUG.; *Dict.*, No. 4, *Encyc. Méth.*, pl. 166, f. 2. LAM.; *An. sans Vert.*, v. 676.
- Pentelásmis striata, LEACH; *Cirrhyp. campyl.*

Very similar to the preceding. Its angles are everywhere more pointed; the surface is marked with radiating lines proceeding from the anterior-inferior and posterior-superior angles; this latter angle is at some distance from the summit, and the intervening space is often emarginate; sometimes a range of five or six impressed, blackish dots runs from the angle of the base across the side valves; the back valve is compressed throughout its whole length, so as to form a sharp edge, which is often more or less toothed. The margins are faintly tipped with orange, but not broadly, as in the last species. The animal is dark-brown, and does not attain to a great length. The cirri are of a dark slate-color. Size same as *A. levis*.

Such are characters of two species of shells, which I found in great numbers and perfection on a Swedish vessel. I believe them to be the true *Lepas anatifera* and *anserifera* of Linnæus. I am not a little inclined to think that the *A. striata* of modern authors is a different species, of which *L. sulcata* of Montagu is the young, and with which *L. anserifera* is not synonymous. The difference in the marking of the surface is not very remarkable, but the color of the stem and of the cirri is decisive. The back valve of *A. striata* is either sharp or broken into teeth, passing imperceptibly into the next species, which is principally characterized by the sharp serratures along the back.

ANÁTIFA DENTATA.

Surface distinctly striated in a radiated manner; carinated near the anterior margin; posterior valve compressed to a sharp edge, which is sharply serrate.

FIGURE 11.

State Coll., No. 256. Soc. Cab., No. 2085.

Lepas dentata, WOOD; *Gen. Conch.*, 67. DILLWYN; *Catal.*, 32.

Lepas serrata, SOLANDER; *Mss.*

Anatifa dentata, BRUG.; *Encyc. Méth.*, 63, t. 166, f. 6. LAM.; *An. sans Vert.*, v. 676.

Shell rather shorter and less compressed than the preceding; the lines of growth and radiating lines are quite distinct; a very decided angular line or carina passes from the anterior base directly towards the summit, at a little distance from the margin; the summit is broadly truncated almost directly across; the dorsal valve is compressed so as to form a prominent, sharp edge, which at every age presents ten or twelve teeth like those of a saw; this valve is very distinctly furrowed lengthwise.

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GENUS CÍNERAS, LEACH.

This curious genus, with the next, is very singular in its appearance, and very easily recognised. It has the general form, structure, and habits of ANÁTIFA, but the exterior is almost entirely of a leathery texture, with only a few bony pieces at the back and about the aperture. None of them are permanent residents in our seas, but may be always found on foul-bottomed vessels, or attached to tardy-moving fishes. The two genera CÍNERAS and OTION, are almost always found in company, and are united in the genus GYMNÓLEPAS by Blainville. They are not unfrequently called "the naked Cirripedes."

CÍNERAS VITTÀTA.

Covering leathery, angular at summit, with five, narrow, remote valves; color whitish, with three black stripes down each side.

State Coll., No. 257. Soc. Cab., No. 2089.

Lepas coriàcea, POLI; *Test.*, i. tab. 6, f. 20.

Lepas membranàcea, MONTAGU; *Lin. Trans.*, ii. 182, pl. 12, f. 2.

Lepas vittàta, SOLANDER; *Mss.* WOOD; *Gen. Conch.*, 69, pl. 12, f. 2, 3. *Index*, pl. 2, f. 43.

Senóclita fasciàta, SCHUMACHER; p. 98. GRAY; *Annals of Philos.*, x. 100.

Cíneras vittàta, LEACH; *Encyc. Brit., Suppl.*, iii. 170, pl. 57. SOWERBY; *Genera*.

LAM.; *An. sans Vert.*, v. 684.

Gymnólepas Cránchii, BLAINVILLE; *Malacol.*, pl. 84, f. 2.

The exterior is of a leathery consistence, like the stem. There is no distinct line of division between the pedicle and the body, but the stem gradually dilates. The summit is obliquely truncàte, somewhat concave, and margined on each side by a bony formation. The aperture is also margined by two pointed pieces, and a fifth piece runs down the back. Color white, with three black stripes on each side, the two posterior ones uniting to form one on the stem. Tentacula of the color of the stripes. Length, including pedicle, often 2 inches.

Found on the bottoms of vessels, and also on some of the large sluggish fishes, as the *Orthogoriscus mola*.

O T I O N C U V I È R I.

Body hood-shaped, surmounted by two ear-shaped processes or tubes inclined backwards; a small, crescent-shaped valve on each side of the aperture; color livid-brown.

State Coll., No. 258. Soc. Cab., No. 2088.

Lepas aurita, LIN.; *Syst. Nat.*, p. 1110. ELLIS; *Philos. Trans.*, 1758, t. 34, f. 1.

BRUG.; *Dict.*, p. 66. MARTINI; *Conch.*, viii. 345, t. 100, f. 857, 858. WOOD;

Gen. Conch., 70, t. 12, f. 4. *Index*, pl. 2, f. 45.

Lepas leporina, POLI; *Test.*, t. 6, f. 51.

Malacóttia bivalvis, SCHUMACHER; 38.

Otion Cuvieri, LEACH; *Cirrip.*, *Encyc. Brit.*, *Suppl.*, 170, pl. 57, f. 3. LAM.;

An. sans Vert., v. 685. SOWERBY; *Genera*, pl. 1-4. GRAY; *Annals of Philos.*,

v. 10, 100.

Gymnólepas Cuvieri, BLAINVILLE; *Malacol.*, pl. 84, f. 1.

The tunic or covering of this animal is a smooth, leathery membrane, of a livid or leaden-brown hue, appearing glossy when fresh. The pedicle is rather long, and its limit of union with the body is marked by a well-defined constriction. The body is hood-shaped or helmet-shaped, surmounted by two hollow appendages, somewhat resembling the ears of animals, open at their extremities, inclining backwards. The aperture is large and gaping. It is fortified by a small, crescent-shaped valve on each side at its base. Vestiges of rudimentary valves are also to be seen at the summit. Cirri of the same color as the tunic. Length from 2 to 4 inches, of which the pedicle constitutes nearly two thirds.

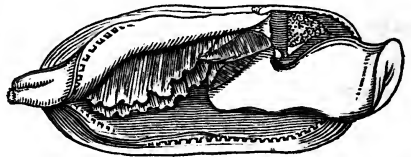
Found on vessels' bottoms and in other situations, in company with *CINERAS vittata*.

CLASS CONCHÍFERA.

This division includes all the mollusca which are inclosed in two shells (*bivalve*), united together at the back by a hinge, like the clam, oyster, mussel, &c. Sometimes the hinge has teeth shutting by the side of each other, and acting much like the common butt-hinge. Sometimes there are small additional bony pieces attached about the hinge, serving to strengthen it; and in such cases the shell is said to be many-valved (*multivalve*).

The animal has no proper head, and its conspicuous parts are, First, its *mantle*, which lines all the interior of the shell, and incloses the other parts of the animal. Its edges are more or less fringed, and are either free, partly united, or entirely so, excepting a passage for the foot before, and for the siphons behind. Second, a muscular mass, usually called the *foot*, which may be protruded from the shell, and serves as the organ of motion. Third, the respiratory organs, or *branchiæ*, arranged somewhat like ruffles behind the foot, enveloping the abdominal mass. Fourth, the *siphons*, which are the openings for the passage of excrement, and for the admission of water to the branchiæ; sometimes they are very long, and their tips are usually fringed. There are also two thin, elongated strips on each side, attached to the mouth and passing back over the sides of the foot, which are supposed to be the principal organs for the detection and selection of food, and are called *palpi*.

This representation of the animal of *MACHÆRA nitida* may serve to exemplify the parts above-mentioned.



The valves are kept closed by strong muscles, which pass from one valve to the other. When these are relaxed, the valves are thrown open by the elastic nature of the cartilage or ligament at the hinge. The uniting substance is called *cartilage* when it is placed between the edges of the valves, and *ligament* when it is situated externally.

The interior of the shell exhibits the indentations and lines

where the muscles and mantle or *pallium* are attached; and are called the *muscular* and *palleal impressions*. The latter usually turns inward towards the centre of the shell, and then outwards, forming a notch or *sinus*, more or less deep, at one end of the shell; this is always the hinder end.

There is sometimes only one muscular impression, but generally there are two, in each valve. These serve as permanent marks by which to divide the conchs into two groups, the *Unimusculòsa* and *Bimusculòsa*.

The following synopsis may enable one to form a near approximation to the genus of any of our bivalve shells. It has been drawn up without any reference to a natural arrangement, and merely to aid the student, by grouping the shells in an artificial manner, to come more easily at their true place and name.

I. *Shell transverse or rounded, with two muscular impressions.* BIMUSCULÒSA.

i. Shell gaping.

1. gaping at base and ends, hinge toothless.

* united by additional valves, *Pholas*.

** united by ligament, *Panopæ'a*, *Glycy'meris*, *Terèdo*.

2. gaping at the ends only, and with hinge (*cardinal*) teeth.

* Cardinal teeth simple, *Solen*, *Solecúrtus*, *Solemy'a*, *Machæ'ra*.

** Cardinal teeth spoon-shaped.

† without lateral teeth, *Mya*, *Anatína*, *Montacúta*, *Cochlodésma*,
Osteodésma.

†† with lateral teeth, *Mactra*, *Mesodésma*, *Cumíngia*, *Kéllia*.

ii. Shell closed.

1. inequivalve, *Córbula*, *Pandòra*, *Thràcia*.

2. equivalve.

* inhabiting the sea.

† teeth rounded, ascending, *Saxicava*, *Petricola*.

†† teeth compressed.

§ sub-parallel, *Psammòbia*, *Tellína*, *Lucína*.

§§ diverging.

a. without lateral teeth, *Cyprína*, *Cytherèa*, *Venus*,
Astárte.

b. with lateral teeth, *Cárdium*, *Cardíta*.

** inhabiting fresh water, *Unio*, *Alásmodon*, *Anodon*, *Cyclas*.

II. *Shell fan-shaped or irregular, with one muscular impression.* UNIMUSCULÒSA.

i. united by an external ligament, *Modíola*, *Mytílus*.

ii. united by an internal cartilage.

1. shell regular, *Pecten*.

2. shell irregular.

* entire, *O'strca*.

** valve perforated, *Anòmia*, *Terebrátula*.

FAMILY TUBICOLARIA, LAM.

Shells inclosed in, or attached to, a shelly tube.

GENUS TEREDO, LIN.

Valves equal, largely open above and below, placed at the larger extremity of a tube open at both ends.

TEREDO NAVÀLIS.

Shell very widely gaping each side, and seated at the end of a flexuous, calcareous tube.

State Coll., No. 237. Soc. Cab., No. 2315.

Terèdo navàlis, LIN.; *Syst. Nat.*, 1267. BLAINVILLE; *Malacol.*, pl. 81, f. 6. SOWERBY; *Genera*. BRUG.; *Encyc. Méth.*, pl. 167, f. 1-5.

This is the curious shell which is so remarkable for perforating holes in timber, giving it a honey-comb appearance. These holes are lined with their solid white tubes, at the bottom of which the shell is found. The shell itself is small, the two valves touching each other at only two points, and so much arched that when in position they form a mere ring.

It is occasionally found in ship-timber, especially where it has been exposed to a tropical sea, and is familiarly known by the name of the *ship-worm*.

FAMILY PHOLADARIA, LAM.

Shell without a tubular sheath; hinge aided by accessory valves, or very widely gaping anteriorly.

GENUS PHOLAS, LIN.

Shell transverse, gaping at both sides; hinge margin rolled outwards and toothless; a rib-like tooth arises from the cavity of the beaks, and shoots nearly across the shell.

Shells of this genus are generally found in logs of wood, in stones, or hard clay, which they have perforated; and they have one or more additional bony pieces on the back of the hinge.

PHOLAS COSTATA.

Shell large, oblong-ovate, white, covered with radiating, toothed ribs.

State Coll., No. 246. Soc. Cab., No. 1702.

Pholas costatus, LIN.; *Syst. Nat.*, 1111. LISTER; *Conch.*, pl. 434. GUALT.; *Test.*, t. 105, f. G. CHEMN.; *Conch.*, viii. t. 101, f. 863. BRUG.; *Encyc. Méth.*, pl. 169, f. 1, 2. BLAINVILLE; *Malacol.*, pl. 99, f. 6. SOWERBY; *Genera*, No. 23, pl. 1. LAM.; *An. sans Vert.*, vi. 45. WOOD; *Gen. Conch.*, pl. 15, f. 1, 2. *Index*, pl. 2, f. 4.

Shell large, thin, inflated, oblong-ovate, rounded before and narrowed behind, white, covered with radiating ribs, the coarse lines of growth rising over them in an undulating manner, so as to produce tooth-like elevations upon them, at regular intervals; the interior is marked with corresponding indentations. Length 6 inches, height 2 inches.

This well known species is admitted into our catalogue from the fact, that Professor Adams has lately discovered an extensive bed of dead shells at New Bedford. It probably is not to be found in a living state in our waters. Indeed, I am not aware that it is found living on the shores of any of the Middle or Eastern States. It is found, in the above locality, of all sizes and ages, its most delicate portions entire, forbidding the idea that these shells were transported by any means from some distant locality. It is certainly remarkable, that a large shell should have been abundant at no very distant period, which cannot now be found living within one or two thousand miles. Something of the same kind is said to belong to the history of the oyster about Cape Cod.

PHOLAS CRISPATA.

Valves touching at the middle of the base, and widely gaping at both sides; a furrow passes from the beaks across the middle, in front of which are radiating, toothed ribs.

State Coll., No. 247. Soc. Cab., No. 2316.

Pholas crispata, LIN.; *Syst. Nat.*, p. 1111. GMELIN; *Syst.*, p. 3216. PENNANT; *Brit. Zool.*, iv. 157, t. 43, f. 2. MONTAGU; *Test. Brit.*, 23. DONOVAN; *Brit. Shells*, ii. pl. 62, 69. CHEMN.; viii. 369, t. 102, f. 872-874. TURTON; *Brit. Biv.*, 6. *Conch. Dict.*, 146. *Lin. Trans.*, viii. 32. HUTCH., *Dorset Catal.*,

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27, t. 3, f. 4. WOOD; *Gen. Conch.*, 81, pl. 15, f. 3-5. *Index*, pl. 2, f. 5. DILLWYN; *Catal.*, 40. DESHAYES; *Encyc. Méth.*, Vers, iii. 754, pl. 169, f. 5, 7. LAM.; *An. sans Vert.*, vi. 46. SCHROET.; *Eint. in Conch.*, iii. 541, No. 6.

Pholas bifrons, DA COSTA; *Brit. Conch.*, 243, t. 16, f. 4.

Pholas latus, LISTER; *Conch.*, t. 436, f. 279, and *Append.*, t. 10, f. 3.

Shell oblong-oval, thick and strong, rounded posteriorly, narrowed anteriorly into a sort of beak; widely gaping at both ends, the valves touching each other only at two points, viz. the hinge, and the middle of the base. Exterior surface marked with numerous coarse, concentric ridges, which become lamellar on the anterior half; the laminae are strongly toothed on their free edge, and the teeth are disposed in radiating series. The valves are divided into two nearly equal portions by a broad channel running from the beaks to the middle of the base. Interior smooth, showing the external furrow, the upper and anterior edge turned outwards so as to present large, smooth callosities over the beaks. The process from within the cavity of the beaks is large, narrow, and a little flattened at the tip. Length 2 inches, height $1\frac{1}{2}$ inch.

A very perfect specimen of this shell is in the cabinet of Dr. S. Bass, which was found at Phillips's Beach. Young specimens were found in hard clay at Phillips's Beach by Mr. Joseph True. They differ principally in gaping only anteriorly. Full grown valves are occasionally thrown up on all our beaches; but it is more common at the South, as along the shores of New Jersey. When alive, a membranous expansion covers the superior border of the shell.

FAMILY SOLENACEA, LAM.

Shell transversely elongated, without accessory pieces, and gaping only at the ends.

GENUS SOLEN, LIN.

Shell equivalve, elongated, sides nearly parallel, gaping at both ends; beaks very small, terminal; cardinal teeth small, rounded, variable.

SOLEN ENSIS.

Shell six times as long as high, curved, front and back parallel, smooth, yellowish-green; hinge with one tooth and a sharp lateral

plate of one valve entering between two teeth and a double plate of the other.

State Coll., No. 241. Soc. Cab., No. 1709.

Solen ensis, LIN.; *Syst. Nat.*, 1114. PENNANT; *Brit. Zool.*, t. 45, f. 22. CHEMN.; *Conch.*, vi. t. 4, f. 30. MONTAGU; *Test. Brit.*, 48. BRUG.; *Encyc. Méth.*, pl. 223, f. 2, 3. TURTON; *Conch. Dict.*, 160. *Brit. Biv.*, p. 83. WOOD; *Gen. Conch.*, pl. 28, f. 1, 2. *Index*, pl. 3, f. 6. LAM.; *An. sans Vert.*, vi. 55. CONRAD; *Marine Conch.*, pl. 5, f. 1. DONOVAN; *Brit. Shells*, pl. 50. MATON and RACKETT; *Lin. Trans.*, viii. 44.
Solen curvus, LISTER; *Conch.*, t. 411, f. 257.

Shell scabbard-shaped; about six times as long as high, the ends rounded, the front and back nearly parallel, white within, and covered without by a glossy, yellowish or brownish-green epidermis, which folds over the sharp edge of the shell. On the surface is a triangle of lines marking the termination of the longer side at the successive stages of growth; hinge at one end; on one valve is a single tooth from which a rib or plate extends to the ligament; on the other valve are two teeth, and a double plate receiving those of the opposite valve between them; the terminations of the two ribs rise up in a curved manner and cross each other like teeth, when not broken off, as they usually are. Length of a good specimen 6 inches, height 1 inch.

This well-known shell is found on both shores of the Atlantic. It lives on sandy beaches near low-water mark, as at Chelsea, Nahant, and Nantasket beaches, and about Newburyport, Nantucket, &c. It is displaced by heavy storms, and thrown up by the tide. It may often be seen projecting a little above the level of the sand, but, if touched or disturbed, it descends with astonishing rapidity and force, much to the amazement of him who may lay hold of it, thinking to make an easy capture.

The animal is cylindrical, too long for the shell, and is often used as an article of food under the name of *long clam*, *razor-fish*, *knife-handle*, &c. These names are enough to suggest an idea of the shell to any one who is not already familiar with it.

GENUS SOLECÚRTUS, BLAINV.

Shell transverse, elongated, equivalve, the beaks small, sub-central, margins nearly parallel, ends abruptly rounded; hinge

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with two or three cardinal teeth in each valve ; ligament prominent, seated on thick callosities ; palléal impression with a very deep sinus.

The above generic definition will include all the shells originally embraced in the genus by Blainville, except those of his first division, — “shells compressed, thin, with an interior rib passing from the beaks to the basal margin.” An acquaintance with the animal has shown the necessity of subdividing his genus. Mr. Sowerby proposes to limit it to the species having the interior bar. But Deshayes, in his edition of Lamarck, has already limited the genus to shells of a different type ; and it would, therefore, seem most proper that any new name which may be given should be applied to other forms. I have, therefore, separated those with the interior bar and other peculiarities for a new genus.

If we adopt Deshayes' modification of the genus, so that it shall include only such as are transversely oblong-oval, covered with obliquely undulating striæ, the hinge central, &c., we shall still have another group left, of shells equally distinct in character by their sub-cylindrical, somewhat arched form, compressed at base, the extremities abruptly and usually obliquely rounded, the beaks near the posterior end, the parallel sinus very deep, &c., answering, in fact, to Mr. Conrad's sub-genus *CULTÉLLUS*. This would, of course, assume the rank of a genus in case the correctness of the above views should be acknowledged.

Deshayes says, that the animal of *S. Caribæus*, *legumen*, &c., approaches closely to that of the true *Solen*. But, as the genus *Solen* now admits only shells with terminal beaks, they must still be arranged under *Solecúrtus*.

SOLECU'RTUS (*Cultéllus*) CARIBÆ'US.

Shell sub-cylindrical, thick, rounded posteriorly, obliquely truncated anteriorly ; beaks nearest the posterior extremity.

State Coll., No. 224. Soc. Cab., No. 14.

LISTER ; *Conch.*, t. 421. f. 265.

Solen Guineénsis, CHEMN. ; *Conch.*, xi. t. 198, f. 1937. DILLWYN ; *Catal.*, 62, No. 13. BRUG. ; *Encyc. Méth.*, pl. 225. f. 1.

Solen Caribæus, LAM. ; *An. sans Vert.*, vi. 58.

Solecúrtus Caribæus, CONRAD ; *Amer. Mar. Conch.*, 4, f. 3.

Shell oblong, transverse, very slightly curved, thick and strong, the upper and lower margins nearly parallel; beaks obtuse and slightly elevated, nearest the posterior end; this side is narrowest, rounded at the extremity, and having an obtuse ridge running obliquely backwards from the beaks; anterior extremity obliquely truncated or abruptly rounded; basal margin somewhat compressed; surface coarsely wrinkled by the stages of growth, and on its disc are a few short, deep, straight scratches from the beaks towards the base; the whole covered by a dense and strong yellowish epidermis, which folds over the edge. Hinge with two awl-shaped cardinal teeth in each valve, curved, ascending: behind them is a thick rounded callus, on which the ligament is fixed. Interior white, thickened; pallial impression with a sinus which passes beyond the beaks. Length 4 inches, height $1\frac{1}{2}$ inch, breadth 1 inch.

Found in Buzzard's Bay, at New Bedford and in its vicinity, occasionally, which seems to be its northern limit.

It cannot be mistaken for any other of our shells.

SOLECURTUS (Cultellus) FRA'GILIS.

Shell transversely oblong-ovate, arcuated, equilateral, with a reddish stripe from the beaks passing a little backwards, designating the place of an obsolete rib within; epidermis yellowish.

State Coll., No. 242. Soc. Cab., No. 2317.

Solen frágilis, PULTENEY; *Dorset Catal.*, 28. pl. 4, f. 5. MONTAGU; *Test. Brit.*, 51. *Suppl.*, 26. PENNANT; *Brit. Zool.*, iv. 174. WOOD; *Gen. Conch.*, 126. pl. 29, f. 4, 5. *Index*, pl. 3. f. 11. DILLWYN; *Catal.*, 65. FLEMING; *Brit. Anim.*, 460.

Solecúrtus frágilis, CONRAD; *Amer. Mar. Conch.*, 19, pl. 4, f. 1.

Solen centrális, SAY; *Journ. Acad. Nat. Sciences*, ii. 316.

Psammòbia tæniàta, TURTON; *Brit. Biv.*, 85, pl. 8, f. 5.

Shell small and delicate, much broader than high, sub-oval; beaks not prominent, nearly central; the upper and lower margins curved, nearly parallel, the posterior end being, however, somewhat more sharply rounded than the anterior; when viewed at the back, the shell has a peculiar compressed appearance. Surface smooth at the central region, and somewhat wrinkled at the ends; with a remarkable band of reddish purple passing from the

beaks across the shell, growing wider and fainter in its progress ; some fainter and broader radiations may also be seen in old shells, when the epidermis is removed. Epidermis straw-colored, or becoming fawn-colored, slightly wrinkled posteriorly. Within, livid, smooth, and shining, becoming thickened by age. The red stripe is visible within, and covered by a faint, rib-like thickening.

Hinge of two large, ascending teeth on each valve, one of which, on the left valve, grows broad and is emarginate at tip. Length $1\frac{1}{2}$ inch, height $\frac{1}{2}$ inch, width $\frac{7}{8}$ inch.

This, like the preceding species, is occasionally found at New Bedford, and other places in Buzzard's Bay. It is rather common about Rhode Island. I have never met with a specimen north of Cape Cod ; though, if our shell be identical with the *S. fragilis* of British writers, it is found on the Canada coasts. It differs from the fragile specimens known in British Cabinets, simply in growing to a much larger size, and becoming thick and strong.

GENUS MACHÆRA, GOULD.

Shell transversely oblong-oval, compressed, inequilateral, moderately gaping ; beaks minute. Hinge with three diverging cardinal teeth in the left valve, the middle one bifid, the third one compressed, delicate, taking the direction of the margin, or obsolete ; on the right valve two, entering between those of the opposite valve. Within, usually crossed by a strong, longitudinal rib. Muscular impressions joined by a deeply sinuous palleal line. Ligament prominent.

Animal not much larger than the shell ; lobes of the mantle united for about half their length, the whole of their margin pectinated with fleshy teeth from near the siphon to the hinge, except where they pass over the foot ; similar bodies are also found along their inner sub-margin, near the siphon. Labial palpi long, extending quite across the foot, pointed. Branchiæ extending to the opening of the siphon and embracing about half the breadth of the foot. Foot hatchet-shaped, dilating towards its extremity, which is obliquely truncated. Siphons united to their tips, which have scattered hairs. (WOOD-CUT of *M. costata*, see page 24.)

The above is the description of the animal of *M. costata*. It

differs from Deshayes' description of the animal of *SOLECURTUS strigillatus*, in some obvious particulars. He makes no mention of the fringe of fleshy teeth along the margin of the mantle, which are so remarkable, and which are probably retractile. The branchiæ do not enter the siphon; — the foot is not tongue-shaped, but somewhat club-shaped, and bent at a right angle within the shell; and the siphons are united entirely to their extremities, though the branchial is slightly more elongated than the anal siphon.

This genus embraces, besides the two species here described, the *Solen radiatus*, LIN., (*Solecúrtus lucidus*, Conrad,) *SOLEN máximus*, WOOD, (*Solecúrtus Nuttállii*, Conrad,) *SOLEN inflexus*, WOOD, and *S. pellucidus* of Europe. These accord with our shells in all respects, except that the third tooth of the left valve in some of them, is replaced by a marginal elevation simply. They differ in their ovate and compressed form from *SOLECURTUS*, and especially do they differ from sub-genus *CULTELLUS* by having the beaks placed anteriorly. The sinus of the paleal impression usually extends about half way to the hinge.

MACHÆRA NITIDA.

Shell slightly recurved, thick, white, undulated by the lines of growth, covered with a strong, greenish-yellow, shining epidermis, corrugated at the posterior extremity.

FIGURES 25, 26.

State Coll., No. 240. Soc. Cab., No. 1717.

Shell thick, white, oblong-ovate, beaks small, situated at the anterior fifth of the shell, narrowed behind, rounded at both extremities; the posterior hinge margin is straight and somewhat compressed, and the basal margin being at the same time regularly curved gives the shell a somewhat recurved aspect. Epidermis thick, shining, as if varnished, of a dusky greenish-yellow or dark-gamboge color, wrinkled obliquely at the posterior extremity, and projecting beyond and folding around the edge of the shell. Lines of growth broadly and prominently rounded, giving a wavy appearance. Within white and strengthened by a prominent rib, which, extending from the beaks, inclining very slightly backwards, and expanding, loses itself in the shell about half way across the

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valve. Hinge having the teeth seated upon the base of the rib ; in the left valve three ; the first strong, ascending and curved, the second still stronger and widely branched, one branch being erect, the other nearly prostrate, the third very much compressed, delicate, at right angles with the first and directed parallel to the margin, just under the ligament ; on the other valve two teeth, the first prominent, a little oblique, the other very thin and oblique, entering between the middle and last tooth of the opposite valve. Ligament quite protuberant. Height $1\frac{1}{2}$ inch, length $2\frac{1}{2}$ inches, width $\frac{3}{8}$ inch.

Not unfrequently taken from the stomachs of cod-fish caught on the Banks, and sometimes off our shores.

This species differs from all its co-species by the inclination of the rib towards the longer side of the shell, and also by its apparent backward curvature. It is, however, very closely allied to the shells figured by Wood and Conrad.

It is very rare to find all the teeth entire. The two thin teeth next the ligament are almost always broken ; but a careful examination will discover their vestiges ; and they never seem to be obsolete. The erect tooth of the left valve is not unfrequently broken, and perhaps one of the branches of the bifurcated tooth. The large tooth of the right valve is most constant.

MACHÆRA COSTATA.

Shell thin, smooth, shining ; epidermis greenish, zoned and radiated with livid-violaceous ; internal rib inclining forward.

FIGURE, see Wood-cut, page 24.

State Coll., No. 239. Soc. Cab., No. 1716.

Solen costatus, SAY ; *Journ. Acad. Nat. Sc.*, ii. 315.

Solecúrtus costatus, SAY ; *Amer. Conch.*, pl. 18. CONRAD ; *Amer. Mar. Conch.*, 21, pl. 4, f. 2.

Shell ovate-elliptical, thin, fragile, smooth, and diaphanous ; beaks very minute, placed at the anterior fourth of the shell ; posterior side very little pointed, its upper margin compressed and somewhat crested ; basal margin sometimes a little contracted ; elsewhere regularly arcuated. Epidermis very smooth and shining, of a light yellowish-green color blended with livid-violaceous.

in such a manner as to form three radiated compartments of each color. There are minute wrinkles about the posterior extremity, and minute series of them across the middle of the shell, arranged so as to appear like radiating lines. Within livid, and somewhat iridescent. Rib white, inclining backwards, and extending about two thirds across the valves. Teeth as in the preceding species, excepting that the branch of the bifurcated tooth is less prostrate. The same remark as to their deficiencies applies to this species as to the other. Height $\frac{3}{4}$ inch, length $\frac{7}{8}$ inch, width $\frac{3}{10}$ inch.

Found abundantly upon every sandy beach, and probably inhabits the sand in shallow water. It is one of our most beautiful shells. It is much more delicate and smaller than *M. nitidus*. The radiations of color are evident, but have no very distinct dividing lines; a whitish, narrow ray, running obliquely backwards, and another answering to the interior rib, are generally conspicuous. The colors are also arranged in zones, as well as rays.

GENUS SOLEMYA, LAM.

Shell equivalve, inequilateral, transverse; epidermis thick and shining, projecting far beyond the margin; beaks inconspicuous; hinge margin widened and excavated to form a receptacle for a cartilage, usually resting on a rib-like support.

SOLEMYA VELUM.

Shell oblong, very thin and fragile; epidermis pale yellowish-brown, marked with radiating lines; within purplish-white; cartilage-support arched, the points directed across the shell.

State Coll., No. 222. Soc. Cab., No., 1738.

Solemy'a velum, SAY; *Journ. Acad. Nat. Sc.*, ii. 317.

Shell remarkably thin and fragile, transversely oblong, rather broadest behind; very inequilateral, upper and lower margins nearly parallel, ends rounded; beaks in no degree elevated, but having a slight pit in front of them; surface of the valves radiated with about fifteen slightly impressed, double lines, most conspicuous posteriorly, and most widely separated across the middle; short end distinctly wrinkled by the lines of growth; epidermis light yellowish-brown or chestnut-color, firm, elastic, glossy, at

the hinge margin connecting the valves together for nearly their whole length, and elsewhere projecting far beyond the margin of the calcareous portion, and slit at each of the radiating lines, whence the edges have a ragged, fringed appearance, the angles of the lobes rounded; hinge toothless, consisting of a large triangular receptacle for the cartilage, in each valve, resting on, and partly inclosed by, a whitish bony support, arched beneath, the legs of the arch partly inclosing the anterior muscular impression, and the hinder branch directed nearly across the shell. Length 1 inch, height $\frac{1}{2}$ inch, breadth $\frac{3}{16}$ inch.

Found upon Chelsea, Nahant, Nantasket, and other sandy beaches, generally in the early months, and some years in great abundance. At Dartmouth harbour, Professor Adams found them in mud, far beyond low-water mark.

It is an exceedingly delicate and curious shell; its epidermis, hanging over the edges like a veil, at once distinguishing it. The dimensions, given above, include the epidermis, and are those of a shell of the largest size. In the younger stages the border of the epidermis is entire. The bony substance of the valves is so thin, that the lighter-colored radiations are quite obvious within.

Its special distinguishing marks will be more particularly pointed out in the description of the next species.

SOLEMYA BOREALIS.

Shell fragile, oblong; epidermis dark-brown, with fifteen to twenty lighter radiating lines; within grayish-blue; cartilage-support forked, the hinder branch directed obliquely forwards.

State Coll., No. 221. Soc. Cab., No. 1739.

Solemya borealis, TOTTEN; *Silliman's Journ.*, xxvi. 366, fig. 1.

Solemya velum, CONRAD; *Amer. Mar. Conch.*, pl. 66, f. 16.

This shell would be described in terms so similar to those employed for the preceding species, that a notice of those points in which they differ will be the best description.

It greatly excels in size, — the smallest that has been noticed exceeding the largest *S. velum*. The valves are less convex, and very much more solid, and their color within is always a grayish-blue or lead-color; the basal margin is a little arched upwards; the ends are a little scolloped, there being a slight pro-

jection corresponding to each fissure of the epidermis ; the cartilage-support instead of being arched is forked, and the hinder branch is directed obliquely forwards, extending half way to the anterior margin ; the epidermis is always of a very dark brown or tar-color, marked with fifteen to twenty radiating lines ; the projecting margin is slashed as in the other species, but the angles of the lobes are not rounded, their edges have a thinned, crimped margin, and are usually rolled back.

Chelsea Beach is the only locality in Massachusetts, that I know of, where this species has been found. A very large and perfect specimen was found there by Mr. J. P. Couthouy, and is now in the cabinet of the Boston Society of Natural History. Colonel Totten found it in considerable numbers in the vicinity of Newport.

Only two other species of this genus have been described ; the *S. Mediterranea* from the Mediterranean, which is distinguished from all the others by wanting the callous supports of the cartilage, and the *S. australis* from New Holland, which has the size and strength of *S. borealis*, and the color of *S. velum*. A notch in the hinge margin behind the cartilage is also spoken of, which we do not find in *S. borealis*. It is not a little remarkable that a genus embracing so few species should be so widely distributed.

GENUS PANOPÆA, MÉNARD.

Shell equivalve, transverse, unequally gaping at the sides and at the base ; a small, conical tooth on each valve, and a rounded callosity at each side to which the ligament is affixed.

PANOPÆA ÁRCTICA.

Shell oblong, sub-cylindrical, strong, widely gaping at both ends, rounded anteriorly, truncated posteriorly, traversed by two radiating, wave-like ridges, which divide the surface into three nearly equal portions.

FIGURE 27.

State Coll., No. 236. Soc. Cab., No. 1720.

Glycymeris arctica, LAM. ; *An. sans Vert.*, vi. 70.

Shell thick and strong, oblong, somewhat cylindrical, inequilateral, the posterior portion being nearly twice the length of the

anterior; somewhat acutely rounded before, obliquely truncated and widely gaping behind, the posterior margin thickened within and turning outwards; the hinge and basal margins are usually about parallel, but in old shells the lower and posterior angle is considerably prolonged, so as to render this portion broadest; and it is the only point at which the valves meet, the rest of the base widely gaping; beaks rather prominent, directed slightly forwards, and from them extend two broad, wave-like ridges, one directed to the lower posterior angle, the other dividing the portion anterior to this into two nearly equal parts, so that the surface is thus divided into three triangular, concave compartments; surface also ridged at the stages of growth. Directly under the beak in each valve is a single small, triangular tooth; these shut side by side; running backwards from each of them, along the margin, is a thick, rounded, crest-like callus, having a groove at its external base in which a strong ligament is fixed, which arches over these crests. Muscular impressions deep; pallial impressions looking like an irregular series of muscular pits of various sizes; interior smooth and shining, corresponding to the external undulations; exterior antiquated, livid. Length $2\frac{1}{2}$ inches, height $1\frac{3}{4}$ inch, breadth $1\frac{1}{10}$ to $1\frac{6}{10}$ inch.

Inhabits the Banks of Newfoundland, whence it is brought by fishermen.

I believe this to be the shell which Lamarck intended by his *Glycymeris arctica*, and which Deshayes, with good reason, pronounces to be a PANOPÆA. I am aware that the *P. Aldrovandi* varies much at different ages, and has consequently been described under several names. It is also said to be an inhabitant of Newfoundland, while Lamarck gives the "Arctic Ocean, the White Sea," as the habitat of *P. arctica*. But *P. Aldrovandi* never presents upon the disc the two ridges and intervening central valley, so characteristic of our shell; it is also nearly equilateral, broadest before, and the anterior extremity is scarcely more rounded than the posterior, and even at the immense size, to which that species often arrives, it is scarcely more thickened than our small shell, which, indeed, bears evidence of entire maturity. The "costis duabus obtusis," and the remark, that "externally it resembles *Mya truncata*," are enough to identify the shell. A single valve would be passed over as the toothless valve of *Mya truncata*.

It is an interesting shell on account of the genus being found plentifully on both continents in a fossil state, while recent specimens are so rare.

GENUS GLYCYMERIS, LAM.

Shell transverse, inequilateral, greatly gaping above and below; hinge margin callous, without a tooth; ligament external, epidermis thick, extending beyond the margin of the shell.

GLYCYMERIS SÍLIQUA.

Shell transversely oval; epidermis black, dense, and shining, obliquely wrinkled; beaks eroded; interior loaded with thick callus.

State Coll., No. 235. Soc. Cab., No. 1721.

Mya síliqua, CHEMN.; *Conch.*, xi. 192, pl. 198, f. 1934. DILLWYN; *Catal.*, i. 49.

Glycymeris incrassata, LAM.; *Syst. des An. sans Vert.*, 126.

Glycymeris síliqua, LAM.; *An. sans Vert.*, vi. 69. BLAINV.; *Malacol.*, pl. 80, f. 3.

AUDOUIN; *Ann. des Sc. Nat.*, 1833, pl. 14, 15, 16, (excellent.) SOWERBY; *Genera*, No. 8.

Mya pícea, WOOD; *Gen. Conch.*, 96, pl. 22, f. 5. *Index*, pl. 2, f. 10.

Shell oval, ponderous, widely gaping, surface undulated at the different stages of growth; covered with a thick, horny, glossy-black epidermis, which projects a considerable distance beyond the limit of the valves; it is obliquely wrinkled at various parts, especially at the posterior end; beaks not prominent, always more or less eroded; ligament large and protuberant; interior of the shell white, loaded with a very thick mass of calcareous substance, giving the shell great weight, its margin having a somewhat fringed arrangement. Length $1\frac{1}{2}$ inch, breadth $3\frac{1}{2}$ inches.

Its proper habitat is the Banks of Newfoundland; but several fine specimens have been hooked up or dredged in the neighbourhood of Provincetown, within Cape Cod.

It is a very interesting shell, the only one of the genus yet known. Its wide gaping, thick interior deposit, toothless hinge, and black exterior, render it impossible to confound it with any other shell. The great size of the animal, which the shell can never enclose, renders it a welcome morsel for that denizen of the Banks, the cod-fish; and,

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accordingly, it is not difficult to obtain specimens through the fishermen. In young shells the epidermis is smooth, and of a light chestnut-color.

FAMILY MYARIA.

Shell often inequivalve, inequilateral, gaping; hinge with an erect, more or less spoon-shaped tooth in one valve, received into a corresponding excavation in the opposite valve, united by an interposed cartilage.

GENUS MYA, LIN.

Shell transverse, gaping at both ends; left valve with a single broad, compressed, erect tooth, received into a pit in the opposite valve.

MYA ARENARIA.

Shell transversely ovate, chalky-white, covered with a thin, wrinkled epidermis; tooth of equal length and breadth, inclined a little backwards and inwards, with an oblique rib on the back.

State Coll., No. 234. Soc. Cab., No. 1722.

Mya arenaria, LIN.; *Syst. Nat.*, 1112. PENNANT; *Brit. Zool.*, iv. 79, t. 42, f. 16. CHEMN; *Conch.*, vi. 10, t. 1, f. 3, 4. FABR.; *Fauna Grænl.*, 405. DILLWYN; *Catal.*, i. 42. BRUG., *Encyc. Méth.*, pl. 229, f. 1 to 8. BLAINV.; *Malacol.* pl. 77, f. 1. SOWERBY; *Genera*, No. 32. MONTAGU; *Test. Brit.*, 30. WOOD; *Gen. Conch.*, 91, t. 17, f. 3. *Index*, pl. 2, f. 2. DESHAYES; *Encyc. Méth., Vers.*, ii. 592, pl. 229, f. 1. LAM.; *An. sans Vert.* (Desh. ed.), vi. 74. MATON and RACKETT; *Lin. Trans.*, viii. 35. TURTON; *Conch. Dict.*, 98. *Brit. Biv.*, 32. DONOVAN; *Brit. Shells*, t. 85. FLEMING; *Brit. Anim.* 463. CONRAD; *Amer. Mar. Conch.*, 42, pl. 9, f. 1.

Mya mercenaria, SAY; *Journ. Acad. Nat. Sc.*, ii. 313.

Mya acuta, SAY; *Ibid.*

Shell ovate, equivalve, nearly equilateral, moderately thick, gaping at both ends, especially at the posterior, which cannot be closed on account of an outward curvature of the valves; anteriorly shortest and regularly rounded; posteriorly narrowed and rounded; surface wrinkled, and in some parts raised into ridges at the lines of growth; faint radiating lines and colors depart from the beaks; color dingy-white, covered with a very thin, dirty-brown epidermis, irregularly wrinkled; beaks small, pointed,

slightly curved forwards, directly under which, in the left valve, rises an erect tooth, rounded at its summit, of about equal breadth and height ; its inner face is smooth and rounded ; its outer face is divided into two portions, the largest of which is spoon-shaped, the other flat and traversed across the middle by a grooved ridge which projects beyond the margin of the tooth like a smaller tooth ; on the right valve we have a deep excavation imbedded in the cavity of the beak ; in this and in the concave portion of the tooth is fixed the very strong cartilage ; anterior muscular impression narrow and long, club-shaped ; posterior one semi-oval ; palleal impression scolloped along the base, and very deeply notched behind. Common length $3\frac{1}{2}$ inches, height 2 inches, breadth 1 inch. I have a specimen, the corresponding dimensions of which are $5\frac{1}{2}$, $3\frac{4}{10}$, $2\frac{1}{10}$ inches.

This shell (the Clam) is familiar to every one who resides on the sea-coast. It is always to be seen in every market, and on every quiet shore. Its residence is always between high and low tide, or in such places as allow it to be partially exposed to the air a part of the time. Such are our sandy beaches, muddy inlets, and mouths of streams emptying into the sea, &c. It usually lies just below the surface, and over it is a round hole through which the animal occasionally ejects a jet of water to a considerable height above the sand ; and, if the shallow water is observed where they are known to dwell, it will be perceived to be kept in constant eddies by the suction and ejection of the water. The value of the clam as an article of food, in the fisheries, and for manure, will be spoken of elsewhere.

There seems to be no character which affords any ground for separating our shell from the European clam. Mr. Say, as he merely refers to Pennant's figure, had probably never seen a specimen from the other shore of the Atlantic. A comparison would certainly have saved him from the error of describing it as a new species. Nor can I believe there is any occasion to make two species, the *mercenaria* and *acuta*, as he has done. His *acuta* was formed from a specimen in which the posterior extremity was very acute ; but in this part we find great diversity of proportions in different specimens.

It seems not to be a common shell at the British Islands, and to be seldom used as food there.

Its surface is often colored by the earth in which it is found. Very often it has a rusty color, or a bluish clay-color ; and the solidity of

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the shell varies according to its exposure to the chafing of the sea. Some specimens, obtained in the still, sandy harbour of Provincetown, are very white, and nearly as thin as paper.

In the young shell the valves are quite unequal, and the tooth is produced towards the longer side, so as to be somewhat triangular. I have compared shells in this state, a third of an inch in length, with specimens of *SPHÈNIA Swainsòni*, TURTON, and can find no differences in the hinge, and none in the shell, unless that perhaps the latter may be a little thinner, and proportionally longer than the former.

MYA TRUNCA'TA.

Shell oblong-oval, inequilateral, rounded anteriorly, truncated posteriorly; widely gaping; tooth broader than long.

State Coll., No. 233. Soc. Cab., No. 2319.

Mya truncata, LIN.; *Syst. Nat.*, 1112. Gmel. No. 1. FABR.; *Fauna Grœnl.*, 404. PENNANT; *Brit. Zool.*, iv. pl. 41, f. 14. CHEMN. *Conch.*, vi. 8, tab. 1, f. 1, 2. MONTAGU; *Test. Brit.*, 32. MATON and RACKETT; *Lin. Trans.*, viii. 35. WOOD; *Gen. Conch.*, 90, t. 17, f. 1, 2. *Index*, pl. 2, f. 1. DILLWYN; *Catal.*, i. 42. DES-HAYES; *Encyc. Méth., Vers.*, ii. 591, pl. 229, f. 2 to 6. DONOVAN; *Brit. Shells*, pl. 92. LAM., *An. sans Vert.* vi. 73. TURTON; *Conch. Dict.*, 97. *Brit. Biv.*, 31. LISTER; *Conch.*, t. 428, f. 269. GUALT.; *Test.*, t. 91, f. D. BROOKE; *Introd.*, pl. 1, f. 10.

Shell oblong, inequilateral, longest and rounded before, narrower and abruptly cut off, generally obliquely, behind; the valves are strong, deeply concave and often unequal, but sometimes the right valve, and sometimes the left, is most prolonged; surface irregularly ridged along the lines of growth; color dingy white, covered with a thick, tough, yellowish, wrinkled epidermis, which folds over the edges of the shell, and is greatly prolonged posteriorly, forming a tube six or eight inches long, supplying in some measure the apparent loss of protection to the animal by the truncation of the shell. The truncated edges are a little flaring, and the shell is left wide open behind; beaks moderately prominent, turning slightly forwards; teeth broader than long, projecting a little inwards; inner face smooth, and nearly flat; outer face similar to that of *M. arenaria*, but the oblique rib merely forms a thickened lobe at the edge, and does not project into a tooth-like process; on the opposite valve is an excavation in the beak for

the reception of the tooth, and insertion of the ligament. Length $2\frac{3}{4}$ inches, height $1\frac{7}{8}$ inch, breadth $1\frac{1}{2}$ inch.

Single valves of this shell are thrown upon our beaches by violent gales; but I have never heard of any living specimen being taken directly on our coast. At St. George's and Grand Banks, however, it is abundant, and is a favorite food of the cod-fish, from whose stomachs it is taken plentifully by our fishermen. On the English coast it is spoken of as more plentiful than *M. arenària*, found at the mouths of rivers. It is not mentioned as an article of food.

It is very easily recognised by the peculiar manner in which the posterior end seems to be chopped off; sometimes directly across, and sometimes obliquely; sometimes leaving the posterior portion of about the same length as the anterior, and at other times not half so long. Its membranous tube, when not broken off by the removal of the animal, as it usually is, is quite a curiosity. There is one shell which at first sight resembles it, the *Panopæa àrctica*; but it is gaping at both ends, and has no tooth.

GENUS CÔRBULA, LAM.

Shell inequivalve, inequilateral; hinge with a small, upright, conical tooth in each valve, one received into a pit by the side of the other; cartilage between the teeth.

CÔRBULA CONTRÁCTA.

Shell small, white, valves sub-equal, covered with numerous concentric, elevated lines; rounded before, somewhat acute behind; basal margin contracted at the middle.

FIGURE 37.

State Coll., No. 218. Soc. Cab., No. 1742.

Côrbula contrácta, SAY; *Journ. Acad. Nat. Sc.*, ii. 312.

Shell small, ovate-globose, white, nearly equilateral, shortest and rounded before, narrowed and somewhat pointed behind, basal margin contracted and arched near the middle; surface beautifully plaited with regular, smooth, rounded, concentric ridges; beaks rather prominent, inclined forwards; a distinct angular ridge running from them to the posterior extremity defines a broad rhomboidal space; left valve nearly as large and

convex as the right, though still shutting considerably within it. Hinge tooth slender, erect; within smooth; impressions very faint. Length $\frac{2}{5}$ inch, height $\frac{1}{4}$ inch, breadth $\frac{1}{5}$ inch.

Found at Martha's Vineyard, in the neighbourhood of New Bedford, &c. It is abundant about Rhode Island, and is also an inhabitant of the coasts of Georgia and East Florida.

This species is remarkable for the equality of its valves; but still they are unequal enough to attract notice at once. The regular and beautifully rounded ribs are also quite characteristic. It bears a close resemblance to *Cumingia tellinoides* in its exterior.

GENUS PANDORA, BRUG.

Shell inequivalve, inequilateral, pearly within; right valve flat, left valve convex; hinge with two diverging teeth in the flat valve and corresponding grooves in the opposite one.

PANDORA TRILINEATA.

Shell oblong-ovate, rounded before, and with a recurved beak behind. Along the posterior hinge margin of both valves run two rough, elevated, radiating lines.

State Coll., No. 217. Soc. Cab., No. 1745.

Pandora trilineata, SAY; *Journ. Acad. Nat. Sc.*, ii. 261. *Amer. Conch.*, pl. 2.
CONRAD; *Amer. Mar. Conch.*, 49, pl. 11, f. 1. LAM.; *An. sans Vert.*, vi. 147.
Pandora nasuta, SOWERBY; *Species Conch.*, f. 18, 19.

Shell pearly-white, ovate, inequilateral, the anterior side broad and regularly rounded, about half the length of the posterior side, which has the hinge margin flattened, straight, or somewhat concave, the edge of the flat valve shutting over the edge of the convex valve, and terminating in a recurved or ascending tip, its points coarsely wrinkled, irregular, and slightly gaping; the anterior portion of the basal margin has a depending or pouch-like appearance; the upper edge is margined by two wrinkled, rounded lines radiating from the beaks, most obvious on the convex valve; surface wrinkled with undulating lines of growth, and with very faint radiating lines; sometimes there is a slightly impressed line passing from the beak to the middle of the base. Hinge in

the left or convex valve with three diverging teeth, the anterior one much the longest and strongest, the middle one very delicate, the third is rather a thickening of the posterior margin, with a ledge in it for the reception of a tooth in the opposite valve. Right or flat valve with two teeth, one short, triangular, strong, directed across the shell, the other long, inclined to the posterior hinge margin. Within iridescent; muscular impressions rounded, connected by a series of about a dozen rough spots for the adhesion of the mantle. Length $1\frac{3}{10}$ inch, height $\frac{7}{10}$ inch, breadth $\frac{1}{2}$ inch, nearly.

Found about the sandy regions of Cape Cod, and not unfrequently discovered adhering to oysters in the market. Dr. J. W. Mighels of Portland, Maine, has taken it by dredging in Casco Bay. Mr. Say found it as far south as Florida.

This is a very curious shell, easily recognised by its pearly substance, its flat valve, and its upward curved tip. From all other species yet described it is distinguished by the two lines bordering its posterior hinge margin. Mr. Say has figured a small young specimen; the rostrated tip is represented as too slender, as is also the whole shell, and the pouch-like appearance of the posterior base is not sufficiently indicated for adult shells. There is often a good deal of contortion and irregularity in the shape of the shell.

FAMILY OSTEODESMACEA.

Shell transverse, inequilateral, inequivalve, fragile, somewhat pearly, slightly gaping at one end; hinge with a thickening, or spoon-shaped process, to which the ligament is attached, usually supported within by an ossiculum.

There seems a propriety in separating from the family Myaria some of the genera formerly included under it. The delicate and pearly fabric of the shell, and the presence of the little irregularly shaped bone resting against the hinge within, are well-marked characters. These shells attain to a considerable size, and live in the sand about low-water mark.

GENUS OSTEODESMA, DESH.

Shell inequivalve, subtriangular, fragile, pearly; hinge having a narrow ledge within each valve, to which the ligament is attached, and against which adheres a four-sided ossiculum.

In the course of the reformations recently made in the indefinite genus ANATINA of Lamarck, this natural group of shells has received several generic appellations. A genus was instituted by Leach, to receive the old MYA *Norvegica*, which he called MĀGDALA; and, still later, Scacchi has named it PANDORINA. Perhaps I may be censured for breaking, in this instance, the salutary rule, that the oldest published name should take precedence of all others. The genus LYONSIA of Turton certainly preceded that of OSTEODÉSMA, and so, I think, did MĀGDALA. But the name OSTEODÉSMA is so well chosen, and is so well made known in the recent edition of Lamarck's work, being, moreover, the type of the natural family Osteodesmacea, that I cannot refrain from giving it the preference.

OSTEODÉSMA HYALINA.

Shell sub-ovate, fragile, pearly, translucent, inequilateral; elongated, compressed and truncated posteriorly; covered with radiating wrinkles; ossiculum a truncated wedge.

FIGURE 10.

State Coll., No. 220. Soc. Cab., No. 250.

Mya hyalina, CONRAD; *Journ. Acad. Nat. Sc.*, vi. 261, pl. 11, f. 12.

Lyonsia hyalina, CONRAD; *Amer. Mar. Conch.*, 51, pl. 11, f. 2.

Osteodésma hyalina, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 166.

Shell elongated, subovate, thin, fragile, pearly, translucent, inequilateral, the posterior side much the longest, narrowed, closely compressed at the end, but slightly truncated, so as to gape a little; posterior superior margin a straight line, and compressed; the remaining outline regularly rounded; beaks prominent, inclining forwards; region of the beaks tumid and smooth; a broad marginal portion is covered with a thin membranous epidermis projecting beyond the edge, and wrought into regular wrinkles, radiating from the beaks; these wrinkles are minutely fringed so as to entangle grains of sand, by which the surface is sometimes entirely coated. The hinge consists of a delicate ledge, running from the beak obliquely downward and backward, serving for the attachment of a ligament, which is also attached to the edge of the wedge-shaped ossiculum lying against that part. Muscular and

palleal marks indicated only by a more pearly appearance ; they are far within the shell, and the latter has no well-marked sinus. Length $\frac{7}{10}$ inch, height $\frac{4}{10}$ inch, breadth $\frac{3}{10}$ inch.

It is found thrown upon the sandy shores of Cape Cod, Chelsea, Lynn, and other similar localities. Its fragile structure is such as to indicate that it could not live elsewhere than in quiet sand. In April, 1836, the beach at Chelsea was strewed with multitudes of very large and mature ones. Since then I have found only an occasional specimen.

The ossiculum is almost always detached and lost. Sometimes, when the valves are separated, it adheres to one of them, and then it looks like the tooth of a MYA. When destitute of the ossiculum, if reliance were placed upon the hinge alone, the shell would probably be called an AMPHIDÉSMA, or some undescribed genus. There is no other shell on our coast, however, which presents the radiated wrinkles of the epidermis, together with the pearly lustre, of this shell.

The genus OSTEODÉSMA now embraces but three or four species. One of these, the *O. Norvégica* of northern European seas, is very similar to ours. But it is distinct. It grows to a much larger size, is more inequilateral, more broadly truncate ; the base is less regularly curved, and is covered by a much stronger and more opaque epidermis.

Young specimens are very thin, and have a horn-colored exterior, and numerous thin, concentric ridges at the different stages of growth.

If the valves are unequal, according to the definition of the genus, the difference must be very slight.

GENUS ANATINA.

Shell sub-equivalve, gaping slightly ; hinge with a prostrate, spoon-shaped tooth in each valve to receive the cartilage, and a small ossiculum resting in front of the teeth, usually removed with the animal.

ANATINA POPYRÁ'CEA.

Shell thin, fragile, white, rounded-ovate, inequilateral, the shorter side narrowed and truncated ; tooth narrow, directed obliquely forwards.

FIGURE 28.

State Coll., No. 231. Soc. Cab., No. 2322.

Anatina papyrätia, SAY; *Journ. Acad. Nat. Sc.*, ii. 314.*Anatina papyrätia?* TOTTEN; *Silliman's Journ.*, xxviii. 347, f. 1.

Shell small, broadly rounded-ovate, fragile and thin, white and pearly; the right valve most convex; inequilateral, the posterior or shorter side narrowed, and at the tip clipped, and moderately gaping; margin, from the beak backward, a straight line; the rest of the outline regularly curved; beaks placed about one third of the length of the shell from the posterior extremity, moderately prominent, inclining forwards, and cleft across the middle; from the beaks to the lower posterior angle runs an elevated, angular ridge; surface finely marked by the lines of growth, vestiges of a yellowish-white epidermis; interior pearly; tooth long and narrow, slightly concave, directed obliquely across the shell, supported beneath by a short, sharp, elevated rib; muscular and palleal impressions very superficial. Ossiculum somewhat like two crescents joined at the extremities, fitting in front of the teeth. Length $\frac{1}{3}$ inch, height $\frac{1}{2}$ inch, breadth $\frac{1}{4}$ inch.

Found in the stomachs of fishes caught off Nahant; and taken by dredging in Newport harbour by Colonel Totten.

This is undoubtedly the shell described at length by Colonel Totten, and for which he proposes the specific name *fragilis*, provided it be not the *A. papyrätia* of Say. Mr. Say's dimensions differ a little in their proportions from the New England shell; but our shells have sufficient latitude of dimensions to render this variation of little importance.

The only shell we have that resembles it, is the *Sanguinolària fusca*; but that shell has less breadth, is equilateral, and rounded throughout, besides the great difference of the hinge.

GENUS COCHLODÉSMA, COUTHOUY.

Shell inequivalve, inequilateral, slightly gaping at both ends; beaks small, cloven; hinge a spoon-shaped process in each valve, supported by an oblique rib, and receiving the cartilage.

COCHLODESMA LEANA.

Shell thin, white, sub-oval, the shorter side of the right or more convex valve truncated; rib-like support directed backwards.

FIGURES 29, 30.

State Coll., No. 230. Soc. Cab., No. 1726.

Anatina Leana, CONRAD; *Journ. Acad. Nat. Sc.*, vi. 263, pl. 11, f. 11.

Cochlodésma Leana, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 170.

Shell sub-oval, thin and brittle, white, with a thin, yellowish epidermis; the right valve convex, and truncated at the shorter end; the left valve nearly flat, and rounded at both ends; posterior end gaping, a little the shortest, and usually a little the narrowest; beaks very small, scarcely prominent, cleft at one side; a faint, wave-like ridge passes from them to the lower posterior angle; surface slightly wrinkled by the lines of growth, somewhat pearly beneath; interior chalky-white, the muscular and palleal impressions superficial, pearly. The spoon-shaped hinge process nearly horizontal, directed across the shell, and resting on a rib-like support, directed to the posterior muscular impression, immediately in front of which is another thread-like branch in the direction of the cleft in the beak. Ossiculum none. Length $1\frac{2}{3}$ inch, height 1 inch nearly, breadth $\frac{9}{16}$ inch.

Found about Cape Cod in almost every direction, inhabiting sandy beaches; also about Nantucket. I have never heard of it on the north shore of Massachusetts Bay, but it is more abundant to the south of us.

The animal has the mantle closed in front, except an opening for a broad, compressed foot, extending the whole length of the small abdominal mass; edges of the mantle a little thickened and wrinkled; siphons long, slender, separate in their whole extent.

This genus, proposed by Mr. Couthouy, has, I observe, been admitted by J. E. Gray, in the "Annals of Science," and I have therefore adopted it without hesitation.

This species very closely resembles *Mya* (*Cochlodésma*) *praténuis* of Pennant (*Ligula praténuis*, Montagu), but differs in being more rounded, less convex, less narrowed behind, and has no signs of a granulated or shagreened epidermis, like that shell.

GENUS THRACIA.

Shell inequivalve, slightly gaping at both sides; beaks conspicuous, one of them perforated; hinge with prominently thickened margins, to which an external ligament is attached.

THRACIA CONRADI.

Shell tumid, thin, inequilateral, rounded-ovate, with the smaller extremity truncated, exterior pale ashy-white, beneath which it is pearly.

State Coll., No. 219. Soc. Cab., No. 2318.

Thracia declivis, CONRAD; *Amer. Mar. Conch.*, 44, pl. 9, f. 2.

Thracia Conradi, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 153, pl. 4, f. 2.

Shell ovate, orbicular, rounded before, narrowed and truncated behind, thin, light and fragile, of a dingy white color; beaks nearly central, protuberant, turned a little backwards, that of the right valve perforated to receive the point of the other; the flattened area about the ligament is large and lance-shaped, bounded by a distinct ridge; surface coarsely wrinkled by the lines of growth, undulated by a ridge extending from the beak to the lower posterior angle, and by another broader eminence running from the beak to the middle of the base, causing an outward curve to the margin at that part; the right valve is considerably larger than the left, projecting beyond it, and much more convex. Ligament large, protuberant, and rounded, attached within to strong, thick, rounded eminences, which run backwards from the beaks along the edge. Interior of a chalky white color; pallial impression broad, with a very deep, acute-angular sinus. A thin, brownish epidermis is found on some portions of the shell. There is no ossiculum. Length 3 inches, height $2\frac{1}{2}$ inches, breadth $1\frac{1}{2}$ inch.

Found perfect, and containing the living animal, on Chelsea Beach, after violent easterly storms, and probably lives in the sand not far from low-water mark. Single valves have been found abundantly on Rhode Island, and also on the coast of Maine, and in Buzzard's Bay, so that it probably inhabits the whole New England coast.

This is a large and interesting shell, easily distinguished from most

of our shells by its toothless hinge; and, when the valves happen to be found united, the disparity in their size and convexity is at once perceived. When the external coating is removed, we come to a silvery substance like mother-of-pearl. I have a specimen, the dimensions of which are, length 4 inches, height $3\frac{4}{8}$ inches, breadth $2\frac{1}{8}$ inches. Dr. Prescott of Lynn has one nearly as large.

I have carefully dissected the animal, and find it to correspond in all essential particulars with the anatomy as laid down in Kiener.

Like many others of our shells, this has had the misfortune to have several names applied to it which it cannot claim. It is beautifully and accurately figured by Mr. Conrad, but his synonymy is entirely erroneous. In the "Catalogue of Animals and Plants of Massachusetts, 1834," it is referred to under the name of *Anatina convéxa*. In Dr. Storer's Translation of Kiener's "Iconography," &c., it is alluded to under the supposition that it is *T. corbulóides*, to which species it is, indeed, closely allied. But it is more equilateral, more rounded, proportionally narrower behind, and its surface has not the shagreen roughness of that shell.

Mr. Couthouy has fully pointed out its distinctive characters, and established it as a species; and for more minute particulars his article in the "Boston Journal" may be referred to.

FAMILY MACTRÁCEA, LAM.

Shell equivalve, usually somewhat gaping at sides; hinge with an internal cartilage, and sometimes an external ligament also.

GENUS MACTRA, DESH.

Shell transverse, slightly gaping at sides; beaks prominent; hinge a prostrate, concave tooth to contain the cartilage, having at one margin a delicate, erect tooth like the letter V; two lateral teeth near the central ones.

MACTRA SOLIDÍSSIMA.

Shell large, massive, strong, oval, covered with a dirty-brown epidermis, sub-equilateral; hinge strong, V tooth delicate; palleal impressions slightly indented posteriorly.

State Coll., No. 228. Soc. Cab., No. 1729.

Mactra solidissima; CHEMN.; *Conch.*, x. t. 170, f. 1656. DILLWYN; *Catal.*, i. 140. WOOD; *Index*, pl. 6, f. 22. CONRAD; *Amer. Mar. Conch.*, 64, pl. 14, f. 7.

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Mactra gigantèa, LAM.; *An. sans Vert.*, vi. 97. DESHAYES; *Encyc. Méth., Vers.*, ii. 394, pl. 259, f. 1.

Mactra lutèola, LOVÈN; *Mss.* (young.)

Shell very large and solid, transversely ovate, somewhat triangular, nearly equilateral, anteriorly a little the shortest, and with a fissure between the beaks; surface slightly folded at the lines of growth, covered with a thin, dirty-brown or straw-colored epidermis, which is usually worn from the disc; beaks large and protuberant, inclined a little forwards; behind them is a broad, lanceolate space, bounded by sharp ridges passing from the beaks to the upper part of the basal angle, in which the epidermis is foliaceous, or very loosely wrinkled; a much more faintly developed areola may also be observed before the beaks. Hinge very strong, spoon-shaped cavity very large and broad, the V tooth very delicate, and adhering by a very small base, so that it is usually broken off in the cartilage; lateral teeth long and thin, striated on their receiving surfaces. Muscular and paleal impressions very decided, the posterior sinus of the latter quite shallow. Length $4\frac{1}{2}$ inches, height 3 inches, breadth $1\frac{1}{2}$ inch.

It is found about sandy beaches on all our coast, and its inhabitant is much esteemed by some, as an article of food. At low water it is dug out of the sand with shovels. At higher tides, when the shell is open, the fishermen wade into the water, thrusting a pointed stick into the sand before them, as they walk along. If the stick happens to pass between the valves, they are closed upon it by the animal, and the shell is thus drawn up.

This is sufficiently characterized at maturity by its great magnitude, which entitles it to the name of *giant clam*. No other species of the genus approaches it in size except the next, from which it may be distinguished at all stages by its striated lateral teeth. The largest specimen I have seen measures $6\frac{1}{2}$ inches in length, 4 in height, and $2\frac{1}{2}$ in breadth. It preserves its general features through all ages, except that, when young, it is more nearly equilateral, and, after it has attained its full dimensions, it acquires great weight and thickness. Some specimens obtained in Provincetown harbour, where there are no rocks and little surf, are very light, thin, and white.

A specimen from the cabinet of Colonel Totten, which he found at Newport, I presume to be the *M. similis* of Say. Whether it be sim-

ply a variety of *M. solidissima* or not, I will not presume to decide from this one specimen; and, as it is not strictly a Massachusetts shell, I shall merely notice it in this way. The shell has certainly quite a different aspect. It is triangular, the beaks are more elevated, the marginal outlines are straight, and the comparative dimensions vary as follows:

M. solidissima, length $1\frac{1}{2}$ inch, height $1\frac{3}{10}$ inch, breadth $\frac{3}{4}$ inch.

M. similis, length $1\frac{1}{2}$ inch, height $1\frac{4}{10}$ inch, breadth $\frac{1}{2}$ inch.

I have received a shell, about three fourths of an inch long, from Dr. Lovèn of Stockholm, which he calls *M. lutèola*. I cannot perceive that it differs from the young of this shell, of a corresponding size.

MACTRA OVALIS.

Shell large, thick, obovate, coarse, nearly equilateral, covered with a tough, dusky-brown epidermis; V tooth strong; lateral teeth not striated; sinus of palleal impression deep.

FIGURE 32.

State Coll., No. 229. Soc. Cab., 2324.

Mactra similis, GRAY; *Append. to Beechey's Voyage*, pl. 44, f. 8.

Mactra grandis, DESHAYES; *Encyc. Méth., Vers*, ii. 395, not *M. grandis* of CHEM-NITZ and others.

Shell large, thick, and coarse, somewhat compressed, sub-oval, a little shortest anterior to the beaks, and, the anterior slope of the hinge margin being slightly concave, it is there somewhat narrowed; posterior slope convex, extremity slightly gaping, base regularly curved; beaks but little elevated; before, there is a short, faintly defined areola; behind them is another portion bounded by an elevated line extending from the beaks to near the lower angle, and here the epidermis is very coarsely and loosely wrinkled; the surface has a rugged appearance from the coarse lines of growth, and is rendered still more so by the folds of the thick, strong, dusky-brown epidermis in the same direction. Interior bluish-white; hinge supports strong and smoothly rounded; V tooth strong and firm, having the anterior side in the right valve much more elevated than the posterior; lateral teeth short and slender, not striated; muscular and palleal impressions rather superficial; sinus of the latter deep. Length $3\frac{1}{2}$ inches, height $2\frac{1}{4}$ inches, breadth $1\frac{1}{4}$ inch.

Found at the Bank fisheries, in the stomachs of fish. The young, from a fourth of an inch to an inch in length, are found abundantly in fish caught in Boston harbour. At least, they differ from the young of *M. solidissima*, and correspond in external proportions and appearance to our shell, and the teeth are slender and without striæ.

This shell is inferior in size to the *M. solidissima* only. The largest valve I have seen measures $4\frac{1}{5}$ by $2\frac{4}{5}$ inches. In general it is found smaller than the dimensions given. Such specimens have a straw-colored epidermis.

Its size, shape, and surface distinguish it from *M. grandis*, CHEMN. *M. sólida*, and all other known species except *M. solidissima*. Compared with that more common shell, it differs in its coarser surface, its thick, dusky epidermis, its less elevated beaks and less convex valves, the longer and narrower anterior portions, the rough, oval portion behind the beaks embracing more of the shell, the more feeble hinge, the stout and firm V tooth, and the deep sinus of the palleal impression.

I have very little doubt that this is the shell described by Deshayes as *M. grandis*. The descriptions correspond well. But, as it is not figured or quoted by other authors, and the habitat was not known to him, it is impossible to decide with certainty. Singularly enough too, Deshayes himself does not cite it in his new edition of Lamarck. Provided it be the same, however, the specific name must necessarily be changed, as his name was previously given to a different species by Chemnitz.

This appears to be the same species, a small specimen of which is figured by Mr. Gray in the Appendix to Beechey's Voyage, under the name of *M. similis*. This name is pre-occupied by Mr. Say.

MACTRA LATERALIS.

Shell small, triangular, very convex, nearly equilateral; beaks elevated, the spaces before and behind them broad heart-shaped.

FIGURES 34, 35.

State Coll., No. 227. Soc. Cab., No. 2325.

Mactra lateralis, SAY; *Journ. Acad. Nat. Sc.*, ii, 309. CONRAD; *Amer. Mar. Conch.*, 62, pl. 14, f. 4.

Shell small, triangular, tumid, nearly smooth, shining; nearly equilateral, the posterior side somewhat prolonged, and sloping less rapidly than the anterior side; ends rounded; beaks elevated, not meeting, pointed and inclined forwards; the regions before and behind the beaks are broad, flattened, and more or less heart-shaped, defined by slightly elevated ridges; surface finely marked by the lines of growth, white, covered with a thin, dirty-brown epidermis; hinge strong, the pit for the cartilage being a small recess penetrating deeply into the beaks; before it is a strong, prominent V tooth, and on each side of it, in the left valve is a stout and prominent lateral tooth, and in the other a deep fossa with elevated sides to receive it; cavity of the beaks deep; muscular impressions deep; pallaeal impressions distinct, with a shallow sinus posteriorly; interior clear glossy-white. Length $\frac{1}{2}$ inch, height $\frac{7}{16}$ inch, breadth $\frac{3}{16}$ inch.

The only places, where I have found this shell living, are the inlets of the salt marshes between Roxbury and Boston. But all the flats, which have been drained by the erection of the Mill dam, have a layer of them just beneath the surface; and vast numbers were un-earthed in throwing up the embankments for the rail-ways which cross them. They doubtless exist plentifully in the bed of the river on the other side of the Mill-dam. They are found abundantly at New Bedford also, and I know them to be common about Rhode Island.

It assumes very various forms, depending mostly on age. When young, the shell is thin, rather compressed, and the beaks are inconspicuous and touching each other. By age it becomes very thick and turgid, the beaks elevated and widely separated, and the height of the shell often equals its length.

The small, deeply penetrating pit of the hinge is very peculiar.

The dimensions of one from the track of the Providence Railroad is as follows. Length $\frac{9}{10}$ inch, height $\frac{8}{10}$ inch, breadth $\frac{6}{10}$ inch. It is represented by Figure 34.

It is not likely to be mistaken for any other species. The young of *M. solidissima* and *M. ovalis* are much less triangular, and of a very different aspect. It has more the proportions of *M. solida* of Europe.

GENUS CUMÍNGIA BROD. and SOWERBY.

Shell ovate, inequilateral, equivalve; a shallow spoon-shaped cardinal tooth, and a single small tooth by its side in each valve, and a strong lateral tooth on both sides in one valve only; palleal impression with a large sinus.

CUMÍNGIA TELLINOÍDES.

Shell ovate-triangular, thin, white, nearly equilateral, pointed and warped behind; surface with sharp, elevated lines of growth.

FIGURE 34.

State Coll., No. 225. Soc. Cab., No. 1744.

Mactra tellinóides, CONRAD; *Journ. Acad. Nat. Sc.*, vi. 258, pl. 9, f. 2, 3. *Amer. Mar. Conch.*, 60, pl. 14, f. 2.

Cumíngia tellinóides, CONRAD; *Journ. Acad. Nat. Sc.*, vii. 234.

Shell transversely triangular-ovate, thin, fragile, bluish-white; nearly equilateral, anteriorly broad, tumid, and regularly rounded; posteriorly compressed, warped, ending in a rounded point, the margin declining more rapidly than in front; beaks raised, not inclining to either end. Stages of growth marked by sharp, raised ridges, which are crossed by microscopic, radiating lines; in front of the beaks is a small, well-defined areola. Within, glossy-white; pit for the cartilage shallow, directed slightly backwards; in front of it, in each valve, is a linear tooth forming part of its wall, and at its side a fossa for receiving the corresponding tooth; lateral teeth distinct in the right valve, but wanting in the left, the anterior one longest. Muscular impressions faint, palleal impression far within the shell, with a broad, deep indentation opposite the base. Length $\frac{3}{8}$ inch, height $\frac{9}{20}$ inch, width $\frac{1}{4}$ inch.

Found abundantly in the region of New Bedford and Martha's Vineyard, and probably may be found everywhere south of Cape Cod.

Its warped, slightly folded end gives it the aspect of a TELLÍNA. Its shape and surface is similar to those of *Córbula contrácta* of the same size. The raised lines are, however, thin, elevated, sharp in this, while in *C. contrácta* they are thick and rounded, and the shell is so much more compressed as to preclude mistake.

A species of this genus is found in the West Indies, perhaps the

same, and one or two more have been found in the Pacific; and these are all the species at present known.

GENUS MESODESMA, DESH.

Shell triangular, compressed, thick, generally closed, hinge a spoon-shaped tooth in each valve, which receives the cartilage, and a simple lateral tooth on each side, without a V tooth.

MESODESMA ARCTATA.

Shell sub-triangular, very inequilateral, truncated before, smooth and covered by a shining yellow epidermis; lateral teeth straight, striated.

FIGURE 39.

State Coll., No. 223. Soc. Cab., No. 1737.

Mactra arctata, CONRAD; *Journ. Acad. Nat. Sc.*, vi. 257, pl. 11, f. 1.

Mactra deaurata, CONRAD; *Amer. Mar. Conch.*, 59, pl. 14, f. 1.

Mactra subtriangulata, WOOD; *Index, Suppl.*, pl. 1, f. 10.

Shell sub-triangular, wedge-shaped, thick and strong, very inequilateral, the posterior side very short, forming the base of the wedge, its lower portion truncated; the upper and anterior edge is a straight line, the anterior extremity narrowed, regularly rounded, as is also the base; beaks very slightly elevated, not inclined to either end; a sharp ridge passes from them to the hinder and lower angle; surface with occasional rounded ridges at the lines of growth, covered with a thin, golden-yellow epidermis, reflecting a metallic lustre; hinge composed of a very deep, spoon-shaped cavity for the cartilage, a long V tooth opening at a very acute angle, and on each side a straight lateral tooth, partially double in the right valve, their articulating surfaces striated, the posterior tooth much the shortest; muscular impressions well defined, connected by the simple palleal impression which has a sinus behind, of about the size of the rounded muscular impression at its side. Length $1\frac{1}{2}$ inch, height 1 inch, breadth $\frac{11}{16}$ inch.

Found abundantly at Plumb Island, below Newburyport; vast numbers are also thrown upon the outer side of Cape Cod; and a few specimens have been taken from fish caught off Nahant. At Nantucket it is rare.

The name and general shape of the English *M. deaurata* would lead one to suppose it to be identical with our shell, and Mr. Conrad has adopted that opinion. But Mr. Sowerby pronounces them not to be the same. Indeed an examination of Turton's figure in his "British Bivalves" would show his shell to be more closely allied to, if not identical with, the next species.

MESODE'SMA JAURE'SII.

Shell ovate-triangular, thick, antiquated, coarsely ridged concentrically, inequilateral, lateral teeth very strong, curved, faintly striated.

FIGURE 38.

State Coll., No. 268. Soc. Cab., No. 2326.

Mesodésma Jaurèsii, DE JOANNIS; *Guérin, Mag. de Zool.*, Oct. 1834.

Shell ovate-triangular, thick and massive, surface rising into ridges at the stages of growth, and covered by a coarse, dusky-brown epidermis; very inequilateral, behind short and regularly rounded to the base, where there is an abrupt turn, and the basal margin continues in nearly a straight line, or is a little arched; upper hinge margin also a straight line or slightly concave, anteriorly regularly rounded; beaks scarcely rising at all, not inclined to either end; the greatest diameter of the shell is midway between the beaks and the anterior extremity. Spoon-shaped cavity for the cartilage very deep; on its anterior edge is the vestige of a short, widely diverging V tooth, which will seldom be found, as it is scarcely possible to open the valves without destroying it. On each side is a very strong, curved, lateral tooth, with a pit above it for the reception of the tooth in the opposite valve; the anterior tooth much longer than the posterior and supported beneath by a thickening of the shell; striæ on the teeth very faint. Within glossy white; muscular impressions profound, united by a simple palleal line, which has a small, semi-circular sinus behind. Length $1\frac{3}{4}$ inch, height $1\frac{1}{10}$ inch, breadth $\frac{7}{10}$ inches.

Brought from St. George's and Grand Banks. I am not aware that it has actually been found in the waters of this State.

The obvious distinguishing marks between this shell and the preceding are, in *M. Jaurèsii* the coarse, rough exterior, its longer and un-

cut posterior side; its very peculiar outline when viewed with the beaks presenting, on account of its thickness anteriorly; and its strong, curved, nearly smooth lateral teeth.

GENUS MONTACUTA, TURTON.

Shell ovate or oblong, equivalve, inequilateral, nearly closed; hinge with two teeth in each valve, and a cavity between them; lateral teeth none.

This genus with the following, seems to have been adopted by several distinguished conchologists. There appears, however, no very good grounds for separating them. The genus *Tellimya* of Brown, which comprehends them both, may yet supersede them. Fleming conjectures that they are merely the fry of *Mya* and *Lutraria*; but in this I think he is in error. None of the shells found on our coasts could ever have originated from such forms. *Montacuta* would probably come under *Ungulina*, and *Kellia* under *Erycina*, of Lamarck.

MONTACUTA BIDENTATA.

Shell minute, white, ovate-triangular; surface roughened with loose lines of growth, beaks pointed; tooth on the shorter side oblique and excavated for the reception of the ligament.

State Coll., No. 215. Soc. Cab., No. 2320.

Mya bidentata, MONTAGU; *Test. Brit.*, 44, t. 26, f. 5. MATON and RACKETT; *Lin. Trans.*, viii. 41. PENNANT; *Brit. Zool.*, iv. 166. WOOD; *Gen. Conch.*, 99. *Index*, pl. 3, f. 16. DILLWYN; *Catal.*, 45. TURTON; *Conch. Dict.*, 102. *Brit. Biv.*, 60.

Shell minute, fragile, white within and without, ovate-triangular, inequilateral, rather convex; beaks nearest the broader end, acute and prominent, pointing to the longer end; upper margin sloping rapidly from the beaks, ends regularly and bluntly rounded, base scarcely curved; surface shining, but rendered somewhat scabrous or rough by numerous, loosely cohering edges of the stages of growth; its only variation in color consisting in the opacity or transparency of its substance. Within, polished, and

destitute of any apparent muscular or palleal impressions except in very old specimens, but faintly marked with radiating lines. Hinge consisting of two teeth diverging from the beaks, so as to leave a triangular vacancy between them; one of them considerably elevated, and more so in one valve than in the other, while that on the shorter side scarcely rises, at its tip, above the edge of the valve, and its inner surface is excavated and receives the ligament. Length nearly $\frac{1}{2}$ inch, height $\frac{1}{8}$ inch, breadth $\frac{1}{12}$ inch.

Found by Mr. C. F. Shiverick, in New Bedford harbour. Only a few specimens have, as yet, been obtained.

It is very difficult to refer, with certainty, so small a shell to any described species or even genus. However, by means of specimens of *M. substriata* furnished me by Dr. Lovèn, I have become fully satisfied as to the genus. It seems also to accord sufficiently well with the *M. bidentata* to warrant us in designating it as that species. It is probably a borer like its European co-species, and may, most likely, be found abundantly in the antiquated surfaces of old and thick oyster shells.

GENUS KÉLLIA, TURTON.

Shell somewhat globular, equivalve, closed; hinge with two approximate teeth, and a remote lateral tooth in one valve, and a concave tooth and remote lateral one in the other.

KÉLLIA RUBRA.

Shell sub-oval, white, with a thin, purplish epidermis; beaks prominent.

FIGURE 23.

State Coll., No. 216. Soc. Cab., No. 2321.

Cárdium rubrum, MONTAGU; *Brit. Shells*, 83, t. 27, f. 4. PENNANT; *Brit. Zool.*, iv. 189. WOOD; *Gen. Conch.*, 213. DILLWYN; *Catal.*, 131.

Cárdium læve, WALKER; *Test. Minut.*, 24.

Tellina rubra, TURTON; *Conch. Dict.*, 168.

Kéllia rubra, TURTON; *Brit. Bio.*, 58. FLEMING; *Brit. Anim.*, 430.

Shell minute, rather thick, sub-oval, very inequilateral, rather compressed; beaks rather prominent, and in contact, having before them a deeply excavated, elongated, smooth areola; ends

broadly rounded, especially the posterior tip ; basal margin scarcely curved and nearly parallel with the superior margin ; surface marked with the lines of growth, eroded at the beaks, and covered with a purplish or dirty-brown rather thick epidermis. Within white and glossy ; two muscular impressions and the palleal line directly connecting them, without any sinus, quite perceptible. Hinge consists, in the right valve, of a narrow, erect, central tooth, and an imperfect one each side, slightly detached from the edge of the valve ; in the left valve, of a well-defined tooth on each side, barely separated from the edge of the valve, leaving a triangular vacancy between them to receive the central tooth of the opposite valve. Length $\frac{1}{8}$ inch, height $\frac{1}{8}$ inch, breadth $\frac{1}{16}$ inch.

Several specimens of this minute shell were found by Mr. C. F. Shiverick in the harbour of New Bedford. I have also found it about the roots of sea-weed, which seems to be its proper station.

The arrangement of the teeth does not seem to be well expressed in the generic description ; but as they accord precisely with those of a specimen of *K. sub-orbicularis* sent me by Dr. Lovèn, I do not hesitate to place our shell under the genus. I cannot find that it differs essentially from the foreign *K. rubra*, except that its color does not appear to be of so bright a red as Montagu's figure.

FAMILY LITHOPHAGIDÆ, LAM.

Shell burrowing, but without a tube or accessory valves, more or less gaping ; ligament external.

GENUS SAXICAVA, LAM.

Shell transverse, inequilateral, gaping posteriorly and above ; hinge nearly toothless.

SAXICAVA DISTORTA.

Shell oblong, inequivalve, rounded before, and generally truncated behind, and with a prominent ridge running from the beaks to the lower posterior angle ; surface rough and irregular.

FIGURE 40.

State Coll., No. 243. Soc. Cab., No. 1751.

Saxicava distorta, SAY; *Journ. Acad. Nat. Sc.*, ii. 318.

Mytilus rugosus, LIN., &c.

Shell oblong-oval, coarse, white, very irregular in shape; inequivalve, the right valve projecting over the left except at the shorter end; inequilateral, the anterior side rounded and generally of about one half the length of the other side, but the beaks are sometimes nearly terminal; the posterior end is most frequently truncated, but at other times rounded; gaping; beaks rather prominent, from which two ridges or elevated lines run backwards, one near the margin, and the other to the lower angle, giving the included surface a lozenge shape. In some shells these lines are very distinct, and they are armed with a series of elevated, arched scales or spines; the basal margin is usually contracted at the middle, and slightly arched upwards; surface coarsely marked with the lines of growth, and irregularly undulated; epidermis thin, dingy-yellow. Ligament aided by the mantle, which adheres all along the back. Teeth for the most part wanting; when not wanting, a single rudimentary tooth in one valve is received into a pit in the opposite valve; muscular impressions obscure. Length 1 inch, height $\frac{3}{8}$ inch, breadth $\frac{2}{5}$ inch.

Found adhering to marine objects. They may almost always be found among the roots of fuci, which are thrown up by storms, adhering to stones, shells, &c. The best I have ever obtained were taken from a log drawn out of one of our timber docks, to which they were adhering by a silken byssus issuing from the middle of the base.

The foot of the animal is of a bright orange-color.

This shell is a perfect Proteus, of which no description can be given that is not liable to mislead. I think there can be little doubt, that the same shell exists on the European shores, and that it has been already described under at least one name. But, as I have not the means of arriving at certainty on this point, I have chosen, until better satisfied, and as it will introduce no new name, to retain that which Mr. Say applied to it.

In the first place, it would come under the genus *Byssomya*, on account of its being furnished with a byssus. But the majority of the best modern conchologists regard this circumstance as of little importance, and consequently reject the genus. Some specimens cor-

respond well with the description of *S. phóladis*, LAM., the *Mya byssífera* of FABR. These are found in places where their regular growth is unobstructed. Other specimens, and especially adult ones, seem not to vary from *S. rugòsa*. Nothing could apply better to our shell, than Turton's description of *Mytilus rugòsus*, in his "Conchological Dictionary." But our shell is less likely to belong to this than to *S. phóladis*, inasmuch as, besides the presence of a byssus, our shell is not a borer like *S. rugòsa*; indeed, there are no rocks on our coast of a calcareous nature.

Again, there are small specimens in which the two lines or ridges along the posterior slope, armed with spines, are very conspicuous, corresponding to the *S. rhombóides* of Deshayes, the *Mytilus præcisus* of Montagu, and doubtless the *Hiatélla ártica* of Lamarck, (*Solen minútus*, LIN.)

Now all these varieties are found living promiscuously together; and, as their shape is known to be greatly modified by the circumstances under which they are developed, the rational conclusion is, that they all pertain to the same species; and the probability is, that they are identical with the European shell; but under what name to place them, and whether under one or more, it is now impossible to say.

GENUS PETRICOLA, LAM.

Shell transverse, inequilateral, rounded before, narrowed posteriorly; hinge almost toothless; ligament exterior.

PETRICOLA PHOLADIFÓRMIS.

Shell ovate-cylindrical, chalky-white, very inequilateral, acutely rounded before, covered with elevated radiating lines and ribs; an ovate areola before the beaks; teeth two in each valve, one in the left valve deeply cleft.

State Coll., No. 244. Soc. Cab., No. 1746.

Petricola pholadifórmis, LAM.; *An. sans Vert.*, vi. 159. DESHAYES; *Encyc. Méth.*, Vers, iii. 747. SOWERBY; *Genera*, *Petricola*, f. 1, 2. SAY; *Amer. Conch.*, pl. 60, f. 1. - CONRAD; *Amer. Mar. Conch.*, pl. 7.

Petricola fornicàta, SAY; *Journ. Acad. Nat. Sc.*, ii. 319. RUSSELL; *Essex Co. Soc. Journ.*, i. 55.

Shell much elongated, ovate-cylindrical, chalky-white within and without; equivalve, very inequilateral, the anterior portion

very short, and acutely rounded ; posteriorly very little narrowed, the hinge and basal margins nearly parallel, and the extremity bluntly rounded and a little gaping ; beaks elevated, and inclined forwards ; in front of them is a sharply ovate lunule, distinctly defined, and marked only by the lines of growth ; behind them is a projecting ligament of considerable length ; surface coarsely marked by the stages of growth, and covered with elevated, radiating lines, various in size and distance ; at the posterior hinge margin they are crowded and very faint, while anteriorly they are large and distant ; about seven or eight of them are more prominent than the rest, and the lines of growth rise upon them into vaulted, tooth-like scales ; hinge margin very narrow ; teeth two in each valve, seeming to arise out of the cavity of the beaks, and curving upwards ; in the right valve one tooth is prominent and furrowed ; the other, arising a little before it, and a little deeper within the shell, is quite short ; in the left valve is one large, prominent tooth, so deeply divided as to resemble two, and directly behind it, diverging widely in the direction of the margin, is a thin, much less elevated tooth. Muscular impressions faint, connected by a very deeply notched palleal impression ; furrows within answer to the ribs without. Length $1\frac{1}{2}$ inch, height $\frac{7}{16}$ inch, breadth $\frac{3}{8}$ inch.

Found on various parts of our coast ; at Chelsea and Nahant beaches it is found abundantly, imbedded in jutting fragments of a marsh which once existed there, but which has been washed away by inroads of the sea, and now only an occasional remnant lifts its head above the surrounding sand. Also in great quantities boring into the hard blue clay, at low-water mark, on Phillips's Beach.

Deshayes remarks, that this is a very extraordinary shell on account of its exterior aspect, which would lead one to mistake it for a small *Pholas*. To any one who has seen a *Pholas*, the resemblance is striking ; but the want of any wide gaping, and the articulated hinge, at once correct the first impression.

The teeth are so long and slender, that it is a rare thing to find a specimen in which some of them are not fractured.

The animal, according to the observations of the Rev. J. L. Russell, has two tubes or siphons extending from the longer end, the orifice of the one for imbibing water fringed with a circle of feathery

hairs, consisting of four large and four small ones; and the same number of short, obtuse points, without fringe, surround the orifice of the other tube.

PETRICOLA DACTYLUS.

Shell elongated-ovate, chalky-white, very inequilateral, covered with radiating lines and ribs; no areola before the beaks; teeth, two in the right, and three in the left valve.

FIGURE 41.

State Coll., No. 245. Soc. Cab., No. 2327.

Petricola dactylus, SOWERBY; *Genera*, *Petricola*, f. 3. SAY; *Amer. Conch.*, pl. 60, f. 2.

This shell very closely resembles the preceding, and will be best described by a comparison with it. It has a more ovate form, the basal margin being considerably arcuated; the anterior extremity is broader, and obtusely rounded; there is no marked areola before the beaks, but a deep depression under them; the ligament is longer; the radiating lines are more numerous, the rib-like anterior ones are more numerous (about sixteen), less elevated, and the lines of growth merely undulate over them without being raised into vaulted scales; in the right valve are two teeth similar to those in *P. pholadiformis*, but shorter and grooved; in the left valve, instead of the large, cleft tooth, we have two teeth, the division between them answering to the cleft in the other species; the large middle tooth is folded, and the posterior one is very slender. Length $1\frac{3}{4}$ inch, height $\frac{3}{4}$ inch, breadth $\frac{1}{2}\frac{1}{0}$ inch.

Sent to me by Dr. L. M. Yale from Martha's Vineyard.

It is a proportionally shorter and broader shell; but its most obvious mark of distinction is the want of an areola before the beaks.

FAMILY NYMPHACEA, LAM.

Not more than two cardinal teeth on the same valve; nymphæ, in general externally prominent, and covered by the ligament.

GENUS SANGUINOLARIA, LAM.

Shell equivalve, inequilateral, sub-ovate, compressed, rounded anteriorly, sub-rostrate posteriorly, slightly gaping at sides; hinge

with two small cardinal teeth in each valve ; palleal impression with a deep sinus.

SANGUINOLÀRIA FUSCA.

Shell compressed, ovate-orbicular, sub-equilateral, rounded before and somewhat pointed behind ; white, covered with a dusky epidermis ; teeth two in each valve, the largest of which is grooved.

FIGURE 42.

State Coll., No. 212. Soc. Cab., No. 1754.

Psammòbia fusca, SAY ; *Journ. Acad. Nat. Sc.*, v. 220.

Sanguinolària fusca, CONRAD ; *Amer. Mar. Conch.*, 34, pl. 7, f. 1.

Tellina inconspicua? SOWERBY ; *Zool. Journ.*, iv. 359.

Tellina Grönlándica, BECK.

Tellina Bálthica, LIN.

Shell thin, white, compressed, ovate-orbicular, nearly equilateral, height nearly equal to length, rounded before, somewhat narrowed and pointed behind ; beaks minute ; an imperfect ridge or fold runs from the beaks to the posterior termination ; surface finely wrinkled by the lines of growth, covered by a whitish or dusky epidermis ; ligament exterior ; two unequal, parallel teeth in each valve, the large one opposing the small one in the other valve, and deeply grooved or cleft ; muscular impressions distinct. Length $\frac{9}{16}$ inch, height $\frac{7}{16}$ inch, breadth $\frac{7}{16}$ inch.

This is one of our most abundant bivalve shells. It is thrown up on every beach, and appears to live everywhere in shallow, still water. Multitudes appear in the mud which is obtained about Boston at low tide for raising wharves, extending the land, &c.

Its varieties in size, strength, and color, are very great. In muddy bays they grow to a large size, are thick, and of a bluish or sometimes a rusty color, and are covered with a firm, dark epidermis. In clean, sandy localities they are very delicate and thin, pure white, or sometimes of a delicate rose-color or lemon-color, and the epidermis is very slight.

All recent authors, except Deshayes, agree in calling this a *Sanguinolària*.

It is undoubtedly identical with *Tellina Grönlándica* of Beck ; and it certainly is very like, if not identical with, Sowerby's *T. inconspicua*, published in the "Zoological Journal." The young, delicate, white, or rose-tinted ones accord in every respect with *T. Bálthica*.

SANGUINOLA'RIA SÓRDIDA.

Shell sub-oval, thin, white, covered with a dusky epidermis ; anterior side semi-oval, and longest, posterior termination somewhat angular ; hinge teeth, two in each valve, one of which is cleft.

State Coll., No. 209. Soc. Cab., No. 2329.

Tellina sordida, COUTHOUY ; *Bost. Journ. Nat. Hist.*, ii, 59, pl. 3, f. 11.

Shell sub-oval, compressed, thin and brittle, slightly gaping, inequilateral, the anterior side being longest and semi-oval ; behind the beaks the margin declines rapidly in nearly a straight line, forming a rounded angle as it joins the base, and bordered by a faint, roughened wave ; surface somewhat undulated by the lines of growth, especially on the anterior slope, and covered by a thin, dusky or dirty-white epidermis ; beaks minute ; cardinal teeth two in each valve, a large one which is cleft, and a very delicate one which is seldom entire ; lateral teeth wanting, or consisting of a feeble compression and elevation of the posterior hinge margin ; sinus of the palléal impression nearly reaching the anterior muscular impression ; interior bluish-white. Length $\frac{9}{16}$ inch, height $\frac{6}{16}$ inch, breadth $\frac{1}{4}$ inch.

Found in considerable numbers, and in a fresh state, in fish caught off Nahant.

It is quite clear that this shell belongs to the same genus as Say's *Psammöbia fusca*. The hinge is precisely the same, and the slight wave along the posterior margin is no more conspicuous than in that shell. Its habit and general aspect are also the same.

GENUS TELLINA, LIN.

Shell transverse, sub-equivale, compressed, angular, and somewhat rostrated at the posterior end, where there is an irregular, wave-like fold ; two small cardinal teeth, and generally two lateral teeth in each valve.

TELLINA TENTA.

Shell white, oval, behind shortest, narrowed, very much warped and widely gaping ; lines of growth very fine ; within polished, and with numerous, fine, radiating lines.

FIGURE 43.

State Coll., No. 210. Soc. Cab., No. 2328.

Tellina tenta, SAY; *Amer. Conch.*, pl. 65, f. 3.

Shell small, thin, white, oval; beaks pointed, moderately prominent behind the middle; posterior side narrowed, the point slightly truncated, the posterior hinge margin curvilinear; valves very convex, the left one most so, widely gaping, and very far bent to the right; posterior fold distinct on the right valve; outer surface shining, but not polished, minutely wrinkled by the lines of growth, and with a few fine, radiating lines across the middle; inner surface polished, white, tinted with yellow, and covered with radiating lines, which produce a finely indented margin. Hinge very delicate, with two diverging cardinal teeth on the right valve, and a single one on the left; a posterior lateral tooth on the right valve, and a corresponding groove on the left; ligament minute, prominent; muscular and pallial impressions distinct. Length $\frac{3}{8}$ inch, height $\frac{2}{8}$ inch, breadth $\frac{1}{8}$ inch.

Found by Professor Adams in 1838 in Dartmouth harbour; and in 1839 he obtained numerous single valves in mud dredged up in New Bedford harbour. Mr. Say received it from South Carolina.

This is a distinctly characterized, true *Tellina*, and differs from all others of our shores. It is larger than *T. ténera*, and has not its polished surface. It differs from others principally in its less triangular, strongly warped, and widely gaping posterior portion, and the radiating lines within.

TELLINA TE'NERA.

Shell oblong sub-oval, thin, white, iridescent, delicately marked by the lines of growth; inequilateral, shortest and pointed behind; posterior lateral tooth obsolete.

FIGURE 44.

State Coll., No. 211. Soc. Cab., No. 1783.

Tellina ténera, SAY; *Journ. Acad. Nat. Sc.*, ii. 303.

Shell small, thin, and delicate, transversely sub-oval, or, if we regard the posterior portion, sub-triangular; slightly longest and

semi-oval before the beaks ; the posterior slope sudden and nearly straight, forming a blunted angle by its junction with the base ; marginal fold well marked ; surface regularly and delicately marked by sharp lines of growth ; color white, or slightly tinged with rose-color, and iridescent ; ligament short and prominent ; cardinal teeth two in each valve, the posterior one of the left valve rudimentary, the principal one in each valve grooved ; lateral tooth on the longer side distinct ; that on the shorter side, just behind the ligament, scarcely perceptible ; sinus of the palleal impression nearly reaching the anterior palleal impression. Length $\frac{11}{30}$ inch, height $\frac{7}{20}$ inch, breadth $\frac{5}{40}$ inch.

Found abundantly cast upon all our sandy beaches, and probably lives not far from low-water mark.

It is a very pretty little species, its beauties becoming developed by examination. There are two other species closely allied to it ; the *T. polita*, which is a somewhat larger and stronger shell, its posterior angle more prolonged and sharper, and its surface smooth, glossy, porcelain-white ; also *T. iris*, of about the same size, solidity, and color, but its surface is marked by oblique grooved lines which at once distinguish it. This is not found on our shores, nor am I certain that *T. polita* has been. It is not likely to be confounded with any other shell.

GENUS LUCINA, BRUG.

Shell rounded, beaks small ; two diverging cardinal teeth, one of which is bifid, and usually two lateral teeth, one of them near the cardinal teeth, in each valve ; there is sometimes a posterior angle, but never a fold, as in Tellina ; palleal impression without a sinus.

LUCINA RA'DULA.

Shell orbicular, compressed ; surface with numerous concentric, laminated striæ ; lunule depressed, lanceolate ; lateral teeth wanting.

State Coll., No. 213. Soc. Cab., No. 2330.

Tellina rádula, MONTAGU ; *Test. Brit.*, 68, pl. 2, f. 2. PENNANT ; *Brit. Zool.*, iv. 181. RACKETT ; *Lin. Trans.*, viii. 54. WOOD ; *Gen. Conch.*, 183, pl. 42, f. 4, 5. TURTON ; *Brit. Bio.*, 116. *Conch. Dict.*, 175. CHEMN. ; *Conch.*, vii. 16,

70 INVERTEBRATA OF MASSACHUSETTS.

t. 38, f. 399. DESHAYES; *Encyc. Méth., Vers.*, ii. 379. LAM.; *An. sans Vert.*, vi. 225.

Venus boreàlis, DONOVAN; *Brit. Shells*, iv. pl. 130.

Venus spùria, DILLWYN; *Catal.*, 194. GMELIN; *Syst.*, 3284.

Pectúnculus subfúscus, LISTER; *Conch.*, t. 293, f. 129.

Shell white, thick, orbicular, regularly but moderately convex; hinge margin straight; beaks small, pointed, slightly prominent, inclining forwards over a small, indented, smooth, lanceolate lunule; on each side of the hinge runs a shallow furrow, which, terminating in the margin, causes a slight undulation. Surface covered with fine concentric, lamellar ridges, in the intervals of which are often seen minute, radiating lines; interior chalky-white, except around the margin, where it is polished; with radiating lines, most apparent near the margin. Hinge straight, without lateral teeth, and with a single cardinal tooth in the left valve, and two small, diverging ones in the right. Anterior muscular impression very narrow, and directed obliquely to the centre of the valves. Length $1\frac{1}{2}$ inch, height the same, breadth $\frac{6}{10}$ inch.

This must be considered a rare shell, and an inhabitant of deep water. A few valves have been picked up on our beaches after severe storms. It is a common shell on the other side of the Atlantic.

LUCINA DIVARICATA.

Shell white, orbicular, lenticular, sculptured with grooves bent obliquely downwards at both sides; lateral teeth obsolete; margin dentated.

State Coll., No. 214. Soc. Cab., No. 1792.

Tellina divaricata, LIN.; *Syst. Nat.*, 1120. GMELIN; *Syst.*, iv. 3241. No. 74. BONANNI; *Recr.*, iii. f. 349. SCHROET.; *Einl. in Conch.*, ii. 663. PETIV.; *Gaz.*, t. 156, f. 26. KLEIN; *Ostracol.*, t. 9, f. 28. FAVANNE; *Conch.*, pl. 48, f. E. CHEMN.; *Conch.*, vi. 134, t. 13, f. 129. BRUG.; *Encyc. Méth.*, pl. 285, f. 4, a, b. PÖLI; *Test.*, 1. pl. 15, f. 25. DILLWYN; *Catal.*, i. 102. No. 7. TURTON; *Conch. Dict.*, 178.

Cárdium arcuatum, MONTAGU; *Test. Brit.*, 85, pl. 3, f. 2.

Pectúnculus parvus, LISTER; *Conch.*, t. 301, f. 142.

Lucina divaricata, LAM.; *An. sans Vert.*, vi. 226. *Ann. du Mus.*, vii. 239.

DESHAYES; *Encyc. Méth., Vers.*, ii. 376, pl. 285, f. 4. BLAINV.; *Malacol.* pl. 72, f. 3, 3 a. PAYRAUDEAU; *Catal.*, 42, No. 69.

Strigílla divaricata, TURTON; *Brit. Biv.*, 119.

Shell white, thin, rounded, regularly convex, sub-equilateral; beaks elevated, inclined forwards, in front of which is a long and narrow areola somewhat crested. Surface glossy; stages of growth strongly marked; deeply sculptured with regularly disposed and nearly parallel lines, flexed at nearly right angles along the anterior third, so as to pass obliquely downwards towards both ends, and forming teeth around the entire margin, most prominent behind. Hinge margin nearly straight. Teeth, one in the right valve, very small, and two small, diverging ones in the left valve. Lateral teeth wanting or rudimentary. Ligament almost entirely concealed. Length 1 inch, breadth $\frac{2}{3}$ inch, height $\frac{9}{10}$ inch.

This shell, so remarkable for its universal dispersion, as well in a fossil, as in a living state, is not unfrequently thrown upon our ocean shores in such a state as to indicate a neighbouring residence. At Nantucket, it is far from rare. It is found on every Atlantic shore even to the Southern Ocean, and also in all the tertiary formations of Europe.

It varies considerably in the development of the lateral teeth, and in the approximation of the striæ.

LUCINA FLEXUOSA.

Shell small, white, globose triangular; a deep fold along the posterior margin renders the base sinuous; hinge with only a single rudimentary tooth in each valve.

FIGURE 52.

State Coll., No. 196. Soc. Cab., No. 2413.

Tellina flexuosa, MONTAGU; *Test. Brit.*, 72. FENNANT; *Brit. Zool.*, iv. 183.

RACKETT; *Lin. Trans.*, viii. 56. WOOD; *Gen. Conch.*, 188, t. 47, f. 7, 8.

DILLWYN; *Catal.*, 99. TURTON; *Conch. Dict.*, 177.

Venus sinuosa, DONOVAN; *Brit. Shells*, ii. pl. 42, f. 2.

Cry'ptodon flexuosa, TURTON; *Brit. Biv.*, 121, pl. 7, f. 9, 10.

Shell minute, white, ovate-globose, or somewhat triangular, nearly equilateral; beaks prominent, inclined forwards, and having a rounded depression in front of them; behind them, a remarkable widened groove runs near the margin to the posterior base, producing a deep indentation in the outline of the margin at that part; elsewhere regularly rounded; surface smooth, dead white.

Hinge with only the vestige of a cardinal tooth, and no lateral ones. Ligament long and rather large, partly concealed. Interior glossy white, with minute radiating lines. Length $\frac{3}{16}$ inch, height somewhat more, breadth $\frac{1}{16}$ inch.

It inhabits deep water, and is very frequently taken from cod-fish, caught in Massachusetts Bay.

There can be no doubt that this is identical with the British shell, though the specimens I have seen are much smaller than the foreign specimens usually are.

I have arranged it under the genus *LUCINA*, as most of its characters pertain to it, and none of them seem absolutely to forbid. The genus *CRYPTODON* has, however, been formed by Turton to embrace this shell, on account of its single tooth.

FAMILY CONCHACEA, LAM.

Three cardinal teeth, on one valve at least; the other with as many or fewer; sometimes with lateral teeth.

GENUS CYCLAS, LIN.

Shell small, thin, ovate-globose; hinge with two minute cardinal teeth in each valve, but sometimes in one only; also compressed, lateral teeth; inhabits fresh water.

CYCLAS SIMILIS.

Shell oval, truncated at the extremities in young, and rounded in adult specimens, convex, sub-equilateral; beaks slightly elevated; surface with conspicuous, concentric wrinkles; epidermis dark chestnut-brown.

FIGURE 53.

State Coll., No. 204. Soc. Cab., No. 1808.

Cyclas similis, SAY; *Nicholson's Encyc., Amer. ed.*, iv. pl. 1, f. 9.
Cyclas sulcata, LAM.; *An. sans Vert.*, vi. 271.

Shell sub-oval, nearly equilateral, varying much in its outline. In the adult shell the extremities are broadly and nearly equally rounded, the posterior side being somewhat the longest and most pointed, the base very little curved; valves very convex, re-

markably broad across the beaks, which are but slightly elevated; color dark chestnut-brown, within bluish. The young shell is thin and compressed, the hinge margin nearly a straight line, the extremities truncated so as to give the shell a quadrilateral form; and the color is a light lemon-color, or honey-yellow. The intermediate specimens exhibit all the gradations of shape or color between the old and young. Surface at every stage regularly wrinkled concentrically, with strongly raised, sharp lines of growth, and generally a more conspicuous wave marking the former year's growth of the shell; beaks usually eroded. Hinge with minute, very oblique cardinal teeth, the lateral ones distinct, strong and white. Length $\frac{7}{16}$ inch, height $\frac{1}{2}$ inch, breadth $\frac{2}{3}$ inch.

Found in the larger ponds and rivers, especially along the muddy banks of the Connecticut.

This species is closely allied to the *C. rivicola* of Europe in shape and size; its raised concentric striae, however, appear to be much more prominent. It may always be distinguished by these conspicuously raised lines, for they are exhibited by no other American species in so great a degree. Several other species are described as having them, such as are named under the synonyms; but they are probably all of them varieties of this species. The young, differing widely as it does from the adult, has been commonly received in our cabinets as Say's *C. rhombóidea*. A specimen one fourth of an inch long would answer very well to his description. What the true rhombóidea is, I have not yet been able to satisfy myself. The two species of Lamarck, also, I believe to be varieties of this shell; and very probably his *C. striatína* also.

CYCLAS PARTUMÈIA.

Shell rounded-oval, sub-equilateral, narrowest anteriorly, somewhat angular behind; thin and fragile; valves very convex, minutely wrinkled by lines of growth, and obsoletely radiated; light horn-color; beaks elevated.

FIGURE 54.

State Coll., No. 203. Soc. Cab., No. 1699.

Cyclas partumèia SAY; *Journ. Acad. Nat. Sc.*, ii. 380.

Cyclas córnea, var. 2, 3. LAM.; *An. sans Vert.*, vi. 268.

Shell rounded-oval, broadest behind, thin, fragile, pellucid, somewhat inflated; beaks nearly central, moderately elevated, inclining inwards; hinge margin nearly straight, passing by a regular curve into the rounded anterior extremity, but curving suddenly behind, so as to form a conspicuous obtuse angle, causing this side to appear broader, and giving the whole shell a somewhat rhombiform appearance; basal margin regularly rounded; valves very tumid, especially in mature shells; surface shining, inconspicuously wrinkled by the lines of growth, with very indistinct radiating lines; color of the young very light yellowish; of the adult light-greenish horn-color, with a marginal border of lilac or yellow; cardinal teeth small, diverging; lateral teeth strong; white; interior tinged with lilac. Length $\frac{9}{16}$ inch, height $\frac{2}{3}$ inch, breadth $\frac{4}{5}$ inch.

Found everywhere in fresh water brooks and ditches, in mud, or more usually inbedded among submerged turf, and roots of water-plants and shrubs.

The animal is of a light, delicate pink color, and draws itself about rapidly.

The general resemblance of this shell to the *C. córnea* of Europe is very close. Its size, color, delicacy, and tumid form are the same. But that species has the beaks much less elevated, is broader from side to side, and the two ends are almost precisely alike, without any angle, or any widening behind. Our shell is, on the whole, more delicate. It is unquestionably the variety noticed by Lamarck as coming from America. The young and old differ both in shape and color. The young are less tumid and longer, and the disparity of the sides is much greater, than in the adult. They have also a light honey-yellow color and great transparency. They would scarcely be recognised as the same species except by being found in company, and also by being actually found within the adult shell.

CYCLAS E'LEGANS.

Shell rhombic-orbicular, tumid, beaks not prominent, sub-equilateral; color olivaceous, margined with yellowish; surface elegantly marked with fine concentric ridges.

FIGURE 55.

State Coll., No. 285. Soc. Cab., No. 2335.

Cyclas elegans, ADAMS; *Bost. Journ. Nat. Hist.*, iii. pl. 3, f. 11.

Shell in its younger stages compressed, in an adult state tumid, sub-globular, the extremities truncated or terminating abruptly, so as to appear somewhat four-sided or rhomboidal; beaks not prominent, the anterior side a very little the shortest and narrowest; basal margin nearly straight and parallel to the upper margin; the valves are not regularly convex, but somewhat flattened down the middle, so as to exhibit an obtusely rounded ridge passing from the beaks towards each lower angle; surface delicately marked with fine, rounded, concentric wrinkles; color olive-green, with a straw-colored margin, and narrower zones at each stage of growth. Hinge rather strong, the cardinal teeth rudimentary, the lateral ones large and strong. Interior bluish. Length nearly $\frac{1}{2}$ inch, height $\frac{7}{8}$ inch, breadth $\frac{1}{4}$ inch.

Found in a ditch running through the Cambridge meadows, near Fresh Pond.

This is a remarkable and beautiful species, and seems to be rather rare. Excepting the above locality, I know of no other but at Weybridge, Vermont, whence it was sent me by Professor Adams. It is of about the size and width of *C. partumèia*, but is a very much thicker shell, differently colored and sculptured, and its four-sided, angular outline is quite different. The young of *C. similis*, though equally four-sided, is much longer proportionally, the color much darker, and the ridges on the surface much coarser. In this species the four sides are nearly equal.

CYCLAS DUBIA.

Shell oblique, triangular-ovate, pale-olivaceous, with fine concentric ridges; beaks but slightly elevated; teeth strong, white.

FIGURE 56.

State Coll., No. 286. Soc. Cab., No. 1809.

Cyclas dubia, SAY; *Nicholson's Encyc., Amer. ed.*, iv. pl. 1, f. 10.

Shell small, rather thick, triangular, with its corners rounded, shining; beaks at one end, very little elevated; hinge margin and short end straight, the two lines forming a right angle; base and

the longer side regularly rounded; valves tumid, surface with minute, concentric wrinkles, which, towards the base, enlarge into obvious, sharp folds; color a light-olive, with darker zones, and a marginal border of yellowish; within bluish or greenish; teeth well developed. Length $\frac{1}{2}$ inch, height $\frac{1}{5}$ inch, breadth $\frac{3}{8}$ inch.

Found in streams in Bristol County, and in ditches in the Cambridge meadows, in company with the last species, and probably in all parts of the State.

Here, again, we have a shell bearing a close resemblance to a transatlantic species, the *C. obliqua* of Lamarck, *C. ámnica* of some writers. The foreign shell, however, is somewhat longer, less inequilateral, and more oval, and the wrinkles are somewhat more conspicuous. The young shells of our species have the beaks more removed towards the centre, and the short side more rounded, so as to be scarcely distinguishable from the European species. In general appearance it is very like *Núcula ténuis*.

GENUS ASTÁRTE, SOWERBY.

Shell rounded, sub-equilateral, compressed, thick; hinge with two strong, diverging, cardinal teeth on one valve, and two very unequal ones on the other, or only one large one; palleal impression simple; ligament exterior.

ASTÁRTE CASTÁNEA.

Shell sub-orbicular, with prominent and nearly central beaks; lunule deeply excavated; surface very slightly waved, covered with a chestnut-brown epidermis; margin crenulated within.

FIGURE 44.

State Coll., Nos. 205, 207. Soc. Cab., No. 1806.

Venus castanea, SAY; *Journ. Acad. Nat. Sc.*, iv. 273.

Astárte castánea, SAY; *Amer. Conch.*, pl. 1. TOTTEN; *Silliman's Journ.*, xxviii. f. 2.

Crassina castánea, LAM.; *An. sans Vert.*, vi. 258.

Shell thick and ponderous, sub-orbicular, or sub-triangular, the beaks nearly central, and much elevated, generally eroded; the areola in front of the beaks is ovate-lanceolate, short, broad, deeply excavated, very smooth and darker colored; posterior

slope nearly straight, with a long, narrow, lanceolate depression ; basal margin regularly rounded, thick ; surface very slightly undulated at the stages of growth, covered with a thick, chestnut-colored epidermis, wrinkled and stained with black posteriorly, with alternately paler and darker zones ; ligament small and feeble. Hinge very strong, the hinge margin very broad, bearing on the right valve one stout tooth, with a pit on each side ; on the left valve two teeth somewhat diverging, with a deep pit between them for the reception of the opposite tooth ; cavity small ; muscular impressions deep, elongated, united by a direct palleal impression ; margin in adult shells regularly crenulated. Length 1 inch, height 1 inch, breadth $\frac{11}{8}$ inch.

Found abundantly in Provincetown harbour, west and north of the light-house, at low-water mark. Occasionally, specimens are picked up on Chelsea Beach. It is more abundant along the coast of the Middle States.

The foot of the animal is of a bright vermilion-color, and when seen protruded, one would hardly persuade himself that a red wafer was not embraced by the valves.

This shell appears to be a well characterized species, quite distinct from any species inhabiting the British coast. The species most nearly allied to it is *Venus (Astarte) compressa*, of Montagu.

Its remarkable points are, its height being usually greater than its length, its prominent central beaks curved so as to give the shell a somewhat kidney-shaped appearance, the broad, excavated lunule before them, and the smooth, chestnut-colored surface. The blackening of the posterior region of the shell is very peculiar. Some specimens look as if this portion had been dipped in tar.

The varieties in form and coloring are very numerous ; one or two of which may be designated.

Var. *A. picea*, is large and solid, surface with a few wrinkles without waves, and the epidermis of a dark tar-color. All the specimens I have found upon Chelsea Beach are of this variety. In specimens found about Sandy Hook, New York harbour, the epidermis partakes of this dark appearance, of about the color of Mr. Say's figure in the "American Conchology," though the surface is undulated. Hence I infer that the oceanic specimens are of the dark variety, while those which lie in quiet, sandy localities, like Provincetown harbour, have rather a

brownish-yellow color. In proportions it agrees with the type specimens.

Var. *A. prócera*, inhabits Provincetown harbour, and is fully described and figured by Colonel Totten in "Silliman's Journal," as a probable variety of *A. castànea*, but as possibly a distinct species. Its variation consists in its very light-colored epidermis, and the great elevation of its beaks. The color of all the shells in that harbour is remarkably light, as is noted of *Maetra solidíssima* and *Mya arenària*, so that in regard to its color it is merely a local distinction. The elevation of some of the specimens is remarkable; but these are found living intermingled with those of the normal form, and are found of every intervening degree of elevation. The shell in all its varieties, but in this one in particular, strongly reminds one of the termination of the recurved, round-pointed table or fruit knife. The foot of the animal has the same vermilion-color; and, on the whole, this must be regarded as merely a variety. The proportions of the most elevated specimen figured by Colonel Totten are; length $\frac{4}{5}$ inch, height 1 inch, width $\frac{1}{4}$ inch.

ASTARTE SULCÀTA.

Shell ovate-triangular, the surface with deep, concentric furrows and ribs, vanishing at the extremities; beaks prominent; lunule and corselet long, narrow, and deeply excavated.

FIGURES 45, 46.

State Coll., No. 206. Soc. Cab., No. 1805.

Venus sulcàta, MONTAGU; *Test. Brit.*, 131. PENNANT; *Brit. Zool.*, iv. 203.

MATON and RACKETT, *Lin. Trans.*, viii. 81, pl. 2, f. 1. DILLWYN; *Catal.*, i. 167. TURTON; *Conch. Dict.*, 235.

Astàrte sulcàta, FLEMING; *Brit. Anim.*, 439.

Venus Danmònia, MONTAGU; *Test. Brit.*, 45, t. 29, f. 4. PENNANT; *Brit. Zool.*, iv. 212. WOOD; *Index*, pl. 7, f. 21. DILLWYN; *Catal.*, 167.

Venus Danmoniènsis, BLAINV.; *Malacol.*, 557, pl. 75, f. 7.

Crassina sulcàta, TURTON; *Brit. Biv.*, 131, pl. 11, f. 1, 2.

Crassina Danmoniènsis, LAM.; *An. sans Vert.*, vi. 257. DESHAYES; *Encyc. Méth.*, Vers, i. 77.

Astàrte Danmoniènsis, SOWERBY; *Genera*, f. 1 to 3. TOTTON; *Silliman's Journ.* xxviii. 349, f. 3.

Venus Scòtica, MONTAGU; *Test. Brit.*, 44 (the young). MATON and RACKETT; *Lin. Trans.*, viii. 81, pl. 2, f. 3. TURTON; *Brit. Biv.*, 130, pl. 11, f. 3, 4. *Conch. Dict.*, 236. WOOD; *Index*, pl. 7, f. 20.

Shell sub-orbicular, in some specimens approaching to ovate, in others to triangular, thick and strong, somewhat compressed;

inequilateral, the anterior slope shortest and concave, bearing a long, lanceolate, deeply excavated, smooth lunule; posterior slope a straight line, usually rounded, but sometimes a little truncated at the hinder end, and including a very long, triangularly excavated corselet; beaks moderately elevated, pointed, and coming in contact; surface undulated with ten to twenty strongly developed concentric furrows and ridges, the depressed portions wider than the raised ones, vanishing at both ends, covered with a thick, greenish-yellow or glossy, brownish-olive epidermis. Hinge margin strong, two teeth in the left valve and one in the right; interior polished, bluish-white; muscular impressions distinct. Length 1 inch, height $1\frac{1}{4}$ inch, breadth $\frac{2}{3}$ inch.

Very small and half-grown shells are not uncommonly found in the fish of Massachusetts Bay. It has been found by dredging in Newport and Portland harbours; and occasionally a full-grown specimen is thrown up, with sea-weed attached, on our beaches. I have no doubt it would be found in many places by dredging. Along the coast of Maine it is common. At Augusta, Maine, Dr. C. T. Jackson found it plentifully in a partially fossilized state, and in company with other shells, such as are now common on the coast of Maine, imbedded in the earth many feet above high-water mark, showing, conclusively, that that region has, by some cause, been recently elevated above its former level.

This shell seems to have caused much perplexity to all who have undertaken to describe it. It is quite uncertain how many real species are embraced in the above synonyms. The discrepancy of authors, and the variety in the form and sculpture of the shells, which must come under one or the other of the names, leaves us in doubt. I have thought best to present them as one, and to include them under the name which seems most appropriate of the three. For, in the first place, the *Venus Scôtica* and *V. Danmònia* of Montagu are clearly the immature and mature of the same shell; the distinctive mark which he gives, viz. the smooth margin of the first, and the crenulated one of the latter, being an insufficient one. He says, "The construction of the margin must be considered as inviolable; no common shell, whose character is to possess a plain margin, is ever found with a crenulated one, or *vice versâ*." Now, it is perfectly certain, that no species of the genus is found with a crenulated margin, until the shell

has arrived at its full dimensions, and the margin of the valves begins to thicken, as it always does; and then, so far as my observation goes, there is *always* a crenulated margin; so that this is merely a mark of maturity.

In the next place, Turton and others, with apparently good reasons, conclude, that the *sulcàta* and the *Danmònia* are the same. It is certain, that Montagu's figure of *Danmònia*, and Turton's of *sulcàta*, in his "British Bivalves," represent precisely the same shell. Turton, however, has fallen into Montagu's error of making two species, the *Scòtica* and *sulcàta*, which he says are precisely alike in all respects except the margin. Both the figures accurately represent one of the forms found on our coast, and that which might be regarded as the intermediate form. The figure of *V. sulcàta* in the "Linnæan Transactions," pl. 2, f. 2, and even its description, would apply better to our *A. castànea*, than to the shell in question.

Two pretty well marked groups of this furrowed species may be made out. One in which the shells are somewhat elongated, and pointed posteriorly, of an oval shape, undulations about fifteen, and very strongly marked, epidermis very dark greenish-yellow. Some of them are quite inequilateral, and occasionally the undulations vanish not far below the summit, and the remainder of the surface is merely wrinkled. These do not correspond with any British shells or figures I have seen. They may possibly prove to be distinct; and, if so, I would name them *A. undàta*.

In the other group the shell is rounded, the beaks nearly central, broad posteriorly, and usually a little blunted or truncated at the point; the undulations are much more numerous, twenty and upwards, and of course more crowded; the epidermis is dark yellowish-brown, or piceous. These, I regard as the true *A. Danmoniènsis*. They agree with the figures of Montagu and Turton, and with the outlines given by Colonel Totten.

ASTÁRTE LÁCTEA.

Shell sub-orbicular, much compressed, concentrically wrinkled, epidermis yellowish-brown; an obsolete marginal tooth in each valve; margin plain.

FIGURE 47.

State Coll., No. 208. Soc. Cab., No. 1804.

Astárte láctea, BROD. and SOWERBY; *Zool. Journ.*, iv. 365. *Appendix to Beechey's Voyage*, pl. 44, f. 12.

Shell orbicular-elliptical, rather thin, much compressed ; surface marked with rather remote, rounded, rib-like ridges, most conspicuous along the posterior slope of the disk ; covered with a dark yellowish-brown epidermis ; beaks nearly central, elevated and inclined forwards, with a short, lanceolate lunule in front, and a longer corselet behind, both of them deeply excavated ; the anterior slope from the beaks is concave for a short distance, the posterior is straight, and both extremities are broadly rounded ; ligament broad ; hinge margin narrow and rather feeble, and cardinal teeth slightly elevated ; on one side of them is a tooth-like ridge along the margin, and on the other a groove to receive this ridge ; in the right valve the groove is before, and the ridge behind, the cardinal teeth ; cavity of the valves rather shallow ; muscular and palleal impressions rather indistinct ; the margin, in the specimens I have, is sharp and not crenulated. Length $1\frac{1}{10}$ inch, height 1 inch, breadth $\frac{2}{3}$ inch.

This shell, from the cabinet of Colonel Totten, was brought from the Grand Bank. Of the two specimens, one is about half the size of the other.

The specimen from the Arctic seas, figured in the "Appendix to Beechey's Voyage," is much larger than either of these.

It is distinguished from *A. sulcata* by its broadly rounded extremities, compressed form, delicate and short ridges, slender hinge, shorter impressions each side of the beak, and its probably plain margin.

ASTARTE QUADRANS.

Shell triangular, slightly oblique, anterior side longest ; surface smooth ; epidermis yellowish-olive ; hinge with a lateral tooth on the anterior margin.

FIGURE 48.

State Coll., No. 202. Soc. Cab., No. 2331.

Shell small, triangular, solid, nearly equilateral, side margins bounded by straight lines, the anterior somewhat longer and more oblique than the posterior ; basal edge very sharp and regularly rounded, so that the whole shell is nearly a quadrant ; beaks pointed, and not inclined to either side, generally eroded ; lunule lance-shaped, slightly impressed, and a broader and longer areola

behind the beaks ; surface smooth, very slightly wrinkled by the lines of growth ; epidermis light yellowish-olive ; interior glossy, bluish-white ; hinge margin narrow, with a small lateral tooth on the left valve, about half way along the anterior margin, and a groove to receive it on the right valve ; muscular impressions rather shallow ; inner margin not crenulated. Length $\frac{9}{20}$ inch, height $\frac{8}{20}$ inch, breadth $\frac{2}{20}$ inch.

Several specimens of this small and very distinct species have been furnished me for description by Dr. Prescott, of Lynn, and by Dr. Storer, of Boston. They were taken from the stomachs of fish caught in Massachusetts Bay.

Its triangular form, smooth, glossy surface, and more especially the small lateral tooth, at once distinguish it. In all our other species the anterior margin is shortest and concave, and the lunule deeply excavated ; but in this the posterior and anterior slopes are equally direct from the very summit.

It must be very closely assimilated to the *Venus triangularis* of Montagu, the *Cyprina triangularis* of Turton, in his "British Bivalves." But I cannot make out the requisite number of teeth to bring it within the genus *Cyprina*, or to correspond with their descriptions. A hasty observer might confound it with the young of *Cyprina Islándica*, which is more rounded and rough.

The existence of a lateral tooth would, literally, exclude the shell from this genus. But the general characters will bring it naturally into the same genus with *A. castanea* and *sulcata*. Moreover, a lateral tooth is more or less developed in individuals of all the species ; and this only shows the close alliance of the genus to VENUS, with which, indeed, Blainville unites it.

GENUS CYPRINA, LAM.

Shell obliquely heart-shaped, beaks prominent ; hinge with three unequal, diverging, cardinal teeth, and a remote lateral one ; pallial impression simple.

CYPRINA ISLÁNDICA.

Shell ponderous, ventricose, round-ovate, inequilateral, shortest and compressed anteriorly ; lunule none ; epidermis chestnut-brown, thick, and coarsely wrinkled ; edge simple.

State Coll., No. 201. Soc. Cab., No. 1815.

Pectúnculus máximus, LISTER; *Conch.*, t. 272, f. 108.

Pectúnculus crassus, DA COSTA; *Brit. Conch.*, 183, pl. 14, f. 5.

Venus Islándica, LIN.; *Syst. Nat.*, 1131. GMELIN; *Syst.*, 3271. MONTAGU; *Test. Brit.*, 114. MATON and RACKETT; *Lin. Trans.*, viii. 83. WOOD; in *Lin. Trans.*, vi. t. 17, f. 1, 2. DILLWYN; *Catal.*, 176. CHEMN.; *Conch.*, vi. 340, pl. 32, f. 341. DONOVAN; *Brit. Shells*, iii. pl. 77. MÜLLER; *Zool. Dan.*, i. 29, pl. 28, f. 1 to 5. TURTON; *Conch. Dict.*, 238.

Venus mercenària, PENNANT; *Brit. Zool.*, iv. pl. 53, f. 47.

Venus bucàrdium, BORN; *Mus.*, pl. 4, f. 11.

Cyprina Islándica, LAM.; *An. sans Vert.*, vi. 290. DESHAYES; *Encyc. Méth.*, *Vers.*, i. 46, pl. 272, f. 6. BLAINV.; *Malacol.*, pl. 70 bis, f. 5. TURTON; *Brit. Div.*, 135. FLEMING; *Brit. Anim.*, 444.

Cyprina vulgàris, SOWERBY; *Genera*.

Shell large, thick and heavy, ovate orbicular, tumid; beaks elevated, pointed, turned forwards and inwards so as to come nearly in contact; anterior side shorter, narrower, rounded and compressed; posterior side full and broad at the back, slightly angular at the extremity; a very superficial ridge passes from the beaks to the lowest posterior point; the space which they include is very coarsely wrinkled; there is a shallow oval pit before the beaks, but no distinctly marked lunule; the ligament is strong and protuberant; epidermis of a dark, shining, burnt-brown color, sometimes almost black, coarse and strong, rough with crowded and loose wrinkles; hinge margin broad and strong; cardinal teeth diverging, three in each valve, or rather one large double tooth and a small one in the right valve; lateral tooth along the posterior margin, slightly developed, blunt; inside chalky-white, muscular and palleal impressions superficial, the latter having no sinus; margin at base sharp and simple. Length $3\frac{1}{2}$ inches, height 3 inches, breadth $1\frac{3}{4}$ inch.

This shell is an inhabitant of all the northern Atlantic seas, especially near where some river empties into the ocean. It is sometimes thrown upon our beaches in great numbers after storms, being driven up from deep water. The young are found abundantly in the stomachs of fishes taken in Massachusetts Bay. It appears not to be common, if it is found at all, to the southward of Massachusetts.

It is one of our largest shells, and resembles no other shell of our coast except the *Venus mercenària*, with which it was confounded by

Pennant. From this it is easily distinguished by its epidermis, and also by wanting the purple border along the interior margin of the shell.

It is subject to very little variety. Sometimes the surface has a series of concentric ridges, and sometimes the beaks are unnaturally elevated and curved. The old shells have a very dark epidermis, and are generally much decorticated. The young are of a light fawn-color, with darker and lighter zones; and the wrinkles, being much raised, and very regular, give the surface a very pretty appearance. The rougher surface, greater proportionate length, rounded form, and want of a lunule, distinguish them from *Astárte quadrans* of a similar size. From *Astárte compréssa*, they differ little.

They are obtained of every size, from one fourth of an inch to four inches in length.

GENUS CYTHEREA, LAM.

Shell inequilateral, rounded; hinge with four diverging teeth in one valve, one of which is separate from the others, and three in the other valve; no lateral teeth.

CYTHEREA CONVÉXA.

Shell oval, tumid; lunule heart-shaped; beaks prominent and recurved; color chalky-white.

FIGURE 49.

State Coll., No. 198. Soc. Cab., No. 2332.

Cytherèa convéxa, SAY; *Journ. Acad. Nat. Sc.*, iv. 149, pl. 12, f. 3; vi. 261.

Shell oval, rather thin, valves very convex, color a dead-white or with a rusty tinge, usually chalky; inequilateral, beaks elevated, curving forwards, in front of which is a well-marked heart-shaped lunule; anterior side about half the length of the posterior, compressed and somewhat pointed; regularly rounded behind and at base; surface marked with coarse lines of growth, which are most regular anteriorly; ligament long, rather sunken; within milk-white, polished; impressions superficial. Length $1\frac{3}{4}$ inch, height $1\frac{1}{2}$ inch, breadth 1 inch nearly.

A few specimens have been found on Chelsea Beach, but it is rare. It has been found about Rhode Island by Colonel Totten;

and it has also been taken with the dredge by Drs. Mighels and Wood of Portland, in the harbour of that place.

Mr. Say knew it only as a fossil, in which state it occurs in the tertiary formation of Maryland.

This is by no means an attractive shell, its dead-white surface leading one to suppose it to be some beach-worn specimen of *Cyprina*, or perhaps of *Venus mercenaria*. It is, however, much longer than the former, and somewhat longer than the latter; and it never attains to any thing like the size of either of them.

GENUS VENUS, LIN.

Shell inequilateral, sub-ovate; hinge with three diverging cardinal teeth in each valve; palleal impression with a sinus.

VENUS MERCENARIA.

Shell solid, obliquely ovate, very inequilateral; lunule heart-shaped; surface antiquated, bluish-white, with numerous, concentric, laminated ridges; inner margin broadly edged with violet.

FIGURE 52.

State Coll., No. 197. Soc. Cab., No. 1859.

Venus mercenaria, LIN.; *Syst. Nat.*, 1131. GMELIN; *Syst.*, 3231. LISTER; *Conch.*, t. 271, f. 107. CHEMN.; *Conch.*, x. t. 171, f. 1659, 1660. DESHAYES; *Encyc. Méth., Vers.*, iii. 117, pl. 263. LAM.; *An. sans Vert.*, vi. 346, pl. 263, f. 1 to 3. DILLWYN; *Catal.*, i. 176. WOOD; *Index*, pl. 7, f. 40.

Shell large, thick and solid, obliquely ovate, or heart-shaped, tumid; exterior a dirty-white and chalky; the beaks are placed far forwards, projecting nearly to the front of the shell; they are elevated, and curved so as to make nearly half a turn forwards and inwards; in front of them is a heart-shaped, rough lunule, bounded by an impressed line; behind the beaks the edge is very broad and obtuse, the ligament large and protuberant, with a space around it somewhat excavated, smoother than the rest, and bounded by an obtuse ridge; anterior end very short, round; posterior end terminating in a blunt, occasionally truncated point; looking at the side of the shell as it stands on this point, it is accurately heart-shaped; surface with concentric grooves and ridges, the

ridges being crowded and rising into thin, sharp plates, most conspicuous at the ends ; the central portion is nearly smooth. There are also minute lines, radiating from the beaks to the margin, most conspicuous on the beaks, where they form a lattice-work with the concentric lines ; color a dirty-white, except the smooth portion of the disk, which is dark-violet ; within pure white ; muscular impressions deep, united by a well-marked palleal impression which has an acute-angled, not very deep sinus ; the margin outside the impressions is more or less of a beautiful deep-violet hue ; basal and anterior margin crenulated. Length 3 inches, height $2\frac{1}{2}$ inches, breadth 2 inches.

Brought from Wellfleet and other towns on Cape Cod in considerable quantities to Boston market. It is found more abundantly to the South, and in New York and Philadelphia markets supersedes the use of the *Mya arenaria* almost entirely. While it may be found in greater or less abundance in all the region of Cape Cod, and scantily in all parts of Massachusetts Bay, I cannot learn that it is ever found north of Cape Ann.

The shell is easily known by its size and weight, and by its heart-shaped form when resting upon its point. It is about the same size as *Cyprina Islndica*, from which it is distinguished by the sharp ridges on its surface, and by the want of an epidermis ; also by the violet-colored border of the interior of the valves. This mark, however, is not constant. In young shells it is wanting, and also in very old shells the color is often obscured by a thick, white glazing. Fishermen say, that those found outside Cape Cod, in the region of Chatham, are always devoid of it. The shell has become quite famous from the fact that, from its purple edge, the aborigines manufactured their purple wampum ; while the white wampum was made of various species of shells.

It is known in Massachusetts under the name of *Quahog*. The upper outline of the figure represents this shell.

VENUS NOTATA.

Shell ovate-orbicular, inequilateral, posterior side truncated ; surface with concentric, sharp ridges, mostly wanting on the disk ; color yellowish or greyish-white, and with fawn-colored, zigzag markings ; interior wholly white.

FIGURE 52.

State Coll., No. 195. Soc. Cab., No. 1877.

Venus notata, SAY; *Journ. Acad. Nat. Sc.*, vi., 271.

Shell very similar to the preceding, and perhaps merely a local variety. The differences which I shall mention appear, however, to be constant. The shell is less heavy and coarse. The hinge-slope declines less rapidly, so that the posterior side is broader, and its extremity broadly truncated; the area about the ligament is much more smooth, and usually colored brown or purplish. The concentric ridges are more regular in their distances, are somewhat undulated, and frequently are lost in each other; on the centre of the shell the ridges seem to have been worn off, leaving the surface nearly smooth; there are no conspicuous radiating lines upon the beaks forming a lattice-work with the concentric ridges; but between the ridges are fine lines of growth. The surface is shining, not chalky, of a flesh-color, and with zigzag blotches of fawn-color or brown; these, however, are not always present. The interior is wholly of a yellowish-white. The lower outline of the figure shows its form compared with *V. mercenaria*.

Mr. Say's *V. præparca* seems to me to be the same thing, in which merely the zigzag lines are wanting. Lives along the shores of Cape Cod.

VENUS FLUCTUOSA.

Shell transversely-ovate, lenticular, white, with a yellowish epidermis; surface with recurved, concentric waves vanishing at the sides; areola none.

FIGURE 50.

State Coll., No. 193. Soc. Cab., No. 2333.

Shell oblong-ovate, lenticular, rather thin, nearly equilateral; white, beneath a glossy, thin, straw-colored epidermis; anterior side shortest and broadest; both ends widely rounded; beaks slightly elevated, with a smooth, heart-shaped space before them, not distinctly defined by any boundary; surface with from twenty to twenty-five concentric waves, not quite extending to the margin, especially anteriorly, so that the marginal edges are plain; when closely examined, these waves or ridges are found to be compressed, thin, and inclined towards the beaks; cardinal teeth three in each

valve, the middle one cleft in both valves ; muscular and palleal impressions very superficial, the latter with a deep sinus. Length $\frac{4}{5}$ inch, height $\frac{3}{8}$ inch, breadth $\frac{9}{16}$ inch.

Of this shell I have three specimens brought from the Bank fisheries. The largest specimen is proportionally more convex than the others, and the ridges are less definite. The ridges and grooves of the surface are like those of *V. papilionacea*.

I know of no species very closely approaching this. Most of those allied to it have the posterior extremity more or less angular ; this is always accurately rounded. *Venus ænea* of Turton, small specimens of *V. gallina*, and of those Indian species allied to *V. papilionacea*, may be mentioned as allied to it.

VENUS GEMMA.

Shell minute, nearly round and nearly equilateral, concentrically furrowed, violet and white, margin crenulate.

FIGURE 51.

State Coll., No. 194. Soc. Cab. No. 2334.

Venus gemma, TOTTEN ; *Silliman's Journ.*, xxvi. 367. f. 2, a, b, c, d.

Shell small, nearly orbicular, beaks nearly central, slightly elevated ; generally eroded. No defined lunule in front of them ; surface shining, with minute, concentric, crowded furrows ; anterior portion, and mostly the base, white or tinged with rose-color ; posterior and upper portion reddish-purple ; within white, except posteriorly, where it has the purple color of the outside ; muscular and palleal impressions distinctly marked, the latter with an acute sinus ; teeth divergent, the middle one in each valve stout and triangular, the anterior tooth of the right, and the posterior one of the left valve thin, and not easily distinguished ; inner margin crenulated. Length $\frac{3}{8}$ inch, height $\frac{1}{4}$ inch, breadth $\frac{1}{8}$ inch.

This beautiful little amethystine gem, as it has been appropriately called, is found in great abundance on all the sandy shores of Massachusetts Bay. Col. Totten also found it in Newport harbour. Beyond this, its range is not known. It was noticed by some of the early visitors to New England, and specimens of it, were sent home to England among other curiosities. It is,

therefore, not a little remarkable, that a shell so long ago observed should have remained, until very lately, undescribed. But it is only recently that it has been recognised as a distinct species and described by Colonel Totten. It is commonly regarded as the fry of the *quahog* (*V. mercenaria*), on account of its purple tip. But on close examination it will be found to be a fully developed, mature shell, different in every important particular from that species. It is a very interesting shell, as being by far the least of any species of the genus known.

FAMILY *CARDIACEA*, DESH.

Shell somewhat heart-shaped; cardinal teeth two or three; lateral teeth one or two.

GENUS *CARDIUM*, LIN.

Shell somewhat heart-shaped; beaks prominent; margin generally toothed or folded within; hinge with two oblique cardinal and two lateral teeth in each valve; pallear impression without a sinus.

CARDIUM ISLANDICUM.

Shell large, rounded-ovate, tumid, sub-equilateral, with about thirty-six sharp, three-sided ribs; epidermis lax, and rising into a fringe, on the angle of the ribs.

FIGURE 58.

State Coll., No. 190. Soc. Cab., No. 1924.

Cárdium Islándicum, LIN; *Syst. Nat.*, 1124. CHEMN.; vi. 200, t. 19, f. 195, 196.

GMELIN; *Syst.*, 3252. BRUG.; *Encyc. Méth.*, 222. WOOD; *Gen. Conch.*, 225, pl.

55, f. 2, 3. INDEX, pl. 5, f. 27. LISTER; *Conch.*, t. 329, f. 166. GUALT.;

Test., t. 71, f. M. KNORR; *Délices, &c.*, vi. t. 8, f. 3. BORN; *Mus.*, 49.

Cárdium ciliátum, O. FABR.; *Fauna Grænl.*, 410.

Cárdium pubéscens, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 60, pl. 3. f. 6, (young.)

Shell large, rather thin, nearly equilateral, a little obliquely rounded-ovate; tumid; anterior side shortest and narrowest, ends regularly rounded; beaks prominent, the points turned inwards, and nearly in contact; in front of them is a narrow, heart-shaped depression; on each valve are thirty-six, or more, three sided, sharp-edged, radiating ribs, the furrows between them round-

90 INVERTEBRATA OF MASSACHUSETTS.

ed, and regularly wrinkled by the lines of growth ; epidermis yellowish-brown, lax, and bristling into a stiff fringe on the sharp edge of the ribs ; within straw-colored, the portions covered by the mantle pearly ; grooves, answering to the ribs without, are obvious within, and the edges are strongly notched. Length 2 inches, height somewhat less ; breadth 1 inch.

Found plentifully in the stomachs of fish caught in Massachusetts Bay.

This shell seems not to have been hitherto described, in all its characters, by any one writer. English authors seem to have possessed superannuated specimens, which had lost the epidermis ; and such we have long been in the habit of receiving from the Bank fishing-grounds. On the other hand, Mr. Couthouy, having only immature specimens, failed to trace their pedigree. Through the kindness of Dr. Storer, I have had an opportunity to examine specimens of Mr. Couthouy's *C. pubescens* of the size above indicated, taken in our Bay, covered with their peculiar epidermis ; under which disguise, however, it was not difficult to detect the *C. Isländicum*. A few years since, I examined a denuded specimen, brought by Dr. C. T. Jackson from the coast of Maine, where he says they are not uncommon, measuring $2\frac{7}{10}$ inches in length, by $2\frac{4}{10}$ in height. Those taken in Massachusetts Bay seldom exceed half an inch in diameter.

Destitute of an epidermis, it looks much like *C. edule*, but is easily distinguished by the number of ribs. In two of my specimens there are thirty-eight ribs ; in all the others there are thirty-six ; *C. edule* has twenty-six. It is usually found in company with *C. pinnulatum*, and would not be readily discriminated from it. But, besides the greater number of ribs, its bristled fringe upon the ribs, instead of little tubercles, marks it. It closely resembles *C. exiguum* also ; but, among other obvious differences, that shell has an angulated form.

CA'RDIIUM PINNULA'TUM.

Shell small, sub-orbicular, with a slight angle posteriorly, sub-equilateral ; surface with twenty-six ribs, with a single range of arched scales upon each.

FIGURE 57.

State Coll., No. 191. Soc. Cab., No. 2336.

Cárdium pinnulátum, CONRAD ; *Journ. Acad. Nat. Sc.*, vi. 260, pl. xi. f. 8.

Shell very small, fragile, dingy white, nearly orbicular, somewhat oblong; nearly equilateral; beaks slightly elevated, inclined inwards; an obtuse ridge passes from the beaks to the posterior point of the shell, rendering this side a little angular; the anterior side is shortest and regularly rounded; surface with about twenty-six rounded ribs, on each of which is a series of equidistant, arched scales, most conspicuous along the posterior slope, where they sometimes assume the form of spines; interior white or flesh-colored, sometimes with a brownish blotch at the posterior muscular impression; furrowed to correspond to the ribs without. Length $\frac{9}{20}$ inch, height $\frac{4}{10}$ inch, breadth $\frac{3}{10}$ inch.

This very small and pretty species is as common as any other shell in the stomachs of fishes, and may be obtained from them at almost any time. Mr. Conrad obtained his specimens from Massachusetts, and I have never heard of it in any other locality.

It is usually accompanied by the young of *C. Isländicum*, from which it is distinguished by fewer ribs, and the scales crossing them. It resembles the young of *C. edule* so much, as to excite one's suspicions that it is not a distinct species. But a careful comparison will show good characters. It is less equilateral and less convex than *C. edule*, and the posterior termination is quite different. From *C. exiguum* it differs in not having a short, diminished anterior side, elevated beaks, and a very prominent ridge posteriorly. The whole aspect of that shell is angular, while our shell is scarcely at all so. If it is the young of any known shell, I think it is that of *C. echinatum*.

CARDIUM MORTONI.

Shell small, thin, sub-globose, smooth, pale fawn-color, sometimes blotched with dark brown; within striated, bright yellow, with a purplish blotch posteriorly.

State Coll., No. 192. Soc. Cab., No. 1928.

Cardium Mortóni, CONRAD; *Journ. Acad. Nat. Sc.*, vi. 259, pl. xi. f. 5, 6, 7.

Shell small, thin, obliquely sub-ovate, sub-globose; beaks large and prominent, incurved, nearly central; posterior side a little produced and directed obliquely downwards; surface glossy, destitute of ribs or radiating lines, with fine lines of growth, and

an occasional darker zone ; color very pale yellowish, covered with a very thin, darker epidermis, thicker and more wrinkled behind ; in young specimens are blotches or zigzag lines of dark fawn-color ; teeth well developed ; inside with very faint and minute radiating lines ; margin white, the remainder bright yellow ; there is always a dark purplish blotch along the posterior margin, and it is sometimes mottled with bands and stains of reddish-brown on other parts of the interior ; muscular impressions superficial. Length of largest specimens 1 inch, height $\frac{9}{16}$ inch, breadth $\frac{7}{16}$ inch.

Found plentifully about Nantucket, Martha's Vineyard, and Rhode Island, south of which I cannot learn that it has been found.

This shell is very closely allied to the *C. lævigatum* of the West Indies, and has no other well marked distinction than the purple blotch on the posterior margin within, which, so far as I have observed, is never wanting in our species, and never present in the West India shell. In the angular markings of the young shells they are similar, and also in their form and color ; but the exterior of our shell is less smooth and polished than *C. lævigatum*, a difference which might depend on climate.

CÁRDÍUM GRŒNLÁNDICUM.

Shell large, sub-triangular, drab-colored, with very numerous, obsolete, radiating ridges ; slightly gaping posteriorly, beaks slightly prominent, incurved ; margin within salmon-colored, centre opaline.

State Coll., No. 199. Soc. Cab., No. 1916.

Cárdium Grœnlândicum, CHEMN. ; *Conch.*, vi. t. 19, f. 198. GMELIN ; *Syst.*, 3232, No. 22. BRUG. ; *Encyc. Méth.*, 222, No. 17, pl. 300, f. 7. MONTAGU ; *Test. Brit.*, 29. MATON and RACKETT ; *Lin. Trans.*, viii. 69. DILLWYN ; *Catal.*, i. 129. LAM. ; *An. sans Vert.*, vi. 407. WOOD ; *Gen. Conch.*, 227. *Index*, pl. 5, f. 28.

Mactra radiata, DONOVAN ; *Brit. Shells*, v. pl. 161.

Cárdium edéntulum, SOWERBY ; *Genera*, f. 2. *Conchol. Manual*, f. 123*. FLEMING ; *Brit. Anim.*, 425.

Aphrodite colúmba, LEA. ; *Trans. Am. Philos. Soc.*, (*New Series*), v. pl. 18, f. 54.

Shell large, not very thick, sub-triangular, elevated, rather compressed ; beaks not very prominent, curved inwards and

slightly forwards, nearly central ; anterior margin regularly rounded ; posterior side somewhat elongated, margin protuberant below the ligament, bordered by a slight wave, which gives the posterior termination a somewhat sinuous or truncated appearance, and leaves the shell gaping at this point ; this region is also more coarsely wrinkled than the rest ; surface marked with minute lines of growth, divided into zones by darker indications of the stages of growth, which successive increments appear very loosely attached posteriorly ; these are crossed by numerous, inconspicuous, radiating ridges ; epidermis thin, shining, of a drab or very light fawn-color ; hinge slender ; cardinal teeth nearly wanting ; lateral teeth distinct, but small ; muscular and palleal impressions profound, within which the shell is opalescent-white, the margin light salmon-color ; edge slightly crenated. Length $2\frac{3}{4}$ inches, height $2\frac{3}{8}$ inches, breadth $1\frac{1}{4}$ inch.

Brought from the Grand Banks, but not as yet found on the shores of this State.

This singular shell, from its triangular, compressed form, and its smooth surface, has rather the aspect of a *MÁCTRA* than a *CÁRDÍUM*. The not unfrequent entire want of cardinal teeth, has misled one distinguished conchologist as to its true relations, while its external characters have so little point, that another was not led to it by any existing description, and made of it a new species. Dr. Lovèn informs me, that Beck has instituted a new genus for it which he calls *SÉRRIPES*, on account of the serrated margin of the foot.

The old shells, one of which measures in height $3\frac{1}{4}$ inches, in length $3\frac{1}{4}$ inches, in breadth $1\frac{1}{4}$ inch, become solid and strong, and also more tumid, especially behind. The young shells often have the surface variegated with stripes, or angular markings, of rusty-brown color. This species is also remarkable for gaping posteriorly to a considerable extent.

GENUS *CARDITA*, LAM.

Shell inequilateral, regular, hinge with a short, strong, erect tooth under the beaks, and an oblique one stretching along the margin.

CARDITA BOREALIS.

Shell obliquely sub-cordate, beaks prominent and recurved, with about twenty radiating ribs; margin crenate; lunule small and deep.

FIGURE 59.

State Coll., No. 189. Soc. Cab., No. 1930.

Cardita borealis, CONRAD; *Amer. Mar. Conch.*, 39, pl. 8, f. 1. SOWERBY; *App. to Beechey's Voy.*, pl. 44, f. 1.

Arcturus rudis, HUMPHREY; *Mss.*

Shell rounded, obliquely heart-shaped, thick, and strong; inequilateral; the beaks elevated and turned forwards, so as almost to be even with the anterior extremity, which is regularly rounded; posterior margin regularly rounded by a much larger curve, which, meeting the base, forms an obtuse angle; surface raised into about twenty rounded, radiating ribs, which are broader than the grooves between them; these are rendered rough by coarse lines of growth, and covered by a strong, rusty-brown epidermis; lunule very strong, and deeply imprinted, rhomboidal; ligament small and sunken, nearly concealed; hinge strong, two teeth in each valve; in the left valve a small triangular one under the beak, and an oblique, grooved, or partially double one along the posterior margin as long as the ligament; on the right valve a long, tapering, oblique tooth, fitting between the two teeth of the opposite valve, and a more slender one on which the ligament partially rests; interior white, margin strongly crenate; impressions distinct. Length 1 inch, height 1 inch, width $\frac{7}{8}$ inch.

Found along the whole coast of Massachusetts, and is one of the most common shells found in fishes. It is a more northern shell, and is found along the coast of Maine, and in the Arctic seas, of a very large size.

The shape of the shell is much varied by age. In the young the beaks are nearly central, very little elevated, and scarcely recurved; but the posterior portion advancing in growth faster than the anterior, produces the obliquity of the old shell. It is closely allied to *C. tridentata*, SAX, but it grows to a much larger size, is more inequilateral, and has two teeth in the right valve, while that shell has but one.

FAMILY *ARCACEA*, LAM.

Teeth small, numerous, disposed in a line along the hinge margin of each valve.

GENUS ARCA, LIN.

Shell transverse, beaks separated by a diamond-shaped area for the ligament ; series of teeth in a straight line.

ARCA PEXÀTA.

Shell oblong ; beaks prominent, very oblique ; the ligamentary space very narrow ; surface with about thirty-two radiating ribs, covered with a shaggy, brown epidermis.

FIGURE 60.

State Coll., No. 186. Soc. Cab., No. 1949.

Arca pexàta, SAY ; *Journ. Acad. Nat. Sc.*, ii. 268.

Shell thick and heavy, oblong, somewhat ovate ; very inequilateral ; the beaks are ventricose and prominent, directed very obliquely forwards, terminating in points which are nearly in contact over the anterior termination of the series of cardinal teeth ; at the other extremity of the series, the outline of the shell, which is elsewhere regularly rounded, has an obtuse angle ; the ligamentary area, or space between the beaks, is very narrow, scarcely separating them. Surface with thirty-two to thirty-six radiating ribs, rather broader than the channels between them ; these are traversed by minute lines of growth, and interrupted by the more distinct overlapping zones of increase. The whole is covered by a thick, shaggy, fibrous epidermis of a dark brown-color, sometimes protruding from the interstices of the ribs in a fringe-like manner. Interior white, the margin polished, and profoundly scalloped by the alternate terminations of the ribs and grooves. In front of the regular series of teeth are a few irregular pits and prominences which fit into each other. Length $2\frac{1}{4}$ inches, height $2\frac{1}{10}$ inches, breadth $1\frac{1}{2}$ inch.

The *Arca pexàta* has never been found to the north of Cape Cod. I have it from Martha's Vineyard ; it is not rare in Buzzard's Bay, and is common about Rhode Island.

It is distinguished from other North American species by the position of its beaks, its epidermis, its narrow area between the beaks, and by its being equivalve. Its height increases posteriorly, so that the interior of a valve has an ovate shape.

Mr. Say remarks, that, when violently opened, an effusion of red sanies issues; and hence it has acquired the name of *bloody clam*.

ARCA TRANSVÉRSA.

Shell rhomboidal, with from thirty-two to thirty-five ribs; beaks at the anterior third of the series of teeth.

State Coll., No. 187. Soc. Cab., No. 2337.

Arca transvérsa, SAY; *Journ. Acad. Nat. Sc.*, ii. 269.

“Shell transversely oblong, rhomboidal, with from thirty-two to thirty-five ribs placed at nearly the length of their own diameters distant from each other. Apices separated by a long narrow space, and situated at the termination of the posterior (anterior) third of the length of the hinge margin; extremities of the hinge margin angulated; anterior [posterior] edge, the superior half rectilinear; posterior [anterior] edge rounded; inferior edge nearly rectilinear, or very obtusely rounded; on the hinge space, one or two angulated lines are drawn from the apex diverging to the hinge edge.” Say. Length $1\frac{1}{2}$ inch, height 1 inch, breadth $1\frac{1}{2}$ inch.

Found about the sands of Nantucket and Martha's Vineyard, and it is said to be not uncommon in Buzzard's Bay.

I have quoted the description by Mr. Say, above, merely interchanging the terms anterior and posterior, to accord with the parts of the shell to which those terms are applied in other parts of the Report. The position of the beaks distinguishes it from the preceding species.

GENUS NUCULA, LAM.

Shell transverse, without an area for the ligament between the beaks; a straight series of teeth each side, forming an angle at a spoon-shaped pit which separates them.

NUCULA THRACIÆFÓRMIS.

Shell kidney-shaped, inequilateral, covered with a dark olive-green epidermis ; a rib-like wave passes from the beaks to the posterior-inferior angle ; gaping at both ends.

FIGURE 66.

State Coll., No. 183. Soc. Cab., No. 2318.

Núcula thraciæfórmis, STORER ; *Bost. Journ. Nat. Hist.*, ii. 122 (wood-cut.)

Shell oblong-ovate, or rather kidney-shaped, somewhat pointed before, broadest and truncated behind, thin ; gaping at both ends ; inequilateral ; the beaks considerably elevated, pointed, inclined backwards, and touching each other, are situated near the anterior third of the shell ; an obtuse, rib-like wave passes obliquely over the shell from the beaks to the posterior third of the basal margin, dividing the surface of the shell into two unequal triangles ; the outline of the anterior triangle is regularly curved, excepting a shallow, lengthened notch between the centre of the base and the wave ; the upper margin of the other triangle is nearly direct, a little upturned or beaked, and its edge is compressed into a sharp crest, the posterior margin moderately rounded, joining above and below with an abrupt curve of a truncated appearance ; the anterior portion is inflated, and the epidermis of a dusky green ; the posterior portion is compressed, has one or two faint waves or radiations, and the epidermis is of a lighter yellowish-green, minutely wrinkled ; surface coarsely marked with lines of growth, and covered with a sooty powder, which easily rubs off and leaves a glossy black. Hinge with a very large, spoon-shaped cavity, and on each side of it are about twelve teeth, each one folded from the centre to an angle of 45° ; cavity of the beaks very capacious ; interior polished white, impressions faint, the palleal one with a deep sinus. Length $2\frac{4}{5}$ inches, height $1\frac{1}{2}\frac{3}{8}$ inch, breadth $1\frac{1}{8}$ inch.

First taken by Dr. Storer from the stomachs of *Pleuronectes dentata*, or *sand-dab*, caught off Race Point, in December, 1837. In that winter a dozen or more specimens were taken from the same species of fish, and from the same locality ; but last winter they were sought for without success.

It is a very extraordinary shell, far exceeding in size any known species of the genus. Indeed, its peculiar shape, very large spoon-hinge, and the teeth folded like those of *ARCA*, entitle it to a generic distinction so far as the shell is concerned; and I believe that a knowledge of the animal will establish its claims to one.

NU'CU'LA LIMÁTULA.

Shell oblong-ovate, rostrated, very smooth and shining; beaks sub-central; teeth twenty-two on the anterior, and eighteen on the rostrated side.

FIGURE 62.

State Coll., No. 184. Soc. Cab., No. 1962.

Nucula limátula, SAY; *Amer. Conch.*, pl. 12.

Shell transversely-ovate, very much elongated, thin, lines of growth very minute, otherwise smooth and covered with a beautifully glazed, light-green epidermis, with an occasional darker zone, and two or three lighter radiations; beaks nearly central, not prominent, inclined backwards; hinge margin behind rectilinear nearly to the tip, compressed, the compression not reaching the tip, which is a little recurved, pointed and not truncated; anterior and basal margin almost regularly rounded, entire; interior bluish-white, somewhat pearly; cartilage-pit small; the series of teeth, extending more than two thirds the length of the shell, is slightly bent at the pit, teeth prominent, most so at the middle of each side, their summits forming a regular arch, twenty-two on the anterior, and eighteen on the rostrated side, excavated on their outer faces; impressions quite obvious. Length $1\frac{9}{16}$ inch, height $\frac{9}{16}$ inch, breadth $\frac{5}{16}$ inch.

Found in various parts of Massachusetts Bay.

This beautiful shell may be distinguished from other species of our coast by its length, which is more than twice as great as its height. Its posterior portion is also more narrowed than in other species. The dimensions given above are those of a specimen larger than is ordinarily found. But I have a single valve sent me by Dr. Mighels of Portland, which he dredged in the harbour of that place, where he found them abundantly, measuring $2\frac{1}{8}$ inches in length, and $1\frac{1}{8}$

inch in height. He informs me that the animal is very active, and that it leaps to an astonishing height, exceeding in this faculty the *scollop-shells*.

NUCULA MYALIS.

Shell ovate, smooth, olive-colored; anterior side longest and rounded; posteriorly acuminate, and sub-rostrated; teeth about twelve on each side.

State Coll., No. 200. Soc. Cab., No. 2215.

Nucula myalis, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 61, pl. 3, f. 7.

Shell ovate, thin, slightly gaping at both extremities, moderately convex; surface somewhat undulated by distant concentric ridges, and covered with an olive-colored epidermis, arranged in alternate darker and lighter zones; beaks not elevated, a little behind the middle; anterior side semi-elliptical; posterior side sub-triangular, upper margin behind the beaks straight, compressed and sharp to the very tip, which is obtusely pointed as the regular curve of the base meets the dorsal line. Interior yellowish-white, glossy, with greenish zones, and minute radiating lines or striæ; cartilage cavity deep, triangular; series of teeth about twelve on each side, increasing in size and distance towards the outer extremities. Length $1\frac{1}{8}$ inch, height $\frac{7}{16}$ inch, breadth $\frac{7}{16}$ inch.

Taken from the stomachs of fish caught in various parts of Massachusetts Bay.

The general aspect of this species is like that of *N. limátula*. It is distinguished by the position of the beaks, and the smaller number of teeth; the whole shell, and the posterior side especially, is less elongated, and the epidermis is of a darker, more strictly olive color, and far less glossy. It never attains to so great a size. It has almost precisely the shape and size, but none of the oblique striæ of *N. ártica*, BROD. and SOWERBY. *N. Éightsii*, COUTHOUY, from the Antarctic seas, must also be very closely allied. A shell from Spitzbergen sent me by Dr. Lovèn, and named by him *N. hyperbórea*, as to the exterior and the position of the beaks is like this; but its height is less, and there are eighteen teeth in the posterior range.

NU'CU'LA SAPOTÍLLA.

Shell elongated-ovate, sub-equilateral, sub-rostrated, tumid at the beaks, with a slight flexure under the posterior tip, pale yellowish-green, polished; teeth about sixteen on each side.

FIGURE 61.

State Coll., No. 182. Soc. Cab., No. 2338.

Shell ovate, prolonged, thin, fragile, translucent, the beaks a little in advance of the centre, not elevated, but considerably inflated laterally; anterior half regularly semi-oval; posterior portion narrowed and compressed, the line running from the beaks to the posterior tip straight, and rendered sharp by the compression of a very narrow portion of the margin; beneath the tip is a truncation or shallow indentation of the margin, bounded by a wave-like swell passing from the beaks to its anterior termination; surface marked only by exceedingly minute concentric lines, and covered by a very thin and glossy epidermis of a light yellowish-green color, with an occasional narrow zone of a darker color; within pearly-white; cavity of the cartilage deep and triangular; teeth about sixteen or eighteen on each side, long and pointed, very small and crowded at the centre. Length $\frac{9}{16}$ inch, height $\frac{4}{8}$ inch, breadth $\frac{3}{16}$ inch.

Inhabits the vicinity of Cape Cod, where it may be found in the stomachs of fishes, and also by dredging. Many specimens have been kindly furnished me by Colonel Totten, which he took by dredging in Provincetown harbour.

This is the living analogue of the fossil species described by Mr. Say under the name of *N. levis*, in "American Conchology," pl. 12. In size, shape, and the position of the beaks they accurately agree; but the fossil species wants the emargination or flexure under the posterior tip. *N. myàlis* is greater in height, thicker, darker, and has the beaks about as far removed towards the posterior as they are towards the anterior extremity in this shell.

Eroded spots, filled with a black substance, are frequently seen externally, which are marked by a corresponding chalky opacity within.

In its shape, and the perfect polish of its surface, this shell resembles the seed of the Sapotilla (*Achras sapòta*), a tropical fruit; and I have substituted that name instead of *N. lævigàta*, under which I gave the specific characters of the shell in the "American Journal of Science," as I find that name preoccupied.

NUCULA MINUTA.

Shell ovate-lanceolate, inequilateral, posteriorly much narrowed and rostrated; surface with numerous concentric ridges, covered with a light greenish-yellow epidermis; teeth twelve before and sixteen behind the beaks.

State Coll., No. 180. Soc. Cab., No. 2339.

Arca minuta, GMELIN; *Syst.*, 3309, 14. MONTAGU; *Test. Brit.*, 140. CHEMN.; *Conch.*, x. 170, f. 1657, 1658.

Arca caudata, DONOVAN; *Brit. Shells*, pl. 78.

Nucula minuta, TURTON; *Brit. Biv.*, 178. FLEMING; *Brit. Anim.*, 402.

Nucula rostrata, SOWERBY; *Genera*, No. 17, f. 5.

Nucula tenuisulcata, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 64, pl. 3, f. 8.

Shell ovate-lanceolate, thin, the posterior side double the length of the anterior, narrowed to a point, the tip being a little upturned, truncated and gaping, the upper margin straight and sharp; anterior side regularly rounded; surface wrought into numerous and crowded concentric folds, excepting a compressed, lanceolate area behind the beaks reaching nearly to the tips, which is smooth and shining; a delicate, sub-marginal angle runs from the beaks to the lower angle of the truncated tip, at which the concentric folds or ribs are bent at nearly a right angle, so as to be parallel to the margin; epidermis light greenish-yellow, or sap-green color, within pearly white; an elevated ridge runs from within the cavity of the beaks to the lower angle of the truncated tip, corresponding to the exterior angle; teeth twelve to fourteen before the beaks, and sixteen to eighteen behind them. Length 1 inch, height $\frac{9}{16}$ inch, breadth $\frac{3}{16}$ inch.

Found, not very rarely, in the stomachs of fishes taken off Nahant.

This shell is readily distinguished from our other species by the folds and grooves of its surface. It is much more pointed than the

other species, and does not attain to a large size, the above dimensions being those of a shell one third longer than the usual size. It is closely allied to *N. concéntrica*, Say, which, besides being a fossil species, is not described or figured as having a truncated tip. It is also allied to *N. costellàta*, Sowerby, "Conch. Illust." f. 8. I have carefully compared our shell with a specimen of *N. minùta*, from the coast of Norway, sent me by Dr. Lovèn, and can find no difference in the number of teeth, or in any other respect.

Note. The following undescribed fossil species, is so closely allied to the preceding, that I may, with propriety, introduce a description of it here, though it has not been found in this State.

NŪCULA JACKSONII.

Shell ovate, convex, inequilateral, posteriorly diminishing to a narrow, ascending beak, truncated at tip, and with a flexure in the margin beneath it; surface with concentric, elevated lines; teeth fifteen before, and twenty behind the beaks.

FIGURE 65.

Shell ovate, elongated, ventricose, rather solid; beaks at the anterior third; anteriorly rounded; posteriorly rapidly attenuated so as to form a somewhat ascending beak, truncated at tip; posterior hinge margin straight and sharp, compressed at each side so as to form an area defined by denticulated lines, and smooth; under the tip is a flexure or shallow indentation of the basal margin, and an elevated ridge runs from the beaks to the lower angle of the tip; surface covered with fine, crowned, elevated, concentric lines; within grooved and irregular, with accumulations of calcareous matter, the most remarkable of which are one under the posterior series of teeth, and a rib going to the middle of the truncated tip; cartilage pit a narrow cavity, which penetrates through the shell and forms a transverse fissure between the beaks, which are widely separated; series of teeth strongly curved, fifteen before and twenty behind the beaks, short, very broad, and folded outwardly. Length 1 inch, height $\frac{1}{2}$ inch, breadth $\frac{2}{3}$ inch.

Found at the land-slip at Pride's Bridge, Presumpscot River, Westbrook, Maine, September, 1837; and also by Dr. C. T. Jackson at Augusta, while engaged in the geological survey of Maine, in honor of whom I have named it.

It is remarkable for its great width, which makes it almost cylindrical. The concentric lines are finer and closer than in *N. minuta*. In general outline it resembles *N. rostrata*, SOWERBY, "Conch. Illust." f. 12. The denticulated boundary line of the beaks, both before and behind, are very peculiar.

NUCULA NAVICULARIS.

Shell small, fragile, crescentic, sub-equilateral; surface smooth; epidermis light-green; rounded before, slightly truncated behind; umbones tumid; teeth eight before and ten behind the pit.

State Coll., No. 288. Soc. Cab., No. 2341.

Nucula navicularis, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 178, pl. 4, f. 4.

Shell small, thin, fragile, of a crescentic, or somewhat kidney-shaped form, smooth, tumid at the beaks, and compressed at the sides, slightly gaping at both ends; beaks very nearly central, prominent, and directed backwards; anterior side elliptically rounded; posterior side somewhat narrowed and compressed, and very slightly truncated; basal margin strongly curved; surface smooth, with very indistinct lines of growth; epidermis a light pea-green, thin, with many eroded spots. Ligamentary fosset broad, prominent, and oblique; teeth about eight before and ten behind the fosset. Interior glossy white; margin simple. Length $\frac{1}{2}$ inch, height $\frac{5}{16}$ inch, breadth $\frac{3}{16}$ inch.

Found in the stomachs of fish caught off Nahant and Plymouth; not common.

This small shell might at first be regarded as the young of some other species. But the central position of the beaks, the number of teeth, and its crescentic or boat-shaped form are good characteristics. The size above indicated is about one third larger than that of the specimens usually found.

NUCULA PRÓXIMA.

Shell oblique, ovate-triangular, anterior side perpendicular to the base; crossed by minute, concentric, and radiating lines; epidermis olivaceous; within pearly, margin crenulated; teeth, twelve before and eighteen behind the beaks.

FIGURE 63.

State Coll., No. 185. Soc. Cab., No. 1963.

Nùcula próxima, SAY; *Journ. Acad. Nat. Sc.*, ii. 270.

Shell small, thick and solid, very oblique, triangular, the outline and angles a little rounded; the anterior side nearly vertical, and about two thirds the length of the posterior side, forming something less than a right angle with it; beaks somewhat elevated, inclined forwards; anterior slope with a large, ovate area, defined by an angular ridge; posterior edge broad and flattened; surface crossed with somewhat coarse lines of growth, and by very minute, radiating lines; epidermis light olive-color, with darker zones; interior pearly, the margin very finely crenulated; cartilage pit very small; series of teeth twelve before and eighteen behind the beaks, including the very small ones near the pit, short and broad, the two series nearly at right angles with each other. Length $\frac{9}{20}$ inch, height near anterior side $\frac{7}{20}$ inch, breadth $\frac{5}{20}$ inch.

Found not uncommonly in the stomachs of fishes taken near Nahant. Professor Adams found it abundantly at Dartmouth, in mud taken up beyond low-water mark; and Dr. Yale sent it to me collected on the shores of Holmes's Hole.

By many, this shell has been supposed identical with the *N. nùcleus* of English authors, — the *N. margaritacea* of Lamarck. But actual comparison shows a wide difference. The *N. nùcleus* is less triangular, the posterior tip broadly rounded; its proportional diameter is not more than half as great, the epidermis is firm and darker, the teeth are ten and twenty, and the whole shell is double the size of ours. It is much more closely allied to, if not identical with, a shell sent me by Mr. Sowerby under the name of *N. nitida*. The number and arrangement of teeth is the same; and if there be any difference, it is that the British shell is smoother, narrower, the angle made by the anterior and superior margins is greater, and the shape less obliquely transverse. The striæ are very obvious under the epidermis. In young specimens a series of transverse indentations may be seen along each side of the posterior hinge margin.

NUCULA TENUIS.

Shell trapezoidal, thin, smooth, without radiating lines; epidermis grass-green; beaks prominent, placed anteriorly; margin simple, teeth very few.

FIGURE 64.

State Coll., No. 287. Soc. Cab., No. 2340.

Arca tenuis, MONTAGU; *Test. Brit., Suppl.*, 56, pl. 29, f. 1. PENNANT; *Brit. Zool.*, iv. 218. DILLWYN; *Catal.*, 246. TURTON; *Conch. Dict.*, 11.

Nucula tenuis, TURTON; *Brit. Div.*, 177. FLEMING; *Brit. Anim.*, 402.

This shell is very similar to the preceding, and would not at once be distinguished from it. The following are some of the essential differences. The posterior margin, instead of running straight to the posterior tip, runs about half the distance parallel with the base, then forms an angle, and, by a broadly rounded curve, joins the curve of the base; the tip is, therefore, not pointed as in *N. próxima*, and the angle of this side gives the shell a four-sided, instead of a triangular figure, the greatest height being somewhat behind the beaks; beaks prominent, curved forwards, and having a deep pit before them, not found in the other species; anterior margin forming as much as a right angle with the posterior; while in *N. próxima* we have rather less than a right angle. The surface is smooth, glossy, grass-green, without any radiating lines. Interior a silvery-white, but not pearly like the other. The teeth are very long and slender, scarcely if at all folded, and only about eight behind and four or five before the beaks. The interior margin is always simple, but never so in the smallest specimens of *N. próxima*. The shell is very thin, and its breadth very small. Length $\frac{3}{10}$ inch, height $\frac{1}{4}$ inch, breadth $\frac{3}{20}$ inch.

Found in the stomachs of fishes, but much more sparingly than the preceding.

This shell, as far as I can recollect, is the one in the collection of the Academy of Natural Sciences at Philadelphia, marked "*N. lucida*, BLANDING." It corresponds precisely with a specimen of *Nucula tenuis* sent me by Mr. Sowerby, and it is his opinion that they are identical.

FAMILY *NAIADES*, LAM.

Shells fluviatile; hinge having a simple or divided, furrowed, cardinal tooth, with or without a lateral tooth extending along the margin; and sometimes destitute of teeth; muscular impressions compound.

The shells embraced in this family are familiarly known by the names of *fresh-water clams* or *mussels*. They inhabit most if not all of our collections of fresh water, whether still or of rapid flow. Their aspect is peculiar, and there is such a stamp of identity upon them as forbids their being confounded with any other family of shells. Exteriorly, they seldom present any thing very attractive; but no one can fail to admire the beautifully tinted pearl of their interior. The few species inhabiting New England are simple and unpretending in their appearance; but our Western waters furnish species infinite in the variety of their shapes, colors, and marking; and no shells are more eagerly sought for by foreign collectors than the American *Naiades*.

The teeth, when they exist, are strong, pyramidal, or compressed, and appear as if they had been abruptly fractured at their tips. The beaks of mature shells are almost always found to be eroded, either by the gravel or other substances which are washed over them, or by some chemical process. The foot of the animal is tongue-shaped, and serves to perform no inconsiderable journeys. In quiet water, where there is a layer of mud at the bottom, the furrows, traced by dragging the shell along on its sharp edge, are readily seen.

All the species are capable of producing pearls; and occasionally some of no inconsiderable beauty and value are found. Old and deformed shells are most likely to contain them; and in fact they seem to be the products of injury or disease.

The animal, in all the genera included in this family, seems to have the same organization; and the teeth, on the arrangement of which the genera are founded, are observed to dwindle from their greatest number and fullest developement in such a continued series, until they wholly vanish, as to lead to the belief that all the *Naiades* might be reduced to a single genus.

GENUS UNIO, BRUG.

Shell equivalve, inequilateral; hinge with a stout, irregular, striated, simple or divided cardinal tooth, in each valve, and an elongated, compressed, lateral tooth extending along the margin.

UNIO COMPLANATUS.

Shell transversely ovate, somewhat angular posteriorly, inequilateral; beaks not much elevated, epidermis dark-brown; interior purple or salmon-colored; hinge teeth deeply striated, pyramidal.

FIGURES 68, 69, 70.

State Coll., No. 176. Soc. Cab., No. 2150.

Mya complanata, SOLANDER; *Mss., Portland Catal.*, 100. DILLWYN; *Catal.*, i. 51.

Unio purpureus, SAY; *Nich. Encyc. (Amer. ed.)* iv. 3, f. 1. DESHAYES; *Encyc. Méth., Vers*, ii. 581, pl. 249, f. 5. BARNES; *Silliman's Journ.*, vi. 216.

Unio purpurascens, LAM., *An. sans Vert.*, vi. 535.

Unio violaceus, SPENGLER.

Unio rarisulcata, *coarctata*, *rhombula*, *carinifera*, *Georgina*, *glabrata* and *sulcidents* of LAM.; (*An. sans Vert.*, vi.) on the authority of Lea.

Unio fluviatilis, GREEN.

Unio complanatus, LEA; *Naiades*, 30. *Trans. Amer. Phil. Soc.*, (New Series,) iii. 416, vi. 130, not of DESHAYES.

Shell very variable in form, usually oblong-ovate, sometimes sub-rhomboidal or sub-oval, very inequilateral, broadest behind, rather compressed. Beaks about the anterior fourth of the shell, little elevated, always much eroded, and exhibiting numerous layers of greenish epidermal matter; anterior extremity always regularly rounded; superior margin, behind the beaks, straight and somewhat ascending for one half its length, then, suddenly declining, it forms an indefinite angle; posterior end pointed, rounded or slightly clipped; inferior margin regularly curved, or sometimes a little arched at the middle; an obtuse ridge passes from the beaks to the posterior tip. Surface coarsely wrinkled by the lines of growth, and covered by a dark, tar-colored, or very dark-green epidermis. Interior usually of a beautiful dark peach-blossom color, and passes from this through salmon-color to mother-of-

pearl tinged violet. Hinge having a single, erect, pyramidal, coarsely striated cardinal tooth in the right valve, with the vestige of a tooth before, and a pit behind it ; on the left valve are two nearly equal teeth of a triangular, pyramidal form, the space between them corresponding to the opposite tooth ; lateral teeth compressed, long, very slightly curved. Ordinary length $3\frac{1}{2}$ inches, height 2 inches, breadth 1 inch.

This is the most common fresh-water mussel we have. It is found in every considerable brook or collection of water emptying into the Atlantic ; and it is said never to be found in any of the streams beyond the Atlantic slope.

It is perhaps the most variable of all species, as we may judge by noticing the numerous species, which, according to Mr. Lea, Lamarck made of its varieties. And it is to be feared that Mr. Lea himself has not entirely avoided this error. Certain it is, that shells answering well to his *Roanokensis*, *jejunus*, and some others, are not seldom found in Massachusetts, among the indisputable *complanatus*.

The shell is always rounded before, somewhat widened and angular behind, and slightly truncated at tip, especially if viewed inside. Nor is it ever much inflated. Its true form is transversely oblong-oval ; but it is often nearly oval, and sometimes is much curved. In one specimen before me, the height is five eighths of the length, and in another it is only two fifths. In this latter, the breadth is one fourth of the length, while, in a third, it is nearly one half. The epidermis is usually coarsely wrinkled, without lustre, and of a pitchy-black color ; but I have a series of a strongly marked variety from the Shawsheen river in Andover, where the color is dark-chestnut with considerable lustre, the young shells are radiated with dark lines almost as much as *U. radiatus*, and some of the old shells are very coarsely plaited, from the beaks downwards, into parallel folds.

The only New England species with which this is liable to be confounded are, *U. nasutus* and *U. radiatus*. The first differs, externally, in its more smooth, greenish, and somewhat radiated epidermis ; the angular ridge running from the beaks backwards, produced by the strong compression of the hinge margin ; and by a contraction of the basal margin, near its posterior termination, so as to form a sort of beak ; and internally by the silvery, iridescent nacre, and the slender, very oblique cardinal teeth. *U. radiatus* has the hinge very nearly the same as *U. complanatus* ; but the nacre is white, or somewhat

livid, the shell never becomes so large, is more regularly convex; the epidermis is nearly smooth, shining and yellowish-green, with conspicuous rays of olive color.

UNIO NASUTUS.

Shell transversely oblong-lanceolate, hinge margin compressed, anteriorly rounded, posteriorly somewhat beaked; epidermis dusky-green, obscurely rayed; cardinal teeth compressed, oblique; nacre very bright, bluish-white, iridescent.

FIGURE 71.

State Coll., No. 178. Soc. Cab., No. 2158.

Unio nasutus, SAY; *Nich. Encyc.*, (Am. ed.) iv. pl. 4, f. 1. CONRAD; *Uniónidaæ*. *Mya nasuta*, WOOD; *Index, Suppl.*, pl. 1, f. 4.

Unio rostratus, VALENC.; *Recueil d'Obs. de Zool., &c., par Humb. et Bonpl.*, ii. 233. pl. 53, f. 3. LISTER; *Conch.*, t. 151, f. 6.

Shell slender, oblong-lanceolate, very inequilateral; beaks, small, pointed, and slightly elevated; hinge margin straight to more than half the distance from the beaks to the posterior end, when it suddenly declines and continues straight to the point; lower margin nearly parallel with the upper, though somewhat rounded at the middle, and towards the end turns rapidly upward towards the point, which is considerably produced, so as to form a sort of snout. An angular ridge passes backwards from the beaks to the tip, above which the shell is very much compressed; two or more radiating furrows are usually seen traversing this portion. Surface rather smooth, not much wrinkled by the lines of growth. Epidermis somewhat glossy, of a dark olive-green color, which in old shells becomes quite dusky, with darker and lighter zones alternating, and delicate, rather obscure rays of dusky. Within, silvery white, iridescent, and oftentimes with shades of bluish or salmon-color. Hinge with the cardinal teeth rather delicate, compressed, and directed obliquely forwards, so as to look to the middle of the front. Cavity of the beaks small. Length 3 inches, height $1\frac{1}{4}$ inch, breadth $\frac{3}{4}$ inch.

This species is rather rare. I have found it in Fresh Pond, Cambridge, and have received it from the ponds in Plymouth.

Mr. T. J. Whittemore found several good specimens in the Middlesex Canal, not far from Charlestown. It is more common in the Middle States.

It is not difficult to distinguish this from any of the species found in Massachusetts. The prolongation of the posterior extremity, which is made more conspicuous by a contraction of the basal margin just before the tip, and its compressed and oblique teeth, are well marked characteristics. But it is not so easy to distinguish smaller specimens of this, from those of *U. rectus* and *U. gibbosus*, as the general form is the same, and the prolongation of the tip in them is not very remarkable.

UNIO RADIATUS.

Shell transversely oblong-ovate, broadest and angular behind, inequilateral; epidermis wrinkled, brownish-olive, zoned and rayed with dusky-green; within bluish-white; cardinal teeth strong, erect, pyramidal.

FIGURE 73.

State Coll., No. 175. Soc. Cab., No. 2145.

Mya radiata, Gmelin; *Syst.*, 3220. Dillwyn; *Catal.*, i. 51. Wood; *Gen. Conch.*, 109.

Unio radiata, Lam.; *An. sans Vert.*, vi. 535. Desh.; *Encyc. Méth., Vers.*, ii. 581.

Unio radiatus, Barnes; *Silliman's Journ.*, vi. 265, (young cariosus.) Hil-dreth; *Silliman's Journ.*, xiv. Lea; *Trans. Amer. Phil. Soc.*, iii. 415, vi. 127, pl. 15, f. 48, 49. (animal.) *Synops. Nàïad.*, 25. Conrad; *Uniónida*, 24, pl. 10, f. 2.

Unio Virginiàna, Lam.; *An. sans Vert.*, vi. 544.

Mya oblongata, Wood; *Suppl.*, pl. v, f. 2.

Shell oblong ovate, broadest and angular behind, beaks near the front, little elevated; epidermis loosely and delicately wrinkled concentrically, olivaceous, with numerous rays of dusky-green; sometimes the wrinkles are also disposed in a radiated manner. Hinge margin a little angular at the beaks; anterior extremity narrow, about one fourth the length of the shell, regularly rounded, but the hinge margin turns downwards with a very abrupt curve; posterior side angular above, rounded at tip; hinge margin very little compressed; basal margin regularly curved. Interior white, iridescent posteriorly, with sometimes bluish or

flesh-colored tints. Cardinal teeth erect, triangular, pyramidal, strengthened by a stout rib behind the anterior muscular impression. Length 3 inches, height $1\frac{7}{8}$ inch, breadth $1\frac{1}{8}$ inch.

This is one of our common species, and is to be found in most of the large streams and ponds. It is also one of the shells confined to the eastern slope of the range of Alleghanies.

It exhibits but little variation in form, except the usual one, that those inhabited by the female are broader behind than those inhabited by the male.

No species is now better established than the one above described, though there is good reason to believe that the *U. radiatus* of Barnes, Dillwyn, Wood, and perhaps Say, was the young of either *U. cariosus* or *U. ochraceus*, or both. It is most likely to be confounded with *U. siliquoides*; but that shell has the epidermis lighter colored, very closely adhering, and perfectly smooth and glossy; the teeth also are more compressed and more oblique. Mr. Barnes observes of it that, "amidst a variety almost infinite, like that of the human countenance, there is still a characteristic identity of this species, which can scarcely be mistaken by an experienced observer. One variety of *radiatus* approaches nearest to this species, but the least appearance of rays forbids its association." This last remark is far from being just.

UNIO CARIOSUS.

Shell ovate, inflated, not very thick, inequilateral, beaks rather prominent; epidermis yellowish-olive, usually radiated with dark-green; within usually bluish-white; teeth compressed, oblique.

FIGURE, 72.

State Coll., No. 179. Soc. Cab., No. 2354.

U. nio cariosus, SAY; *Nich. Encyc. (Amer. ed.)* iv. pl. 3, f. 2. BARNES; *Silliman's Journ.*, vi. 271. LEA; *Trans. Amer. Phil. Soc.*, (New Series), vi. 126, pl. 15, f. 45. (animal). *Synops. Naiad.*, 23.

U. nio cariosa, LAM; *An. sans Vert.*, vi. 545.

U. nio ovata, VALENC.; *Recueil d'Obs. de Zool. par Humb. et Bonpl.*, ii. 226, pl. 50, f. 1.

U. nio cariosus, CONRAD; *Unionida*, 40, pl. 19.

Musculus latior subfuscus, cæruleis lineis radiatus, LISTER; *Conch.*, 152, f. 7.

Shell very variable in form, ovate, or rounded, moderately

thick, inflated; beaks placed at the anterior third, rather prominent, usually very much eroded; hinge margin straight, ascending from before backwards; anterior end narrow, regularly rounded; posterior end regularly curved above and below, and in the male terminating in a distinct angle, but in the female very broadly rounded; a sharp ridge usually passes from the beaks towards the posterior tip. Surface considerably undulated by the lines of growth; epidermis smooth, shining, and sometimes with rays of minute wrinkles; color dull greenish-yellow or light olive, usually with rays of bright, dark-green, especially along the upper posterior margin. Interior bluish-white, with sometimes a flesh-colored tint. Cardinal teeth compressed and oblique; lateral tooth rather short; cavity of the beaks rather large. Length 3 inches, height of male $1\frac{3}{4}$ inch, of female $2\frac{1}{4}$ inches, breadth $1\frac{1}{4}$ inch.

Found in the Connecticut river and its tributaries, and in ponds in Plymouth County.

It is very difficult to fix upon characters which shall indicate this shell, its variation in shape is so great. When young, it is thin and beautifully radiated, and not easily distinguished from the young of *U. ochraceus*; and at maturity, no species presents a greater contrast between the male and female than this. As found in this region it is quite thin, and radiated only along the posterior margin; but in the waters south of New England, it becomes larger and more solid.

UNIO OCHRACEUS.

Shell oblong, sub-ovate, inflated, thin, inequilateral angular behind; epidermis loosely wrinkled posteriorly, yellowish-green, finely radiated with olive; cardinal teeth compressed, nearly parallel with the margin; within salmon or rose-colored.

FIGURE 74.

State Coll., No. 174. Soc. Cab., 2203.

Unio ochraceus, SAY; *Nich. Encyc. (Amer. ed.)* iv. pl. 2, f. 8. LEA; *Trans. Amer. Phil. Soc.*, (New Series,) vi. 126. pl. 15, f. 44. (animal). *Synops. Naiad.*, 23. CONRAD; *Unionida*, 37, pl. 17, f. 2.
Symphynota ochracea, LEA; *Trans. Amer. Phil. Soc.*, (New Series,) iii. 69.

Shell transversely oblong, sub-ovate, thin, translucent, very much inflated; beaks more than one third from the front, elevated, inclined forwards and touching at the points; hinge margin straight, ending in an angle both anteriorly and posteriorly; anterior end narrowest, compressed, especially above, rounded, and widely gaping; posterior end having its point angular in consequence of a sharply angular ridge which passes from the beaks and terminates there, and encloses a broad, depressed space, with the margins compressed into a keel; base regularly rounded. Surface tolerably regular; epidermis lying in fine loose folds about the posterior end, color olivaceous, rather yellowish in shells of the ordinary size, and finely radiated and zoned with dark-olive over every part of the shell. Interior a very delicate rose-color, or deep salmon-color, tinted with rose-red. Cardinal teeth compressed, striated, directed forwards, and nearly parallel with the hinge margin; lateral teeth short; cavity of the beaks capacious. Length $2\frac{3}{4}$ inches, height 2 inches, breadth $1\frac{1}{4}$ inch.

Some specimens are found much larger. I have one, from Pennsylvania, which measures 4; $2\frac{2}{3}$; $1\frac{3}{4}$. Such shells become much thickened and proportionally elongated posteriorly; they lose the radiations of the epidermis, which is of a dark olive-color. I do not know that any such shells have been found in Massachusetts.

This shell is very rare, and I do not know of its having been found anywhere except in the Plymouth ponds. When young, it is scarcely to be distinguished from *U. cariosus*; but it is more inflated, and the radiations of the epidermis are finer, and cover more of the shell; it is not so glossy, and its interior is more colored.

GENUS ALÁSMODON, SAY.

Shell transverse, inequilateral; hinge like that of U'nio, except that it is destitute of a lateral tooth.

ALA'SMODON ARCUATA.

Shell more or less kidney-shaped, very inequilateral, thick,

beaks not prominent; epidermis pitchy-black; within bluish-white; teeth erect, conical, grooved.

FIGURE 75.

State Coll., No. 172. Soc. Cab., No. 2175.

Alasmodonta arcuata, BARNES; *Silliman's Journ.*, vi. 277, pl. 12, f. 20.

Mya margaritifera? LIN.; DILLWYN; WOOD; &c.

Margaritana margaritifera, LEA; *Trans Amer. Philos. Soc.*, vi. 135.

Shell transversely much elongated, ovate or kidney-shaped, thick and strong; beaks within the anterior fourth, scarcely rising above the line of the hinge, very much eroded; hinge and basal margins usually curved, nearly parallel; nearly as broad before as behind the hinge, and rounded; more pointed behind, and the tip appears as if slightly truncated; surface somewhat waved by the lines of growth; epidermis close and smooth upon the disk, loosely wrinkled towards the margin and posteriorly, color pitchy-black. Within smooth, bluish-white, and sometimes tinted flesh-color at the centre; nacre not extending to the margin, leaving a greenish border. Cardinal teeth two in the left valve, erect, strong, pyramidal, the posterior one deeply grooved in front, so as to form four or five denticles along its edge; one on the right valve, long, erect, a little twisted, deeply grooved along its front, and with a pit each side, at base; cavity of the beaks shallow. Length $4\frac{1}{2}$ inches, height 2 inches, breadth $1\frac{1}{4}$ inch.

Found in most running streams in the interior; I have never found it near the sea-board.

It is a very common shell, and is at once known by its curved form, dark color, and the want of a lateral tooth. It is the largest fresh-water mussel we have.

Mr. Lea regards our shell as identical with the European *Mya margaritifera* of the older authors, the *Unio elongata* of Lamarck, &c; but the shells which I have had an opportunity of examining present some constant differences. The foreign shell is shorter, the beaks more nearly central and more elevated, and the portion of the interior, within the palleal impression, is minutely granulated; and, as my foreign specimens agree accurately with the figures of Chemnitz and Turton, I am induced to think there may be a constant difference. The intervention of an ocean would strengthen the supposition. I

have, therefore, felt disposed to retain the very appropriate name of Barnes, until more fully satisfied. The European shell is the famous river *pearl-mussel*, in which pearls of considerable beauty are occasionally found. But, as far as I have observed, they are not oftener found in our *Alasmodon* than in other species of fresh-water mussels.

ALA'SMODON UNDULATA.

Shell transversely-ovate, inequilateral, angular behind; beaks tumid, elevated, undulated; epidermis dark-green, obscurely rayed; one cardinal tooth in each valve, supported by a strong internal rib.

FIGURE 76.

State Coll., No. 177. Soc. Cab., No. 2174.

U'nio undulata, SAY; *Nicholson's Encyc.*, (*Amer. ed.*), iv. pl. 3, f. 3.

Alasmodonta undulata, BARNES; *Silliman's Journ.*, vi. 279.

Mya undulata, WOOD; *Suppl.*, pl. 1, f. 5.

Margaritana undulata; LEA; *Trans. Amer. Philos. Soc.*, (*New Series*), vi. 135.

Synops. Naiad., 44.

U'nio hians, VALENC.; *Recueil d'Obs. de Zool.*, par Humb. et Bonpl. ii. 235, pl. 54, f. 2.

Alasmodon undulata, SWAINSON; *Lardner's Cab. Cyclop.*, cxxiii. 288, f. 61.

Shell transversely-ovate, strong, much inflated, widely gaping; beaks at the anterior third, very prominent, tumid, with three or four large, concentric, oblique undulations upon them; anterior and basal margins broadly and regularly curved, with a very slightly lobed appearance in front of the beaks; posterior margin angular behind the ligament, and pointed at tip, rapidly narrowed; ligamentary area imperfectly marked by an ill-defined ridge, which is usually wrinkled in the direction of its course; margin compressed. Surface a good deal undulated by the stages of growth; epidermis shining, of a dark olive-color, everywhere rayed with fine lines, alternately yellowish and dark, which are not very conspicuous unless held up to transmitted light. Within, the anterior half is thickened, opaque, and the color white; the posterior half is translucent, thin, of a silvery lustre, exhibiting the exterior radiations. Hinge supported on a very strong rib,

tooth of the right valve erect, conical, striated above; tooth of the left valve erect, produced backwards in a triangular manner, under the ligament, with a pit in front of it; cavity of the beaks very deep and capacious. Length 2 inches, height $1\frac{1}{2}$ inch, breadth 1 inch.

Found in Blackstone River and its tributaries, and in Plymouth county.

It is easily known by its short, tumid appearance, the undulations on the beaks, and the peculiar hinge.

ALÁSMODON MARGINA'TA.

Shell transversely-ovate, wedge-shaped, inequilateral; beaks prominent; surface obliquely wrinkled posteriorly; epidermis olivaceous, imperfectly radiated with dark green; tooth small, compressed, looking forwards; nacre bluish-white, with a chalky-white margin.

FIGURE 77.

State Coll., No. 173. Soc. Cab., No. 2171.

Alasmodóna marginàta, SAY; *Journ. Acad. Nat. Sc.*, i. 459. BARNES; *Silliman's Journ.*, vi. 279.

Unio varicòsa, LAM.; *An. sans Vert.*, vi. 543.

Alasmodóna truncàta? SAY.

Margaritàna marginàta, LEA; *Trans. Amer. Philos. Soc.*, (New Series,) vi. 135.

Mya rugulòsa, WOOD; *Index, Suppl.*, pl. 1, f. 7.

Shell ovate, thin, widely gaping behind, wedge-shaped from before backwards; beaks at the anterior third, rather small, but elevated, and having three or four small undulations; anteriorly low and rounded, but increases rapidly in height; the posterior hinge margin suddenly declines to form a rounded tip; ridge from the beaks elevated and well defined, above which the shell exhibits coarse, rounded wrinkles, running obliquely upwards and outwards; epidermis shining, olive-green, somewhat mottled with dark and light shades, and with obscure, broken, radiating lines; within bluish-white, with shades of green, the margin chalky-white. Hinge delicate, the teeth, one in each valve, small, compressed, directed along the hinge margin so as almost to coincide with it; sometimes the teeth are only rudimentary; cavity of the

beaks rather deep, not very capacious. Length 2 inches, greatest height $1\frac{1}{8}$ inch, breadth $\frac{1}{8}$ inch.

Found in the Blackstone River and its tributaries, and in Shawshin River, Andover. I have also received very beautiful specimens from a pond in West Brookfield.

It not common, and may be readily distinguished from our other species by its wedge-like form, when seen from above, by the remarkable series of oblique wrinkles along the posterior slope, and by its delicate teeth, which, in fact, sometimes wholly disappear. In the character of its wrinkles it is much like *A. rugòsa*. It is more elongated than *A. undulàta*, and has its greatest height at the posterior termination of the hinge, instead of opposite the beaks, as in that shell.

Mr. Lea regards our shell as being the same as the western shell named *A. truncàta* by Say. Some of our specimens approach them very closely, but ours is in general a less inflated, less angular shell.

GENUS ANODON, BRUG.

Shell transversely elongated, inequilateral, thin ; hinge toothless.

ANODON FLUVIÁTILIS.

Shell thin, inflated, transversely sub-oval, hinge margin straight, crested behind ; beaks moderately elevated, epidermis deep grass-green, obscurely rayed, darker above the posterior ridge ; within white, tinted lilac.

FIGURE 80.

State Coll., No. 171. Soc. Cab., No. 2181.

Anodónta catarácta, SAY ; *Nicholson's Encyc.*, (Amer. ed.), iv. pl. 3, f. 4.

My'tilus fluviátilis, DILLWYN ; *Catal.*

Anodónta fluviátilis, LEA ; *Trans. Amer. Phil. Soc.*, (New Series,) vi. 138.

Synops. Nàiad., 51.

My'tilus íllitus, SOLANDER ; *Portland Catal.*, 163.

LISTER ; *Conch.*, t. 157, f. 12.

Shell transversely sub-oval, sub-cylindrical, thin, fragile, inflated ; beaks at the anterior two fifths of the shell, tumid, somewhat elevated, and minutely undulated at tip. Hinge margin straight ; anterior imperfectly angular above, nearly as high as be-

hind the beaks ; upper posterior margin forming an obtuse angle at the termination of the ligament, and declining in a straight line to form a somewhat produced, blunted point ; this margin is compressed into a sort of crest ; basal margin a good deal curved ; surface undulated somewhat irregularly by the lines of growth ; epidermis smooth and close except at the upper and posterior portion, where it is loosely wrinkled ; a few radiating series of wrinkles may also be seen ; color a deep grass-green, becoming dusky behind and above, and obscurely radiated. Nacre silvery, or tinged with bluish or yellowish, margin greenish ; cavity of the beaks not deep, large ; hinge edge very thin, rounded, scarcely curved. Length $4\frac{1}{2}$ inches, height $2\frac{3}{4}$ inches, breadth $1\frac{1}{2}$ inch.

Inhabits ponds in the western and central parts of this State, and is seldom found in any other part. Professor Adams, however, assures me he has found it at Falmouth, and I have collected a few specimens from clay-pits near Winter Hill, in Charlestown.

It greatly resembles the *A. cygnea* of Europe, and is chiefly distinguished by the latter having the beaks less central, and not at all elevated. From the next species the most obvious distinctions are, the bright green-color, together with the thinness of the shell. It is very difficult, if not impossible, to draw the line between our shell and some of the species of the Western waters. They seem, most of them, to be mere variations in size.

ANODON IMPLICATA.

Shell transversely-oblong, sub-oval, variable in proportions, thick and strong ; exterior coarse ; epidermis yellowish-olive ; nacre flesh-colored.

FIGURE 78.

State Coll., No. 169. Soc. Cab., No. 2192.

Anodonta implicata, SAY ; *New Harmony Disseminator*.

Anodonta Newtoniënsis? LEA ; *Trans. Amer. Phil. Soc.*, (New Series,) vi. 79, pl. 21, f. 66.

Anodonta marginata? SAY ; (young) *Nicholson's Encyc.*, (*Amer. ed.*), iv. pl. 3, f. 5.

Shell transversely-oblong, sub-oval, almost as broad as high, sub-cylindrical, thick, opaque, strong, and heavy ; beaks removed about two fifths the length of the shell from the anterior end, rather elevated, obtuse ; breadth of shell greatest behind the

middle ; hinge margin a little curved, forming an angle at both its terminations ; the backward slope from this angle is usually a little curved, and the posterior tip is rather blunt and somewhat truncated ; the ridge from the beaks to this tip is very prominent, generally bluntly rounded, but sometimes quite abrupt ; the space above it is rough, but is little compressed, except in young specimens ; three or four coarse lines often run along this space in the direction of the ridge ; basal margin very gently curved in young specimens, nearly parallel with the hinge margin in the middle-aged, and deeply contracted or arched in old shells. Surface rough, with coarse and irregular lines of growth ; epidermis yellowish-olive, darker above and behind, and with dusky-brown zones ; young shells are of a delicate grass-green, slightly rayed. Interior silvery till after the middle age, when it becomes of a delicate flesh-color or salmon-color. Length 4 inches, height $2\frac{1}{4}$ inches, breadth $1\frac{7}{8}$ inch. Of another specimen $4\frac{1}{2}$ inches, $2\frac{4}{10}$ inches, $1\frac{9}{10}$ inch ; of another 3 inches, $1\frac{6}{10}$ inch, $1\frac{1}{10}$ inch.

Inhabits ponds in Essex and Middlesex counties, and is also found in Maine ; whether it occurs southward or not is uncertain. A Pennsylvania shell, which Mr. Lea describes under the name of *A. Newtoniënsis*, is so much like some varieties of this shell as to render it probable that they are the same, and that it is found throughout a wide southern range.

The above is the description of a characteristic specimen of a shell which probably varies more in its form, color, and weight, than any other *Anodon*. It is undoubtedly the *A. implicata* of Say, for it accords well with his description, and was received from a region where no other species is found. In their younger stages it is difficult to distinguish them from *A. fluvialtilis* ; but the great thickening near the margin, which the adult undergoes, and its light-yellowish epidermis, render them entirely dissimilar. I have specimens in which portions of the valves are three tenths of an inch thick. At the middle age, some specimens so much resemble very old ones of *Unio radiatus*, that it is impossible to name them without examining the hinge. In the young, the beaks are delicately undulated, the hinge margin is compressed and connate, and the angle at its posterior termination is very decided. Some specimens, of a middle size, lose all their angles, and the upper and lower margins are similarly curved. Some have a dark tar-colored epidermis ; these are generally very broad in proportion to their height.

ANODON UNDULATA.

Shell transversely ovate, rather thick; beaks prominent, epidermis dark-brown, radiated, coarsely wrinkled; hinge margin undulated, and with the vestige of a tooth.

FIGURE 79.

State Coll., No. 170. Soc. Cab., No. 2191.

Anodonta undulata, SAY; *Nicholson's Encyc.*, (Amer. ed.), iv. pl. 3, f. 6. LEA; *Synops. Naiad.*, 50.

Anodon rugosus, SWAINSON; *Zool. Illustr.*, pl. 96.

Shell oblong-ovate, thick and strong; beaks sub-central, elevated, the points in contact, and when not eroded they exhibit four or five small undulations upon them; before them is a spear-shaped pit or areola, not covered by the epidermis; behind them the margin is slightly compressed, and has two or three coarse, sub-marginal furrows; no distinct angle at the termination of the ligament; posterior end somewhat bluntly rounded; anterior end compressed, sharply rounded; basal margin regularly curved; epidermis dark-brown, radiated in most specimens, smooth, and closely adhering towards the beaks, but lying in numerous, rather loose folds near the margin; interior inclined to salmon-color, and granulated centrally, bluish-white outside of the pallial impression, with a broad margin of olive-color. Hinge margin waved under the beaks, compressed on the right valve so as to form something like an elongated cardinal tooth, which is received into a corresponding recess in the left valve. Length $3\frac{1}{2}$ inches, height 2 inches, breadth $1\frac{1}{2}$ inch.

Found in the Blackstone River and its tributaries, of large size and great perfection.

It is impossible to be certain that this is *A. undulata* of Say, on account of the small size of the specimen he described; but it seems to be the shell which Mr. Lea regards as such. It seems to be a different thing from the shell described by Hildreth under that name. I apprehend that it is the same as *A. edentula*, Say, and *A. areolatus*, Swainson. If there be any difference among them, it is, that our shell is less compressed, less radiated, and less fragile than *A. edentula*. The hinge is the same, and the areola before the beaks is produced by a wave-like digression of the right valve to form a peculiar tooth. The young shells are thin, and much more radiated than the old ones,

and the size of adults is seldom more than two thirds of the dimensions above given. It is one of the connecting links between ALASMODON and ANODON.

FAMILY *MYTILACEA*, LAM.

Hinge with the ligament marginal, partly included, linear, extending along a great part of the posterior border. Shell rarely foliated; adheres by a byssus.

GENUS *MYTILUS*, LIN.

Shell elongated, sub-triangular; beaks terminal, pointed, straight; hinge generally toothless; muscular impression elongated, club-shaped.

MYTILUS EDULIS.

Shell ovate-triangular, beaks terminal and pointed, basal margin straight, ligament margin straight; posteriorly widened and rounded; hinge with a few denticulations; epidermis dark-bluish, shell violet beneath.

FIGURE 82.

State Coll., No. 156. Soc. Cab., No. 1987.

Mytilus edulis, LIN.; *Syst. Nat.*, 1157. Gmelin; *Syst.*, 3353. Turton; LIN.; iv. 291. Chemn.; *Conch.*, viii. 169, t. 84, f. 750. Pennant; *Brit. Zool.*, iv. 236, t. 66, f. 2. Montagu; *Test. Brit.*, 159. *Lin. Trans.*, vi. t. 18, f. 13, 14. Dillwyn; *Catal.*, 309. Turton; *Conch. Dict.*, 109. *Brit. Biv.*, 196. Deshayes; *Encyc. Méth., Vers*, ii. 562, pl. 218, f. 2. Knorr; *Vergn.*, iv. pl. 15, f. 4. Lam.; *An. sans Vert.*, vii. 47. Gualt.; *Test.*, t. 91, f. E. Donovan; *Brit. Shells*, t. 128. Wood; *Index*, pl. 12, f. 21. Fleming; *Brit. Anim.*, 411. *Mytilus vulgaris*, Da Costa; *Brit. Conch.*, 216, t. 15, f. 5. *Musculus subcæruleus*; Lister; *Conch.*, t. 362, f. 200. *Mytilus borealis*, Lam.; *An. sans Vert.*, vii. 46.

Shell triangular-ovate, solid, coarse, shining; beaks pointed, placed at one end, and slightly diverging; basal or anterior margin generally straight, sometimes slightly convex, and sometimes excavated; hinge margin rising in a straight line unites with the upper or posterior margin by a somewhat abrupt curve; this margin takes a direction parallel to the base, for a short distance, and then the two unite by a regular curve; an abrupt ridge passes from the beaks to the lower and hinder angle, above which the shell gradually slopes to a sharp edge, and below which it bends so abruptly as to present a broad, flattened space, in the centre of

which is a slight fissure for the passage of a byssus. The shell itself is of a violet-color; the epidermis is usually of a dark, shining blue-black. Within, the shell is white and silvery in the centre, but all the margin is a dark-violet or blue-black. Under the beaks are about four thin, oblique denticulations, quite distinct when the overlapping epidermis is removed. Length $2\frac{4}{10}$ inches; height $1\frac{3}{10}$ inch, breadth 1 inch.

Variety *pellucidus*. Shell smooth, thin, transparent, radiated with blue and horn-color; beaks with two or three teeth.

Mytilus pellucidus, PENNANT; *Brit. Zool.*, iv. 237, pl. 66, f. 3. MONTAGU; *Test. Brit.*, 160. MATON and RACKETT; *Lin. Trans.*, viii. 107. DILLWYN; *Catal.*, 310. TURTON; *Conch. Dict.*, 110. *Lin. Syst.*, iv. 292. *Brit. Biv.*, 197, pl. 15, f. 1. CHEMN.; *Conch.*, viii. 84, f. 751. DONOVAN; *Brit. Shells*, 81. WOOD; *Index*, pl. 12, f. 22.

This beautiful variety has been regarded by many conchologists, such as those named above, as a distinct species, while others, with more apparent propriety, consider it as a variety, depending chiefly on age, of the true *M. edulis*. None of the specific marks given to it seem to be constant. Radiations appear in the solid old shell, as well as in the thin ones; and, on the other hand, the thin ones are often without radiations. Turton thinks it may always be distinguished "by having only two or three tubercular teeth under the beaks." But this does not accord with my observations.

The shell is subject to many distortions from accident, and from the form of the bodies on which it grows, or of cavities in which it becomes wedged. Hence, probably, arises that curved form which takes the name of *M. incurvatus*.

This *Mussel* is one of the most common and best known of all our shells. It is very extensively distributed throughout all northern seas. It is abundant on the coasts of England, France, Norway, and Russia, where it is extensively used as food, as its name imports, and also for manure. In this country it has, as yet, been put to no economical use, though I am assured by a friend of acknowledged good taste, that when cooked it is more palatable than the common clam. Unlike the *Modiola modiolus*, it appears to inhabit shallow waters, in positions where it is left uncovered at the recess of the tide. It attaches itself by its byssus to rocks and timbers, and may be thus seen under

bridges and other submerged structures, in shallow inlets with a pebbly bottom, and especially on rocks not far from high-water mark, clinging in immense crowds of all sizes, colors, and figures; some beautifully radiated, some dark blue-black, and others light horn-color; some beautifully smooth, regular, and glistening, others distorted, rough, and dingy; the whole surface of the young shell is beset with a bristly beard. While, like the *M. plicátula*, it clusters about the shore, it does not, like that, bury itself in the mud, but is always exposed and attached to some solid body. It is common to find it wedged in among the rocks and crevices of such shores as Nahant and Cape Ann.

GENUS MODIOLA, LAM.

Shell oblique, wedge-shaped; beaks very near the anterior end; hinge as in Mytilus; impression of the mantle irregular.

MODIOLA MODIOLUS.

Shell oblong-ovate, gradually widening from before backwards; hinge margin ascending, straight for about half the length of the shell; beaks tumid, obtusely angular; epidermis dark chestnut-color.

State Coll., No. 162. Soc. Cab., No. 1973.

Mytilus modiolus, LIN.; *Syst. Nat.*, 1158. PENNANT; *Brit. Zool.*, iv. 239, t. 69. MONTAGU; *Test. Brit.*, 163. CHEMN.; *Conch.*, viii. 178, t. 85, f. 759. KNORR; *Vergn.*, iv. t. 15, f. 3. LISTER; *Conch.*, t. 1057, f. 5. DILLWYN; *Catal.*, i. 314. WOOD; *Index*, pl. 12, f. 31. *Lin. Trans.*, viii. 107. DONOVAN; *Brit. Shells*, pl. 23.

Modiola modiolus, TURTON; *Brit. Biv.*, 199, pl. 15, f. 3 (young). *Conch. Dict.*, 111.

Mytilus Papuanus, DESHAYES; *Encyc. Méth., Vers*, ii. 564, pl. 219, f. 1.

Modiola Papuana, LAM.; *An. sans Vert.*, vii. 17. BLAINV.; *Malacol.*, pl. 64, f. 3.

Modiola vulgaris, FLEMING; *Brit. Anim.*, 412.

Mytilus barbatus, LIN.; *Syst. Nat.*, 1156. DONOVAN; *Brit. Shells*, pl. 70.

MONTAGU; *Test. Brit.*, 161. PENNANT; *Brit. Zool.*, iv. 238, pl. 67, f. 2.

Shell large, thick, coarse and solid, ovate-oblong; beaks placed at one side, points inclined outwards, and projecting nearly as far as the anterior extremity, which is very short and narrow; the upper edge is ascending, and straight about one half the length of the shell, when it curves gently downwards to the posterior extremity, which is obtusely rounded; the basal margin is somewhat arched upwards, and at the arched portion the shell is gaping for

the passage of the byssus. From the beaks a very convex, broad ridge runs diagonally across the shell ; above this the shell is compressed, and along its lower and anterior side is a broad depression or constriction, terminating at the lower margin where the shell gapes. Surface roughly marked by the lines of growth, and by a few faint, radiating lines ; epidermis thick and leathery, folding over the margin, of a chestnut or pitchy-brown color, smooth, glossy, and with radiating wrinkles before the ridge where it is generally darker colored, while the ridge is lighter colored. The groove for the ligament is long and deep, resting upon a prominent rib. Interior pearly, of a somewhat livid color ; muscular impressions large and deep ; byssus colored like the epidermis. Length $4\frac{1}{2}$ inches, height $2\frac{1}{4}$ inches, breadth 2 inches.

Inhabits deep water, and is thrown up on every shore exposed to the open sea. It probably dwells upon a rocky or pebbly bottom, as its byssus would find no attachment in mere sandy or muddy regions.

This shell is well known on account of its size and universal distribution along our coast. It often attains to a great size, and is not unfrequently seen six inches in length. Specimens are rarely found which are not in some way distorted. Hence the shells assume a great variety of form. The distortion seems to depend upon two causes ; first, the body to which they are attached by the byssus, which may modify the form of the basal margin, rendering it more or less arched ; and second, the frequent injuries sustained by being dashed about by storms among the rocks which they inhabit. They are the more liable to accidents of this kind, in consequence of their affording attachment to the *Laminària*, and other large sea-weeds, which, being acted upon by the violence of the waves, tear the shells from their resting places, and they are thus dragged great distances. In fact, it is not usual to find a specimen on the beach without some parasite attached. A common deformity occurs at the posterior or broader end, by what would seem to be an arrest of developement. The growth does not go on in this direction, the successive layers extending very little beyond each other, and thus we have a broad, blunt termination.

The *M. umbilicatus* of Pennant can be nothing more than a distorted variety from some injury to the lower margin, nearly under the beaks, or from adhesion to some small convex body, causing great contraction at this part, as may be frequently noticed.

In young and entire shells the hinge margin rises in a straight line to a considerable height, and then slopes downwards, suddenly forming a conspicuous angle; but in older shells the angle disappears in a great measure, and the whole superior outline is regularly curved. When young, the epidermis seems to be prolonged at the lines of growth, into fringe-like shreds. Specimens thus clothed, are generally allowed to be the *Mytilus barbatus* of Pennant. *M. Gibbsii* is said to differ in having these shreds serrated or gashed along one edge. I cannot but strongly suspect, though I cannot demonstrate it, that this apparent extension of the epidermis is a parasitic vegetable; and that *M. Gibbsii* is not, in reality, a different shell, but has a different vegetable growing upon it.

Old shells are also encrusted with various species of *Madrepore*, *Corallina*, and *Flustra*.

In young shells there is usually a broad, waxen-yellow radiation from the beak along the front side of the elevated ridge; and this region, in fact, always has a lighter color than other parts of the shell.

Deshayes thinks it is now impossible to say what was the true *Mytilus modiolus* of Linnæus, and therefore approves the course of Lamarck in dropping the name altogether, and assuming a new one. I cannot see any reason to doubt that the shell under consideration was the *M. modiolus* of Linnæus, while there is ground to question whether the shell which Lamarck had in view, when he applied the name *Papuana*, the name now universally applied to our shell, was in reality identical with our species. I have seen several specimens of the East Indian shell, and, though very closely allied, it seems to differ in many particulars when the two shells are placed side by side. Dr. Lovèn has lately assured me that this is the true *M. modiolus*, and repeats my conjectures as to the distinctness of the real *M. Papuana*.

The animal is of a dark orange, or red-ochreous color, perhaps a little tinted with brown. It is not used for food with us, though there seems to be no reason why it should not be as palatable as most of the shell-fish that are eaten.

MODIOLA PLICATULA.

Shell oblong, falciform, widening posteriorly; surface traversed by numerous radiating ribs, occasionally branching; epidermis glossy, green and yellow.

FIGURE 81.

State Coll., No. 161. Soc. Cab., No. 1977.

Mytilus demissus, DILLWYN; *Catal.*, i. 314. WOOD; *Index*, pl. 12, f. 30.*Modiola plicátula*, LAM.; *An. sans Vert.*, vii. 22.*Mytilus plicátulus*, DESHAYES; *Encyc. Méth., Vers*, ii. 368, pl. 220, f. 5. SOWERBY; *Genera*, f. 7.*Modiola semi-costata*, CONRAD; *Journ. Acad. Nat. Sc.*, vii. 244, pl. 20, f. 7. LISTER; *Conch.*, pl. 353, f. 196.

Shell transversely oblong-ovate, much elongated, narrow before and widening backwards, somewhat falciform or arched; beaks moderately prominent, not curving outwards, and nearly in contact, very near the anterior extremity, which is small and rounded, and the shell is much compressed at this part; the lower margin is generally curved or arched upwards, and gaping before the middle for the passage of the byssus; hinge margin straight, and ascending for about two thirds the length of the shell so as to give it additional height, then, by a regular downward curve, it produces an obliquely rounded termination to the shell; a broad, elevated ridge crosses obliquely from the beaks to this termination, above which the shell is compressed; surface ornamented with numerous radiating, somewhat undulating, occasionally branching ribs, most conspicuous above and behind, very fine on the anterior third. Shell silvery-white, rather brittle, covered with a thin, varnished epidermis, variegated with yellow, green, and scorched colors, usually arranged in zones; stages of growth conspicuous; within silvery-white, the muscular impressions and margins of a livid color; margin of the posterior half and anterior side crenulated by the ribs. Length 3 inches, height $1\frac{3}{8}$ inch, breadth $\frac{9}{10}$ inch.

Inhabits the tide waters of small streams where there is some admixture of fresh water; and also the drains in salt marshes. In these localities they are found crowded in among the stones of the bed of the stream, or imbedded in the peat-like soil of the banks, near high-water mark. In this position, with the upper posterior portion slightly exposed, they crowd in such numbers as to form a complete stratum of six to twelve inches in thickness. A great portion of the time they are, of course, out of water; but they retain enough to serve the demands of their economy during the recess of the tide, and eject it when any disturbance prompts them to close their shell.

This species seems to be subject to little variety. Sometimes, however, we find the lower margin nearly straight. In this case the upper margin is nearly parallel to the lower, so that the shell increases but little in height; and in such shells the beaks appear much more prominent than in ordinary specimens.

The principal variations seem to consist in the coloring, which is made up of various shades from bright-yellow, passing through horn-color and chestnut to dark bronze-green, and arranged in various modes and in various proportions. What Mr. Conrad regards as a distinct species under the name *semi-costata*, certainly can be nothing more than a variety of this shell.

MODIOLA PECTINULA.

Shell obovate, ventricose, with about forty equal, radiating ribs; beaks prominent, projecting as far as the anterior margin; epidermis brownish yellow.

FIGURE 85.

State Coll., No. 159. Soc. Cab., No. 2342.

Shell small, strong, of a strictly ovate form, excepting that a very short portion of the hinge margin is straight; broadly rounded at both extremities, but most so behind; valves convex, without any marked ridge passing from the beaks, and very little compression at the hinge margin; beaks rather prominent, blunt, and in contact with each other, reaching forward as far as the anterior extremity; surface covered with about forty equal, rounded, radiating ribs; epidermis a dark gamboge-yellow; lines of growth minute; within pearly, of a livid or leaden color; entire margin crenulated by the ribs; cavity of the beaks considerable. Length $\frac{7}{10}$ inch, height $\frac{1}{2}$ inch, breadth $\frac{7}{10}$ inch.

Inhabits St. George's Bank.

This very strongly marked species seems to have been hitherto undescribed. It is closely allied to *M. discrepans*, but is smaller, stronger, lighter-colored, and entirely covered with ribs. Of five or six specimens which I have seen, all apparently mature shells, the largest was of the size given above. *M. arctica*, Leach, is a smaller and more rounded shell, and the ribs are much more numerous.

MODIOLA NEXA.

Shell ovate, ferruginous, beaks prominent, and placed considerably behind the anterior extremity; minutely reticulated with fine, corrugated, concentric, and radiating lines.

FIGURE 86.

State Coll., No. 154.

Shell small, thin, long-ovate, largest behind, slightly produced at the posterior extremity; basal edge less curved than the superior edge, which is moderately compressed; beaks prominent, pointed, directed forwards, scarcely touching each other, placed unusually far from the anterior extremity; a rather sharp ridge passes from the beaks diagonally across the shell, but loses itself about half way across. Surface very beautifully sculptured with a net-work of very minute, crowded lines of growth, and very numerous, fine, indented radiating lines or ridges, which are obsolete along two thirds of the base, and most conspicuous behind, where a very fine line divides into two each ridge, going to the extreme posterior portion; while above these, on the compressed portion, a beautiful lace-work of hexagonal indentations is formed. The portion in front of the beaks is conspicuously radiated. Epidermis a rusty-brown, with shades of olive, glossy; interior livid, with a pearly or silvery lustre, and with minute, radiating lines; cavity of the beaks large; margin simple. Length $\frac{7}{16}$ inch, height $\frac{9}{32}$ inch, breadth $\frac{5}{16}$ inch.

This new and beautiful shell was taken by dredging in the harbour of Provincetown, by Colonel Totten, where he obtained several living specimens.

It is allied to *M. discors* and *M. discrepans* by its outline, and by the triangular portion across the disk nearly destitute of radiating lines. But it is more compressed than either of those shells, less inequilateral, and its sculpture far more beautiful. The radiating lines seem all to have indentations or punctures like the wing-covers of many large beetles (*Cárábi*). The honey-comb arrangement near the hinge margin is very beautiful. Dr. Lovén has sent me the shell, from Sweden, as the true *M. discrepans* of Montagu and Turton; but in this he is at variance with the opinions and figures of all other authors.

MODIOLA DISCREPANS.

Shell sub-oval, broadest behind; beaks nearly terminal; hinder extremity somewhat lobed; surface divided into three compartments, of which the anterior is marked by about eight, and the posterior by numerous radiating lines, epidermis olivaceous.

FIGURE 83.

State Coll., No. 157. Soc. Cab., No. 2345.

Mytilus discrepans, MONTAGU; *Test. Brit.*, p. 169, and *Suppl.*, 65. pl. 26, f. 4.

MATON and RACKETT; *Lin. Trans.*, viii. pl. 3, f. 9. PENNANT; *Brit. Zool.*, iv.

241. DILLWYN; *Catal.*, 319. TURTON; *Brit. Biv.*, 202. *Conch. Dict.*, 112.

FLEMING; *Brit. Anim.*, 413. WOOD; *Index*, pl. 12, f. 38.

Mytilus discors, O. FABR.; *Fauna Grænl.*, 191. CHEMN.; *Conch.*, viii. 191, t. 86, f. 767. (var.)

Modiola lævigata, (var.) GRAY; *Appendix to Parry's 2d Voyage*.

Shell somewhat oval, rather oblique, highest about the middle, rounded before, base slightly curved, hinge margin straight and then curving obliquely downward; beaks near the anterior end, prominent, and rounded; valves moderately convex; surface coarsely marked by the lines of growth, and divided into three fan-shaped compartments, of which the foremost one is marked by about eight small, rounded, rib-like ridges, the spaces between them being flat, the hinder one by numerous similar ridges, and the central one is plain, or with very minute radiating lines; the limits between the posterior and middle compartments are designated by an elevated ridge passing from the beaks, and here the basal margin of the posterior compartments projects abruptly beyond that of the middle one, so that the rounded point of the shell forms a projecting lobe. Epidermis olive-green with dark chestnut-colored shades, folding over the edge. Interior of a brilliant silvery lustre; edge of the two extreme compartments crenulated, and very strongly near the ligament; a few folds on the edge, not corresponding to the external ridges, are found just in front of the ligament. Length 1 inch, height $\frac{1}{2}\frac{3}{8}$ inch, breadth $\frac{1}{10}$ inch.

Found on Chelsea Beach, and in fishes' maws. Larger specimens are brought from the Newfoundland Banks. I have two specimens which measure $1\frac{1}{2}$ inch in length, $\frac{3}{4}$ inch in breadth.

130 INVERTEBRATA OF MASSACHUSETTS.

This species, with *M. discors*, is common to the northern coasts of Europe and America, and they are distinguished from all others by the three compartments into which their surface is divided. The distinctive marks between them are particularly pointed out under *M. discors*. The epidermis becomes nearly black by age.

MODIOLA DISCORS.

Shell oval, tumid, upper edge somewhat compressed and arching, posterior tip somewhat produced and pointed; beaks large, nearly terminal; surface with about sixteen ribs at the anterior third and very numerous ones at the posterior third.

FIGURE 84.

State Coll., No. 158. Soc. Cab., No. 2344.

Mytilus discors, LIN; *Syst. Nat.*, 1159. CHEMN.; *Conch.*, viii. 191, t. 86, f. 764. MONTAGU; *Test. Brit.*, 167. PENNANT; *Brit. Zool.*, iv. 240. MATON and RACKETT; *Lin. Trans.*, viii. 111. t. 3, f. 5. DONOVAN; *Brit. Shells*, pl. 25, f. 1. DILLWYN; *Catal.*, 319. TURTON; *Conch. Dict.*, 112. WOOD; *Index*, pl. 12, f. 39.

Modiola discrepans, LAM.; *An. sans Vert.*, vii. 23. DESHAYES; *Encyc. Méth.*, *Vers*, ii. 567.

Modiola discors, FLEMING; *Brit. Anim.*, 413.

Shell irregularly oval, tumid, heart-shaped when viewed in front, bluntly rounded before; hinge margin somewhat ascending and a little compressed; at the termination of the ligament the margin gradually curves downwards, so that the shell is terminated behind by a lobular, somewhat pointed tip on a level with the base; basal margin an undulating curve, nearly parallel with the upper margin; beaks large and prominent, not in contact, overhanging the anterior extremity; surface as in *M. discrepans*; but there are sixteen or more ribs in the anterior compartment, those in the posterior compartment are more crowded, more distinct, the intervening spaces rounded; and when viewed under the microscope, the whole surface is found to be covered with minute wrinkles of the epidermis crossing the ribs and the spaces between them, and also the middle compartment; epidermis greenish-yellow with clouds of olive. Within silvery, margin crenulated by the ribs, and with three or four teeth before the beaks.

Byssus very long. Length $\frac{1}{2}$ inch, height $\frac{3}{10}$ inch, breadth $\frac{2}{10}$ inch.

Found adhering to the stalks of sea-weed (*Laminario*), cast upon the sea beach.

The most obvious distinctive marks between this shell and *M. discrepans* are, the more numerous anterior ribs, and the concentrically corrugated epidermis. The shell is proportionally broader, the tip is more pointed, more depressed, and forms a projecting lobe much like that shell; and the ribs are more decided. The shell is much smaller and very much more rare. This is not *M. discors* of Lamarck, an East Indian species. The *M. discors* of Turton (*Brit. Biv.*, pl. 15, f. 4.) seems to be a still different species, and I have received it from Dr. Lovén under the name of *M. marmorata*, Forbes.

MODIOLA GLÁNDULA.

Shell obliquely rounded-oval, regularly convex; beaks small, separate; surface with minute lines of growth, crossed by minute and crowded radiating lines; epidermis brownish-yellow; margin crenulated.

FIGURE 87.

State Coll., No. 160. Soc. Cab., No. 2346.

Modiola glándula, TOTTEN; *Silliman's Journ.*, xxvi. 367, f. 3, c, f. g.

Shell small, thin, rounded-oval, rather inflated, convexity regular; beaks small, rather prominent, curving, not in contact, placed at about half the height of the shell; anterior portion slightly depending, base nearly straight, and the rest of the margin regularly rounded; surface with minute lines of growth, crossed by very small, rounded, radiating ribs, about equal in size on all parts of the shell, the number increasing as the spaces between them widen; epidermis thin, brownish-yellow; within white, somewhat pearly; edges sharp and minutely crenulated, except the short portion occupied by the ligament. Length $\frac{5}{10}$ inch, height $\frac{9}{20}$ inch, breadth $\frac{3}{10}$ inch.

This very pretty and singularly shaped *Modiola* was first found by Colonel Totten, in Provincetown harbour. It is one of the

most common shells found in the stomachs of fishes caught in Massachusetts Bay. The shell is not often so large as above mentioned.

Its rounded-oval and regularly convex form, with its radiating lines, forbid that it should be confounded with any other shell except an English species, the *Crenélla elliptica* of Brown, (*Conch. Illust. of Great Brit.*, &c. pl. 31, f. 12 to 14,) the *Mytilus decussatus* of Montagu. For my own part, in comparing a small specimen of this shell with one of ours of a similar size, I must confess I can discover no difference, though Mr. Sowerby supposes they are distinct. In giving the dimensions I have supposed the shell to be placed in the ordinary position of other species, with the beaks placed laterally.

FAMILY PECTÉNIDES, LAM.

Ligament interior or half interior. Shell in general regular, compact, not foliated.

GENUS PECTEN, TURTON.

Shell rounded, inequivalve, eared; superior margin straight; beaks contiguous. Hinge toothless, with a triangular internal pit for the cartilage.

PECTEN MAGELLA'NICUS.

Shell orbicular, inequivalve, upper valve more convex than the lower; exterior surface everywhere marked with closely arranged radiating lines; interior surface without ribs; ears small and equal.

State Coll., No. 152. Soc. Cab., No. 2028.

Ostrea Magellánica, GMELIN; 3317. No. 9. CHEMN.; *Conch.*, vii. t. 62, f. 597. DILLWYN; *Catal.*, 250.

Pecten Magellanicus, LAM.; *An. sans Vert.*, vii. 134. DESHAYES; *Encyc. Méth.*, Vers, iii. 718, pl. 208, f. 5. CONRAD; *Amer. Mar. Conch.*, pl. 1, f. 1.

Shell orbicular, rather higher than long, thin and translucent when young, thick, strong, and opaque when mature, equilateral, inequivalve, the lower valve being nearly flat, and not attaining the edge of the upper valve by an eighth of an inch or more;

upper valve moderately convex ; valves widely gaping near the hinge, surface everywhere sculptured with radiating, punctured lines, or grooves, about half as wide as the spaces between them, somewhat zigzag in their course ; these lines are crossed by closely arranged lines of growth, which, on the convex valve, are scalloped or vaulted over the radiating lines ; flattened valve white, convex valve dingy reddish-brown, or flesh-colored. Hinge margin narrow, straight, ears equal, the notch in the lower valve rounded, and shallow. Interior white, smooth, glossy, with minute radiating lines not corresponding to the exterior grooves. Length 5 inches, height $5\frac{1}{2}$ inches, breadth $1\frac{1}{2}$ inch.

This shell is not common on the Massachusetts shore ; but single valves, of a very large size and very solid, are occasionally thrown up, and smaller ones are found in the stomachs of fishes. Its proper habitat is farther north, and along the eastern part of the coast of Maine it is found abundantly in its greatest perfection. It does occasionally pass to the south of Cape Cod, (the usual terminus for northern species) for I have a fine specimen which was drawn up alive, by a hook, off Block Island.

The general aspect of the lower valve is smooth ; nor do we see any thing like ribs on the upper surface.

PECTEN ISLANDICUS.

Shell sub-orbicular, reddish or orange-brown ; ears unequal ; surface covered with small, crowded, irregularly disposed, scaly, radiating ribs, which re-appear within.

FIGURE 89.

State Coll., No. 151. Soc. Cab., No. 2039.

- Ostrea Islandica*, MÜLLER ; *Zool. Dan., Prod.*, No. 2990. LIN. ; *Iter Westrogoth.*, 200, t. 5, f. 7. GMELIN ; 3326. No. 55. SHAW ; *Zool. Misc.*, xxiii. t. 978, 987. FABR. ; *Fauna Grænl.*, 415. KNORR ; *Délices, &c.*, t. i. pl. B. f. 3, 4. LISTER ; *Conch.*, t. 1057, f. 4. GUALT. ; *Test.*, t. 73, f. R. SEBA ; *Mus.*, ii. t. 87, f. 7.
- Pecten Islandicus*, CHEMN. ; *Conch.*, vii. t. 65, f. 615, 616. TURTON ; *Conch. Dict.*, 258. *Brit. Biv.*, 216. DESHAYES ; *Encyc. Méth., Vers*, iii. 724. FLEMING ; *Brit. Anim.*, 385, pl. 212, f. 1. LAM. ; *An. sans Vert.*, vii. 145. SAY ; *Amer. Conch.*, pl. 56.
- Ostrea cinnabarina*, BORN ; *Mus.*, 103. DILLWYN ; *Catal.*, 266, No. 20. SCHROET. ; *Einkl.*, iii. 326, No. 9.
- Pecten Pealii*, CONRAD ; *Amer. Mar. Conch.*, 12, pl. 2, f. 2.

Shell sub-orbicular, or broadly ob-ovate, equal, the upper valve slightly more convex than the lower, covered with an indefinite number, fifty to a hundred, of narrow, unequal, crowded, irregularly disposed, radiating ridges, bearing a multitude of erect, vaulted scales; their ridges are grouped, so as to form a number of unequal ribs, which are better defined on the interior of the shell. Ears unequal; posterior one shortest, and its angle slightly obtuse, alike in both valves, and covered with scaly, radiating ridges; the anterior ear of the right valve is more deeply notched than that of the left, and has five radiating ribs, occupying about two thirds of its surface. Valves closed except at the notch; color passing from light-orange to dark reddish-brown; the upper valves usually zoned, or blotched, with deeper colors, and the lower valve much the lightest. The margin jagged by the elevated lines, all but the notch of the right valve, which is plain, excepting that there are five or six minute teeth in the angle. Interior white and glossy, the left valve usually having a large roseate spot near the beaks. Length 3 inches, height $3\frac{1}{2}$ inches, breadth 1 inch.

Occasionally found, of a small size, in the stomachs of fishes. Its proper residence, however, seems to be the Newfoundland Banks, where it is a favorite food of fishes.

In a young state the vaulted scales do not appear; but the interstices between the ribs are filled with a beautiful lozenge-shaped or tile-work sculpture, which may usually be seen near the beaks in adult specimens. The coloring varies greatly, and has given rise to two or three synonyms.

PECTEN CONCE'NTRICUS.

Shell orbicular, ears sub-equal, valves convex, nearly closed, with about twenty rounded ribs.

FIGURE 88.

State Coll., No. 150. Soc. Cab., No. 2036.

Pecten concéntricus, SAY; *Journ. Acad. Nat. Sc.*, ii. 259. CONRAD; *Amer. Mus. Conch.*, pl. 1, f. 2.

Shell nearly round, rather strong; valves convex, the lower very little less so than the upper one, with about twenty elevated,

rounded ribs, the depressed spaces being similarly rounded, and about equal to the ribs in width ; loosely wrinkled concentrically by fine lines of growth. Usual color a dusky or blackish horn-color, with alternately darker and lighter zones. Ears two thirds of the length of the shell, nearly equal, and crossed with small, radiating ridges ; notch in the convex valve deep, and forming an acute angle, or narrow slit. Interior shining, grooved to correspond with the exterior ribs, the intervening spaces flat ; color white, generally tinged with purple-brown about the hinge, and around the margin, sometimes altogether of that color. Ligamentary pit small and shallow. Length $2\frac{2}{3}$ inches, height $2\frac{1}{2}$ inches, breadth 1 inch.

The *scallop-shell* is found abundantly about the extremity of Cape Cod, though it does not extend far along its inner shore. It is common along all its outer shore, at Nantucket, Martha's Vineyard, &c., and, according to Mr. Say, is one of the most common shells along the shores of New Jersey.

It is subject to great variation in coloring. The flatter valve is often white, and always of a lighter color than the other valve. Sometimes both valves are white, orange, ochreous, reddish, or purplish, and sometimes they are zoned or mottled with two or more of these colors. In consequence of which they are very pleasing to the eye, and are extensively employed in the manufacture of card-racks, pincushions, &c.

FAMILY OSTRACEA, LAM.

Shell irregular, foliated, sometimes paper-like ; ligament internal or partly internal.

GENUS OSTREA, LIN.

Shell very irregular, inequivalve, the larger one adhering, the smaller moving forwards as the shell advances in age, and leaving a lengthening groove for the ligament exposed along the beak of the adhering valve.

The *Oyster* varies in surface and shape so much, according to the position in which it lies during growth, that it is not only impossible to give any description which shall delineate the various

transformations it may undergo, but it is also very difficult to designate the limits of species. Lamarck indicates three species belonging to this coast; but it is very doubtful whether, in reality, there are even two.

It is also a question on which there are various opinions, whether the oyster was indigenous in Massachusetts Bay; or whether all which grow in the various oyster-beds owe their parentage to inhabitants of the Delaware, Chesapeake, and Oyster Bays, &c. That they now grow spontaneously, and, for aught we can learn, always have grown so, on the south shore, there is no reason to doubt. And that they are occasionally found of patriarchal appearance, in all parts of our Bay, is certainly true. But the question is, whether these places are their natural habitat, or whether they have been accidentally dropped where they were found. Many incline to this latter opinion, especially the younger oyster-men, and some scientific gentlemen. But the old settlers of Cape Cod are of a different opinion. They say that Wellfleet, where the southern oysters are *planted* for Boston use, was originally called Billingsgate, on account of the abundance of fish, and especially of oysters, found there; that they continued to be abundant until about the year 1780, when from some cause they all died; and, to this day, immense beds are shown there, of shells of native oysters which perished at that time. They say, that, before that time, no such thing was thought of, as bringing oysters from the south.

OSTREA VIRGINIANA.

Shell elongated, narrow; beaks pointed, not much curved; ligamentary eminence of the upper valve extending back to the apex.

State Coll., No. 148. Soc. Cab., No. 2350.

Ostrea Virginiæna, LISTER; *Conch.*, t. 200, f. 34. FAVANNE; *Conch.*, pl. 41, f. C. 2. KLEIN; *Tentam.*, 122. SOWERBY; *Genera of Shells*, f. 2.

Ostrea Virgínica, GMELIN; *Syst.*, 3336. No. 113. DILLWYN; *Catal.*, i. 277. LAM.; *An. sans Vert.*, vii. 225. WOOD; *Index*, pl. 11, f. 68. DESHAYES; *Encyc. Méth., Vers.*, ii. pl. 179, 1 and 2.

Grand Huitre de la Virginie, DAVILA; *Catal.*, 290, No. 613.

Virginia Rock-oyster, PETIVER; *Gazophyl.*, t. 105, f. 3.

O'strea rostrata máxima, CHEMN.; *Conch.*, viii. 38, t. 73, f. 677.

O'strea elongata, SOLANDER; *Mss.*

O'strea Canadensis, LAM.; *An. sans Vert.*, vii. 226.

Shell narrow, elongated, gradually widening, moderately curved, for the most part with a long and pointed beak at the apex, and rounded at the other extremity. Upper valve the smallest, flattest and smoothest, surface, when not worn, presenting everywhere leaf-like scales, of a somewhat leaden-color. The hinge presents the usual channel in the beak of the lower valve, longer or shorter according to the age of the shell, and marked with lines exhibiting the successive removes of the cartilage; and in the upper valve we have the corresponding elevation, which is also continued back to the point of the shell. The muscular impression is nearly central, of a dark-chestnut, or sometimes dark violet-color. It often measures 12 or 15 inches in length, but seldom more than 3 inches in breadth.

This is the common oyster of the Chesapeake Bay. It is occasionally found in the vicinity of Boston, and also about Prince Edwards' Island, at the mouth of the St. Lawrence. Its distinctive characters are its narrow, elongated form, and the lengthened, pyramidal hinge ridge along the beak of the upper valve. The *O. Canadensis* is either a variety of this, or the next species, most likely of this.

O'STREA BOREALIS.

Shell somewhat rounded, curved, scaly, greenish; beaks rather short, considerably curved; hinge having the furrow in the lower valve from the apex, but having in the opposite valve merely a transverse ridge, not extended backwards.

State Coll., No. 149. Soc. Cab., No. 2055.

O'strea borealis, LAM.; *An. sans Vert.*, vii. 220.

O'strea Canadensis, BRUG.; *Encyc. Méth.*, pl. 180, f. 1 to 3.

O'strea edulis, LIN; &c.

Shell somewhat obliquely rounded-ovate, usually curved, upper valve smallest, flattest; the beaks are never greatly prolonged, more curved than in *O. Virginica*. The surface is very irregular, displaying loosely arranged flakes of a greenish-color;

the margins are generally more or less plaited or scolloped, entirely bony in the lower valve, but membranous and somewhat flexible in the upper one. The hinge differs from the preceding in having the beaks less prolonged, and the upper valve, instead of having a lengthened, pyramidal ridge extending backwards to the apex, has only a transverse ridge, abrupt behind, and sloping into the shell, like a mere partition, behind which the cartilage is attached. The muscular impression is also dark-violet. Interior, either chalky or greenish-white.

This species also grows to a great size. A specimen before me measures a foot in length, and 6 inches in breadth. A common size is five and six inches in length.

This is the common New York oyster, and, although they are said to have been once abundant in various parts of Massachusetts Bay, especially within Cape Cod, yet the Boston market is now chiefly dependent for its supply on the oyster-beds in the vicinity of New York and in the Chesapeake. In those parts of Buzzard's Bay which border upon Sandwich, the native oyster is still found in great abundance.

The oystermen maintain that our shell is identical with the English *O. edulis*; and there are certainly forms in which the American and European specimens could not be distinguished.

GENUS ANOMIA, LAM.

Shell irregular, inequivalve, one valve convex, the other flattened or concave, perforated near the beak for the passage of a muscle, by which it adheres.

ANOMIA EPHIPIUM.

Shell rounded, margin irregular; surface scaly, variously wrinkled and undulated; beaks pointed, not quite reaching the margin; aperture ovate.

State Coll., No. 146. Soc. Cab., No. 2060.

Ostreum parvum, LISTER; *Conch.*, t. 204.

Anomia ephippium, LIN.; *Syst. Nat.*, 1150. GMELIN; *Syst.*, 3340, No. 3. GUALT.; *Test.*, t. 97, f. B. D'ARGENV.; *Conch.*, t. 19, f. C. PENNANT; *Brit. Zool.*, iv. t. 62, f. 70. CHEMN.; *Conch.*, viii. t. 76, f. 692, 693. MONTAGU; *Test. Brit.*, 155. WOOD; *Lin. Trans.*, vi. pl. 18, f. 11, 12. MATON and RACKETT; *Lin.*

Trans., viii. 102. DONOVAN; *Brit. Shells*, t. 1, pl. 26. BORN; *Mus.*, p. 117. SCHROET.; *Einkl. in Conch.*, iii. 383. POLI; *Test.*, ii. 186, pl. 30, f. 9, 11. DA COSTA; *Brit. Conch.*, 165, pl. 11, f. 3. FAVANNE; *Conch.*, pl. 41, f. B. DILLWYN; *Catal.*, i. 286, No. 3. BLAINV.; *Malacol.*, pl. 59, f. 3. SOWERBY; *Genera*, f. 1, 2, 3. TURTON; *Brit. Biv.*, 227. *Conch. Dict.*, 2. LAM.; *Annals Vert.*, vii. 273. FLEMING; *Brit. Anim.*, 395.

Shell generally rounded, but often produced at one side or at base so as to assume an oval form; its margins more or less jagged, and its surface scaly from the loose edges of the lines of growth, and variously distorted, undulated, and plaited, according to the objects to which it adheres. Lower valve flat, its aperture ovate, reaching the margin by a fissure. Upper valve slightly convex, little elevated about the beak, which is small, acute, not quite reaching the margin. Substance of the shell pearly, or like talc, of a greenish tinge, reflecting golden and silvery hues; within smooth, the muscular impressions opaque white. Usually about an inch in diameter, but growing to three times that size.

It is found in abundance in oyster beds, adhering to oysters. At New Bedford it has been found anchored by its muscle to pebbles.

This shell varies so much in its form, that it is very difficult to characterize it. The most constant trait is the rugged, scaly exterior. It not unfrequently assumes a ribbed appearance, in consequence of having adhered to valves of *Pecten concentricus*.

ANOMIA ACULEATA.

Shell rounded, inclined to be straight at the hinge margin; color dingy-white; beaks obtuse, terminal; upper valve covered with fine, prickly, radiating lines; lower valve smooth; aperture circular.

FIGURE 90.

State Coll., No. 147. Soc. Cab., No. 2347.

Anomia aculeata, GMELIN; *Syst.*, 3346. TURTON; *Lin. Syst.*, iv. 285. *Brit. Biv.*, 233. *Conch. Dict.*, 4. CHEMN.; *Conch.*, viii. 92, t. 77, f. 702. MONTAGU; *Test. Brit.*, 157, t. 4, f. 5. PENNANT; *Brit. Zool.*, iv. 233. DILLWYN; *Catal.*, 288. MATON and RACKETT; *Lin. Trans.*, viii. 103. WOOD; *Index*, pl. 11, f. 3.

Shell small, rounded, the hinge margin more or less truncated or straight, color yellowish-white; upper valve convex, the beak

obtuse and marginal, the surface covered with minute, concave, or prickly scales, arranged in radiating, undulated lines; lower valve very thin, smooth, or with a few prickles near the margin; aperture nearly circular; within shining; the convex valve exhibiting the exterior ribs near the margin. Diameter about half an inch.

Found amid the roots of fuci which are thrown up attached to stones, shells, &c.

This shell is easily distinguished from its co-species by the scaly or prickly radiating lines upon its upper valve. It seems never to attain a large size.

Besides the two species before mentioned, there are probably two others found in this State. But all species are so distorted as to render it difficult to separate them definitely.

1. *ANOMIA ELÉCTRICA*, Lin.— distinguished by its sulphur or golden hue, defined edge, and very convex upper valve. It is generally much distorted, transparent, and not so fragile as most species, not scaly.

Found among oysters.

2. *ANOMIA SQUÁMULA*, Lin.— a small, smooth, rounded, or oblong-oval shell, very thin and regular, exhibiting regular concentric lines of growth; color whitish; edges well defined; aperture rounded.

Found attached within old bivalve shells.

These two species, however, are not positively made out.

FAMILY *BRACHIÓPODA*, LAM.

Shell adhering to marine bodies either directly or by means of a tendinous cord; animal having a pair of fringed arms, spirally coiled when at rest.

Instead of being regarded as a family of the *CONCHÍFERA*, according to the arrangement of Lamarck, the *BRACHIÓPODA* are fully entitled to be ranked as a class. The animals are as distinct and peculiar in their organization, as the *CIRRIPEDES* are. Instead of the back of the animal being placed against the hinge, as in other bivalves, and the sides against each of the valves, in these we have the back against one valve, and the belly against the other. The pair of long arms, with curled fringe at their edges, is found in no other mollusca.

GENUS TEREBRÁTULA, BRUG.

Shell inequivalve, one valve prolonged into a sort of beak, and perforated at its tip for the passage of a tendinous cord by which it affixes itself. On the interior of the smaller valve are two bony processes.

TEREBRÁTULA CAPUT-SERPÉNTIS.

Shell obovate, whitish, upper valve truncated horizontally at the apex; foramen large, one side completed by the apex of the lower valve; surface with minute, radiating striæ.

State Coll., No. 145. Soc. Cab., No. 2348.

Anòmia caput-serpéntis, LIN.; *Syst. Nat.*, 153. BORN; *Mus.*, pl. 6, f. 14. GMELIN; *Syst.*, 3344, No. 21. CHEMN; *Conch.*, t. 78, f. 712. WOOD; *Index*, pl. 11, f. 22.

Terebrátula, BRUG.; *Encyc. Méth.*, pl. 246, f. 7, a, b, c, d, e, f.

Terebrátula caput-serpéntis, LAM. *An. sans Vert.*, vii. 332.

Anòmia pubéscens, DILLWYN; *Catal.*, i. 293.

Terebrátula pubéscens, DESHAYES; *Encyc. Méth.*, *Vers.*, iii. 1024. BLAINV.; *Malacol.*, pl. 52, f. 6. SOWERBY; *Genera*, f. 2.

Terebrátula septentrionalis, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 65, pl. 3, f. 18.

Shell rather thin, semi-transparent, yellowish or reddish-white, broadly obovate; upper valve slightly convex, narrow at the summit, and abruptly widening below; beak slightly projecting, truncated horizontally so as to form a large, semi-elliptical orifice, completed below by the apex of the lower valve, which valve is rounded, flattish, slightly protuberant down the middle; both valves covered by minute, but distinct and well-rounded radiating ribs, which increase in number with the width of the shell; these are crossed by a few irregular lines of growth; the whole covered by a thin, silvery, fibrous epidermis. From under each tooth in the lower valve arises a thin process curving a little inwards, whose extremities support an oval, partially twisted ring of a similar ribband-like structure, about an eighth of an inch in diameter. Margin of the shell minutely toothed by the terminations of the ribs. Length $\frac{1}{2}\frac{1}{10}$ inch, height $\frac{1}{2}\frac{2}{10}$ inch, breadth $\frac{5}{2}\frac{5}{10}$ inch.

Found in considerable numbers in the stomachs of fish, and occasionally on the sea-beach. It has also been taken alive on

the coast of Maine. Its usual residence is in more northern seas.

An examination of the descriptions of *T. caput-serpéntis*, given by Linnæus, Müller, and Chemnitz, and a comparison of them with our shell, had well satisfied me of their correspondence. The downy epidermis is a character too singular to be often found, or to be overlooked. This, however, is rubbed off very easily. No account of the internal bony processes is given in any description except that by Mr. Couthouy. These would afford the best possible specific character, were it not that they are usually more or less broken. But I have been relieved from all further speculation by the receipt of specimens from Dr. Lovèn, which settle the identity of our species with the European *caput-serpéntis*. Deshayes conjectures, probably with justice, that the *Anòmia aurita* of Gmelin is the same thing; and also that *Anòmia pubescens* of the same author and others is this shell in a young stage, when plentifully coated with pubescence. *T. costàta*, described and figured by Lowe, in the "Zoological Journal," ii. 105, pl. 5, f. 8, 9, is very closely allied; but it is a smaller, more solid shell, with fewer ribs, and entirely different internal processes.

TEREBRÁTULA PSITTÁ'CEA.

Shell sub-triangular; narrowed above, the beak produced into a decurved horn; surface striated, foramen triangular.

FIGURE 91.

State Coll., No. 144. Soc. Cab., No. 2349.

Terebrátula psittácea, GMELIN; *Syst.*, 3348. CHEMN.; *Conch.*, viii. 78, f. 713. DESHAYES; *Encyc. Méth., Vers*, iii. 1025, pl. 244, f. 3, a, b, c. LAM.; *An. sans Vert.*, vii. 333. LISTER; *Conch.*, 211, 46. DILLWYN; *Catal.*, 296. TURTON; *Brit. Biv.*, 236. *Conch. Dict.*, 5, f. 12 to 14.

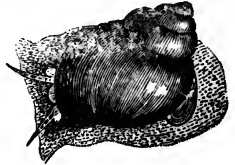
Shell thin and fragile, brownish-black or sea-green, of an inflated, triangular form, one of the valves produced into a long, pointed and strongly curved beak, something like a parrot's beak; along this runs a triangular channel, (formed by the inflected margins,) the third side of which is completed by the tip of the other valve; the smaller valve is obovate or fan-shaped, about two thirds the length of the longer valve; surface marked with concentric lines of growth, and with numerous, fine, diverging striæ,

increasing in number as the shell widens. The interior bony processes consist of two slender, curved, parallel prongs arising from the base of the teeth of the upper valve. Height $\frac{1}{2}$ inch, length $\frac{7}{8}$ inch, breadth $\frac{1}{3}$ inch.

I have as yet met with only one specimen of this shell of the above dimensions, which was taken from the stomach of a cod-fish. It appears to be everywhere rare, and is probably an inhabitant of more northern seas, especially the region of Newfoundland.

CLASS GASTERÓPODA, CUVIER.

The GASTERÓPODA form much the most numerous class of Mollusca. They are distributed over the whole surface of the globe, and live on the land, and in all waters. They receive their name from the peculiar conformation of their organ of progression. The under part of the belly is flattened out into a smooth, elongated disk, and on this they glide along. Some of them have also the power of swimming at the surface of the water in an inverted posture. They have a distinct head, furnished with one or two pairs of tentacula, and almost always they have rudimentary eyes situated on or near one pair of them.

[*Paludina decisa*, Sav.]

The shell, almost without exception, consists of only one piece (*univalve*), and is more or less revolving in a spiral coil. Into it the animal is capable of withdrawing entirely, and is usually provided with a horny or bony cover (*operculum*) attached to the hinder part of the foot, which accurately closes the aperture of the shell after the body has wholly receded.

The arrangement of the respiratory organs is various, and affords good characters for distribution into families. In some of them the respiratory orifice is at one side, under the edge of the mantle. In others the mantle is folded so as to form a long flexible proboscis or *siphon*; and the shells of these have a notch or groove in the front of the aperture, in which the siphon lies.

All those which live on the land or in fresh water feed on decaying vegetables; while a great portion of those living in the sea feed on animal food, and devour not only dead animals, but many of them are real cannibals, and have the power, either by their jaws, or by the application of an acid, to perforate the shells of their fellow testacea, without respecting even their own species, and thus suck out the juices of the living occupant.

Not a few of them are destitute of shells, and, in fact, the greater part of the naked mollusca belong to this class. Of the few that have been observed in this region, some notice has

already been given. These were the true GASTERÓPODA of Lamarck, while his MOLLÚSCA were limited to what we have embraced in the present class.

The following synopsis may aid in arriving at the genera of the testaceous coverings of such of the GASTERÓPODA, as are found with us.

I. *Aperture entire, not interrupted in front by a notch or elongated canal.*

i. Shell shield-like or cup-shaped, aperture very large.

1. multivalve. *Chiton*.

2. univalve.

* simple. *Patélla, Lóttia, An'cytus*.

** with a fissure at summit. *Cemòria*.

*** with a partial partition, parallel to the aperture. *Crepídula*.

ii. Shell tusk-shaped. *Dentólum*.

iii. Outer whorl enveloping all the others, the spire often invisible. *Bulla*.

iv. Shell with an evident spire.

1. inhabiting the land and breathing air.

* sub-globular, or wheel-shaped. *Helix*.

** ovate, with an elongated spire. *Pupa, Bulimus, Succinea*.

2. inhabiting fresh water.

* spire wheel-shaped, evident above and beneath. *Planorbis*.

** spire elevated.

† aperture ovate. *Límnea, Physa, Paludina, Amnicola*.

†† aperture circular. *Valvata*.

3. inhabiting the sea.

* spire ovate-globose.

† aperture ovate.

§ pillar simple. *Nática, Littorina, Jánthina*.

§ pillar with an umbilical groove. *Lacuna*.

†† aperture circular. *Margarita, Skénea*.

** spire elongated.

§ pillar simple. *Turritélla, Scalària, Cingula, Pyramis*.

§ pillar with teeth or folds. *Melampus, Tornatélla, Odostómia*.

*** spire ear-shaped. *Sigarétus*.

**** spire irregular, lax. *Vermétus*.

II. *Aperture terminating in front by a notch or elongated beak.*

i. With a notch.

1. pillar simple. *Buccinum, Columbélla*.

2. pillar plaited. *Cancellària*.

ii. With a canal.

1. canal short.

* recurved. *Cerithium, Fusus*.

* straight. *Rostellària, Trichótopis, Púrpura, Pleurótoma*.

2. canal prolonged. *Py'ru'la, Ranélla*.

FAMILY *PHYLLIDIANA*, LAM.

Shell not spiral, shield-shaped, composed of one or more pieces ; aperture very large.

GENUS CHITON, LIN.

Shell oval, consisting of eight arched pieces, arranged across the body of the animal in a series overlapping each other, their ends set in the skin, which forms a rim around them.

CHITON APICULATUS.

Dorsal triangles with series of elevated points ; lateral triangles with scattered, elevated dots.

FIGURE 20.

State Coll., No. 131. Soc. Cab., No. 740.

• Chiton apiculatus, SAY ; *Amer. Conch.*, No. 8.

Shell oval-oblong, convex, sub-carinated ; color grayish or light-chestnut ; valves eight ; anterior valve crescentic, with three or four concentric lines, and numerous, separate, elevated, equal, sub-equidistant dots, arranged somewhat in regular lines along the margin ; the six following valves have, on their dorsal triangles, from twenty to thirty longitudinal series of elevated points, like beads, somewhat converging towards the summit ; on the lateral triangles, which are distinctly elevated above the dorsal triangles, are scattered points like those on the anterior valve ; posterior valve with the series of dots like the dorsal triangles, a central tubercle, and the remainder with scattered dots like those on the anterior valve. Margin coriaceous, with alternate stripes of white and dusky pubescence. Length 1 inch, breadth $\frac{3}{8}$ inch.

Inhabits the southeastern waters of this State, after passing Cape Cod. I have received it from Nantucket and Martha's Vineyard. It is found more abundantly along the coast of New York and New Jersey. Dr. Jay found it in great numbers at Gardiner's Island.

This species, so accurately described by Mr. Say from a single specimen sent him by Dr. Ravenel of Charleston, South Carolina, cannot be confounded with any other. The beautiful and conspicuous bead-like series of dots are not found on any other described species, though they partially and inconspicuously appear on *C. cinereus*. On account of their arrangement, I had formerly indicated the shell under the name of *C. pectinatus*. The recent publication of Mr. Say's Manuscript has established his name. The lines of dots are not all of equal length, and sometimes they become so blended as to form merely an elevated line, but they are generally very definite. I have seen some British shells labelled *C. ruber*, which have precisely the same sculpture; but they are much more elegant in marking, and are of a bright reddish-brown or rose-color. They cannot be *C. ruber*, however, according to any description I have seen under that name.

CHITON MARGINATUS.

Shell ovate, the valves carinated across the middle, and pointed behind; of a dead cinereous or greenish-color, and minutely shagreened; margin pulverulent.

FIGURE 22.

State Coll., No. 167. Soc. Cab., No. 2353.

Chiton marginatus, PENNANT; *Brit. Zool.*, iv. 71, t. 36, f. 2. LIN.; GMELIN; *Syst.*, 3206, No. 26. MONTAGU; *Test. Brit.*, 1. PULTENEY; *Dorset Catal.*, 25, pl. 1, f. 2. MATON and RACKETT; *Lin. Trans.*, viii. 21, pl. 1, f. 2. WOOD; *Gen. Conch.*, 21, pl. 3, f. 4. SCHROET.; *Einl. in Conch.*, iii. 508. D'ARGENV.; *Conchyl.*, t. 25, f. M. LAM.; *An. sans Vert.*, vii. 492. SOWERBY; *Conch. Illust.*, f. 106 to 112. FLEMING; *Edin. Encyc.*, vi. 102. *Brit. Anim.*, 289. *Chiton cinereus*, LOWE; *Zool. Journ.*, ii. 99, pl. 5, f. 5.

Shell small, ovate, moderately convex, with an elevated ridge along the centre, where each of the valves projects backwards in a minute beak, ending at the centre of the posterior valve; valves faintly divided into triangles; surface otherwise apparently smooth, but under the magnifier it is found to be beautifully shagreened, the granules being arranged in diamonds on every part. Color a dead, dull ashen or greenish color, sometimes mottled. Margin narrow, membranous, coated with a dusty pigment, which is alternately hoary and brownish. Length $\frac{1}{2}$ inch, breadth $\frac{3}{10}$ inch.

A single specimen of this shell was found living, a few years since, by Dr. Charles Pickering, at Phillips's Beach, and is now in the Cabinet of the Academy of Natural Sciences at Philadelphia. It is a common British species.

It is an inelegant shell at first sight, its dingy, dull surface presenting nothing attractive. But no one can fail to admire its beautiful sculpture when viewed under the magnifier. The serrated, reflected margin usually mentioned in descriptions, is merely a contraction of the margin about the ends of the valves, such as we see in many other species.

It is allied to *C. apiculatus*; but we find the lateral triangles as much sculptured as the dorsal in this; the dots are diamond-shaped, and arranged in quincunx, and not bead-like, and arranged in series. From our other species it is distinguished by its dead surface.

CHITON FULMINATUS.

Shell ovate-oblong, brownish or yellowish-red, variegated with angular, whitish lines, and a series of whitish points along the posterior margin of the valves; surface minutely granulated; margin pubescent.

State Coll., No. 134. Soc. Cab., No. 972.

Chiton fulminatus, ΣΟΥΤΗΟΥ; *Bost. Journ. Nat. Hist.*, ii. 80, pl. 3, f. 19.

Shell oblong-ovate, rather flat; color varying from bright-red to yellowish or dark reddish-brown, with numerous, fine, zigzag, whitish lines arranged over the whole surface, and a line of six or eight whitish spots alternating with dark-red along the posterior edge of each valve; valves carinated and slightly beaked, their surface covered with microscopic granulations arranged in quincunx; to the naked eye smooth and shining; division into triangular areas very indistinct; lines of growth very faint. Margin narrow, coriaceous, coated with a close, short down, alternately red and white. Within white at the edges of the valves, deepening towards the centre to a rose-color. Length $\frac{7}{16}$ inch, breadth $\frac{9}{32}$ inch.

Found in the stomachs of fishes caught off Egg Rock, Cohasset, &c.

This very beautifully marked species varies considerably in outline, size, marking, and color. Some have the sides nearly parallel, and others are decidedly ovate; some exceed an inch in length; some have the lines of growth deeply marked, while others are nearly smooth; some have a dead, ashen color, but such are apparently very old. In some the zigzag lines and white dots are very distinct, in others not.

This may very probably prove identical with some species of the North of Europe; but as it is utterly impossible to say which one, I will not run the risk of adding further confusion to the already inextricable synonymy of the Chitons, by offering any conjectures. Dr. Lovèn says, "It is a very common species with us [in Sweden]. I think it is the *S. lavigatus*, FLEMING." Mr. Sowerby thinks "it would be impossible to find a distinguishing character" between this and *C. cinereus*. In this he is certainly mistaken. It comes much nearer to his red variety of *C. marginatus*; but the granulations of the surface of our shell are not half so distinct as in either *C. marginatus* or *C. cinereus*. It is, therefore, best to use Mr. Couthouy's name for the present, as it is the only one to which the shell can now, or perhaps ever, be referred with certainty.

CHITON RUBER.

Shell small, oval, elevated, carinated; valves marked by lines of growth; otherwise smooth, strongly beaked; margin pulverulent, red and white.

FIGURE 24.

State Coll., No. 166. Soc. Cab., No. 2352.

Chiton ruber, LOWE; *Zool. Journ.*, ii. 101, pl. 5, f. 2. SOWERBY; *Conch. Illust.*, f. 103, 104, lower fig. FLEMING; *Edin. Encyc.*, vi. 102. *Brit. Anim.*, 289.

Shell small, strong, nearly oval, being but slightly narrowed before, convexly elevated and traversed by an elevated ridge or keel along the back; valves without any appearance of granulations or punctures under the magnifier, but marked with conspicuous grooves, indicating the stages of growth, most marked near the border; otherwise perfectly smooth, shining, and polished; posterior margin strongly beaked. Color, light brick-red or flesh-color, with occasional dashes of dark crimson across one or more

valves, sometimes arranged in stripes ; such a stripe will usually be found at a little distance on each side of the keel, while the keel itself has a stripe of crimson spots, occasionally replaced by a yellow spot. It is frequently incrustated with a black foreign substance. Margin coriaceous, coated with a red and white dust arranged in alternate stripes. Triangular areas generally well marked. Interior bright rose-red, becoming fainter at the margins of the valves. Length $\frac{1}{2}$ inch, breadth $\frac{3}{16}$ inch.

Found adhering to stones dragged from the deep by kelp ; also in the maws of fishes.

It is not difficult to distinguish at sight well-marked individuals of this species from those of *C. fulminatus*. But there are intermediate specimens which it is not easy to pronounce upon. In general, this species is smaller, more solid, more convex, the valves more beaked, lines of growth more deep, the zigzag lines never appearing, though the posterior margin of the valve is sometimes dotted with white and red. The impunctured or ungranulated surface, however, is the best, as it is a constant, characteristic.

That this is the *C. ruber* of Lowe and Sowerby, I think there can be no question, though it may not be *C. ruber* of other authors. The figure in Pennant, "Brit. Zool.," pl. 36, f. 3, also represents accurately most of the adult specimens, though it is quoted by authors as *C. levis*, which is distinguished by its finely reticulated margin.

CHITON ALBUS.

Shell small, elliptical, valves carinated and partially beaked, minutely granulated ; margin beaded.

FIGURE 27.

State Coll., No. 133. Soc. Cab., No. 973.

Chiton albus, MONTAGU ; *Test. Brit.*, 4. SOWERBY ; *Conch. Illust.*, 99, 99 a, 100.

BROWN ; *Conch. of Great Brit., &c.* pl. 35, f. 2.

Chiton aselloides, LOWE ; *Zool. Journ.*, ii. 103, t. 5. f. 3. WOOD ; *Suppl.*, pl. 1, f. 9.

Chiton sagrinatus, COUTHOUY ; *Bost. Journ. Nat. Hist.*, ii. 82.

Shell small, elongated-oval ; covered with a bluish-black pigment, which easily rubs off, and leaves the ground yellowish or ash-colored ; surface beautifully granulated, under the microscope,

so as to resemble the finest shagreen. Valves moderately carinated, and with a minute beak; distinctly marked with lines of growth, and a feeble diagonal ridge often divides each side into two triangles; anterior valve crescentic, with about twelve marginal teeth. Margin membranous, yellowish, covered with beaded granules. Length $\frac{9}{32}$ inch, breadth $\frac{5}{32}$ inch.

Found in the stomachs of fishes in considerable numbers.

This shell was first discovered on this side the Atlantic by Mr. Joseph P. Couthouy, and supposed by him to be new. But it agrees in all respects with Mr. Lowe's figure and description of *C. aselloides*; and Mr. Sowerby, on an examination of our shell, accords with me in opinion that it is that shell. Mr. Lowe subsequently states (Zool. Journ., iii. 79.) that his species "is clearly identified with *C. albus* of Montagu." But, as it is only white when divested of its pigment, the name *aselloides* is much more descriptive.

The ridges, edges, and interstices of the valves usually have the pigment worn off, so as to present a yellowish-color. The beaded margin distinguishes it from all our other species; but it is rare to find the margin unimpaired.

CHITON EMERSONIANUS.

Shell ovate-oblong, white; valves reniform, each with a central cordiform, sculptured area, the remainder covered with a dirty membrane, with two rows of hairy tufts at the margin; anterior valve emarginate.

FIGURE 19.

State Coll., No. 132. Soc. Cab., No. 2351.

Chiton Emersonii, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 83, pl. 3, f. 10.

Shell ovate-oblong, broadest behind; of a light drab-color; valves eight, kidney-shaped, the extremities being rounded and the posterior margin deeply arched; posterior valve narrowed and excavated at the tip; on the centre of each valve is a small, heart-shaped area, beautifully sculptured with bead-like granules, three or four series of which are parallel to its border, and the central ones on each side are arranged in a somewhat concentric manner; the beak is elevated and pointed, and smooth or slightly striated;

the area on the anterior valve is shaped like the valve. The remaining portion of the valves is smooth, with three radiating lines passing from the beaks to the middle of each base, enclosing two rounded, threadlike ribs. It is also covered with a thin membrane, coated with a dirty, scurfy epidermis which is easily rubbed off. Margin broad and thick, resembling macerated calf-skin, coated like the rest of the surface, and having two ranges of small tufts of yellowish hair, two on each of the intermediate, and six or eight around the terminal valves. Length $\frac{4}{8}$ inch, breadth $\frac{6}{16}$ inch.

Found in the stomachs of fishes taken in Massachusetts Bay.

This is a very curious shell, and, with three or four other described species, might constitute a sub-genus. It is so rough and unseemly that it is very likely to be rejected as some decayed specimen; or the discoverer would begin to clear off, as some extraneous substance, the coating which belongs to it, and gives it a character.

The shape of the valves, the sculptured areas, and the emarginate anterior valve, will not allow it to be confounded with any other species. Could it be presumed that so remarkable characters as the central areas and the anterior valve were overlooked, we might suppose this to be the *C. vestitus*, BROD. and SOWERBY (Zool. Journ., iii. 368.) The areas, however, are easily defaced, and might not have attracted notice in their specimens. In other respects their description would apply well to our shell. The figure recently given of it, in the Appendix to Beechey's Voyage, represents a shell proportionally much narrower than ours.

GENUS PATELLA. LIN.

Shell low-conical, apex nearly central and inclining a little forwards; aperture oblong-oval, cavity basin-shaped.

PATELLA CA'NDIDA.

Shell small, white, with numerous diverging ribs, checked by revolving lines, apex central.

State Coll., No. 124. Soc. Cab., No. 2381.

Patélla cándida, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 86, pl. 3. f. 17.

Shell small, conical, white, oval, having numerous minute radiating ribs, traversed by equally fine concentric lines, which give the surface, when viewed under a magnifier, the appearance of net-work; summit nearly central, margin slightly scalloped by the termination of the ribs; interior white. Length $\frac{7}{8}$ inch, height $\frac{1}{10}$ inch, breadth $\frac{1}{5}$ inch.

Only three specimens of this shell are yet known. The first one found was taken by Mr. Couthouy from the stomach of a fish caught off Barnstable, and was described by him. A second has since been found by Mr. W. W. Wheildon, of Charlestown. It is at once distinguished by its checkered or granulated surface, no other species, yet described, having that character.

GENUS LÓTTIA, GRAY.

Shell basin-shaped, apex obtuse, usually more depressed and thinner than Patélla, and distinguished from it chiefly by its inhabitant.

LÓTTIA TESTUDINÁ' LIS.

Shell oblong-oval, greenish-white, for the most part with brownish sub-dividing radiations; centre within, dark-brown.

FIGURE 12.

State Coll., No. 129. Soc. Cab., No. 767.

Patélla testudinàlis, MÜLLER, *Prodr.*, p. 237. FABR.; *Fauna Grœnl.*, 385. LAM.; *An. sans Vert.*, vii. 543. DILLWYN; *Catal.*, 1045. WOOD; *Catal.*, No. 63, pl. 37.

Patélla testudinària, KAEMMERER, *Rudolst Conch.*, 12, pl. 2, f. 4, 5.

Patélla testudinària Grœnlândica, CHEMN.; *Conch.*, x. 325, pl. 168, f. 1614, 1615.

Patélla tessellata, MÜLLER; *Zool. Dan.*, iii. 2868, teste Dr. Beck.

Patélla Cléalandi, SOWERBY; *Records of Lin. Soc.*, viii. 621. FLEMING; *Brit. Anim.*, 287.

Patélla virgínea, MÜLLER; *Zool. Dan.*, iii. 2867.

Patélla virgínea? GMELIN.; 3711. DILLWYN; *Catal.*, 1052.

Patélla amœ'na, SAY; *Journ. Acad. Nat. Sc.*, ii. 223.

Patellóidea amœ'na, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 171.

Patellóida testudinàlis, LEA; *Trans. Amer. Phil. Soc.*, (New Series,) vii. 73.

Patélla cly'peus, BROWN; *Conch. of Great Brit., &c.*, pl. 37, f. 9, 10.

Lóttia Antillàrum, SOWERBY; *Conchol. Manual*, f. 231.

Shell oblong-oval, moderately elevated, thin ; apex behind the middle, pointed, and turning forwards ; surface finely checkered with minute radiating lines crossed by encircling lines ; general color a greenish-white, with dark-brown stripes radiating from the summit, and frequently dividing, before they reach the margin, which is sharp and entire ; within, the central portion is dark-brown, and the margin is more or less bordered or checkered with the same color, by the exterior markings showing through. Ordinary length $\frac{4}{8}$ inch, breadth $\frac{1\frac{3}{8}}$ inch, height $\frac{1}{4}$ inch.

Found along our whole coast, adhering to the rocks, and is common on the northernmost shores of Europe and America.

This shell varies infinitely in its markings. The general appearance is as above described. Sometimes, all exterior coloring is wanting ; and commonly, the lines are so delicate, and arranged in such a manner, as to exhibit a kind of net-work. The largest specimens I have seen were brought from Castine, Maine. These were $1\frac{1}{4}$ inch in length. There can no longer be any doubt that this is the shell long known in the North of Europe as *P. testudinàlis*. Specimens sent me from Ireland, Scotland, and Norway, agree in every particular with ours. Probably the *P. Antillàrum* is the same, though Mr. Sowerby does not intimate this in his correspondence.

Mr. Couthouy was the first to determine the generic place of this shell, by an inspection of the animal.

I have employed the generic term *LÓTTIA*, of Gray, as it has the right of priority, is not an objectionable derivative, and is in general use among all conchologists except the French. *PATELLÓIDEA* was also given, as the name of a family, by Blainville. The arrangement of the branchiæ of the animal would, strictly, remove the genus from this family.

LÓTTIA ÁLVEUS.

Shell oblong-oval, compressed at the sides, thin, colored with a net-work of white and brown.

FIGURE 13.

State Coll., No. 130. Soc. Cab., No. 777.

Patélla álveus, CONRAD ; *Journ. Acad. Nat. Sc.*, vi. 267, pl. 11, f. 20.
Patellóidea álveus, COUTHOUY ; *Bost. Journ. Nat. Hist.*, ii. 177.

Shell small, thin and fragile, elevated, compressed at the sides, so that the margins are nearly parallel, the ends of equal breadth, and obtusely rounded; apex at the posterior third, pointing forwards; outer surface beautifully checked with the lines of growth, and fine, but distinct, radiating lines; color a reddish-brown, with oval or circular yellowish-white spots, arranged in a somewhat regular manner, so that the whole resembles a net-work. The thinness of the shell allows the external coloring to appear on the inside; edge entire. Length $\frac{5}{16}$ inch, breadth $\frac{3}{16}$ inch.

Found abundantly on the eel-grass (*Zostera marina*), to whose narrow leaves its form is exactly adapted.

In old specimens a lateral compression is very obvious, and the sides are at least parallel, and sometimes incurved for one half the length of the shell. The apex, when not worn off, is acute, and projects distinctly forwards. The markings usually give the shell a checkered appearance; but occasionally we have stripes, as in the preceding species.

This shell is the very miniature of *Patella compressa*. Mr. Sowerby suggests that it bears the same relation to *P. testudinalis* as *Patella compressa* does to *P. miniata*; in other words, it is the same species, changed in form from having adhered to a narrow sea-weed instead of a stone. The general marking of the shell, and the circumstance of its seldom, if ever, being noticed living anywhere except upon the narrow leaves before mentioned, render this opinion not at all improbable.

FAMILY CIRROBRANCHIATA, BLAINV.

Animal with the branchiæ in the form of numerous long filaments, arising from two radical lobes placed above the neck, and enveloped, with the head, by the mantle. Shell tubular, not spiral.

GENUS DENTALIUM, LIN.

Shell tubular, elongated-conical, slightly curved, opening at each end by a rounded orifice.

DENTALIUM DENTALE.

Shell polished, slightly curved, with eighteen or twenty faint, unequal ribs.

FIGURE 5.

State Coll., No. 265. Soc. Cab., No. 2415.

Dentàlium dentàlis, LIN.; *Syst. Nat.*, 1263. BORN; *Mus.*, t. 18, f. 13. MATON and RACKETT; *Lin. Trans.*, viii. 237. DESHAYES; *Mem. de la Soc. d'Hist. Nat.*, ii. 353, pl. 16, f. 9, 10. LAM.; *An. sans Vert.*, v. 595.

Dentàlium striatùm, MONTAGU; *Test. Brit.*, 495.

Dentàlium attenuatùm, SAY; *Journ. Acad. Nat. Sc.*, iv. 154, pl. 8, f. 3.

Shell slender and tapering, curved like an elephant's tusk, the tip cut off, leaving a very small opening. Surface rather glossy, yellowish-white, marked with about twenty closely arranged, unequal, rib-like striæ, running the whole length of the shell. Length about an inch; diameter at the larger end about $\frac{1}{8}$ inch.

I am enabled to add this shell to our list through the kindness of my friend W. W. Wheildon, of Charlestown, who sent me the specimens, accompanied by the following memoranda.

"Two specimens of *Dentàlium* were taken from the stomachs of cod-fish, in the Spring of 1839. They were both found to have penetrated the entrail of the fish, and were firmly fixed there. They had probably been in the fish for some length of time. Both specimens were unfortunately eroded, one of them so much so that it is quite impossible to determine any of its characters, except its size, its markings being entirely obliterated. In the other specimen the striæ are distinct, and seem to conform to the *D. dentàlis* of the coast of England. Twenty to twenty-two striæ may be counted on its surface."

FAMILY CALYPTRÆCEA, LAM.

Shell basin-shaped, serving as a cover to the animal; distinguished from the preceding family by the branchiæ being situated in a peculiar cavity upon the back.

GENUS CEMÒRIA, LEACH.

Shell small, like Patèlla, with the apex elevated and curved forwards, and with a fissure just behind the apex.

CEMÒRIA NOACHINA.

Shell small, white, conical, covered with unequal, radiating ribs; apex curved forwards, and perforated obliquely backwards.

FIGURE 18.

State Coll., No. 114. Soc. Cab., No. 1652.

Patélla Noachina, LIN.; *Mantissa*, 551. CHEMN.; *Conch.*, xi. 186, pl. 197, f. 1927, 1928.

Patélla apertúra, MONTAGU; *Test. Brit.*, 491, pl. 13, f. 10. WOOD; *Index*, pl. 38, f. 89.

Patélla fissurélla, MÜLLER; *Zool. Dan.*, i. t. 24, f. 4 to 6. GMELIN; *Syst.*, 3728, No. 193.

Fissurélla Noachina, LYELL; *Obs. sur le Soulèvement de la Suède*, No. 16, pl. 2, f. 13, 14. LAM.; *An. sans Vert.*, vii. 604. SOWERBY; *Conch. Illustr.*, (*Fissurélla*) f. 15.

Puncturélla Noachina, LOWE; *Zool. Journ.*, iii. 77.

Cemòria Flemingii, LEACH; SOWERBY; *Conch. Man.*, f. 244.

Sipho striata, BROWN; *Conch. of Great Brit., &c.*, pl. 36, f. 14 to 16.

Shell bluish-white, conical, its summit pointed and turned backwards, and the surface covered with about twenty-two ribs, with intervening smaller ones, and wrinkled by the lines of growth. A narrow, diamond-shaped slit is presented at the summit, which opens in the interior by a circular aperture, towards the margin, the course of this canal being as it were arched over by a thin plate of the shell, when viewed within; edge oval and scalloped by the ribs. Length $\frac{1}{2}$ inch, breadth $\frac{1}{3}$ inch, height $\frac{1}{10}$ inch.

This curious little shell, the only recent species of its genus known, is frequently taken from the stomachs of fishes. It is also an inhabitant of the northern seas of Europe, and is found in a fossil state also.

It has been arranged under different genera, but undoubtedly has claims to be the type of a distinct genus. Besides those mentioned above, the genus *Ri'mula* of DeFrance, would also probably embrace it. But *CEMÒRIA* has the priority over all those which have been constructed, though any one of the others would seem to have been better chosen names. Lowe remarks, that the *P. apertúra* of Montagu has been ascertained, almost beyond a doubt, to be nothing more than the young of *Fissurélla Græca*. But his figure represents this shell.

GENUS CREPIDULA, LAM.

Shell oval, arched, somewhat boat-shaped, with an imperfect spire pressed against the margin; cavity partially divided within by a horizontal partition.

CREPIDULA FORNICATA.

Shell oval, apex turned to one side, and terminating in the margin ; partition appressed to one side.

FIGURE 17.

State Coll., No. 123. Soc. Cab., No. 817.

Patélla fornicata, LIN.; *Syst. Nat.*, 1257. MARTINI; *Conch.*, i. 160, t. 13, f. 129, 130. LISTER; *Conch.*, t. 545, f. 33, 35. KNORR; *Vergn.*, vi. t. 21, f. 3. Crepidula fornicata, LAM.; vii. 641. SAY; *Journ. Acad. Nat. Sc.*, ii. 225.

Shell obliquely-oval, one side more oblique than the other, apex a little prominent, turned to one side, not separate from the body of the shell, and generally united with the margin of the aperture; convexity moderate, but varying according to the object on which it is seated; surface wrinkled by the lines of growth, of a dirty-white color, and figured with interrupted, waved, longitudinal lines, of a light-chestnut color, and covered with a yellowish epidermis; aperture obliquely sub-oval, the edge entire and sharp, color light-brown, with darker dots and blotches; a ray from the apex along the middle of the shell generally lighter than the rest; diaphragm white, occupying about one half the aperture, one side of it defined by a distinct line, the other, for a considerable space, compressed against the side of the shell, and firmly united to it, the free edge waving, one half advancing considerably beyond the other, and leaving a conspicuous notch at the side, outside the boundary line, surface in general concave, but a narrow, arched portion traverses the middle. Length $1\frac{1}{2}$ inch, breadth $1\frac{1}{5}$ inch.

Found adhering to other shells and to each other.

This is probably, what Mr. Say supposed it to be, a variety of *C. fornicata*, as originally described, and is a species found in various seas. It is found occasionally thrown upon the beaches near Boston after a storm, but is not uncommon about Cape Cod, and the islands to the southeastward. The best specimens I have seen, were brought, on oysters, from Prince Edward's Island, off the mouth of the St. Lawrence. Its shape varies according to the body on which it rests. Four or five of different ages are frequently found riding upon each

other. When growing upon *Pecten concéntricus* it is found to have ribs corresponding to those of the *Pecten*. It is a solid shell, and the diaphragm is situated near the mouth, leaving no cavity extending under the beak. The manner in which one edge is pressed against the side of the shell is quite characteristic. The margin of the aperture is generally white, dotted with chestnut; the remainder of the interior is more or less brown. Sometimes the attachment of the diaphragm is bordered with reddish-brown.

CREPIDULA PLANA.

Shell ovate, flat, white; apex acute, terminal; diaphragm convex.

FIGURE 16.

State Coll., No. 143. Soc. Cab., No. 821.

Crepidula plana, SAY; *Journ. Acad. Nat. Sc.*, ii. 226. *Amer. Conch.*, pl. 44.

Shell ovate, flat, or as often a little concave or convex, thin, transparent, white, wrinkled with concentric lines of growth; apex minute, pointed, turning a little to one side, and constituting the extreme termination of the shell; the other extremity broader, and regularly rounded; interior white, of a brilliant polish, and iridescent; diaphragm less than half the length of the shell, convex, rising to a level with the margin, free edge for the most part straight, but having a projecting angle near one side. Length $1\frac{1}{4}$ inch, breadth $\frac{9}{17}$ inch.

Found in the aperture of other shells.

This species has also been observed through a wide region. Mr. Say noted it as far south as Florida. It does not, however, frequent localities north of us. It is still regarded by some as a variety of the *C. fornicàta* modified by its position. But the peculiarity of form, coloration, diaphragm, and habit of living, seem to render it sufficiently distinct. When young, it is of a more rounded form, but becomes elongated by age. It is otherwise very variable in shape, conforming to the position it occupies in the throat of some other shell.

This is very likely to prove to be the *C. unguiformis*, Lam., (*Patella crepidula*, Lin.). In this opinion I have the concurrence of Mr. Sowerby. Deshayes observes that he can hardly think that the shell figured as *Calyptrea unguiformis* by Broderip, in "Trans. Zool. Soc.," i. pl. 29, f. 4, is the shell of Linnæus. He says the shell of

Linnæus is distinguished by a profound notch at one extremity of the partition, and a feebler one at the other; that the shell described by Mr. Say as *Crepidula plana* wants this notch, and is the shell figured by Broderip. Now it so happens, that the only specimen which I am certain is entire has this notch precisely as described, and the tooth-like process which separates the large notch from the rest of the margin is such as would be likely to be broken in almost every instance. This fact leads me to suppose, that all three of the shells in question are of the same species, and should be called *C. unguiformis*. If so, its habitat is as wide as that of *C. fornicata*. But as I have not yet the means of confirming my supposition, I give Mr. Say's name.

CREPIDULA CONVÉXA.

Shell elevated, apex terminal, separated from the body of the shell; diaphragm convex, less than half the aperture, edge simple.

FIGURE 15.

State Coll., No. 122. Soc. Cab., No. 822.

Crepidula convéxa, SAY; *Journ. Acad. Nat. Sc.*, ii. 227.

Shell small, opaque, very convex, obliquely ovate, one side nearly vertical, the other sloping; surface wrinkled, color ashen-brown, with bands, stripes, or dots of dark reddish-brown; apex acute, separate from the body of the shell, turning very little to one side, and downwards as far as the tip of the shell; within shining, of a uniform dark reddish-brown color; aperture oval; diaphragm deeply situated, leaving a cavity extending into the beak, convex, brown, the free edge white and simply curved. Length $\frac{9}{16}$ inch, breadth $\frac{6}{16}$ inch, height $\frac{4}{16}$ inch.

Found on sea-weed, and on stones among the roots of sea-weed.

It is seldom found entire. Mr. Say described from dead shells, and had not seen its true colors. In most instances one side is nearly upright, while the other is sloping; but sometimes the two sides are nearly similar. The diaphragm is regularly arched, the arch terminating at a regularly curved, depressed line, on one side, and here the free edge makes a slight projection.

This shell is easily distinguished from all our other species by its convexity and by the color of its deeply seated diaphragm.

CREPIDULA GLAUCA.

Shell oval, smooth, apex separate, slightly turned to one side ; diaphragm less than half the length of the shell, edge waved.

FIGURE 14.

State Coll., No. 121. Soc. Cab., No. 818.

Crepidula glauca, SAY ; *Journ. Acad. Nat. Sc.*, ii. 226.

Shell obliquely oval, thin, moderately convex, of a glaucous or grayish-green color, faintly freckled with dots of darker and lighter color ; surface nearly smooth ; the apex is pointed, projecting considerably beyond the outline of the aperture, and, turning downwards, and a little to one side, does not quite reach the plane of the aperture ; aperture rounded oval, the margin usually expanded ; interior a uniform, dark reddish-brown, or occasionally mottled ; the edge is margined with yellowish-white, and dotted with brown ; diaphragm white, running within the beak so as to exhibit a considerable recess ; it is waved, two thirds being convex, and the remainder concave ; the free margin has a concave curve in proportion as the diaphragm is arched. Length $\frac{11}{16}$ inch, breadth $\frac{9}{16}$ inch, height $\frac{1}{16}$ inch.

I have taken only one specimen of this shell, which I found on a stone dragged upon Chelsea Beach by a *Laminaria* attached to it. It is, however, common on the ocean shore of Rhode Island, and is doubtless to be found at the Elizabeth Islands, and along the South Shore. The specimens I have received from Colonel Totten have a peculiar figure, and from their undulated edges I should conjecture they were taken from off the *Pecten concentricus*, which is found abundantly about Cape Cod.

It is readily distinguished from *C. convexa* by its depressed and broader figure, and white diaphragm. From small specimens of *C. fornicata* it is distinguished by its projecting and central apex, and by the constant recess under the beak. In some specimens the arching of the diaphragm is greater than in others, and then its free margin is more or less curved also. There is no decided notch at either extremity.

FAMILY BULLEANA, LAM.

Shell thin, rolled up like a scroll; animal destitute of tentacula, and having the branchiæ in a special cavity, at the posterior part of the back, covered by the mantle.

GENUS BULLA, LIN.

Shell thin, oval or cylindrical, the last whorl enclosing all the others, seldom exhibiting any spire; aperture narrow, nearly the length of the shell, lip sharp.

BULLA INSCULPTA.

Shell oval, bluish-white, fragile, the last whorl enveloping all the others, and covered with minute, regular, revolving lines, with an imperfect opening in the region of the spire.

FIGURE 92.

State Coll., No. 118. Soc. Cab., No. 838.

Bulla insculpta, TOTTEN; *Silliman's Journ.*, xxviii. 350, fig. 4.

Bulla solitaria? SAY; *Journ. Acad. Nat. Sc.*, ii. 245.

Shell oval, rather broadest before the middle, thin, pellucid, bluish-white; the last whorl enveloping all the others, wrinkled lengthwise, and covered with minute, close, revolving lines; the region of the spire is depressed, and sometimes we find there a very small opening; aperture narrow behind, broad before; outer lip very sharp, rising in a regular curve backwards above the summit of the shell; as it ascends from below upon the body of the shell, it becomes a little thickened, and forms a very slight fold at the umbilical region; a very thin layer of enamel is found covering the inner margin; umbilicus none. Length $\frac{1}{3}$ inch, breadth $\frac{1}{4}$ inch.

Found at Martha's Vineyard, at New Bedford, and in the muddy inlets in Roxbury.

The differences between *B. solitaria* and *B. insculpta*, if there be any, must be very slight. Nor do I see that the two descriptions are at all inconsistent with each other. Still, it is true that the shells from Martha's Vineyard are precisely like some from Charleston, South

Carolina, and accord with Mr. Say's *solitaria*; and those from Roxbury are precisely like those found by Colonel Totten at Newport, Rhode Island, and described by him. The observable differences are, that the first are of a more dead white, are more cylindrical, the summit has a more square appearance, the revolving lines are less distinct, and there is always a perceptible opening in the region of the spire. These differences may be ascribed to age or locality. I have used Colonel Totten's name, since I am not sure that it is the shell intended by Mr. Say.

BULLA HIEMALIS.

Shell minute, globular, very thin, dusky, no spire perceptible, with a small umbilicus.

FIGURE 100.

State Coll., No. 119. Soc. Cab. No. 2385.

Bulla hiemalis, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 180, pl. 4, f. 5.

Shell globular, very thin and brittle, transparent, of a brownish tinge, except near the tip where it is whitish; body-whorl enveloping all the rest, so as to leave no perceptible spire, and marked with the lines of growth; the aperture is narrow behind, but greatly enlarged forwards; the outer lip revolves, from its junction behind, nearly a third of a revolution before it turns forwards; a thin plate of callus is spread over the inner margin, and rises so as to form a small but distinct umbilicus. Length and breadth about $\frac{1}{10}$ inch.

Procured from cod-fish taken off Provincetown, in about thirty fathoms water.

It is a remarkable shell, sufficiently distinguished by its globular form, and its peculiar lip.

BULLA GOULDII.

Shell ovate, white, rather opaque, composed of four whorls, the last including all the others, and covered with minute revolving lines; spire nearly flat.

FIGURE 94.

State Coll., No. 117. Soc. Cab., No. 2384.

Bulla Gouldii, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 181, pl. 4, f. 6.

Shell small, ovate, shining, of a dead white color, covered with a yellowish epidermis; whorls four, rounded at their upper edges, their dividing line well marked; the last whorl is as long as the shell, and includes all the others; under the magnifier its surface appears covered with revolving lines; the whorls all rise to about the same level, so that the summit is nearly flat; the anterior extremity is rather narrower than the posterior; the aperture is narrow behind, and suddenly enlarged by the curvature of the inner margin, which is a little thickened, white, and polished. The outer lip, from its junction behind, advances a little as it turns forward by a regular curve, and, finally turning backward by a rather sharp turn, it joins the body of the shell with a gentle twist; umbilicus none. Length $\frac{3}{16}$ inches, breadth $\frac{3}{8}$ inch.

Found by Mr. Couthouy in the stomachs of fishes, taken off Cohasset Rocks, and dredged by Col. Totten in Provincetown harbour.

In shape it somewhat resembles *B. solitaria*; but it is a smaller and much more solid shell, and its flat summit, with the display of all its whorls there, plainly distinguishes it. The anterior extremity is also more pointed. It is much broader and less cylindrical than *B. canaliculata*, nor has it the conspicuous fold on the pillar, as that shell has.

BULLA DE'BILIS.

Shell obliquely ovate, small, transparent, inflated, smooth, partially umbilicated; whorls four, terminating on a level; pillar lip terminating abruptly in front.

FIGURE 95.

State Coll., No. 112. Soc. Cab., No. 2388.

Bulla debilis, GOULD; *Silliman's Journ.*, xxxviii. 196.

Shell small, obliquely ovate, tumid, thin and brittle, greenish-white; whorls four, all rising to about the same height, division distinct, each very convexly rounded; last whorl the whole length of the shell, including all the others, and partially detached from them above; surface without apparent marks; aperture as long as

the shell, widening from behind forwards ; outer lip attached behind, a little before the summit of the shell, it rises to a level with the spire, and then descends in a regular, though slightly waved curve to the front of the pillar, where it terminates quite abruptly ; inner lip spread out in a thin enamel upon the body of the shell, partially covering an umbilical indentation placed at about one fourth the length of the shell. Length $\frac{1}{10}$ inch, breadth $\frac{1}{8}$ inch.

Obtained from fishes taken in Massachusetts Bay.

This shell has no marked resemblance to any other with which I am acquainted, unless it be to *B. Gouldii*, of which it may possibly be the young. It is, however, much smaller and thinner, more globular, and its greatest breadth is before, instead of behind, the middle. The peculiarity of the base, also, is well marked. In many respects, it has a general resemblance to Montagu's *B. diáphana*, (*Test. Brit.* pl. 7, f. 8,) but that has an elevated spire, and is not umbilicated. Brown figures a shell, which he calls *Diáphana pellúcida*, (*Conch. of Great Brit.*, &c., pl. 38, f. 10, 11,) which bears a still more striking resemblance.

These two last named species would come under the sub-genus *APLUSTRE* of Blainville ; in which the whorls are all visible, but the spire not projecting ; and in which there is a thickened portion at the anterior termination of the pillar.

BULLA TRITI'CEA.

Shell cylindrical, smooth, whitish, of the size of a grain of rice, a pit in place of the spire.

FIGURE 98.

State Coll., No. 116. Soc. Cab., No. 3871.

Bulla triticea, COUTHOUY ; *Bost. Journ. Nat. Hist.*, ii. 88, pl. 2, f. 8.

Shell cylindrical, polished, rather solid, of a dull white color, and covered with a thin, rusty epidermis ; marks of growth very delicate, and numerous minute revolving lines may be seen under a magnifier ; a circular pit occupies the region of the spire, from the margin of which the outer lip takes its origin, and, rising a little, passes forward in a direction nearly parallel to the left margin of the shell, forming a long, narrow aperture, which suddenly becomes double this breadth, near the front, by the curvature of the inner lip ; occasionally the lip is a little waved in-

wards at the middle, narrowing the aperture ; at the region of the umbilicus is a flattened, white space, thickened by enamel, gradually disappearing within the aperture ; the whole inner margin is sometimes slightly coated with enamel. Length $\frac{1}{4}$ inch, breadth $\frac{1}{8}$ inch.

Found plentifully in the maws of fishes taken in Massachusetts Bay.

This shell is analogous to the *B. cylindræca* of Pennant, (*Brit. Zool.*, pl. 70, f. 85.) But that is a much longer shell, and decidedly umbilicated in the region of the spire. Brown figures a shell under the name of *Volværia alba*, (*Conch. of Great Brit., &c.*, pl. 38, f. 43, 44,) which bears a striking resemblance to this shell.

BULLA CANALICULATA.

Shell nearly cylindrical, spire somewhat elevated, with a groove on the summit of the whorls.

FIGURE 97.

State Coll., No. 113. Soc. Cab., No. 2390.

Volværia canaliculata, SAY ; *Journ. Acad. Nat. Sc.*, v., 211.

Bullina canaliculata, SAY ; *Amer. Conch.*, pl. 39.

Shell cylindrical, white and shining, with very faint lines of growth ; spire a little elevated, crowned with a minute but prominent tip ; whorls about five, the summit of each having a shallow, rounded groove ; outer lip arching forwards ; inner lip over-spread with a thin plate of enamel, and having a single oblique fold near the base.

I have found only one specimen of this shell from the waters of Massachusetts. This was discovered, among other minute shells, in sand brought from Martha's Vineyard. Prof. Adams found them in considerable numbers in New Bedford harbour.

I have been induced to place this species under the genus *BULLA*, in consequence of the remarks of M. Deshayes, in his edition of Lamarck's work. He thinks the main character of Férussac's genus *BULLINA*, as modified by Blainville, viz., "an apparent and prominent spire," is not of sufficient importance to constitute a genus ; and, while Mr. Say states that the animal of *BULLINA* differs from that of *BULLA*

by having two distinct tentacula, Deshayes, a much later authority, says it is perfectly well ascertained that the animals accord with each other most accurately.

BULLINA may at least be regarded as a sub-genus of BULLA, to which this species and the next will belong. At the same time, its shape and the fold on the columella would seem to approximate it to VOLVA'RIA, where Mr. Say originally placed it.

BULLA OBSTRIC'CTA.

Shell oval-cylindrical, white, nearly smooth, spire somewhat elevated, last whorl nearly as long as the shell, and slightly girted at the middle; a fold on the pillar.

FIGURE 96.

State Coll., No. 113. Soc. Cab., No. 2389.

Bulla obstric'cta, GOULD; *Silliman's Journ.*, xxxviii. 196.

Shell small, cylindrical, with each extremity rounded, semi-transparent, opaque white, or pale horn-color; whorls five, the last nearly involving the others, somewhat girt in at the middle, nearly smooth, covered with a light-yellowish epidermis; spire obtuse, rising above the junction of the lip to about one fifth the length of the shell; suture deep, apparently double in old specimens, or rather, a narrow and deep line revolving on the shoulder of each whorl, near the suture, forms a sort of channel; aperture very narrow behind, widening before; outer lip sharp, entire, joining the preceding whorl by a gradual approach, and then turning down the inner border in the form of a thick, slightly attached plate of enamel; from the front, as it turns back, it becomes thicker and rounded, and at the umbilical region it enters the shell and forms a conspicuous fold. Length $\frac{7}{40}$ inch, breadth $\frac{4}{40}$ inch.

Found on Chelsea Beach by myself, at Provincetown by Colonel Totten, at New Bedford by Prof. Adams, and is not unfrequently taken from fishes.

The same remarks which were made under the preceding species, as to its generic place, apply to this species.

This shell closely resembles the figures, and agrees in general with the description, of *Bulla obtusa*, of Montagu; but in neither of them is any fold at the base of the pillar noted, and our shell has a more ele-

vated spire, and wants the conspicuous lines of growth which peculiarly mark the British shell. *B. canaliculata* differs in its more slender, cylindrical, and smooth appearance, the broad and shallow groove of the whorls, its very acute summit, and its more slightly plaited pillar-lip. In adult specimens it is easy to discriminate the two species; but the half grown specimens are so nearly alike, as to render it almost impossible to separate them. Mr. Lea describes and figures a fossil species in his "Contributions to Geology," under the name of *Actæon Wetherilli*, which must very closely agree with this shell.

BULLA ORYZA.

Shell minute, white, glossy, sub-oval, last whorl enveloping all the others, and marked with a few revolving lines; summit depressed, imperforate.

FIGURE 93.

State Coll., No. 120. Soc. Cab., No. 2387.

Bulla oryza, TOTTEN; *Silliman's Journ.*, xxviii. 350, f. 5.

Shell not very small, not very thin, translucent, white, regularly diminishing from the middle towards each end, the tip being depressed into a shallow pit, and the front being rather pointed; last whorl enclosing all the others; surface marked with minute lines of growth, a few revolving lines on the anterior portion, and a few more obscure ones near the shoulder, none of them perceptible without a magnifier. Aperture as long as the shell, narrow behind, and widening forwards; outer lip simple and sharp, commencing beyond the axis of the shell, and rising a little, then turns, and passes forwards by a regular curve; the left margin is thickened, and forms a smooth, glossy pillar, which is twisted so as to form an oblique fold; at the base it terminates abruptly, so as almost to form an obtuse tooth; a thick callus, commencing at the junction of the outer lip, runs round within the whorl, giving strength to the region of the spire. There is no umbilical opening either at the tip or base. Length $\frac{3}{8}$ inch, breadth $\frac{1}{10}$ inch.

Found by Professor Adams in the mud of New Bedford harbour. It was originally found by Colonel Totten in the harbour of Newport. It seems not to have passed Cape Cod.

In solidity, color, polish and general shape, this is allied to *B. Gouldii*; but is much smaller, and is at once distinguished by its exhibiting no spire.

BULLA LINEOLA'TA.

Shell minute, ovate, ferruginous; whorls three, the last enveloping all the others, and marked with numerous revolving lines; aperture dilated anteriorly.

FIGURE 99.

State Coll., No. 115. Soc. Cab., No. 2386.

Bulla lineolata, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 179, pl. 3, f. 15.

Shell very small, oblong-ovate, broadest anteriorly, very thin and fragile, covered with a thin, rust-colored epidermis; whorls three, forming a flattened spire, the outer one somewhat inflated, and delicately marked with numerous, impressed, revolving lines; aperture extending the whole length of the shell, very narrow behind, and rapidly widening forwards, so that the lip is broadly rounded in front; the pillar has a faint oblique fold near the middle. Within glossy, yellowish-white. Length $\frac{3}{8}$ inch, breadth $\frac{3}{16}$ inch.

Several specimens of this very delicate and very singular shell have been taken from the stomachs of fishes caught in the Bay.

It appears like a diminutive specimen of *Bulla lignaria*, but its somewhat elevated spire is one good distinctive mark. The revolving lines are rather distant, regularly disposed, and always conspicuous under a magnifier.

FAMILY COLIMACEA, LAM.

Animal terrestrial, breathing air, tentacula cylindrical, bearing eyes. Shell spiral, destitute of any external prominences except ridges of increase, the outer lip often reflected.

GENUS HELIX, LIN.

Shell orbicular or sub-globular, spire not much elevated; aperture oblique, broader than long; the pillar and outer lip continuous, simple or armed with teeth.

HELIX ALBO'LABRIS.

Shell orbicular-conical, yellowish horn-color; whorls five or six, convex, marked with the lines of growth, and minute revolving lines; lip white, broadly reflected; umbilicus closed.

FIGURE 101.

State Coll., No. 101. Soc. Cab., No. 1008.

Helix albólabris, SAY; *Nicholson's Encyc.*, (*Amer. ed.*), iv. pl. 1, f. 1. *Long's 2d Expedition to St. Peter's River*, ii. 258. *Amer. Conch.* pl. 13. FE'RUSSAC; *Hist. des Moll.*, pl. 43, f. 1 to 3. BINNEY; *Monogr.*, pl. 2. *Bost. Journ. Nat. Hist.*, i. 475, pl. 13.

Cóchlea Virginiána, LISTER; *Conch.*, t. 47, f. 45.

Shell orbicular, depressed-conical, thin, shining, of a yellowish-brown or russet-color; whorls five to six, rounded, separated by a well-defined suture, and forming a moderately elevated spire, regularly and distinctly wrinkled by the lines of growth, which are crossed by very numerous, delicate, revolving hair lines, scarcely visible without a magnifier; aperture semi-elliptical, contracted by the lip, which is white and very broadly reflected; outer edge sharp, somewhat waved, and colored orange on the back; umbilicus, covered by the extremity of the lip. Diameter generally over one inch.

The *animal* varies in color, sometimes being pure white, cream-color, or grayish; head brownish above; tentacula dusky at tip; eyes black; back shagreened with glandular tubercles; foot rather more than twice the diameter of the shell, pointed behind.

Found in large numbers in all the partially cleared forests of New England, sheltered in the moist mould under decaying logs and rotten stumps; and sometimes about stone walls and rocks in the open fields. It is found in all the States, except, perhaps, the southernmost.

This is our largest snail, and, though so simple in its structure and coloring, is a pleasing shell. Its delicately striated surface, and broad, white lip, cannot fail to gain admiration. It is subject to very little variety, the principal variations being its want of the white re-

flected lip, and an open umbilicus in its immature stages. It has no tooth on the pillar, like *H. thyroïdus*, and *H. zalèta*, is smaller than the former, and less globular than the latter.

The economy of these animals may be briefly stated as follows. They subsist upon decaying leaves and vegetable fibre, under which they usually shelter themselves. In moist weather, and after showers, they issue from their retreats, and crawl over the leaves or up the trunks of trees, until driven back by a change of weather. In early spring they are often seen collected in groups on the sunny side of rocks. In June they deposit their eggs, to the number of thirty to eighty in the light mould by the side of rocks and logs. These are white, opaque, and elastic; and in about twenty to thirty days the young animal issues from them with a shell consisting of one whorl and a half. In October they cease to feed, and select a place under some log or stone where they may be sheltered for the winter, and there they fix themselves, with the mouth upwards. This they close by secreting a thin, transparent membrane, and as the weather becomes cold, they grow torpid, and remain in that state until the warmth of spring excites them to break down the barrier, and enter upon a new campaign of duty and pleasure.

HELIX THYROÏDUS.

Shell convex, yellowish horn-color; whorls five, delicately wrinkled; aperture rounded; lip white, widely reflected; pillar with a single white tooth; umbilicus partial.

FIGURE 108.

State Coll., No. 100. Soc. Cab., No. 1015.

- Helix thyroïdus*, SAY; *Nich. Encyc.*, (*Amer. ed.*), iv. *Journ. Acad. Nat. Sc.* i. 123, ii. 161. *Amer. Conch.*, pl. 13, f. 2. FE'RUSSAC; *Hist. des Moll.*, pl. 49 A. f. 4. DESHAYES; *Encyc. Méth.*, *Vers*, ii. 230. LAM.; *An. sans. Vert.*, viii. 114. BINNEY; *Bost. Journ. Nat. Hist.*, ii. pl. 18.
Cóchlea umbilicàta, LISTER; *Conch.*, t. 91, f. 91.
Cóchlea terrestris Virginiàna, SCHROET.; *Einl. in Conch.*, ii. 192.
Mésodon leúcodon, RAFINESQUE.

Shell rounded, convex, of a uniform yellowish-brown or russet-color; whorls about five, convex, marked with delicate and parallel lines of growth; suture distinct; aperture broad, semi-lunar, contracted by the lip; lip white, widely reflected, and

sometimes grooved, its exterior yellowish ; at the inner side, on the last whorl, is a white, tooth-like tubercle, placed obliquely ; umbilicus exhibiting only one volution, and partially covered by the reflected lip. Diameter about three fourths of an inch.

Animal of a dirty yellowish-color, with a greyish hue in some individuals ; tentacula darker ; eyes black ; base of the foot dirty white ; length equal to twice the diameter of the shell.

Found in nearly all parts of this State, but by no means common. It is numerous in all the Southern and Western States.

This is a plain but pretty shell, bearing a great resemblance to *H. albólabris*, yet readily distinguished from it. It is a smaller shell, more globose ; its aperture is more oblique, and the partially closed umbilicus and tooth on the inner lip are specially characteristic. It varies considerably in its size, and in the degree of its convexity. The umbilicus is sometimes entirely closed ; and in immature shells the tooth is generally wanting. It is occasionally found reversed.

HELIX HORTE'NSIS.

Shell sub-globose, thin, smooth, greenish-yellow, or variously banded with brown ; lip reflexed, white, thickened within ; umbilicus closed.

State Coll., No. 102. Soc. Cab., No. 994 to 996, 1062.

Helix horténsis, MÜLLER ; *Verm.*, 52, No. 247. BORN ; *Mus.* t. 16, f. 18, 19. CHEMN. ; *Conch.*, ix. t. 133, f. 1199 to 1201. DRAPARNAUD ; *Moll.*, pl. 6, f. 6. FE'RUSSAC ; *Hist. des Moll.*, pl. 35 and 36. LAM. ; *An. sans Vert.*, viii. 55, where references to numerous other works may be seen.

Helix sub-globòsa, BINNEY ; *Bost. Journ. Nat. Hist.*, i. 485, pl. 17. *Monogr.*, pl. 6.

Shell sub-globular, thin, smooth, and shining ; whorls four or five, convex, with apparent lines of growth ; suture distinct ; termination of the outer whorl declining ; aperture rounded, slightly contracted at the base by the thickening and inflection of the lip ; lip slightly reflected, white, thickened within ; base somewhat convex, umbilicus covered ; general color greenish-yellow, more or less dark ; sometimes plain, but generally variously banded with dark reddish-brown. Diameter about three fourths of an inch.

The *animal* has the head and neck blackish, with a slight tinge

of brown ; tentacula smoky ; eyes black ; base of foot inky, tip dirty flesh-color ; respiratory orifice surrounded by a dark circle ; length about twice the diameter of the shell.

Inhabits the sea-coast, and is common on the lower parts of Cape Cod and Cape Ann. It is very abundant on Salt Island, near Gloucester. It has been noticed in the region of Portland, Maine, and along the banks of the St. Lawrence.

This species, so abundant in Europe, and so well known in every cabinet, has been undoubtedly imported to this continent, and has not as yet made great advances into the interior. The specimens first discovered by Dr. Binney were all of the plain, greenish-yellow variety ; and, though he could not fail to perceive their affinity to the *H. horténsis*, he thought he discovered differences enough to entitle them to a specific distinction, and therefore described them under the name *H. sub-globosa*. But numerous specimens have since been brought from the same vicinity, bearing all the various zones of the European specimens. His remarks on the manner in which the epiphragm, which closes up the orifice in winter, is formed, are curious. Unlike other American species, they are not found burrowing under stones and decayed leaves, but on the ground, and crawling up the stems of plants.

The best authorities now regard the *H. horténsis* of authors as merely a variety of *H. nemoralis*, Lin., with a white instead of a dark lip.

HELIX TRIDENTATA.

Shell depressed, yellowish horn-colored ; whorls obliquely wrinkled ; aperture contracted, three-lobed, two teeth on the outer lip, and a curved one on the pillar ; lip reflexed, white ; umbilicus deep.

FIGURE 115.

State Coll., No. 103. Soc. Cab., No. 1019.

Helix tridentata, SAY ; *Nich. Encyc.*, (*Amer. ed.*) iv. FE'RUSSAC ; *Hist. des Moll.*, pl. 51, f. 3. DESHAYES ; *Encyc. Méth., Vers.*, ii. 213. LAM. ; *An. sans Vert.*, viii. 115. WOOD ; *Index, Suppl.*, pl. 7, f. 2. BINNEY ; *Bost. Journ. Nat. Hist.*, iii. pl. 22, f. 1.

Shell flattened, slightly convex above and below, yellowish horn-colored ; whorls four and a half to six, slightly convex,

crossed obliquely with numerous fine and regular lines of growth ; aperture contracted, rendered trilobate by the presence of two small, pointed teeth on the outer lip ; opposite the middle lobe, placed obliquely on the inner lip, is a thin, somewhat curved, white tooth ; lip broad, white, partially reflected, with a constriction behind it ; umbilicus not large, deep, and partly covered by the extremity of the reflected lip. Diameter about half an inch.

Animal dark-bluish slate-color, deeper on the head, back and tentacula ; foot nearly twice as long as the diameter of the shell.

This well-marked species is not found near the sea-coast, and but rarely in the forests, at the western part of this State. It inhabits all the Atlantic States, and those north of the Ohio.

It varies much in size and other respects, in different localities. Specimens from this region have the lip narrow, the teeth small, the aperture but slightly contracted, the spire depressed, and are of a medium size. In Ohio it is larger, in Florida much smaller.

Dr. Binney regards the *H. fallax* of Say, as a variety of this species, in which the spire is more elevated, and the parts about the aperture greatly developed, so that the aperture is nearly closed by the teeth and the stricture behind the lip ; the upper lip-tooth has often two or three points, and the tooth on the inner lip extends quite to the base of the shell, so as to unite with the extremity of the lip.

The middle one of the three lobes is smallest, and their outline regularly arched, so as to resemble somewhat the ace of clubs.

HELIX MO'NODON.

Shell rather depressed, dusky horn-color, hispid ; aperture semilunar ; lip white, reflexed ; with a single elongated tooth fixed obliquely to the pillar ; umbilical region excavated.

FIGURE 113.

State Coll., No. 105. Soc. Cab., No. 1054.

Helix monodon, RACKETT ; *Lin. Trans.*, xiii. 42, pl. 8, f. 2. BINNEY ; *Bost. Journ. Nat. Hist.*, iii. pl. 14, f. 1.

Shell slightly convex ; whorls five or six, narrow, diminishing very gradually in breadth from the outer whorl to the apex, marked with very fine lines of growth, and covered with a dark russet

or chestnut-colored epidermis, which is beset with very minute, hair-like projections; aperture contracted by a deep groove behind the lip; lip white, narrow, reflexed, a little grooved on its face, extending on the base to the umbilicus and slightly contracting it, and its outer edge not projecting beyond the surface of the whorl; umbilicus deep, not exhibiting all the volutions, partially covered by the lip; base rounded, very much excavated at the umbilical region, with a compressed, elongated white tooth at the edge of the aperture. Greatest diameter nearly half an inch.

Animal yellowish-brown, darker on the head and tentacula. Foot narrow, cylindrical, half as long again as the diameter of the shell, terminating in a point. Eyes black.

Found in the middle and western parts of this State, sometimes in forests with other species, but more commonly on the hill-side pastures under stones, where other species rarely occur. Two individuals are commonly found together. It is also found in the Northern and Northwestern States.

The hairy processes are most conspicuous in young shells, but are often wanting at every stage of growth. The oblique lines of growth are so minute, that the shell often appears quite smooth and shining.

This species and *H. fratérna* of Say are very similar, if not identical. He separates his species on account of the almost invariable closure of the umbilicus, and Dr. Binney, in his "Monograph," adopts Mr. Say's opinion. If they are the same, the name *mónodon* has the claim to priority.

HELIX HIRSUTA.

Shell globular, hairy, chestnut-colored; aperture very narrow; outer lip reflexed, having a fissure on its inner margin; pillar lip with a long, compressed tooth; umbilicus closed.

FIGURE 116.

State Coll., No. 104. Soc. Cab., 1017.

Helix hirsuta, SAY; *Journ. Acad. Nat. Sc.*, i. 17, ii. 161. FE'RUSSAC; *Hist. des Moll.*, pl. 50 A. f. 1 to 3. DESHAYES; *Encyc. Méth., Vers*, ii. 253, No. 117. LAM.; *An. sans Vert.*, viii. 113. BINNEY; *Bost. Journ. Nat. Hist.*, iii. pl. 14, f. 3.
Helix fratérna, WOOD; *Index, Suppl.*, pl. 8, f. 16.
Stenotrèma convèxa, RAFINESQUE;

Shell nearly globular ; whorls five, rounded ; suture distinct ; epidermis brownish, covered with numerous sharp, rigid hairs ; aperture very narrow, almost closed by an elongated, lamelliform tooth, situated on the pillar lip, and extending from the centre of the base nearly to the junction of the lip with the outer whorl ; lip narrow, very much depressed and reflected against the body whorl, with a deep cleft or fissure near the centre of the inner margin ; base convex ; umbilicus wholly closed. . Greatest diameter $\frac{1}{3}$ inch, ordinary size less than $\frac{1}{4}$ inch diameter.

Animal whitish, head and tentacula slate-colored ; foot slender, semi-transparent, length less than twice the breadth of the shell ; cavity of the tentacula apparent when they are drawn in, by two dark lines, with a whiter space between.

Found to the west of Connecticut River, not common. In the Middle and Western States it is abundant.

This very peculiar snail is at once distinguished from every other species by the singular fissure on the inner edge of the lip. There is sometimes a minute, tooth-like process on the inner and upper part of the lip, which is visible only on looking into the aperture. Sometimes its hairy vesture covers it at every part ; at other times it is quite smooth. Dr. Binney has once or twice noticed a white band on the body whorl.

HELIX PULCHE'LLA.

Shell minute, white, depressed ; whorls four, suture deep ; aperture circular, lip reflexed, thickened ; umbilicus large.

FIGURE 102.

State Coll., No. 41. Soc. Cab., No. 1056.

Turbo helícinus, LIGHTFOOT ; *Lond. Phil. Trans.* 1786.

Helix pulchélla, MÜLLER ; *Verm. Hist., &c.* No. 232, 30. DRAPARNAUD ; *Hist. &c.*, 112, pl. 7, f. 30 to 34. BRARD ; *Moll.*, 56, t. 2, f. 9. ALDER ; *Mag. Zool. and Bot.*, ii. 109. LAM., *An. sans Vert.*, viii. 76. DESHAYES ; *Encyc. Méth., Vers*, ii. 440. FE'RUSSAC ; *Hist. des Moll.*, No. 173. BINNEY ; *Bost. Journ. Nat. Hist.*, iii. pl. 13.

Helix paludòsa, MONTAGU ; *Test. Brit.*, 440. RACKETT ; *Lin. Trans.*, viii. pl. 5, f. 5.

Turbo paludòsus, TURTON ; *Conch. Dict.*, 228.

Helix minùta, SAY ; *Journ. Acad. Nat. Sc.*, i. 123.

Zuràma pulchèlla, LEACH; *Mollusc.*, 108. GRAY; *Edit. of Turton's Brit. Land., and Fr. Water Shells*, 141.

Lucèna pulchèlla, HARTMANN; t. 1, f. 6.

Shell minute, semi-transparent, white, or very light horn-color, thin, depressed; whorls four, very minutely marked with lines of growth, the last spreading at the mouth like a trumpet; suture deeply impressed; aperture circular, the lip very nearly surrounding it, much thickened, white, and reflected; umbilicus large, exhibiting all the volutions within. Diameter one tenth of an inch.

Animal pale, semi-transparent.

Rather common in the vicinity of Boston, under stones in rich soil, and about decaying stumps. It is probably abundant in all parts of this State, and has been noticed in Ohio, and on the banks of the Missouri as high up as Council Bluffs.

This very minute snail is a very beautiful shell when examined by a magnifier. It has rather the external characters of *Cyclóstoma* than of *Helix*. It agrees with the *H. pulchèlla* of Müller in all respects, except that it is never supplied with the sharp, parallel ribs which are frequently found on the foreign specimens, though by no means constantly. It is thought by some to have been introduced from Europe. But, as Dr. Binney remarks, "it does not seem possible that so small an animal, if naturalized since the arrival of Europeans, could have been able to penetrate to the remote points in the interior of the continent where it is now found."

HELIX ALTERNÀTA.

Shell orbicular, depressed, fawn-colored, barred with oblique, zigzag lines of dusky; whorls five or six, with prominent wrinkles at the lines of growth; lip simple; umbilicus large and deep.

FIGURE 114.

State Coll., No. 99. Soc. Cab., No. 1045.

Helix alternàta, SAY; *Nicholson's Encyc., (Amer. ed.)*, iv. pl. 1, f. 2. *Journ. Acad. Nat. Sc.*, ii. 161. FÉRUSSAC; *Hist. Nat. des Moll.*, pl. 79, f. 8, 9, 10. DESHAYES;

Encyc. Méth., Vers, ii. 219. BINNEY; *Bost. Journ. Nat. Hist.*, iii. pl. 32.

Helix scabra, LAM.; *An. sans Vert.*, viii. 66.

Helix radiàta, GMELIN; *Syst.*, 3674, No. 73. LISTER; *Conch.*, t. 70, f. 69.

Shell orbicular, depressed, slightly convex above and below ; general tint a light fawn-color, which, on the upper surface, alternates, in about equal proportions, with oblique, zigzag bars of dark-brown ; these bars grow narrower and lighter on the lower surface as they converge to the umbilicus ; they are generally interrupted by a light-colored zone which issues from the middle of the inner margin of the aperture ; whorls five to six, flattened above, conspicuously plaited at the lines of growth so as to produce a rough surface above, but nearly smooth beneath ; the shell has a sharp dividing line between the upper and lower surfaces in all its earlier stages, which disappears only at maturity, forming a circular aperture, slightly modified by the preceding whorl ; lip simple and delicate ; umbilicus large and deep, exhibiting all the volutions. Diameter often an inch.

Animal with the head and tentacula of a light slate-color, back brown, remainder of the upper surface brownish-orange ; eyes black ; base of foot drab-colored ; collar saffron. Tentacula one third of an inch long, blackish at tip. Foot not much exceeding the diameter of the shell, terminating in a broad, flat, obtuse tip ; a light marginal line runs along the foot from the head to the posterior tip.

Found everywhere in old forests and in moist situations under decaying logs and stumps. In this State it is not often found near the sea-coast. Dr. Yale, however, has observed numerous dead specimens on Martha's Vineyard.

The shell varies in being more or less depressed, and the wrinkles more or less obvious ; sometimes no bars are observable on the lower surface.

The animal and its tentacula are proportionally shorter than in our other species. Its habits are gregarious, so that several are usually found in company.

HELIX STRIATÉLLA.

Shell small, orbicular, depressed, rufous ; whorls six, with prominent lines of growth ; aperture declining, rounded ; lip simple ; base widely and deeply umbilicated.

FIGURE 112.

State Coll., No. 98. Soc. Cab., No. 2391.

Helix striatélla, ANTHONY ; *Bost. Journ. Nat. Hist.*, iii. 278, pl. 3, f. 2. BINNEY ; *Bost. Journ. Nat. Hist.*, iii. pl. 28, f. 3.

Shell small, orbicular, very much depressed, almost discoidal, of a uniform reddish horn-color; whorls four, flattened above and rounded below, separated by a well-defined suture, delicately wrinkled by the elevated and sharp lines of growth, and in all immature stages presenting a sharpened or carinated edge at the circumference; aperture rounded, declining, somewhat broader than high; lip simple and thin; lower surface rendered cup-shaped by a broad and deep umbilicus, whose diameter is nearly that of the outer volution. Diameter about one fourth of an inch.

The *animal* has the tentacula bluish-black; margin, and posterior part of foot, white. Foot transparent, less than twice the diameter of the shell in length; terminating acutely.

Found abundantly in all parts of this State, about old stumps, and under the bark of decaying logs.

The cup-shaped base, and beautifully raised lines of growth, sufficiently designate this shell. Its form is like that of *H. rotundata* of Europe, which, however, is checkered by darker bars, like our *H. alternata*.

This is the shell, which, till recently, has been regarded as the *H. perspectiva* of Say. Several gentlemen in Ohio, where both species are found, have for some years discriminated the two shells; and in January, 1839, Mr. J. G. Anthony communicated to the Boston Society of Natural History a description of this species. After mature examination, conchologists have become satisfied that the Massachusetts shell is the *H. striatella*, and that *H. perspectiva* is not found in this region. The differences are, that *H. striatella* is altogether a more delicate shell in structure and marking, the number of whorls is one less, the color is lighter, and the shell smaller; the sharp external edge is also more conspicuous, and, looking into the throat, we do not find the tooth-like thickening which exists within the lower margin of *H. perspectiva*. Mr. Anthony also observes, that it is found in low lands, near running streams, and never about rotten logs, the common residence of *H. perspectiva*. This, however, does not accord with its habits in Massachusetts.

HELIX LINEATA.

Shell small, discoidal, green; whorls four, with fine, elevated, parallel, revolving lines; aperture narrow, semi-lunar; lip simple;

throat with two or more pairs of teeth ; umbilicus broad and deep.

FIGURE 103.

State Coll., No. 108. Soc. Cab., No. 2393.

Helix lineata, SAY ; *Journ. Acad. Nat. Sc.*, i. 18, ii. 273. FÉRUSSAC ; *Hist. Nat. des Moll.*, pl. 79, f. 1. BINNEY ; *Bost. Journ. Nat. Hist.*, iii. pl. 29, f. 3.

Shell minute, discoidal, flat above, concave beneath, greenish ; whorls about four, flat above, higher than broad, separated by a distinctly impressed suture, covered with numerous, parallel, raised, revolving lines ; otherwise smooth ; aperture narrow, semi-lunar ; lip simple and thin ; umbilicus wide and deep, exhibiting each volution to the apex. Within the aperture, on the external wall, are placed two pairs of white, conical teeth, the first pair in sight on looking into the aperture, the other more remote, and seen only through the semi-transparent shell. Diameter one eighth of an inch, usually less.

Animal whitish, transparent, thread-like.

Found in this, and all the other New England States, and in Pennsylvania. It has been noticed, for the most part, under the bark, or in the interstices, of rotten wood ; sometimes under stones and leaves in damp places.

At first sight, one would be disposed to call this shell a *Planorbis* rather than a *Helix*. Perhaps it is the *P. parallélus*, of Say. Its wheel-shaped form, greenish color, revolving raised lines, and singular teeth, are characters which cannot be mistaken. One pair of these teeth may always be found and seen ; and in one instance Dr. Binney noticed even a third pair still farther within the whorl.

HELIX CELLARIA.

Shell orbicular, depressed, thin, pellucid, glistening, smooth ; whorls five, flattened ; aperture rounded ; lip simple ; umbilicus deep.

FIGURE 104.

State Coll., No. 97. Soc. Cab., No. 1059.

Helix cellaria, MÜLLER ; *Verm. Hist.*, No. 230. CHEMN. ; *Conch.*, ix. t. 127, f. 1129, 1, 2. FÉRUSSAC ; *Hist. Nat. des Moll.*, No. 212. DESHAYES ; *Encyc.*

Méth., Vers., ii. 215. LAM.; *An. sans Vert.*, viii. 71. BINNEY; *Bost. Journ. Nat. Hist.*, iii. pl. 26, f. 2.

Helix nitida, DRAPARNAUD; *Moll.*, pl. 8, f. 23 to 25.

Helix nitens, MATON and RACKETT; *Lin. Trans.*, viii. 198, pl. 5, f. 7. BRARD; *Hist. des Moll.*, 34, pl. 2, f. 2.

Helix gláphyra, SAY; *Nicholson's Encyc.*, (Amer. ed.), iv. pl. 1, f. 3.

Zonites cellàrius, GRAY's *Turton, &c.*, 170, pl. 4, f. 40.

Zonites lúcida, LEACH; *Mss.*

Shell small, orbicular, depressed, concave beneath, thin, pellucid, smooth, and glistening; whorls five, slightly convex, with minute, almost imperceptible lines of growth, otherwise highly polished; color light-greenish, horn-colored above, drab-colored beneath, or milky-white. Aperture rounded, but broader than high; lip simple, very thin and sharp; base elegantly rounding into a rather large and deep umbilicus. Diameter rather less than half an inch.

Animal has its upper surface light indigo-blue, darkest on the head, neck, and tentacula, collar greenish, eyes black. Foot narrow and slender, not much exceeding in length the diameter of the shell, and terminating acutely.

Found in gardens, damp cellars, about cisterns, and similar moist and fertile localities.

There can be no doubt that the *H. gláphyra* of Say is identical with the *H. cellària* of Müller; a comparison of shells of the same size and growth showing them to be absolutely similar in every respect. It was probably imported from Europe, as it may have easily been, about water casks, green-house plants, &c.

It seems as yet to be confined to the Northeastern and Middle States. The shell which is very commonly found marked as *H. gláphyra* is the *H. inornàta*, SAY, in an immature state. This is a less delicate shell, but in its earlier stages, when there is but a small umbilicus, there is no inconsiderable resemblance between the two, and it would accord well with the description; but no one familiar with the present species would ever mistake one for the other.

HELIX INDENTA'TA.

Shell orbicular, depressed, very thin and shining; whorls four, the external one marked with rather distant impressed lines radiating from the closed umbilicus; lip simple.

FIGURE 109.

State Coll., No. 106. Soc. Cab., No. 1058.

Helix indentata, SAY; *Journ. Acad. Nat. Sc.*, ii. 372. BINNEY; *Bost. Journ. Nat. Hist.*, iii. pl. 29, f. 1.

Shell small, orbicular, very low conical, thin, pellucid, very light horn-color, highly polished and shining; whorls four, slightly convex, the whole spire having a conical slope from the apex to the edge; the outer one rapidly increasing, marked with somewhat remote, sub-equidistant impressed lines, in the direction of the lines of growth, the intervening spaces very smooth; suture moderately deep; aperture large, well rounded; lip simple; base having the umbilical region deeply excavated, but not perforated, with very few exceptions, the lip usually terminating at the central point. Diameter one fifth of an inch, sometimes more.

Animal bluish-black upon the upper parts; margin and posterior extremity lighter.

Found in company with *H. arborea* and *H. striatella*, about decaying stumps and logs. At Oak Island, in Chelsea, I have found it abundantly. It has been noticed in New Jersey, Pennsylvania, and Ohio.

This species is of about the same size as *H. arborea*. Its color is much lighter, its apex less depressed, its whorls less in number by one, the outer whorl increases much more rapidly, its umbilicus is usually closed; and, moreover, the impressed lines, which look like water lines, or the lines on a gooseberry, apparently radiating from the umbilicus, are entirely characteristic, and distinguish it from every other species. They are not readily discerned without a magnifier.

HELIX ARBOREA.

Shell small, orbicular, depressed, thin, pellucid, shining; brownish horn-colored; whorls four, minutely wrinkled; aperture rounded; lip simple; umbilicus open.

FIGURE 110.

State Coll., No. 96. Soc. Cab., No. 1057.

Helix arborea, SAY; *Nicholson's Encyc.*, (*Amer. ed.*), iv. pl. 4, f. 4. FÉRUSAC; *Hist. Nat. des Moll.*, No. 219. BINNEY; *Bost. Journ. Nat. Hist.*, iii. pl. 26, f. 1.

Shell small, orbicular, slightly elevated, the apex a little depressed, concave beneath, brownish horn-colored, smooth, thin, fragile, pellucid, shining; whorls fine, slightly rounded above, separated by a well-impressed suture, marked with very fine lines of growth, more decidedly wrinkled at the suture; beneath very smooth, regularly rounding into a moderately large, deep, and well-developed umbilicus; aperture rounded; lip simple and thin. Diameter commonly one fifth of an inch, sometimes one fourth.

Animal has the head and tentacula blackish, upper parts bluish, posterior parts whitish, transparent. Foot thin and narrow.

A very common species, always to be found about decaying stumps, old logs, &c. It has been noticed in nearly every part of the continent.

This shell has very little to distinguish it except its very simple structure. It is like *H. cellària* except in its smaller size. *Helix indentàta* and *gulàris* have both a similar size and external appearance; but the first is known by its distant, impressed, radiating lines, and the second by the peculiar tooth within its aperture. Férussac supposed it to be a variety of *H. lúcida*, Drap.; but our shell has the umbilical region more excavated, and the umbilicus larger; there is also one whorl less, in shells of the same size, so that the surface appears less crowded. The aspect of the two shells, on comparison, is sufficiently diverse. *H. eléctrina* has also one whorl less, and has a much more polished appearance.

Occasionally, a thickening of the shell seems to take place at intervals, so as to produce an opaque appearance.

HELIX ELÉCTRINA.

Shell small, depressed, pellucid, fragile, amber-colored; whorls four, conspicuously wrinkled by the lines of growth; aperture rounded; lip simple; umbilicated.

FIGURE 111.

State Coll., No. 107. Soc. Cab., No. 2392.

In the size, depressed-conical shape of the upper surface, the number of whorls, and the rapid enlargement of the lowest whorl, this shell corresponds with *H. indentàta*. It differs in its darker,

smoky horn-color, its constant umbilicus, its rather thick and shining lip, and its whitish wrinkles, which, instead of being remote, are crowded as in other species. From *H. arborea* it differs in having one whorl less, the last one dilating; its apex not being depressed, its thinner, more shining structure, and its somewhat smaller umbilicus. In *H. arborea* the outer lip has a flexuous curve, but is nearly a direct section of the whorl in this. Though all of the same size and general appearance, the three may be readily separated, when seen in company. Indeed, its claims as a distinct species are not very obvious without viewing the three together. It may be briefly described by saying, that it resembles *H. indentata* above, and *H. arborea* beneath.

This shell was first discovered by Mr. T. J. Whittemore, about the borders of Fresh Pond, in Cambridge, where it has since been found abundantly by him and by myself, under fragments of board in damp places, near the water's edge, in company with *H. chersina* and *Pupa modesta*. I have never seen it in company with either *H. indentata* or *H. arborea*; and it seems to differ widely from them in its habits, in thus preferring the vicinity, and even the intrusion, of water. Professor Adams informs me, that he has selected numerous specimens of this species from among small snails collected by him in Missouri.

HELIX LABYRINTHICA.

Shell minute, conic-globose; whorls six, with conspicuous oblique lines; lip reflected; aperture with one or two teeth prolonged within it; umbilicus minute.

FIGURE 106.

State Coll., No. 109. Soc. Cab., No. 1030.

Helix labyrinthica, SAY; *Journ. Acad. Nat. Sc.*, i. 124. *Nicholson's Encyc.*, (Amer. ed.), iv. FÉRUSAC; *Hist. Nat. des Moll.*, pl. 51 B. f. 1. BINNEY; *Bost. Journ. Nat. Hist.*, iii. pl. 24, f. 1.

Shell small, rounded-conical, apex obtuse; spire elevated, whorls six, separated by a well-marked suture, with conspicuous, oblique lines or ridges at regular distances; epidermis dark brownish horn-color; aperture small; outer lip thickened, and somewhat reflected, often rose-colored; inner lip with a long,

raised line or tooth, which appears to revolve within the shell parallel to the suture, and sometimes a second nearer to the base, less conspicuous, and terminating farther within the aperture; beneath flat, umbilical region impressed, and the umbilicus minute. Greatest diameter one tenth of an inch, height nearly as much.

Animal has the head slate-colored above, the tentacula quite dark; foot white as printing paper, linear; space between the four tentacula and neck lighter colored.

Found in various parts of this State, usually in the fissures of decaying wood, or under fragments of wood in moist places, or in beds of decaying leaves. It inhabits a wide range of territory, having been found as far distant as Missouri. It is not frequently found, however, on account of its minuteness, and its dusky color.

It is readily distinguished from other species by the remarkable raised lines revolving within the aperture. Usually, but one of them exists; but when both are present, their parallel position gives them a close resemblance to the track of a rail-road. The oblique plaiting of the whorls is very conspicuous, and renders the exterior quite beautiful. The outer lip in fresh specimens has a rose-colored tint. The shell varies considerably in the elevation of the spire, being sometimes much flattened, and again it has a pointed apex.

HELIX CHÉRSINA.

Shell minute, globose-conic, pellucid, very smooth and shining; whorls six, suture deep; aperture narrow; lip simple; umbilicus closed.

FIGURE 105.

State Coll., No. 110. Soc. Cab., No. 2394.

Helix chérsina, SAY; *Journ. Acad. Nat. Sc.*, ii. 156. BINNEY; *Bost. Journ. Nat. Hist.*, iii. pl. 24, f. 3.

Shell minute, sub-globose-conic, thin, pellucid, very smooth and shining, of a smoky horn-color; whorls separated by a deep suture, and so crowded that they appear much higher than broad, and present an elevated, somewhat turretted spire, with a rounded apex; they are so smooth that scarcely any traces of the lines of growth are visible; aperture semi-lunar, narrow,

much higher than broad, of about an equal width above and below ; lip simple ; base convex, umbilical region indented, but closed. Diameter about one tenth of an inch, height somewhat less.

Found abundantly about the margin of Fresh Pond, under fragments of wood, in company with *Succinea ovalis*, *Pupa modesta*, &c., and also in moist beds of leaves in forests. It has been found in Vermont, and Mr. Say originally found it in Georgia, so that it is a widely spread species.

This is a very well marked shell, not liable to be confounded with any other species except *H. labyrinthica*, which is of about the same size and shape. But the coarsely wrinkled surface of the one, and the polished, highly reflecting surface of the other, are distinctions which strike the eye at once ; if any thing further is needed, the parallel ridges within the mouth of *H. labyrinthica* will put the question beyond doubt. When viewed from above, its numerous, narrow, accurately adjusted volutions render it a very beautiful object.

GENUS PUPA, LAM.

Shell small, more or less cylindrical, and obtuse at tip ; aperture irregular, for the most part semi-oval, and modified by teeth.

PUPA CONTRÁCTA.

Shell ovate-conical, whitish ; whorls five, convex ; aperture sub-ovate, lip spreading ; throat armed with three teeth, and contracted, by a large concave tooth on the transverse lip, into the form of a horse-shoe.

FIGURE 117.

State Coll., No. 88. Soc. Cab., No. 2395.

Pupa contracta, SAY ; *Journ. Acad. Nat. Sc.*, ii. 374. GOULD ; *Bost. Journ. Nat. Hist.*, iii. 399, pl. 3, f. 22.

Shell ovate-conical, of a waxen white-color ; whorls five, convex, faintly marked by lines of growth, separated by a well-impressed suture, and gradually tapering to a somewhat pointed apex. Aperture irregularly ovate, about half the width of the

lower whorl, broadest above, and somewhat pointed in front ; lip widely reflected, not flattened, so as to give a bell-shaped form ; throat with three, and perhaps four teeth ; a large spoon-shaped one, concave to the right side, seated on the transverse lip, and greatly contracting the throat into something of a horse-shoe-shape ; a very slight undulation near the top of the left lip ; an oblong, thin tooth, seated at the front of the pillar, so far within as scarcely to be discerned without breaking the shell ; and a minute tooth about the middle of the right lip ; umbilicus large and distinct ; last whorl indented at some distance behind the outer lip. Length $\frac{1}{10}$ inch, breadth $\frac{1}{20}$ inch.

Found about old stumps, and decaying logs, usually under the bark, and near the earth. It has been observed in most parts of the United States.

It is readily known by its whitish, translucent appearance, by its bell-shaped aperture, and especially by its large, spoon-shaped tooth, which gives such a peculiar form to the throat. The teeth at the sides may rather be regarded as inward protuberances of the margin. It appears to be covered with a hairy or glutinous coating, which causes dirt to adhere to it.

PUPA MILIUM.

Shell sub-oval, wrinkled, light chestnut-colored ; whorls four, suture moderate ; aperture heart-shaped, armed with six teeth ; umbilicus free.

FIGURE 118.

State Coll., No. 92. Soc. Cab., No. 1140.

Pupa milium, GOULD ; *Bost. Journ. Nat. Hist.*, iii. 402, pl. 3, f. 23.

Shell minute, of a nearly oval form, color a light-chestnut ; whorls four, or somewhat more, obviously wrinkled, rather convex, arranged so as to form a bluntly rounded apex ; suture deep ; aperture half the width of last whorl, heart-shaped, the apex being its right upper angle ; the transverse margin is nearly direct, the outer margin is scolloped by an indentation of the lip ; the remainder of the margin is regularly rounded ; lip white, slightly everted ; throat with six teeth, two of which are on the transverse

lip, equidistant ; one with a tubercle at its base, on the middle of the left lip, and nearly at right angles with the former is the largest ; a fourth is on the indenture of the outer lip, directed between the two on the transverse lip, and two smaller ones, more retired within the shell, are equidistant between the two last mentioned ; umbilicus large and deep. Length less than $\frac{1}{8}$ inch, breadth $\frac{1}{8}$ inch.

This shell I first found in November, 1839, at Oak Island, Chelsea, after a warm rain. Professor Adams has found it in Vermont. It was crawling on the damp leaves, in company with *Bulimus lubricus*.

Not finding any description answering to it, I have proposed a name. It is even more minute than *P. exigua*, and is not readily detected. In size and outline it resembles *P. vértigo*, Drap., *V. pusilla* of other authors ; but that shell is reversed, and has a different armature. The teeth are all distinct, long, compressed, and very sharp.

I have labored to make this out to be the *P. ovata* of Say ; but on the whole I think the discrepancies are too important to be reconciled. That shell is described as larger, with a semi-oval aperture, and with seven teeth, differently arranged from those of our shell.

PUPA MODE'STA.

Shell ovate-conic, amber-colored ; whorls five or six, convex, wrinkled ; aperture semi-oval, broader than long ; teeth five ; umbilicus distinct.

FIGURE 119.

State Coll., No. 90. Soc. Cab., No. 2397.

Pupa modésta, SAY ; *Long's Second Expedition, Append.*, ii. 259, pl. 15, f. 5.

Shell minute, ovate-conic, thin, amber-colored ; whorls five ; sometimes six, minutely wrinkled, well rounded, and defined by a deep suture, gradually diminishing to a rather acute apex ; aperture about half the breadth of the last whorl, slightly oblique ; rather broader than long ; semi-oval, but modified by an inflection of the outer lip ; lip simple, not reflected, joining the preceding whorl behind, by a curve ; teeth five, slender, sharp and direct, like the teeth of a comb ; one on the middle of the transverse lip, a still larger one at right angles on the middle of the pillar lip, a

minute one at the front of the pillar, and two farther within the shell, one opposite the tooth on the transverse lip, the other on the indentation of the outer lip; umbilicus small, distinct. Length $\frac{3}{8}$ inch, breadth $\frac{1}{3}$ inch.

Inhabits damp, rich places, near water, or in fertile fields under bits of board, chips, sticks, &c. It was first noticed in this region by Mr. T. J. Whittemore, at Cambridge. Mr. Say found his specimens in the North West Territory.

It is a very small, but interesting shell; double the size, however, of the preceding species, and of a much more conical shape. Their color is similar. In their armature the two are very different. The pillar lip is somewhat broad and flattened.

Mr. Say describes only four teeth, but the small one at the base of the pillar probably escaped his observation, as it would only be seen under a high magnifier. One of the teeth on the right lip is often wanting. I have occasionally noticed a specimen with two, and even three, teeth upon the transverse lip.

PUPA CURVIDENS.

Shell elongated-ovate, obtuse at apex, smooth; whorls five; aperture sub-triangular, armed with nine teeth, the two largest of which are curved; lip white, broadly everted; umbilicated.

FIGURE 120.

State Coll., No. 89. Soc. Cab., No. 2396.

Shell minute, ovate, but much elongated; of a spermaceti-white color; whorls five, convex, smooth, gradually diminishing to an obtuse apex; suture deeply impressed; aperture sub-triangular, with the front and outer angles rounded, and the outer lip curved inwards, so as almost to make the aperture heart-shaped; the transverse margin is straight, and slightly oblique; the inner lip is also nearly straight, so that these two form a right angle at their junction; lip widely reflected, flattened, white; throat armed with nine teeth; the longest, somewhat curving to the left, compressed and pointed, is situated on the middle of the transverse lip, and has a small one seated at its left side; at the front, nearly opposite the large tooth, almost as large and inclined to

the left also, is a quadrangular, blunt tooth, more slightly curved; on the left margin are three teeth, of which the upper one is largest, and about half the size of the basal tooth, of a blunt quadrangular figure; the other two are minute; on the outer lip are also three teeth, of which the two upper are very small and pyramidal; umbilicus open. Length $\frac{1}{15}$ inch, breadth $\frac{1}{16}$ inch.

This minute species I first found under a loose stone on the ledges at Phillips's Point, Lynn, near the Ocean House. It was somewhat broken, so as to give an excellent view of the teeth, since then I have met with it not unfrequently, in damp places, under leaves and boards, in company with *P. modesta*.

The shell goes on regularly narrowing both downwards and upwards from the middle of the lower whorl. Four of the teeth are very small, and would scarcely be discerned without being highly magnified, and they seem to be seated farther within the aperture; the small one on the transverse lip, the basal one, and the upper one on the right lip are liable to be wanting. So far as I can ascertain, it has not been previously described, unless several of the teeth have been overlooked. It is nearest allied to *P. pentedon*.

PUPA SIMPLEX.

Shell minute, cylindrical-ovate, smooth; whorls five; aperture circular, toothless; umbilicated.

FIGURE 121.

State Coll., No. 93. Soc. Cab., No. 2398.

Pupa simplex, GOULD; *Bost. Journ. Nat. Hist.*, iii. 403, pl. 3, f. 21.

Shell minute, two thirds of the shell cylindrical, surmounted by a rapidly formed, blunt apex, smooth, light chestnut-colored. Whorls five, moderately convex, separated by a distinct suture, quite smooth; aperture circular, except for a small section from the posterior portion, which is cut off by the encroachment of the preceding whorl; lip simple and sharp, slightly everted on the left side, and partially hiding a small umbilicus. No trace of a tooth has been detected in any of the specimens examined. Length $\frac{1}{15}$ inch, breadth $\frac{1}{16}$ inch.

The only locality where this has been hitherto found is a small grove, a little northward of Fresh Pond, in Cambridge. In this place it has been found among the moist leaves, on three successive visits in the months of May and June, in company with *Helix lineata*, *labyrinthica*, *chêrsina*, and *indentata*, and *Pupa modesta*. None of the shells exhibit any trace of a tooth, although their aspect, and the season of the year, indicate that they can be none other than adult shells. Indeed, were it not for the infringement of the last whorl but one on the aperture, we might rather refer the shell to *Cyclostoma* than to *Pupa*.

It is rather smaller than *P. modesta*, and about the size of *P. curvidens*; but the simplicity of the unarmed, circular aperture distinguish it from every American species. The aperture of *P. modesta*, before the development of the teeth, is broader than long. It is the analogue of the *Vértigo edentula* of Europe.

PUPA EXIGUA.

Shell minute, whitish, oblong-ovate, rather pointed; whorls five; the transverse lip very oblique, with a small fold near its internal angle; outer lip widely reflexed.

FIGURE 122.

State Coll., No. 290. Soc. Cab., No. 2416.

Pupa exigua, SAY; *Journ. Acad. Nat. Sc.*, ii. 375. GOULD; *Bost. Journ. Nat. Hist.*, iii. 398, pl. 3, f. 20.

Shell elongated, pellucid, tapering somewhat to both ends, apex not very blunt; color watery-white; whorls five, rather convex, very oblique; suture very distinct; aperture obliquely oval; transverse lip very oblique, and having, near its inner termination, a small, tooth-like fold; another very small, tubercular tooth is found at the middle of the pillar; outer lip white, widely reflected, but not flattened. Length $\frac{1}{75}$ inch, breadth $\frac{1}{40}$ inch.

A few specimens have been found in Cambridge, by Mr. T. J. Whittemore, under boards, in damp places. Professor Adams has found it in Vermont, and it is common in Ohio.

This very minute species, is principally remarkable for its long, tapering form, large and very oblique aperture, and broadly reflected

lip. It is almost precisely like the *Turbo cary'chium* of Montagu; (*Cary'chium minimum* of Leach.) It is much smaller than *P. corticò-ria*, and its aperture differs in having the tooth of the transverse lip near the inner, instead of near the outer termination.

PUPA FALLAX.

Shell turretted, dusky; whorls six, smooth, convex; suture distinct; aperture sub-oval; lip widely reflected; umbilicus distinct.

FIGURE 123.

State Coll., No. 63. Soc. Cab., No. 1139.

Cyclòstoma marginàta, SAY; *Journ. Acad. Nat. Sc.*, ii. 172.

Pupa fallax? SAY; *Jour. Acad. Nat. Sc.*, v. 121.

Shell small, turretted, regularly and not rapidly tapering to a somewhat pointed apex; color dusky or light horn-color; whorls six, shining, moderately convex, very slightly and finely wrinkled; suture well impressed; aperture less than one third the length of the shell, rounded oval, somewhat irregular; the preceding whorl forms a nearly transverse boundary above, and is usually enamelled; the pillar lip is nearly straight, and turns abruptly at the front, so as to form nearly a right angle; front broadly curved; outer lip white, widely and equally reflected and thickened; umbilicus distinct. Length $\frac{1}{2}$ inch, breadth $\frac{1}{8}$ inch.

I have seen but two or three specimens of this shell which have been found in Massachusetts, one of which was sent me by Dr. L. M. Yale, from Martha's Vineyard; I have seen others from Rhode Island. It is found abundantly in Ohio.

This shell is certainly not a *CYCLOSTOMA*, for its aperture is not circular, nor has it an operculum of any kind. It belongs to *PUPA* rather than to any other existing genus, except, perhaps, the genus *PA'RTULA*. If it is brought under this genus, the specific name must be changed, as Mr. Say suggests. He described a shell from Massachusetts under the name of *Pupa fallax*, which he says very much resembled his *Cyclòstoma marginàta*, except that it was much larger. He seems to have re-described the same shell, in the "New Harmony Disseminator," under the name of *Pupa plácida*. It may not be improper, therefore, to apply the first of the above names to the shell under consideration, while the latter is retained for the larger shell,

which is now in the Cabinet of the Academy of Natural Sciences at Philadelphia, and no other specimen of which has as yet been found. A multiplication of names will thus be avoided.

GENUS BULIMUS, BRUG.

Shell oblong-oval, aperture simple, rounded anteriorly, longer than broad, inhabiting the land.

BULIMUS LUBRICUS.

Shell small, oblong-ovate, obtuse, smooth and polished, transparent, brownish horn-color; whorls six, rounded; aperture small, ovate; lip simple, thickened within.

FIGURE 124.

State Coll., No. 87. Soc. Cab., No. 1200.

Helix lubrica, MÜLLER; *Verm.*, 104, No. 303. CHEMN.; *Conch.*, ix. t. 135, f. 1235. FENNANT; *Brit. Zool.*, vi. 337, pl. 85, f. 4. MONTAGU; *Test. Brit.*, 390, pl. 22, f. 6. MATON and RACKETT; *Lin. Trans.*, viii. 213, t. 5, f. 12. TURTON; *Conch. Dict.*, 64. LAM.; *An. sans Vert.*, viii. 237.

Bulimus lubricus, BRUG.; *Dict.*, No. 23. BRARD; 98, t. 3, f. 20. PFEIF.; 50, pl. 3, f. 7. FLEMING; *Brit. Anim.*, 265. DRAPARNAUD; *Hist. des Moll.*, 75, pl. 4, f. 24.

Cionella lubrica, JEFFR.; *Lin. Trans.*, xvi. 347. SOWERBY; *Conch. Man.*, f. 285.

Achatina lubrica, MICHAUD; *Compl. à Drap.*, 51, No. 1. ALDER; *Mag. of Zool. and Bot.*, ii. 110.

Turbo glaber, DA COSTA; *Brit. Conch.*, 87, pl. 15, f. 18.

Cochlicopa lubrica, FÉRUSSAC; *Hist. Nat. des Moll.*, *Tab. Syst.*, 55, No. 374.

Zua lubrica, LEACH; *Moll.*, 114. GRAY'S *Turton's Man.*, 188, t. 6, f. 65; and for numerous other references see Lamarck.

Shell small, rather larger than a grain of wheat, elongated-oval, obtuse at apex, of a smoky horn-color, exceedingly thin and transparent, exhibiting the pillar throughout its whole length; surface very bright and polished; whorls five or six, rounded; suture distinct; lower half of the last volution somewhat tapering towards the base; aperture small, ovate, not broadly rounded at base; lip simple, thickened within, and of a claret tint, inner lip a little thickened so as to give the appearance of a slight notch at base; umbilicus none. Length $\frac{3}{16}$ inch, breadth $\frac{1}{16}$ inch.

Found in woods and groves under leaves and the bark of decaying stumps. On visiting Oak Island, Chelsea, after a warm rain in October, I found the surface of the ground covered with these shells in incalculable numbers. Hundreds might be taken up clinging to a single fallen leaf; as the moisture evaporated they all disappeared beneath the leaves. Mr. Say found this shell in the North West Territory.

The above description applies to the shell in its most perfect living state. After death it soon becomes opaque and whitish, and the lip loses its reddish color. In some aspects the peculiar termination of the pillar, gives the aperture the look of an *ACHATI'NA*; and this is evidently one of the connecting links between the two genera. Indeed, this shell, with a few others, has been set apart by Jeffreys in a new genus, which he calls *CRONE'LLA*, characterized by being sub-effuse at base, with the columella partially interrupted.

GENUS SUCCINEA, DRAP.

Shell ovate, rather lengthened, very thin; last whorl very large; aperture very large, ovate, rounded before, angular behind; lip simple; amphibious.

SUCCI'NEA OVA'LIS.

Shell sub-oval, pellucid, straw-colored; whorls three, oblique; aperture large, ovate.

FIGURE 125.

State Coll., No. 76. Soc. Cab., No. 1653.

Succinea ovalis, SAY; *Nicholson's Encyc.*, (Amer. ed.), *Conchology*. FÉRUSSAC; *Prodromus*, 26, No. 8. *Hist. Nat. des Moll.*, pl. 11 A. f. 1. DESHAYES; *Encyc. Méth.*, Vers, ii. 20, No. 2. LAM.; *An. sans Vert.*, viii. 319.

“Shell sub-oval, pale-yellowish, diaphanous, very thin and fragile, with nearly three oblique volutions; body very large. Spire small, but little prominent, somewhat obtuse; aperture longitudinally sub-ovate, large. Columella much narrowed, so as almost to permit the view of the interior apex from the base of the shell. Scarcely any calcareous deposit on the pillar lip.” (SAY.) Length $\frac{9}{16}$ inch, breadth $\frac{5}{16}$ inch, length of aperture $\frac{7}{16}$ inch, divergence 56° .

This species is found about the margins of ponds, and low, damp places, where the surface is always moist. It crawls over the mud, or up the stalks of plants; and, although it seems to be but little incommoded by water, it cannot endure being entirely submerged, and seems not to have the power of directing its way in the water, though it will generally float.

The *animal* is larger than the shell; its color pale, with minute black points, which are assembled into stripes upon the neck, and into squares, or bands, upon the sides; the neck is granulate above; a black line passes each side on the neck, from the tip of the tentacula, disappearing under the shell. The shell is so vitreous, that all the markings of the animal and colors of the viscera are seen through it, as are also the circulating vessels branching across the back, and the heart pulsating, and sending the fluids through them.

Further particulars will be stated under the next species.

SUCCI'NEA CAMPE'STRIS.

Shell ovate, thin, transparent, pale-yellow; whorls three, not very oblique, very convex; the last very large and turgid; suture deep; aperture sub-oval.

FIGURE 126.

State Coll., No. 86. Soc. Cab., No. 1254.

Succinea campestris, SAY; *Journ. Acad. Nat. Sc.*, i. 281.

The general resemblance between this species and *S. ovalis*, is very great. It differs, however, in some well-marked particulars. It attains a much larger size, is thicker and less fragile; its color is darker, having a somewhat smoky tinge. Its form is much more robust, the breadth being proportionally greater; the whorls are much more convex and tumid, being regularly inflated, while the upper portion of the large whorl of *S. ovalis* is compressed, so that its broadest portion is somewhat below the middle. The whorls are less oblique. The aperture is more oval, being nearly as broadly rounded above as below. Common length $\frac{3}{8}$ inch, breadth $\frac{2}{8}$ inch, divergence 80° to 90° .

It is more commonly found in moist places, but spreads itself

over rich or cultivated ground, whether lowland or upland, and may be found in dry weather partially sheltered by sods, or lying along by the side of stones, where it may enjoy the benefit of the moisture condensed by these bodies.

The animal is very similar to that of *S. ovalis*, but in general the markings are darker, and the marbled appearance which its viscera exhibit through the transparent shell, combines yellow instead of whitish colors. Radiating lines of furrows also are quite conspicuous on the posterior part of the foot.

It is extremely probable that this, is after all, the *S. amphibia* of Europe. No distinct and constant difference can be pointed out between them. In specimens of the foreign shell which I have seen, the surface may perhaps be a little more glossy, and the shell may have somewhat more of an appearance of solidity. Like that shell, too, it varies considerably in the prominence of its spire.

I think there can be no doubt that our shell is the true *S. campestris* of Say, though it presents nothing which would suggest the character of "white and vitreous lines, irregularly alternating."

SUCCI'NEA AVA'RA.

Shell very thin, wrinkled, yellowish, whorls three, rounded; suture deep; aperture rounded, ovate, more than half as long as the shell.

FIGURE 127.

State Coll., 85. Soc. Cab., No. 1256.

Succinea avàra? SAY; *Long's 2d Expedition, Append.*, 260, pl. 15, f. 5.

Succinea vermèta, SAY; *New Harmony Disseminator*.

Shell rather small; very thin and fragile, of a deep straw-color; surface irregularly wrinkled; whorls about three and a half, well rounded, and separated by a deep suture, the last whorl composing the greater part of the shell, but not very broad; aperture in adult and elongated shells, about half as long as the shell, but generally proportionally shorter, of a rounded form, the curve of the outer lip, where it joins the preceding whorl, being so great as to render the aperture nearly as broadly rounded behind as in front. Length $\frac{7}{30}$ inch, breadth $\frac{5}{30}$ inch, divergence 56° .

Found about the margins of muddy streams, or sheltered under loose objects lying about moist places.

I have much hesitation in deciding upon a name for this shell. It is quite different from any other species I am acquainted with. The spire is longer, and acutely pointed, the body-whorl less developed, and the aperture is shorter and more rounded; but, although the suture is deep, it is not so much so as to "give the whorls the appearance of being almost separated from resting on each other," as Mr. Say remarks of *S. vermèta*. In this character, individuals differ very greatly. Some specimens with unusually lax spires may have been used by Mr. Say in drawing up his description. But the young shells present no prominent spire, and a large, rounded aperture, agreeing precisely with Mr. Say's description and figure of *S. avàra*; and they are also always coated with earth adhering to a glutinous matter on the surface. It seems probable that the two should form one species; unless they do, I am at a loss under which name to place our shell, as, considering specimens of all ages and forms, it will come under one as well as the other. The name I have chosen is to be preferred, because it is a legitimate Latin word, while the other is not.

The *animal* has a dark head, and gives a dark color to the shell; the foot is very narrow, with a flesh-colored tint.

GENUS AURÍCULA, LAM.

Shell oblong-ovate; aperture long and narrow, rounded in front, lips sharp or reflexed, disunited posteriorly; pillar having one or more plaits.

AURI'CU'LA BIDENTA'TA.

Shell ovate-conical, grey or brownish horn-color; spire short and obtuse, aperture narrow, two folds on the pillar.

FIGURE 130.

State Coll., No. 52. Soc. Cab., No. 941.

Melampus bidentatus, SAY; *Journ. Acad. Nat. Sc.*, ii. 245.

Aurícula córnea, DESHAYES; *Encyc. Méth., Vers*, ii. 90. LAM.; *An. sans Vert.*, viii. 339.

Shell ovate-conical, broadest at about the upper third, where there is a faint angle, thin, translucent, of a brownish horn-color, smooth and shining, often becoming eroded, wrinkled lengthwise, with occasional broken revolving lines, very minute; whorls five

or six, the lower one three fourths of the length of the shell, the others, separated by a distinct suture, and flattened, form a short, blunt spire ; aperture long and narrow, broadest below ; outer lip thin and sharp, the posterior third suddenly bending inwards joins the body of the shell by a very acute angle ; the inner lip, usually covered with enamel, has two folds upon it, a transverse one below the middle, and another formed by the outer lip as it rises and turns within the shell ; this portion is usually white ; within the outer lip are occasionally to be found from one to four elevated, white, revolving ridges, not reaching the edge of the lip. Length $\frac{1}{2}$ inch, breadth $\frac{3}{16}$ inch, divergence 68° .

Inhabits marshes that are occasionally overflowed by the tide, and never far below high-water mark. They frequently crawl up the stems of grasses at the margins of inlets, apparently to escape the rising tide. In October, 1839, I observed great numbers of them at Oak Island, a small, wooded upland spot in Chelsea, surrounded by salt marsh. They were burying themselves under the leaves, and in the loose earth at the base of rotten stumps. This spot is now never overflowed by the tide. I have also two specimens brought from Windsor, Vermont, which I was assured were obtained there, living with *Planorbis armigerus*.

The *animal* is reddish-brown above, paler beneath, foot about the length and breadth of the shell, broad before, and bluntly pointed behind, the margins somewhat scolloped, or undulated, and divided across at about the anterior third ; tentacula slender and tapering, the eyes at the inside of the base ; rostrum nearly as long as the tentacula, with an expanded lobe each side.

This shell, with its kindred species, is very peculiar in its structure and habits. It belongs to the genus *MELAMPUS* of Montfort, *CONOVULUS* of Lamarck ; but it seems to be the received opinion that there are no characters to authorize a separation from *AURICULA*.

The perfect shells are smooth and brown, with usually three or four darker, narrow bands ; but the shells soon become eroded, and the surface is left rough, and of a greyish color. The ridges within the outer lip are not seen except in aged shells.

There is an English shell named *Voluta bidentata*, which, if it is not a variety of *V. denticulata*, would form a species under this genus. In that case we must adopt the specific name *A. cornea* for our shell, given by Deshayes.

AURI'CU'LA DENTICULA'TA.

Shell ovate-conical, smooth, reddish horn-color; spire elevated and pointed; inner lip with three teeth; lip reflexed.

FIGURE 129.

State Coll., No. 84. Soc. Cab., No. 1220.

Volùta denticulàta, MONTAGU; *Test. Brit.*, 234, pl. 20, f. 5. MATON and RACKETT; *Lin. Trans.*, viii. 130. DILLWYN; *Catal.*, i. 516. TURTON; *Conch. Dict.*, 249. BERKELEY; *Zool. Journ.*, v. pl. 19, f. 3, (animal.)

Actæon denticulàtus, FLEMING; *Brit. Anim.*, 337.

Jamínea denticulàta, LEACH; BROWN; *Conch. of Great Brit.*, &c., pl. 51, f. 6.

Conóvulus denticulàtus, GRAY; in *Turton's Manual*, 225, pl. 12, f. 144.

Aurícula myosòtis, JEFFREYS; *Lin. Trans.*, xvi. 368. DRAPARNAUD; *Hist. des Moll.*, pl. 3, f. 16 to 17. LAM.; *An. sans Vert.*, viii. 330. BLAINV.; *Malacol.* pl. 37, bis, f. 6.

Cary'chium personàtum, MICHAUD; *Compl. à Drap.*, 73, pl. 15, f. 42 to 43.

Aurícula personàta, DESHAYES; LAM.; *An. sans Vert.*, viii. 334.

Shell of an elongated oval form, slightly opaque, shining, horn-color, often tinted with reddish or violet; lines of growth very faint; spire elevated and pointed, composed of seven or eight slightly convex whorls, separated by a well-defined suture, which often has a marginal line revolving near it; the lowest whorl much larger than all the others together; aperture ovate, broadest below; outer lip thin and sharp, reflexed and white, joining the preceding whorl by a very acute angle; on the inner lip the adult shell has three white folds or teeth; the lower one formed by the turning of the lip within the aperture; the second tooth-like and nearly transverse, thin and prominent, a little below the middle of the inner margin; and a third, minute one, a little above; the lower portion of the left margin expands a little, and conceals a very minute umbilicus; two or three teeth are also sometimes found within the outer lip. Length $\frac{3}{16}$ inch, breadth $\frac{5}{40}$ inch, divergence 35°.

Found in the crevices of decaying wooden wharves, about and below high-water mark, in shaded situations.

Animal very light drab-color, head and tentacula darker and wrinkled; tentacula about one tenth of an inch in length, globose at tip, the eyes kidney-shaped, and seated on a slight enlargement

at the inner base of the tentacula; foot about half the length and width of the shell, rounded behind, two-lobed in front, and transversely divided at the anterior third. Respiratory orifice far back, on the right side.

This little shell is very readily distinguished from any other found on our coast, and seems to be another of the connecting links between the land and water shells, or rather, between those which breathe air, and those which breathe water. It has, accordingly, been frequently transferred from one genus to another, according to the conjectures of different writers. I have arranged it where Guilding placed it rather doubtfully, after a series of experiments as to the nature of its respiration. Its habits certainly associate it with the preceding species. It is widely distributed over the seas, and is doubtless conveyed to great distances on floating pieces of decaying timber.

It varies much in its characters according to its age. Its color varies from light horn-color to deep violet, and sometimes it becomes opaque-white. There is usually a single revolving line of rigid hairs just before the suture. When young, it is proportionally broader, and the lower whorl proportionally longer, has but two teeth, and the margin of the lip is not reflexed. A third, and sometimes a fourth, tooth appears at maturity, and also some teeth or tubercles within the right lip. This is, indeed, made a part of its character by European writers; but, of several specimens sent me by Mr. Sowerby, only one had them. In fact it must be very doubtful whether the species described under the names of *bidentata*, *triplicata*, *pusillus*, *alba*, *ringens*, *reflexa*, and perhaps *Firmini*, are any thing more than modifications by age, accident, and locality, of this same species.

FAMILY LIMNEANA, LAM.

Shell spiral, generally smooth externally, and having the outer margin of the aperture always sharp, and not reflexed.

GENUS PLANORBIS, LAM.

Shell discoidal, whorls apparent above and below, aperture crescent-shaped, remote from the axis of the shell; operculum wanting; animal with thread-like tentacula.

PLANORBIS TRIVÓLVIS.

Shell concave on both sides ; whorls four, strongly carinated on the left side ; aperture acutely angulated by the carina, right margin extending beyond the plane of that side.

FIGURE 131.

State Coll., No. 94. Soc. Cab., No. 1275.

Cochlea trium orbium, LISTER ; *Conch.*, pl. 140, f. 46. PETIVER ; *Gazophyl.*, pl. 106, f. 17.

Planórbis trivólvis, SAY ; *Nicholson's Encyc.*, (*Amer. ed.*) iv. pl. 2, f. 2. *Amer. Conch.*, pl. 54, f. 2.

Shell orbicular, yellowish-white, brownish, or chestnut-color ; umbilicated on the right side, cup-shaped on the left ; on the right side scarcely three volutions, separated by a profound suture, are visible, as they disappear in the umbilicus, their faces, especially those of the interior whorls, being slightly carinated ; on the left side at least four whorls are seen, which, by their faces, form a cup-shaped depression, scarcely distinguished by the suture, except the last half of the outer whorl, on the whole of which a well-marked carina revolves, forming a margin to the cup ; the carina gives the whorl a flattened appearance on this side ; surface covered with fine, regular, raised, transverse lines, somewhat grooved between them ; aperture sub-ovate, inclining to the right, its right margin more advanced than the left, broadly and regularly rounded ; left lip abruptly angulated where the carina terminates ; lip usually thickened within, and of a reddish brown-color. Large diameter $\frac{7}{8}$ inch, small diameter $\frac{3}{8}$ inch.

Animal dark-russet or dusky, covered with pale-yellowish dots.

Found in the western parts of this State in rivers and ponds. It is widely extended over the Northern and Western States.

Planórbis corpulentus of Say seems little else than an exuberant growth of this shell. The following differences may be noted. It is at least double, often three times, the size. It is a thinner shell. On the right side the revolutions are less compact, and exhibit a larger portion of each whorl ; on the left side the suture is more and the carina less distinct ; the aperture is much more expanded, and projects

far to each side of the preceding whorl. Inhabits the vicinity of the Great Lakes. *P. trivólvis* differs from the next species by its carina, and the position of its aperture.

PLANÓRBIS LENTUS.

Shell concave on both sides ; whorls four, sub-carinate on the left side ; aperture nowhere distinctly angular, right margin in the plane of that side.

FIGURE 132.

State Coll., No. 83. Soc. Cab., No. 1270.

Planórbis lentus, SAY ; *Amer. Conch.*, pl. 54, f. 1.

Shell orbicular, each whorl encircling the preceding, greenish horn-color at the circumference, yellowish at the sides and bordering the aperture ; on the right side concave, exhibiting scarcely three rounded volutions, separated by a well-defined suture, and disappearing in a deep umbilicus ; left side presents a shallow cup, formed of four compact, slightly carinated whorls, distinguished by a tolerably distinct suture ; surface marked with raised, sub-equidistant lines of growth ; aperture large, ovate, inclining to the right ; lip on the right side slightly curved, lying in the plane of that side of the shell ; in front, regularly and broadly arched ; on the left side it stands out considerably beyond the preceding whorl, and undergoes a sudden curve before its junction with that whorl ; the lip is sharp, very slightly spreading, and thickened within, by dark reddish-brown callus. Greater diameter $\frac{7}{10}$ inch, smaller diameter $\frac{5}{8}$ inch.

Animal dark olivaceous above and below ; foot oval, about one half the diameter of the shell in length, minutely dotted beneath, and frosted above with amber dots ; these are abundant about the bases of the tentacula ; edges of mouth honey-yellow ; motions sluggish.

Found abundantly in all our ponds, small brooks, and stagnant pools.

This is a somewhat darker shell than *P. trivólvis*, and is distinguished from it by its left side and its aperture. The cup of the left side is less smooth and regular, and is not bounded by the sharp, elevated

line ; when this shell is laid upon its right or upper side, the lip of that side will scarcely touch the plane on which it lies, while, in *P. trivólvis*, the shell would be lifted by the lip ; the aperture has not the sharp angle of the left side, produced by the termination of the carina, but in the young stages it is difficult to distinguish the two. It is very closely allied to *P. córneus* of Europe ; but in that shell the left side is scarcely concave, and the suture is deep ; the aperture is nearly orbicular, being almost equally rounded on both sides.

This shell has hitherto generally borne the name of *P. trivólvis* in New England ; but it is not the *trivólvis* of Say, and is either his *P. lentus* or a new species.

PLANORBIS BICARINATUS.

Shell deeply concave on both sides ; whorls three ; strongly carinated on both sides ; aperture abruptly arched at the carina of the left side, its lip extending far beyond the plane of the preceding whorl.

FIGURE 134.

State Coll., No. 81. Soc. Cab., No. 1268.

Helix angulatus, RACKETT ; *Lin. Trans.*, xiii. 42, pl. 5, f. 1. WOOD ; *Index, Suppl.*, pl. 7, f. 12.

Planorbis bicarinatus, SAY ; *Nicholson's Encyc.*, (*Amer. ed.*), iv. pl. 1, f. 4. *Amer. Conch.*, pl. 54, f. 3. SOWERBY ; *Genera*.

Shell orbicular, its tube rapidly increasing, deeply excavated on both sides, color brownish-yellow on the carina. Whorls rather more than three, as seen on both sides, forming on the right side a large and deep concavity, bounded by a sharp, raised line or carina, and on the left side a still deeper, inversely conic cavity, bounded by a similar carina, but of smaller circuit ; surface rather smooth, with faint, irregular lines of growth, most distinct on the right side ; aperture ovate, right side broadest, and on the general plane of that side of the shell ; left margin strongly modified by the carina, and extending far beyond the plane of the preceding whorl ; lip slightly expanded, white ; interior brownish, with white lines in the grooves answering to the carina. Longest diameter $\frac{1}{2}$ inch, shortest diameter $\frac{3}{16}$ inch.

Animal light russet-color, beautifully dotted with amber ; foot

tongue-shaped, nearly as long as the diameter of the shell. The strong angle of the aperture fully displays the respiratory opening, which has a jagged flap, over which lies an acute groove ; movements sluggish.

Inhabits still waters, not so generally pools, as the margins of large ponds. Not very common.

This species is smaller than either of the preceding, and is at once distinguished from them by the very obvious angularity of the whorls on both sides, and by the very deep, conical cavity of the left side. Sometimes a few faint revolving lines may be found on the surface. The tentacula of the animal are usually very long, but sometimes one or both of them seem to have been broken.

PLANORBIS CAMPANULATUS.

Shell with the last whorl distorted, concave on both sides ; whorls four, strongly carinate on the left, and sub-carinate on the right side ; throat campanulate ; aperture turned to the left.

FIGURE 133.

State Coll., No. 79. Soc. Cab., No. 1265.

Planorbis campanulatus, SAY ; *Journ. Acad. Nat. Sc.*, ii. 166.

Shell discoidal, yellowish or brownish-green, lighter at the sides ; diameter of its tube nearly twice as great from side to side as in the contrary direction ; right side exhibiting scarcely more than two whorls, which are elevated to an obtuse ridge, and form an umbilical vortex very nearly perforating the shell ; on the right side are four volutions, distinctly separated by the suture, which are carinated, and form a shallow, salver-shaped depression ; the whorls enclose each other in a very regular spiral to the last fifth of the outer one, when there is a sudden enlargement and distortion towards the left, by which a large, bell-shaped throat is formed ; aperture also dilated, and strongly angular on the left side ; within glazed, reflecting light-blue and brown ; surface regularly marked with fine, transverse, raised lines, and intervening grooves. Greatest diameter $\frac{1}{2}$ inch, at right angles with this $\frac{2}{5}$ inch, small diameter $\frac{1}{5}$ inch.

Found in the larger collections of fresh water, at Fresh Pond, Jamaica Pond, &c.

This shell does not attain the size of the preceding species; and, when mature, its dilated throat distinguishes it from every other known species; and the remarkable manner in which it is turned, as it were by violence, so as to look to the left, is a still further distinction. The outer whorl is everywhere of the same breadth; and the immature shell, before the dilatation of the throat, may be known by the very regular enrolment of the whorls, and the very contracted aperture in consequence of the very unequal diameters.

PLANORBIS ARMIGERUS.

Shell flat on the right side, and concave on the left; whorls four, with minute revolving lines on the concave side; throat with five unequal teeth far within the aperture.

FIGURE 138.

State Coll., No. 80. Soc. Cab., No. 1264.

Planorbis armigerus, SAY; *Journ. Acad. Nat. Sc.*, ii. 164.

Shell small, brownish horn-color, or light-chestnut, orbicular; right side nearly plane, with only a slight central pit, showing four rounded volutions, distinctly separated by the suture; left side deeply concave, exhibiting all the whorls, which on this side are sub-carinated; surface shining, faintly marked by the lines of growth, and, on the left side, may be distinctly seen several raised revolving lines on each of the whorls; aperture slightly inclining to the left, rounded, and very slightly modified by the carina, very oblique; edge of lip dark-brown; at some distance within the throat are five white teeth, nearly closing the passage; a large, prominent, oblique one is situated on the side of the preceding whorl, and may always be seen; a very small one is by its side; opposite to them are the three others which are small. Larger diameter $\frac{5}{16}$ inch, smaller diameter $\frac{1}{16}$ inch.

Animal very active, of a blue-black or slate-color; foot long and narrow. The shell is carried inclined at an angle of 45° . The respiratory groove is very acutely pointed.

Found abundantly in shady, stagnant pools and ditches, in which an abundance of decaying vegetable matter is immersed.

This common shell is well marked by its external simplicity. At the same time, the complicated armature of the aperture, so unique in

this family, would seem to entitle it to be arranged as a sub-genus. It differs from the preceding in having the umbilicus on the left instead of the right side, being its natural place. Mr. Haldeman proposes to make this species the type of a sub-genus, which he calls *Planórbula*.

PLANÓRBIS HIRSÚTUS.

Shell light yellowish-brown, concave on both sides, most so on the left; whorls three; surface beset with revolving lines of rigid hairs; aperture large, very oblique.

FIGURE 135.

State Coll., No. 82. Soc. Cab., No. 1278.

Planórbis hirsútus, GOULD; *Silliman's Journ.*, xxxviii. 196.

Shell small, somewhat transparent, of a brownish yellow-color; both sides concave, the left rather more than the right, but the concavity is there more limited by the presence of a sub-angular ridge on the outer whorl; whorls three, the outer one rapidly increasing; surface exhibiting traces of revolving lines when denuded, but usually covered with a dark pigment or epidermis, bristling with rigid hairs, which are arranged in close revolving lines; lines of growth very faint; aperture sub-oval, oblique, its diameter from side to side shorter than in the opposite direction; its plane very oblique. Long diameter $\frac{1}{5}$ inch, short diameter $\frac{1}{7}$ inch.

Animal has the head slate-colored above, with a darker line along each tentaculum, not originating from the eyes; foot chestnut-colored.

This shell was first found by Professor C. B. Adams, in Mansfield, from whom I received it. I have since found it in several localities in Dorchester, Dedham, and Cambridge, adhering to sticks in stagnant water; and it may doubtless be found in all similar localities.

This *Planórbis*, though in many respects it resembles in shape *P. defléctus*, is readily distinguished from all other American species by the revolving hairy lines. It is the analogue of the European *P. albus*, from which it is difficult to designate any very characteristic difference. It is, however, a thinner shell, the last whorl increasing

more rapidly; and it maintains its yellowish horn-color, whereas *P. albus* assumes a spermaceti or still whiter appearance. The lines, too, disappear more entirely when the epidermis is gone.

PLANORBIS ELEVATUS.

Shell small, whorls three or four, swelling above, with the apex sunken, deeply concave beneath; aperture slightly oblique.

State Coll., No. 291. Soc. Cab., No. 2417.

Planorbis elevatus, ADAMS; *Bost. Journ. Nat. Hist.*, iii. pl. 3, f. 15.

Shell small, light grass-green, translucent, faintly marked with lines of growth; whorls three and a half or four, the tube not rapidly enlarging, and considerably flattened; whole shell flat, or slightly elevated above, the tip depressed so as to form a small pit; below forming a deep, tunnel-shaped cavity, the whorls presenting an obscure angle as they revolve around it; suture deeply impressed; aperture slightly oblique, its upper edge on a level with the spire, or very slightly declining; lower edge descending considerably below the level of the under surface; portion of the preceding whorl embraced by the aperture constituting about one fifth of its circuit. Breadth $\frac{1}{4}$ inch, height $\frac{1}{10}$ inch.

Inhabits rivulets and pools in Norfolk and Plymouth Counties.

This shell is closely allied to *P. parvus* and *P. hirsutus*. But the first is a more depressed, discoidal shell, its upper surface more broadly and deeply concave, the lower surface very little more concave than the upper, and the aperture much more oblique. *P. hirsutus* has a still greater altitude, a very rapidly increasing tube, is deeply concave above and below, its color is lighter, and its lines of hairs, when present, afford a very marked distinction. It may possibly prove to be the immature shell of some other species.

PLANORBIS DEFLÉCTUS.

Shell concave on the left side; whitish horn-color; whorls four, compressed, sub-carinated, aperture greatly declining.

FIGURE 136.

State Coll., No. 168. Soc. Cab., No. 1266.

Planorbis deflectus, SAY; *Long's 2d Exped., (Appendix)*, 261, pl. 15, f. 8.

Shell small, distorted, compressed, of a light greenish-yellow color, something like dirty, bleached wax ; right side in general convex, but with the centre slightly indented, suture distinct ; left or under side concave, forming an expanded umbilicus, exhibiting about one half of each volution ; whorls four or five, very much compressed, and reduced to a somewhat carinated perimeter ; the last fourth of the outer whorl turns, somewhat suddenly and quite remarkably, to the left, or downwards ; aperture large, ovate, lip commencing below the carina, and embracing but a very small portion of the preceding whorl ; much narrower from side to side, its plane very oblique to the axis of the shell ; lip simple, very slightly everted beneath ; surface finely wrinkled by the lines of growth. Greater diameter $\frac{3}{10}$ inch, small diameter $\frac{1}{5}$ inch.

Animal dusky above, and with a still darker line to tip of tentacula.

Found in all our ponds, clinging to sticks, stones, &c.

It is distinguished at once, except in its very early stages, by the remarkable manner in which a portion of the last whorl is diverted from its regular course, downwards, if we consider the shell to be lying on its concave face. It is almost entirely turned off from the preceding whorls, so that the aperture comes in contact with only about half of its lower face. When immature it may be recognised by its light color and concave form. Scattered hairs may often be observed upon its surface. It has a general resemblance in its structure to *P. exacutus*, but the constantly sharp edge of that species is a never failing mark of distinction. I must at present regard the *P. virens* of Adams (*Bost. Journ. Nat. Hist.*, iii. pl. 3, f. 16) as a variety of this species, in which the last whorl is not remarkably diverted from its regular course.

PLANORBIS EXACUTUS.

Shell lenticular, umbilicated ; whorls four, broader than high, gradually thinning to a sharp edge.

FIGURE 137.

State Coll., No. 95. Soc. Cab., No. 1267.

Planorbis exacuous, SAY ; *Journ. Acad. Nat. Sc.*, ii. 166.

Shell lenticular, light transparent horn-color; whorls four, flattened so that the width of each is at least twice its depth, the upper and lower surfaces convex, and brought to a sharp exterior edge; the last half of the outer whorl deflected, so that the termination of the sharp edge is on a level with the lower surface of the preceding whorl; inner whorls slightly depressed, and somewhat more rounded; suture moderately impressed; striæ of growth faint; beneath abruptly umbilicated, displaying the edges of all the whorls within; aperture very oblique and angular; edge very sharp, below running forwards a little along the umbilical edge of the preceding whorl, then crossing obliquely forwards and upwards, leaving a callus, it passes off again a little below its carinated edge. Longest diameter $\frac{1}{5}$ inch, shorter diameter $\frac{3}{8}$ inch.

It is found in most brooks, ditches, and margins of ponds, which are permanent through the summer, adhering to sticks and stones.

This shell has a striking resemblance to the *P. fontana* of Europe, (Lightfoot, *Phil. Trans.*, lxxvi. pl. 2, f. 1-4. Montagu, *Test. Brit.*, 462, pl. 6, f. 6. Pl. *nítidus*, Müll., Turt., &c.) except that the aperture is entirely below the sharp edge, instead of embracing nearly an equal portion on each side, as in that shell. It is allied to *P. defléctus*, Say; but in that the whorls are more numerous, the exterior edge much rounded, the umbilical region broader and more shallow, and the labrum also embraces but half of the lower surface of the preceding whorl. Were it among the land shells it would be a most unequivocal CAROCÓLLA.

I cannot but think that the name under which this shell appears in the "Journal of the Academy," is not exactly as was intended by the author, as it is neither a Latin word nor a Latin termination. Supposing that by a typographical error, an *o* has taken the place of a *t*, we have a legitimate term, and one very expressive of the form of the shell.

PLANORBIS PARVUS.

Shell very much compressed, almost equally concave on both sides; whorls four; surface nearly smooth; aperture rounded.

FIGURE 139.

State Coll., No. 77. Soc. Cab., No. 1283.

Planorbis parvus, SAY; *Nicholson's Encyc.*, (*Amer. ed.*), iv. pl. 1, f. 5.

Shell very small and compressed, discoidal, light-yellowish horn-color; right side nearly plane, but excavated at the centre; left side broadly concave; whorls four, almost equally exhibited on both sides, the outer one usually somewhat angulated at its circumference; surface minutely marked by the lines of growth, shining, clear; aperture rounded, rather longer than broad, not inclining to either side, its plane very oblique; lip sharp, slightly reflected on the left side; within bluish-white. Greatest diameter $\frac{1}{4}$ inch, lesser diameter $\frac{1}{15}$ inch, but generally much smaller.

Animal whitish, dusky above, with a still darker line at tip of tentacula.

Abundant in brooks and ponds.

This is the smallest shell of the genus which we have, unless, perhaps, it be *P. exacutus*, which is commonly found of as small a size. It is not difficult to be recognised by its regular figure, and its very thin, compressed appearance. *P. deflectus*, *armigerus*, *exacutus*, and *hirsutus*, all have marked peculiarities, which at once separate them from this undistinguished species.

PLANORBIS DILATATUS.

Shell small, circumference carinated, flat above, convex below, and with a small, deep umbilicus; whorls three; aperture large, expanded.

FIGURE 140.

State Coll., No. 75. Soc. Cab., No. 2399.

Shell small, of a yellowish green-color, minutely wrinkled by the lines of growth; spire flat, composed of not more than three whorls, separated by a well-defined suture; the outer whorl has a sharp margin on a level with the spire, diminishing near, but still modifying, the aperture; below this line the whorl is very convexly rounded so as to encircle a small, deep, abruptly formed umbilicus. This whorl rapidly enlarges, and terminates in a very large, not very oblique aperture, with the lip expanded so as to

make it trumpet-shaped. Largest diameter $\frac{3}{16}$ inch, breadth $\frac{1}{16}$ inch.

This curious little shell was found several years since on the island of Nantucket, clinging to some damp moss, and was communicated by Mr. J. M. Earle, of Worcester. Specimens of it have also been sent to me by Professor Foreman, of Baltimore. But its characters were not fully ascertained from these few specimens. In July, 1840, Mr. T. J. Whittemore found it in great numbers at Hingham, in a small pool, southeast of the Old Colony House.

It has a miniature resemblance to *P. bicarinatus* as to its two sides, but it has only a single carina, which encircles the shell, instead of one on each side. Its large, expanded aperture, and small, deeply sunken umbilicus, readily distinguish it from any of the small species hitherto known. The surface is rather rough, and perhaps a little hispid when viewed under the microscope.

The *P. lens* of Lea (*Amer. Philos. Trans., New Series*, vi. 68, pl. 23, f. 83), which he received from near Cincinnati, is probably the same as this shell. His name, however, is pre-occupied by a fossil species.

GENUS PHYSA, DRAP.

Shell reversed, oblong-ovate, spire prominent; aperture rounded before, narrowed and angular behind, lip sharp; inner lip twisted. Animal has thread-like tentacula, and the sharply lobed mantle is turned back upon the shell.

PHYSA HETERÓSTROPHA.

Shell ovate, smooth, yellowish-green; whorls four, inflated, suture distinct, surface reticulated.

FIGURE 141.

State Coll., No. 73. Soc. Cab., No. 1306.

Bulla fontinalis Indiæ Orientalis, CHEMN.; *Conch.*, ix. 33, pl. 103, f. 879, 880.

Cóchlea neritóides, LISTER; *Conch.*, pl. 135, f. 34.

Bulla fontinalis, var. 3. GMELIN; *Syst.*, 3407. SCHROET; *Einl. in Conch.*, t. I, 201, *Helix*, No. 84.

Bulla crássula, DILLWYN; *Catal.*, t. i. 487, No. 36.

212 INVERTEBRATA OF MASSACHUSETTS.

Limnæa heteróstropha, SAY; *Nicholson's Encyc.*, (*Amer. ed.*), Art. *Conchology*, pl. 1, f. 6.

Physa heteróstropha, SAY; *Long's 2d Exped.*, *Append.*, 264. LAM.; *An. sans Vert.*, viii. 402.

“Shell sinistral, sub-ovate; color pale-yellow, chestnut, or blackish; whorls four, the first large, the others very small, terminating rather abruptly in an acute apex; aperture large, somewhat oval, three fourths the length of the shell, or rather more; within of a pearly lustre, often blackish; lip a little thickened on the inside, and tinged with dull red.” (SAY, in *Nich. Encyc.*) Ordinary length about $\frac{1}{2}$ inch, breadth $\frac{1}{4}$ inch, divergence 68° . My largest specimen is $\frac{7}{10}$ inch by $\frac{2}{3}$ inch.

When the shell is fresh and perfectly clean, it is always of a light greenish-yellow, and becomes a little more dusky with age. The surface, under the magnifier, appears beautifully checkered with minute, revolving, and longitudinal lines, which are also a little waved. Sometimes there are one or more whitish, opake bands, as if scratched by the mantle of the animal. The thickening of the lip is found only in old specimens, and in these also there is a broad layer of pearly enamel reflected over the columella, which has also a very prominent fold.

The *animal* is olivaceous, surface very smooth and silky; the foot is kite-shaped, longer than the shell, terminating in an acute point; expansions each side of the mouth acutely angled; tentacula olivaceous above, light ferruginous beneath, long and thread-like. The pointed lobes of the mantle are very conspicuous.

The motions of the animal are very rapid, and it seems to move with equal facility in an inverted posture, at the surface of the water.

The ova are excluded, enveloped in a gelatinous substance, about twelve or fifteen in number, and of an egg-shaped form. In about a fortnight they escape from the jelly, and move about with great rapidity. In fact, they are seen in motion for some time previous, apparently struggling to disengage themselves from their nidus.

This shell is everywhere to be found. Scarcely a brook or pool is met with but some of these shells will be found in it. It is more especially to be found in the running brooks.

The difference between this and *P. fontinalis* of Europe, is very slight. The spire may be a little more prolonged and acute.

It is quite interesting to keep a number of them in a vessel of water, and observe their motions and habits. The manner in which they open their mouths and display the lingual organ,—the manner in which they rise to the surface and open the air cavity, into which its structure permits no water to enter,—and above all, the beautiful and unaccountable manner in which it glides along, will never fail to excite astonishment. They feed freely upon any kind of vegetable.

We have here an instance of the interminable chain of existences, and of the subserviency of one animal to another. And it is curious, too, that, in general, we have the power to elude or subdue animals of greater strength and magnitude than ourselves, much better than we can those which are inferior to us. On looking carefully about the neck of the animal of this shell, we find him beset with numerous little things looking like short, minute, white lines, which are, in truth, little parasites (*Górdius inquilinus*, Müll.) attached like leeches, and which derive their nourishment from the fluids of the animal, without his having the power to dislodge them.

PHYSA ANCILLARIA.

Shell ovate-globose, pale-yellowish ; whorls four, smooth ; suture not impressed ; aperture nearly as long as the shell.

FIGURE 142.

State Coll., No. 74. Soc. Cab., No. 1308.

Physa ancillaria, SAY ; *Journ. Acad. Nat. Sc.*, ii. 124.

“ Shell heterostrophe, sub-globose, pale-yellowish ; whorls rather more than four, very rapidly attenuated ; spire truncated, hardly elevated beyond the general curve of the surface ; suture not impressed ; aperture but little shorter than the shell, dilated ; labium a little thickened on the inner sub-margin.” (SAY.) Length $\frac{11}{16}$ inch, breadth $\frac{7}{16}$ inch, divergence 90° .

Found in Connecticut and Merrimack Rivers, Fresh Pond, &c.
Animal of a bright lemon-color.

This shell is distinguished from the preceding by its much shorter spire, more angular outline, and especially by its suture, the margin of one whorl being so closely and perfectly applied to the pre-

ceding as to give the appearance of a double suture. The surface is exceedingly smooth, no revolving lines being detected by the magnifier. The base of the aperture is somewhat narrowed, and prolonged downwards, and considerably effuse. The twisted fold of the columella is less conspicuous than in *P. heteróstropha*. The shell becomes more ponderous and yellowish by age; and the reddish rib along the outer lip, and the enamel on the columella, much thicker.

PHYSA ELONGÀTA.

Shell thin, slender, elongated, apex acute, pale-yellowish; whorls six, polished; suture slightly impressed; aperture half as long as the shell.

FIGURE 143.

State Coll., No. 284. Soc. Cab., No. 1307.

Physa elongàta, SAY; *Journ. Acad. Nat. Sc.*, ii. 171.

“Shell heterostrophe, pale-yellowish, very fragile, diaphanous, oblong; whorls six or seven; spire tapering, acute at tip; suture slightly impressed; aperture not dilated, attenuated above, about half as long as the shell; columella much narrowed near the base, so that the view may be partially extended from the base towards the apex.” (SAY.) Length $\frac{1}{2}$ inch, breadth $\frac{1}{3}$ inch, divergence 34° .

Found in stagnant waters in all the northern and western parts of the United States. In the vicinity of Boston it is rare.

Animal dusky, the head above of an orange hue; tentacula rather short and blunt, lighter at tip; respiratory groove long, narrow and thin, movable in various directions, almost as long as a tentacle, with two black spots like eyes near its tip.

This species is easily recognised by its slender, elongated form, and the great proportionate length of the spire. It is in every respect similar to *P. hypnòdrum* of Europe, unless, perhaps, its spire may be somewhat more produced.

It is not very common in Massachusetts, and is seldom found as long as the above dimensions; while Mr. Say gives it $\frac{7}{10}$ of an inch in Illinois.

It probably belongs to the genus *APLÉXUS* of Gray (*Turton's Man.*, 255), which he institutes upon the elongated form of the shell, the

want of auricles at the base of the tentacula, and the simple, entire edge of the mantle. This latter point I did not notice, when the animal was before me.

Mr. Say describes the animal as black, and spotless above and below; tentacula with a white ring at base. He must have observed them at a more advanced age than any I have seen living; or else the species observed are different.

GENUS LIMNÆA, LAM.

Shell thin, oblong or turreted, last whorl large; aperture large, rounded before, narrowed and acute behind, outer lip sharp, inner lip forming a fold on the pillar, and usually spreading over it. Animal with short, triangular tentacula.

LIMNÆA COLUMÉLLA.

Shell ovate, fragile, transparent, pale-green; whorls four, the three upper ones minute, lines of growth distinct, undulated by revolving lines; aperture ample; umbilicus minute.

FIGURE 144.

State Coll., No. 68. Soc. Cab., No. 1302.

Lymnæa columélla, SAY; *Nicholson's Encyc. (Amer. ed.)*, iv. *Journ. Acad. Nat. Sc.*, i. 15.

Lymnæus navícula, VALENC.; *Recueil d'Obs. de Zool., par Humb. et Bonpl.*, 251.

Shell ovate, ventricose, extremely thin and fragile, transparent, of a pale-greenish or yellowish color, the apex acutely pointed; whorls four, of which the last is much inflated, and composes nearly the whole shell; the upper ones are very small, forming an acute apex; surface with conspicuous and nearly regular lines of growth, minutely waved by revolving lines, some of which are distinctly elevated; suture slightly impressed; aperture large, four fifths the length of the shell, generally somewhat dilated; lip very sharp, ending with a small curve behind; on the left margin the edge is slightly turned over a minute umbilicus, and forms a considerable fold; a thin, closely adhering enamel stretches

across from it to the angle of the aperture ; the inner lip is so arched as to display a considerable portion of the interior of the shell. Length $\frac{8}{10}$ inch, breadth $\frac{5}{10}$ inch, divergence 68° ; of another specimen, length $\frac{13}{10}$ inch, breadth $\frac{4}{10}$ inch, divergence 56° .

Inhabits stagnant pools and miry places, and is common. It is found at maturity very early in the spring.

The *animal* is large, semi-transparent, of a dusky or light-drab color, dotted with silvery white. It is very sluggish in its motions. The head above is slightly tinted with lilac.

This very brittle shell has rather the aspect of *SUCCI'NEA*, than of *LIMNÆA*. It varies a good deal in form, being in some specimens rather slender, and in others broad and distended. The aperture is usually somewhat dilated, especially at its broadly-rounded base ; but occasionally the outer lip is pressed inwards. The surface is shining, and delicately corrugated by revolving lines.

Var. *CHALY'BEA*. Fig. 145. State Coll., No. 72.

The spire is more pointed, its divergence being only 50° ; the aperture is more expanded, and the fold on the inner lip more obvious. It is thin, but not very brittle, ringing like hard-burnt crockery. The last whorl is partially detached from the preceding one, so as to form a thread-like channel at the suture. The enamel rests loosely against the shell, and is wrinkled. The exterior is covered by a bluish-black pigment, not easily removed, and the interior has a steel-blue or black-lead color.

This shell, which I found two years in succession in a muddy pool in Cambridge, I thought was sufficiently distinct to be regarded as a new species ; and I accordingly gave its characters under the name of *Limnæa chaly'bea*, in Silliman's Journal, xxxiii. 196. But as it has not been found in any other place, I am now disposed to regard it as a strongly marked local variety of *L. columella*. It is very possibly such a shell to which Mr. Say alludes in the "Journal of the Academy of Natural Sciences," ii. 167, as "*L. columella*, var. a. small, black, from Cold Water Creek, Missouri."

LIMNÆA MACRÓSTOMA.

Shell fragile, ovate, apex acute ; whorls four, lines of growth corrugated ; aperture four fifths the length of the shell, ample, expanded, umbilicus minute.

FIGURE 148.

State Coll., No. 133. Soc. Cab., No. 1296.

Lymnæus macróstomus, SAY ; *Journ. Acad. Nat. Sc.*, ii. 170.

Limnæa acuminàta, ADAMS ; *Silliman's Journ.*, xxxix. 374, (young.)

Shell fragile, pellucid, light horn-colored, ovate-conical ; last whorl very large, moderately inflated, surmounted by three very small, oblique ones, forming an acute apex ; surface shining, marked by fine lines of growth, which are crossed and rendered flexuous by numerous revolving lines, faintly visible without a magnifier ; suture distinct, the whorls approaching it by a gradual slope ; aperture ovate, very ample, four-fifths the length of the shell, and, when mature, broadly expanded ; outer lip very sharp and thin, broadly rounded in front, and, maintaining its sharp edge, it rises and disappears within the shell ; pillar so broadly arched as to allow a view of much of the interior of the spire ; a minute umbilicus is formed by a reflected scale of enamel ; in mature shells a glazing of enamel is found upon the preceding whorl as it encroaches upon the aperture. Length $\frac{1}{2}\frac{1}{8}$ inch, breadth $\frac{7}{8}$ inch, divergence 73° .

Found at New Bedford by Mr. Shiverick. Much larger specimens were obtained by Colonel Totten, at Tiverton, Rhode Island. Dr. Binney found it also in Vermont.

This shell is closely allied to *L. columélla*, and in an immature state is not easily distinguished from it ; but that shell is much more elongated, and regularly tapering, the divergence of the spire being not more than 60° . Such specimens Professor Adams described as his *L. acuminàta*. But at maturity the shell is very distinctly characterized by its widely spreading outer lip, which gives great expansion to the aperture. Mr. Say received it from the rice-fields of Carolina. It is the analogue of the *L. ovàtus*, of Europe.

LIMNÆA UMBILICA'TA.

Shell small, ovate ; whorls five, rounded, and marked with fine decussating lines ; suture deeply impressed ; aperture small, oval ; no conspicuous fold on the columella ; umbilicus distinct.

FIGURE 149.

State Coll., No. 136. Soc. Cab., No. 2402.

Limnæa umbilicata, ADAMS ; *Bost. Journ. Nat. Hist.*, iii. 325, pl. 3, f. 14. *Silliman's Journ.*, xxxix. 374.

Shell small, short-ovate, apex obtuse ; whorls five ; very convex and rounded, slightly oblique, their surface reticulated with fine lines, and modified by numerous facets or indentations, arranged in imperfect revolving series, four or five in number ; suture deeply impressed ; aperture small, about half the length of the shell, broad-oval, not expanded but rather seeming contracted ; outer lip sharp, thickened within by a sub-marginal, pinkish-colored deposit ; passing backwards on the inner side in a smooth and rounded plate, it joins the preceding whorl at about half the height of the aperture ; a thin glazing of enamel covers the remainder of the inner margin. There is scarcely any approach to a fold on the pillar ; umbilicus large and deep. Length $\frac{3}{16}$ inch, breadth $\frac{1}{8}$ inch, divergence 65° .

First collected by Mr. Shiverick, at New Bedford.

Limnæa modicellus is of about the same size and general appearance ; but its surface is smooth, its whorls more oblique, its mouth twice as large, and it has no conspicuous umbilicus. *L. caperata* is similar in its form, and its small, oval aperture, but is at once recognised by the regular revolving, hispid lines.

LIMNÆA MODICE'LLUS.

Shell ovate, thin, light-olive colored ; whorls four, convex ; suture deep ; aperture rather large, ovate ; fold of columella conspicuous ; sub-umbilicated.

FIGURE 151.

State Coll., No. 71. Soc. Cab., No. 2403.

Lymnæus modicellus, SAY ; *Journ. Acad. Nat. Sc.*, v. 122.

Shell small and short-ovate, very thin and transparent, color a light-olive, or sea-green; whorls four or five, convexly rounded, and somewhat shouldered or flattened above; surface rather coarsely marked by the lines of growth; anterior whorl large and inflated, two thirds the length of the shell; posterior whorls small; suture deep; aperture rather large, somewhat more than half the length of the shell, ovate, or nearly as broad behind as before, not acutely rounded behind, but considerably arched; slightly effuse at base; columella arched, its fold conspicuous; inner lip reflected over a small umbilicus, and the enamel usually broadly spread across to the posterior angle. Length $\frac{7}{8}$ inch, breadth $\frac{4}{5}$ inch, divergence 68° .

Lives along the muddy margins of brooks.

The *animal* is of a dark sea-green or bottle-green color above, dotted with amber-color; beneath much paler. Foot long, and inclining to a point behind. In the region of the eyes, between the tentacula, are clusters of white points, which give an appearance of white eyes. The animal seems to shun immersion, being usually found on the damp mud at the margins of ponds and brooks. When put in a vessel of water, it soon rises above the surface, crawls about the table, and will remain out of water two or three days without injury. The shell is usually thickly coated with mud.

This species is distinguished from the young of *L. elòdes* by the depth of the suture, and the maturity of its aperture, which is also proportionally larger. It is less elongated than *L. desidiòsa*, its suture is deeper, its aperture rather smaller, and the color is quite different.

LIMNÆA DESIDIÒSA.

Shell ovate-elongate, turretted; whorls five, convex, the upper ones very small; suture deep; aperture sub-ovate, longer than the spire; sub-umbilicated.

FIGURE 150.

State Coll., No. 70. Soc. Cab., No. 1295.

Limnæus desidiòsus, SAY; *Journ. Acad. Nat. Sc.*, ii. 169.

Limnæus desidiòsus, SAY; *Amer. Conch.*, pl. 55, f. 3.

Shell ovate, thin and fragile, the spire elongated and turreted; color a pale, dirty yellowish-green; whorls five, very convex, and for the most part suddenly contracted above, so as to present a conspicuous shoulder; the two or three uppermost whorls are very small, and the body whorl about seven tenths the length of the whole shell; surface generally dead, and somewhat checked with irregular revolving and longitudinal raised lines; aperture large, usually three fifths the length of the shell, oval, broadly and sub-equally rounded both behind and before; the lip is considerably everted in front, and along the left margin, where it is not closely appressed to the whorl, and leaves a small, but evident umbilical opening; callus rather abundant; fold on the pillar slight, and smoothly rounded. Length $\frac{1}{2}$ inch, of aperture $\frac{3}{7}$ inch, breadth $\frac{2}{5}$ inch, divergence 45° .

This species is found in most regions, about the muddy margins of ponds and pools.

It is intermediate between *L. elodes* and *L. modicellus*. Its spire is proportionally more slender, its suture deeper, its aperture proportionally larger and more oval, the fold of its columella much less conspicuous, and it is a much more fragile shell than the former. The latter, while it has the large, oval aperture, the deep suture and shouldered whorls, is still more fragile, of a deep green-color, and is a short, inflated shell, with a much greater divergence of the spire, and with one whorl more than *L. desidiösa*. The habits of the two last are similar, but the animal of *desidiösa* is a much lighter green, and has not the remarkable white dots between the tentacula.

The characters of the aperture and spire seem to be constant; that is, the aperture is always large and broadly rounded behind; and the spire is tapering, the two whorls at the tip seeming somewhat as if superadded; so that if a line should pass down one side so as to touch all the whorls, this line would be concave. The only variations I have noticed are, that the suture is sometimes shallow, and the shoulder nearly wanting, so as to render the spire more regularly tapering. Mr. Say's description is not definite, and his figure is much shorter than the dimensions he ascribes to it. He gives its length seven tenths of an inch, while it rarely exceeds half an inch.

LIMNÆA ELÔDES.

Shell turretted, elongated, dull horn-colored ; whorls five, convex ; suture deep ; aperture sub-oval, less than half the length of the shell, within brownish, fold of the columella profound.

FIGURE 145, 146, 147.

State Coll., No. 139. Soc. Cab., No. 1301.

Lymnæus elôdes, SAY ; *Journ. Acad. Nat. Sc.*, ii. 169. *Amer. Conch.*, pl. 11, f. 3.

Shell tapering, elongated, turretted, thin and fragile, dull and dingy horn-colored, inelegant ; whorls five, or a little more, the two smallest being generally broken off ; they are regularly and largely convex, not flattened or compressed posteriorly, but the adjacent margins of two whorls curve regularly to the deeply impressed suture ; the last whorl, measured upon the back, constitutes from a little more than one half, to about two thirds the whole length of the shell ; surface coarsely wrinkled by the lines of growth, sometimes minutely reticulated by revolving lines, and sometimes exhibiting small, plane facets, irregularly disposed. Aperture generally less than, but never exceeding one half the length of the shell ; sub-oval, rather contracted ; right lip thin, with now and then a sub-marginal thickening, within colored reddish-brown ; pillar margin copiously overlaid with white enamel, not closely appressed at the umbilical region ; fold of the pillar large and oblique ; umbilicus for the most part closed. Length $\frac{9}{16}$ inch, breadth $\frac{4}{16}$ inch, divergence 43 to 45°.

The *animal* is of a dusky-greenish color, similar to that of the shell, varying like it in intensity, minutely dotted with amber-color. Foot somewhat paler, tongue-shaped, reaching about two thirds the length of the large whorl when in motion, obtusely rounded behind.

The animal attains maturity and dies about the end of June. At this time the young may be seen with the old, about an eighth of an inch in length, and these continue to grow rapidly during the season. But after the early part of July it is rare to find an adult shell containing a living animal. At this time the exterior of the shell is much eroded ; in fact the animals, as they cluster together,

actually devour each other's shells; the aperture becomes white and somewhat chalky, and the brown, sub-marginal callus of the outer lip is thus covered over.

The most common species found in Massachusetts, and one which it is exceedingly difficult to describe, or to determine, if it has been already described. After much observation, and a comparison of many individuals collected from various localities, and an exchange of specimens with the most distinguished conchologists of this country, I have come to the conclusion, that it must be regarded as the *L. elodes* of Say. Its European analogue is *L. palustris*. The only Massachusetts shell which bears much affinity to it, is *L. desidiösa*, which is smaller, has a more slender spire, and larger aperture, proportionally. But it is closely related to *L. umbrosä* and *L. reflöxa* of the Western and Middle States. The former is more solid, more corpulent, with the whorls and aperture more oblique, and its color darker than that of our shell. The latter has the whorls still more oblique, much less convex, forming a much less turreted and regularly tapering spire; the fold of the pillar much less prominent, and the color yellowish. After all, these species are so nearly allied, that no description, and perhaps no figure will enable a person to determine any one of them by itself. They must be learned by comparison, and by interchanging specimens. But the difficulty does not end here. It is no easy matter to assign the limits of the species. No one presents a greater variety. The length of mature shells varies from half an inch to an inch; and it is remarkable that the largest specimens are usually the most fragile. The surface usually has an uneven, unfinished, inelegant aspect, coated with mud; but occasionally we find the conformation of the shell perfectly regular, the color a shining greenish horn-color, and the surface smooth and beautifully reticulated with longitudinal and revolving lines. It is then a very pretty, fragile shell. The aperture is small in proportion to the shell, generally rather contracted; again, we find the lip beginning to expand, and in some specimens received from Vermont, which I suppose to belong to this species, the lip is broadly flaring. Young specimens might be confounded with *L. umbilicäta*, *L. desidiösa*, *L. modicöllus*, and *L. caperäta*; but a little attention to the umbilicus, the aperture, the color, and the revolving lines will enable us to distinguish them, respectively. The umbilicus is usually entirely obstructed by the overlaying callus; but in some specimens it is partially open.

LIMNÆA CATASCŌPIUM.

Shell ovate, strong, chestnut-brown ; whorls four, wrinkled, convex, the last large ; suture deep ; aperture sub-oval, half the length of the shell.

State Coll., No. 69. Soc. Cab., No. 1304.

Lymnæa catascōpium, SAY ; *Nicholson's Encyc. (Amer. ed.)*, pl. 2, f. 3.

Limnæus catascōpium, SAY ; *Amer. Conch.*, pl. 55, f. 2.

Lymnæus córnea, VALENC. ; in *Humb. et Bonpl. Recueil d'Obs. &c.*, (teste Fé-russac).

Shell rather large, oblong-ovate, ventricose, thick and strong ; epidermis chestnut or brownish horn-color ; whorls four or a little more, forming a short, pointed spire, delicately but rather regularly wrinkled by the lines of growth, and these are rendered somewhat corrugated by obsolete revolving lines ; last whorl constituting nearly the whole shell, very much distended ; suture deeply impressed ; spire very short, acute at apex ; aperture rather more than half the length of the shell, sub-oval, very little narrowed behind ; not dilated ; right lip simple, thick and regularly curved ; left lip having a thick, narrow layer of enamel, and a rather slight fold midway ; umbilicus not open. Length $\frac{7}{10}$ inch, breadth $\frac{4}{10}$ inch, divergence 60°.

Found in the southern parts of this State, but I have not met with it near Boston.

Its great solidity, and its remarkably broad, corpulent aspect, approximating in character to *PALUDINA*, cause it to be easily recognised. Its analogue on the European continent is *L. péreger*, which, however, differs from this in being a less solid shell, in having the aperture somewhat expanded, its anterior curve broader, and the fold of the pillar less deep. It comes nearer to *L. emarginata* than to any other American species.

GENUS ANCYLUS, MÜLLER.

Shell boat-shaped, without a spire, apex pointed, inclining forwards and to one side ; aperture ovate.

It is not yet satisfactorily determined under what family this genus should be arranged. Its animal is closely allied to the LIMNEANA, and its natural relations are certainly stronger to this family, notwithstanding the form of the shell, than to the CALYPTRA'CEA, where it has usually been placed.

A'NCYLUS RIVULA'RIS.

Shell elongated-oval, sides rectilinear, apex nearer to one side, nearly central.

FIGURE 153.

State Coll., No. 281. Soc. Cab., No. 842.

Ancylus rivularis, SAY; *Nicholson's Encyc. (Amer. ed.)*, Art. *Conchology*, *Journ. Acad. Nat. Sc.*, i. 125.

Shell small, narrow, elongated-oval, the sides nearly parallel, but one end is somewhat narrower than the other, and both are regularly rounded; apex nearly equi-distant from both extremities, nearer to, and leaning to, one side and one end; aperture oval; color dark-green. Length $\frac{1}{2}$ inch, breadth $\frac{1}{10}$ inch.

Found on stones and floating leaves in rivulets and ponds.

It is closely allied to *A. fluviatilis* of Europe; but the apex is less acute and more central. There is another American species, the *A. tardus*, Say, which has been found by Professor Adams in Vermont, but which I have not yet found in this State. It is much more rounded and conical than this, and the apex is not lateral.

A'NCYLUS FUSCUS.

Shell oval, depressed, convexity regular, not compressed laterally, curvilinear at the sides; apex obtuse, a little to the right and rear of the centre; epidermis coarse, brown, surpassing the margin.

FIGURE 152.

State Coll., No. 283. Soc. Cab., No. 2383.

Ancylus fuscus, ADAMS; *Bost. Journ. Nat. Hist.*, iii. 329, pl. 3, f. 17.

Shell small, very thin and pellucid, of a rounded oval form, the entire outline regularly curved; depressed and regularly convex, not compressed at the sides; apex slightly elevated, bluntly

rounded a little behind, and to the right of the centre ; stages of growth visible ; epidermis coarse and strong, rough, dusky yellowish-brown, extending beyond the margin of the testaceous matter, and insensibly coalescing with it on all sides, which are inclined to turn upwards ; within glistening, polished. Length $\frac{3}{10}$ inch, height $\frac{1}{20}$ inch, breadth $\frac{2}{10}$ inch.

Found in a rivulet in Andover by Mr. K. Prescott, of the Theological Seminary ; and also found by Professor Adams in Mansfield ; and by myself, in Fresh Pond.

It differs from all other described species in its depressed form, its obtuse apex, and its coarse epidermis projecting beyond the margin ; and, as this extends in the direction of the plane of the object to which it is found attached, and not in continuation of the convex form of the shell, the edges seem to be turned upwards. *A. rivularis*, Say, is narrower, and has the sides nearly parallel. *A. tardus*, Say, has its apex prominent, acute, and farther behind the middle.

FAMILY PERISTOMATA, LAM.

Shell conical or sub-discoidal, the margins of the aperture united posteriorly ; operculated ; inhabiting fresh water.

GENUS VALVATA. MÜLLER.

Shell conical, whorls cylindrical, loosely cohering ; aperture circular, its margin entire ; operculum orbicular.

VALVATA TRICARINATA.

Shell sub-discoidal, thin, pale pea-green ; whorls three, the last tri-carinate ; umbilicus large.

FIGURE 156.

State Coll., No. 67. Soc. Cab., No. 1542.

Cyclostoma tricarinata SAY ; *Nicholson's Encyc.*, (Amer. ed.), Art. *Conchology*, *Journ. Acad. Nat. Sc.*, i. 13.

Valvata tricarinata, SAY ; *Journ. Acad. Nat. Sc.* DESHAYES ; LAM. ; *An. sans Vert.*, (2d edit.), viii. 507.

Valvata carinata, SOWERBY ; *Genera*, f. 2.

Shell small, depressed, thin, transparent and shining, of an emerald or light pea-green color ; whorls three or four, flattened

at the summit, faintly marked by lines of growth, and separated by a distinct suture ; each of the interior whorls has one or two prominently raised, rounded, revolving lines or keels, and the exterior one has three, one of which issues from the lower junction of the lip and borders the umbilicus ; a second originates from the upper junction of the lip, and circumscribes the whorl ; the third midway between this and the suture, thus giving the whorls a prismatic or quadrangular instead of a cylindrical appearance ; aperture circular, modified by the keels ; lip simple, surrounding the aperture, except a small space between the two lower keels ; umbilicus broad, deep, tunnel-shaped. Height $\frac{1}{10}$ inch, breadth $\frac{7}{16}$ inch.

Var. *SIMPLEX*, without the keels. Professors Benedict and Adams have found this species in Vermont ; and in very many instances it is perfectly simple and cylindrical, individuals occurring with every degree of carination, showing that it is still the same species. In this state, the large, tunnel-shaped umbilicus is the best characteristic.

It is found in most of our small lakes, usually under stones, or sheltered by the deserted shells of some of the fresh-water mussels.

The shell is usually rendered somewhat opaque by an earthy coating, which seems to answer the purpose of an epidermis ; but, when this is removed, the surface is shining and pearly, of an emerald-green color, lighter on the keels. It is one of our most curious shells.

VALVATA PUPÓIDEA.

Shell minute, elevated, chestnut-colored ; whorls four or five, the last nearly disjoined.

FIGURE 155.

State Coll., No. 65. Soc. Cab., No. 1363.

Valvata pupóidea, GOULD ; *Silliman's Journ.*, xxxviii. 196.

Shell small, elongated-ovate, opaque, chestnut-colored, when divested of the rough, dirty pigment which usually adheres closely to it ; whorls four or five, minutely wrinkled, the posterior one small and flattened so as to form an obtuse apex ; the others

cylindrical, and so partially in contact as to expose about one half of the cylinder ; the last entirely disjoined from the preceding one for at least the half of a revolution ; aperture circular, lip simple and sharp ; on looking at the shell from below, no umbilical opening is found ; operculum horny, apex central, elements concentric. Length $\frac{1}{8}$ inch, breadth $\frac{3}{8}$ inch.

Found at Fresh Pond and other ponds, on stones and submerged sticks ; and has been for many years in our cabinets marked as a PALUDINA.

Animal very active ; head probosciform, half as long as the tentacles, bi-lobed in front, dark, terminated with light ; tentacles rather stout, light drab-colored, with a line of silvery dots on the upper side, over the large, black eyes ; foot, tongue-shaped, as long as the first whorl, dilated into two acute angles in front, light drab-color ; respiratory organ occasionally protruded to half the length of a tentacle on the right side.

This species is widely distinguished from all other described ones by its minuteness, its color, its elongated form, and its want of an umbilicus ; of which characters the last two seem to arise from the loose manner in which the whorls are united.

GENUS PALUDINA, LAM.

Shell ovate-conical, whorls rounded ; aperture ovate, acute posteriorly, and modified by the preceding whorl, margin simple ; operculum horny, origin near one edge, elements concentric.

PALUDINA DECISA.

Shell sub-conic, thick and strong, olivaceous ; whorls five, convex, covered with minute, revolving lines, eroded at tip ; aperture ovate, half the length of the shell, bluish within ; umbilicus none.

FIGURE, see Wood-cut, page 144.

State Coll., No. 61. Soc. Cab., No. 1347.

Cóchlea Virginiàna e flava viridescens, non fasciata, LISTER ; *Conch.*, t. 27, f. 27.

PETIVER ; *Gazophyl.*, t. 116, f. 18.

Paludina decisa, SAY ; *Nicholson's Encyc.*, (*Amer. ed.*), pl. 2, f. 6. *Amer. Conch.*, pl. 10.

Paludina limòsa, VALENC. ; *Recueil d'Obs. de Zool. &c.*, par Humb. et Bonpl., ii. 253. pl. 1, f. 1.

Shell ovate-elongate, thick and strong, color varying from yellowish-green to dark olive-green; whorls five, regularly convex, inclining rather abruptly towards the suture, so as to form a moderate shoulder; surface marked with fine wrinkles of growth, and occasional stripes of dark purplish, indicating the position of preceding apertures; also with minute, revolving lines, which in young specimens, when viewed in the water, are seen to be garnished with fine, pubescent hairs; two or three of the whorls at the apex are usually broken off, leaving an irregular, eroded surface; aperture oval, not exceeding half the length of the entire shell, forming an angle above; lip simple, very sharp, until, as it rises towards the columella, it becomes thickened, and, turning outwards, forms a smooth, rounded margin, leaving no umbilicus; a thick enamel spreads across the preceding whorl, margined with purplish; interior bluish. Operculum thin, ovate, beaked, with a groove from the centre to the tip of the beak. Length $1\frac{1}{8}$ inch, breadth $\frac{7}{8}$ inch, divergence 56° .

Animal with a broad, tongue-shaped foot, drawn out into angles each side in front, of a livid olive-color varied with dark, vivid-orange, transverse spots above, and minutely dotted with the same beneath; tentacula olive above, spotted with orange, lighter below. Eyes on a niche at the exterior base of the tentacula.

Found in ponds and muddy streams, usually concealed under shelving banks, or imbedded an inch or two among loose mud and roots.

This is the only large species inhabiting the waters of New England. It is less massive than *P. ponderosa*, its whorls more convex, and its aperture less elongated. It is less globular when young than *P. sub-purpurea*, and the spire in the adult more symmetrical. The young are excluded in a living state with a shell of three complete whorls. It is peculiar for the almost constant loss of its tip.

GENUS AMNÍCOLA, GOULD and HALD.

Shell ovate-conic, thin; spire acute, composed of a few rounded whorls; aperture small, oblique, rounded-ovate; lips continuous, simple; operculum horny, spiral, with a few volutions.

Animal having an elongated foot, rounded posteriorly, with each anterior angle produced laterally; head half the breadth of the foot, and protruding beyond it; tentacula short, filiform, unequal? the eyes seated at the side of the external base; oviparous. Inhabits fresh water.

That this group of small shells should be separated from PALUDINA and also from CYCLOSTOMA, in which genus they were included by Cuvier, is clear from the structure of the operculum, but more especially from the structure and habits of the animal. Among the differences the following are the most obvious: In this genus, the head precedes the foot in progression; in PALUDINA it is the contrary; in this the tentacula are all the way of a size, and without any enlargement for the reception of the eyes, instead of being tapering, with a niche for the eyes; they are also frequently, if not always, unequal in length; perhaps this is a sexual difference. The animal has the power of rising and swimming in an inverted posture at the surface of the water, which the true Paludina never does. So far as observation has yet gone, the Amnicola is oviparous, while the true Paludina is ovo-viviparous. It is found crawling upon stones, sticks, and aquatic plants, while Paludina remains upon the mud, and is usually observed partly, or entirely, imbedded in it. On these grounds Mr. Haldeman concurs with me in instituting the genus AMNICOLA. Its position seems to be intermediate between PALUDINA and MELANIA.

Under this genus will come *P. porata*, *lustrica*, *grana*, and *limosa* of Say; *Nickliniana* of Lea; and *Cincinnatiensis* of Anthony, and perhaps some of the sub-globular MELANIE.

The genus NEMATUBA of Benson includes shells very similar to these, but they are said to have the last whorl contracted, as it approaches the aperture.

AMNICOLA PORATA.

Shell small, sub-globose, thin, smooth; whorls four, very convex, suture deep; aperture nearly circular; inner lip barely touching the preceding whorl; umbilicus large.

FIGURE 157.

State Coll., No. 64. Soc. Cab., No. 1361.

Paludina porata, SAY; *Journ. Acad. Nat. Sc.*, ii. 174.

Shell minute, conic-globose, thin, translucent, smooth, or with most delicate lines of growth; varying from a bronze-green to a light olive-green color, but usually invested with mud; whorls four or less, very convex, and flattened near the suture, so as to present a conspicuous shoulder; the last whorl rather more than two thirds the length of the shell, and as broad as long; suture deeply impressed, almost channelled; aperture nearly circular, both lips being about equally curved, and uniting posteriorly at a broad angle; lips sharp, in some instances a little everted; inner lip, at maturity, barely touching the preceding whorl just before it joins the outer lip, leaving a very large, deep umbilicus. Length $\frac{3}{16}$ inch, breadth $\frac{5}{16}$ inch, divergence 68° .

Found in ditches and brooks, clinging to stones or submerged plants, oftentimes in great numbers.

Animal a light drab-color tinted pink, the head a little flesh-colored above; tentacula silvery, with a dark line running along the outside from the eyes, which are at the external base; foot not reaching beyond the first whorl, broadly rounded behind, dilated into angles at each side in front; head half the width of the foot, and projecting beyond it, motions very slow. In delicate and clean specimens, a dark mark parallel to the outer lip, and another bisecting it, and belonging to the animal, appear through the shell.

Under this species I include all the small shells, hitherto regarded as PALUDINÆ, which are collected in this region, ascribing the very great differences they present in color and size to differences of locality and age. The shoulder of the whorls, the conspicuous umbilicus, and the rounded aperture, almost like VALVATA or CYCLOSTOMA, are the most obvious characters. It is less solid, less elongated, the aperture more circular, and the inner lip much less closely appressed to the preceding whorl than *P. limosa*, Say. *P. lustrica*, Say, is described as much smaller, much more elongated, and more cylindrical. This I strongly suspect to be identical with *Valvata pupoides* in an immature state. It approaches nearest to *P. Cincinnatiensis*, Anthony, which is larger and more conical and elongated.

FAMILY *NERITACEA*, LAM.

Shell semi-globose or depressed-oval, the inner lip like a partial partition, operculated; residing in fresh and in salt water.

GENUS *NATICA*, BRUG.

Shell sub-globular, umbilicated; aperture entire, semi-circular; inner lip oblique, with a callus which modifies the umbilicus, and sometimes covers it; operculated.

NATICA HEROS.

Shell sub-globose, ash-colored, whorls five, a dark, chestnut-colored band revolving about the three upper ones; umbilicus large and simple.

FIGURE. 160.

State Coll., No. 57. Soc. Cab., No. 79.

Natica heros, SAY; *Journ. Acad. Nat. Sc.*, ii. 248.

Shell globose-ovate, thick, ash-colored, or sometimes brownish, shining when divested of its thin, yellowish epidermis; distinct lines of growth, and very minute revolving lines cover the surface; whorls five, very convex, slightly flattened near the top, so as to present a slight angular appearance; the three posterior whorls have the lower half of a dark chestnut-color, and the other half rather lighter than the rest of the shell; suture well marked; aperture ovate; the lip, sharp above, becomes thicker and smoothly rounded, and as it rises by the side of the umbilicus it expands to a considerable breadth; a very thin layer of enamel is spread over the portion of the whorl which completes the aperture; throat of a delicate, somewhat clouded chestnut-color, with a margin sometimes bright-yellow; umbilicus large, rounded, displaying the whorls nearly to the summit, coarsely wrinkled, the callus covering only a very small segment of it. Operculum horny. Ordinary length $2\frac{1}{2}$ inches, breadth 2 inches.

It is found on sandy or muddy beaches along the whole coast; but much more seldom to the south than to the north of Cape Cod.

This shell is distinguished from all others by its inflated, globular appearance, and its simple, deep umbilicus. It very much resembles an AMPULLARIA, and is most probably the *N. ampullaria* of Lamarck. It also grows to a larger size than any other known species. I have one specimen the greatest length of which is $4\frac{1}{2}$ inches, and greatest breadth $3\frac{1}{2}$ inches; and I have seen one 5 inches by $3\frac{3}{4}$ inches. The shell is light for its size, and its whole structure and appearance are very simple.

This, in common with other species of NA'TICA, is very voracious, and plays a conspicuous part in devouring the dead fish and other animals which are thrown up by the tide. Many of the shells thrown upon the shore are found to be perforated with a small round hole. This is done principally by the different species of NA'TICA. They have the power of perforating shells, it is generally supposed, by discharging an acid which decomposes the shell; and through the aperture they extract the juices, and destroy the lives of the otherwise secure inhabitants. Their foot is very large, so as completely to envelope the objects on which they prey. In moving, they burrow in the sand, so as to be almost entirely concealed by it, and their place is generally indicated by a small heap of sand.

The singular nidus, in which the animal of NA'TICA deposits its eggs, has been an object of much curiosity and speculation. It is a mass of sand glued together into the shape of a broad bowl, open at the bottom, and broken at one side. Its thickness is about that of an orange-peel, easily bent without breaking when damp, and when held up to the light will be found to be filled with little cells arranged in quincunx order. Each of these cells contains a gelatinous egg, having a yellow nucleus which is the embryo shell. It is found plentifully at midsummer, on every sandy flat where any species of NA'TICA resorts. It has passed under many names, and its true nature seems to have been first suspected by Mr. Boys, who gave a description and plate of it, in the "Linnæan Transactions," vol. v. 230, pl. 10. In the 14th volume of the same work, Mr. Hogg fully demonstrated its character, by hatching, from those found on the English coast, the young of *Natica glaucina*.

To show what a puzzle it has been, I will add some of its names found in books.

Flustra arenosa, ELLIS; *Zooph.*, and also his *Corallines*, pl. 25, f. e.

Flustre aréneuse, LAMOUROUX; *Polyp. flex.* 111, No. 220.

Flustre arénacée, BLAINV.; *Dict. des Sc. Nat.*, and *Man. d'Actinol.*, 446.

E'schara lutòsa, PALLAS; *El. Zooph.*, 37, No. 5.

E'schara millépora arenòsa A'nglica, RAY; *Syn.*, 31.

Alcyonium arenòsum, GMELIN; *Syst. Nat.*, iv. 654. SHAW; *Nat. Miscell.*, t. 272.

Discópora cribrum, LAM.; *An. sans Vert.*, ii. 250.

NÁTICA TRISERIÀTA.

Shell ovate-globose, whorls five, usually checkered with three series of dark spots on the lower whorl, and one on the upper whorls; umbilicus small, nearly free.

FIGURE 165.

State Coll., No. 60. Soc. Cab., No. 1519.

Nática triseriàta, SAY; *Journ. Acad. Nat. Sc.*, v. 211.

Shell ovate, approaching to globular, of a yellowish-white or ash-color; whorls five, convex, lines of growth distinct, and usually covered with a thin yellowish epidermis; lower whorl has three revolving series of twelve to fourteen bluish or dark chestnut-colored, oblique spots, usually of a square or oblong form, and sometimes crescent-shaped; the upper one just below the suture; the middle one is divided by the junction of the lip, and the third is half way between it and the umbilicus; the upper one is continued on all the whorls, but the next one disappears soon; the spaces between the spots often appear like whitish bands, and the sutural region is of the same color; spire considerably elevated, sutural line delicate; aperture ovate, lip sharp and white within; a thick white callus covers the inner margin, very slightly modifying the umbilicus, where it has a fissure at the posterior margin of the umbilicus; a dense mass of callus, within the aperture, at its upper angle, strengthens the lip; throat colored with dark-chestnut, or transmitting the exterior markings; umbilicus rather small and simple, not much wrinkled within; operculum horny. Length $\frac{7}{16}$ inch, breadth $\frac{1}{2}$ inch.

Found along the whole coast to the north of Cape Cod, on flats which are left by the tide at low water; but it is as yet doubtful whether it passes to the south of this limit.

This has been thought by some to be the young of the preceding species. In general aspect there is a resemblance; but the propor-

tionate length of this is greater, the thick, white callus indicates a mature shell, and the dark portion of the upper whorls is at the upper instead of at the lower portion of the whorl, as in *N. heros*, and the umbilicus is proportionally smaller instead of larger, as is the case in young shells. Besides, I have never seen a large shell in the localities where this species is abundant. The largest specimen I have seen, which I could distinctly refer to this species, is less than an inch in length. It is evidently analogous to *N. canrena* of Europe.

It varies in marking greatly. Some specimens are of a pale yellow-color, and destitute of marking; on some, the spots blend so as to present alternate bands of light and dark color; again, some of the series are blended, and some are not. The spots may be square, oblong, or crescentic, and are usually oblique. The ivory-white callus seems to be the most constant character.

NÁTICA IMMACULÁTA.

Shell small, sub-ovate, solid, bluish-white, spotless, glossy, umbilicus free.

FIGURE 168.

State Coll., No. 46. Soc. Cab., No. 951.

Nática immaculáta, TOTTEN; *Silliman's Journ.*, xxviii. 351, f. 6.

Shell sub-ovate, extremities rather pointed, solid, milk-white, and glossy when deprived of its thin, greenish-yellow epidermis; spotless, lines of growth faintly perceptible; whorls about five, the spire very short and pointed, and the suture not impressed; the lower whorl convex and rounded, prolonged at the base; aperture narrow oval, rather acutely curved at base; outer lip sharp, inner margin coated with ivory-white callus, not modifying the umbilicus, but extending along the margin to its posterior limit; at the posterior angle of the aperture it is much thickened, and, running along under the junction of the whorls, causes a white spiral line to appear externally, just below the suture; the region before the umbilicus too, is very white; umbilicus rounded and deep; operculum horny. Length $\frac{1}{4}\frac{3}{8}$ inch, breadth $\frac{9}{16}$ inch.

First found by Colonel Totten in Newport harbour, and afterwards in Provincetown harbour. It is found plentifully in the stomachs of fishes taken in Massachusetts Bay.

I know of no species resembling this, except it be *N. Anglica*, of

which some specimens are said to be immaculate. But that shell has a more elongated spire, a broader aperture and base, and its greatest breadth is rather below instead of rather above the middle, as in this species. It is the smallest species with which I am acquainted, though I have seen one specimen $\frac{2}{5}$ of an inch in length; and, for so small a shell, it is remarkable for its solidity.

NATICA CANALICULATA.

Shell ovate, smooth, covered with a dusky yellow-colored epidermis; whorls four; spire channelled at the suture; umbilicus a mere line.

FIGURE 161.

State Coll., No. 43.

Natica canaliculata, GOULD; *Silliman's Journ.*, xxxviii. 197.

Shell ovate, rather ponderous, dingy-white, nearly smooth, and somewhat glossy, covered with a dark gamboge-colored epidermis; whorls four, the upper portion of each turning before it joins the preceding whorl, so as to form a broad, shallow canal at the suture, and giving the spire a turreted appearance; aperture about two thirds the length of the shell, nearly semicircular; lip sharp, a little spreading in front, the inner margin nearly a straight line, and overspread with a thick callus; interior white; umbilical opening a mere slit, one side of which is formed by the callus, sometimes altogether concealed; operculum horny, sub-spiral. Length $1\frac{1}{16}$ inch, breadth $\frac{7}{16}$ inch.

Taken from fishes caught on the Banks, and one fine specimen from a fish caught in Massachusetts Bay. I have a specimen also from the coast of Norway.

The aspect of this shell is such, that I was first led to refer it, doubtfully, to the genus PALUDI'NA. It very greatly resembles *Paludina ponderosa*, Say. All doubt, however, on that point, has been since happily removed through the kindness of Colonel Totten, who furnished me with several specimens containing the sub-spiral operculum.

The remark of Deshayes, that NATICA is without an epidermis, will not hold good in regard to this species, nor, indeed, to any of the species found on our coast. He, however, was aware of the small value of this characteristic, and alludes to a species then under his eye, which I take to be *N. heros*, having the shape and epidermis of

AMPULLA'RIA, but the operculum of NA'TICA. A specimen sent to me by Dr. Lovèn was regarded by him as new, and he had applied to it the name of *N. éxulans*.

NA'TICA DUPLICATA.

Shell conical-ovate, usually with a dark band above the suture on the upper whorls ; umbilicus deeply grooved, and partially or entirely covered with a chestnut-colored callus.

FIGURES 163, 164.

State Coll., No. 58. Society's Coll., No. 78.

Natica duplicata, SAY ; *Journ. Acad. Nat. Sc.*, ii. 247.

Shell solid, ovate, the upper portion of the whorls compressed so as to give it a pyramidal outline ; surface marked with very faint revolving lines, and more conspicuous lines of growth ; color light chestnut-brown above a line marking its greatest circumference, whitish or ash-colored below it ; usually having a dark-brown band on the lower portion of the posterior whorls, and the upper portion whitish ; whorls five or more, spire rather prominent ; aperture ovate, very oblique ; outer lip very thin and sharp, joining the whorl behind by a very small angle, but this angle is so filled up within with callus, that the real aperture is rounded, and at a considerable distance from the junction of the lip ; throat chestnut-brown, or livid, lower portion white, generally of a pearly lustre ; umbilicus irregular, having a deep groove revolving within it, and covered wholly or partly with a very thick, chestnut-brown callus ; operculum horny. Length 2 inches, breadth rather more.

Inhabits the same localities as *N. heros* ; is less common in the vicinity of Boston, but common at Nantucket.

This species is subject to considerable variation in shape, some individuals having the spire much more elevated than others. It is easily distinguished by its conical figure, and by the great amount of callus, which renders it a remarkably heavy shell. Specimens along the Southern coast are generally less elevated, more smooth and brown than those found in Massachusetts. I have a specimen from the Grecian island, Syra, which corresponds with these, except that the colors are

brighter, and the shell more smooth, as might be expected if modified by a milder climate. A figure in Lister, (pl. 562, f. 3,) represents this shell.

Natica cónica, of Lamarck, is a much more elevated shell, though his description might be applied to our shell in every particular.

Its ordinary length is half an inch less than is given above.

NÁTICA PUSÍLLA.

Shell small, sub-oval, ash-colored ; umbilicus imperfect ; operculum horny.

FIGURE 166.

State Coll., No. 42.

Natica pusilla, SAY ; *Journ. Acad. Nat. Sc.*, ii. 257.

Shell sub-oval, bluish-white, with a light, ash-colored epidermis ; surface glossy, smooth, or with merely microscopic revolving lines, and lines of growth ; whorls four, regularly convex ; spire moderately elevated, blunt ; suture fine and deep, the edge of the whorl rising a little by the side of it ; sometimes one or two faint, brownish bands may be seen on the lower whorl ; aperture ovate, more than half the length of the shell ; outer lip thin and sharp ; inner margin thick, the callus white, abundant, and pressed into the umbilicus so as to leave only a narrow, curved chink by the side of the lip ; throat white ; operculum horny. Length $\frac{1}{2}$ inch, breadth $\frac{2}{3}$ inch.

Taken from fishes caught in Massachusetts Bay, in company with *N. clausa*, and *N. immaculata*.

Most of the specimens have about half the dimensions above given.

I was not a little gratified in looking over a parcel of the *N. clausa*, to find several specimens differing from them in having a horny instead of a bony operculum, a partial umbilicus, and no flattening of the top of the whorls. In color, size, and general aspect, they were the same. On finding that this shell corresponds to Mr. Say's *N. pusilla*, I was still more gratified, inasmuch as it is represented in the Cabinet of the Academy of Natural Sciences, at Philadelphia, by a species of MARGARITA (*Turbo inflatus*, Totten), and I had despaired of finding any representative elsewhere. Mr. Say remarks, that it is generally mistaken for the young of *N. duplicata*. But the evidences of ma-

turity in its callus, the umbilicus, and the color of the throat, sufficiently distinguish it from both *N. duplicata* and *N. heros*.

NÁTICA CLAUSA.

Shell sub-globose, more or less tinged with brown ; umbilicus closed ; operculum calcareous.

FIGURE 167.

State Coll., No. 45. Society's Coll., No. 952.

Nática clausa, BROD. and SOWERBY; *Zool. Journ.*, iv. 360. GRAY; *Zool. of Beechey's Voy.*, 136, pl. 37, f. 6, and pl. 34, f. 3.

Nática consolidata, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 89, pl. 3, f. 14.

Nática boreàlis, БЕКК; (not Gray) teste Lovèn.

Shell small, sub-globular, surface of a dim lustre, marked by striæ of growth only ; color from a livid-white, to dark reddish-brown, those of the latter tint exhibiting conspicuously a zone of the former color at the base ; epidermis thin, bony, brownish horn-color ; whorls four or five, tumid, but a portion near the sutures is slightly depressed ; spire slightly elevated, obtuse ; suture well defined ; aperture oval, unusually wide behind ; outer lip sharp, thickened and rounded as it ascends to the umbilicus, which is completely consolidated by an ivory-white, shining callus ; on the whorl the callus is thin, but a free deposit of it within the angle firmly supports the junction of the lip to the whorl, a zone of which calcareous deposit also surrounds the umbilical region ; throat white ; operculum calcareous, bluish-white. Length $\frac{1\frac{3}{8}}{8}$ inch, breadth $\frac{1\frac{1}{8}}{8}$ inch.

Taken alive from the stomachs of fishes, plentifully.

This species is readily distinguished from all others of our coast by its bony operculum, and by its small umbilicus, into which just enough of white callus seems to have been crowded to fill it accurately.

Mr. Sowerby, on actual comparison, declares this to be his *N. clausa* ; and, as his description was published several years prior to that given by Mr. Couthouy, his name must take precedence. Mr. Sowerby states it to be nearly an inch in diameter ; whereas the dimensions above given exceed those of the specimens usually found with us. But, as it is evidently an Arctic shell, Mr. Sowerby's specimens having been brought from Melville's Island, and I have seen one from the Banks quite as large as those he mentions, I insert also the name given to it by Beck, on the authority of Dr. Lovèn.

NÁTICA FLAVA.

Shell thin, sub-globose ; aperture large ; inner margin sinuous ; umbilicus none.

FIGURE 162.

State Coll., No. 44.

Natica flava, GOULD ; *Silliman's Journ.*, xxxviii. 196.

Shell of an inflated, globular form, light and thin, white, with a bright straw-colored or golden epidermis ; surface very minutely checkered with very faint, revolving lines, and lines of growth ; spire very little elevated, composed of four rounded whorls, a little compressed behind, near the suture, which is faintly impressed ; aperture occupying one half the front aspect of the shell, broad oval, modified by a curve which looks as though it might be caused by a contraction and obliteration of the umbilicus ; outer margin very sharp ; umbilical region about the middle of the left margin much retreating, and deeply indented in most specimens, though evidently never open ; a thin callus, commencing at the upper angle, expands and thickens over this region, then, narrowing, forms a thick, rounded, ivory, vertical margin to the front of the shell. Length about 1 inch, breadth a little less.

From the collection of Colonel Totten, who obtained it from the Bank fishing grounds.

The aspect of this shell immediately suggests the *Helix aperta*, Born, (*H. naticoides*, Drap.,) to which it bears a very striking resemblance in shape. If the existence of an umbilicus is an essential characteristic of the genus, and so it is laid down by Lamarck, this shell cannot come under it. There is no approach to an umbilicus, even in the youngest specimens, the space intended to be occupied by one having been apparently thrown into the aperture. There is one other described species conforming to the same type, the *N. fluctuata*, Sowerby (*Tankerville Catal.*, p. 12), and figured by Dr. Jay in his "Catalogue, 1836," under the provisional name of *N. imperforata*. Their form is so peculiar that Mr. Sowerby has recently grouped them with several others in a new genus, which he calls *GLOBULUS*. Swainson employs the word *GLOBULARIA* as having a better termination.

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Of the five specimens I have examined, three were mature, and two young. In the oldest, the width of the shell is proportionally greater, and there is a tendency to angularity at about the upper fourth of the last whorl.

GENUS JÁNTHINA, LAM.

Shell sub-globose, thin, fragile, spire short; aperture angular at the anterior junction of the inner and outer lips; pillar twisted; lip thin, with a sinus at the middle.

JÁNTHINA FRÁGILIS.

Shell thin, brittle, conical, ventricose, violaceous beneath, whiter on the spire.

State Coll., No. 292. Soc. Cab., No. 942.

Helix jánthina, LIN.; GMELIN; *Syst.*, 3645, No. 103. LISTER; *Conch.*, t. 572, f. 24. RUMPHIUS; *Mus.*, t. 20, f. 2. GUALT.; *Test.*, t. 64, f. O. SLOANE; *Jamaica*, t. 1, f. 4. BROWN; *Jamaica*, t. 39, f. 2. D'ARGENV.; *Conch.*, pl. 6, f. 5. CHEMN.; *Conch.*, v. t. 166, f. 1577, 1578. WOOD; *Index*, pl. 34, t. 116. *Jánthina frágilis*, BRUG.; *Encyc. Méth*, pl. 456, f. 1. *Ann. du Mus.*, xi. 123 (animal). BLAINV.; *Malacol.*, pl. 37 bis., f. 1 a. SOWERBY; *Conch. Man.*, f. 333.

Jánthina commúnis, LAM.; *An. sans Vert.*, (1st. ed.) vi. 206.

Shell globose-conic, thin, brittle, transparent; whorls three or four, forming a short spire, the last one very large, and angular at the middle; beneath the angle the color is deep violet, lighter about the axis, and above it the color is merely tinted with violet, a little darker at the suture; surface shining, wrinkled by the lines of growth, and with short, oblique wrinkles above the angle of the last whorl, and marked with revolving lines beneath that angle; aperture large, semi-oval, outer lip very thin, retiring as it passes the angle of the whorl, so as to produce a shallow recess; inner lip cylindrical, straight, corresponding with the axis of the shell. Length $\frac{3}{16}$ inch, breadth 1 inch.

The *Jánthina* floats, by means of a mass of vesicles, at the surface, throughout the wide ocean, and is not unfrequently driven upon the ocean shores by storms. After a severe gale, in the

autumn of 1839, great numbers of them were collected on the shores of Nantucket, some specimens of which were furnished me by T. A. Greene, Esq., of New Bedford.

FAMILY *MACROSTÓMATA*, LAM.

Shell ear-shaped, the aperture much dilated, margins disunited posteriorly ; operculum none.

GENUS *VELUTINA*, BLAINV.

Shell small, thin, sub-globose, composed of two rapidly enlarging volutions ; aperture large, sub-ovate, lip thin, not joined behind ; usually covered with a velvety or powdery epidermis.

VELUTINA LÆVIGATA.

Shell obliquely ovate, very fragile, consisting principally of the last of three whorls ; epidermis brown, rising into regular, equidistant, spiral folds.

FIGURE 159.

State Coll., No. 125. Soc. Cab., No. 2408.

Helix lævigata, LIN. and English authors. DONOVAN ; *Brit. Shells*, t. 105. MONTAGU ; *Test. Brit.*, 382.

Helix haliotóidea, FABR. (non Lin.) ; *Fauna Grænl.*, No. 387.

Bulla velutina, MÜLLER ; *Zool. Dan.*, iii. t. 101, f. 1 to 4.

Velutina capulóidea, BLAINV. ; *Malacol.*, pl. xlii. f. 4.

Velutina rupícola, CONRAD ; *Journ. Acad. Nat. Sc.*, vi. 266, pl. xi. f. 17, 18.

Galericulum lævigatum, BROWN ; *Conch. of Great Brit.*, &c., pl. 38, f. 35, 38.

Shell obliquely ovate or ear-shaped, very thin and fragile, transparent, flesh-colored, or reddish-white ; whorls three, the last extremely large and distended, the others very small, turned to one side, and partly sunken within the last ; suture distinct ; surface faintly marked with the lines of growth, and covered with a thick, brownish epidermis, which is raised at close and regular intervals into fringe-like ridges revolving round the shell ; aperture ample, rounded-oval ; lip extremely thin, but thickening a little as it rises upon the body of the shell ; the two lips uniting behind by a plate of enamel crossing the body of the shell, which, in mature

shells, renders the aperture nearly circular; interior smooth and shining. Diameter about $\frac{4}{10}$ inch, length a little more.

Found among the sea-weed on the sea-beach, and in the stomachs of fishes. Mr. Conrad states, on the authority of Dr. Pickering, that it dwells on rocks, with habits like the PATELLA. But the fact of so fragile a shell being usually found entire in the stomachs of fishes, rather forbids this idea. It could not be detached by them without being fractured.

This shell, as hitherto found, is extremely fragile, seeming to consist almost entirely of epidermis, with a small deposition of calcareous matter within. The ordinary English specimens are said to be of about the size of a pea, or perhaps twice as large; but it sometimes becomes three fourths of an inch in diameter. I sent our ordinary specimens to Mr. G. B. Sowerby, who sent larger ones in return, assuring me of their identity. These differ from the shell as we find it, in being more solid, the epidermis more wrinkled lengthwise, the surface shining where this is removed, and the lowest whorl is disunited from the preceding one at the aperture. These changes may all be attributed to age. We may anticipate finding specimens of equal size here, since we have already found them four times as large as the one described by Mr. Conrad, who allows the very close affinity of his minute one to the *lavigata* of Europe.

The quoting of *Bulla velutina* by Lamarck as a synonym to his *Sigarëtus haliotóideus* is plainly erroneous. The *Helix haliotóidea* of Fabricius, which is the *Bulla velutina* of Müller, is not the *H. haliotóidea* of Linnæus and others; and hence the probable misquotation.

The figure in Pennant's "British Zoology" is poor; that of Blainville represents the common appearance when arrived at that size, the transverse wrinkles becoming more conspicuous than the revolving ones, which evidently become obsolete with age. The white zone which he represents, however, I have never seen. Brown's figure is very good for a shell of the size, and Conrad's is sufficiently characteristic for specimens as we usually find them.

VELUTINA ZONATA.

Shell oval-orbicular, compressed, pellucid, covered with a striped, calcareous incrustation; inner lip flattened and channelled.

FIGURE 160.

State Coll., No. 126. Soc. Cab., No. 2409.

Shell thin, opake, white, and in some places pellucid, minutely striated both ways ; whorls less than three, the first two minute, and not seen when the shell is viewed in front ; the last, widening with great rapidity, becomes large, though it is not tumid, but appears rather depressed as it lies upon the aperture ; the surface is covered with a chalky incrustation, deposited by the animal, apparently instead of an epidermis ; it is white, or flesh-colored, and generally with numerous zones of brown, of various widths ; when this is removed, the shell is left pellucid ; aperture ovate, ample, nearly the whole length of the shell, more than double the size of the body of the shell ; outer lip sharp and spreading ; inner lip sharp-edged, but margined by a flattened, crescent-shaped, white, channelled space ; the sharp edge is lost as it revolves within the shell, and a thin plate of enamel covers the space between it and the junction of the outer lip. Length $\frac{9}{10}$ inch, breadth $\frac{1}{4}$ inch.

Specimens have been found on Chelsea Beach, but are most easily obtained from fishes.

It is readily distinguished from the preceding by its more solid structure, its flattened form, its expanded aperture, the flattening of the left lip, and the peculiarity of the surface. Mr. Sowerby sent a specimen from a raised beach on the Frith of Clyde, labelled "*Galerículum undatum*, Brown," which is partly fossilized, but bears a very close resemblance to our shell. The most marked differences in the shell I received are, the greater breadth and excavation of the flattened lip, and a more irregular exterior, which, from the name it bears, I suppose to be constant. It may also be the shell figured in Brown's "Conchology of Great Britain," as *Galerículum ovatum*, but nowhere described. The peculiar coating of the shell adheres very closely, and might not be detected except by accident. Perhaps it does not always exist ; but in the striped specimens it will always be found. I should think that specimens entirely white, or flesh-colored, are as often found as the zoned ones. In one fish, caught off Cape Ann, I found about a dozen very large and beautiful specimens.

GENUS SIGARETUS, LAM.

Shell ear-shaped, aperture ample, spire small and depressed, pillar spiral.

SIGARETUS HALIOTÓIDEUS.

Shell obliquely ovate, pellucid, white, compressed ; aperture very large ; spire minute and lateral.

FIGURE 158.

State Coll., No. 54. Soc. Cab., No. 964.

- Helix haliotóidea*, LIN.; *Syst. Nat.*, 1250. MARTINI; *Conch.*, i. t. 16, f. 151.
Bulla haliotóidea, MONTAGU; *Test. Brit.*, 211, pl. 7, f. 6, and vign. 2, f. 6. MATTON and RACKETT; *Lin. Trans.*, viii. 123. BROWN; *Encyc. Brit.*, vi. 462. WOOD; *Index*, pl. 18, f. 61.
Sigarétus haliotóideus, LAM.; *An. sans Vert.*, (1st ed.) vi. 208. FLEMING; *Edin. Encyc.*, vii. 66. *Brit. Anim.*, 360. BROWN; *Conch. of Great Brit., &c.*, pl. 44, f. 1, 2.
Oxy'noe glabra, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 90, pl. 3, f. 16.

Shell small, obliquely ovate, thin, pellucid, white, smooth and shining; lines of growth very faint; whorls two, the first, situated towards one side, is a mere nucleus for the last, which otherwise constitutes the whole shell; aperture nearly the whole area of the shell; outer lip sharp, entire, and somewhat expanded; inner lip sharp, with the edge a little turned, regularly curved in conformity to the left outline of the shell, and, entering the cavity of the spire, is seen to terminate there; in the other direction, the curvature suddenly ceases, and, forming a slight angle, goes onward to join the outer lip; a thin plate of enamel connects the two lips above. Length $\frac{1}{2}$ inch, breadth $\frac{2}{5}$ inch.

Several specimens of this shell have been found, all of them in the stomachs of fishes. They are about equal in size, but vary somewhat in shape and convexity. The shell is precisely the same as the European one bearing the above name.

As it is not certain that its entire animal has yet been seen, its genus remains undetermined. Mr. Couthouy rejects the genus SIGARETUS, because, from what he saw of the animal, he judged the shell to be external, and adopted the genus OXY'NOE of Rafinesque, with which

no one has any acquaintance except its author, and no characters are given of its shell except that it is exterior and bulla-form. It seems better, therefore, to leave it where the conformation of the shell would place it, and where others have arranged it, until its animal is fully known, and its place determined. It will most probably be found to belong to the genus CORIOCELLA.

FAMILY *PLICACEA*, LAM.

Aperture not spreading; pillar plaited.

GENUS *TORNATELLA*, LAM.

Shell oval, spirally grooved, whorls few; aperture long, narrow, rounded before; outer lip thin, inner lip spirally twisted to form a fold.

TORNATELLA PUNCTO-STRIATA.

Shell minute, white, sub-oval; whorls four or five, the lowest one large, the lower half marked with revolving, punctured lines; suture deep; fold of columella distinct.

FIGURE 188.

State Coll., No. 31. Soc. Cab., No. 2367.

Tornatella puncto-striata, ADAMS; *Bost. Journ. Nat. Hist.*, iii. 323, pl. 3, f. 9.

Shell minute, white, elongated-oval, inclining to ovate; whorls four, perhaps five, the lowest one at least three fourths the length of the shell, distended, the portion above the aperture plain and smooth, the remainder marked with ten to fifteen deep, rather distant revolving lines, which are indented with minute punctures; the other whorls form a short, rapidly diminishing spire, and each of them is flattened so as to form a shoulder at the suture, which is deep and somewhat channelled. Aperture narrow, two thirds the length of the lower whorl, widening downwards; outer lip sharp and simple, regularly curved, not very broadly rounded at base; pillar thickened, exhibiting a prominent fold; umbilical region depressed, and in immature specimens it is open. Length $\frac{1}{10}$ inch, breadth $\frac{3}{40}$ inch, divergence 60° .

Found by Professor Adams in mud dredged up from New Bedford harbour.

This is the smallest species hitherto described, but it bears every mark of maturity. It has a general resemblance to the *T. tornatilis* of Europe, but the spire is shorter and less acutely pointed. The punctured revolving lines, which cover the anterior half of the lower whorl, are constant and decisive marks of distinction, in addition to its minute size.

FAMILY *SCALARIANA*, LAM.

Shell without plaits on the pillar; margins of the aperture circularly united.

GENUS VERMÉTUS, ADANSON.

Shell tubular, spiral at the apex, irregularly and loosely twisted towards the aperture; operculum horny.

VERMÉTUS LUMBRICALIS.

Shell conic-tubular; usually many tubes are intertwined into a group; unequal striæ run the whole length of the tube.

State Coll., No. 56. Soc. Cab., No. 922.

Serpula lumbricalis, LIN.; *Syst. Nat.*, 1266. LISTER; *Conch.*, t. 548, f. 1. MARTINI; *Conch.*, i. 48, t. 2, f. 12 B. DILLWYN; *Catal.*, ii. 1078. KNORR; *Vergn.*, ii. t. 13, f. 1.

Vermiculària lumbricalis, LAM.; *Syst. des An. sans Vert.*, 97.

Vermétus lumbricalis, LAM.; *An. sans Vert.* SOWERBY; *Conch. Man.*, f. 345.

Shell consisting of a long, rough, ash-colored, conical tube, marked with numerous, unequal, raised lines along its whole length. At the pointed end is a spire of eight or ten closely connected whorls, upon each of which are two sharp, elevated ridges. This portion usually lies in a horizontal direction, and is attached by one side to some foreign body. The coil then becomes ascending and lax until it can barely be called tortuous. The aperture is circular, with a sharp, simple edge, and is closed by a horny operculum, having a central nucleus, and concentric elements.

The length of the closely spiral portion is from half an inch to an inch; it is then continued indefinitely. Some of my specimens must be eight or ten inches in length. Diameter of aperture

about one fourth of an inch. It is very seldom that one specimen is found by itself; numbers are usually grouped and intertwined with each other.

A very fine group was hooked up by a friend in New Bedford harbour, containing not less than fifty individuals, inseparably intertwined. The living animals then occupied them. Professor Adams has also found small ones in the same region. Several specimens of *Cumingia tellinoides* were entangled within the folds, and in one of the tubes was a *Crepidula plana*. In the case of this shell we have the paradox of the apex or commencement of the shell being situated beneath the base.

GENUS SKENEÆ, FLEMING.

Shell minute, discoidal; whorls few, and destitute of spines; aperture dilated; operculum horny.

SKE'NEÆ SERPULÓIDES.

Shell minute, discoidal, concavely umbilicated beneath, horn-colored, whorls three, mouth expanded.

FIGURE 189.

State Coll., No. 55. Soc. Cab., No. 2411.

Helix serpuloides, MONTAGU; *Test. Brit., Suppl.*, 147, pl. 21, f. 3. DILLWYN; *Catal.*, ii. 884.

Turbo serpuloides, TURTON; *Conch. Dict.*, 228. WOOD; *Index*, pl. 32, f. 165.

Delphinula? *serpuloides*, ADAMS; *Bost. Journ. Nat. Hist.*, iii. 334.

Delphinóidea serpulóidea, BROWN; *Conch. of Great Brit., &c.*, pl. 51, f. 40, 41.

Skeneæ serpuloides, FLEMING; *Brit. Anim.*, 313.

Shell minute, flat, slightly convex above, and broadly concave below, forming a deep umbilicus, which displays all the whorls within; whorls three, smooth, a little depressed, light horn-color; apex scarcely elevated; suture channelled; aperture turning downwards, circular, somewhat trumpet-shaped, in contact with, but not embracing any part of, the preceding whorl; lip sharp, and receding so as to form an acute gap as it joins the preceding whorl; operculum horny, multi-spiral, the apex central. Breadth $\frac{1}{20}$ inch, height $\frac{1}{30}$ inch.

Clings to stones lying about low-water mark. I have found it

occasionally, but Professor Adams has found it in great numbers along the southwestern shore of East Boston.

It is clearly described, and accurately figured by Montagu, but its generic place is very doubtful. It is allied to DELPHINULA, and Brown, in his "Conchology of Great Britain," &c., figures several co-species, and embraces them in a genus which he calls DELPHINOIDEA. The genus SKÉNEA, of Fleming, is adopted in preference, because its characteristics have been described.

GENUS SCALÀRIA, LIN.

Shell turreted, spire long, composed of rounded, sometimes separated whorls, crossed by elevated ribs; aperture oval; lip continuous, reflected.

SCALÀRIA NOV-ÁNGLIÆ.

Shell white, whorls convex, and barely in contact; ribs numerous, slender, unequal, and with numerous, fine, revolving lines, in the intervening spaces; umbilicated.

State Coll., No. 48. Soc. Cab., No. 2410.

Scalària NOV-Ángliæ, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 96, pl. 3, f. 5.

Shell turreted, elongated, thin, of a glossy white-color, with here and there an irregular rusty blotch; whorls ten, cylindrical, barely touching each other, crossed by eleven somewhat oblique, delicate bars, of a pure white-color, three or four of which, on the lower whorls, are more robust than the rest; the bars do not cross the sutures, and each has a little spine at its posterior termination. The space between the ribs is thickly marked with very fine revolving lines, which are also crossed by still finer ones; aperture nearly circular, bordered by a robust rib, with a spine like the others, flattened so as to form a blunt angle at its anterior portion, and partially concealing a small umbilicus. Length $\frac{7}{10}$ inch, greatest breadth $\frac{1}{4}$ inch.

Only one specimen has as yet been found, and this was taken from the stomach of a fish caught, off Cape Ann, by Mr. Couthouy.

It very much resembles *S. multistriata*, Say, but that shell is described as imperforate, whereas this has a small umbilical opening; and no mention is made of the ribs being crowned by a spine. In general form it is also like *S. clathrus*, but that is imperforate, and is smooth between the ribs. To the *S. mucronata*, Risso, it is also closely allied.

SCALARIA GRÆNLA'NDICA.

Shell elongated, regularly tapering to a point, of a livid color; whorls ten, in close contact, moderately convex, and traversed by flattened, white ribs, the intervening spaces with distant, coarse, revolving lines; no umbilicus.

FIGURE 160.

State Coll., No. 49. Soc. Cab., No. 1634.

Turbo clathrus Grænlândicus, CHEMN.; *Conch.*, xi. t. 1878, 1879.

Scalaria planicosta, KIENER; *Iconog.*, (*Scalaria*), pl. vii. f. 21.

Scalaria subulata, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 93, pl. 3, f. 4.

Shell turreted, long, and regularly tapering to a fine point, of a dead bluish-white or livid-brown color; whorls ten, rather flattened, barred with eight to fifteen stout, flattened, oblique, white ribs, some of which are apparently double; ribs not terminating abruptly, but bending, and flowing along the sutural space to the preceding ones; the intervening space is marked by six or eight coarse, rounded, equidistant ridges and revolving lines; a single one, nearly as elevated as the ribs, revolves from the upper angle of the aperture; aperture nearly round, bordered by a rib; left lip a little expanded, and projecting into a perceptible angle in front. Length 1 inch, greatest breadth $\frac{7}{10}$ inch, divergence 34° .

Found thrown upon Nahant Beach, and taken from fishes caught in Massachusetts Bay, and at the Grand Banks, abundantly. Mr. Couthouy found one alive at Phillips's Beach, the animal of which he describes nearly as follows:

Animal yellowish-gray, thickly and irregularly marked with dull-whitish spots, most conspicuous on the sides of the neck; foot short, thick, and nearly quadrangular; head elongated, rounded superiorly, not separated from the neck by any distinct line; tentacula two, about an eighth of an inch long; eyes small, black

and shining, at the outer base of the tentacula ; mouth rather large, rounded, corrugated ; operculum horny, strong, opaque, of few turns. It was sluggish in its movements, and fed eagerly upon fresh beef, especially if somewhat macerated.

Two imperfect shells in my possession, which I had supposed to be *S. Turtònis*, I am now satisfied belong to this species. They are three or four times as large as the shells observed by Mr. Couthouy, and ordinarily found. But by comparison with specimens of *S. Turtònis* sent me by Mr. Sowerby, I find the color different, and the brown bands entirely wanting in our shell. In *S. Turtònis* the whorls are more numerous, and more convex ; the ribs are more delicate, and the intervening revolving lines are more numerous and far more delicate. Moreover, Mr. Sowerby, in indicating it to be the *Turbo clathrus Grœnlandicus* of Chemnitz, and hence called *Scalària Grœnlandica*, observes, that it sometimes attains the length of two inches and a half. On account of the flatness of the whorls, and the suture being partially filled by the ribs, this shell has the outline of a TE'REBRA.

SCALÀRIA LINEÀTA.

Shell conical, white, with eight whorls, traversed by sixteen to eighteen delicate ribs, and the lower one by a revolving, raised line and one or more brownish bands ; aperture oval ; lip strong ; umbilicus none.

State Coll., No. 50. Soc. Cab. No. 3200.

Scalària lineàta, SAY ; *Journ. Acad. Nat. Sc.*, ii., 242. *Amer. Conch.*, pl. 27.

Shell elongated-conical, pointed, white or tinged with brownish ; whorls eight, rounded, not disjoined, but defined by a well-impressed suture ; about sixteen to eighteen very delicate and slightly raised longitudinal ribs, not crossing the suture, traverse each one ; intervening spaces smooth ; a raised line or rather step, originating from the junction of the lips, revolves on the lower whorl, and defines the upper edge of a reddish-brown revolving band ; another fainter band is usually seen just below the suture. Aperture sub-oval, bordered by a strong, rounded lip,

which is a little expanded at the anterior angle. Umbilicus none. Length about $\frac{1}{3}$ inch, breadth $\frac{1}{5}$ inch, divergence 36° .

Found by Mr. C. F. Shiverick, at New Bedford and vicinity.

It differs from *S. Nov-Angliæ* in its more robust and firm structure, its more numerous ribs, raised shoulder, and bands on the lower whorl, its absence of umbilicus and revolving lines, &c. It belongs to the South, and is not uncommon there. Mr. Say speaks of it as subject to considerable variety in the size of the ribs, the breadth of the colored bands, &c.

SCALARIA MULTISTRIATA.

Shell white ; spire acute ; whorls eight ; ribs numerous, the spaces between them marked with fine revolving lines ; umbilicus none.

State Coll., No. 51. Soc. Cab., No. 928.

Scala'ria multistriata, SAY ; *Amer. Conch.*, pl. 27.

Shell rather small, solid, white, acutely conic ; whorls eight, very convex, in firm contact, but well defined by the suture ; ribs numerous, varying in number from fourteen to twenty, equidistant, and moderately elevated, simple, erect, rounded at edges ; spaces between them marked with numerous fine revolving lines. Aperture rounded-ovate, more than one fourth the length of the shell, margined by a rib ; pillar lip thick and rounded ; umbilical opening none. Length $\frac{1}{2}$ inch, breadth $\frac{3}{8}$ inch, divergence 30° .

Two small specimens, which I think must be regarded as of this species, were found by Mr. Shiverick, outside of Dartmouth harbour.

They vary in some respects from the description of Mr. Say. The number of whorls is only seven, and of ribs thirteen. But ours are small specimens, less than one fourth of an inch in length ; and Mr. Say gives only sixteen ribs in his description, whereas, an undoubted specimen before me, has as many as twenty. The specific character seems to consist in the revolving lines between the ribs, and the destitution of an umbilicus. In this last respect it differs from *S. Nov-Angliæ*, while it corresponds with that shell in the first character, and in its general outline. Other, and probably larger, specimens will be

found, and all doubts may thereby be removed. Should it prove a distinct species, Professor Adams has proposed for it the name of *S. pulchella*.

FAMILY TURBINACEA, LAM.

Shell turreted or conoid; aperture rounded or oblong, not spreading; lips disunited posteriorly.

GENUS MARGARITA, LEACH.

Shell conical, moderately elevated; whorls few, sub-inflated; aperture rounded, imperfect posteriorly; lip sharp; umbilicus deep; operculum multi-spiral; the nucleus central.

MARGARITA CINEREA.

Shell low-conical, thin, ash-colored, umbilicated, with four to six elevated and numerous smaller revolving ridges, and regular, eroded, elevated lines of growth.

State Coll., No. 128. Soc. Cab., No. 2278.

Turbo cinereus, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 99, pl. 3, f. 9.
Trochus costalis, LOVE'S; in letters.

Shell small, thin, of a low conical or pyramidal shape; color a dull ashy-white, sometimes tinted with green; whorls five to seven, convex, and rendered angular by prominent, irregularly disposed revolving ridges, of which from four to six are more elevated, with less conspicuous intervening ones; and the lowest of these elevated ridges forms a limit, at which the whorl slopes abruptly, and presents a broad, slightly convex base, marked with fine, equal, and equidistant revolving lines; the whole surface is also covered with crowded, very fine, and distinctly prominent lines of growth; the umbilicus is broad and deep, and bounded by the last revolving line, which forms an angle terminating at the most anterior point of the otherwise circular aperture, and here causes an angular prolongation; outer lip regularly curved, sharp, finely scolloped; it rises on the left margin, and terminates just behind the umbilicus, slightly expanding and par-

tially covering it ; a very thin stratum of enamel sometimes extends across the body of the shell ; throat within, with lines corresponding to the external marking ; operculum circular, multi-spiral. Height $\frac{4}{5}$ inch, base a little less.

Found in a very fresh and beautiful condition, but rather rare as yet, in the stomachs of fishes caught in Massachusetts Bay.

It is distinguished by the beautiful, sharp lines of growth, which are not interrupted by the spiral ridges, and by these ridges covering all the base ; also, by the slight projecting angle of the aperture. It is very closely allied to *M. striata*, Broderip and Sowerby, "Zool. Journ.," iv. 371, and figured in Sowerby's "Conch. Illust.," (*Margarita*) fig. 3. By the kindness of Mr. Sowerby, however, I have been enabled to compare the two. In *M. striata* the whorls are not angulated by the revolving lines, the largest of which are not larger than those on the base of our shell, while its base is nearly smooth ; its umbilicus is much smaller. In color, size, and general shape, the shells are alike.

MARGARITA OBSCURA.

Shell depressed-conical, solid ; spire obscure, reddish-brown, base ash-colored ; whorls angulated by two or three revolving ridges ; lines of growth coarse ; aperture circular, pearly within.

FIGURE 161.

State Coll., No. 33. Soc. Cab., No. 2279.

Turbo obscurus, COUTHOUY ; *Bost. Journ. Nat. Hist.*, ii. 100, pl. 3, f. 2.

Shell small, solid, orbicular, low-conical, of a dull reddish-brown above, and of a light ash-color at base ; whorls five, convex, and rendered angular about the middle by a prominent revolving ridge ; on the lower whorl are often one or two less conspicuous ridges, and numerous very fine lines ; on the base these are so faint, as to be usually imperceptible without a magnifier ; these, with rather coarse lines of growth, somewhat prominent at intervals, often produce an indented or cellular appearance on the surface ; umbilicus large and deep, bounded by a sharp, angular ridge ; aperture circular ; lip simple and sharp ; within iridescent ; operculum horny, multi-spiral. Height $\frac{5}{10}$ inch, diameter of base $\frac{7}{10}$ inch.

Found rather plentifully in fishes caught off Nahant.

It has a general resemblance to *M. cinèrea*, but it is more solid, less elevated, less angular, revolving lines fewer and less elevated, the base smoother, the aperture more simple and circular, and the color very different.

It may perhaps be identical with *M. costellàta*, Sowerby, described in the "Malacological and Conchological Journal," No. 1., and figured in his "Conchological Illustrations" (*Margarita*) fig. 15. On inspection, Mr. Sowerby, though not having his shell at hand for comparison, regards it as distinct from *M. costellàta*.

When the exterior is worn off, the shell beneath is found to be of a brilliant silvery lustre, with crimson reflections, rendering it one of the most attractive shells found in our waters.

MARGARITA UNDULATA.

Shell orbicular, low-conical, dark flesh-color, encircled with regularly disposed spiral lines, alternately larger and smaller, coarsely plaited at the sutures.

FIGURE 162.

State Coll., No. 35. Soc. Cab., No. 2277.

Margarita undulata, SOWERBY; *Malacol. and Conchol. Mag.*, i. 26. *Conchol. Illust.*, (*Margarita*), f. 4.

Turbo incarnatus, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 98, pl. 3, f. 13.

Shell thin, orbicular, depressed-conical, usually of a bright brownish-red color; sometimes rose-red, at others pale flesh-colored; whorls four, convex, somewhat flattened above, undulated near the suture by short folds or wrinkles, and encircled by numerous, elevated, smooth spiral lines at uniform distances, and for the most part alternately larger and smaller; base considerably flattened, of a lighter color, and with finer striæ; umbilicus broad, funnel-shaped, distinctly bounded by a spiral line, and partially covered by the reflected inner lip; aperture nearly circular, very oblique; lip sharp, slightly jagged; throat pearly, with greenish and golden reflections; operculum thin, horny, multi-spiral. Height $\frac{3}{10}$ inch, base $\frac{4}{10}$ inch.

Found in great numbers in the stomachs of fishes, and also alive on Phillips's Beach. Mr. Sowerby received it from the Arctic Ocean.

This beautiful shell cannot be mistaken for any other species on the American Atlantic coast. Its color, its regular spiral lines, undulated sutural region, and pearly aperture, render it a very beautiful shell, having more of the aspect of a tropical, than of a northern shell. Mr. Sowerby's description and figure were *published* in the same month in which Mr. Couthouy *read* his description to the Boston Society of Natural History; and we must, therefore, allow his name the right of priority.

There is considerable variety in the coloring; the freshest young shells are of a rose-red, and of a more depressed form; the majority are of a brownish red; the undulations are seldom, but sometimes, wanting.

MARGARITA A'RCTICA.

Shell orbicular, depressed, smooth and shining, translucent, of a light horn-color, with very fine revolving lines on the base; aperture circular.

FIGURE 163.

State Coll., No. 36. Soc. Cab., No. 895.

Margarita ártica, LEACH; in *Ross's Voyage of Discovery*, 8vo. 1819. *Appendix*. SOWERBY; *Malacol. and Conchol. Mag.*, part i. 25. *Conchol. Illust.*, (Margarita), f. 6.

Margarita helicóides, BECK; MS.

Turbo inflátus, TOTTEN; *Silliman's Journ.*, xxvi. 368, f. 5, a, b, c.

Paludina infláta, MENKE;

Shell small, orbicular, depressed, thin and translucent, smooth and shining, of a light yellowish horn-color or light olive; whorls four or five, very convex, the last very large and tumid, a little flattened above; minutely wrinkled by the lines of growth, and at its base marked with very fine spiral lines; suture well impressed; aperture large, circular, somewhat expanded; edge sharp and simple, a little reflected at the umbilicus, which is large and profound, not bounded by an angular ridge; operculum horny, multi-spiral. Length $\frac{1}{2}$ inch, breadth nearly $\frac{3}{16}$ inch.

Found abundantly on all our sandy beaches. In some seasons, however, I have looked for them almost in vain. Their proper habitat is the deep sea, as they are thrown up alive, on the large

leaves of *Laminària*. They were received by Leach and Beck from Greenland, Baffin's Bay, and the Arctic Seas. I have obtained them of a much larger size than is given by any other observer.

It is a very pretty shell, generally iridescent, or reflecting a metallic, bronze lustre. It has more the aspect of a land or fresh-water shell, than that of a sea shell. It is not likely to be confounded with any other species except the following.

I have given this species as the *M. àrctica*, Leach, in accordance with the opinion of Mr. Sowerby, who compared our shells with the authentic specimens in the British Museum.

I must confess, also, that in comparing the descriptions of *M. vulgàris* and *M. àrctica* in the "Malac. and Conch. Magazine," and specimens of *M. vulgàris*, sent me by Mr. Sowerby with small specimens of the above described shell, I can perceive no essential distinction, excepting in size; the first is said to be palish, the second olivaceous.

MARGARITA ARGENTA'TA.

Shell depressed-conical, of a pearly-white color, covered with microscopic, revolving lines; umbilicated.

FIGURE 164.

State Coll., No. 35. Soc. Cab., No. 2412.

Shell minute, conical, with an obtuse tip, of a dead pearly-white color; composed of four convex whorls, the last of which is very slightly angular; the next above is elevated, but the uppermost, and frequently the two uppermost, are not elevated above the succeeding whorl, so that the apex is obtuse; everywhere covered with crowded and very fine revolving lines; suture deep; aperture circular; lip sharp, simple; interior pearly and iridescent; umbilicus moderately large. Length $\frac{1}{8}$ inch, breadth $\frac{1}{8}$ inch.

Found in fishes caught off Cape Ann, and Cohasset, in considerable numbers.

It is the smallest of the species of this genus that we find. It is most obviously distinguished from small specimens of the last species by its dead surface, which may be well compared to chased silver; and, on a more intimate examination, it is found to have more uniform and decided revolving lines, and its spire is more elevated.

I was at first disposed to regard it as the *M. cárnea*, Lowe; (*Zool. Journ.*, ii. 107, pl. v. f. 12; 13, 132). But, in the following essential characters belonging to that, it differs from our shell, viz. an acutely pointed spire, an angular aperture, and a uniform yellowish flesh-color. The revolving lines, too, are said to be elevated and sub-distant; terms which allow of much latitude of meaning, but which we should not be likely to apply to the crowded, microscopic lines on our shell. They appear quite conspicuous on the figure quoted. The young of *M. undulata* would answer better to that description. If it is not *M. cárnea*; it has not been described; Mr. Sowerby hesitates to call it so.

GENUS LITTORINA; FE'RUSSAC.

Shell thick; top-shaped, spire of a few rounded whorls; aperture entire, rounded-ovate, large; outer lip sharp, inner lip somewhat flattened; lips not continuous posteriorly; operculum horny; spiral.

LITTORINA RUDIS.

Shell strong and coarse, volutions convex and well defined, with revolving ridges; pillar flattened, prolonged so as to form an angle in front; color yellowish.

FIGURE 165.

State Coll., No. 39. Soc. Cab., No. 881.

Turbo rudis, DONOVAN; *Brit. Shells*, i. t. 33, f. 3. MONTAGU; *Test. Brit.*, 304. TURTON'S LIN.; iv. 480. *Conch. Dict.*, 197. CHEMN.; *Conch.*, v. t. 185, f. 1853. MATON and RACKETT; *Lin. Trans.*, viii. 159, t. 4, f. 12, 13. WOOD; *Index*, pl. 30, f. 7. LAM.; *Ån. sans Vert.*, (1st ed.) vii. 49. FLEMING; *Brit. Anim.*, 298. *Turbo obligatus*, SAY; *Journ. Acad. Nat. Sc.*, ii. 241.

Shell broad-ovate, strong and coarse, generally yellowish or ash-colored, sometimes orange or olive, for the most part of one uniform color, but occasionally banded with white, or blotched with some lighter color; surface marked with very perceptible

and sometimes conspicuous revolving lines and grooves ; whorls four or five, convex, well defined by the suture, forming a moderately elevated spire, rather obtuse at its apex ; last whorl three fourths the length of the shell ; aperture one half the same, obliquely broad-ovate ; outer lip bevelled within to a sharp edge ; the pillar margin is broadly flattened, and, widening forwards, projects so as to form an angle ; within colored, generally brown, except the bevelled edge, which is yellowish-white ; operculum horny, subspiral ; sometimes a small umbilical indentation is found. Length $\frac{1}{2}$ inch, breadth $\frac{2}{3}$ inch, divergence 68° .

Found on rocks of the ocean shore.

It is usually of a much smaller size than above mentioned. Indeed, had it not been for a few large specimens sent me by Dr. L. M. Yale, from Martha's Vineyard, which correspond, in every respect, with specimens of *L. rudis* received from Mr. Sowerby, I should not have recognised the species. The small specimens, such as we usually find on the ocean rocks, answer well to Mr. Say's description of *Turbo obligatus*, and were doubtless the shells intended by him. They are usually darker colored, and more mottled, than adult specimens. Mr. Say thought his specimens might be mere varieties of his *T. palliatus*, with obtuse, elevated, revolving lines. He must have inadvertently associated them with that species, to which they have no affinity, instead of with his *T. vestitus*, to which they are closely allied, and from which they would not be distinguished by the unpractised eye. The conviction that they are the *L. rudis*, has greatly diminished the number of what I had regarded as varieties of *L. tenebròsa*.

The variations consist in the greater or less prominence of the revolving lines ; sometimes these are almost imperceptible, and at others they would bear the name of ribs. The coloring is principally yellow, of various shades ; some small specimens are quite white ; many are olive and grey. Dr. Lovèn has named a flesh-colored variety *L. incarnata*.

From *L. palliata*, it is distinguished by its more elevated spire, and distinctly defined whorls, its striated surface, and the compression of the lip in front, so as to form an angle ; from *L. tenebròsa*, it differs in its less elongated spire, its larger aperture, encircled as it were by a broad, thick, flattened rim.

I have not seen the *animal*, but Montagu says it is yellowish, without stripes or spots ; the tentacula of the same color, marked with a

dusky streak on the outside. If so, we should have another decisive distinguishing mark.

After long and careful observation and study of the myriads of specimens on our shores, so infinitely varied in proportions, coloring, and sculpture, I have become satisfied in my own mind, to what species they should be referred. The limits of the species too, in adult specimens, are decidedly marked both by the shells themselves and by the animals. But, as to the young, to use the language of Montagu, "the shades and gradations are so intimately blended, that it is scarce possible to determine what marks a characteristic line of division." The angle of the front I regard as the most constant character of the last species.

It seems almost incredible that Mr. Say should have drawn upon the State of Maine for specimens of shells, which are so extensively distributed, and so innumerable with us; and still more incredible, that, from the few specimens which he probably received, he should have discriminated and described the three species so accurately, though, if my conclusions are correct, some of them were previously described.

LITTORINA TENEBROSA.

Shell ovate-conical; spire elevated, whorls tumid, with numerous revolving lines, dark-green or dusky-brown, with interrupted cream-colored lines; aperture circular; purplish-chocolate within.

FIGURE 166.

State Coll., No. 38. Soc. Cab., No. 879.

Turbo tenebrosus, MONTAGU; *Test. Brit.*, 303, t. 20, f. 4. MATON and RACKETT; *Lin. Trans.*, viii. 160. DILLWYN; *Catal.*, ii. 818. TURTON; *Conch. Dict.*, 197, f. 36, 37. BROWN; *Conch. of Great Brit., &c.* FLEMING; *Brit. Anim.*, 298. *Turbo vestitus*, SAY; *Journ. Acad. Nat. Sc.*, ii. 241.

Shell small, ovate-conical, rather thin, dark-olive or dusky-brown, usually prettily checkered with buff-colored, broken lines, generally obscured by a gray or rusty coating; spire elevated and pointed, of five or six rounded, tumid whorls, marked with obscure revolving lines; suture well defined; lower whorl two thirds the length of the shell; aperture less than one half, nearly circular; outer lip thin and sharp, yellowish, thickening a little as it meets the flattened and slightly everted pillar lip, forming a

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slightly perceptible angle at base ; throat deep chocolate or purplish-brown ; operculum thin, shining, horny, brown. Length $\frac{1}{2}$ inch, breadth $\frac{7}{10}$ inch, divergence 65° .

This species is found about sluggish waters, wharves, bridges, ditches and pools upon marshes, on the mud, and climbing culms of grass. It is often found on the marshes at a considerable distance from any water, but I do not recollect that I have ever found it at the open sea, where it was liable to sustain any violence from currents or the surf.

The *animal* has a dark-olive head, and an olive stripe on the tentacula, from the eye ; the sides of the foot are beautifully lined with the same, and it is very sluggish in its movements. It lives a week or more, after being removed from the water.

Actual comparison of our shell with the British *Turbo tenebrösus*, the authority of Mr. Sowerby, its correspondence with the descriptions and figures above cited, and the similarity of habit, render their identity quite certain.

Its distinctive points are, the elevation of the spire, formed of very tumid whorls, abrupt and not sloping at the suture ; the short, nearly circular mouth, with its thin, yellow lip, the very partial flattening of the inner lip producing a very slight angular curve in front ; the dark purplish-brown interior ; and above all, the olive-colored head and markings of the animal.

Its varieties of form are not great, consisting in the greater or less elevation of the spire. In coloring, it is not so variable as *L. palliata*. It is generally very dark-green, interrupted with dashes of buff ; but sometimes it is dark-chocolate color, or light-grey, and the widest variety I have seen is a dark-brown, with one, two, or three bands of white. In sculpture, there is considerable variation, consisting in the deeper or more superficial revolving grooves. In most cases, however, there are none distinctly visible to the naked eye.

The limits of the species are not very readily declared ; but I now suppose it to be a less variable species than I had at first thought. Some further remarks on it may be found under *L. rudis*.

LITTORINA PALLIATA.

Shell small, globular-ovate, thick, smooth ; spire small and depressed, generally of one color, or variegated with bands and spots ; aperture rounded, outer lip sharp, pillar widely flattened.

FIGURE 167.

State Coll., No. 40. Soc. Cab., No. 1648.

Turbo palliatus, SAY; *Journ. Acad. Nat. Sc.*, ii. 240.*Turbo neritoides*? LIN.; *Syst.*, 1232. CHEMN.; *Conch.*, v. 234, t. 185, f. 1854.

Shell semi-globular, solid, smooth and shining, with very faint revolving lines, and lines of growth; color variable, white, yellow, orange, olive, slate, and brown; usually of a single color, but often striped, banded, or spotted in various ways with darker and lighter colors; whorls four, the last very large, and the others scarcely rising above it; suture faintly marked, scarcely denoting the limits of the whorls; aperture nearly circular, the lip bevelled within, to a sharp edge; the pillar margin broadly flattened and white, continuous with the outer lip; color of the interior corresponding to the exterior color; operculum horny, semi-heart-shaped, smooth, sub-spiral. Length $\frac{8}{10}$ inch, breadth $\frac{9}{10}$ inch, divergence 85° .

Found along the whole coast. Their resorts are usually exposed to the open sea. They are found on rocky shores in great abundance, and at low tide are easily obtained from the rocks and rock-weed, to which they cling, and on which they are seen in rapid motion.

The *animal* has the head orange, darker above, and the foot of a drab or cream color.

The varieties of coloring are innumerable; combining the colors above mentioned in every possible manner. They consist principally, however, in bands of different widths, from hair lines, up to a third of the width of the body whorl; but the surface is sometimes reticulated, or marked with triangular spots.

The great points of distinction are the smooth surface, short, depressed spire, broadly flattened pillar, and, above all, the orange-colored head of the animal.

Its proportions vary with its age. While young the aperture is not much longer than the spire, but at maturity it is seven eighths of the length of the shell.

This shell would by many be considered the same as the *Turbo neritoides* of authors. It may be the *T. neritoides* of Linnæus, but not of Férussac and Lamarck. I have sent our shells to Mr. Sowerby

and Dr. Lovèn, who are of the opinion that they are distinct. To some of the small European specimens, parallels might be produced from our largest ones; but in general the spire of our shell is less depressed, has no decided angle bounding the flattened spire, and it is less narrowed forwards. Mr. Sowerby sent a shell labelled *Litt. expansa*, Brown, from the Frith of Forth, which much more closely resembles our shell. Dr. Lovèn has given to a dirty olive-colored shell from the coast of Norway the name of *L. squálida*; but it is precisely the same as similarly colored shells of this species. As there is still so much cause for doubt, it seems better, for the present at least, to retain Mr. Say's specific name.

GENUS LACÙNA, TURTON.

Shell globose or conical, thin; spire consisting of a few rapidly enlarging whorls; aperture semi-lunar; inner lip oblique, flattened; umbilicus forming a lengthened groove along the pillar.

LACÙNA VINCTA.

Shell small, ovate-conical, with five rounded volutions, encircled by four or five purplish-brown bands, and very numerous, minute, undulating lines.

FIGURE 168.

State Coll., No. 41. Soc. Cab., No. 915.

Turbo vinctus, MONTAGU; *Test. Brit.*, 307, pl. 20. f. 3. TURTON; *Conch. Dict.*, 195, f. 92, 93. WOOD; *Index*, pl. 31, f. 69. DILLWYN; *Catal.*, ii. 844. MATTON and RACKETT; *Lin. Trans.*, viii. 167.

Turbo quadrifasciatus, FLEMING; *Brit. Anim.*, 299.

Lacùna pertusa, CONRAD; *Journ. Acad. Nat. Sc.*, vi. 266, pl. 11, f. 19.

Shell small, thin, ovate-conic; spire pointed, composed of five very convex whorls, separated by a fine and deep suture, of a dingy-white or purplish horn-color; the lower one encircled by four darker chestnut-colored bands, two of which revolve upon the posterior whorls also; the surface is also marked by faint lines of growth, and numerous, flexuous, revolving marks, which require a magnifier to render them conspicuous; aperture nearly orbicular; outer lip sharp thin and simple; pillar lip white, flattened, and excavated by a smooth, crescent-shaped groove, termi-

nating in an umbilicus ; as the two margins join each other at the base, they form a slight projecting angle. A slight angular ridge revolves from the upper angle of the aperture, on some specimens quite perceptible. Operculum horny, sub-spiral. Length $\frac{1}{2}$ inch, breadth $\frac{3}{10}$ inch, divergence 58° .

Variety FUSCA. Figure 169. Shell proportionally shorter, more solid and opaque, of a darker, generally uniform color, sometimes yellowish, and sometimes purplish horn-color, occasionally with one or two bands, or banded shades ; the mouth more angular, and the angular revolving ridge more frequently conspicuous.

Found, driven up, on all our beaches, and alive among the roots of *Laminaria* and other marine plants, attached to stones and shells, and dragged by storms from deep water.

It is easily distinguished from all our shells by its peculiar umbilicus, and its elongated form, by which it is distinguished from the next species. The size above given is larger than in most specimens, but not so large as in many. It is undoubtedly the *L. vincta* of the British shores, as settled by actual comparison and the opinion of Mr. Sowerby. Mr. Conrad seems not to have been acquainted with the *L. vincta*, when he described his *L. pertusa*, distinguishing it from *L. quadrifasciata*. The variety is found in about equal numbers with the type. It does not depend on age ; for small young specimens are proportionally short, dark, and solid. But the approaches to each other are so insensible, that I do not venture to make a species of it ; but attach to it, as a variety, a name some years since proposed for it by A. Binney, a Representative. It may prove to be a technical species, and perhaps is actually the *Turbo canalis*, Mont.

LACUNA NERITÓIDEA.

Shell globular-ovate, with three whorls and a half, the last very large, smooth, yellowish-green ; aperture semi-lunar, oblique ; umbilicus large and deep.

FIGURE 170.

State Coll., No. 35. Soc. Cab., 2413.

Lacuna neritóidea, GOULD ; *Silliman's Journ.*, xxxviii. 197.

Shell small, thin, hemispherical, or obliquely ovate; whorls three and a half, regularly convex, minutely wrinkled near the suture, and with an occasional transverse scratch; otherwise smooth, and covered with a rough, greenish-yellow epidermis; the sutural region is depressed and sub-channelled; the spire is scarcely prominent above the very large lower whorl, and is placed a little to one side; aperture oblique, semi-circular, angles a little rounded; outer lip sharp; inner lip straight, like a rounded white rib, broadest and twisted behind; at the side of it is a narrow, crescentic, white space, bounded externally by the continuation of the sharp lip, along which a groove runs, terminating in a deep umbilicus; operculum horny, sub-spiral. Length $\frac{1}{4}$ inch, greatest breadth $\frac{1}{4}$ inch, divergence 95° .

A few specimens of this shell have been collected at different times on Chelsea Beach. It is probably floated ashore on seaweed.

It is sufficiently distinct from specimens of *Turbo pallidulus*, sent me from Europe for comparison, by its narrower channelled space, and its smaller umbilicus; and more especially by the aperture not being at all trumpet-shaped, or angular, as in that shell. They are so nearly alike, however, that it is very difficult to delineate, either by description or figures, distinctions which are very obvious on inspection: I have received it from Dr. Lovèn, labelled, doubtfully, *L. Montaguì*, Turton.

GENUS CINGULA, FLEMING.

Shell small, thin, elongated, of several whorls; aperture small, entire, the lip continuous posteriorly; operculum horny; sub-spiral.

A group of small shells here referred to, seems to present characters which entitle it to a generic rank. These shells differ from the short, solid LITTORINÆ by their elongated form, and thin, horny structure; and the animal has a prolonged muzzle, which that of LITTORINA has not. Fleming divides his genus into two sections; first, those which have the "outer lip thickened by a rib," and which answer to the genus RISSOA of Freminville, a well-marked genus; second, those with the "outer lip

not thickened," to which I would restrict the genus CINGULA, and which seem also to constitute the genus HYDRØBIA of Hartmann, judging merely from references made to it.

CINGULA MINUTA.

Shell minute, elevated conic, thin, smooth, yellowish-green; whorls five, convex; suture distinct.

FIGURE 171.

State Coll., No. 37. Soc. Cab., No. 1365.

Turbo minutus, TOTTEN; *Silliman's Journ.*, xxvi. 369, f. 7.

Shell minute, ovate-conic, elevated, obtuse at apex, thin, yellowish-brown, or dark horn-color when containing the animal; usually coated with a dark-green pigment, or some minute vegetable; whorls five, convex, faintly wrinkled by the lines of growth, the two upper ones forming an obtuse apex, and the lowest less than two thirds the whole length of the shell; suture distinct, with a slight shoulder to the whorl near it; aperture about one third the length of the shell, oval, the lips united in mature shells by a loosely attached enamel, which rises before an umbilical pit; operculum horny, sub-spiral. Length of large specimens $\frac{3}{8}$ inch, breadth $\frac{1}{10}$ inch, divergence 28° .

Animal. Head probosciform, dusky-brown, or blackish, half as long as the black-tipped tentacula; eyes on a partial peduncle or dilatation on the exterior base of the tentacula; region of the mouth, the tentacula, and a stripe each side of the neck, leaving a pyramidal dark line between, of a light drab-color; foot oval, bifid, and dilated into wings before, rounded behind, dusky above, and pale beneath. Motions very active.

Found plentifully on sea-weed, and on moist banks, about high-water mark, especially on the thread-like plants which grow in ditches and brackish pools about marshes, in company with *Littorina tenebrøsa*.

It is closely allied to several species received from Europe, and perhaps identical with some one of them; as the *Littorina Balthica*, from Copenhagen; the *Turbo ulvæ*, from England; and the *Paludina thermàlis*, from France. But, as the shell has been submitted to Mr.

Sowerby, and he did not pronounce it a European species, but sent the last-named shell as the nearest allied to it of all the species with which he is acquainted, and as it certainly is not identical with that, I shall not venture to claim for it any more remote history than that given by Colonel Totten.

This shell is so plain as to present no striking mark of distinction, and it is consequently not easy to describe it. The only shells liable to be confounded with it, are the *Odostomia fusca* and *O. exigua*; a slight examination of the aperture readily solves any doubt on this point.

CINGULA ACULEUS.

Shell minute, sub-cylindrical; whorls convex, covered with regular, microscopic revolving lines; aperture ovate; umbilicus partial.

FIGURE 172.

State Coll., No. 32. Soc. Cab., No. 2359.

Shell minute, ovate-cylindrical, elongated, light yellowish horn-color; whorls six, convex, and separated by a deep sutural region; the two upper ones forming a blunt apex, the lowest rather more than half the length of the shell; the whole covered with regular, crowded, microscopic revolving lines; aperture one third the length of the shell, oval, oblique, angular behind, the margin simple and entire, barely touching the preceding whorl, somewhat expanded, and on the left side elevated, and slightly turned over an umbilical depression or chink; operculum horny. Length $\frac{3}{8}$ inch, breadth $\frac{1}{15}$ inch, divergence 23° .

Found sparingly on the partially decayed timbers of an old wharf, and plentifully on stones, about low-water mark, at East Boston.

It is a small, but well characterized shell, distinguished by its elongated form, its entire aperture, and the minute spiral lines with which it is covered. It is nearly as long as, and much more slender than, *C. minuta*. Brown figures two or three species, which closely resemble this.

GENUS TURRITELLA, LAM.

Shell turreted, elongated, spirally grooved, pointed; aperture entire, rounded; lips disjoined posteriorly; operculum horny.

TURRITE'LLA ERÒSA.

Shell elongate-turreted, pale-brown, composed of about ten smooth, flattish whorls, sloping above to the suture, and grooved with from three to five, obtuse, revolving furrows.

State Coll., No. 38. Soc. Cab., No. 2286.

Turritella eròsa, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 103, pl. 3, f. 1.

Shell elongated-conical, turreted, pale horn-colored, with a light reddish-brown epidermis; whorls about ten, flattish, smooth, sloping towards the suture, so that each whorl seems a little shelving over the succeeding one, and furrowed with from three to five abrupt, revolving grooves, nearly as wide as the spaces between them. From five on the largest whorl, the number goes on diminishing above; the whorls at the apex are usually broken off, and much of the summit is a good deal eroded. Lines of growth are quite conspicuous in the grooves, but scarcely perceptible elsewhere; aperture nearly circular; lip sharp, meeting the prolonged pillar, so as to produce a partial angle; operculum horny, multi-spiral. Length $\frac{4}{7}$ inch, breadth $\frac{3}{10}$ inch.

Found in the stomachs of fishes caught in Massachusetts Bay. It is usually found either incomplete, or much defaced and broken. I have seen but one specimen containing the animal.

It is quite different from any described species, unless it be *T. Virginiana* of Lamarck. His description is not sufficiently definite to identify his shell with ours, and the character "basi annulo griseo-violacescente notatâ," I have never found upon it. It bears a distant resemblance to the old *Turbo térebra* of English authors, but it does not slope to a point so rapidly, and the sculpture seems to be from grooves, and not from raised lines, as in *T. térebra*.

TURRITE'LLA INTERRU'PTA.

Shell small, subulate, brownish-white, reticulated with numerous ribs and revolving lines, which are interrupted by the ribs, and three faintly colored bands.

FIGURE 173.

State Coll., No. 271. Soc. Cab., No. 2358.

Turritella interrupta, TOTTEN; *Silliman's Journ.*, xxviii. 352, f. 7. ADAMS; *Bost. Journ. Nat. Hist.*, ii. 275.

Shell small, very slender and pointed, pale brownish-white, glossy; whorls eight or ten, slightly convex, the suture well defined, on which are from twenty-five to thirty straight, blunt ribs, crossed by about fourteen revolving lines, which are interrupted by the ribs; these lines are arranged in pairs, but so close to each other, as not always to be distinguished, and would usually be regarded as one; on the anterior half of the lower whorl, the ribs vanish, and the fine revolving lines are uninterrupted. In fresh specimens may be seen a purplish band just below the suture, and on the anterior whorl two faint-yellow ones; aperture about one sixth the length of the shell, ovate, sharply angular behind; outer lip sharp and simple, inner lip slightly everted. Length $\frac{1}{4}$ inch, breadth $\frac{1}{16}$ inch, divergence 12° .

First found by Colonel Totten in the harbour of Newport, Rhode Island; and since found by Professor C. B. Adams, in Dartmouth harbour, by dredging beyond low-water mark. He has also found it in New Bedford harbour.

It is readily recognised by its slender, pointed, glossy appearance, and its reticulated surface. Several recent and fossil species resemble it in size and shape, among which are *Turbo elegantissimus*, Montagu; *Turritella æqualis*, Say, and *T. laqueata*, Conrad.

This species does not belong to the genus TURRITE'LLA; but will probably come under the genus EU'LIMA of Risso.

GENUS PYRAMIS, BROWN.

Shell elongated, of numerous whorls; aperture short, ovate, entire in front; lip sharp, disunited behind; pillar without a fold.

PYRAMIS STRIÁTULA.

Shell turreted, dingy-white; whorls eight, nearly flat, with numerous fine, revolving lines; upper whorls tapering rapidly; suture distinct.

FIGURE 174.

State Coll., No. 53. Soc. Cab., No. 2360.

Pyramis striátula, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 101, pl. 1, f. 6.

Shell elevated, obelisk-shaped, thick, bluish-white, usually having a dead, unpolished appearance; whorls seven to nine, nearly flat, distinctly separated by the suture, a few of the upper ones tapering rather suddenly to an acute point, thus giving it an obelisk shape; marked with obvious lines of growth, sometimes approaching to varices, and with from twelve to fifteen fine, regular revolving lines, diminishing in number towards the apex; aperture ovate, acute-angular behind; outer lip sharp and simple, without any sinus behind; slightly turned outwards at base, as it joins the regularly arched pillar margin. Length $\frac{1}{2}$ inch, breadth $\frac{7}{8}$ inch, divergence 23° .

First found by Mr. Couthouy in the stomachs of fishes caught off Cape Ann. Several specimens have since been found, but it is by no means common.

I have employed the genus PYRAMIS, not because I would adopt it, but because I know not any established genus under which this shell would come; and do not wish to confuse, if I cannot correct. The characters of the aperture are like those of the preceding species, but the exterior has a different character. Its aspect is precisely that of a shell sent me as MONOTIGMA, Gray; but I cannot find the plait on the inner lip, from whence that genus derives its name.

GENUS ODOSTOMIA, FLEMING.

Shell conical, elongated; aperture ovate; lips disunited posteriorly, and sometimes produced anteriorly; pillar with a tooth-like fold; operculum horny, sub-spiral.

ODOSTOMIA PRODUCTA.

Shell small, conic-cylindrical; whorls eight, nearly flat; epidermis light-brown; columella flexuous.

FIGURE 175.

State Coll., No. 28. Soc. Cab., No. 2372.

Jamínia producta, ADAMS; *Bost. Journ. Nat. Hist.*, iii. pl. 3, f. 8.

Shell small, elongated, conic-cylindrical, very slender, composed of eight or more flattish whorls, separated by a well-impressed suture; tip blunted, as if one or more whorls were removed; surface faintly marked by lines of growth, and covered with a dusky, horn-colored epidermis; occasionally, an indistinct revolving line may be seen on two or three of the lowest whorls; aperture about one fourth the length of the shell, ovate, regularly rounded in front, the pillar margin modified by the rising and revolving of the outer lip around it, so as to produce a partial fold. Umbilicus none. Operculum thin, horny, spiral, apex at one side. Length $\frac{1}{4}$ inch, breadth $\frac{1}{5}$ inch, divergence 12° .

Found by Professor Adams, in September, 1839, near high-water mark, in a cove on the east side of Fairhaven.

It is distinguished from *O. exigua* by the same characters as *O. fusca* is. To this last it is very closely allied; and, as neither of them has any very prominent peculiarities, it may not be possible to make apparent in words, distinctions which are quite obvious to the eye. This is, however, a much more slender shell than *O. fusca*, has one or more additional whorls, a much lighter colored epidermis, less convex whorls, and no approach to an umbilicus. While the two shells are about equal in length, the lower whorl of *O. producta* is not more than two thirds as large as that of *O. fusca*; so that it has a very much more slender and cylindrical form; and this it is, which most readily strikes the eye on comparison.

This does not belong to the genus JAMI'NIA of Leach; and Brown has given us no characters for the genus, as he employs it.

ODOSTOMIA FUSCA.

Shell small, elevated-conical, rather blunt at tip, and sub-umbilicated; color dark-brown; aperture broadly-ovate.

FIGURE 176.

State Coll., No. 29. Soc. Cab., No. 2373.

Pyramis fusca, ADAMS; *Bost. Journ. Nat. Hist.*, ii. 282, pl. 4, f. 9.

Jamínia fusca, ADAMS; *Ibid.*, iii. 337.

Shell small, thin, elongated-conical, rather blunt, or worn off at apex, a smooth and glossy violet-brown epidermis covering it, through which the lines of growth are perceptible; whorls six, probably eight when the tip is entire; slightly convex, regularly tapering, and separated by a well-defined suture, and sometimes by a revolving line just below it, so that the suture seems double; aperture ovate, widened at the middle by a twist of the pillar lip, acutely angular behind; simple and sharp, widely and regularly rounded in front; it ascends upon the columella, and forms an oblique, nearly transverse ridge, as it revolves within the aperture, and so deep as to be nearly concealed; space between this fold and the posterior angle of the aperture joined by a thin plate of enamel; an umbilical indentation about the middle of the left lip. Length $\frac{5}{8}$ inch, breadth $\frac{3}{8}$ inch, divergence 26° .

This shell was first found by Professor C. B. Adams, at New Bedford, clinging to planks, not far above low-water mark, and from him I received my specimens. They have since been found at Dartmouth and Tiverton.

Compared with *O. exigua*, with which shell it is most likely to be confounded, it is shorter and more blunt-pointed; the whorls are more flat, and the lowest in exact keeping with the rest; the color very much darker; the aperture is broader and modified by the twist of the left margin, without any prolongation at base. The turning of the lip into the aperture forms a fold, which, in some specimens, is not seen without looking far within; in others it is quite conspicuous, and in others it is even divided by a furrow into two folds. The figure and description in the "Boston Journal of Natural History" were drawn from specimens much smaller and less perfect, than some since found; so that they are both imperfect. The spiral ridge or fold on the columella is there said not to exist at all.

These two last shells differ in some characters from the following, and perhaps belong to a different genus. The shell is thin and horny, the aperture regularly rounded in front, and the fold on the pillar inconspicuous. In the true ODOSTOMIÆ, the shells are of a solid, ivory structure, and the lip somewhat produced in front, forming the connecting link with CERITHIUM and the CANALÍFERA.

ODOSTÒMIA EXÍ'GUA.

Shell small, ovate-conical, smooth, whitish; with a single revolving line below the suture; aperture oval; sub-umbilicated.

FIGURE 177.

State Coll., No. 27. Soc. Cab., No. 2371.

Jamínia exí'gua, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 92, pl. 2, f. 7:

Rissoa rupéstris, FORBES; *Ann. of Nat. Hist.*, ii. 107, pl. 2, f. 13.

Turritélla bisuturális? SAY; *Journ. Acad. Nat. Sc.*, ii. 244.

Shell small, ovate-conical, somewhat turreted, rather obtuse at apex, surface smooth, light-green, under a brownish epidermis, lines of growth scarcely perceptible; whorls five or six, separated by a well-defined suture; and, in most specimens, a distinct line revolves just before the suture, giving the appearance of a double suture; the lowest whorl is proportionally larger than the others, and constitutes about half the length of the shell; aperture oval, outer lip sharp and simple; pillar lip bluish-white, smooth and rounded; a transverse, white fold is formed by the turning of the lip within the shell, before which it is a little raised and turned outwards, producing an umbilical chink, and is extended so as to form a considerable projecting angle at the lower extremity; operculum horny. Length $\frac{1}{2}$ inch, breadth $\frac{1}{10}$ inch, divergence 28° .

First found by Mr. Couthouy, at Chelsea, near the ferry landing, adhering to decaying wood. It has since been found in various similar situations, and under the damp portions of loose stones left on the shore at low tide.

It is distinguished from *O. trífidus*, with which it would be confounded without intimate examination, by its being a less slender and pointed shell, the disproportion of the last whorl, and the greater convexity of all the whorls, and the want of two or three revolving lines so characteristic of *O. trífidus*. In the latter shell, the fold of the columella is oblique, and in *O. exí'gua* it is nearly transverse. It will also be necessary to compare it with the next species. I should be disposed to regard it as the same with *Turbo unidentátus*, Montagu, (*Test. Brit.* 324); but as it is impossible to decide on such minute species,

with no obvious characteristics, from description only, I must leave it unsettled.

It is almost certainly the *Turritella bisuturalis* of Say; at least, I know of no other shell which will at all answer to his description. The figure and description of *Rissoa rupéstris*, Forbes, also correspond with it.

ODOSTOMIA SEMINUDA.

Shell acute-conic, white, with coarse revolving lines, crossed on the upper whorls, and on the upper half of the lower whorl, by longitudinal lines.

FIGURE 178.

State Coll., No. 30. Soc. Cab., No. 2418.

Jamínia seminuda, ADAMS; *Bost. Journ. Nat. Hist.*, ii. 230, pl. 4, f. 13.

Shell acute-conic, glossy white, translucent; whorls six or seven, convex, the upper ones and one half the lower whorl with numerous ridges or folds, crossed by three, equidistant revolving lines, giving the surface a granulated appearance; at the base of the lower whorl are four more revolving lines, beginning on the middle where the folds terminate abruptly; suture distinct, divided by an indistinct spiral ridge; aperture oval, one third the length of the shell; the outer lip very thin, and scolloped by the revolving lines; the base is prolonged into a concave angle, and, rising, revolves within the shell, forming a single inconspicuous fold on the pillar. Length $\frac{1.5}{100}$ inch, breadth $\frac{7}{100}$ inch, divergence 30° .

First found by Professor Adams, at Dartmouth, on valves of *Pecten concéntricus*, taken up beyond low-water mark.

This shell is readily distinguished from all others found in our waters of a similar size and outline, by the sculpture of the lower whorl, the upper half of which is granulated by the decussating lines, and the lower half marked by revolving lines only. It is smaller, and less elevated proportionally than *O. trifidus*. Making allowance for variations in magnifying two shells so small, this seems not to differ much from *Turbo spirális* of Montagu, (*Test. Brit.* 323, pl. 12, f. 9). He neither represents nor describes any revolving lines crossing the folds. These he may have overlooked; for Fleming distinctly mentions them.

ODOSTOMIA TRÍFIDA.

Shell small, acute-conic, glossy white, with numerous impressed revolving lines, of which the two uppermost, and those about the base of the last whorl are most distinct ; aperture narrow.

FIGURE 179.

State Coll., No. 26. Soc. Cab., No. 2370.

Actæon trifidus, TOTTEN ; *Silliman's Journ.*, xxvi. 368, pl. 1, f. 4, a, b.

Shell elevated, pointed, smooth and glossy, of an ivory-white color ; whorls about eight, flat, separated by a sharp, slightly depressed suture, on which are from three to five revolving lines, of which the two next below, and the one immediately above, the suture are most deeply sculptured ; about the front of the lower whorl are usually ten or twelve very fine lines also ; aperture narrow, about one third the length of the shell, acutely angular above ; outer lip sharp and thin, sometimes showing within, and on its sharp edge, the impressed lines ; the inner margin regularly curved ; the pillar, widening and expanding a little, is produced so that an acute angle is formed by the junction of the two lips in front ; about the middle of the inner margin is a single, sharp, oblique fold, formed by the revolution of the outer lip within the shell ; operculum horny ; apex nearly terminal, sub-spiral. Length $\frac{1}{4}$ inch, breadth $\frac{1}{10}$ inch, divergence 23° .

First found by Colonel Totten on the shores of Rhode Island, adhering to *Pecten concéntricus*. Since then it has been found by Professor Adams among sand from New Bedford harbour.

FAMILY CANALÍFERA, LAM.

Shell with a canal, more or less extended, in front of the aperture ; the outer lip of which does not alter its form by age.

GENUS CERÍTHIUM, LIN.

Shell elongated, turreted ; aperture short, oblong, oblique, terminating in front by a short, recurved canal.

CERITHIUM EMERSONII.

Shell long-conical, chestnut-colored; whorls seventeen, flat, each encircled with three series of granules; canal less than half the length of the aperture.

FIGURE 180.

State Coll., No. 276. Soc. Cab., No. 2361.

Cerithium Emersonii, ADAMS; *Bost. Journ. Nat. Hist.*, ii. 284, pl. 4, f. 10.

Shell small, conical, elongated, glossy, reddish-brown, with a regularly granulated surface; whorls sixteen or seventeen, flattened, with a revolving series of bead-like granules at the upper and lower margins of each, and another intervening one, but nearer to the upper than to the lower series, and less prominent, commencing at ten or twelve whorls from the summit, and becoming more distinct as it approaches the base; in each series the granules are connected by a rather narrow, but elevated revolving line, nearly as high as the granules; they are also connected in a similar manner in a longitudinal direction; posterior edge of the whorls margined by a sharp ridge, of a darker color; suture profoundly impressed; the ridge terminates abruptly before, in a very short, twisted, wrinkled beak; aperture small, about one sixth the length of the shell; outer lip scolloped when perfect. Length $\frac{1}{2}$ inch, breadth $\frac{1}{8}$ inch, divergence 22° .

Obtained by Professor C. B. Adams, at Nantucket and in New Bedford harbour, by whom it was described and named in honor of G. B. Emerson, Esq., President of the Boston Society of Natural History.

This prettily sculptured shell is distinguished by its short aperture and beak, its broad base, from which the flattened whorls regularly taper to an acute apex; and by the pretty strings of bead-like granules encircling it. These beads are sometimes so worn down as to present the appearance of a continuous line dilating at regular intervals.

This shell is unequivocally pronounced by Mr. Sowerby to be the *Murex tuberculàris* of Montagu. But, after a careful examination of all the descriptions of that shell, I am led to conclude, either that I

sent Mr. Sowerby a poor representation of our shell, or that he would decide differently on a second, more careful inspection. No author ascribes to *M. tuberculàris* more than eight or ten volutions, and one fourth of an inch for its length; while ours has commonly twice that length, with sixteen or eighteen volutions. Montagu says, in his Supplement, "It has as an invariable character, three series of tubercles of equal size, on each volution." But at the ordinary length of *M. tuberculàris*, our shell has but two series of granules; and when the third appears, it is very perceptibly smaller than the other two series. On account of so decided a variation in size and sculpture, I think it proper still to regard our shell as a distinct species, trusting to future observations to settle the point definitely.

CERITHIUM TEREBRÀLE.

Shell conic-turreted; whorls ten, flattened, having three sharp, elevated, revolving ridges on each, with numerous fine, longitudinal lines between the ridges; canal very short.

FIGURE 181.

State Coll., No. 280. Soc. Cab., No. 2364.

Cerithium terebràle, ADAMS; *Bost. Journ. Nat. Hist.*, iii. pl. 3, f. 7.

Shell small, elongated-conic, composed of ten or twelve flattened whorls, separated by a slightly excavated sutural region; color reddish-brown, with occasionally a whitish revolving band at the lower part of each whorl. On each whorl are three elevated, compressed, revolving ridges, at about equal distances from each other, and perhaps we may reckon a fourth, very small and bordering on the suture. The spaces between the ridges are regularly rounded out, and checked with crowded, minute, longitudinal lines, none of which cross the summits of the ridges. On the lower whorl are two additional ridges. The base of the shell is abrupt; the canal very short and small; the aperture oval, about one eighth the length of the shell. Length $\frac{1}{2}$ inch, breadth $\frac{1}{8}$ inch, divergence 20° .

Found by Mr. C. F. Shiverick, at New Bedford and in its vicinity, below low-water mark.

This species is closely allied to *C. Emersonii*. Its size and proportions are the same ; but it can scarcely be regarded as a variety. It is at once known by the prominent ridges, which resemble the threads of a screw. There is nothing like the nodulous surface of *C. Emersonii*, and the minute barring between the ridges is a striking arrangement, to which there is no approach in that shell.

CERITHIUM NIGROCINCTUM.

Shell small, reddish-black, granulated ; whorls twelve, reversed ; aperture small ; beak short and recurved.

FIGURE 182.

State Coll., No. 279. Soc. Cab., No. 2363.

Cerithium nigrocinctum, ADAMS ; *Bost. Journ. Nat. Hist.*, ii. 286, pl. 4, f. 11.

Shell small, conico-cylindrical, blackish-red, with three revolving series of rounded, bead-like granules, formed by numerous ribs or folds, which are cut by two deep, revolving lines into equal parts ; the middle series is wanting on the posterior fifth of the shell, and the upper series is smaller than the lower, at last disappearing also ; whorls twelve or more, reversed, convex, forming an elongated, acutely pointed spire, somewhat swelling in its outline ; suture broad, divided by a somewhat granular, black ridge, which, in the progress of growth, changes its place, and forms the lower edge of the last whorls ; this ridge retains its color when the rest of the shell fades, and then becomes a conspicuous belt ; an impressed line each side of the sutural ridge, and two others emerging from the aperture, revolve about the base of the anterior whorl ; aperture oval, about one fifth the length of the shell, ending in a twisted canal about one third as long as the aperture ; outer lip sharp, notched by the revolving lines ; inner lip deeply arched, the pillar twisted, black and projecting. Length $\frac{3}{10}$ inch, breadth $\frac{3}{40}$ inch, divergence 23° .

Found by Professor Adams, in Dartmouth harbour, clinging to sea-weed, a few feet below low-water mark.

It is at once distinguished by its black color, slightly tinged red, and its reversed whorls. It is closely allied to the *Murex adversus*, Mon-

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tagu, but is probably different, as that shell has the middle series smaller, and the canal straight. It is also of a lighter color.

The whole shell, when fresh, is of a uniform color, so that the dark revolving line at the suture is scarcely distinguishable, instead of something evident, as we should expect from the name. The specific appellation, on this account, is not well chosen. In some lighter-colored individuals, however, the zone is very apparent.

CERITHIUM SAYI.

Shell small, ashy or slate-colored, covered with a fine net-work of elevated lines; aperture rounded; canal merely an oblique fissure.

FIGURE 183.

State Coll., No. 278. Soc. Cab., No. 713.

Cerithium reticulatum, TOTTEN; *Silliman's Journ.*, xxviii. 352, fig. 8.

Pasithea nigra, TOTTEN; (the young;) *Silliman's Journ.*, xxvi. 369, pl. 1, f. 7.

Cerithium Sayi, MENKE.

Shell small, elongated-conical, somewhat turreted, the upper whorls of a blue-black or slate-color, and two or three of the lower ones usually much lighter, white, or ashy gray; whorls six or eight, forming an elevated, conical spire; surface covered with a granular net-work from the crossing of slightly elevated, rounded folds or ribs, and elevated spiral lines; of the ribs there are about twenty, which vanish on the lower half of the anterior whorl; of the spiral lines there are about six on the lower whorl but one, five on the next above, and so on; besides these, on the anterior whorl are about six raised revolving lines about the base, partially granulated; suture distinct, with the series of granules next below it rather largest, so as to form a slight shoulder; aperture oblique, rounded, and flaring, about one quarter the length of the shell, broad anteriorly; outer lip sharp, modified by the revolving lines; inner margin angular-concave, with a plate of enamel, not pressed close upon the body whorl, uniting the two lips above, and forming an umbilical fissure below; canal a mere oblique fissure or notch, not prolonged forward so far as the lip; operculum horny, ovate; apex at the centre of the broader part, concave outwardly, with four or five spiral turns. Length $\frac{3}{16}$ inch, breadth $\frac{1}{8}$ inch, divergence 28° .

Found very abundantly at Nantucket, Martha's Vineyard, New Bedford, &c. It has not been found to my knowledge within, or to the north of, Cape Cod. Its proper station is on sea-weed, stones, and marine bodies, about low-water mark. The young are sometimes seen in such numbers as to conceal the sand beneath them. These are always reddish-black, with a very different aperture. It seems not to attain its growth the first season, and the second year's growth is usually distinctly indicated by its much lighter color.

The name given by Colonel Totten, at my suggestion, is pre-occupied by an English species. Its wide expanded mouth, with scarcely any thing like a canal, renders its claim to a place in the genus CERITHIUM rather equivocal. These characters, with its sculpture, distinguish the species.

CERITHIUM GREENII.

Shell small, reddish-black, tumido-conic, elongated, with longitudinal ridges and revolving lines ; canal very deep and very short, slightly curved.

FIGURE 184.

State Coll., No. 277. Soc. Cab., No. 2362.

Cerithium Greenii, ADAMS ; *Bost. Journ. Nat. Hist.*, ii. 287, pl. 4, f. 12.

Shell small, elevated-conic, sloping somewhat abruptly above the middle, to a prolonged, pointed apex ; whorls ten or twelve, flattened, traversed by numerous folds or ridges, of which there are from twenty to twenty-five on the lower whorl, crossed by three revolving impressed lines, producing three series of granules, of which the lower one is largest, so that the base of each whorl seems to jut over the one below it ; the upper series is nearer to the middle one than that is to the lower one, and soon disappears on the upper whorls ; then the middle one vanishes, and finally the lower one, so that the whorls at the apex are either smooth or merely wrinkled ; two black threads, emerging from the aperture, revolve around the base of the shell ; suture distinctly marked ; aperture about one eighth the length of the shell, nearly circular, terminating in a deep, very short canal, partly closed over by the

lips ; outer lip sharp, notched, and a little everted ; pillar twisted, regularly arched above. Length $\frac{1}{2}$ inch, breadth $\frac{1}{8}$ inch, divergence 35° .

Found by Professor Adams in Dartmouth harbour, clinging to marine plants, a few feet below low water, with other species.

This little shell would hardly be distinguished when mixed with the young of *C. Sayi*. Its color is the same, and it is not unlike it in marking. From the full-grown shell it is readily distinguished by its bulging shape, the apparent jutting of one whorl over another, its smaller size, and by its deeply notched canal.

GENUS PLEURÓTOMA, LAM.

Shell turreted, generally ribbed ; aperture terminating in a straight, more or less elongated canal ; outer lip, at its posterior junction, having a fissure or notch.

PLEURÓTOMA DECUSSÁTA.

Shell oval, ashy or flesh-colored, with twenty-five minute folds, and close revolving lines ; notch of the outer lip shallow.

FIGURE 185.

State Coll., No. 272. Soc. Cab., No. 2364.

Pleurótoma decussata, COUTHOUY ; *Bost. Journ. Nat. Hist.*, ii. 183, pl. 4, f. 8.

Shell small, ovate, of an ashy-white, or flesh-color, covered with remnants of an olive-colored epidermis ; whorls five or six, convex, the lowest being two thirds the length of the shell, covered with twenty-five to thirty inconspicuous folds or ribs, undulated and oblique in conformity to the outer lip, and vanishing on the convexity of the whorl ; lines of growth regular and distinct, and these, with numerous, elevated revolving threads, make a fine net-work over the whole shell ; spire regularly sloping to an acute point ; suture well marked, with a slight shoulder near it on the whorls ; aperture half as long as the shell, narrow-oval, terminating in a broad and very brief channel ; outer lip sharp, with a shallow recess or notch, as it joins the whorl ; pillar arched, flattened, and smooth ; operculum pear-shaped, with the apex

below, and the elements concentric. Length $\frac{7}{10}$ inch, breadth $\frac{3}{10}$ inch, divergence 48° .

Found in the stomachs of fishes, not unfrequently.

This is not liable to be confounded with any shell of our coast, except *Fusus harpularius*, to which it has a miniature resemblance. But, besides being so much smaller, it is distinguished by the notch at the posterior angle of the aperture, and by the net-work formed by the more numerous and fainter folds, and revolving lines. The color, which Mr. Couthouy makes a distinctive mark, is very nearly the same. His specimens were less perfect and white. In my freshest specimen there is a broad, lighter-colored band near the top of the lower whorl. *Pleurótoma reticulata*, Brown, ("Conchology of Great Britain," &c., pl. 48, f. 29, 30,) may, perhaps, be intended to represent the same.

PLEURÓTOMA BICARINATA.

Shell ovate-fusiform, turreted, dusky-white; whorls convex, with two revolving ribs, and other less conspicuous lines and grooves; notch of the lip shallow.

FIGURE 186.

State Coll., No. 273. Soc. Cab., No. 2365.

Pleurótoma bicarinata, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 104, pl. 1, f. 11.

Shell small, tapering at both ends, turreted, of a dusky-white or slate-color; whorls six, convex, the lowest being half the length of the shell, and marked with numerous, slightly elevated, revolving lines, and smaller intervening ones; about the middle is a deep groove, on each side of which is a prominent revolving ridge or keel, continued upon the upper whorls; lines of growth very minute; aperture elliptical, narrow, ending in a very short canal, inclining a little to the left; outer lip sharp, toothed by the revolving ribs, with a slight recess or notch at its posterior junction; pillar lip arched posteriorly. Length $\frac{3}{10}$ inch, breadth $\frac{2}{10}$ inch, divergence 48° .

First found by Mr. Couthouy in a fish caught off Nahant; since this single specimen, three or four others have been found by Dr. Prescott, of Lynn, and Mr. W. W. Wheildon, of Charlestown.

This is not likely to be confounded with any other of our shells. Its two revolving ridges mark it well. It is interesting as being the first species of the genus found in our northern Atlantic waters. Neither of our three species belongs, unequivocally, to this genus; they approach very near to *FUSUS*. Still, the direction of the lines of growth indicates the sinus in the lip to be constant; and on this rests their claim to a place in the genus *PLEURÓTOMA*.

PLEURÓTOMA PLICATA.

Shell small, cinereous, ovate; whorls six, reticulated with prominent, longitudinal ribs, and elevated, revolving lines; sinus of the lip distinct.

FIGURE 187.

State Coll., No. 274. Soc. Cab., No. 2366.

Pleurótoma plicata, ADAMS; *Bost. Journ. Nat. Hist.*, iii. pl. 3, f. 6.

Shell small, elongated-ovate, somewhat turreted, of an ashy-white color; whorls six, the lowest one about two thirds the length of the whole shell, and bearing about twelve prominent, somewhat oblique, rib-like folds, which are crossed by ten or more elevated, revolving threads, rendering the ribs a little nodulous; the other whorls form a very pointed, somewhat turreted spire, on which the ribs and revolving lines are continued. Aperture narrow, less than half the length of the shell; outer lip greatly thickened by one of the ribs, the notch at its posterior part being deep, distinct, and smooth. Length $\frac{1}{4}$ inch, nearly, breadth $\frac{5}{8}$ inch, divergence 45° .

Found in mud from New Bedford harbour, by Professor C. B. Adams.

This species is of about the same size and shape as *P. decussata*, but is distinguished by the much more conspicuous folds, which run the entire length of the whorl; and the revolving lines also are much more distinct, and fewer in number. The canal is very short.

GENUS *CANCELLARIA*, LAM.

Shell ovate, turreted, cancellated; canal partial, very short or wanting; pillar plaited, the folds nearly transverse.

CANCELLARIA COUTHOUYI.

Shell ovate-conic, white, reticulated with coarse revolving lines, and lines of growth; three folds upon the pillar.

FIGURE 190.

State Coll., No. 25. Soc. Cab., No. 2368.

Cancellaria buccinoides, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 105, pl. 3, f. 3.
Cancellaria Couthouyi, JAY; *Catal. of his Cabinet*, 1839.

Shell ovate-conical, somewhat turreted, milky-white, approaching to horn-color; whorls five or six, convex, flattened at the top; suture well defined, and sometimes profound; apex acute, the anterior whorl composing two thirds the length of the shell; surface marked with distinct lines of growth, and sometimes rising into folds near the suture; coarse revolving lines surround it, which, with the folds, form a net-work; aperture half the length of the shell, oval; outer lip sharp, slightly crenulated by the revolving lines; inner lip arched with three inconspicuous, oblique folds, of which the middle one is largest; a thin coating of enamel spreads upon the anterior whorl in mature specimens; base sub-channelled. Length $\frac{1}{2}$ inch, breadth $\frac{2}{5}$ inch, divergence 58° .

Found in fishes taken in various parts of Massachusetts Bay, and usually occupied by a hermit crab. It is somewhat abundant.

It was first described by Mr. Couthouy under the name of *C. buccinoides*, a name previously given to a species from the Pacific by Mr. Sowerby; on which account, Dr. Jay has since applied to it the name of its first describer, — a merited compliment, but in conformity to what seems to me a very bad custom. It is not at first obvious to what genus this shell belongs; Mr. Sowerby coincides in the opinion that it is correctly referred to *CANCELLARIA*. He states, moreover, that he has for several years possessed it, brought from the Arctic seas. Hence, it is probably more abundant to the north of us. It varies considerably in its external appearance, from the greater or less prominence of the folds and striæ. A specimen belonging to Dr. Prescott, of Lynn, measures $\frac{1}{10}$ inch in length, and $\frac{1}{10}$ inch in breadth. It somewhat resembles *C. australis*, Sowerby. This is the only species of the genus found in the northern Atlantic, so far as I am aware.

GENUS FUSUS, LAM.

Shell elongated, tapering to both ends, without varices ; aperture oval, terminating in a straight or slightly curved canal ; operculum horny, pear-shaped, with the nucleus at the small end.

FUSUS ISLÁNDICUS.

Shell elongated, bluish-white, covered with a horn-colored epidermis ; whorls eight, marked with equidistant, revolving lines ; aperture as long as the spire.

State Coll., No. 17. Soc. Cab., No. 315.

Murex córneus, PENNANT ; *Brit. Zool.*, iv. 124, t. 76, f. 99. MONTAGU ; *Test. Brit.*, 258. DONOVAN ; *Brit. Shells*, ii. pl. 38. TURTON ; *Conch. Dict.*, 89. DILLWYN ; *Catal.*, ii. 733. WOOD ; *Index*, pl. 27, f. 107.

Murex Islándicus, GMELIN ; *Syst.*, 3555.

Fusus Islándicus, MARTINI ; *Conch.*, iv. 159, t. 141, f. 1312, 1313. LAM. ; *An. sans Vert.*, vii. 126. BRUG. ; *Encyc. Méth.*, pl. 429, f. 2. KIENER ; *Species*, (*Fusus*) pl. 7, f. 2.

Fusus córneus, SAY ; *Amer. Conch.*, pl. 29. FLEMING ; *Brit. Anim.*, 348. BROWN ; *Conch. of Great Brit., &c.*, pl. 47, f. 7, 9. *Encyc. Brit.*, vi. 448.

Búccinum grácile, DA COSTA ; *Brit. Conch.*, 124, t. 6, f. 5.

Búccinum angústius, LISTER ; *Conch.*, t. 913, f. 5.

Shell ovate, elongated, bluish-white, ponderous, semi-transparent, covered with a horn-colored, somewhat velvety epidermis ; whorls eight or nine, moderately convex, somewhat compressed before the suture, the anterior whorl equalling two thirds the length of the shell ; the whorls covered with equidistant, sub-equal, raised revolving lines, quite apparent through the epidermis ; lines of growth faint ; suture distinct, somewhat channelled. Aperture oblong oval, half as long as the shell, polished, porcelain-white within ; outer lip sharp, and minutely crenulated by the revolving lines ; pillar smooth, and overspread with enamel ; canal moderately produced, and gently curved backwards. Length $2\frac{3}{4}$ inches, breadth $1\frac{1}{10}$ inch, divergence 45° .

Var. *pygmæus*. Figure 199. Shell not exceeding four fifths of an inch in length, whorls six, and preserving the proportions of the type.

A deep-water shell. Very large specimens, much worn, are occasionally found upon Chelsea and Phillips's beaches ; along

the coast of Maine, and farther eastward, they are not infrequent. The small variety is found abundantly in fishes caught in our harbour, though I have never found it washed ashore.

I have regarded the small shells as the young, or a dwarf variety of the type, though Mr. Sowerby is rather disposed to regard them as a good species. And I had also regarded the next species as variety *abbreviatus* of the same; but as I find it accurately described by Mr. Gray, I have concluded to follow him, since I can do it without imposing any new name. The true *Murex córneus* of Linnæus is said to be the *Fusus lignàrius* of Lamarck.

FUSUS VENTRICÒSUS.

Shell ovate-globose, bluish-white, covered with a thick epidermis; whorls five, marked with revolving lines; aperture longer than the spire.

FIGURE 200.

State Coll., No. 13. Soc. Cab., No. 2376.

Fusus Islándicus (var.), KIENER; *Species*, pl. 15, f. 2.

Fusus ventricòsus, GRAY; in *Zool. to Beechey's Voyage*, 117.

Fusus córneus (var.)? BROWN; *Conch. of Great Brit., &c.*, pl. 47, f. 11, 12.

Fusus striàtus, of Paris collections, on authority of Mr. Sowerby.

This species is closely allied to the preceding in color, marking, and texture. It is, however, much more ventricose, the last whorl composing nearly the whole shell. It maintains its proportions through all the sizes and ages I have seen. It is also shorter and finer lined than *F. Sabini*, Gray, found in the Arctic seas, to which Brown's figure perhaps applies more properly than to this species.

I have never seen it from any other locality than the Bank fishing-grounds, and this may add to its claims to be regarded as a distinct species. Length $1\frac{7}{10}$ inch, breadth $1\frac{1}{10}$ inch, divergence 78° .

The aperture is nearly twice as long as the spire, and the revolving lines are closer and more regular than in *F. Islándicus*.

The above name, applied to it by Mr. Gray, is perhaps not objectionable, though it was formerly applied to *Rostellària curviròstris*.

FUSUS TORNA'TUS.

Shell turreted, coarse, pale-brownish ; whorls eight, convex, encircled by elevated bands of a pale chestnut-color ; aperture rounded, canal short, and strongly recurved.

FIGURE 201.

State Coll., No. 13. Soc. Cab., No. 2376.

Fusus tornatus, GOULD ; *Silliman's Journ.*, xxxiii. 197.

Shell turreted, rough, inelegant, antiquated, dingy-white, or faint brownish horn-color ; whorls eight, very convex, rather ventricose, encircled by distant, elevated, light chestnut-colored bands or ribs ; on the upper whorls two of these lines, more prominent than the rest, give them a bicarinated appearance ; on the last but one there are usually three lines, and on the lowest are several others, gradually diminishing in prominence, and never reaching the front, except in immature shells ; sutural division abrupt ; striæ of growth quite apparent, but, with these exceptions, the shell has a smooth and worn appearance ; aperture rather less than half the length of the shell, broad-oval, and somewhat dilated ; outer lip sharp and somewhat angulated by the most prominent revolving bands ; inner margin covered with a callus in mature shells ; canal short, and very much recurved. Length $2\frac{1}{2}$ inches, breadth $1\frac{1}{4}$ inch, divergence 50° .

From the Bank Fisheries. Taken from cod-fish. Several good specimens of various ages are now before me, for most of which I am indebted to the kindness of Colonel Totten.

This shell is undescribed, unless it be the much-debated and equivocal *Murex despéctus* of Linnæus, about which British writers seem to have been so much puzzled. It differs from the early state of the *Fusus antiquus* of Linnæus, the *F. despéctus* of most British conchologists, in the more rounded form of the whorls, and in being destitute of the net-work formed by the close revolving and longitudinal striæ, and it would evidently never assume the appearance of a mature *F. antiquus*.

The only figures I have seen at all resembling this, are figure 1295 of Martini, which he regards as a variety of *Murex antiquus*, as in-

deed he does the *M. despéctus* of Linnæus also ; and the figure of Donovan in his "British Shells," vol. v. pl. 180, under the name of *Murex despéctus*. I have very little doubt that it is the genuine *M. despéctus* of Linnæus ; but as another shell is now universally received under that name, it seems the most judicious way to apply a new name to this, with the above explanation.

This shell probably never becomes three inches in length. It is inelegant and coarse, in general smooth and somewhat shining, though seeming to be made up of small, plane surfaces, rather than curved ones. The elevated lines are broad, and smoothly rounded, of a darker color than the rest of the shell, and give it an appearance as though it might have been turned in a lathe, but left in an unfinished state. In general outline it very strongly resembles the fossil *F. contrarius* of the English crag formation.

FUSUS DECEMCOSTATUS.

Shell oval, turreted, ash-colored, with ten elevated, rounded, horn-colored ribs on the lower whorl, and two on the upper ones.

FIGURE 202.

State Coll., No. 18. Soc. Cab., No. 314.

Fusus decemcostatus, SAY ; *Journ. Acad. Nat. Sc.*, v. 214.

Fusus carinatus, KIENER ; *Species*, (*Fusus*) pl. 19, f. 1.

Shell obliquely oval, narrowed at both ends, solid, coarse, spire elevated and turreted, ash-colored, composed of about six convex whorls, coarsely wrinkled by the lines of growth ; lower whorl turgid, and girdled by about ten broad, elevated, rounded ribs or keels, of a light reddish horn-color ; they are about equidistant, the posterior one is the largest, and the successive ones go on diminishing, till, about the beak, they become nearly extinct ; between the posterior rib and the suture is a broad, excavated shoulder, giving the shell a turreted appearance ; the two largest ribs revolve also on all the upper whorls ; the space between the ribs is marked by fine revolving lines ; aperture ovate ; outer lip sharp, and modified by the termination of the ribs ; inner margin regularly arched, and thinly spread with white enamel ; the pillar, at its lower third, twists outwards to form a short, curved beak, and has, at this part, an imperfect umbilicus, bounded ex-

ternally by a rough, obtuse, spiral ridge; throat white, having shallow grooves of a chestnut-color at the margin, answering to the external ribs; operculum horny. Length 3 inches, breadth $1\frac{3}{4}$ inch, divergence 68° .

Thrown up after violent storms on the shores of Massachusetts Bay, and along more northerly coasts. It is seldom found with the mouth entire, though it may contain the living animal; showing that it probably inhabits rocks in deep water.

It resembles no other shell of the genus, unless, perhaps, it be *F. carinatus*, which is a more ventricose shell, with fewer and narrower ribs. But Kiener must be mistaken in regarding it as the *F. carinatus* of Lamarck. There is no reason to suppose that his *F. carinatus* was different from that of other authors, who give figures varying widely from our shell. Kiener's figure is taken from a small, slender specimen. It is still more like *Purpura succincta*, in general aspect. It is subject to but little variation; the most important one is, that a third rib is found upon one or more of the upper whorls.

FUSUS SCALARIFORMIS.

Shell fusiform, white or reddish-brown, with fifteen or twenty longitudinal, compressed ribs; aperture of the length of the spire.

FIGURE 203.

State Coll., No. 164. Soc. Cab., No. 2356.

Fusus scalariformis, GOULD; *Silliman's Journ.*, xxxviii. 197.

Shell tapering at both extremities, reddish-brown in the younger stages, white when old, whorls seven, turgid, covered at close intervals with fifteen to twenty compressed, white ribs, or arching plates, laying over each other like tiles; they are generally a little flexuous, the edges sharp and jagged when young, and more erect, smooth, and blunt on old specimens; they are usually somewhat more elevated at the posterior part of the whorls, so as to produce an angular, or coronated appearance; the interstices, in adult shells, are smooth, somewhat wrinkled at the sutures, with numerous faint, revolving lines, which are not visible on younger shells; aperture half the length of the shell, produced into a moderately long, slightly recurved beak, irregularly wrinkled by

the transverse terminations of the ribs ; right lip thickened or sharp, according as it is or is not terminated by a rib ; throat light chestnut-brown, like the exterior of young shells. Length $1\frac{3}{4}$ inch, breadth $\frac{1}{2}$ inch, divergence 45° .

Of six specimens in my possession, four belong to Colonel Totten, who kindly sent them to me for description, one was from Dr. J. B. Forsyth of Sandwich, all of which were from the Bank Fisheries ; and one was taken from a fish caught in Massachusetts Bay by Mr. Couthouy.

This shell is remarkable for its sharp, elevated ribs, as if the surface were raised by flakes arranged like the ribs on most species of *Scalaria*. It is very much like the *Fusus Bámffius*, but, on the whole, I think it is different, inasmuch as we have that species with its undoubted characters, and the two never seem to run into each other. The large figure of Donovan, (*Brit. Shells*, pl. 169, f. 1,) given as *Murex Bámffius*, represents our shell.

It is allied to *M. Magellánicus* ; and the figure in " *Encyc. Méth.*" pl. 438, f. 4, referred to as *M. lyrátus*, Lam., bears a distant resemblance to it.

FUSUS BA'MFFIUS.

Shell small, brownish ; whorls six, ventricose, ribbed lengthwise with numerous sharp, raised plaits ; aperture rounded ; canal curved.

FIGURE 198.

State Coll., No. 12. Soc. Cab., No. 2369.

Murex Bámffius, DONOVAN ; *Brit. Shells*, v. pl. 169, f. 2. MATON and RACKETT ; *Lin. Trans.*, viii. 149. MONTAGU ; *Test. Brit.*, *Suppl.*, 117.
Fusus Bámffius, FLEMING ; *Brit. Anim.*, 351. BROWN ; *Conch. of Great Brit.*, &c., pl. 47, f. 1.

Shell small, light-brownish, composed of six rounded whorls, forming an elevated spire ; suture deeply defined. The stages of growth are distinctly marked by an expansion of the lip, so as to cover the surface of the shell, lengthwise, with from fifteen to twenty sharp, raised folds, of a whitish color, which become rounded into brownish ribs by age ; aperture less than half the length of the shell, rounded-ovate, terminating in a curved canal,

about half as long as the aperture ; lip sharp, direct or reflexed, according to the stage of growth ; aperture brown. Length $\frac{1}{4}$ inch, breadth $\frac{9}{16}$ inch, divergence 33° .

Occasionally found in the stomachs of fishes.

This is undoubtedly the *F. Bámffius* of English authors, as determined by actual comparison. But the similarity of this and the preceding species is such, as to raise the question whether they are not the same. Their shape, color, number of whorls, and character of the surface is the same, and they scarcely differ in any thing but size, this species being a miniature of the other. And yet there is a constancy in both, and none of those intermediate specimens which mark the connection of distant varieties. I have no doubt that the large figure of Donovan, which represents what he regarded as a very large growth of his *M. Bámffius*, was taken from a specimen of what I have described as a new species. Brown seems to have copied that figure, but in such a way as to render it doubtful to which species his figure would best apply. I have never seen this species exceed three fourths of an inch in length ; while my smallest specimen of *F. scalarifórmis*, an immature specimen, is more than an inch in length. It generally appears covered with an ash-colored mouldiness, which disappears when moistened.

FUSUS RUFUS.

Shell slender and tapering, fawn-colored ; whorls eight, having eighteen or twenty oblique, rounded folds, and minute revolving lines.

FIGURE 192.

State Coll., No. 15. Soc. Cab., No. 2374.

Murex rufus, MONTAGU ; *Test. Brit.*, 263. MATON and RACKETT ; *Lin. Trans.*, viii. 145. DILLWYN ; *Catal.*, ii. 744. TURTON ; *Conch. Dict.*, 93. WOOD ; *Index*, pl. 27, f. 134. FLEMING ; *Brit. Anim.*, 350.

Fusus pleurotomárius, COUTHOUY ; *Bost. Journ. Nat. Hist.*, ii. 107, pl. 1, f. 9.

Shell elongated, tapering to an acute point, reddish fawn-colored ; whorls eight, slightly convex, with numerous obliquely undulating folds or ribs, amounting sometimes to eighteen or twenty ; these are quite regular and prominent, the interstices or excavations between them being of equal width with the folds ; they are most prominent on the upper whorls, and vanish about the middle

of the lower whorl ; there are numerous inconspicuous revolving lines, most distinct at the base ; larger whorl rather more than half the length of the shell, with a slight shoulder at the suture ; aperture short and narrow, having a slight notch at its posterior angle, and terminating abruptly in front, without an elongated canal ; outer lip sharp ; pillar smooth, moderately arched. Length $\frac{3}{4}$ inch, breadth $\frac{1}{2}$ inch, divergence 40° .

Found, not unfrequently, in the stomachs of fishes, though rarely in a fresh state.

On comparison with specimens sent from England, I coincide with Mr. Sowerby in opinion, that this shell, first found in our waters by Mr. Couthouy, and described by him as new, is the *Murex rufus* of Montagu. It is, however, generally much larger than those known to Montagu, his specimens being less than half an inch in length.

It is a well marked species, though varying much in its depth of color, and in the distinctions of the spiral lines. The spaces between the ribs are deep, as if grooved out. The canal is almost too short for the genus *Fusus*, while the notch of the lip approximates it to *PLEURO'TOMA*.

FUSUS HARPULARIUS.

Shell long-ovate, pointed, turreted, flesh-colored, whorls angular above, with about sixteen oblique, rounded folds and numerous revolving lines.

FIGURE 191.

State Coll., No. 21. Soc. Cab., No. 2375.

Fusus harpularius, COUTHOUY ; *Bost. Journ. Nat. Hist.*, ii. 106, pl. 1, f. 10.

Shell ovate-oblong, turreted, of a brownish flesh-color, composed of six or eight angulated whorls, flattened above the angle, so as to form a slightly sloping shoulder ; lower whorl more than half the length of the shell, having about eighteen oblique, rounded plaits or ribs, vanishing before they reach the beak, and crossed by fine revolving lines, most conspicuous in the interstices ; the upper whorls are marked in the same manner ; beak white, short, somewhat curved, and pointed ; aperture narrow, broadest and angular behind ; the outer lip sharp ; inner lip white, smooth, and

moderately arched, twisting outwards at the commencement of the beak. Length $\frac{1}{2}$ inch, breadth $\frac{1}{4}$ inch, divergence 48° .

First found by Mr. Couthouy, in fish taken near Nahant, and frequently obtained since from the same locality.

It bears a close resemblance to *Fusus turrícula*; and Mr. Sowerby seems rather disposed to regard it as such. But the marks of distinction are constant. The flesh color is invariable; the length of the body whorl proportionally greater, and it is more convex, and less angular; the folds are more oblique, more rounded, and the beak is shorter, but more curved.

From *F. rufus* it is distinguished by a less dark color, less prominent but closer ribs, more conspicuous shoulder, and by its less elongated and slender form, and the absence of a notch at the posterior junction of the outer lip.

It has a general resemblance to pl. 48, f. 43, 44, of "Brown's Conch. of Great Brit.," &c. which he calls *Fusus castaneus*.

FUSUS TURRÍCULA.

Shell white, thin, whorls very conspicuously angulated and turreted, with twelve or fourteen prominent ribs, and numerous distinct, revolving lines.

FIGURE 193.

State Coll., No. 16. Soc. Cab., No. 2357.

- Murex turrícula*, MONTAGU; *Test. Brit.*, 262, pl. 9, f. 1. TURTON; *Conch. Dict.*, 93. DILLWYN; *Catal.*, 744. MATON and RACKETT; *Lin. Trans.*, viii. 144. *Dorset Catal.*, pl. 14, f. 15. WOOD; *Index*, pl. 27, f. 133.
Fusus turrículus, BROWN; *Conch. of Great Brit.*, pl. 48, f. 51, 52.
Fusus turrícula, FLEMING; *Brit. Anim.*, 349.
Murex angulatus, DONOVAN; *Brit. Shells*, v. 156.

Shell thin, pure white, sometimes yellowish or brownish-white; with seven or eight whorls, rising nearly perpendicularly from each other to an acute apex, and having an abrupt, broad, nearly flat slope at their summits; surface with twelve or fourteen somewhat oblique, rather compressed ribs, which vanish before attaining the front, traversed by numerous distinct, elevated lines, of which one at the angle of the whorls is most prominent, these obsolete at the edge of the ribs; beak short, open, and nearly straight; aperture oblong, broad, and angular behind; outer lip

sharp, or thickened by a rib ; inner lip smooth, slightly arched. Length $\frac{2}{3}$ inch, breadth $\frac{1}{4}$ inch, divergence 42° .

Found in considerable numbers, and in a very fresh state, in the stomachs of fish. It is one of the shells common to both Atlantic shores.

This is a very pretty shell, and is not likely to be confounded with any other except *F. harpulàrius*. From this it is distinguished by being a more delicate shell, by its color, by the smaller number of ribs, and by the remarkably turreted appearance of the whorls. The raised line, revolving at their angle, is so great as to produce a small tubercle there, on each of the ribs. The aperture is usually about half the length of the shell ; but there is a variety in which the aperture is about one third the length of the shell, and the ribs are more numerous. Mr. Sowerby intimates that our shell may not be identical with the European type ; but on the whole, I cannot persuade myself to regard them as different. The variety is like the *Murex angulàtus*, figured by Donovan.

FUSUS MURICATUS.

Shell slender, yellowish ; whorls very tumid, with about ten conspicuous folds and elevated revolving lines ; beak long and straight.

State Coll., No. 14. Soc. Cab., No. 2377.

Murex muricatus, MONTAGU ; *Test. Brit.*, 262, pl. 9, f. 2. TURTON ; *Conch. Dict.*, 95. MATON and RACKETT ; *Lin. Trans.*, viii. 149. DILLWYN ; *Catal.*, 746.

WOOD ; *Index*, pl. 27, f. 138. FLEMING ; *Brit. Anim.*, 351.

Fusus muricatus, BROWN ; *Conch. of Great Brit., &c.*, 48, f. 28.

Shell elongated, slender, yellowish-white, or orange, composed of seven very convex whorls, the suture deeply defined, forming an elevated, pointed spire ; these are traversed by about ten broad, rounded folds or undulations which are crossed by coarse, elevated, revolving, glossy lines, producing a rough, granulated, almost tubercular surface ; aperture broad oval, terminating in a long, straight canal, which together equal half the length of the shell ; outer lip rendered jagged by the revolving lines, and sometimes greatly thickened ; inner margin smooth and simple. Length $\frac{7}{8}$ inch, breadth $\frac{3}{16}$ inch, divergence 45° .

Two shells answering to the preceding description were furnished me from the cabinet of Dr. Prescott, of Lynn, as taken from fish brought to Phillips's Beach. I had some little hesitation in admitting them as native shells, supposing they must have been accidentally mingled with Massachusetts shells. But I am now disposed to regard it as another of the shells belonging to both Atlantic shores. I take it to be the *M. muricatus*, of Montagu, from whose figure our specimens differ only in wanting the thickened outer lip, a character which age would probably produce. I may, however, be deceived on both these points. It is readily distinguished by its long, straight beak, which brings it among the true *FUSI*.

GENUS PYRULA, LAM.

Shell pear-shaped, without varices, broad at the spire, and tapering forwards to form a long, straight beak; aperture longer than the spire, broad behind; pillar twisted.

PYRULA CANALICULATA.

Shell large, pear-shaped, covered with revolving lines, and a hispid epidermis; lower whorl tumid, ending in a long canal, a nodular keel crowns the flattened summit of each whorl, and there is a deep and broad channel at the suture.

FIGURE 206.

State Coll., No. 23. Soc. Cab., No. 317.

Murex canaliculatus, LIN; *Syst. Nat.*, (12th ed.) 1222, No. 555. GMELIN; 3544, No. 65. GUALT.; *Test.*, t. 47, f. A. MARTINI; *Conch.*, iii. t. 66, f. 742, 743. LISTER; *Conch.*, t. 878, f. 2. KNORR; *Vergn.*, i. t. B. 6, f. 4. *Py'rula canaliculata*, BRUG.; *Encyc. Méth.*, 436, f. 3. LAM.; *An. sans Vert.*, (1st. ed.) vii. 138. ADAMS; *Bost. Journ. Nat. Hist.*, ii. 269. *Py'rula spirata*, KIENER; *Species*, pl. 10, f. 1.

Shell large, rather thin, pear-shaped; pale fawn-color, coarsely marked with revolving lines; composed of about six turreted whorls, the last very large and tumid above, gradually diminishing downward, and terminating rather abruptly in a long, nearly straight canal or beak; a nodulous, beaded cord or keel surrounds the most prominent part of each whorl, behind which it is abruptly flattened; at the suture is a broad and deep channel, so that the upper whorls are composed of an upright portion, and a nearly

horizontal one, all terminating in a pointed apex, and forming a winding terrace up the spire ; covered with a dense yellowish-brown epidermis, bristling with stiff, curved hairs along the lines of growth, and at regular intervals corresponding with the revolving lines of the shell ; aperture ovate, three fourths the length of the shell, the outer lip simple, sharp, and arched ; the inner margin concave and twisted as it turns out to form the canal, smooth and enamelled ; within, brightly polished, variously shaded with chestnut and fawn-color ; operculum small for the shell, oval, the apex at the lower extremity, its elements coarse, strengthened on the inner side by a varnished deposit. Ordinary length 6 inches, breadth 3 inches.

Found about Nantucket, Martha's Vineyard, Buzzard's and Narraganset Bays. It is set down, in all the works I have seen, as an inhabitant of the arctic seas, and Canada. But Cape Cod is probably its northernmost limit ; at least, I have never heard of it farther north. I believe too, that it does not extend far south.

It seems superfluous to be minute in the description of a shell which would at once be recognised, when we have said that it is a large, pear-shaped shell, with its peculiar channel at the suture, and each whorl crowned with a beaded circlet. It is subject, however, to considerable variations. It varies in color, from light-orange to livid-brown. In thickness, also, there is great diversity. In the old shells, the nodules, which are so regular in the young, are worn off, and they seldom exhibit more than vestiges of the bristled epidermis. The largest specimen I have seen is seven inches in length. Kiener, like his predecessors, has associated two shells under the same name, which are certainly distinct, and probably come from different quarters of the globe. Which should be held as the *M. canaliculatus* of Linnæus, must remain uncertain, since the essential character of his species is, a canal intervening between the whorls at the suture ("quod anfractus in spirâ non contigui sunt, sed canali distantes"), a character which belongs to both species. Gualter and Davila evidently had reference to our shell alone.

The ova are contained in membranous cases, about the size and thickness of a cent. Great numbers of these are united together in a parallel position, about one fourth of an inch apart, by a ligamentous thong attached to their edge, so as often to form strings a yard in length, gradually diminishing in size from one end to the other. They

are represented in "Ellis's Corallines," t. 33, f. b. When the embryo is sufficiently mature, the young escape through an opening in the edge, opposite to that where the ligament is attached.

PY'RULA CA'RICA.

Shell large, solid, pear-shaped, spire not turreted, suture not channelled, having a series of the triangular, compressed tubercles just above it, and encircling the most prominent part of the body whorl; canal long and flexuous.

State Coll., No. 22. Soc. Cab., No. 316.

Murex cárica, GMELIN; 3545, No. 67. LISTER; *Conch.*, 880, f. 3 b. GUALT.; *Test.*, t. 47, B. MARTINI; *Conch.*, iii. t. 69, f. 744, 756. KNORR; *Vergn.*, vi. t. 27, f. 1.

Py'rula cárica, BRUG.; *Encyc. Méth.*, pl. 435, f. 5. LAM., *An. sans Vert.*, (1st ed.) vii. 138. ADAMS; *Bost. Journ. Nat. Hist.*, ii. 269.

Shell large and thick, ovate pear-shaped, ash-colored; whorls six, the lowest large and capacious, broadest at its posterior fifth where it is crowned by a series of compressed, triangular nodules, one at each stage of growth; the spire suddenly slopes backwards from these to the suture, which is well defined, but not channelled; the spire is a low cone, pointed, the series of nodules encircling the base of each whorl; below the nodules the lower whorl gradually diminishes and extends into a long, conical beak; surface distinctly marked by an elevated ridge of a darker color at each stage of growth, and by revolving lines alternately larger and smaller; aperture long ovate, angular at its junction behind, where a canal is formed by a protuberance of the opposite margin; outer lip simple, sharp, regularly curved to the extremity of the beak, or slightly arched at the middle, not otherwise contracted at the commencement of the canal; pillar lip flexuous, concave above, and to the beginning of the canal where it twists outwards, causing a bluntly rounded projection, and forming the inner margin of the canal, which is gently curved upwards, and to the right; interior bright brick-red or light fawn-color; operculum unguiform, apex at one end, inner side of a wax-like texture,

strengthened by an entire rim of a dark, vitreous substance. Length 7 inches, breadth 4 inches.

Found in company with the preceding, but less abundant. It is a shell belonging to a more southern latitude, and is found of great size, and deep color, on the southern coast of the United States.

This is the largest convoluted shell on this Atlantic coast, and is recognised without difficulty. Still it exhibits great variety in appearance, particularly in the length of the spinous tubercles. Sometimes they are half an inch in length, and at others, mere traces of them are all that is found on the larger volutions; sometimes they are close at the suture, even encroaching upon the whorl below; and at others, they are removed to a considerable distance above it. In the old shells the surface is a nearly uniform dead, ashy-gray color; while in the young, there are stripes at each stage of growth, and imperfect bands of a violaceous-brown color. Southern specimens are more luxuriant, with more brilliant colors, as might be expected from a warmer climate.

GENUS RANÉLLA, LAM.

Shell oblong-oval, thick, nodulous, having a line of varices on each side, formed at each half revolution; aperture oval, terminating in a straight canal in front, and in a notch posteriorly; lip thickened.

RANÉLLA CAUDATA.

Shell rhomboidal, thick, cinereous brown, checkered with longitudinal ribs and revolving lines, canal long and straight.

FIGURE 204.

State Coll., No. 3. Soc. Cab., No. 348.

Ranélla caudata, SAY; *Journ. Acad. Nat. Sc.*, ii. 236. *Amer. Conch.*, pl. 48. ADAMS; *Bost. Journ. Nat. Hist.*, ii. 269.

Shell rhomboidal, solid, of a dark mahogany-color, obscured by a substance like bluish-mould; there are five angular whorls, traversed lengthwise by eleven elevated ribs, of which one at the left side of the largest whorl, and the one bordering the aperture, are

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enlarged into strong, wing-like varices ; these are crossed by equidistant, revolving threads, which together form a network over the shell ; aperture inversely ovate, rounded behind, and pointed before ; outer lip thick, margined within by raised granules which alternate with the external lines ; pillar lip curved, flattened and smooth, and, with the throat, is bluish-white ; canal about the length of the spine, straight or a little recurved, narrow, deep, and partly closed over by the continued lips. Length 1 inch, breadth $\frac{3}{4}$ inch, divergence 60° .

Found sparingly on the shores of Buzzard's Bay, Nantucket, and Martha's Vineyard. According to Mr. Say, it is abundant on the Southern coast. It is the only species known on the coast of the United States, and, as a species, is peculiar on account of the prolongation of its canal.

Mr. Sowerby regards it as identical with *R. muriciformis*, Brod., from Western Columbia. The alliance is very close, but ours is a much more delicate shell. At any rate, Mr. Say's description was published ten years before that of Mr. Broderip.

FAMILY *ALATA*, LAM.

Shell with a straight canal at the front of the aperture ; outer lip changing its form and becoming broadly expanded by age.

GENUS *ROSTELLARIA*, LAM.

Shell turreted, spire long, aperture long and narrow, terminating in a straight canal in front, and in a channel running up the spire posteriorly ; outer lip thickened and widely dilated.

ROSTELLARIA OCCIDENTALIS.

Shell spindle-shaped, the outer lip expanded into a broad, thick wing ; whorls convex, with numerous waving, longitudinal folds, and regular, conspicuous, revolving lines.

FIGURE 205.

State Coll., No. 2. Soc. Cab., No. 3364.

Rostellaria (*Aporrhais*) *occidentalis*, BECK ; *Lyell's Catal. of Fossils of St. Lawrence Bay, in Geolog. Trans.* GUERIN ; *Mag. de Zool.*, May, 1836, pl. 72.

Shell thick but light, of a livid or bluish-white color ; excluding the wing, it is spindle-shaped, composed of eight or nine moderately convex whorls, with numerous smooth, rounded, crescent-shaped folds, which scarcely reach the well-marked sutures ; on the largest whorl there are about twenty-five folds, and on the last but one they become closer and fainter, till they finally disappear on the back ; two or three whorls at the pointed apex are also destitute of folds ; beautiful revolving lines, of uniform size and distance, also ornament the shell ; aperture crescent-shaped, independent of the wing ; this arises a little above the suture of the preceding whorl, and passes off from the spire at an angle of about one hundred and twenty degrees, to a distance equal to the breadth of the lower whorl ; after forming somewhat of a spur at the posterior and outer angle, it advances, smooth and very thick, at nearly a right angle, in a straight line nearly an inch, then, forming an obtuse angle, passes obliquely forward to the pointed termination of the columella, forming with it a short, shallow, and oblique canal ; pillar lip smooth and rounded, convex above, and concave below ; throat livid ; a thick, dusky epidermis. Length $2\frac{1}{4}$ inches, breadth $1\frac{1}{2}$ inch, divergence 40° .

Tips of this shell, some of them, however, wanting nothing but the expansion of the lip, are all that have yet been found in our Bay, and along the coast of Maine. Complete shells are found in fishes taken at the Newfoundland Banks.

It is a very extraordinary shell, resembling, in its expansion without digitations, the fossil species *macróptera*, of which the genus HIPPOCRENE has been formed. The animal is not known, but from the alliance of the shell to the *Aporrhais pes-pelecani* it probably belongs to the same genus. As this cannot now be settled, it is better to leave it still in the genus ROSTELLARIA, from which the *pes-pelecani* has been separated, on account of a difference in the animal.

The lip is very remarkable, and very much resembles the lip of *Strombus tricórnis*.

FAMILY PURPURIFERA, LAM.

Shell with a short, ascending canal, or an oblique notch, or semi-canal, directed upwards.

GENUS TRICHÓTROPIS, BROD. and SOWERBY.

Shell thin, ventricose, keeled, umbilicated; aperture longer than the spire, compressed into a partial canal in front; epidermis horny, rising into hairs at the angles of the shell; operculum horny, nucleus at one side.

The genus TRICHÓTROPIS was instituted by Mr. Sowerby to include this and one other shell, which have unequivocal generic traits, but whose place in the series has not yet been determined. Lesson regards it as allied to JA'NTHINA; and the species which he knew might well lead him to such an opinion. Mr. Sowerby at first compared it with TURBO, BU'CCINUM, and CAN-CELLA'RIA. But in his late work, the "Conchological Manual," he places it among the PURPURIFERÆ, where its aspect would lead us to place it. It is very peculiar in having its axis fall considerably to the left of the canal.

TRICHÓTROPIS BOREA'LIS.

Shell ovate-rhomboidal; whorls four, the last very broad, and encircled by four or five, and the others by two, prominent, fringed ribs, and crossed by minute and regular elevated lines; umbilicated.

FIGURE 207.

State Coll., No. 20. Soc. Cab., No. 2282.

Trichótropis boreàlis, SOWERBY; *Zool. Journ.*, iv. 373, pl. 9, f. 6, 7.

Trichótropis costellatus, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 108, pl. 3, f. 2.

Shell ovate-rhomboidal, turreted, spire pointed; color ashy or yellowish-white; whorls four, separated by a deeply channelled suture; the last whorl very large, and encircled by two prominent, and two or three less conspicuous, rounded ribs or keels, and several still smaller intervening and adjacent ones; the two large ribs only are continued upon the upper whorls, which are thereby rendered angular; very numerous, minute and regular threads, traverse the length of the shell, not being interrupted by the ribs; the whole is covered by a yellowish horn-colored epidermis, which rises like a bristly fringe along the keels, and along

those lines which mark the stages of growth ; aperture ovate, broad and rounded behind, narrowed and somewhat pointed in front ; outer lip thin and sharp, festooned by the projecting ribs ; inner lip arched and flattened, with a slight inward projection at the lower third, rising before the umbilicus, which is also bounded externally by a revolving ridge ; the two lips meet in front at an acute angle, forming a short, slightly excavated canal, turning a little to the right. Length $\frac{7}{8}$ inch, breadth $\frac{4}{8}$ inch, divergence 48° .

Found in considerable numbers, though rarely entire, in fishes taken in Massachusetts Bay.

Mr. Couthouy makes the principal points of difference between his shell and the *borealis* of Sowerby, to be, a greater number of keels on the lower whorl, the less breadth of that whorl, and the shorter fringe upon it. But these detailed portions are by no means constant. I have sent specimens to Mr. Sowerby, who assures me, they are the same as his *borealis* received from Melville's Island, many years ago. He also sent another imperfect shell, dredged at Oban, in Argyleshire, by Mr. Jeffreys, and named by him *T. acuminatus*, which I cannot perceive to differ at all from our shell. This is probably its southern limit.

PURPURA LAPI'LLUS.

Shell ovate, pointed, solid, variegated in color, white, yellow, chocolate, and often banded with white ; surface with numerous coarse, revolving ridges ; aperture oval, outer lip thickened, and toothed within.

State Coll., No. 10 and 11. Soc. Cab., No. 1502.

Buccinum lapillus, LIN.; *Syst. Nat.*, 1202. PENNANT; *Brit. Zool.*, iv. 218, t. 72, f. 89. MARTINI; *Conch.*, iii. 429, t. 121, f. 1111, 1112, and iv. 22, t. 122, f. 1124, 1125, &c. DONOVAN; *Brit. Shells*, pl. 11. WOOD; *Index*, pl. 23, f. 62. MONTAGU; *Test. Brit.*, 239.

Tritonium lapillus, MÜLLER; *Zool. Dan. Prodr.*, 244.

Purpuro-Buccinum, DA COSTA; *Brit. Conch.*, 125.

Purpura lapillus, LAM.; *An. sans Vert.*, (1st. ed.) vi. KIENER; *Iconog.* (Pourpre,) 101, pl. 29, 30, 31, f. 77 to 77s. FLEMING; *Brit. Anim.*, 341.

Shell ovate, acutely pointed at both extremities, thick and solid, varying in color, from white through yellow to a dark choc-

olate, and often with bands of white or yellow, of different widths; surface more or less wrinkled and encircled with numerous, coarse, unequal ridges. Some are nearly smooth, and others, at the lines of growth, have series of raised, concave scales, which render the whole shell rough and prickly to the touch; whorls five or six, in some convex, so that the spire appears turreted, in others flattened below the sutures, so as to be pyramidal. Aperture oval, the outer lip regularly curved, sharp, but thickened, and armed with blunt teeth at a little distance within, so that the aperture appears spreading; the pillar lip moderately flattened, smooth, its lower portion a little twisted, so as to form a moderate projection within the shell, and a crescent-shaped umbilical depression outside; canal short, turning a little to the right; throat generally light reddish-brown, with a lighter border to the lip. Operculum horny, elliptical. Common length $1\frac{1}{4}$ inch, breadth $\frac{7}{16}$ inch.

Inhabits the ocean rocks everywhere.

While there is an individuality about this shell, by which it is easily recognised, yet it is infinitely varied in its details. All specimens have the coarse, revolving ridges, and the peculiar twist of the flattened pillar, characteristic of the genus. They may be divided into two groups, those with a smooth, and those with a rasp-like surface. The smooth shells are the most solid, and are usually flattened near the suture, so as to give the shell a rhomboidal, rather than an ovate outline. This smoothness is not the effect of age, as has been generally stated, for the young shells, in both groups, are like the old. In these there is nothing like an umbilicus. These are the true *P. lapillus*.

In the other group, the whorls are more convex, the suture deep, and the surface is rendered rasp-like by the sharp, scolloped edges of the successive lines of growth, which are most conspicuous in the youngest specimens. In these the callus is abundant upon the pillar, and rises in such a manner as to seem to cover an umbilicus. In some specimens it is so abundant at the posterior angle of the aperture, that the two lips are continuous, and their junction rounded. The canal in this variety is more decided and longer. This variety is Lamarck's species *P. imbricata*.

As to coloration, both varieties pass from white through yellow to a dark chocolate or slate-color; but specimens of the first group,

are both lighter and darker than those of the second group. It is in the first group only that I have met with the banded varieties. These have the portion next the suture, the base, and a central zone dark, and the remainder white; and they constitute Lamarck's species *bizonâlis*. Kiener has figured many varieties, but it would be impossible to represent every aspect of a shell, in which no two individuals may be found exactly alike.

Kiener states that the animal, which is perfectly white, is very carnivorous, and that by it are produced, principally, the perforations so frequently observed in bivalve shells on the shore. This remark might apply to many of the perforated univalve shells; but it would hardly be expected that this animal, whose residence is confined to the rocks, should feed upon the animals of bivalve shells, which reside only in sand or mud. The NA'TICA is the more probable depredator in this case.

GENUS BUCCINUM, LIN.

Shell ovate-conic; aperture having a notch without a canal, in front; pillar not flattened, somewhat twisted.

BU'CCINUM PLICÒSUM.

Shell oval, tapering at both ends, ash-colored, or reddish-brown, with ten or twelve undulations on the lower whorl, crossed by numerous revolving lines.

FIGURE 213.

State Coll., No. 19. Soc. Cab., No. 313.

Fusus cinereus, SAY; *Journ. Acad. Nat. Sc.*, ii. 236. *Amer. Conch.*, pl. 29.
Buccinum plicòsum, MENKE.

Shell long-oval, tapering at both ends, coarse, solid, of a reddish-brown color, more or less dark, covered with an ashy-gray pigment; on some specimens are two faint brown bands on the larger whorl; whorls five or six, convex, compressed about the suture, with ten or twelve rib-like undulations along each, crossed by numerous, somewhat regular, elevated, revolving lines; aperture ovate, and, with the beak, about equals the spire; outer lip sharp, scolloped by the termination of the revolving lines, with one or more series of elevated, whiter lines within, corresponding to the external grooves; pillar margin slightly arched, covered

with enamel, which rises up by the side of an umbilical depression ; beak short, slightly curved ; throat of various hues from light violet, to dark chocolate ; operculum horny, rounded ovate, elements concentric ; the nucleus near one edge. Length 1 inch, breadth $\frac{3}{8}$ inch, divergence 50° .

Found on rocks in bays and inlets, about Nantucket, New Bedford, &c., and occasionally sheltered under the edges of stones in Boston harbour. I am not aware that it is found to the north of Cape Ann, while it is common at the South, and grows to a much larger size.

Animal small, foot scarcely covering the aperture, very little dilated at the front angles, cream-colored, margined with lemon-color beneath, punctured with light drab above ; siphon merely surpassing the tip of the canal ; head scarcely protruded ; tentacula nearly united at origin ; eyes black, at the outer upper third of tentacula, which third is a mere filament, contractile. Motions sluggish.

Mr. Say noticed that its habits were those of *PURPURA* ; but it is removed from both *FUSUS* and *PURPURA* by its operculum, and will probably prove to belong to the genus *PO'LLIA* of Gray. Mr. Say's specific name is pre-occupied by another species of *BU'CCINUM*.

BU'CCINUM DONOVA'NI.

Shell ovate-conic, elevated and pointed ; whorls folded lengthwise, and marked with revolving lines ; the lowest whorl is encircled by a rounded carina ; aperture rounded, lip spreading.

FIGURE 208.

State Coll., No. 165. Soc. Cab., No. 2378.

Buccinum glaciale, DONOVAN ; *Brit. Shells*, v. pl. 154. BROWN ; *Conch. of Great Brit., &c.*, pl. 49, f. 12, 13.

Buccinum Donovanii, GRAY ; in *Zool. to Beechey's Voyage*, 128.

Shell ovate-conic, spire elevated and pointed, solid, of a livid brownish-color, folded obliquely lengthwise, the lower whorl being merely plaited at the suture, and covered with rather coarse revolving lines ; whorls seven or eight, moderately convex, and

gradually tapering; on the lower one, a flattish rib or keel commences at the junction of the lip, and, revolving, terminates about the lower third of the lip; suture deep and undulating; aperture less than one half the length of the shell, rounded; outer lip white, rather thick, and spreading, with a wave at its posterior portion; inner margin nearly destitute of callus; throat livid; canal short, very slightly recurved. Length 2 inches, breadth $1\frac{1}{8}$ inch, divergence 42° .

Inhabits the Bank fishing-grounds.

Distinguished from *B. undatum* by its more slender form, greater polish, its rounded aperture, and spreading lip, and by the ribs encircling the larger whorl. None of the specimens exhibit more than one well-developed rib, and some of them are destitute of any. It has also a more elongated, and more acute spire, than *B. glaciàle*, and Mr. Gray seems to have done well in separating it from that species, as it is commonly received. I have seen a few perfect specimens taken from fishes, which correspond accurately with Donovan's figure.

BUCCINUM UNDATUM.

Shell ovate-conical, ventricose, with broad folds and coarse, revolving lines; whorls six, convex; epidermis grayish; aperture yellowish, lip slightly notched; pillar twisted, canal a mere notch.

State Coll., No. 9. Soc. Cab., No. 511.

Buccinum crassum rufescens, LISTER; *Conch.*, t. 962, f. 14.

Buccinum undatum, LIN.; *Fauna Suec.* No. 2163. *Syst. Nat.*, No. 475. GMELIN; 3492. KNORR; *Vergn.*, iv. t. 19, f. 1. MARTINI; *Conch.*, iv. t. 126, f. 1206 to 1209. PENNANT; *Brit. Zool.*, t. 73, f. 9. HUTCH.; *Dorset Catal.*, 42, t. 17, f. 6. MONTAGU; *Test. Brit.*, 237. KIENER; *Iconog.*, pl. 2, f. 5. DRUMMOND; *Letters to a Young Naturalist*. BLAINV.; *Malacol.*, pl. 22, f. 4. SOWERBY; *Conch. Man.*, f. 421. DONOVAN; *Brit. Shells*, iii. 104. WOOD; *Index*, pl. 23, f. 107. BRUG.; *Encyc. Méth.*, 399, f. 1.

Buccinum vulgare, DA COSTA; *Brit. Conch.*, 122, t. 6, f. 6.

Tritonium undatum, MÜLLER; *Zool. Dan.*, ii. 12, t. 50. FABR.; *Fauna Grænt.*, 394.

Buccinum striatum, PENNANT; *Brit. Zool.*, t. 74, f. 91. LISTER; *Conch.*, t. 962, f. 15. *An. Angl.*, t. 3, f. 3.

Shell thick, ovate-conic, ventricose, grayish or brownish-white, encircled with prominent, raised lines, from one fifth, to one

tenth of an inch apart, with minute, intervening striæ; with twelve or thirteen longitudinal, obliquely waved, elevated ribs or plaits, traversing the upper whorls, fading away on the convexity of the lower whorl, and generally disappearing entirely a short distance from the lip; a yellowish-brown, velvety epidermis covers the shell wholly, or near the lip; whorls six, regularly convex; aperture oval, about one half the length of the shell, white within, or more frequently of a brilliant golden-yellow; minute striæ, corresponding to the prominent lines without, extend some distance within the mouth, and produce faint crenulations of the outer lip; this is somewhat everted, and arched so as often to produce a conspicuous notch at about its posterior third; columella broadly overlaid with callus, somewhat flattened, and twisted at its lower portion; not extending so far as the lip on the opposite side of the canal. Usual length 3 inches, breadth $1\frac{2}{3}$ inch.

It is occasionally found on some of the rocky bars in Boston harbour, particularly Faun Bar, of good size and beauty. On the sandy beaches it is thrown up, in a worn state. Still farther eastward it becomes abundant; and the finest I have ever seen were sent to me by Dr. Mighels, from the vicinity of Portland. I am not aware that it is found south of Cape Cod.

I have given a description of our *B. undatum*, as it most commonly appears with us. It differs, however, in several points from the English shells, as figured and described by Pennant, and others. It is more ventricose, the whorls are one or two less in number; it is not found of so large a size, British specimens being mentioned four or five inches long, while the largest I have seen is only three inches and a half; the striation is far more conspicuous, and the remarkable projection of the columella beyond the rest of the shell, shown in foreign specimens, is not found in ours; the aperture is proportionally broader, and the ribs or folds less distinct. Its golden mouth, too, which is not found in foreign shells, renders it a beautiful shell. In truth, it much more nearly resembles Pennant's *B. striatum*, (*Brit. Zool.*, pl. 74); but Turton states, that, in the *B. striatum* (which is now regarded as a variety of *B. undatum*), the shell is much thinner than the true *B. undatum*, which is not the case in our shell.

Kiener observes, that this species is very variable in size; also in its

form, which is more or less inflated, sometimes the folds, then the striæ, and then both, disappearing. And were specific names to be given to every considerable variety, the nomenclature would be most unscientifically burdened.

The figure of Kiener, and the wood-cut in Drummond's "Letters," &c., are accurate representations of our shell.

BUCCINUM CILIATUM.

Shell ovate-conic, ventricose, thin; whorls six or eight, sometimes folded at the suture; spirally striated, ash-colored, or clouded with brown; epidermis hispid.

FIGURE 209.

State Coll., No. 269. Soc. Cab., No. 2419.

Tritonium ciliatum, O. FABR.; *Fauna Grœnl.*, 401.

Buccinum ventricosum, KIENER; *Species*, (Buccinum,) pl. 3, f. 7.

Shell similar to *B. undatum*, but thin, paper-like, and destitute of folds, except short ones near the suture, so as to give that part a crenated appearance. The whorls are more convexly rounded, so as to be nearly cylindrical; surface with minute and close revolving lines, color yellowish, or livid, most specimens with blotches, or dashes of brown; epidermis fawn-colored, and hispid with short hairs, arranged for the most part along the lines of increase. Aperture short, rounded, lip very thin; throat pure white, or yellowish. The pillar has a very oblique, obscure fold. Length 2 inches, breadth $1\frac{3}{8}$ inch, divergence 58° .

Taken from fishes caught, for the most part, at the Banks.

The thin structure, inflated form, and want of undulations, distinguish this species from the preceding. It agrees very accurately with the description of Fabricius; and Dr. Lovèn assures me that there can be no doubt of its being his *T. ciliatum*. As the epidermis is often removed, or rubbed, however, we do not always find it fringed with short hairs, "*ciliatus pilis brevibus*," as he describes it. Nor is it less doubtfully the *B. ventricosum* of Kiener, although we do not often find it clouded with blotches, or zigzag stripes, as he figures it.

BUCCINUM OBSOLETUM.

Shell ovate, dark reddish-brown, covered with a net-work of lines, and oftentimes folded; aperture ovate, dark-violet, right lip simple and sharp, with elevated lines within.

FIGURE 210.

State Coll., No. 8. Soc. Cab., No. 552.

Nassa obsolèta, SAY; *Journ. Acad. Nat. Sc.*, ii. 232.

Buccinum Nov-Eboracènsis, WOOD; *Index, Suppl.*, pl. 4, f. 26.

Buccinum olivifòrme, KIENER; *Iconog.* (Buccin), pl. 25, f. 99.

Buccinum obsolètum, ADAMS; *Bost. Journ. Nat. Hist.*, ii. 267.

Shell ovular, inelegant, dark reddish-brown or olive-colored, somewhat shining; whorls six, convex, composing a moderately elevated spire, rather blunt at the apex, which, however, is generally much eroded; suture distinctly marked; surface marked with numerous unequal, revolving lines, which are crossed by minute lines of growth, and larger or smaller, more or less numerous oblique folds; these always exist on the smaller whorls, but are often entirely wanting on the lower whorl, the whole giving the shell a granular appearance; aperture oval, outer lip simple and sharp, not thickened within, but marked with elevated lines not reaching the margin, in adult specimens; pillar deeply arched, overspread with enamel, having a protuberance or fold at its front, turning into the interior; canal a mere notch; throat purplish-black, fading within, and, in almost every instance, with a bluish-white band at its posterior third; something similar is found on the opposite lip; operculum horny, not serrated. Length 1 inch, breadth $\frac{1}{2}$ inch, divergence 50° .

The *animal* is variously mottled with slate-color; the foot is as long as the shell, its anterior angles prolonged and turned backwards; head not extending beyond the shell; eyes black, on the exterior side of the tentacula, and above the base; above the eyes the tentacula are suddenly diminished, and bristle-shaped; trunk cylindrical, channelled beneath, half as long as the shell, and very conspicuous.

Its movements are very active, and it collects in numbers about dead crabs and other marine animals, on which it feeds.

Inhabits all our muddy shores, preferring situations not exposed to the surf of the open sea ; such as inlets and extended flats which are drained at low tide. It is found abundantly at the confluence of fresh and salt water, where the taste is merely brackish. Professor Adams remarks, that the finest specimens he had found "were growing at Nantucket, where they are as abundant as in any of our continental harbours."

No shell of equal size is so abundant on the whole Atlantic shore. Specimens from Florida vary only in being smaller, more olivaceous, and by having a thick, broad callus over the pillar.

The younger shells are most likely to be collected, because the old ones become very much eroded and defaced, and a greenish, mould-like plant vegetates abundantly upon it. Very few, therefore, of the shells usually collected, have the lines on the interior of the outer lip. Kiener's figure represents an immature shell.

BUCCINUM TRIVITTATUM.

Shell ovate-conic, turreted, greenish-white, surface wrought into a net-work by elevated, decussating lines ; sometimes with three dark bands on the lower whorl ; raised lines within the lip.

FIGURE 211.

State Coll., No. 6. Soc. Cab., No. 1498.

Nassa trivittata, SAY ; *Journ. Acad. Nat. Sc.*, ii. 231.

Buccinum trivittatum, ADAMS ; *Bost. Journ. Nat. Hist.*, ii. 265.

Shell ovate-conic, turreted, apex acute, greenish or yellowish-white, cross-banded, so as to appear granulated, by means of prominent, equidistant, longitudinal lines, and ten, equally regular, revolving, impressed lines on the larger whorl, and a somewhat more conspicuous groove near the summit of each volution ; whorls seven, flattened above, so as to present a conspicuous shoulder at the suture ; in the best specimens there is a dark band at the top, on the middle, and at the front of the body whorl, each occupying two series of granules ; the lower line of granules on each whorl is also colored ; aperture oval, terminating behind in a canal formed by a dilatation of the right lip, and a fold on the left, and before in a short, ascending beak which is divided from the

body of the shell by a deep groove ; outer lip sharp, and scalloped by the revolving lines ; pillar regularly arched, with a distinct, revolving ridge bordering the canal, and covered, to a considerable extent, with greenish enamel ; throat white, or with brown bands corresponding to those on the outside ; a few elevated lines within, not reaching the margin ; operculum horny, of an irregular, three-sided shape, one half its edge sharply serrated. Length $\frac{7}{10}$ inch, breadth $\frac{3}{10}$ inch, divergence 45° .

Found in a worn state on most of our sea-beaches, and occasionally alive at Chelsea. Dr. William Prescott, of Lynn, found it alive, in abundance, at low-water mark, on Phillips's Beach ; Professor C. B. Adams found it at New Bedford, and says it is abundant at Nantucket, on the inner side of Brant Point, and also on the south shore, less abundant, but larger.

No other shell inhabiting our coast bears any near resemblance to this. Its sculpture is like that of *B. marginulatum* from the Indian Seas, and its whole appearance is very much like that of Kiener's *B. Roissyi* from the Australian Seas. It undergoes considerable variation. The three lines of rufous color which suggested its specific name are very rarely seen on shells in this latitude ; and then, again, we find all the revolving lines more or less colored. In some, the two sets of lines are precisely alike in size and distance ; in others, the longitudinal lines are much the most distant, and become more like undulating folds. These last may be regarded as a well-marked variety ; they are also more acutely pointed, and the shoulder at the suture is more rounded. Specimens from Nantucket have the inner margin thickly coated to a considerable extent with enamel, while those found near Boston have none. I have a specimen $\frac{9}{10}$ of an inch long.

BUCCINUM VIBEX.

Shell thick, short, ovate-conic ; surface checked with wavy folds and revolving lines, and alternately zoned with light and dark color ; lip thickened and toothed within ; pillar with a broad and thick callus, granulated at base.

FIGURE 212.

State Coll., No. 5. Soc. Cab., No. 576.

Nassa vibex, SAY; *Journ. Acad. Nat. Sc.*, ii. 231. *Amer. Conch*, pl. 57, f. 2.
Buccinum vibex, ADAMS; *Bost. Journ. Nat. Hist.*, ii. 264.

Shell solid, short ovate-conic, of an ashy-white color; whorls six, suture very fine; body whorl with about twelve undulating folds or ribs, crossed by about ten elevated lines, most distinct on the ribs; the space between the two upper lines is more deeply indented, forming pits between the ribs; a pale-reddish zone encircles the top, the middle, and generally the base, of this whorl, the upper one and the ribs being continued to the apex; aperture oval, outer lip thickened without and within, with four or five teeth within; pillar very concave, callus abundant, with a few granules at its termination; canal very short, separated from the body by a furrow. Length $\frac{1}{2}$ inch, breadth $\frac{3}{16}$ inch, divergence 67° .

Specimens of this shell are rare, and usually have a chalky aspect. They have been found only to the south of Cape Cod. Mr. Say had it from South Carolina; and I have specimens of a shell from the Spanish Main which differ only in the greater development of callus and brighter colors.

BUCCINUM ROSACEUM.

Shell small, acutely conic, white, tinged with rose-color; whorls six, covered with spiral lines; aperture ovate, shorter than the spire, pillar arched and flattened, lip sharp, and without teeth within.

FIGURE 195.

State Coll., No. 4. Soc. Cab., No. 2379.

Buccinum rosaceum, GOULD; *Silliman's Journ.*, xxxviii. 197.

Shell small, elongated, acutely conic, white, tinged with rose-color, closely covered with minute revolving lines, most conspicuous near the base of the shell, in most parts microscopic; lower whorl as long or longer than the rest of the spire; suture faintly impressed, but distinct; aperture about two fifths the length of the shell, narrow-ovate; outer lip sharp, a little everted, smooth within, gently curving to its junction with the spire; pillar arcuated, a little flattened, smooth and white. Length $\frac{3}{16}$ inch, breadth $\frac{3}{16}$ inch, divergence 40° .

This little shell I took from fish caught off Cohasset. It has since been frequently found in fishes taken in various parts of Massachusetts Bay.

It belongs to Kiener's section of Columbella-formed Buccinum, and greatly resembles his *B. lacteum* in size and general appearance, but is different in color, wants the peculiar spots, and is not toothed within the lip. It is not plaited like *B. pulchellum* and *B. dermestoidesum*. Some specimens are beautifully tinted with rose-red, but others are of a dingy-white, or tinged only around the apex. In one specimen there is something like a dark band just above the suture, and emerging from the posterior angle of the aperture. The revolving lines are very minute, and in old specimens are scarcely discerned on the spire. To the naked eye, the shell appears smooth and shining.

It is probable that both this species and the next, actually belong to the genus COLUMBÉLLA.

BUCBINUM LUNATUM.

Shell small, ovate-conic, surface smooth; color reddish-brown, with two series of crescent-shaped, whitish spots; aperture oval, its outer lip dark-brown, and toothed within.

FIGURE 196.

State Coll., No. 7. Soc. Cab., No. 572.

Nassa lunata, SAY; *Journ. Acad. Nat. Sc.*, v. 213.

Buccinum lunatum, ADAMS; *Bost. Journ. Nat. Hist.*, ii. 266.

Shell small, ovate-conic; whorls six, slightly convex, separated by a shallow suture; surface altogether smooth, excepting a single revolving line below the suture, and a few around the base; color reddish-brown or fawn-color, with two, and sometimes three, series of crescent-shaped, yellowish spots on the lower whorl; the light color often predominating over the dark; aperture oval, narrow, with a small sinus or recess at the posterior angle, and ending in a very short canal in front; outer lip simple, and dark brown, toothed along its inner margin; pillar covered with brown callus, the outer edge of which is somewhat elevated. Length $\frac{1}{2}$ inch, breadth $\frac{1}{10}$ inch, divergence 43° .

Found abundantly to the south of Cape Cod, as far north as Provincetown, about Martha's Vineyard, Nantucket, and Buzzard's

Bay. Professor Adams remarks, that they are found associated, almost without exception, with *Cerithium Sayi*, but much less abundant. In spring they are found upon the surface of the sand. Their station, however, is a few feet below low-water mark, clinging to stones, sea-weed, and other shells.

The principal variations arise from the greater or less elongation of the spire, and from the different proportions of the brown and white coloring; sometimes the shell is almost entirely brown, and at others there is scarcely enough brown to define the crescentic spots. This belongs also to the *Columbella*-formed *Buccina*.

Mr. Say describes the *animal* as follows; "pale-whitish, foot linear, nearly as long as the shell, acute behind, hardly larger than the respiratory trunk, truncate before; trunk more than half as long as the shell, obtuse at tip, with a brown annulation near the tip, and another near the base; tentacula short, cylindrical, annulate with blackish on the middle; eyes black, placed on the base of the tentacula."

This will most likely prove to be a *COLUMBÉLLA*.

FAMILY COLUMELLARIA, LAM.

No canal at the base of the aperture, but a more or less distinct notch; pillar plaited.

GENUS COLUMBÉLLA, LAM.

Shell oval, spire short, pillar plaited; outer lip thickened internally, narrowing the aperture.

COLUMBÉLLA AVA'RA.

Shell small, elongated-ovate, pointed, of various shades of brown reticulated with white, with numerous smooth ribs lengthwise, and revolving lines between them.

FIGURE 197.

State Coll., No. 1. Soc. Cab., No. 673.

Columbella avara, SAY; *Journ. Acad. Nat. Sc.*, ii. 230. ADAMS; *Bost. Journ. Nat. Hist.*, ii. 363.

Shell small, ovate-conic, elevated, strong, of a light straw-color, finely reticulated or blotched with various shades of reddish-

brown ; surface covered with equal and regular revolving lines, interrupted by as many as fifteen smooth, obtuse folds or ribs running lengthwise of the shell ; and as the folds extend only half the length of the lowest whorl, the remaining half is marked by the revolving lines only ; whorls six, nearly flat, forming an elevated, pointed spire ; suture distinct, and somewhat scolloped by the folds ; aperture narrow-oval, about one third the length of the shell ; very little contracted by the thickening of the middle of the outer lip ; this lip is simple, somewhat thickened externally, and having a series of lengthened teeth just within the margin ; inner lip invested with a plate of callus, which is also toothed in a similar manner, in mature shells ; operculum horny. Length $\frac{3}{8}$ inch, breadth $\frac{1}{4}$ inch, divergence 33° .

Sent me from Martha's Vineyard by Dr. L. M. Yale. Professor Adams says it is common at New Bedford and vicinity, also at Falmouth and Nantucket. Cape Cod, however, seems to be its northern limit, though a solitary, worn specimen is occasionally found within the Capes. It lives below low-water mark. It is abundant on the shores of the Southern States.

Mr. Say referred this shell, somewhat doubtfully, to the genus COLUMBÉLLA ; and as it still remains equivocal between COLUMBÉLLA and BÚCCINUM, it is best to let it remain where he placed it. It varies much in its length and coloring, being in general longer than described by Say. It is usually covered with a dirty-brownish pigment. The middle of the last whorl is frequently angular, especially in immature shells ; in these too, and, indeed, in a majority of the shells I have seen, the denticulations of the aperture are wanting. There is, however, no other shell resembling it on our coast, and it is easily recognised.

This concludes the account of the Testacea. I have endeavoured to describe them fully and definitely, and to arrange them as nearly in accordance with the present state of science as my means of information would enable me to do.

RECAPITULATION. We find that there are, in all, 268 species, of which there are of CIRRIPEDES 12, CONCHIFERA (bivalve) 97, BRACHIOPODA 2, GASTEROPODA (mostly univalves) 154. Of these, 29 belong to the land, 42 to fresh water, and 197 are marine.

The numerous discoveries which have been made in this branch of our zoology, are not a little surprising, and indicate the zeal with which the subject has been investigated. The catalogue of shells in Professor Hitchcock's Report, of 1833, contained 126 species; and that of 1835, which was made out with great care, contained 165 species. Of course, there are now added to the second catalogue 103 species, and to the first 142 species. Of these, 70 have been discovered and described within the last five years. In some genera the accessions have been remarkable. Margarita, Pleurótoma, Ceríthium, Bulla, and Núcula may be specially mentioned.

GEOGRAPHICAL DISTRIBUTION. The geographical distribution of shells is a subject of increasing interest, and of some practical importance from its bearing on Geology. In this State we have a remarkable instance of geographical limitation, and should not pass it without notice.

The land and fresh-water univalves are all distributed over every part of the territory, with the exceptions of *Helix horténsis*, which is as yet confined to some parts of the sea-coast, and *Helix tridentata*, *hirsuta*, and *mónodon*, which are found only in the interior and western portions. Of the fresh-water mussels we find *U. complanatus*, *radiatus*, and probably *nasutus*, in every region; *U. cariosus* is only found in the Connecticut and its tributaries, and in Plymouth ponds; *Anodon catarácta* and *Alasm. arcuata* and *marginata* are found everywhere in the interior, while *Anodon implicata* is perhaps entirely limited, in this State, to ponds in Essex and Middlesex, and *Anodon undulata* to Blackstone river and its branches.

The distribution of the marine shells is well worthy of notice as a geological fact. Cape Cod, the right arm of the Commonwealth, reaches out into the ocean, some 50 or 60 miles. It is

nowhere many miles wide ; but this narrow point of land has hitherto proved a barrier to the migrations of many species of Mollusca. Several genera and numerous species, which are separated by the intervention of only a few miles of land, are effectually prevented from intermingling by the Cape, and do not pass from one side to the other. No specimen of *Cochlodésma*, *Montacùta*, *Cumíngia*, *Córbula*, *Jánthina*, *Tornatélla*, *Vermètus*, *Columbélla*, *Ceríthium*, *Pýrula*, or *Ranélla*, has as yet been found to the north of Cape Cod ; while *Panopæa*, *Glycymeris*, *Terebrátula*, *Cemòria*, *Trichótopis*, *Rostellària*, *Cancellària*, and probably *Cyprina* and *Cardita*, do not seem to have passed to the south of it. Of the 197 marine species, 83 do not pass to the south shore, and 50 are not found on the north shore of the Cape. The remaining 64 take a wider range, and are found on both sides. Buzzard's Bay and the south shore have as yet been very little explored ; and we may yet expect to find many species peculiar to those localities.

At least 70 of our species are also found on the transatlantic shores ; and more than 20 of these have been described, by different American conchologists, as new species. About 20 may be regarded as intermediate, being found most frequently by fishermen about the Banks, Newfoundland, and the islands intervening between Greenland and England.

I WILL now proceed to the other classes of Invertebrata which remain to me. I shall not attempt any definite order in arrangement, nor pretend to any thing like completeness, or authority in the details. I shall present the objects in natural groups, giving their nomenclature according to the latest authorities, with such remarks upon some of them as have been suggested to me from books, from correspondents, and from personal observation.

And first, we have remaining other classes of Mollusca, none of which, hitherto found, with a single exception, form shells.

CLASS CEPHALÓPODA, CUVIER.

The body of these animals is composed of a muscular sac, enclosing the viscera, having the mouth at one end, which is surrounded by long fleshy arms, of various shapes. Along these arms, at intervals, are little cups, by which the animal is capable of adhering, with great tenacity. With them it seizes its prey. It also uses them in crawling from place to place, or as oars to propel itself.

SPIRULA PERONII, LAM. *Nautilus spirula*, LIN., BLAINV.; *Malaccol.*, pl. 4, f. 1. *Encyc. Méth.*, 465, f. 5.

This is the only species of the genus known. It inhabits the open sea, and is sometimes found, after storms, upon the shores of Nantucket. The shell is white and pearly, coiled up in two or three turns which do not touch each other, something like a ram's horn. The surface exhibits constrictions, at short intervals, each of which corresponds to an internal partition, so that the whole shell is divided off into chambers, having a tube, however, at one side, so that the whole are in communication.

Of the very curious and minute *Nautilæa*, so many of which have been found about the British Islands, there are doubtless many among the sands of our shores; but none have as yet been detected.

LOLI'GO ILLECEBRO'SA, LESUEUR; *Journ. Acad. Nat. Sc.*, ii. 95, with figures.

The Squid. This beautiful animal is occasionally seen on all parts of the shore of Massachusetts. But it is especially abundant about sandy shores, as at Cape Cod. At Provincetown I have seen them stranded upon the beach at low tide, in great multitudes. Their usual mode of swimming is by dilating their sac-shaped body and filling it with water. The body is then suddenly contracted and the water forcibly ejected, so as to propel them backwards, with great rapidity. So swift and straight is their progress, that they look like arrows shooting through the water. Whenever they strike the shore, they commence pumping the water with increased violence, while every effort only tends to throw them still further upon the sand, until they are left high and dry. The body is beautifully spotted with colors which seem to vary with the emotions of the animal. At one moment they are a vivid red, at the next a deep blue, violet, brown, or orange. They devour immense numbers of small fish, and it is amusing to watch their movements and see how, at a distance of several feet, they will poise themselves, and in an instant, with the rapidity of lightning, the prey is seized in their long arms and instantaneously swallowed. They, in their turn, are devoured by the larger fishes, and are extensively used for bait in the cod fishery.

They have a single bone, if it may be so called, running the whole length of the body. It is composed of a flexible, elastic substance resembling mica, and, in this species, its form is like the double paddle of the Greenlander, only it is very slender.

CLASS TUNICATA, CUVIER.

The animals belonging to this class were included by Lamarck among the Radiata, which are of a very different organization. They are marine animals, of a gelatinous or muscular structure, generally in the form of sacs with one or two openings. Most of

them are minute, and although they are numerous, few of those in our seas have been observed, and very few have been satisfactorily made out. The largest, and the only ones of much magnitude, are the two following :

ASCI'DIA RU'STICA, LIN.; *Encyc. Méth.*, pl. 62, f. 7-9. LAM.; *An. sans Vert.*, iii. 528.

It is found of all sizes, from that of a pea to that of an olive, adhering in clusters to floating timbers, to stones, corals, &c. It may always be found in abundance on the under side of logs in the timber-docks about Boston. It is usually of a globular form, but more or less irregular in shape and in the degree of smoothness of its surface, and in substance is much like crude india-rubber. It is usually invested with plants or particles of earth; but, when clean, it is rust-colored. It has two small orifices, near each other, through which a jet of water is projected, whenever a touch induces the animal to contract. I am not aware that it is in any way injurious to man.

BOLTE'NIA RENIFO'RMIS, MAC LEAY; *Lin. Trans.* xiv. 536, pl. 18. *Ascidia globífera*, SABINE; *Append. to Parry's Voy.* No. 10. *Ascidia clavata*, FABR.; *Fauna Grænl.*, 333. LAM.; *An. sans Vert.*, iii. 539.

This is a most curious object, and greatly resembles in shape the flower of Ladies-slipper (*Cypripedium*) on its stalk. It has a kidney-shaped body, of a wrinkled, leathery structure, about two inches long and one in width, suddenly narrowing at the top into a small stalk not larger than a crow-quill, and from six to twelve inches in length. It has two cross-shaped orifices, nearly an inch apart. It is attached by its stalk to stones in deep water, whence it is occasionally hooked up by the fishermen, or driven on shore by storms. Its surface is usually loaded with marine plants, zoophytes, &c.

The other animals of this class are mostly minute, living in communities, and incrusting stones, marine plants, &c., with a gelatinous substance which affords them a common residence. Such are the various species of *Aplidium*, *Polyclinum*, and *Bo-*

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tryllus. In the bathing-house at Craigie's Bridge, I have seen one species of the latter genus, in abundance. I suppose it to be

BOTRYLLUS STELLATUS, PALLAS; *Spicil. Zool.* x. 37, pl. 4, f. 1-5. *Encyc. Méth.*, No. 1. LAM.; *An. sans Vert.*, iii. 506.

It forms over the timbers and sea-weed a semi-transparent, gelatinous crust, studded at short intervals with minute stars. Each ray of these stars is a separate animal, with its head at the circumference and its tail descending into the jelly at the centre.

CRUSTACEA.

UNDER this appellation are arranged animals which have articulated limbs, and are covered by an external crust. This crust is earthy and brittle, and not stony like the shells of Mollusca. A crab or a lobster will convey to the mind a general idea of the characteristics of this class. The Crustacea inhabit both land and water. Some of them are of considerable size, but the great majority are very minute; and the ocean literally swarms with myriads which are too small to be noticed by the naked eye. A single cup of sea-water, taken at random, will always be found to contain some of them. All of them live upon decaying substances, either animal or vegetable. They are naturally repulsive in their appearance, though many of them are beautifully ornamented with colors. Yet they are highly serviceable to man, both for the food they afford him, and for the purity of the pool, the shore, and the sea, which it is their province to promote. They are all edible and palatable, even to man; but to fishes they are a welcome as well as an inexhaustible source of nutriment. The cod and haddock devour great numbers of crabs, and even the Greenland whale is said to subsist mainly upon the minute Crustacea and accompanying Radiata.

Crustacea are distributed into Orders, according to the arrangement and number of the legs.

DECÁPODA.

Those which have five pairs of legs.

GENUS CÁRCINUS, LEACH.

C. MENAS, LIN. *Carapax granulate, with five lateral teeth; front three lobed.*

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Cancer Mœnas, LIN.; *Syst. Nat.* xii. 1043. PENNANT; *Brit. Zool.*, iv. pl. 2, f. 5. HERBST; *Cancr.*, pl. 7, f. 46. LATR.; *Encyc.*, pl. 273, f. 1. LAM.; *An. sans Vert.*, v. 494. BOSQ; *Crust.*, i. 202.

Cárcinus Mœnas, LEACH; *Malac. Podoph. Brit.*, pl. 5. MILNE-EDW.; *Hist. des Crust.*, i. 434.

Cancer granulátus, SAY; *Journ. Acad. Nat. Sc.*, i. 61.

This crab is characterized by the five acute teeth on each side, and its three-lobed front. Its surface is not raised into prominences, but granulated merely. It is of a sea-green color. The wrist has a single spine inside. Length an inch and a half or two inches; breadth a little more.

Sent by Dr. Yale from Martha's Vineyard.

There can be no doubt that our crab is identical with the European species, as an interchange of specimens has shown. It is employed for food in Europe, but not in this country.

GENUS CANCER, LIN.

C. IRRORATUS. *Carapax with nine crenate teeth on each side; front three toothed; hands with four or five elevated lines on the external side.*

C. irroratus, SAY; *Journ. Acad. Nat. Sc.*, i. 59, (in part.) BELL; *Trans. Zool. Soc. Lond.*, i. 340, pl. 46.

Carapax transversely oblong-oval, slightly angular at the sides; regions slightly marked; surface covered with minute, raised granulations. Margin, each side, slightly divided into nine quadrangular lobes, the lines of division extending far inwards, and the posterior one having an indentation at base so as to form almost a tenth tooth; each lobe is minutely denticulated, one or two of the denticles being larger than the rest. Middle tooth of the front longer than the others, and depressed. Orbits circular, with a tooth over the inner angle and two fissures over the centre, and beneath. Abdomen and sternum slightly fringed with hair. Limbs short, fringed beneath, the nails tipped with black. Carpus marked with granulated lines, and having a sharp spine at its inner angle. Hands rather large, smooth on the inner face, with denticulated lines above, and having four or five granulated lines on the outside, two of which are continued upon the finger, which is somewhat deflexed, and, with the thumb, is slaty-black at tip.

The color is yellowish beneath, and brick-red above. The limbs are mottled and reticulated with these two colors, mixed with purplish ; and on the back are two curved ranges of yellowish spots, and a figure, behind the middle, somewhat resembling the letter H. Length $2\frac{1}{2}$ inches ; breadth $3\frac{3}{4}$ inches.

I have been particular to give a full description of this species, because two species have hitherto been confounded under this name, both by Mr. Say and Mr. Bell, under the supposition that one was the male and the other the female. But as I have males for both this and the next species, and females which do not materially differ from the males, there can be no mistake on this ground. They are constantly distinct. It is probable that Mr. Say drew his description principally from individuals of the next species, to which his figure corresponds. But as Mr. Bell has figured this, so beautifully, as *C. irroratus*, it must retain the name allowed it by both authors. Dr. Binney, as well as myself, perceived the differences several years ago ; and he had a drawing of this species made from life.

It is caught in deep water, and is not so common as the next species. It sometimes becomes very large, and a specimen in the cabinet of the Boston Society of Natural History measures 3 inches in length, and $4\frac{1}{2}$ in breadth. It is brought to market for food.

C. SAYI, GOULD. *Carapax transversely oval, with nine simple teeth each side ; front three toothed ; surface dotted with reddish-brown ; hands with four or five elevated lines on the outside.*

C. irroratus, SAY ; *Journ. Acad. Nat. Sc.*, i. 59, (in part,) pl. 4, f. 2.

Resembles the preceding species in general, but differs in the following particulars. The form of the carapax is less oval, being prolonged into angles at the sides ; it is also less convex. The surface is not conspicuously granulated, but smooth ; its ground color yellow, and closely dotted with dark purplish-brown, which becomes reddish-brown after death. The teeth have not their margins denticulated, but simple ; they are more pointed and prolonged, especially the hinder ones. The limbs are at least a fourth longer in proportion, the thighs of the second and third pairs,

in *C. irroratus*, not attaining the margin of the carapax, whereas in *C. Sayi* they greatly surpass it. The hands are decidedly smaller, and while they present the same lines on the external face, these lines are not conspicuously granulated, much less are any of them denticulated; the finger and thumb are scarcely, if at all, slate colored. The dark-brown color of the markings is maintained upon the limbs, or is rather a bright rose-red at the bend of the wrist and along the inner face of the hand; and the series of yellow spots upon the back are much the same. The abdominal segments of the male are broader.

Length $2\frac{3}{4}$ inches; breadth 4 inches.

The differences above mentioned are certainly not sexual; and it seems very improbable that they can be the effects of age.

It is common about the rocky shores of our islands, of Cape Ann, Nahant, &c. It is brought to market for food in considerable numbers.

GENUS PLATYONICHUS, LATR.

P. OCELLATUS. Carapax with five prominent, acute teeth each side; front one toothed; wrist two spined, and one on the anterior angle of the hand above; last joint of the hind feet rounded at tip.

Cancer ocellatus, HERBST; *Cancr.*, pl. 49, f. 4.

Platyonichus ocellatus, LATR.; *Encyc.*, xvi. 162. MILNE-EDW.; *Hist. Nat. des Crust.*, i. 437.

Portunus pictus, SAY; *Journ. Acad. Nat. Sc.*, i. 62, pl. 4, f. 4.

This is usually called the *Sand-Crab*, and is a beautiful species. The number of teeth at the sides, with the flattened hinder feet, are its obvious distinctive marks. It is not often seen near Boston, but is more common in more open seas. I have not seen the figure of Herbst, but rely on the authority of Latreille and Milne-Edwards.

GENUS LUPA, LATR.

L. DICA'NTHA. Carapax transverse, with nine sharp teeth on each side, the last one very long; front three toothed; arms three spined; posterior feet flattened.

Crabe de l'Océan, DEGEER; *Hist. des Insectes*, vii. tab. 26, f. 8-11.

Portunus pelagicus, BOSCH; *Crust.*, i. 22, pl. 5. f. 3.

Portùnus hastàtus, FABR.; *Suppl. Entom. Syst.*, 367.

Lupa hastàta, SAY; *Journ. Acad. Nat. Sc.*, i. 65.

Portùnus dicánthus, LATR.; *Encyc.*, x. 190.

Lupa dicántha, MILNE-EDW.; *Hist. Nat. des Crust.*, i. 451.

This is the crab which is most sought after for food. It is well known throughout the Atlantic States as "the Crab." It is seldom seen in Boston market, however, and is rarely found in Massachusetts Bay. About the Vineyard it is more abundant; and in the Chesapeake and Delaware Bays it is very abundant. It is easily recognised by its flattened feet and the long teeth, which project at the sides like spines. Its color is green, and its limbs are very long, the hands having a beautiful violet color, on which account it is sometimes called the "violet crab."

The *Cancer hastàtus* of Linnæus is a still different species of Lupa; so that the specific name of Fabricius, adopted by Mr. Say, must not be applied to this species. It is still very doubtful whether this is any thing more than a local variety of *L. pelágica*, though Milne-Edwards speaks of the remarkable form of the tail of the male, in this species, like the letter T; and he would certainly have known if the *L. pelágicus* had a similar one.

GENUS GELÁSIMUS, DESM.

G. VOCANS. *Carapax transversely quadrate, smooth, a little narrowed behind; one of the hands in the male very small, the other very large.*

Cancer vocans, LIN. (in part) FABR.; *Suppl.*, 340.

Ocy'pode pugilator, BOSQ; *Crust.*, i. 198. SAY; *Journ. Acad. Nat. Sc.*, i. 71.

Ocy'pode vocans, LATR.; *Hist. Nat., &c.*, vi. 45. DEGEER; *Hist. des Insectes*, vii. pl. 26, f. 12.

Gónoplax vocans, LAM.; *An. sans Vert.*, v. 465.

Gelásimus vocans, DESM.; *Consid., &c.*, 123. MILNE-EDW.; *Hist. des Crust.*, ii. 54.

This is a small crab, found abundantly on bay shores and salt marshes in the southerly part of the State, and on the large islands adjacent. It is well distinguished by its large claw, which is sometimes on the right side and sometimes on the left, and has gained for it the name of the "Fiddler Crab." They sometimes do damage by the holes they dig along the shore, and into which they retreat on the least alarm.

GENUS PILUMNUS, LEACH.

PILUMNUS HARRISII, GOULD. *Carapax having three teeth on each side ; front bilobate ; hands smooth.*

Carapax quadrilateral, narrowed backwards, rounded before, rectilinear behind and at sides. On each side are three triangular teeth ; eyes distant ; orbits oval, with a fissure over the centre ; front divided by a fissure into two lobes. Surface very minutely granulated, and hispid with very short, scattered hairs, which entangle the dirt ; there are three or four broken series of curved, transverse lines or ridges, rising into little crests. Limbs slender, cylindrical. Carpus with a projecting angle in front. Hands robust, smooth, white within and without, and with a double line along the upper edge ; finger deflexed and furrowed ; thumb also furrowed and deflexed. The hands are generally unequal, and the smaller one sometimes has elevated lines on its outer face. Length $\frac{4}{10}$ inch ; breadth half an inch.

First found by Dr. T. W. Harris, on the Cambridge marshes ; and not unfrequently seen, in summer, clinging to floating seaweed in Charles River.

The sculpture of its margin and front, and the form and smoothness of the hands, forbid the idea of its being the young of any of our larger crabs.

GENUS HYAS, LEACH.

H. COARCTATA. *Carapax ovate, warty and hairy, narrowed at the anterior third ; rostrum depressed, divided by a profound fissure ; limbs short and small.*

Hyas coarctata, LEACH ; *Malac. Podoph. Brit.*, pl. 21 B. MILNE-EDW. ; *Hist. Nat. des Crust.*, i. 312. DESM. ; *Consid.*, 148.
Lissa fissirostra, SAY ; *Journ. Acad. Nat. Sc.*, i. 79.

This crab is an inhabitant of deep water, and is a favorite food of the cod-fish, being very frequently found in its maw. I have seen its exuviae in great quantities upon the outside of Cape Cod. It is about two inches in length and somewhat less in breadth, the front projecting and divided by a fissure ; there is a notch a little

behind the head each side. The surface is warty and beset with short, stiff, hooked hairs which entangle sand and portions of seaweed.

GENUS LITHODES, LATR.

L. ARCTICA. *Carapax heart-shaped, spiny, rostrum bifurcated; hands small, unequal; limbs hairy.*

Cancer maja, LIN.; *Syst. Nat.*, i. 1046. HERBST; *Cancr.*, i. 219, tab. 15, f. 87.

Cancer hórridus, PENNANT; *Brit. Zool.*, iv. 7, pl. 7, f. 14.

P'nachus maja, FABR.; *Suppl. Entom. Syst.*, 358.

Parthénope maia, FABR.; *ibid.*, 354.

Lithòdes maja, LEACH; *Zool. Misc.*, i. 107. *Malacol. Podoph. Brit.*, tab. 24.

Lithòdes ártica, LATR.; *Genera*, i. 40. DESM.; *Consid.*, 160, pl. 25. GUÉRIN;

Iconog. du Règne Anim., pl. 12, f. 1. MILNE-EDW.; *Hist. Nat. des Crust.*, ii.

186. LAM.; *An. sans Vert.*, v. 433. *Griffith's Cuvier*, Crustacea, pl. 1, f. 1.

A specimen of this fine crab was obtained from the stomach of a cod-fish by Dr. Prescott, of Lynn, during the autumn of 1839. It is believed to be the only specimen which has come into the hands of naturalists in North America. It is found rarely about the shores of Great Britain, and more abundantly about the shores of Norway, which seems to be its proper habitat. There it is well known, and many superstitious notions have been connected with its history.

This thorny and rugged, but beautiful crab is easily distinguished from our common *Spider-crab* by its more heart-shaped body, its long beak, branching at tip, and by the hinder pair of legs being imperfect. The tail also is very large and very peculiar. The carapax is about four inches long, and the spread of the legs a foot or more.

GENUS LIBÍNIA, LEACH.

L. CANALICULATA. “*Thorax densely hairy, with about seven lateral spines, and a few usually shorter ones on the back; rostrum emarginate at tip, channelled between the eyes; anterior feet unarmed, granulated; hands elongated; fingers white at tip.*” SAY.

Libinia canaliculata, SAY; *Journ. Acad. Nat. Sc.*, i. 77, pl. 4, f. 1. MILNE-EDW.;

Hist. Nat. des Crust., i. 300. *Atlas du Règne An.*, pl. 33, f. 1. LAM.; *An. sans Vert.*, v. 423.

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This is vulgarly called the *Sea-spider* or *Spider-crab*, on account of its small body and long legs. It is often caught in fishing for flounders from the bridges about Boston. I am not aware that it is used for food. The body is somewhat heart-shaped, and may be four inches in diameter, while the legs of the female will span four times that extent.

GENUS PINNOTHERES, LATR.

P. o'STREUM. "*Thorax rounded before, on each side, somewhat truncate behind; clypeus a little advanced, entire; hand gibbous above, near the base of the thumb.*" Say.

Pinnothères ostreum, SAY; *Journ. Acad. Nat. Sc.*, i. 67, pl. 4, f. 5. MILNE-EDW.; *Hist. Nat. des Crust.*, ii. 33.

This little crab is of a rounded form, about the size of a dime, and is very curious in its habits. It is not protected by a hard crust, and in order to supply the want of it, the crab lives among the oysters, and becomes a guest within the walls of their shells; whether a bidden and a welcome one or not, we have it not in our power to say. The crab, however, seems not to molest the oyster, and is even said to act as a monitor, to inform it when to close its shell, so as to entrap the food on which they may both subsist. They live peaceably together, are captured together, served up for the table together, and are scarcely to be distinguished from each other in the eating.

GENUS HIPPA, LATR.

H. EME'RITA. *Body oval, convex, minutely wrinkled; tail lanceolate, more than half as long as the body; front with three teeth; eyes minute.*

Cancer eméritus, LIN.

Hippa emérita, FABR.; *Suppl. Entom. Syst.*, 370. LATR.; *Hist. Nat. des Crust.*, vi. 176, pl. 52, f. 1. DESM.; *Consid., &c.*, 174, pl. 29, f. 2. MILNE-EDW.; *Hist. Nat. des Crust.*, ii. 209.

Hippa talpóida, SAY; *Journ. Acad. Nat. Sc.*, i. 160, 444.

This curious animal is often called the *Sand-bug*. I have received it from Martha's Vineyard, and it seems to extend from

that limit to the shores of South America. Mr. Say thought there were characters belonging to those found on our coast which would entitle them to be considered as a new species ; but I have not found the differences he mentions to be conspicuous or constant. They are of about the size and shape of the first joint of the thumb ; and their numerous jointed, coiled antennæ, and the long, lance-shaped terminating piece of the tail are so remarkable as to attract immediate notice.

GENUS PAGURUS, FABR.

P. BERNHARDUS. *Surface rough and hairy ; right hand largest.*

Cancer Bernhårdus, LIN. ; HERBST ; *Cancr.*, ii. 14, pl. 22, f. 6.

Pagurus streblonyx, LEACH ; *Malacol. Podoph.*, &c., pl. 26.

Pagurus Bernhårdus, FABR. ; OLIV. ; LATR. ; MILNE-EDW. ; LAM. ; DESM. ; *Consid.*, pl. 30, f. 2.

Astacus Bernhårdus, DEGEER ; PENNANT ; *Brit. Zool.*, iv. pl. 17, f. 33.

This and the two following species are known by the name of *Hermit-Crabs*. The posterior portion of the body being unprotected by a firm crust, the animal selects some empty shell which will make him a good fit, and into it he retreats. This he drags about with him, seldom venturing out of it, and retains possession until either he outgrows it, or some of his kindred covet it and claim it by right of the strongest, when he is obliged to go in search of another. The crab is often supposed to be the real architect and owner of the shell ; but is never so in fact.

This species becomes larger than either of the others. It is of a bright cherry-red color, rough and hairy ; the hand is well-proportioned, and the fingers long, slender, and gracefully curved. It occupies large specimens of *Natica* and *Pyrula*.

P. POLLICARIS. *Finely granulated ; right hand longest ; thumb elevated into an angle above ; hand and finger crested and finely toothed beneath.*

Pagurus pollicaris, SAY ; *Journ. Acad. Nat. Sc.*, i. 162. MILNE-EDW. ; *Hist. Nat. des Crust.*, ii. 237. *Ann. des Sc. Nat.*, 1836, vi. 269.

This is also a large species, inhabiting the same shells as the preceding. But its color is a pale brick-red, its surface finely

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granulated but not hairy ; and its short, angular hand, and peculiar thumb, which projects above into nearly a right angle, distinguish it from all other species.

P. LONGICA'RPIUS. "*Right hand larger and longer than the left ; wrist and hand rather long, linear, and granulate ; fingers short, white, equal.*" SAY.

Pagùrus longicàrpus, SAY ; *Journ. Acad. Nat. Sc.*, i. 165.

This is a very small species, inhabiting small specimens of Buccinum, Natica, Purpura, &c. But it is easily distinguished from the young of the two preceding species by its slender hand and white fingers.

GENUS HOMARUS.

H. AMERICA'NUS. *Rostrum two or three spined, with a smaller one each side at base, one more distant on the thorax, and usually one beneath near the tip ; wrist five spined above ; hand six or nine spined on the inner edge.*

Ástacus marinus Americànus, SEBA ; *Thesaur.*, iii. pl. 17, f. 3.

Ástacus marinus, LATR. ; SAY ; *Journ. Acad. Nat. Sc.*, i. 165.

Homàrus Americànus, MILNE-EDW. ; *Hist. Nat. des Crust.*, ii. 334.

The common *Lobster* is too well known to require any comments. It is found about all the islands along shore.

GENUS ÁSTACUS, FABR.

A. BARTONII. *Rostrum concave, pointed ; thorax unarmed ; hands short, destitute of spines ; fingers moderate.*

Ástacus Bartònnii, BOSCH ; *Hist. des Crust.*, ii. 62, pl. 2, f. 1. HARLAN ; *Med. and Phys. Researches*, 230, fig. 3. SAY ; *Journ. Acad. Nat. Sc.*, i. 167.

Ástacus affinis, MILNE-EDW. ; *Hist. Nat. des Crust.*, ii. 332.

The *Craw-fish* or *Fresh-water Lobster* is a miniature of the common lobster, two inches or somewhat more in length. It is strictly an inhabitant of fresh water, and more especially of mountain streams, where it hides under stones, &c. It is much esteemed, as food, by many. The single, elongated point of the

rostrum distinguishes it from other American species. Milne-Edwards has unfortunately interchanged the names of this and another species.

GENUS CRANGON, FABR.

C. VULGARIS. *Rostrum not so long as the eyes, with a spine behind it on the thorax, and another on each side; thorax seven spined; anterior feet with a spine on the third joint beneath.*

Cancer crangon, SEBA; *Thesaur.* iii. pl. 21, f. 8. LIN.; *Syst. Nat.*

Ástacus crangon, HERBST; *Cancr.*, ii. 75, pl. 29, f. 3.

Crangon vulgàris, FABR.; *Entom. Syst. Suppl.*, 410. LATR.; *Crust.*,¹ vi. 267, pl. 55, f. 1, 2. LEACH; *Malacol. Pod. Brit.*, pl. 37 B. MILNE-EDW.; *Hist. Nat. des Crust.*, ii. 341.

Crangon septemspinosus, SAY; *Journ. Acad. Nat. Sc.*, i. 246.

This is the common *Shrimp*, of which vast multitudes are used on the coasts of England and France for food. Mr. Say thought the number of spines on the thorax differed from that on the transatlantic animal; and he therefore gave it a new name. But I have had an opportunity of examining foreign specimens which do not differ from ours; neither do the best figures and descriptions.

It is more plentiful about the ocean shores than within Massachusetts Bay; and it is nowhere sufficiently abundant to make it an object to collect it for food. It may be usually found, however, by searching the little pools left upon the flats at low tide.

C. BOREAS. *Carapax spiny; the second and third pairs of legs filiform.*

Cancer boreas, *Phipps's Voyage*, 194, pl. 11, f. 1.

Cancer homaróides, FABR.; *Fauna Grænl.*, 241.

Ástacus boreas, OLIV.; HERBST; *Cancr.*, ii. 73, pl. 29, f. 2.

Crangon boreas, LAM.; *An. sans Vert.*, v. 350. SABINE; *Append. to Parry's Voy.*, 57. MILNE-EDW.; *Hist. Nat. des Crust.*, ii. 342.

This species is larger and broader than the preceding. It is broad about the head, marbled with scarlet, and having several rows of spines on the thorax. I have taken several specimens from the maws of cod-fish, but have never seen it alive.

GENUS PALÆMON, FABR.

P. VULGARIS. "Rostrum acute, with eight or nine teeth above, and three or four beneath; fingers of the larger pair of feet shorter than the hand." Say.

Palæmon vulgàris, SAY; *Journ. Acad. Nat. Sc.*, i. 248. MILNE-EDW.; *Hist. Nat. des Crust.*, ii. 394.

This animal answers to the *Prawn* of Europe, and is nearly certain to be identical with the *Palæmon squilla* of Europe. But I have not yet had an opportunity of actual comparison. It is a little larger than the shrimp, and is known by the long, upturned, toothed rostrum. It is less than an inch and a half in length.

GENUS PÁNDALUS, LEACH.

P. ANNULICÓRNIS. *Antennæ marked with rings alternately white and red.*

P. annulicórnis, LEACH; *Malacol.*, &c., tab. 40. LATR.; LAM.; DESM.; *Consid.* 220, pl. 38, f. 2. MILNE-EDW.; *Hist. Nat. des Crust.*, ii. 384. GRIFFITH'S CUV., (*Crust.*) pl. 17, f. 3.

A beautiful animal about four inches long, with very long antennæ, elegantly annulated with white and red, and with a long beak like *Palæmon*, from which it is distinguished by having pincers on the second pair of feet only, instead of the first two pairs. I have found it only in the stomachs of fishes.

GENUS HIPPOLYTE, FABR.

H. ACULEÁTUS. *Rostrum recurved, slender, spear-pointed, serrated; segments of the body terminating each side in a reflexed spine.*

Cancer aculeátus, FABR.; *Fauna Grænl.*, 239.

Álpheus aculeátus, SABINE; *Append. to Parry's Voy.*, 237, tab. 2, f. 9, 10. *Append. to Beechey's Voy.*

Hippolyte aculeátus, MILNE-EDW.; *Hist. Nat. des Crust.*, ii. 380.

About an inch in length, having the internal antennæ very short and many-jointed, a compressed, spear-pointed rostrum, and the

segments on each side terminating in a long, curved spine. I have found it, rather abundantly, in fishes.

GENUS MYSIS, LATR.

M. SPINULOSUS. Tail terminated by two short spines and two longer, ciliated plates folding inwards.

Cancer pedatus, FABR.; *Fauna Grænl.* 243.

Mysis saltatorius, LAM.; *An. sans Vert.*, v. 346.

Mysis spinulosus, DESM.; *Consid.*, 242.

Mysis Fabricii, LEACH; *Griffith's Cuv.*, xiii. (Crust.) pl. 17, f. 4.

Mysis Lèachii, THOMPSON; *Zool. Researches*, i. 27.

This curious little animal may be found abundantly, in the midst of winter, in still water along the margins of bays. Its head seems to have a long pair of beautifully fringed shears attached in front; each joint is marked upon the back with a black star; and between the legs of the females is seen a large sac, containing eggs. Two of the antennæ are very long; and the whole is quite transparent. It is about an inch in length.

GENUS NEBÀLIA, LEACH.

A single species has been observed, but the species has not been satisfactorily made out. It is small, the body covered by a single piece like a cuirass, the tail suddenly narrowing, long, and terminating in two bristles. Multitudes are sometimes found in the stomach of a single fish.

AMPHÍPODA.

The Amphípoda are small Crustacea, inhabiting both fresh and salt water, and some of them are well known to every one who is familiar with the sea-shore, under the name of *Sand-fleas*, *Beach-fleas*, &c. They are capable of swimming and leaping, but not of walking. Their feet are short and unequal, and their body is usually so arched as to render it impossible to maintain themselves

erect. Some of them live almost entirely out of the water, and may be at any time found under stones and sea-weed along the sea-beach. Their leaps are effected principally by the appendages to their tails, which they bend underneath them, and by sudden extension toss the body with surprising force. They depend for subsistence on dead animal substances which the waters float to them.

It is very difficult to make out the different species, or even to determine the genera. The species of the European side of the Atlantic are too briefly described and too badly figured to enable one to be certain what species are common to both shores; so that I am not fully satisfied with the following results.

GENUS ORCHÉSTIA, LEACH.

O. LONGICORNIS. *Tálitrus longicórnis*, SAY; *Journ. Acad. Nat. Sc.*, i. 384.

This appears to be the same as *Cancer gámmarus saltátor* of Montagu, (*Trans. Lin. Soc.*, ix. 94, tab. 4, f. 3,) which is given as synonymous with *Tálitrus locústa* of Lamarck, Pennant, and others. But it is not *Gámmarus locústa* of Montagu.

O. GRYLLUS. *Tálitrus gryllus*, Bosc; *Hist. Nat. des Crust.*, ii. 104. SAY; *Journ. Acad. Nat. Sc.*, i. 386.

The following seem to be synonyms, viz.

Tálitrus gamaréllus, LATR. and LAM. *Orchéstia littorèa*, LEACH; *Trans. Lin. Soc.*, xi. 356. DESM.; *Consid.*, &c., 261, pl. 45, f. 3.

GENUS GÁMMARUS, FABR.

G. LOCÚSTA, MONTAGU; *Lin. Trans.*, ix. pl. 4, f. 1. MILNE-EDW.; *Ann. des Sc. Nat.*, xx. 367.

This is not *G. locústa* of Pennant, Gmelin, Pallas, and Fabricius, which is a *Tálitrus*.

G. MINUS, SAY; *Journ. Acad. Nat. Sc.*, i. 576.

Found in ditches and sluggish fresh water, adhering to sticks.

Two or three other species of ORCHESTIA, and one of AMPHITHŒ, remain undetermined.

GENUS HYPÈRIA, LATR.

H. GALBA. Gámmarus Galba, MONTAGU; *Lin. Trans.*, xi. pl. 2, f. 2.

The following are doubtless synonyms :

Oniscus medusarum, O. FABR.; *Fauna Grænl.*, 275. Hypèria Suéurii, LATR.

Hypèria Latréillii, MILNE-EDW.; *Ann. des Sc. Nat.*, xx. 388, pl. 11, f. 1-7.

This curious animal is found in the pouches of the Medusæ or *Sun-fish* as they are commonly called. Whether they make this their home, or whether they become entrapped there or not, it would be difficult to determine. They seem, however, to be quite at their ease in this situation.

Another animal with long, many-jointed antennæ, was found in company with the above, which belongs either to the same genus, or to the genus HIERACONYX.

LÆMIPODA.

GENUS CYAMUS, LATR.

C. CETI, LATR.; *Gen.*, i. 60. DESM.; *Consid.*, 280, pl. 46, f. 4. EDWARDS; *Ann. des Sc. Nat.*, 2d Series, iii. 328, pl. 64, f. 13, 14. Oniscus ceti, LIN.; MULL. Larúnda ceti, LEACH.

The whale-louse may be properly enumerated among our Crustacea, as it is found on the whales which are occasionally caught on our coast. It varies in form, according to its degree of development.

GENUS CAPRELLA, LAM.

I have observed two species of this curious genus, neither of which can I refer to any described species. One of them is very delicate, about half an inch long, with no spines upon any part, that I can discover, and having its back thickly dotted with dark green.

The other is an inch in length, entirely crimson except its black eyes. The head is blunt, the lower antennæ ciliated and extending to the second segment, and the upper ones to the third seg-

ment; first two segments nearly as long as the three next, and about one third of the whole length; on the middle of the first is a spine; two last segments short and heart-shaped. Hands having a long curved finger; an imperfect thumb on the second pair of legs; a tubercle at the base of the ovate carpus, and a small spine at the middle. This might be called *C. sanguinea*, from its color, which it retains in spirits.

These curious animals are found among clusters of zoophytes and delicate sea-weeds, Their mode of walking is like that of some caterpillars, who bring the tail forward to the head and then thrust the body forward its whole length to prepare for another step.

ISÓPODA.

The animals included under this division are small, and many of them well known. They have seven pairs of legs, similar in shape, and nearly equal in length, all of them constructed for walking alone. They live on land, and in both fresh and salt water. They may be distributed into three natural families;—
 1. *Cloportidæ*, which are terrestrial, and well known under the names of *Sow-bugs*, *Pill-bugs*, &c. Their food is decaying vegetable matter. 2. *Cymothoadæ*, which are parasites, and live for the most part about the gills of fishes, from which they suck their nourishment. 3. *Idotæidæ*, those which live in the water, but are not parasites.

GENUS ARMADILLO, LATR.

A. PILULARIS, SAY; *Journ. Acad. Nat. Sc.*, i. 432.

I have had no opportunity to compare this with any European species. It is commonly called the *Pill-bug*, and is very common in gardens and cellars, under stones and boards.

GENUS ONISCUS, LIN.

O. ASELLUS, LIN.; LATR.; DESM.; *Consid.*, 320, pl. 49, f. 5. O. MURARIUS, FABR.; CUV. O. AFFINIS, SAY; *Journ. Acad. Nat. Sc.*, i. 430.

In all the specimens I have examined, the styles are longer

than the last segment, like the European animal, a supposed variation from which, in this respect, caused Mr. Say to regard it as distinct. But on comparison, ours corresponds with foreign specimens, in every respect. This is the common *Sow-bug* of our cellars and gardens.

GENUS PORCELLIO.

P. NIGRA, SAY; *Journ. Acad. Nat. Sc.*, i. 432.

I think there can be little doubt that this is identical with *P. scaber*, LATR. and *Oniscus granulatus*, LAM.

P. LÆVIS, LATR.; *Genera*, i. 70. DESM.; FLEM.

If the animal to which I refer is not this species, it is yet undescribed.

These two species are also called *Sow-bugs*. The first is found everywhere under stones, leaves, bark, &c. ; the second I found in a cellar.

GENUS LIGIA.

One species has been observed about the timbers of a decaying wharf. It seems to be smaller than *L. oceanica*.

GENUS ASELLUS.

A. VULGARIS? LATR. A species is common on sticks submerged in ponds and ditches, which is much larger than either of the species described by Mr. Say ; and I cannot find that it differs from the foreign species.

GENUS IDOTEA.

I. CÆCA, SAY; *Journ. Acad. Nat. Sc.*, i. 424.

Found on sandy beaches, where it forms the little serpentine tracks which are always noticeable soon after the recess of the tide, and at one end of which the animal may be found with his back loaded with sand. When the coming tide overtakes them, they swim about with great activity.

GENUS ANTHURA.

A. GRA'CILIS, LEACH; LAM.; LATR.; DESM.; *Consid.*, 291, pl. 46, f. 13. MILNE-EDW.; *Hist. Nat. des Crust.*, pl. 31, f. 3, 4.

GENUS LIMNORIA.

L. TE'REBRANS, LEACH; *Lin. Trans.*, xi. 370. LATR.; DESM.; COLDSTREAM; *Edin. New Philos. Journ.*, xvi. (1834), 316, pl. 6, f. 1-18. THOMPSON; *ibid.*, Jan. 1835.

A very small animal which burrows in timber immersed in the sea, making small furrows, and, by its numbers, often doing considerable damage.

GENUS STENOSOMA.

S. IRRORA'TA, SAY; *Journ. Acad. Nat. Sc.*, i. 423.

Probably the same as *Oniscus éntomon*, LIN.; *Cymòthöa éntomon*, FABR.; *Idotèa éntomon*, LATR.; DESM., &c.

The animal to which I here refer, I suppose to be the same which Mr. Say had in view. It is extremely common, clinging to the long, narrow leaves of *Zostèra marina*. It becomes nearly an inch in length, but is usually much shorter. Its colors are sea-green, variegated with brown and straw-color. It is often mottled or margined with the latter color, and might lead one to suspect there were many species assembled.

There are two or three other species which I cannot yet refer to any description.

GENUS CYMOTHÖA.

C. CESTRUM, FABR.; *Syst.*, ii. 505. LATR.; LEACH; DESM.; *Consid.*, 309, pl. 47, f. 6, 7. *Griffith's Cuv. (Crust.)* pl. 8, f. 1.

C. (ÆGA) EMARGINA'TA, LEACH; *Dict. des Sc. Nat.*, xii. 349. DESM.; *Consid.*, &c., 305, pl. 47, f. 4, 5. *Griffith's Cuv.*, (*Crust.*) xii. pl. 8, f. 3.

C. (ÆGA) —. Another species.

C. (ANILO'CERA) —. One species.

C. (ICHTHYO'PHILUS) —. One species.

These all inhabit the mouths and gills of fishes.

BRANCHIOPODA.

The animals of this division are small, many of them microscopic, and for the most part inhabiting stagnant fresh water. Their feet are variable in number, solely adapted for swimming, and some of them are constructed so as also to serve the purposes of respiration. Their bodies are enveloped in a membranous covering generally in the form of a shield. They are beautiful objects for microscopic examination. Only a few have as yet been observed.

BRANCHIPUS STAGNÀ' LIS, LAM.; *An. sans Vert.*, v. 198. *Cancer stagnàlis*, LIN.; MÜLL.; FABR.; PENN. *Gamaréllus stagnàlis*, HERBST; *Cancr.*, ii. 121, pl. 35, f. 8-10. *Branchiópoda stagnàlis*, LATR.; DESM.; FLEM.

This animal is often an inch in length, and is remarkable for its numerous, fringed legs, which are kept in continual motion. Found in stagnant pools.

CYCLOPS. One species.

 PÆCILÓPODA.

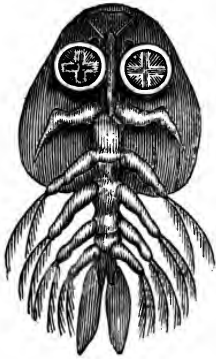
Characterized by having the feet of various forms; those in front being constructed for walking and prehension, and the hinder ones for swimming and breathing. They are deprived of jaws, and instead of them have organs for suction. Most of them live on the bodies of other animals, principally fishes, whose juices they suck for nourishment. The body is covered with a kind of buckler, usually of only one piece.

LÍMULUS POLYPHE'MUS, LATR.; SAY; *Journ. Acad. Nat. Sc.*, i. 433. DESM.; *Consid., &c.*, 354, f. 12. *Monóculus polyphèmus*, LIN. *Limulus Americanus*, LEACH; BUCKLAND; LAM.

This animal is well known under the names of *Horse-shoe*, *King-crab*, and *Sauce-pan fish*.

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A'RGULUS ALO'SÆ. An Argulus sent to me by Dr. T. W. Harris, and procured by him from the gills of the alewife, (*Alosa vulgàris*,) I find to be new. As I have not since been able to obtain specimens, I cannot give a detailed description; but the following characters will serve to distinguish it from other known species.



The shield is obovate or obcordate, covering only the first two pairs of legs, which are so long that the fringed fingers project entirely beyond it. Abdomen bearing the next three pairs of legs, very narrow, and half as long as the shield. Then follow two short folia, covered by two others, each of them nearly as long and as broad as the exposed part of the abdomen.

It differs from *A. foliæceus* in having the shield broader behind than before; by its extended abdomen, the shield in that species covering all but the last pair of legs; and by the much greater length of the caudal appen-

dages. In *A. Catástomi*, the legs scarcely extend beyond the margin of the shield, which is nearly circular, and rather broader than long. Length about half an inch.

CALIGUS PISCINUS, LATR.; *Hist. Nat. des Crust.*, iv. pl. 31, f. 1. DESM. *Monóculus piscinus*, LIN.; FABR.

This little fish-louse may be found, at almost any time, upon the surface of the cod and other deep-water fishes, especially if the fish is unhealthy. It has a small, rounded disc, about a fourth of an inch in diameter, having two flattened, jointed appendages behind, which are sometimes an inch in length, though they are seldom found entire.

I have another species of Caligus, quite different from the preceding, taken from a shark (*Lamna punctàta*). It is remarkable for having, within each posterior angle of the shield, two little elevated crests, placed at right angles to each other. The abdominal and caudal plates are very long and broad, and beyond these the jointed appendages project, making the whole animal an inch

and a half in length. The margin of the shield, behind the antennæ, is very thin and finely fringed, to favor adhesion. This may be *Pterygópoda Latréillii*. Otherwise it may be called *C. cristata*.

ANTHOSOMA SMÍTHII, LEACH; *Dict. des Sc. Nat.*, xiv. 533. *Encyc. Brit.*, *Suppl.*, vii. 406, pl. 20. GRIFFITH'S CUV. (*Crust.*), pl. 21, f. 2. LATR.; DESM.; *Consid.*, &c., 335, pl. 50, f. 3.

Found by Dr. D. H. Storer, on a shark (*Lamna punctata*), in a cavity near the anus, which these animals seemed to have excavated.

CECROPS LATRE'ILLII, LEACH; *Encyc. Brit. Suppl.*, vii. pl. 20, f. 1. DESM.; *Consid.*, &c., 338, pl. 50, f. 2. LATR.; LAM.

Found upon the sun-fish (*Orthogoriscus mola*), by Drs. Binney and Storer. The characters of this curious animal seem to have been but imperfectly known. I have made out a detailed description of it, with figures, which I shall take some other opportunity of publishing.

PENE'LLA FILO'SA, CUV. A long, worm-like animal, with a horned head and bushy tail, which penetrates deeply into the sides of the sun-fish (*Orthogoriscus mola*).

BRANCHIE'LLA THYNNI, CUV.

CHONDRACANTHUS CORNU'TUS, CUV. *Lernea cornuta*, MÜLL.; *Encyc. Méth.*, pl. 78, f. 1.

A N N E L I D A .

THE Earth-worm, the Leech, and similar animals come under this class. They derive their name from the numerous ring-like joints of which their bodies are composed. They dwell in water or in clay or wet sand, and many of them live on the juices which they suck from other animals. Excepting the leeches, they all have little appendages on each side of every ring of the body, furnished with silky hairs and bristles, for the purposes of respiration and locomotion ; and by these it is easy to decide upon the class to which they belong. Many of those which live in the sand, or under stones and in mud along the shore, are used as bait for fishing.

LEECHES. There are three large species of *Hirudo*, besides numerous smaller ones. But they have not been studied, and do not seem even to have received a name, unless from Bosc, whose work I have not seen. There is the common *Blood-sucker*, which is not unfrequently employed in the country for medical purposes. Its value has not been properly tested ; but while foreign leeches, which are always safe and sure in their operations, can be so readily obtained, it is not probable that our leech will be extensively employed in large cities.

The HORSE-LEECH is very large and long, distinguished by its bluish-black back and its ochre-colored belly, which may be compared to the inner surface of calf-skin leather. Its bite is not disposed to heal readily.

The TORTOISE-LEECH, (*Hirudo parasitica*, SAY, *Append. to Long's 2d Exped.* ii. 266,) is a third. It is flattened, somewhat oval in form, granulated and wood-colored upon the back, with each margin checked by a line of dark, square spots. It may often be found adhering to bits of wood in ponds, with a brood of

young adhering to an orifice at the middle of the belly. This must belong to the genus *Clepsina* of Savigny.

PHYLLÏNE HIPPOGLÓSSI, LAM.; *An. sans Vert.*, v. 526. *Encyc. Méth.*, pl. 52, f. 11-14. *Hirudo hippoglóssi*, MULL.

Always found on the bodies of the Halibut (*Hippoglóssus vulgàris*.)

The EARTH-WORM, which is probably the *Lúmbricus terréstris* of Linnæus is classed here.

Of the *CHETÓPODA*, or Annelida with bristly legs, the following have been recognised :

APHRODÏTA ACULEA`TA, LIN. *Halithèa aculeàta*, SAV.; AUD. and EDW.; *Ann. des Sc. Nat.*, xxvii. pl. 8, f. 7.

POLY`NÖE SQUAMA`TA, AUD. and EDW.; *ibid.*, pl. 7, f. 10-16.

NE`REIS MARGARITA`CEA, LEACH. *Lycòris margaritàcea*, LAM.

PHYLLO`DOCE VÍRIDIS, JOHNSTON; *Ann. of Nat. Hist.*, iv. 228, pl. 6, f. 11-15. *Nèreis víridis*, LIN.

PHYLLO`DOCE LAMELLI`GERA, JOHNSTON; *ibid.*, pl. 6, f. 1-6.

The sedentary Annelida have been already mentioned among the Testacea, page 7.

RADIATA.

THE radiated animals, usually known under the name of Zoöphytes, are so called from the peculiar anatomical arrangement of their parts. The mouth is usually central, and the other parts are arranged around it, in a radiated manner. The Star-fish, Sea-nettle, Polypi, &c. are examples of this form.

ECHINODERMATA.

Usually of a solid structure, and always having the surface beset with spines or some rough coating.

ECHINUS GRANULATUS, SAY; *Journ. Acad. Nat. Sc.*, ii.

This animal, from its size, shape, color, and the spines with which it is armed, may be well compared to a chestnut-burr. It is sometimes called the *Sea-chestnut* or *Sea-egg*.

SCUTE'LLA (ECHINARA'CHNIUS) PARMA? RUMPH. A circular, slightly elevated object, apparently composed of sand. It is found from one to three inches in diameter, and has a central star composed of five leaflets, above. The upper surface is divided into small hexagonal areas; and below, it is irregularly veined. When not rubbed, it is found covered with short, delicate spines.

ASTE'RIAS (GONIA'STER) EQU'E'STRIS, LAM.; *An. sans Vert.*, iii. 242. *Encyc. Méth.*, pl. 101, 102.

A fine specimen was thrown upon Phillips's Beach, and found by Dr. Prescott, after a storm.

ASTE'RIAS ARANCI'ACA, LIN.; *Encyc. Méth.*, pl. 111, f. 3, 4.

A small specimen, was taken from the mouth of a cod-fish.

ASTE'RIAS (STELLO'NIA) RUBENS, LIN.; *Encyc. Méth.*, pl. 112, f. 3, 4; pl. 113, f. 1, 2.

This is the common *Star-fish* or *Five-finger* of our coast. Its colors and proportions are very various. Many of the specimens are of a blood-red color during life, and others are yellowish. I regard them all as the same species.

ASTE'RIAS SPONGIO'SA? A small, but beautiful species, of a brick-red color, which may perhaps be this species, was sent from Martha's Vineyard, by Dr. Yale.

OPHIU'RA LACERTO'SA? The disk is small, the rays long and rounded, their sides beset with short, overlapping spines, the color olive-green. It does not agree well with any description I have seen. Dredged by Professor Adams, at Dartmouth.

OPHIU'RA ACULEA'TA, LIN.; *Encyc. Méth.*, pl. 124, f. 2, 3.

The disk is covered with scales and granules, the rays are usually red, but often with alternate rings of red and dark-brown, and their sides are armed with a row of four or five spines on each joint. They are devoured in great numbers by fish.

EURY'ALE SCUTA'TUM, BLAINV. This is one of the varieties of the Linnæan *Astérias caput-Medusæ*. The disk is large, the rays five, repeatedly dividing into two branches until the extremities become mere twigs. I have received two or three specimens which were collected at Cape Ann and about Cape Cod.

HOLOTHU'RIA (CLADODA'CTYLA) PENTA'CTES, MÜLLER; *Zool. Dan. Encyc. Méth.*, pl. 86, f. 5.

Not certainly determined.

HOLOTHU'RIA CHRYSACANTHÓPHORA, COUTH.; *Bost. Journ. Nat. Hist.*, ii. 58.

This is not unlikely to be the *H. forcipàta* of O. Fabricius. Several specimens which I have seen, were all taken from fishes' stomachs, in a mutilated state. Some of the essential characters, therefore, remain yet undetermined. The surface is light colored, and appears to be naked, except that there are several long, flexible, sharp-pointed spines about the mouth, of a shining golden-yellow. One specimen is five or six inches in length.

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HOLOTHURIA (CUIVIERIA) SQUAMATA, MÜLL.; *Zool. Dan. Encyc. Méth.*, pl. 87, f. 10-12.

Very curious for the firm, granulated, brick-colored scales with which its back is shielded.

HOLOTHURIA (SYNAPTA) BRIAREUS, LESUEUR; *Journ. Acad. Nat. Sc.*, ii.

This animal, contracted by alcohol, is two inches and a half in length and about one inch in diameter, and is probably three times that size when extended. Its color has a tint of mazareen-blue, and its surface is covered uniformly with minute, tentacular filaments, about a twelfth of an inch in length, of a yellowish color. Tentacula eight, very much branched into botryoidal tufts, nearly equal in size. The exterior is firm and strong, and without any flattened disk.

It agrees pretty well with the description of *H. briareus*, but if it should prove different, I have proposed the name *Synapta intonsa* for it.

CHIRODOTA ARENATA. Body five or six inches long, club-shaped, rounded before and diminishing posteriorly, without any sudden stricture, till



it forms a tube, the last two inches of which is of uniform size, and about the diameter of a crow-quill. The tentacula are eleven in number, short, sub-equal, clove-shaped, terminating in four points which expand into a star, colored like the body; mouth small; ovarian papilla adjacent. Surface with five longitudinal furrows, answering to the five internal bands, two of which are shortened so as to give the body a crescentic curve; circular wrinkles minute and numberless. Color light drab, with straw-colored reflections, apparently naked, but rough with calcareous grains like very fine sand, thickest a little behind the middle.

This curious animal has been frequently found upon Chelsea beach, after violent storms. I cannot find that it has been described,

ACALEPHÆ.

These animals are many of them familiarly known under the names of *Sun-fish*, *Sea-nettles*, *Sea-jellies*, &c. They are of a gelatinous consistency, usually transparent as glass, of a circular form, and concave or umbrella-shaped. Many of them, when taken in the hand, communicate a prickling sensation much like the stinging of nettles, and hence they receive both their scientific and their popular name. Some of them appear to capture their prey by this miniature electric shock. I have repeatedly seen a BE'RÖE stretch out its filaments several inches until it reached a crustaceous animal of nearly its own size, which, upon contact, instantly fell down, either dead or paralyzed. Some of these animals grow to a great size, and I have seen specimens of CY'ANEA, on the sea-beach, a foot and a half in diameter. Others are small, not more than half an inch or an inch in diameter, but all extremely beautiful; and their motions, which in some of them are performed by a process like the alternate opening and shutting of an umbrella, are very graceful; and nothing can exceed the elegance of those which are propelled by little ciliæ or oars arranged along their sides, as in the BE'RÖE.

The larger species are found only for a short time in summer; but a great number of small species are found in cold weather, especially after a high wind blowing from the ocean. They evidently migrate, and their course and periods are probably directed by the temperature of the water, as they have no visible organs of sense.

The forms of some of them are very beautiful, and many of them would afford admirable patterns for laces and embroidery.

The books to which I have had access enable me to determine but very few species.

CY'ANEA POSTE'LSIJ, BRANDT; *Schirmquallen*, 375, tab. 12, 13.

A very large, liver-colored animal, fringed at the margin, and exhibiting numerous circular bands beneath. It is found on Phillips's and Chelsea beaches, abundantly, in August. Diameter, one foot.

AURELIA AURITA, MÜLL.; *Zool. Dan.*, tab. 76, 77. *Encyc. Méth.*, pl. 94, f. 1-3.

This is our common *Sun-fish* or *Sea-jelly*, well known to all who are familiar with the sea in July and August. I could never perceive any tingling sensation from handling it.

AURELIA FLAVIDULA? PERON and LESUEUR.

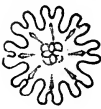
A small species, of a rusty-yellow color, about the size of an English shilling; the margin divided into eight moderately deep scollops, all of which are fringed with long ciliæ. Its surface appears granulated. Observed abundantly in March.

AURELIA ———. Another species, about two thirds the size of the preceding, in which the scollops are much less conspicuous, while the little flaps between them are more developed; the ciliæ are shorter, and the tentacula about the mouth seem to be united into a tube spreading a little at its extremity. Found a little later.



EPHYRA OCTOLOBATA? BLAINV.; *Man. d'Actin.*, 273, pl. 36, f. 3.

About one fourth of an inch in diameter, of a rusty-yellow hue, having eight lobes, the divisions between which extend half way to the centre; each of these lobes is again divided by a deep fissure; margin not ciliated. Found with the preceding.



OCEANIA TUBULOSA, SARS; *Beskr. ov. Polyph.*, 25.



A perfectly hyaline, balloon-shaped animal, about the size of a pistol-bullet. It is open at the bottom, and has four threads hanging from the margin, and from the centre a club-shaped tube, all of which are capable of great extension. Its motions are very rapid. Found in April and May.

HIPPOCRENE BUGAINVILLII, BRANDT; *Schirmquallen*, pl. 20. *Petersburg Trans.*, ii.

Another rather large, balloon-shaped animal, of a bluish tint, having four tufts of ciliæ attached to the margin, and a cross-shaped,

yellowish mass at the centre. It may be well likened to a cupping-glass or the receiver of an air-pump. Found in April; rare.

STOMOBRA'CHIUM LENTICULA'RE? BRANDT; *Schirmqualen*, 122, tab. 3, f. 6, 7.

A slightly convex animal, about the size of a dime, distinguished by its four stomachs, which extend nearly across the animal, forming a cross resembling the fans of a windmill. Its border is fringed all around. Found with the preceding.

ALCY'NÖE VERMICULA'RIS, RANG.; *Griffith's Cur.*, xii. pl. 4, f. 5.
A few specimens found in May.

BE'RÖE (CYDI'PPE) PILEUS, MÜLL. BLAINV.; *Actin.*, 149, pl. 8, f. 1.

A most interesting globular animal, having eight ciliated ribs, and two very long, white threads issuing from it.

POLYPI.

To the Polyphi the name of zoöphytes or *animal plants* more properly belongs. They have a central mouth, around which are arranged thread-like tentacula, which, when expanded, present a close resemblance to various flowers and plants. A few of them are large and solitary; but most of them are very minute, and nearly all of them produce structures of a horny or stony firmness, on which they dwell in communities. There are a few small corals inhabiting our waters; but the coralline structures which we find, are generally spread out in a thin coating upon shells, marine plants, &c. They usually present a honey-comb appearance, and are beautiful objects for the microscope. Other structures resemble miniature trees; and many of the objects found on the sea-shore and supposed to be sea-weeds, are of animal origin. They have as yet attracted but little observation in this country.

ACTINIA MARGINATA, LESUEUR; *Journ. Acad. Nat. Sc.*, i. 172.

The *Sea-anemone* is found in still water, adhering to rocks, timbers, &c. This species is the only one I have found. It is

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often two inches in diameter, when expanded. Its color varies from light fawn to dark chestnut. The tentacula have alternate rings of the same color and of white, so that they are white tipped or not, according to their stage of growth. It may be nothing more than *A. mesembryanthemum* of European authors.

TUBULÀRIA INDIVÌSA, LIN. ELLIS; *Corall.* tab. 16, f. C. LISTER; *Philos. Trans.*, 1834, 366, pl. 8, f. 1. JOHNSTON; *Brit. Zooph.*, 113, pl. 3, f. 1, 2.

A beautiful object, found abundantly around Boston, on the under side of floating timber. It grows in clusters, each animal having a circle of minute filaments, enclosing a group of shorter, pink-colored ones, which, being seated upon a straw-colored stalk three or four inches long, resembles a delicate flower with its petals and stamens.

TUBULÀRIA LARYNX, SOLANDER; ELLIS; *Corall.*, pl. 16, f. b. JOHNSTON; *Brit. Zooph.*, 115, pl. 3, f. 3; pl. 4, f. 3-5.

Similar to the preceding, but smaller. They are principally distinguished by their tubes being somewhat branched, and wrinkled so as to form three or four rings at regular intervals.

TUBULÀRIA RAMC`SA, LIN. ELLIS; *Brit. Zooph.*, tab. 16, f. a, and tab. 17, f. a, A.

Branched like the preceding, and with rings at the origin of the branches; but the polypi have only a single series of tentacula.

TUBULÀRIA STELLÍFERA, COUTHOUY; *Bost. Journ. Nat. Hist.*, ii. 56.

A beautiful, salmon-colored, minute species, growing in clusters on logs around the bathing-house at Craigie's bridge. These clusters look as though they might be patches of moss. I have not been able to refer it to any described species.

SERTULÀRIA PINNÀTA, PALLAS; JOHNSTON; *Brit. Zooph.*, 127, pl. 9, f. 5, 6.

Grows on old shells, and resembles a miniature, thinly-branched cypress.

LAOMEDE`A GELATINO`SA, JOHNSTON; *Brit. Zooph.*, 152, pl. 21, f. 3, 4; pl. 23, f. 1. *Campanulària gelatinòsa*, FLEM., 549.

Found attached to *Tubulària larynx*. The polypi are very

active in their motions, constantly protruding themselves from their bell-shaped recesses, and very suddenly retreating.

MEMBRANÍPORA PILO'SA, JOHNSTON; *Brit. Zooph.*, 280, pl. 24, f. 10-12. FARRE; *Philos. Trans.*, 1837, pl. 27, f. 1-5. Flustra pilòsa, LIN.

Encrusts small sea-weeds and old shells with a membranous lace-work, from each of the meshes of which a hair is seen to issue, unless worn off by friction, as it usually is.

ALCYO'NIUM ECHINA'TUM, FLEM.; *Brit. Anim.*, 517. JOHNSTON; *Brit. Zooph.*, 304, pl. 42, f. 3, 4.

Of a fleshy nature, encrusting dead univalve shells. It becomes stiff when dry, and is then studded with prickles. Such shells appear enveloped in a greenish, filmy scum. Very common on *Búccinum undàtum*.

ESCHA'RA FOLIA'CEA, LAM. JOHNST.; *Brit. Zooph.*, 297, pl. 40. MILNE-EDW.; *Ann. des Sc. Nat.*, vi. 36, pl. 3, f. 1.

Drawn up from deep water. It is a broad membrane, less than a tenth of an inch in thickness, gathered into a flounce. It is so light as to float in water, becomes crisp when dry, of a yellowish-brown color, and is punctured with numerous pores on both sides.

The CORALLINES and SPONGES have by many been ranked among the Polypi. But recent observations have proved that neither of them are inhabited by polypi.

The CORALLINES are now fully proved to be of a vegetable character, allied to the Algæ. We have at least one species, which we find attached to shells which are rolled up from the deep, and also along rocky shores, growing in the little basins which are filled by the dashing of the surf into them. It is of a brownish color when living, but soon becomes white on exposure to the air, and is probably *Corállina rubens* of Linnæus.

The SPONGES still hold a disputed ground between animals and vegetables. Their claim to a place in the animal kingdom seems to rest on the power which the ovules or young are observed to have of floating from place to place at will, by means of vibratory ciliæ. When they have once attached themselves to some solid body, as they always do, they do not afterwards manifest any indications of sensation or volition.

We have three or four species, some of them quite beautiful, but none of them having a structure sufficiently tenacious to render them useful. Such are

SPONGIA OCULATA, MONTAGU; *Wernerian Trans.*, ii. 78, pl. 6, f. 2. ELLIS; *Corall.*, tab. 32, f. F, f.

SPONGIA RAMOSA, MONTAGU; *Wern. Trans.*, ii. 84, pl. 8.

SPONGIA ARBORESCENS, LAM. S. rubens, PALLAS.

Of *parasitic worms* and *infusory animals*, great numbers have been observed. There is not a beast, bird, reptile, or fish, which has not one or more species of worm infesting the intestines or other organs of the body. The little animalcula called infusory animals, may always be found in water, whether fresh or salt; but more especially in warm weather, when the waters of the ditches and stagnant pools become almost opaque with their countless multitudes. They will amuse and astonish any one who will subject a drop of such water to the microscope; but any special enumeration or description of them here would be useless.

The preceding list of Crustacea, Annelida, and Radiata has been prepared almost without assistance, and while almost entirely confined within the limits of the city. Occasional visits to the wharves, timber-docks, and market have been the principal resources for specimens. It serves to show that we have about us an abundance of animals whose structure and habits have received their share of attention in other countries, but which have hitherto found few devotees in this country. So few gleanings have been made in this field, that no other promises a more abundant return for labor. The whole American coast is unexplored. Nearly every spadefull of the sand of the beach, every stone washed by the tide, and every sea-weed will furnish some object which is curious, and often new. If some of the young naturalists whom we see multiplying around us, especially any who reside on the sea-shore, or are in the habit of resorting to it for health or pleasure, should turn their attention to the study of these departments, they would find themselves richly rewarded.

NOXIOUS AND VALUABLE ANIMALS.

WHENEVER any thing is presented to us which has apparently been the result of careful study, but which we do not understand, the first question we naturally ask is, "What is the use of it?"—"In what manner is it calculated to promote or disturb my interests?" There are many, into whose hands the foregoing Report may come, who will feel no other interest in it, than as it may inform them of profitable sources of revenue, or the means of averting damages. For such, I propose to embody here the little there is to be said respecting the injuries and benefits derived from the animals of which we have been taking a view.

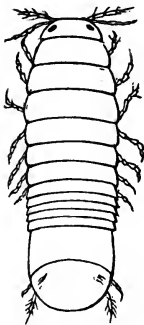
Only a very few of them all are objects of special regard to man. Most of them are small, some very minute, and withdrawn from his view. They are immersed in the streamlet and pool, or concealed under decaying leaves and logs, or buried in the ocean depths. And when seen, they are regarded by the common eye as worthless, or as nuisances. The philosophic mind, however, regards every link in the chain of being as important, worthy of study, and indispensable in the economy of creation. They are proved to be designed for the good of man by their preëxistence. The races of vegetables and animals which preceded the creation of man, all seem to have contributed to prepare the earth for his residence. Much of its solid structure, the coal, marble, and all other limestones, those valuable minerals which contribute in so many ways to the necessities, comforts, and luxuries of man, are but the consolidated remains of the countless generations of plants, shells, and crustaceous animals which have lived in past time. The small and minute creatures make up the mass of these solid structures; while the monsters of olden time, the mammoth, mastodon, and gigantic lizard are of rare occurrence.

The great agency which the animalcula are capable of exercising upon the well-being of man, is thus seen in the past. The fact that

they now exist in such myriads, is enough to satisfy the devout mind that they have still some indispensable office to perform. The great purpose of their existence seems to be, in the first place, to remove dead and decaying substances, before they become obnoxious. Their multitude and minuteness enables them to do this silently, promptly, and effectually, quite unperceived. In the next place, they are employed for food by the higher animals, until they become directly useful to man by nourishing the food on which he himself subsists.

But it is not my design to generalize. This might satisfy the understanding, but not the cupidity of man. Let us therefore proceed to particulars.

Of all the animals in the preceding catalogue, there is but a single one which interferes materially with the interests or possessions of man. It is a little animal which infests and destroys timber and wooden structures built in salt water. It has been named *Limnoria terebrans*.



I

THE LIMNORIA TEREBRANS is a minute crustacean animal about three twentieths of an inch long, and not quite half as broad. Its two ends are rounded, and its sides parallel, so as to have nearly the shape of a small maggot. Its color is grayish. The body is composed of fourteen segments, the seven which succeed the head each bearing a pair of short legs. It is capable of both swimming and crawling. When touched, it rolls itself up, by bending down the head and tail. Its food, contrary to the general, if not otherwise universal rule, among crustacea, is vegetable.

This little animal was first detected by Robert Stevenson, Esq., the architect of the Bell Rock Light-house, in 1808. He sent it to Dr. Leach, who gave it its name and described it, in 1811. Its habits and ravages have since been fully described by Dr. Coldstream and Mr. Thompson, in the "Edinburgh New Philosophical Journal," and my own observations have added but little to what may be gathered from theirs.

The animal attacks, by preference, soft wood, and the softest parts of wood. It selects pine, if it can be had; but it was observed at Bell Rock, that oak, birch, and all other wood there exposed, except teak, was more or less perforated. All wooden structures immersed in the sea are liable to its attacks. Sea-bulwarks are undermined, the piles

and piers of bridges are cut off, and canal locks are rendered inefficient by them. Dr. Coldstream observes, that he is not aware that they ever attack floating timber, but confine themselves to fixed timbers. They are, however, abundant on the under sides of timber floating in timber-docks, which, to be sure, is confined, though floating.

They select their station below low-water mark, though some few rise so high as to be left by the tide a portion of the time. If they have access to the end of the timber, they enter the soft portion between the annual, hard rings of wood, and seldom pass out of the circle which they first enter. Their numbers are so great, that no one penetrates more than an inch from the surface before the whole timber is occupied and crumbling behind him by every wave that chafes it. Such as cannot enter the ends of the timber, attack the sides and burrow just beneath the surface. The whole surface is soon furrowed by them, so that the remains of circle after circle are washed away. It has been found that where the *Limnoria* is abundant, timber, however large, will lose an inch in diameter annually. A timber in the dock of Mr. Aspinwall, near Winnisimmet Ferry, which was once the mast of a frigate, has been reduced to a mere spar of about a foot in diameter.

The animal is probably no less abundant here than about England and Scotland, where its ravages have been so troublesome. I have observed them at low tide, about all the wooden structures which I have examined in the neighbourhood of Boston. It therefore becomes a matter of consequence to know how to guard against them.

No very economical or effectual method of protection has yet been ascertained. Casings of copper have been used in some instances; but the animal has succeeded in getting behind it. Various washes have been applied; and it is said that verdigris paint is effectual. The most efficient method hitherto tried, has been to cover the whole surface with broad-headed nails, set close together.

These little creatures, which force themselves upon our notice by the ravages they commit on private property, or works of great public utility, are nevertheless not without their use. A very trifling portion of their whole number interfere with the works or the possessions of man. The great multitude is employed in devouring and disintegrating submerged timbers, which would otherwise remain almost imperishable. In this respect they correspond to the wood-boring larvæ and beetles of the land. "Let us consider, for instance, how possible it is that large masses of wood, floated down by rivers, might accumulate on

shoals at their mouths to such an extent as materially to diminish the outlet for the waters, which then would rise and overflow their banks, were it not for the destructive boring of the *Limnoria*. What could not be accomplished by brute force, and might baffle even the ingenuity of man himself, is yet quietly accomplished by the gradual and steady operations of a tiny crab. The trees are perforated and then washed away, and with them the sand and mud which had collected around, and which would speedily have formed an effectual impediment to the free efflux of water, and to the navigation of the river." These remarks have full force when applied to the mouths of most of the rivers emptying into the Atlantic. "Nor must we omit to notice the possibility of its being the means, occasionally, of causing the removal of those serious obstacles to the safe navigation of shallow seas, which are caused by the masts of sunken vessels."*

If we except the various *barnacles*, which attach themselves to the bottoms of vessels, sometimes in such numbers as materially to impede their speed, I know of no other animal, coming within our limits, which is either injurious or even disagreeable to man, in any sense. In many, if not in all, parts of Europe, the snails and slugs are exceedingly troublesome in gardens. But in this region snails are rarely seen, and, in addition, the habits of American snails seem to be different from those of European ones. They do not climb plants and shrubs for food, and they mostly flee from the haunts of men. Slugs are also rare, and though occasionally seen in the vegetable garden and the orchard, are not essentially troublesome.

The invertebrate animals which may be noticed as beneficial, are also few in number. They may be mostly arranged under 1. Such as contribute food to man: 2. Such as afford subsistence to other animals: 3. Such as are employed in agriculture and the arts.

1. *Those which contribute food to man.* The article of food which is most familiar as well as most important among the Mollusca, is the Oyster (*O'strea*).

The OYSTER is generally supposed by dealers and market-men to be not now a native of the waters of this State. That it was formerly of native growth, they all admit; but that it has become extinct in places now most favorable to its growth, they all assert. The cause of this extermination is said to have been what is called a *ground frost*; that

* Edinburgh New Philosophical Journal, xvi. 332, 333.

is, a degree of cold so great as to cover the bottom with a coating of ice, and thereby to cut off the oysters from all access to air and nourishment. This is said to have happened about the year 1780; previous to which time, no oysters were brought from more southern waters. Immense beds of the shells of oysters which died at that time are said to be still visible in the neighbourhood of Wellfleet.

The above opinion is not, however, strictly correct. That no beds of native oysters are found at all adequate to the supply of the market, is true. But old men relate that they were accustomed to go up Mystic River and Charles River, and gather oysters of great size, before it was the custom to bring them from New York. And even now, individuals of enormous size are occasionally brought from both these places, and probably might be found, by special search, at any time. Moreover, from Dr. J. B. Forsyth, I learn that, in all probability, the native oyster is abundant on the south shore of Cape Cod. The following are extracts from his letter.

“*Sandwich, June 15, 1840.*”

“DEAR FRIEND,

“I embrace the first opportunity to give you some account of the Oyster found in the western part of this town, lying upon Buzzard’s Bay. I have consulted several aged men in this vicinity, some eighty years of age, and they inform me that there has always been an abundance of the fish in these waters, ever since their remembrance; and it has never come to their knowledge that oysters were ever brought there from any foreign location. They are found along the shores of the bay for several miles, but are much more abundant in two or three locations. They seem to multiply with great rapidity, and the whole shore seems to be lined with them, so that at low water you could, at almost any point, procure a bucket full of them from the rocks.

“I am also informed, that great numbers are taken in the region of Wareham, a few miles from our beds, and should conjecture that, from their proximity of location, they must have had a common origin with ours.

“There is a statute in force which imposes a penalty for catching any of these fish and carrying them out of the town; and no citizen has a right to take for his own use more than one or two bushels at any one time. The oysters are generally collected by a few men, who bring them to the village and dispose of them at fifty cents a bushel, for their trouble; and by selling half a bushel or a bushel to an individual,

the spirit of the statute is not violated. 'This may be repeated every day, until the desired supply is laid in. When placed in the cellar, and fed from time to time with a little meal and water, they will sometimes keep good for months.'

The fact that the oysters on the Buzzard's Bay shore adhere to the rocks and breed there, together with the testimony of very aged men, is sufficient to show that Massachusetts is not without native oysters. But it is also a well-known fact, that the supply for the markets of all the large towns is obtained from the South. Hence has arisen a trade of no small importance; and I have taken some pains to ascertain its extent, and the mode of managing it. From intercourse with several gentlemen long engaged in it, but principally from Mr. Joseph Holbrook, of Boston, and Richard Libby, Esq., of Wellfleet, I have gathered the following particulars.

Almost the whole of the oyster trade belongs to Wellfleet, near the extremity of Cape Cod. About thirty vessels, averaging forty tons each, and manned by one hundred and twenty men, are employed about three months in the year in importing them. The oysters are mostly obtained from Staten Island, Little Egg Harbour, and Somerset, and are called New York oysters. Less frequently, they are brought from the Chesapeake and Delaware Bays. Small ones are selected, about the size of a dollar, and cost fifty cents per bushel. Forty thousand bushels are annually brought to Wellfleet, costing, of course, 20,000 dollars; all of which the oyster fishers require to be paid in specie.

At Wellfleet they are planted, as it is termed, to increase their size. The oyster-ground should be flat, of a sandy or fine gravel bottom, and where the common tide leaves them dry about two hours. Muddy grounds soon choke up and destroy the oysters. The planting is done during the months of March, April, and May, in moderate weather, when the water is not very cold. They are permitted to remain from seven to nine months, during which time they sometimes double their size. Their growth is, however, very variable, depending on the season, and in some years the increase is very slight. They are not permitted to grow larger, as they have then become of a size most profitable for market.

In the autumn, they are again taken up, selected, brought to market, and sold at wholesale for one dollar per bushel, the cost of planting, attending, taking up, &c., amounting to twenty cents per bushel.

Thus a profit of thirty cents on a bushel, or about forty per cent. on the cost, is realized; and the town of Wellfleet thereby realizes an income of about 8,000 dollars annually.

There are many small beds around Boston and the other seaports, where single cargoes are spread out, but they are of little account. The whole amount of oysters used annually in Massachusetts cannot fall short of 100,000 bushels.

The shells are still further valuable, but of these notice will be taken elsewhere.

The CLAM (*Mya arenaria*) is still more important, in an economical point of view, than the oyster. It is extremely prolific; and its exhaustless banks are every day accessible during twelve of the twenty-four hours.

The principal clam-banks are along the coasts of Essex and Barnstable counties. Nowhere are more collected than on the flats of Ipswich and Essex. But clams also abound on every muddy or sandy flat, however small; and there is perhaps not a mile of the whole coast where clams may not be found.

About 5,000 bushels of clams are annually brought to Boston market, and as many more are doubtless consumed at other places.

But it is not as an article of food for man, that the clam is principally important. Its chief use is as bait for fishing cod and haddock. Nothing can be so easily procured and kept in a suitable state for bait as the clam, and nothing else is so palatable to the fish. Immense numbers are employed for this purpose. For the bank fisheries, the shells are opened, and the animals taken out, put in barrels, and salted. This is called *Clam-bait*. Not less than 5,000 barrels of clam-bait are put up every year. Seven bushels of clams make about one barrel of bait; so that thirty or forty thousand bushels are used in this prepared state, and perhaps as many more are used from the shell. The value of the clam-bait is six or seven dollars per barrel.

There are several other shells which, it is averred by those who have tried them, are as palatable as the clam. The QUAHOG (*Venus mercenaria*) is found in considerable numbers about Cape Cod, but it is not fancied by Bostonians for food, though in the New York and Philadelphia markets it is used almost to the exclusion of our common clam.

The GIANT CLAM, or, as some call it, the HEN CLAM, (*Macra gigantea*), is much esteemed by some. But it requires a long process of bruising and maceration before it is sufficiently tender for the table.

The EDIBLE MUSSEL, (*Mytilus edulis*), as its name imports, is abundantly used for food in other countries. It is plentiful with us, but other shell-fish, quite as easily obtained, are preferred.

The LOBSTER (*Homarus Americànus*) is the largest of all crustaceous animals, and is extensively employed for food. The largest which has been seen by the Boston fishermen, weighed twenty-eight pounds; and those weighing ten or twelve pounds are not uncommonly seen in the market. The average, however, is about four pounds.

Lobsters are caught during the six months of warm weather. They might be taken during the whole year, but no adequate sale is found for them in cold weather. They are caught about all the islands in Massachusetts Bay, and in every cove along the coast. A few contractors manage most of the trade. The largest dealers, Ebenezer Weeks & Co., have three vessels employed during the season. They furnish the apparatus for catching them, and pay a certain sum for each lobster caught. One man will attend forty lobster-pots. He raises the pots in the morning and secures his prey, and spends the remainder of the day in catching cod-fish, with which to bait on the following morning. To average one lobster per day to each pot, is considered fair luck. In this way, probably 200,000 are annually taken in the waters of Massachusetts. Nearly one half of this number comes to Boston market, while all the inhabitants of the seaboard supply themselves abundantly; and the New York market is also principally supplied from the waters of this State, about Provincetown.

Lobsters sell at an average price of about ten cents each, affording a profit of about ten per cent.

CRABS are held in little repute as food, though a few hundreds are annually sold at two or three cents each.

2. *Such as afford subsistence to other animals.* Under this head we might at once introduce the whole catalogue. The fishes and aquatic birds devour them all, without distinction or mercy. Ducks, geese, and reptiles pick up the little cockles which live in the brooks and pools. The shell-fish of the sea prey upon each other, and all become food for fishes. It is surprising to find how the largest shells may be, and are, swallowed by the cod-fish. Those, however, are preferred by them which have their shells gaping; such as the *Clams*, *Panopæa*, *Glycymeris*, &c. The death of the animal swallowed soon occurs, the muscles of the shells relax, the gastric juice of the fish soon dissolves the animal, and then the shell is rejected. The use of

the common clam for fish bait has already been mentioned. The Crustacea are all welcomed by the fish in a similar manner. To these we may add the SQUID (*Loligo illecebròsa*) and the various jointed worms (*Annelida*) which live in the sand of the shore, some of which are a foot or more in length.

The KING-CRAB, or HORSE-SHOE, (*Limulus polyphèmus*,) is employed as food for hogs; and many of them are speared by boys for this purpose, and sold for half a cent apiece. It is also regarded as excellent bait for eels.

3. *Such as are employed in agriculture and the arts.* In agriculture, the solid parts of the Mollusca, their shells, are employed on account of the lime which forms their basis. One of the most useful forms in which they are found for this purpose, is the shell marl. In Berkshire County this marl is found in considerable quantities. It is formed of the small, fresh-water shells which have subsided to the bottom, and, mingling with the fine mud, become consolidated. This process is every day going on. In a few specimens which I have examined, I have detected *Planorbis bicarinatus*, *P. campanulatus*, *P. parvus*, *Physa heterostropha*, *Valvata tricarinata*, *Limnæa humilis?* and *Cyclas dubia*, shells which are now everywhere found in the streams of Massachusetts.

Shell lime is very much used in many parts of the world, and in some of the United States, as an ingredient in composts, and for dressing grain lands; but it has not yet become so extensively employed in Massachusetts as would be profitable. Some little diversity of opinion has arisen as to the utility of lime in improving wheat crops. It has been stated by good farmers, that they have dressed their fields freely with lime, without any manifest improvement of the crop; while the next year, when no lime is applied, the crop has been ample. Such statements would seem to discourage the use of lime for grain crops. Dr. C. T. Jackson, who has paid great attention to agricultural chemistry, offers an explanation to this seeming evidence against the utility of lime. He says, that where lime is spread with freedom, it will not form its combinations with the soil so as to be of benefit during the first season; but that on a second season its effects will be abundantly apparent.

Shell lime is preferable to stone lime in agriculture, because it is sure never to contain magnesia, which is always prejudicial to the soil, and which is often a component part of stone lime.

The manufacture of shell lime is carried on extensively by Mr. Kingsley, of Boston. The shells are collected from the various oyster shops, and are given to him for the trouble of removal. Twenty to thirty thousand bushels are thus collected and burned annually. The lime is sold at twelve and a half cents per bushel.

Shell lime is also extensively employed in masonry ; and it is within the memory of man when no other lime was known for building, along the seaboard.

By the addition of the proper materials, clay and magnesia, Mr. Kingsley prepares an excellent hydraulic cement, which is used not only for laying drains, cisterns, &c., but its whiteness renders it suitable for the manufacture of fountains, vases, and ornamental articles, which are to be placed in exposed situations.

We find nothing else which is employed in the arts, except the SCOLLOP SHELL, (*Pecten concéntricus*,) which is so extensively used in the manufacture of card-racks, pin-cushions, &c.

The animals of several shells (*Púrpura* and *Búccinum*) afford a juice, when they are bruised, which dyes a brilliant purple. The ancients are supposed to have derived all their purple dye from this source ; but other more available articles have entirely superseded its use.

PEARLS of various colors and considerable size and beauty are often found in both salt and fresh water mussels. They were once highly valued in England, but are not sought for at the present day.

This summary, short as it is, and containing little that is not already familiar, presents, nevertheless, all that is known to be of direct use and benefit to man. Some may hence be disposed to inquire, "Of what use, then, is the study of so many others which are apparently useless?" A few words only need be said to such objectors. In the first place, all of God's works are wonderful, and worthy of study. Again, negative knowledge is useful. The most useful sciences are made up of trivial facts. Newton's apple, Young's soap-bubble, and Galvani's frog, have given hints which have led to almost the complete developement of some of the most important natural laws which affect us. And again, so limited is our knowledge of the designs of the Author of nature, that animals which appear of little importance in relation to ourselves, are perhaps as necessary to the general plan of the Creator, as those which we place at the top of the scale of being.

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ERRATA.

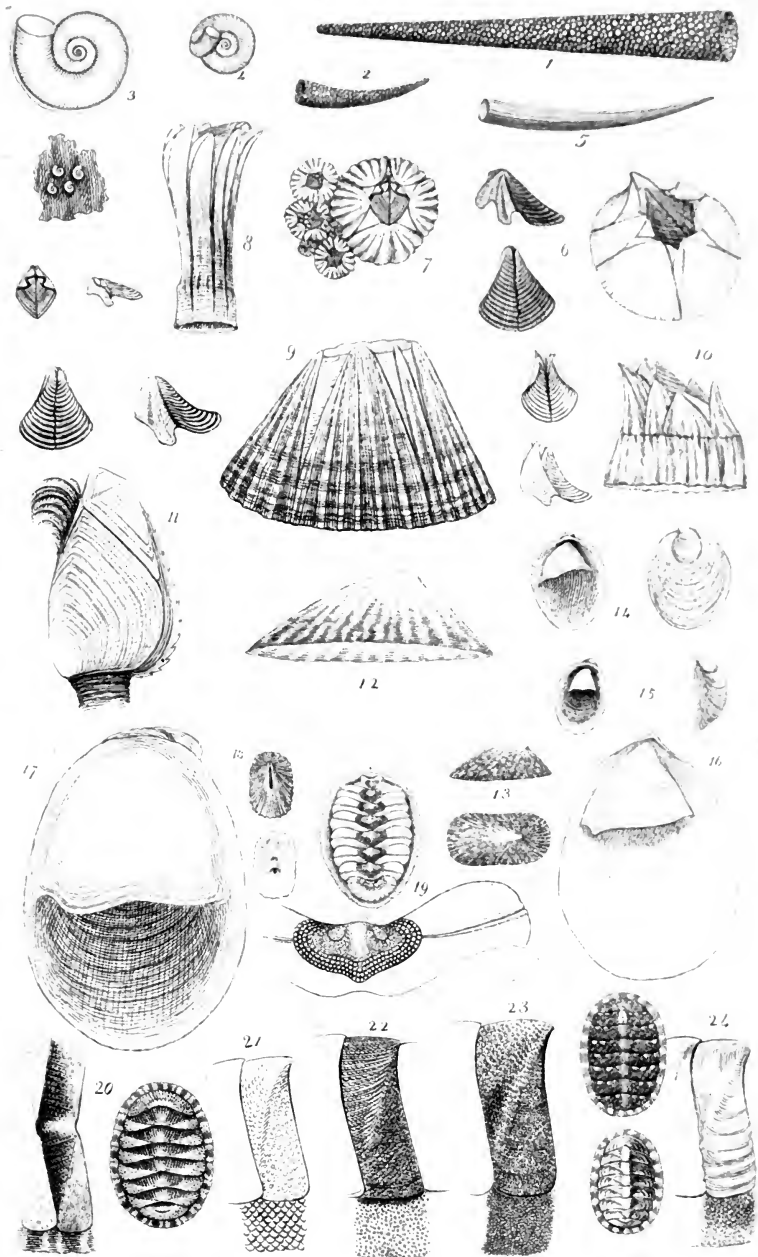
- | | |
|--|-------------------|
| Page 16, line 19, for 10 | read 7 |
| " 24, " 26, " nitida | " costata |
| " 46, " 18, " 10 | " 31 |
| " 56, " 9, " 34 | " 36 |
| " 60, " 26, " 23 | " 33 |
| " 76, " 27, " 44 | " 45 |
| " 78, " 23, <i>dele</i> 45 | |
| " 85, " 17, <i>for</i> 52 | " 67 |
| " 86, " 38, " 52 | " 67 |
| " 122, " 23, " tuburcular | " tubercular |
| " 148, " 19, <i>after pubescent insert</i> Figure 23. | |
| " 150, " 27, <i>for</i> 27 | <i>read</i> 21 |
| " 167, " 13, " 113 | " 47 |
| " 176, " 27, " 41 | " 91 |
| " 221, " 5, <i>dele</i> 145 | |
| " 231, " 12, <i>for</i> 160 | " 163 |
| " 236, " 8, <i>dele</i> 163 | |
| " 249-262, <i>for</i> 160-168 | " 170*, 171*, &c. |
| " 256, <i>line</i> 22, <i>for</i> 35 | " 34 |
| " 263, " 33, " 35 | " 135 |
| " 263, " 26, <i>read</i> by A. Binney, Esq. It may prove to be a good species, &c. | |
| " 267, " 8, <i>for</i> 38 | <i>read</i> 238 |
| " 285, " 16, " 13 | " 24. |







Figure 1 to 24



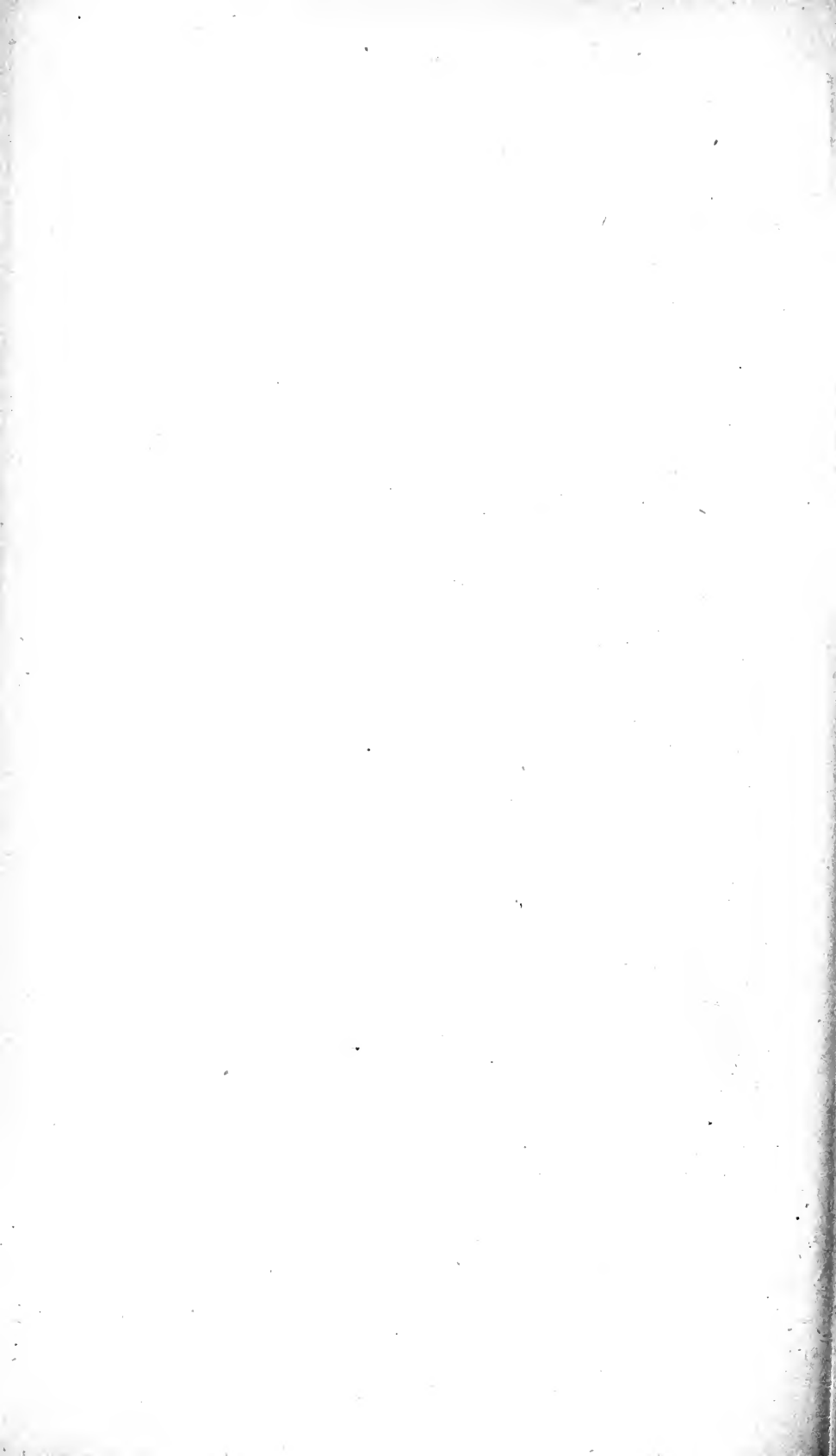


Figure 25 to 33



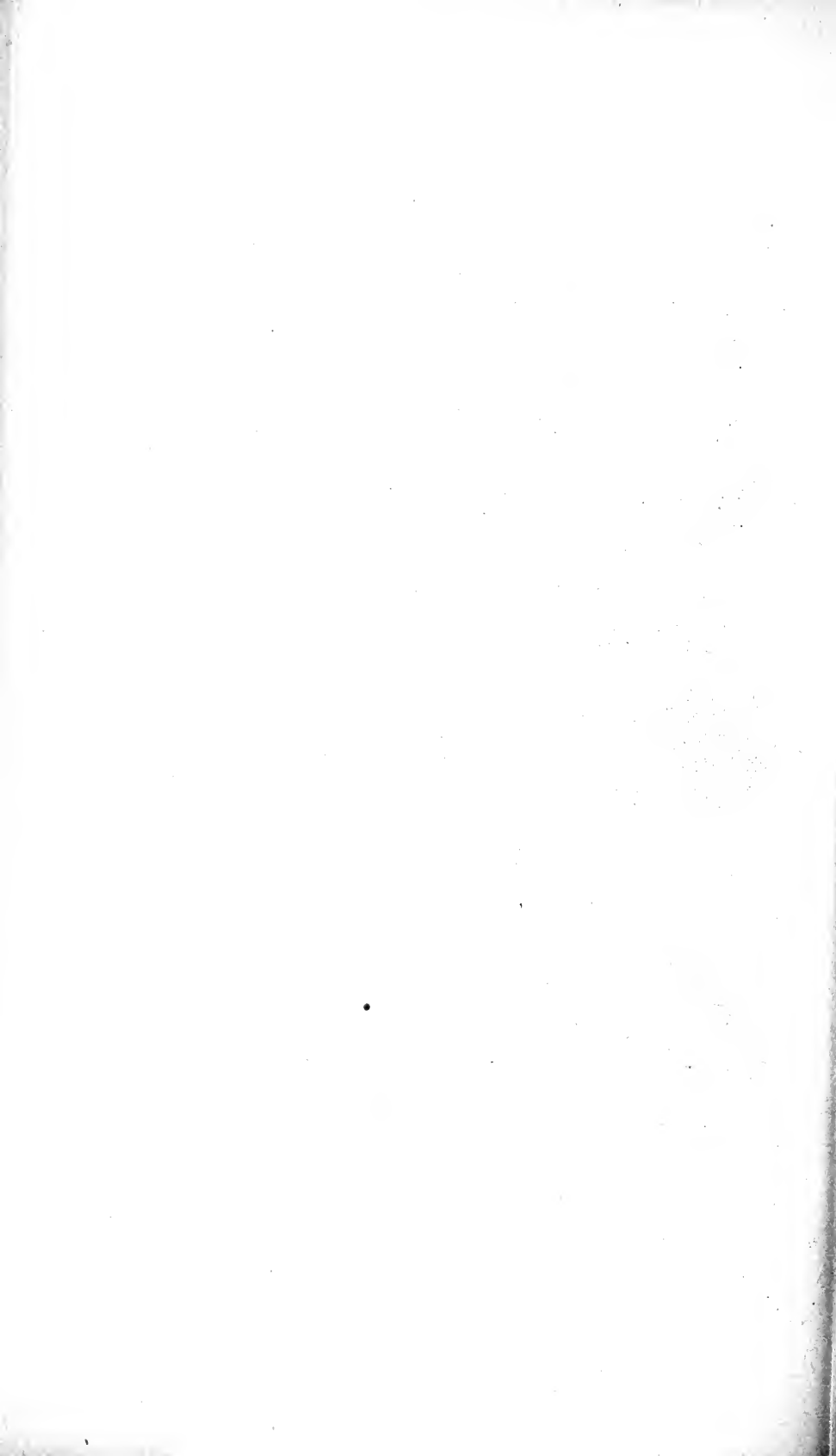
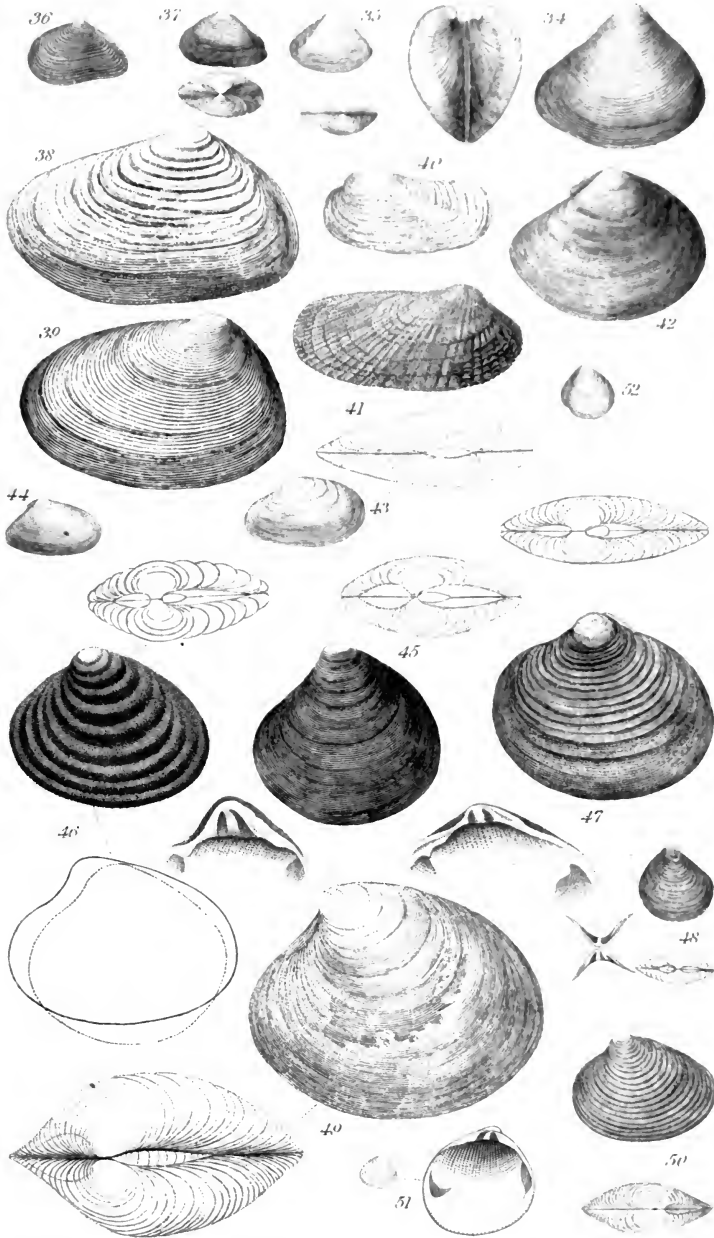


Figure 34 to 52



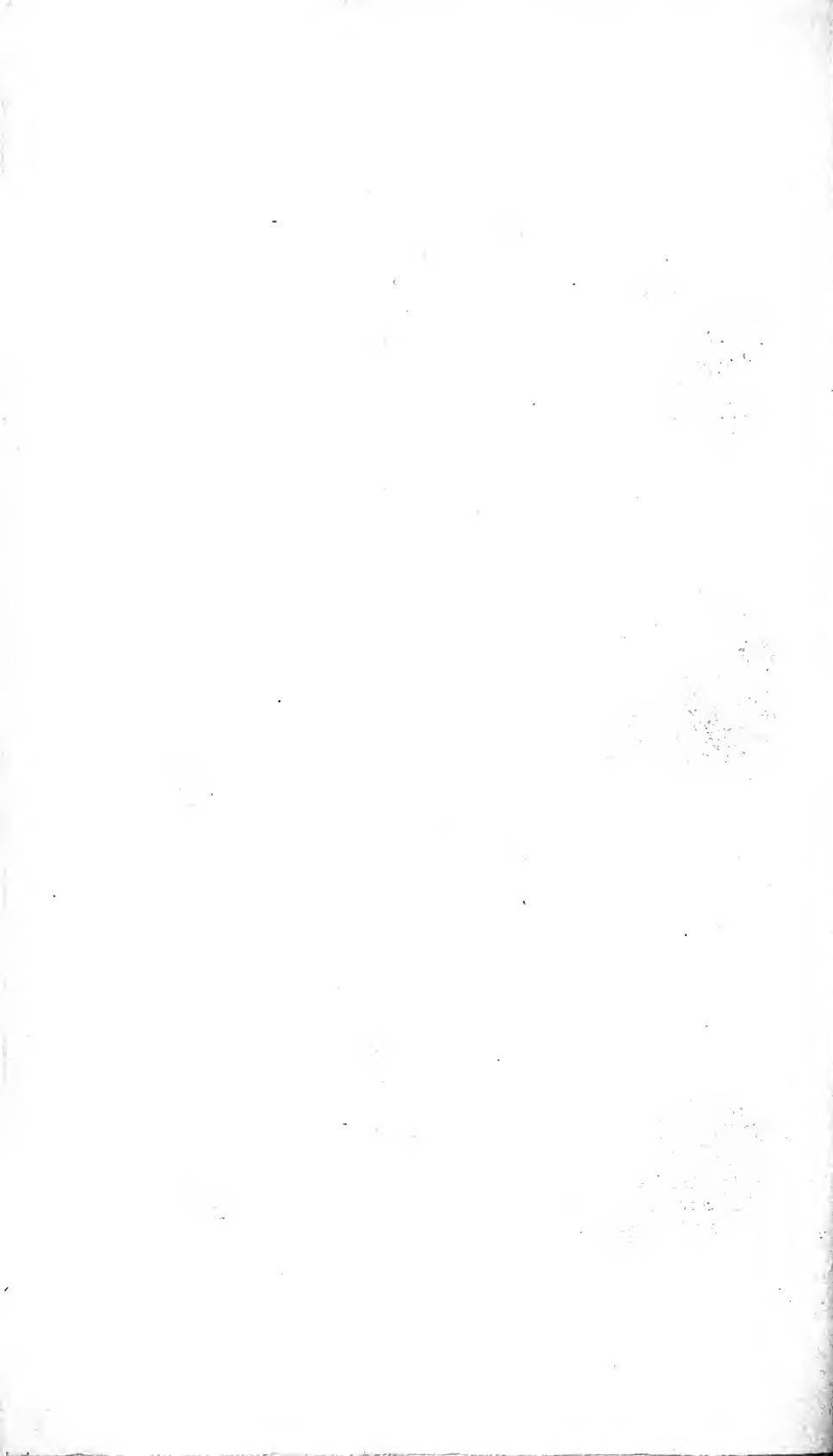
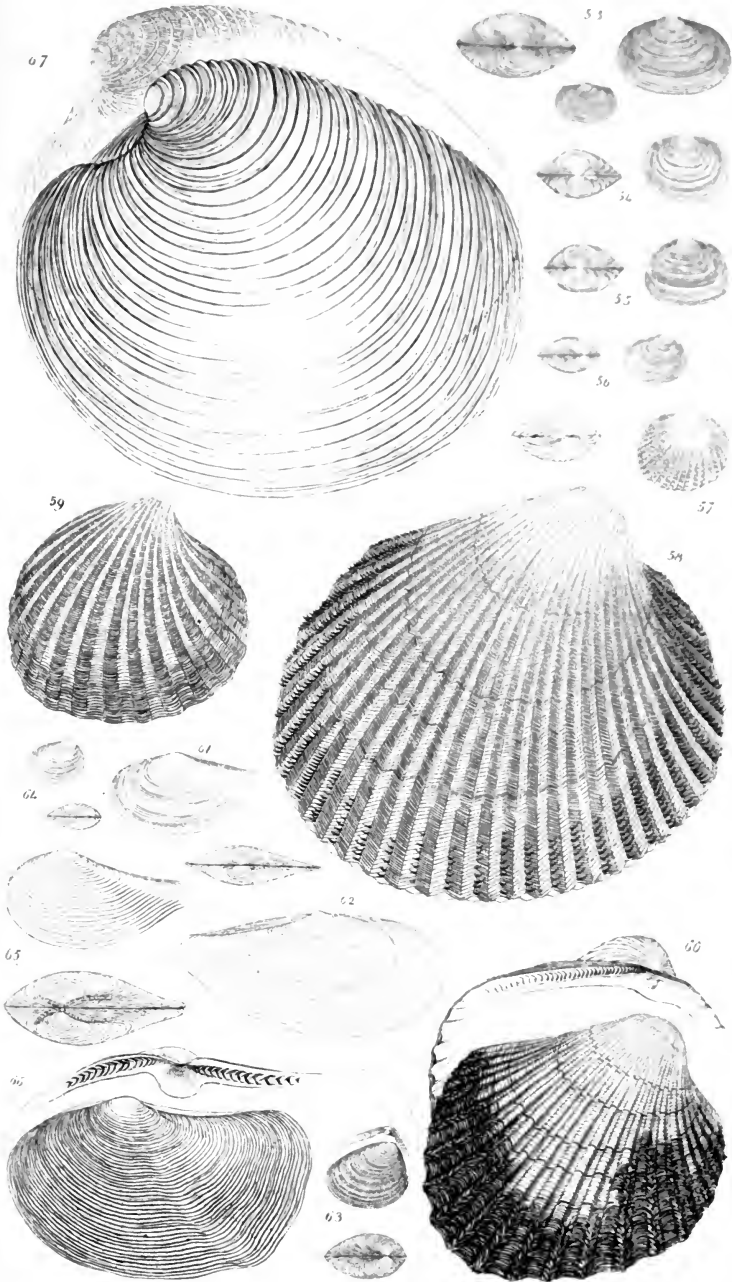


Figure 53 to 67



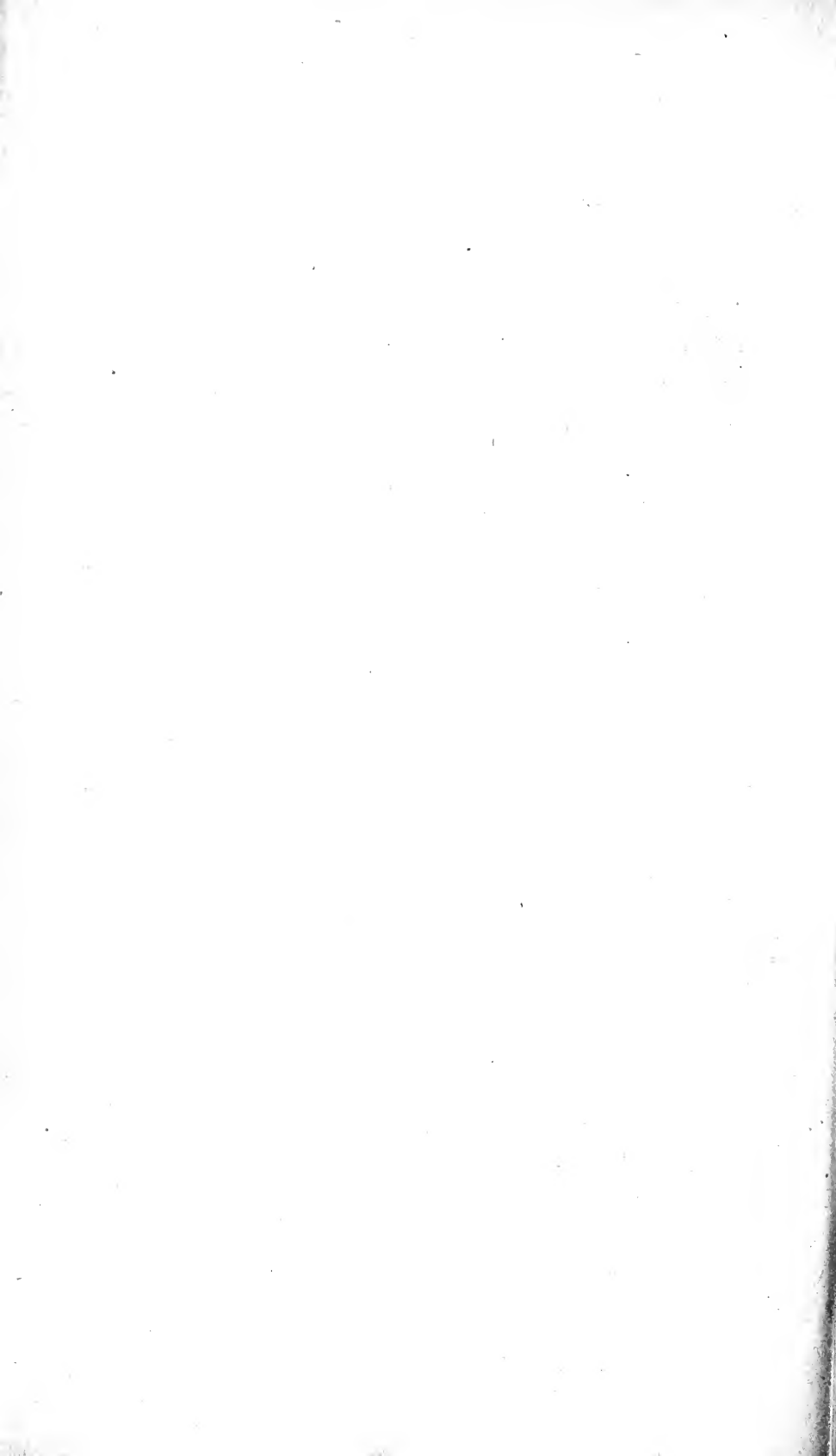
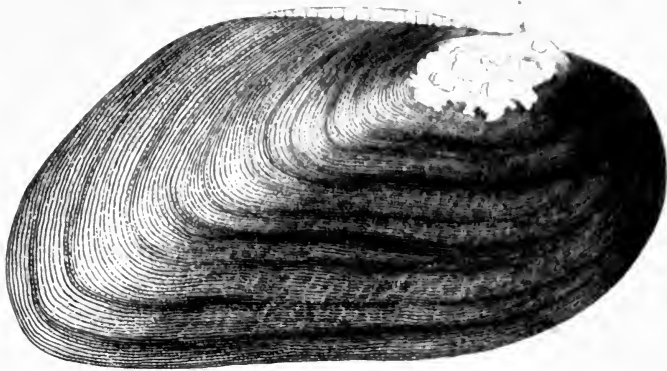
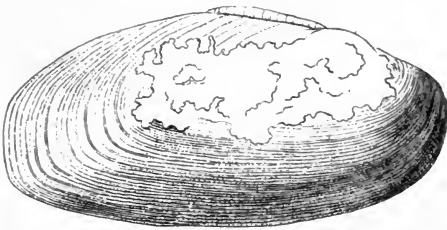
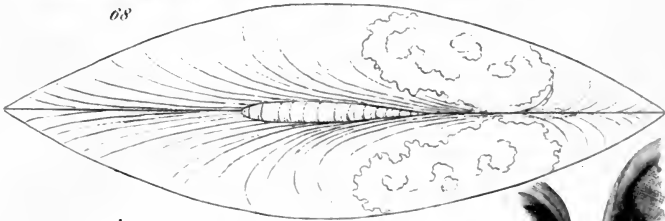


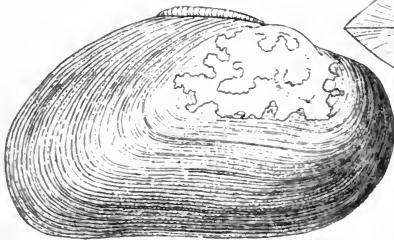
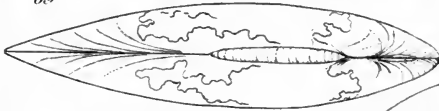
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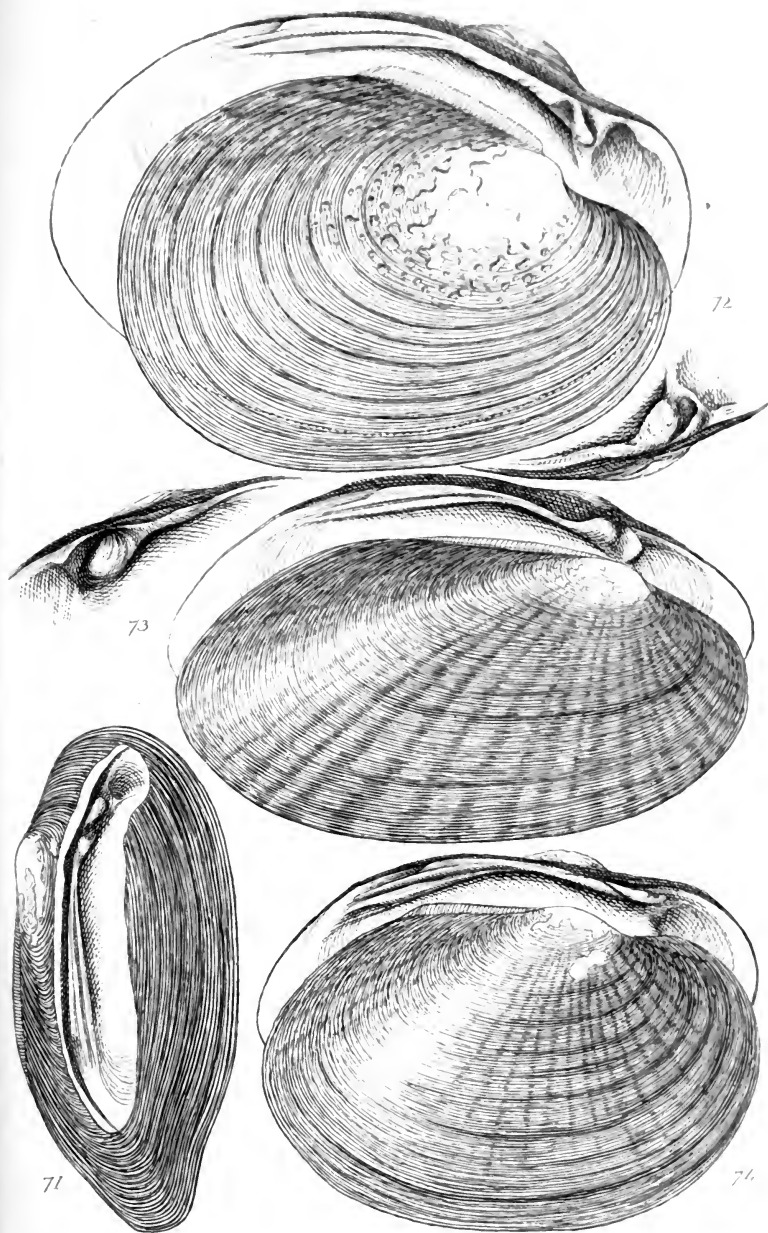
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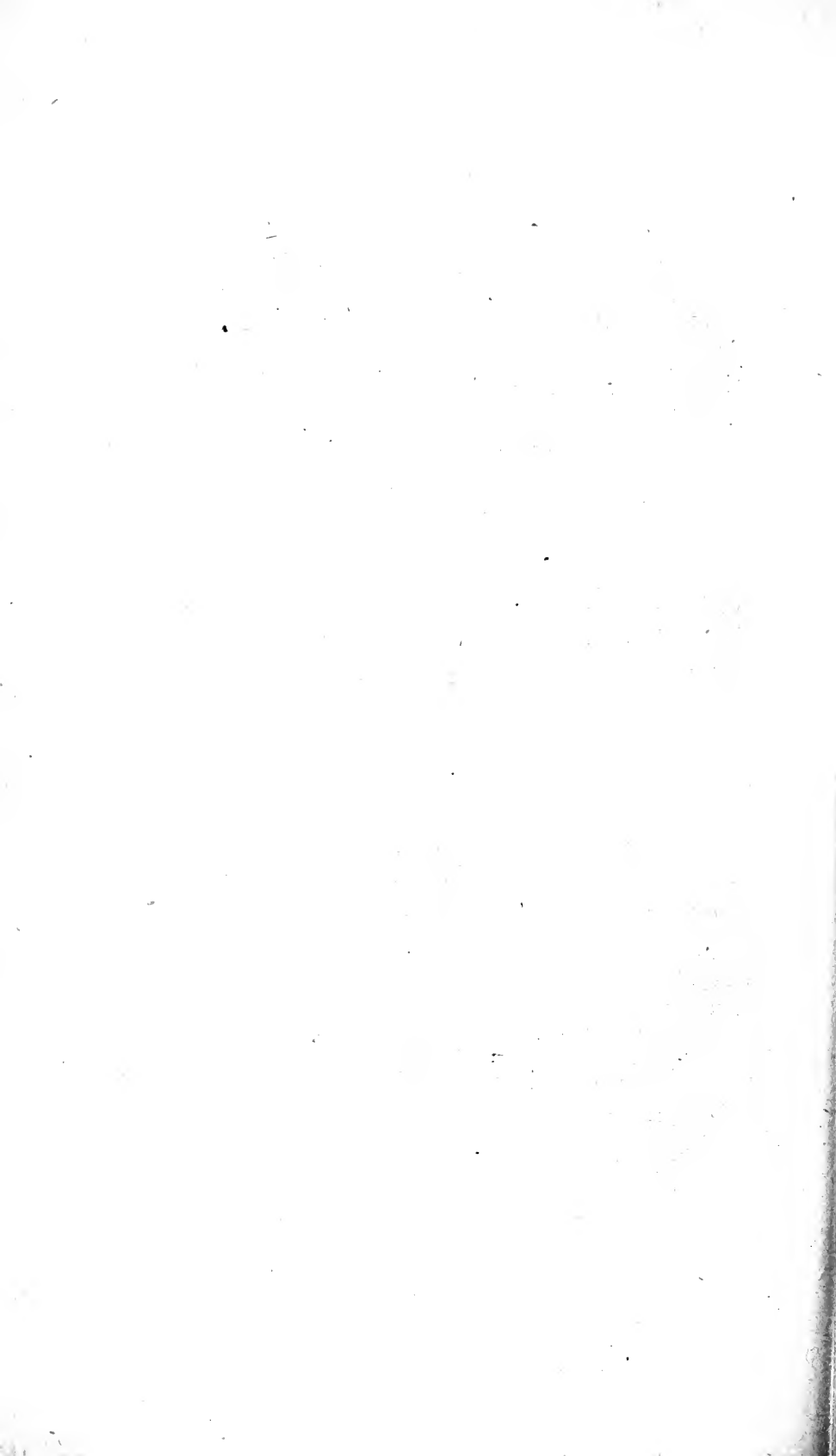
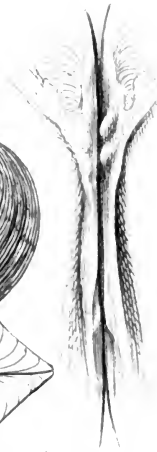
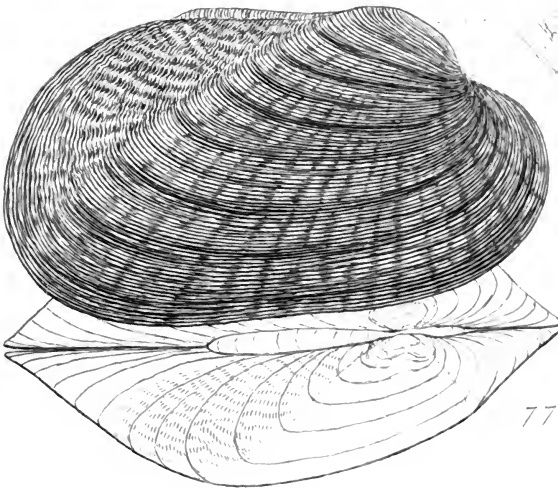
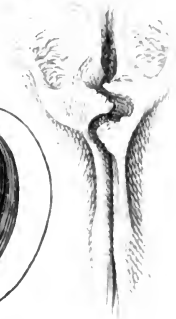
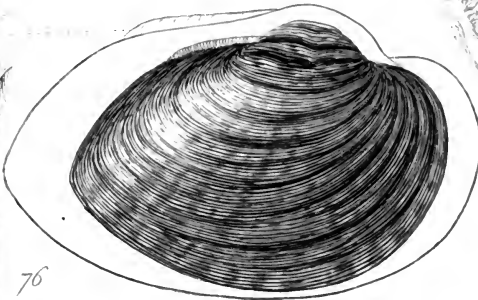
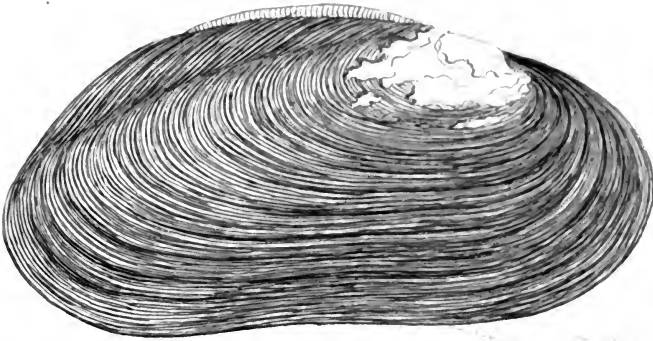


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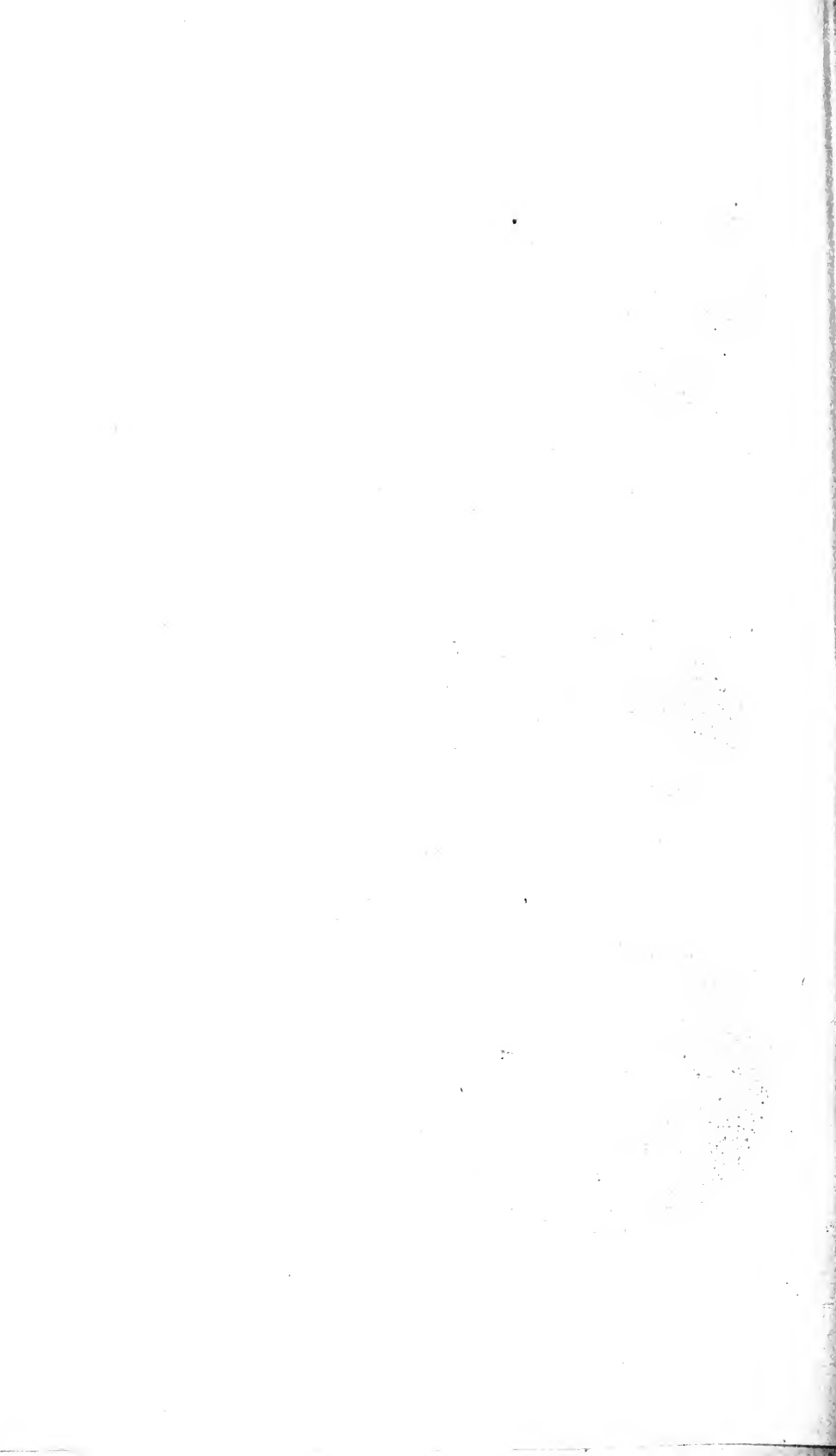
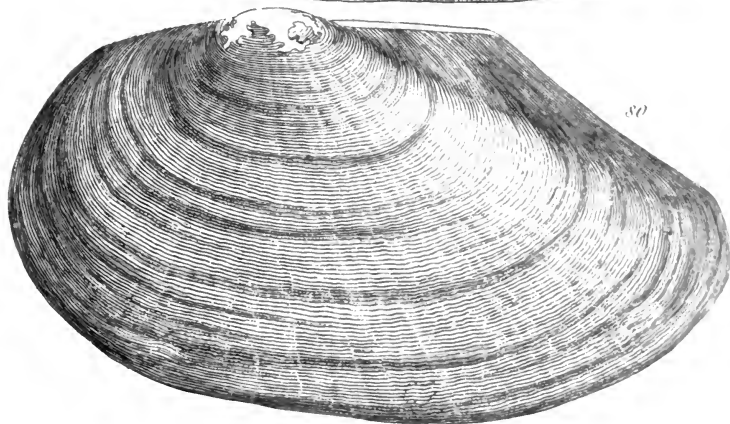
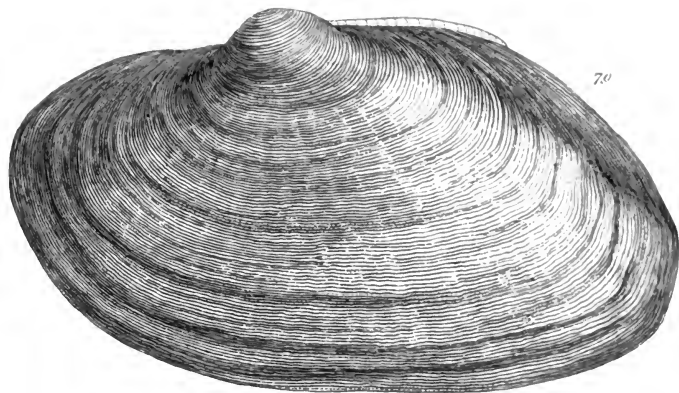
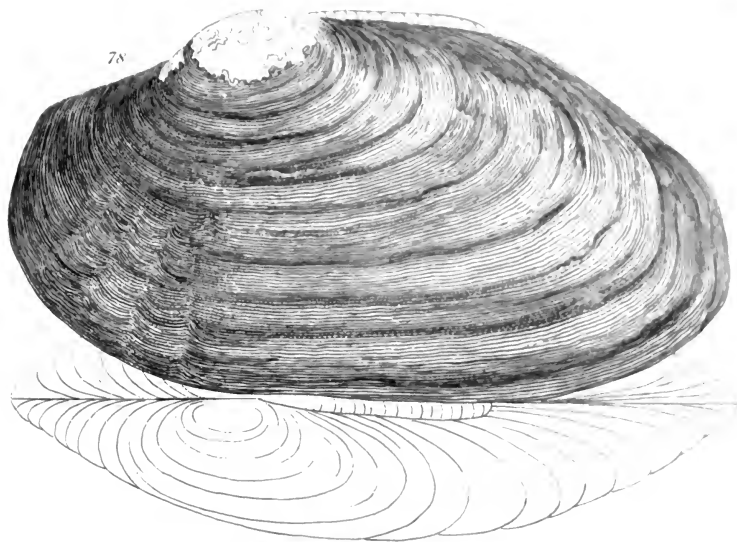


Figure 78 to 80



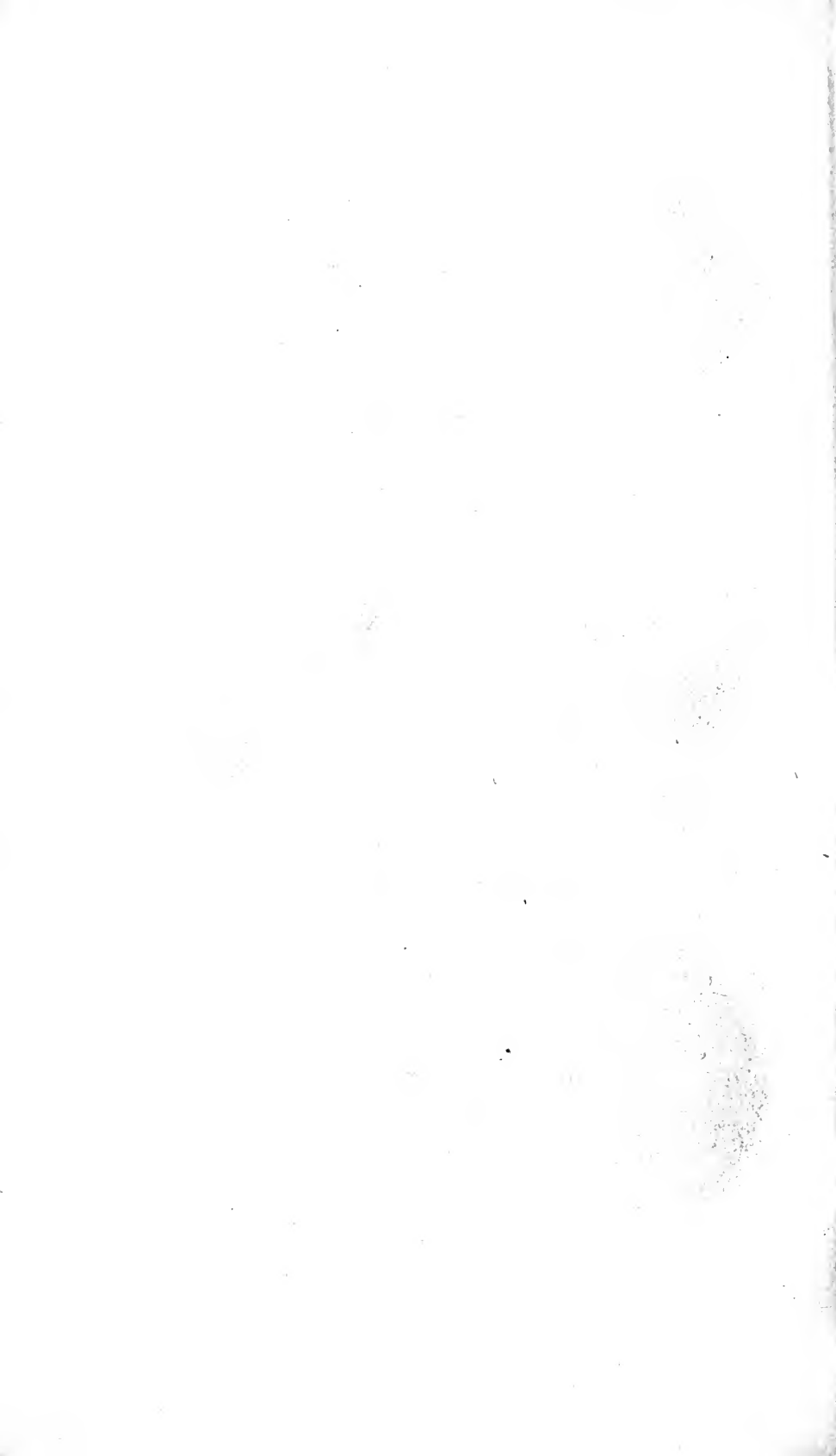
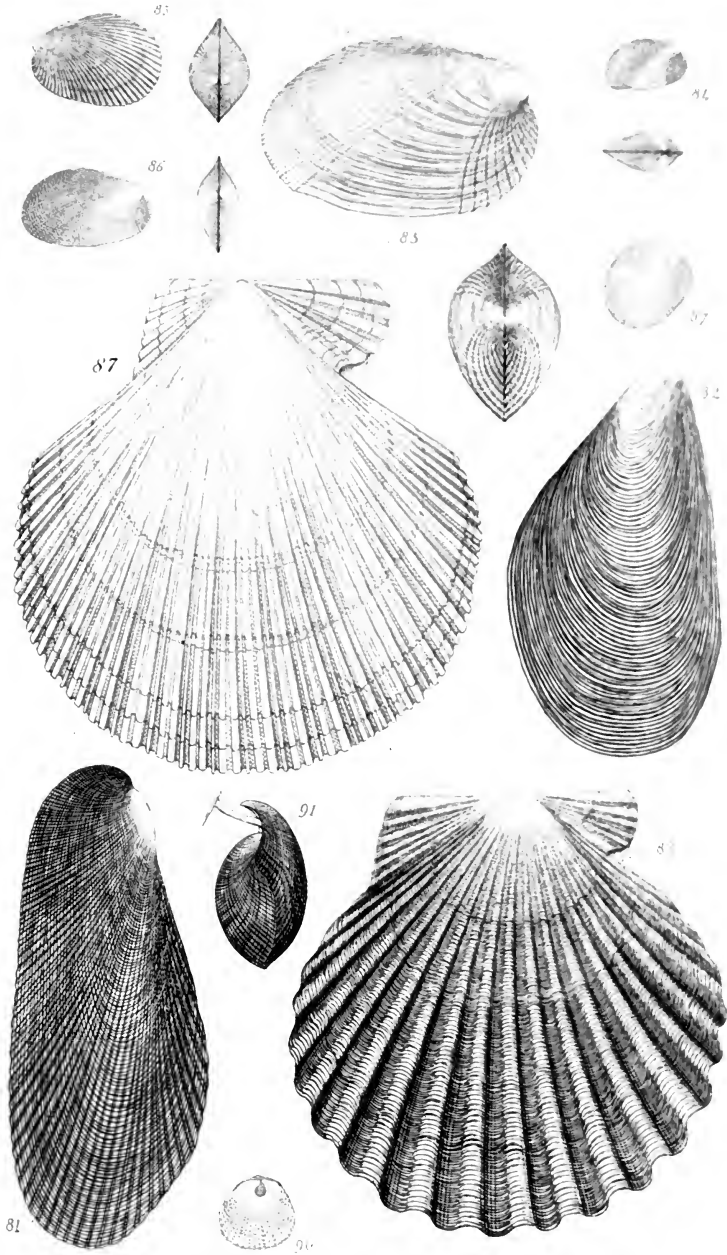


Figure 81 to 91



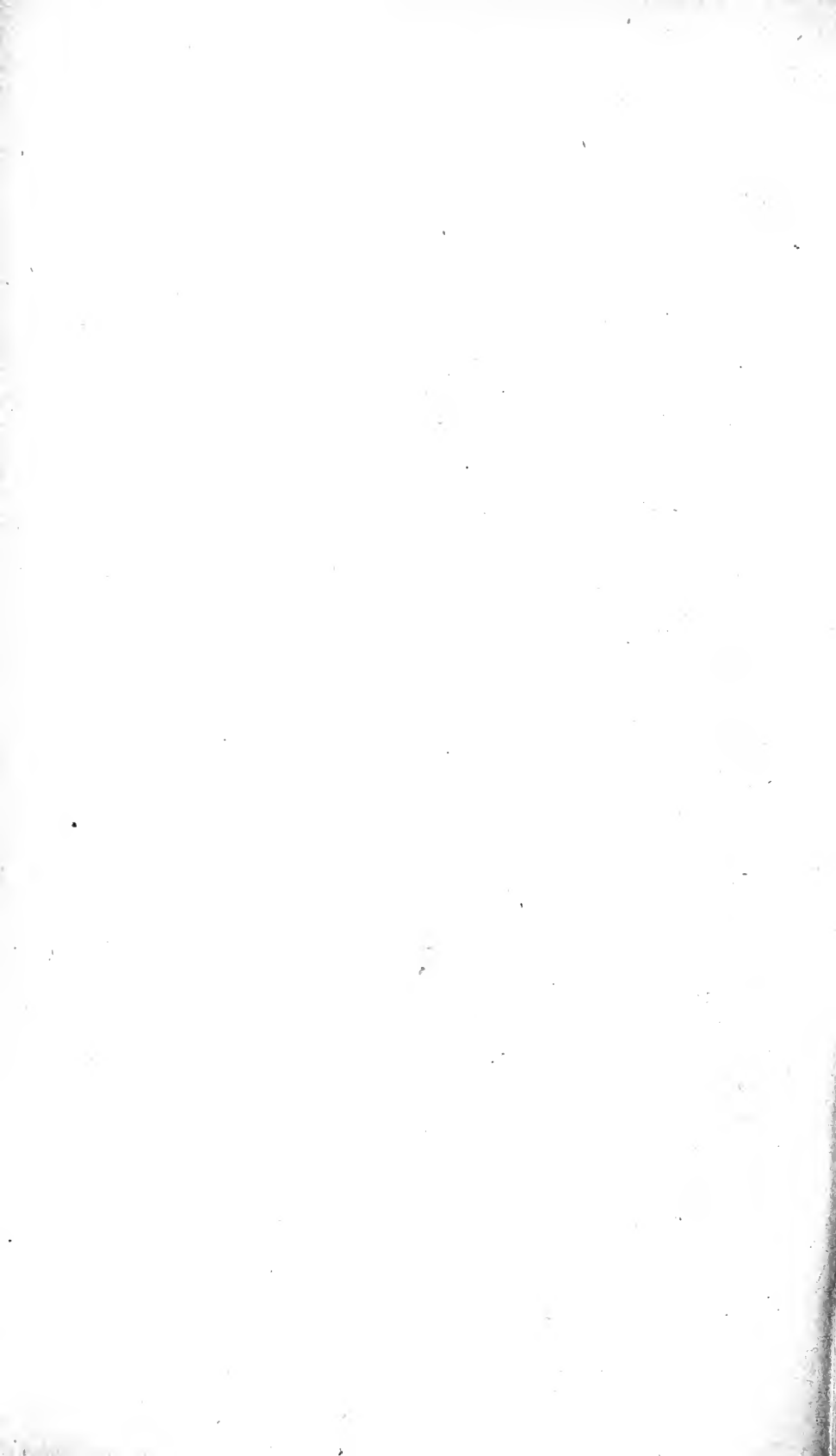
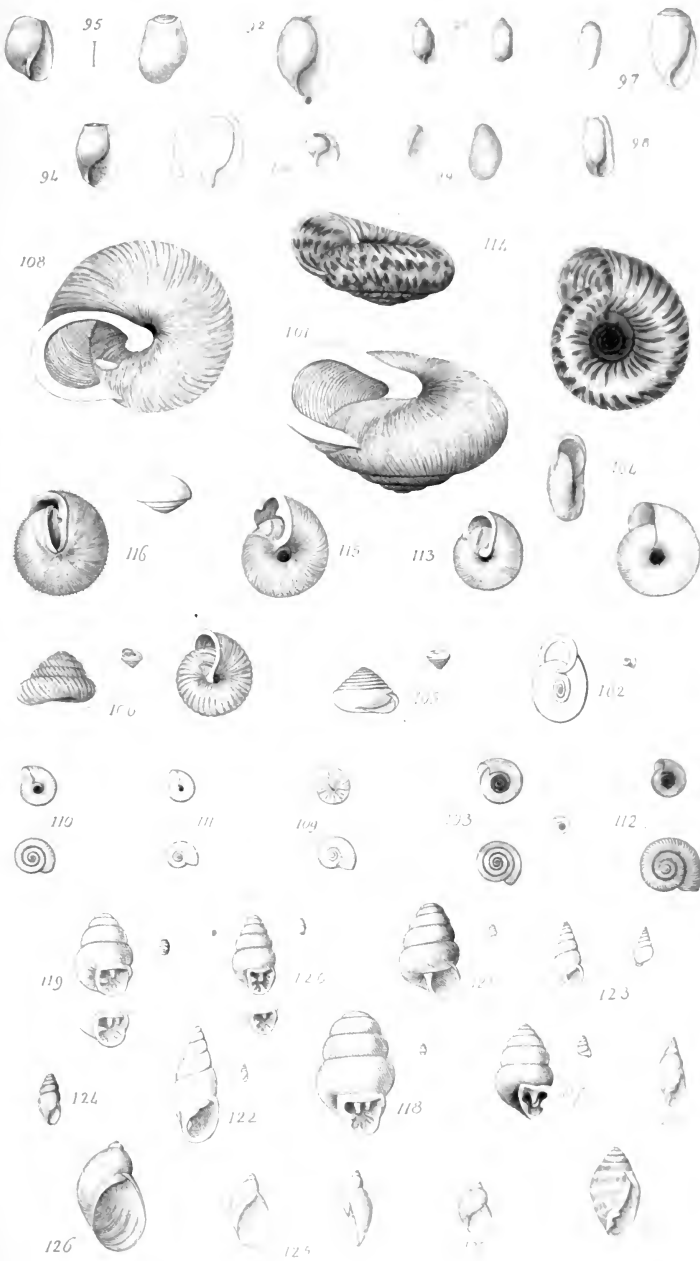


Figure 92 to 130



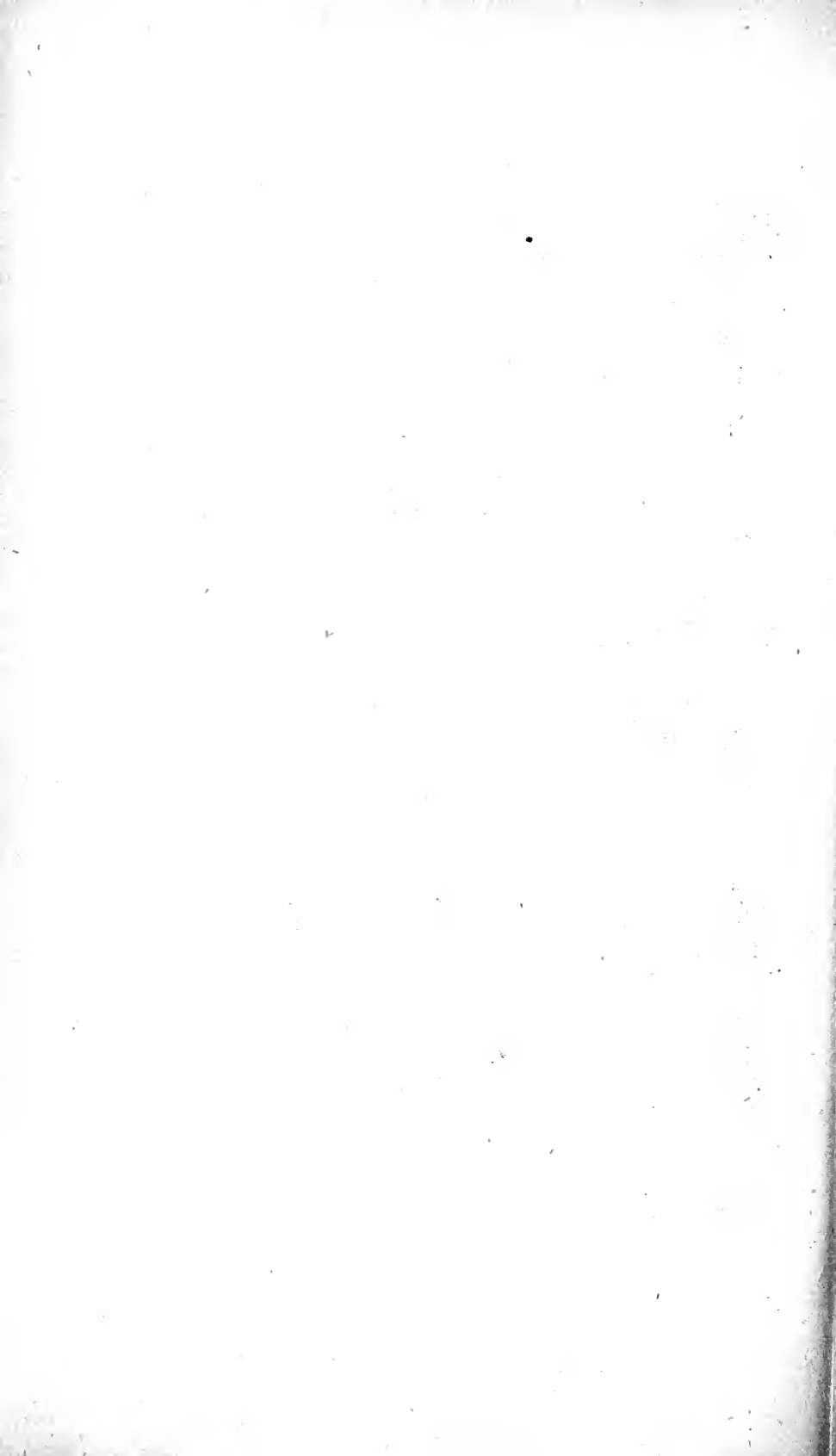
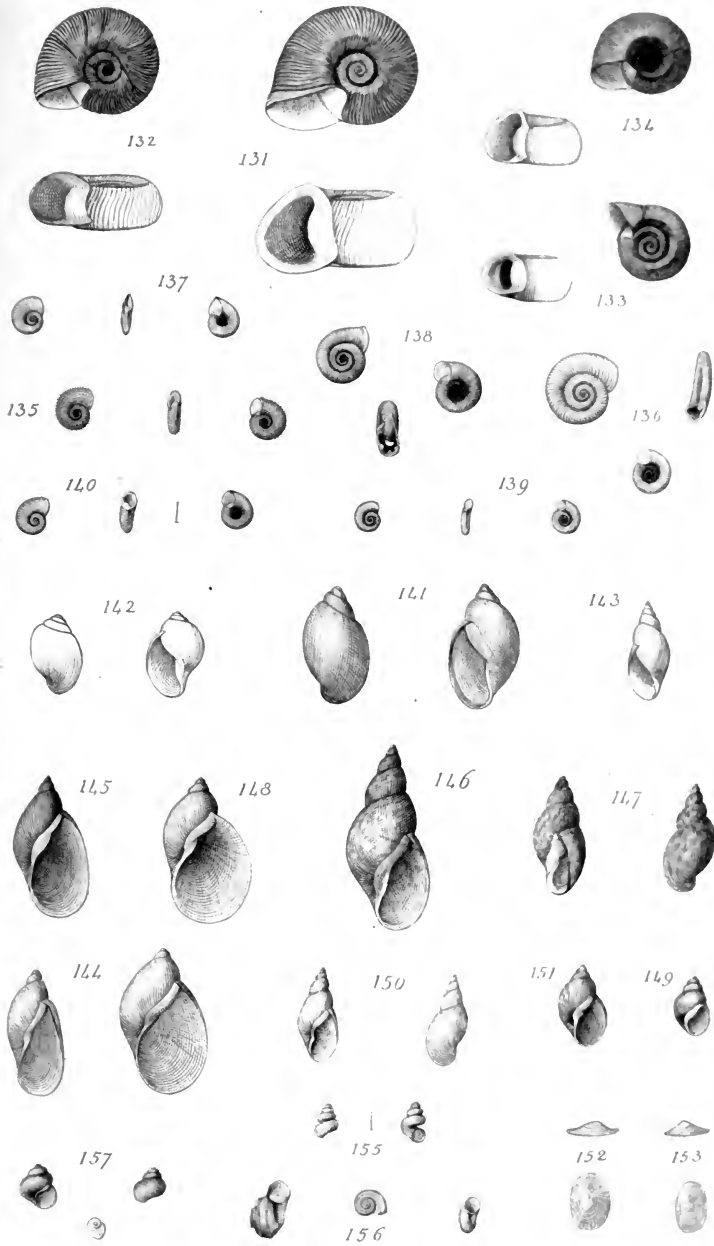


Figure 131 to 157



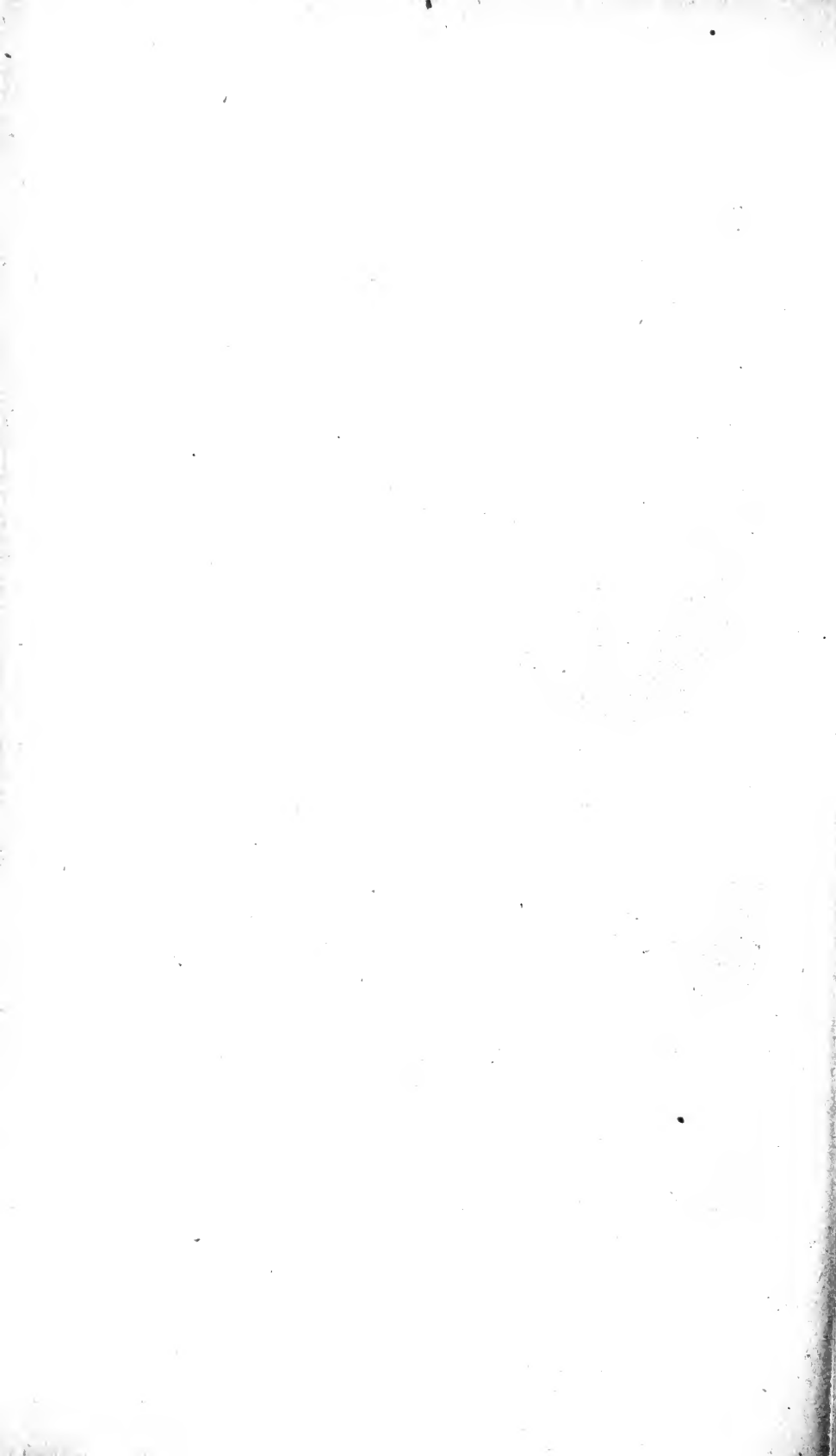
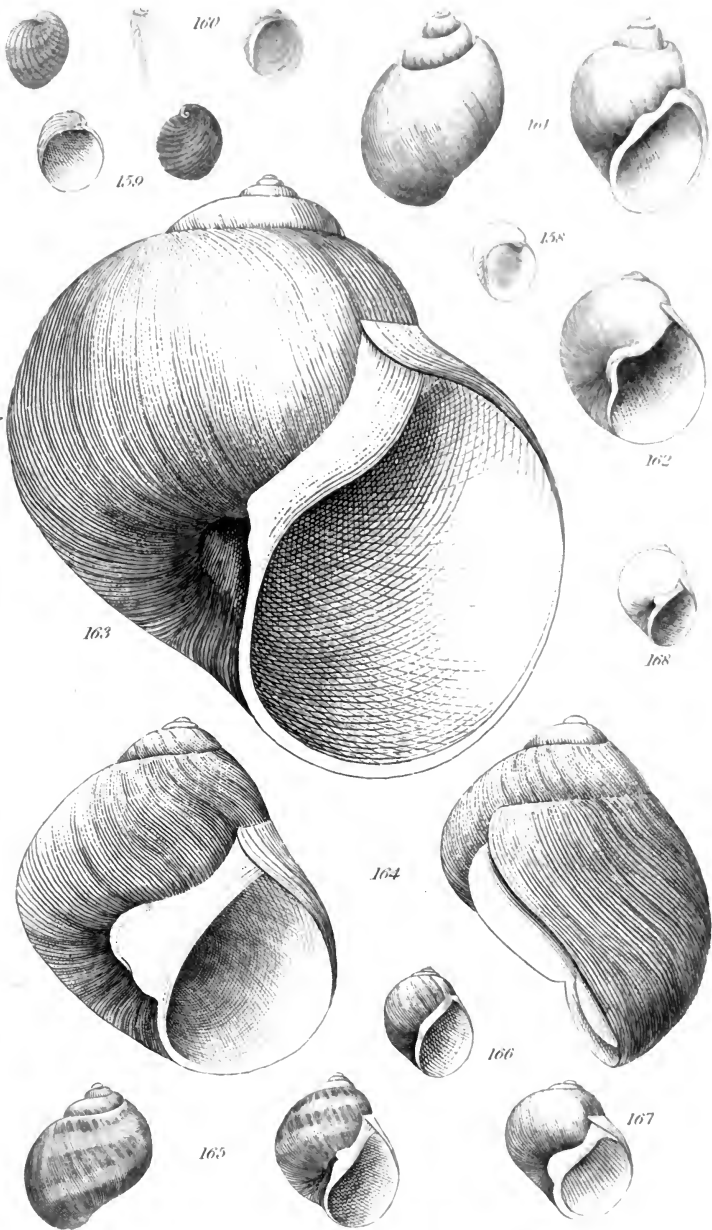


Figure 158 to 168



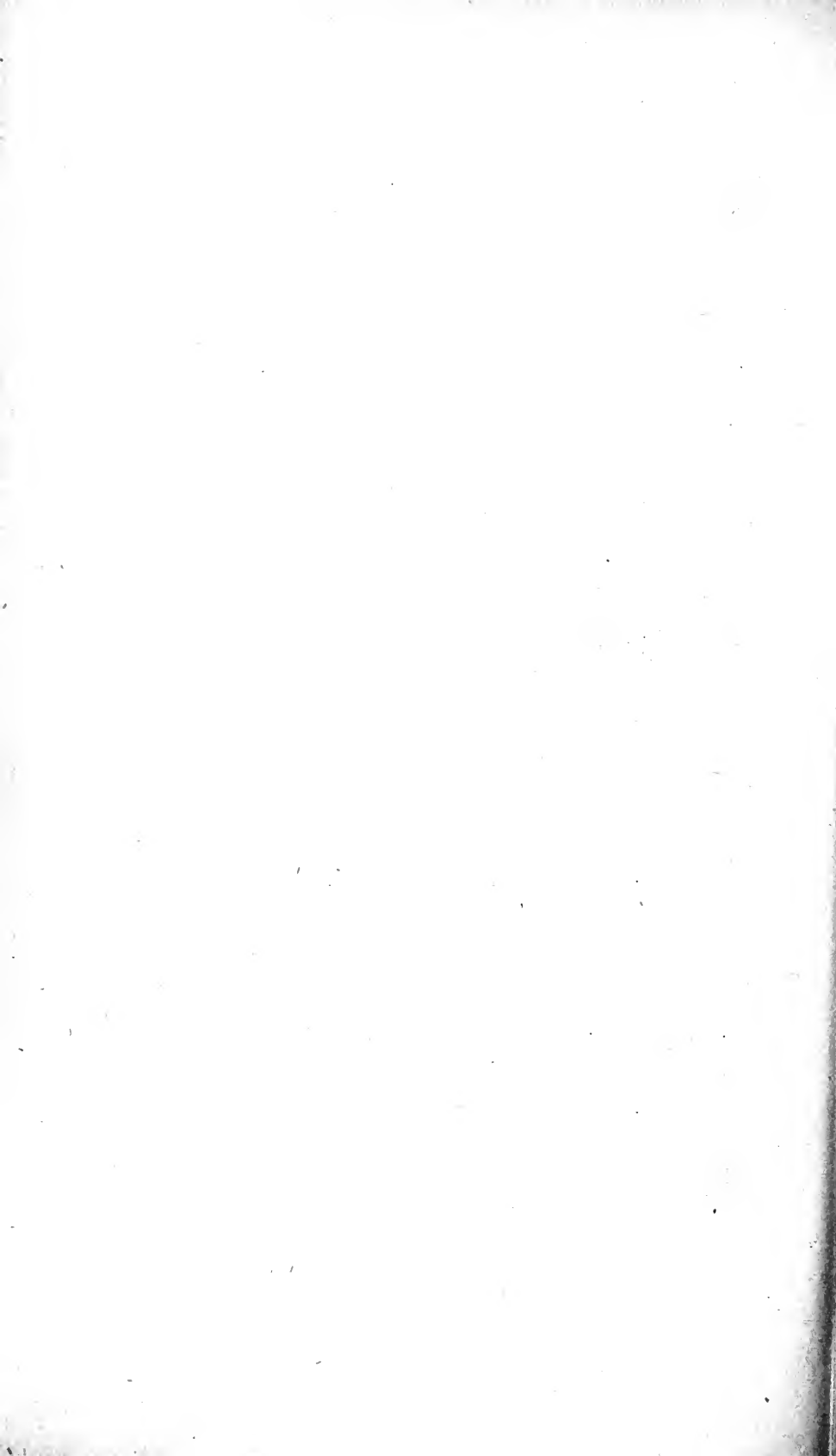
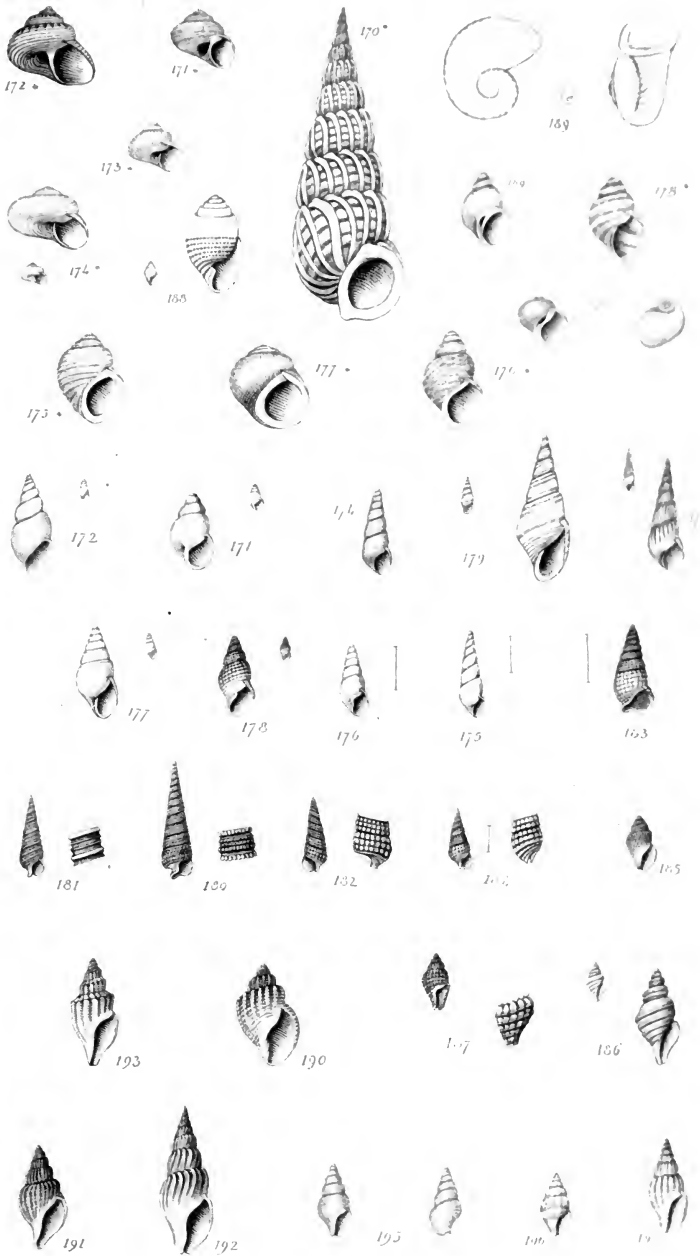


Figure 170 to 197



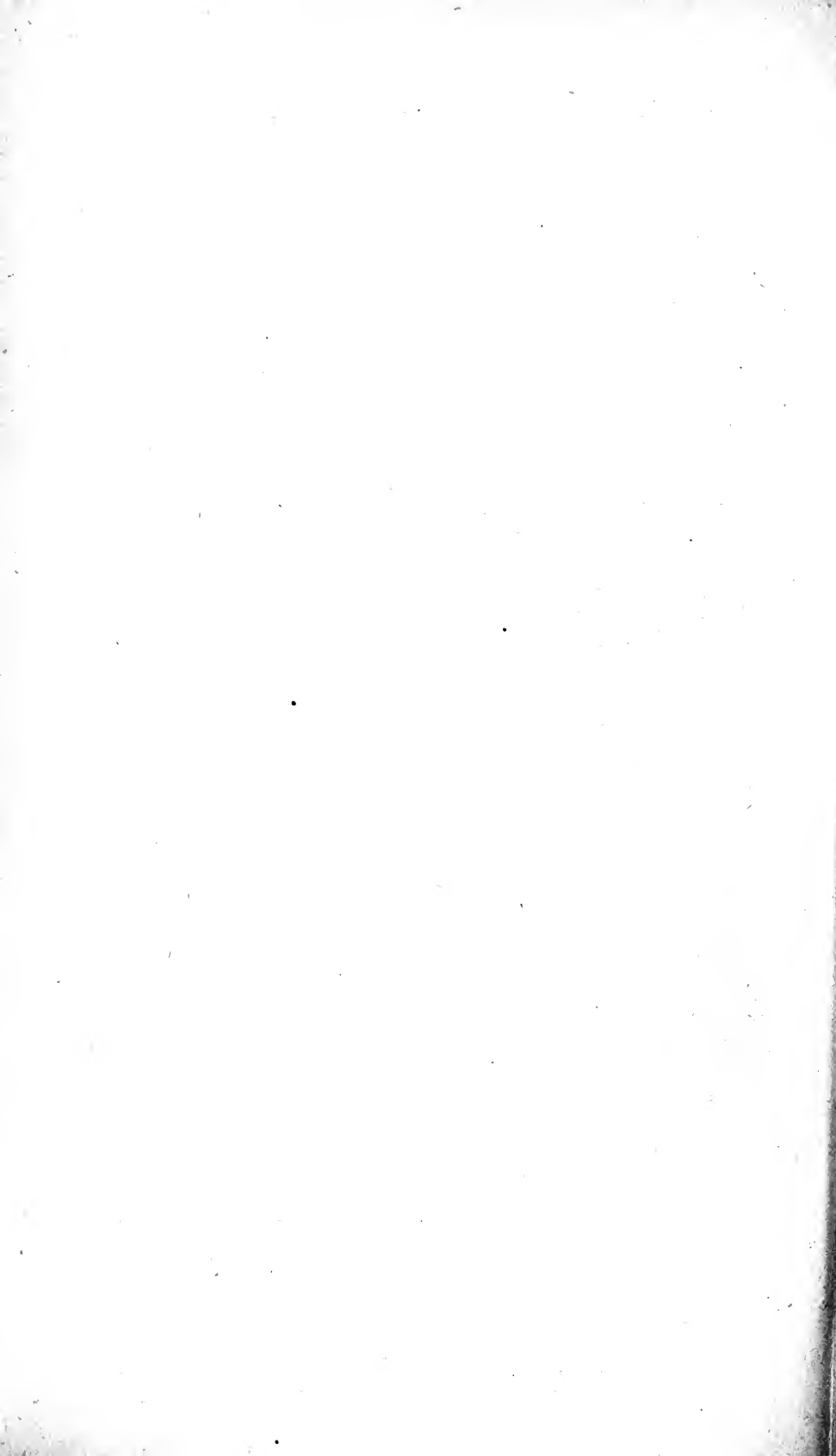
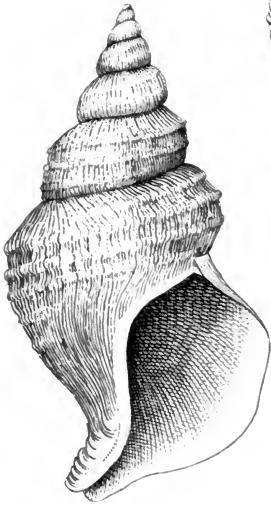
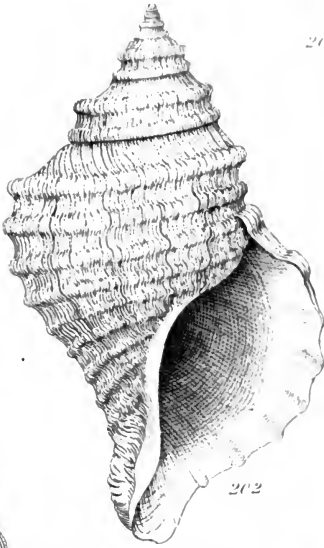
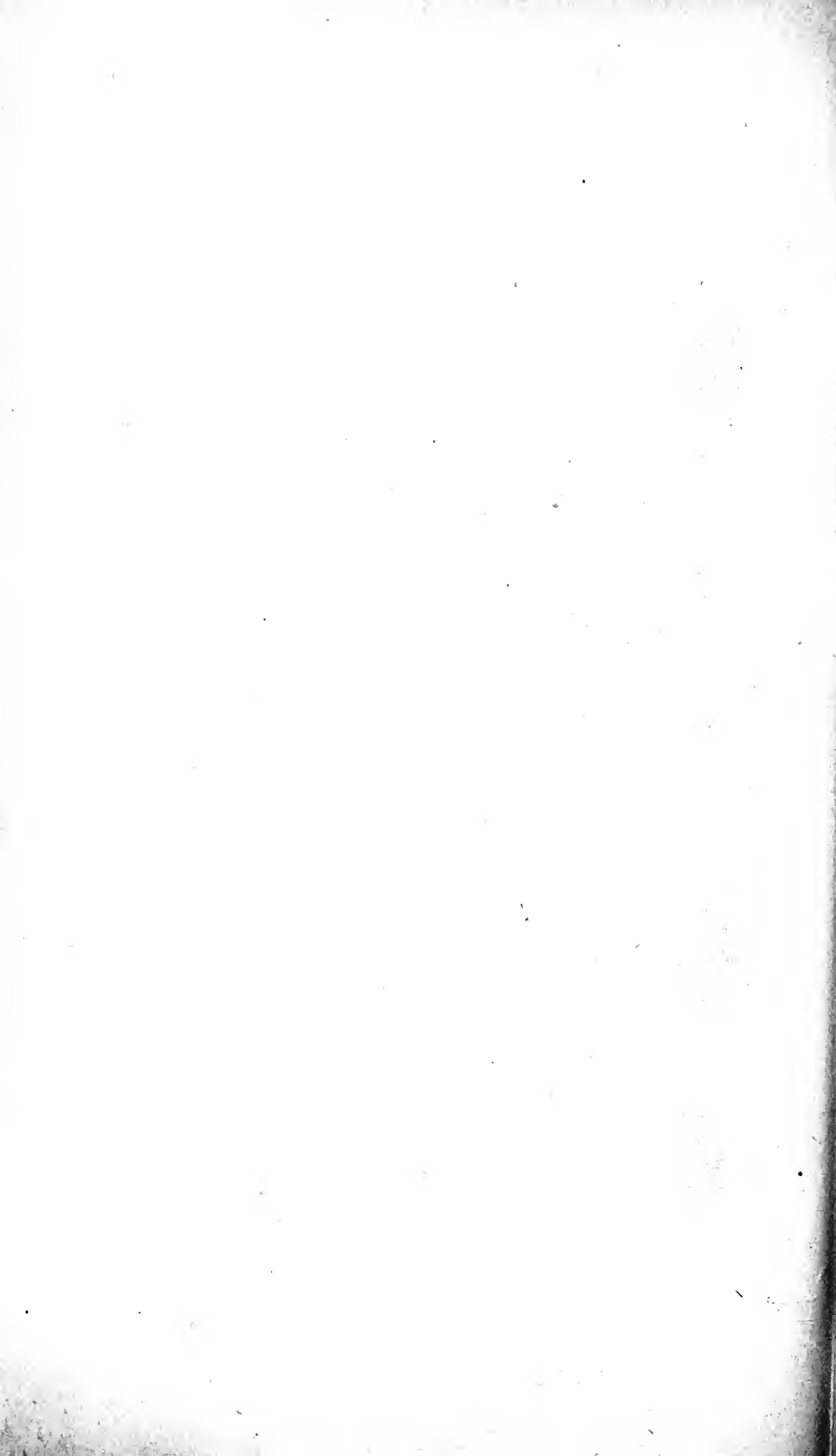
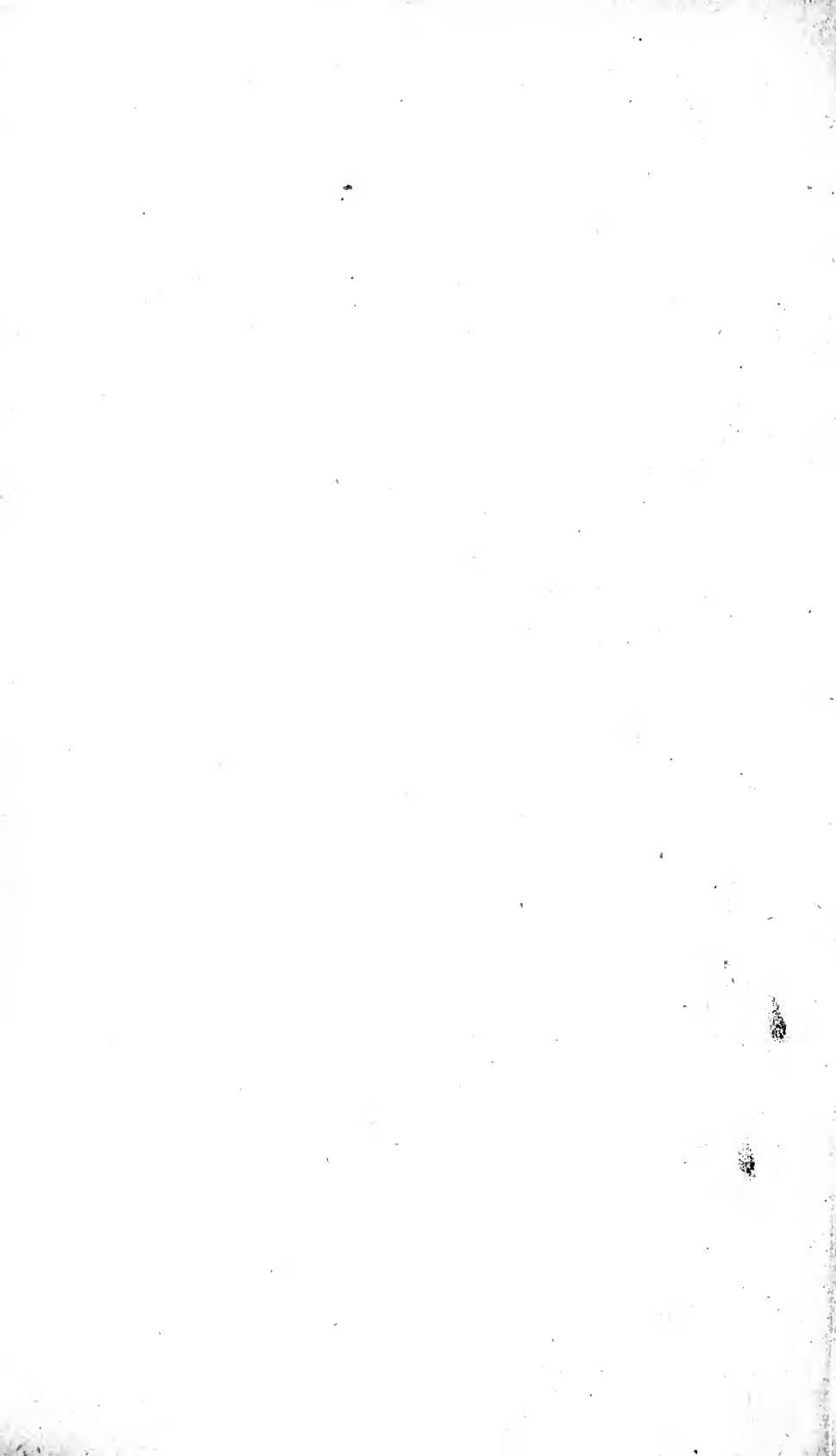


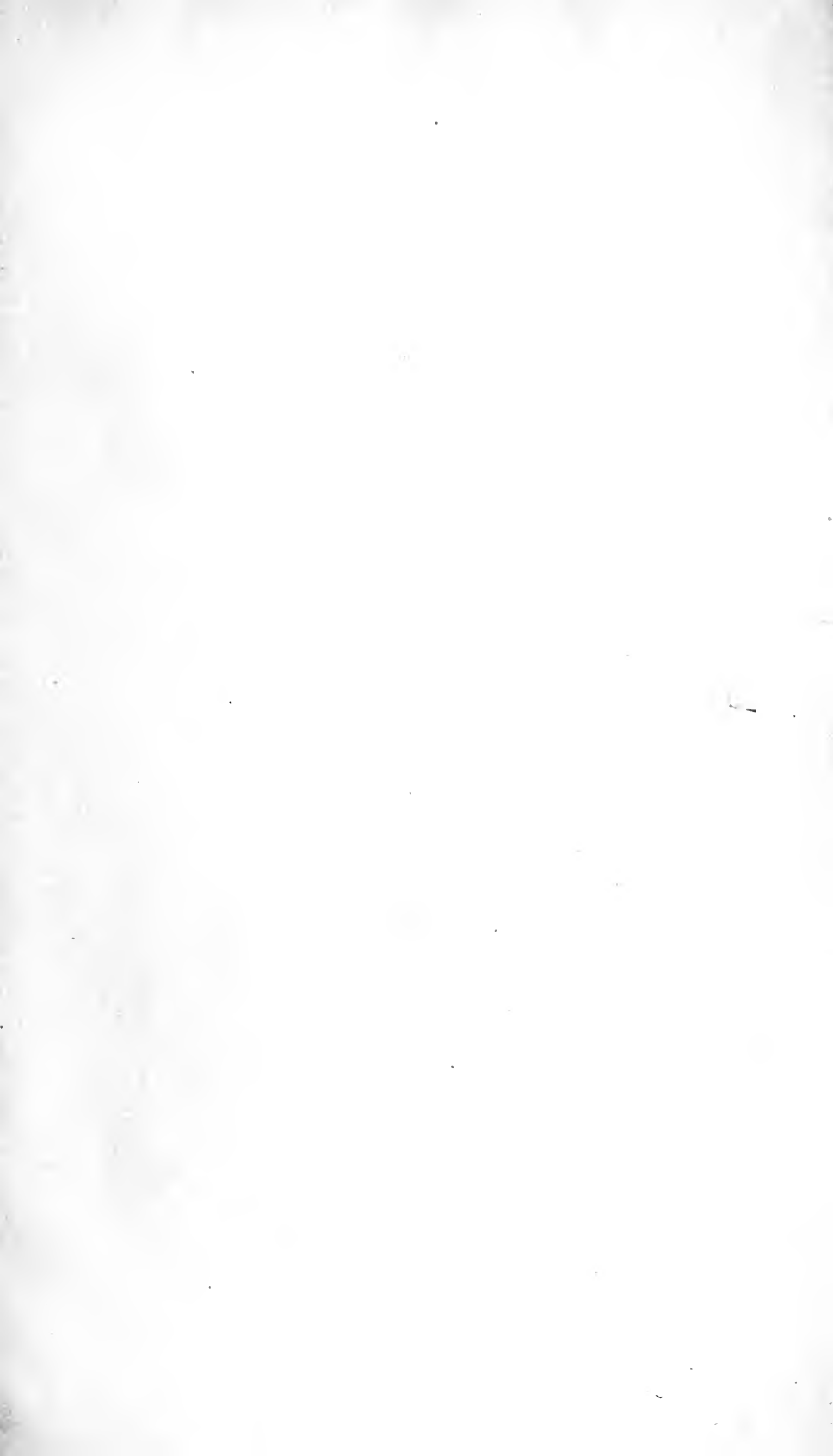
Figure 198 to 204











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