No. 6. — *Reports on the Results of Dredging, under the Supervision of* ALEXANDER AGASSIZ, *in the Gulf of Mexico* (1877–78) *and in the Caribbean Sea* (1879–80), *by the U. S. Coast Survey Steamer "Blake,"* LIEUT.-COMMANDER C. D. SIGSBEE, U. S. N., *and* COMMANDER J. R. BARTLETT, U. S. N., *Commanding.*

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XXIX.

Report on the Mollusca, by W. H. DALL. — Part I. *Brachiopoda and Pelecypoda.*

IN 1878, the mollusks of the "Blake" were intrusted to me for examination and report, and a Preliminary Note upon them appeared in August of that year (Bull. Mus. Comp. Zoöl., Vol. V. No. 6, pp. 60–62).

The following season a second instalment was received, and, in February, 1880, after a cursory examination of the material, I was enabled to furnish Prof. Agassiz with a short *résumé* of the general conclusions which seemed to result from the data obtained by that examination (Bull. M. C. Z., Vol. VI. No. 3, pp. 85–93).

My time during ordinary working hours being absorbed by official duties, and the entire period from February, 1880, to January, 1881, being occupied by field-work on the Pacific coast, progress has necessarily been slow; the more so, as nearly all the material consists of specimens so small as to require reiterated scrutiny under a glass to determine their characters. To separate and label the specimens contained in nearly two hundred different lots, to select specimens for figuring and to scrutinize and revise the drawings, to search the literature relating to mollusks for the scattered data in relation to such as are native to the region in question, and to accurately describe such species as seemed to be new, has been the task before me, to be carried out in the scanty leisure afforded by such evenings and holidays as were not necessarily otherwise employed. The delay in completing the work, it will be seen, has been inevitable under the circumstances, and my thanks are due to Prof. Agassiz, and others interested, for the patience with which they have kept these circumstances in mind.

In 1881, however, I was able to prepare preliminary descriptions of some of the more striking novelties (Bull. Mus. Comp. Zoöl., Vol. IX. No. 2,* pp. 33–144) and enumerate some of the more remarkable forms in the collection which had been described already. The dredgings of the U. S. Fish Commission having produced a number of deep-water species of limpets and chitons, — which were generously submitted to me for study by Prof. A. E. Verrill in charge of that material, — the investigation was facilitated by the possession of the Blake collection, and the study of the whole brought about the publication, in 1882,† of some extremely interesting facts in regard to these groups of mollusks.

Lastly, the investigation of the literature necessary for this work, and for the determination of the Tertiary fossils of the Southeastern United States, culminated in the preparation, under my supervision, of a general index to the species reported from the coast and islands of the region between Cape Hatteras, North Carolina, and Cape San Roque at the northeastern extremity of South America, including the Bermudas and West Indies. This is the first attempt to bring together the names of the alleged species said to inhabit this region, though there have been a number of excellent local catalogues. The list was found so useful for both biological and paleontological purposes, that it was printed by the U. S. Geological Survey as one of its Bulletins.‡ A short article on the characters of *Dimya*, based on the study of the soft parts, first collected by the Blake expedition, was printed in *Science* (No. 2, Feb. 16, 1882, p. 51).

* This Bulletin was first published in signatures, distributed as soon as printed to those most interested, as follows: pp. 33–48, July 12, 1881; pp. 49–64, Aug. 12, 1881; pp. 65–80, Aug. 25, 1881; pp. 81–96, Sept. 26, 1881; pp. 97–112, Oct. 31, 1881; pp. 113–128, Nov. 26, 1881; and the remaining pages and index, Dec. 5, 1881. By the great kindness of the Rev. R. Boog Watson, who supplied me promptly with his preliminary descriptions of the Challenger gastropods, of Dr. Paul Fischer, and of the late Drs. Thomas Davidson and J. Gwyn Jeffreys, who, working on deep-sea material, were equally considerate, I was enabled to complete this preliminary work without clashing in the matter of priority; all the descriptions of particular groups in the Bulletin alluded to being either intentionally subsequent or clearly prior to the work of the above-mentioned gentlemen on the same groups. It need hardly be said, that, when they led the way I was greatly the gainer from the acknowledged experience and ability with which their tasks were performed, and which greatly lessened my own labors.

† "On certain Limpets and Chitons from the deep Waters off the Eastern Coast of the United States, by W. H. Dall." Proc. U. S. Nat. Mus., Vol. IV. pp. 400–414, April, 1882.

‡ Bulletin U. S. Geological Survey, No. 24, 336 pp., 8vo. Washington, Government Printing Office, 1885.

Having enumerated the publications directly or indirectly related to work on the "Blake" molluscan collection, or portions of it, it remains to characterize the final report, of which this is the first part, and to make acknowledgment of the courtesies which have been extended to me by various naturalists.

Owing to the confused state of the Antillean fauna, mentioned in my Preliminary Report, and the wide distribution of many of the abyssal species, the work of identifying species already described, or deciding that they were not described, has required an unusual amount of labor, altogether disproportionate to the apparent result. The existence of quite a number of unfigured yet described species has rendered it probable that among those described some will eventually be found synonymous with forms previously known. This, however, must be expected in any work covering so large a number of little known forms from an imperfectly studied fauna. Those who have attempted similar work will best understand and excuse such involuntary errors. The investigation of the soft parts (in the small proportion of the collection in which I found those preserved) has added some important facts, and enabled a better judgment to be formed of the value of certain anatomical features, especially the gills, in general classification. I believe students will find especial profit in considering the new data in the groups represented by *Cuspidaria*, *Verticordia*, *Meiocardia*, *Dimya*, and *Pecten*. It is my impression, long since avowed, that, in the Pelecypods, no character yet fixed upon for the division of the group into Orders is sufficiently well defined to warrant its use for that purpose. They form a remarkably homogeneous assembly, in which the characters fade out gradually, or are imperceptibly modified in the transition from one minor group to another. The use of the adductor muscles has been by common consent of the best systematists practically abandoned. My friend, Dr. Paul Fischer, in his admirable Manual, now in process of publication, has essayed the use of the characteristics afforded by the gills for ordinal distinctions. The data in the present paper will, I think, show that this attempt can be no more successful than those which have preceded it. In various publications during the last twenty years, especially on the genera *Siphonaria*, *Gadinia*, *Chiton*, the true limpets, the *Cocculinidæ*, and their allies, *Dimya* and *Neæra* (= *Cuspidaria*), I have shown the extreme mutability of the branchiæ within narrow systematic limits; that they are organs which may exist or not exist in nearly allied genera; may be paired or unpaired structures; may be found coincidently with the presence of a lung, or in any stage of development from mere cuticular wrinkles to compound and very complex lamellar organs. If ordinal distinctions exist in the Pelecypods their fundamental basis has yet to be made clear.

The present paper is prefaced with some general observations on abyssal mollusks, the essential principles of which have appeared in several scattered articles, at various dates, but which I have thought it would be well to bring together and elaborate a little on the present occasion. I have added a systematic table of the species referred to in this part of my Report, deferring a complete and alphabetical index until the whole shall be printed.

I have included the Brachiopods under the general title of Mollusca, because I believe that, on the whole, the characters they present are those of animals most nearly allied to Polyzoa and Mollusca, and that there is nothing to be gained by splitting up the sub-kingdom thus constituted, however clearly we may recognize its subdivisions. The dismemberment which has been proposed by various authors is more a matter of phrase than of biological distinction. The intimate relation of the Mollusks, as a group, to the Worms, is indicated by many embryological and histological characteristics. The indebtedness of all the invertebrates to the vermian stock would bankrupt them to pay. To say that the Brachiopods are Worms, in any proper or literal sense of the words, appears to me as absurd as it would to assert that Vertebrates are Ascidians. It is a clear case of including the greater in the less. The relations are there, and should be fully recognized; but the subject should not be clouded by the miscomprehension of systematic values, or the misuse of systematic terms. It should not be forgotten that our knowledge of the development and even the adult anatomy of the Mollusca is trifling compared with the field which remains unexplored. Until more is known, we can well afford to acknowledge the inadequacy of the basis for any comprehensive statement of relations which may be termed conclusive.

During the progress of my studies I have had the privilege of continuous and friendly consultation with two veteran naturalists, Dr. Thomas Davidson and Dr. John Gwyn Jeffreys, who now rest from their labors. In the latter case, I have also had the advantage of being able to consult the original collection of Dr. Jeffreys now forming part of the U. S. National Museum.

To Prof. Spencer F. Baird, Director, and Mr. G. Brown Goode, Assistant Director of the National Museum, I am indebted for the opportunity for study of the collections made by the U. S. Fish Commission steamer

"Albatross" in the Antilles and on the eastern coast of the United States south of Cape Hatteras. These collections, to which frequent reference will be found in the following pages, though less extensive than those of the "Blake," often supplemented the latter in a very helpful manner, without which this report would have been in many cases less full and accurate. They also contained many novelties which will form the subject of future study, and are occasionally noticed here when they tend to throw special light on the subject in hand.

To the Rev. R. Boog Watson I am especially indebted for advice, criticism, early copies of his papers on the Challenger gastropods, and advance proofs of some of his plates to appear in his final report. To Dr. Paul Fischer, conchologist to the French expeditions on the "Talisman" and "Travailleur," and to Mr. Edgar A. Smith of the British Museum, reporter on the Challenger pelecypods, I am also under serious obligations.

To Dr. J. C. McConnell, whose pen drawings of shells for the process adopted in illustrating this paper speak for themselves, every reader will appreciate my indebtedness. It is proper to say, however, that this process does not lend itself like lithography to the reproduction of texture or surface, and that the details of description are in all cases to be taken as conclusive, even when the minor characters mentioned are not fully presented by the figures, or in the case of any supposed discrepancy.

The types of the species described will be found in the Museum of Comparative Zoölogy at Cambridge, and in the U. S. National Museum.

It has not been thought necessary to reprint the descriptions published in 1881, but, for the convenience of the student, the maximum length of the specimen figured, given in millimeters, follows the references to figures in the description of the plates.

The names adopted for species, etc., although conformed to Latin construction and whatever their resemblances, are not to be taken as derived from any classical language. The ravages of the purists upon our nomenclature, already disastrous, must be checked if possible, and I know no other way of doing it than to declare the above-mentioned names absolutely without meaning, whatever reminiscences they may awaken. Compare the observations of Adanson, more than a century ago, on this topic, in the prelude to his "Histoire Naturelle du Sénegal."

The arrangement of tables of distribution, in area and depth, is deferred until the second part of this Report shall be printed. For a satisfactory account of the faunæ of the deep sea the data are wanting, and can hardly be gathered in many years to come. The anatomical plates, which will probably have to be lithographed, are also deferred. Some interesting species, taken up too late to have figures of them included in the present set of plates, will be illustrated at the completion of the work.

General Considerations.

In any account of deep-sea Mollusca it is advisable to premise, first, that our knowledge of them is far from thorough or complete, and consequently our conclusions about them must not be considered as final in all cases. Secondly, the conclusions drawn from a study of the Mollusca, with their special modes of life and reproduction, are frequently quite different from the results which would follow from a study of other animals, such as fishes or sea-urchins, whose modes of life and reproduction are widely different from those of mollusks. In short, in drawing general conclusions we cannot include all classes of deep-sea animals as if they formed a homogeneous population.

There are of course certain features in regard to which general rules apply to all the inhabitants of the deeps, but they are few and liable to modification with greater knowledge.

In discussing the Blake collections the work done by other expeditions is often important for the proper understanding of the facts developed, and consequently will occasionally be referred to for that purpose.

The "Challenger" and "Albatross" have both dredged in close proximity to some of the Blake stations; probably the richest haul on the whole Challenger voyage was that obtained near St. Thomas in the West Indies.

The collection of Mollusca obtained by the parties on the "Blake" was notable in several respects beside those which may be reasonably ascribed to the methods used in collecting. To the latter we may refer the absence or rarity in the collection of very minute forms, which are only accidentally preserved in the contents of a trawl net, even from comparatively shallow water; while it is hardly to be expected that, in the long period of washing and straining which the contents of a trawl undergo while being hauled in from deep water, anything small enough to go through the meshes of the net should be retained.

On the other hand, large shells appear to be rare in the great depths, and when found are usually of great fragility; so that their destruction or serious fracture is almost inevitable. For these or other reasons, deep-sea dredging has afforded few specimens of even moderately large size, judged by the standard of shells living in shallow water or along the shores. Among shell-less mollusks several which were of unusual size have been found by different expeditions, one by the "Challenger," belonging to the *Dorididæ*, being as large as an orange. All of these, however, were of a peculiarly loose and gelatinous consistency. It would seem as if a certain looseness of texture is required by the conditions of great pressure which exist in the depths, in order to afford that thorough permeation of the tissues by water necessary to equalize the pressure. Whether this, as seems most probable, or the expansion due to removal of the pressure on being carried to the surface, is the cause of the looseness referred to, is uncertain, but that the deep-sea animals of this group, as well as the fishes, exhibit such a state is certain. The shells almost without exception are extremely thin and light, often reminding one of the delicate dwellings of some of the tropical land snails; to which a curious resemblance in form and texture may frequently be noted.

The colors of the abyssal shells are almost always faint, or delicate, though often very attractive from their very delicacy. The iridescence or pearly character of the shell, in many groups, is often of peculiar brilliancy and beauty, and it seems as if the texture of many shells not intrinsically pearly was nevertheless of such a character as to give out a sort of sheen in the abyssal species which is wanting in their shallow-water relatives, and may be compared to pearliness.

While we do not find in any of the deep-sea species those sturdy knobs and stout varices which ornament the turbinellas and conchs of shallow water, and have made the great group of rock-purples, or Murices, so attractive to collectors, there are nevertheless many abyssal shells which have a delicate, and sometimes profuse sculpture, even more elegant. The surface is frequently etched with a sort of shagreen pattern, varied in detail and hardly perceptible except by a microscope, but extremely pretty. In some the entire surface is adorned with profuse arborescent prickles; in others, pustulated with the most delicate shelly blisters, systematically arranged, and which perish with a touch. In most representatives from deep water of the family of scallops (*Pecten*), the shell is as thin as a sheet of mica, its constituent prisms large enough to be seen with the naked eye; translucent, strengthened within by delicate shelly riblets radiating from the hinge and often picked out externally with delicate dots and splashes of orange, scarlet, or maroon. Some of the family of top-shells (*Trochidæ*) are variegated with lovely colors. In one form, those dredged in deep water by the Fish Commission in the latitude of New York are stout, tall, and brightly variegated with yellow and red-brown. In the specimens obtained from deep water on the coast of Florida by Pourtalès, and by the "Blake" in the West Indies, the form is more depressed, the shell far more delicate, the colors pale pearly tints of lemon and pink. It seems as if differences of temperature and nutriment, as between the north and the tropics, were indicated in very similar ways, both by the dwellers in the deep sea and those which inhabit the land.

It might be thought that in the abysses, of whatever latitude, the conditions would be so similar that we should find the same animal presenting few, if any differences, from whatever part of the ocean it might come. This is to some extent true of the great oceanic deeps away from the continental shores and archipelagos. There the water is always cold, and a certain and not very profuse mollusk fauna has been found widely spread; having apparently migrated from the polar regions, and perhaps especially from the south polar regions, into the deeps of both hemispheres. It is very necessary, in considering the distribution of the deep-sea mollusks, to bear in mind the different values which the expression "deep sea" has had, and which, if confounded, would give rise to serious errors.

Formerly, when dredging with the usual appliances in small boats, one hundred fathoms was considered extremely deep, and specimens from even half that depth were considered as having come from deep water. This was proper enough when the collections were compared with those from the shore between tides, or even from the adjacent region below tide-marks, but which supported a growth of algæ, either ordinary sea-weeds, or the solid calcareous kinds known as corallines. But when naturalists began to investigate at much greater depths, the old terms lost their meaning.

For present purposes deep-sea mollusks may be taken to include all those living at depths too great to allow algæ of any sort to flourish, the limit depending somewhat on the locality. Those living only above that limit would form the littoral fauna, which, roughly speaking, may be said to extend from the shores to about one hundred fathoms in depth. With them in suitable places would be mixed many deep-water forms, which extend their range to shallow water without being characteristic of it.

The remainder of the sea would naturally be divided rather by temperature than depth. But the temperature itself is somewhat dependent upon the depth, the influence of the great warm currents of the ocean rarely extending below seven or eight hundred fathoms, and this depth corresponds roughly to a temperature of about forty degrees Fahrenheit. Below this it diminishes to the freezing point at the rate of about one tenth of a degree to one hundred fathoms, forming the area which will here be called the abyssal or benthal region. The area between the abyssal and the littoral regions, chiefly on the slopes of the continental platforms, may be called the archibenthal area.* In the abyssal areas the temperature at the bottom is known to be quite uniformly cold, the supply of food sinking from the surface cannot vary much in kind or quantity, and the distribution of life is comparatively sparse and uniform, as might be expected.

But it is not in the abysses that the chiefest treasures of the dredger are to be found, nor the richest abundance of species and individuals. For these we must look to the archibenthal region skirting the continental shores or islands, where strong currents bring abundant food and change of water, especially on relatively steep slopes which descend from the hundred-fathom line toward the deeps; there it is that the richest harvest comes up in the trawl. Such spots were found by Pourtalès near the Florida reefs; by the "Blake" near Cape San Antonio and off Grenada; by the "Challenger" near St. Thomas; and by the Fish Commission off Martha's Vineyard. This increase is due to a variety of causes. In the first place it is certain that warm waters are more favorable to a diversity of development and increase of individuals than cold ones. They are more stimulating to the organization both ot the mollusk and of the creatures which form its food, and both multiply in concert. Secondly, the mollusk fauna of such regions, beside its population derived by migration from the abysses, is made up in great part of forms related to and connected with those which have developed along the shores, which are constantly being carried by tide and other agencies into deeper water than that in which they originated. There a certain proportion of them continue to flourish, probably become more or less modified by change of food and environment, and so contribute to the variety and number of the fauna. It is not always, perhaps not often, that the species of the archibenthal region originally derived from the shores are to be found on the shores immediately adjacent to the spot where they are dredged. Often the littoral and adjacent archibenthal mollusk faunæ are entirely, or almost entirely, dissimilar. This is the case off the coast of Africa, or off the coast of New England, as observed by the naturalists of the U. S. Fish Commission and the French expedition on the "Talisman." But either in the far north or in the tropics we

* These areas have been generally recognized and called by various names. Prof. A. Agassiz has termed the archibenthal area the "continental region."

shall find in shallow water of the appropriate temperature the species in question. Drawing a line from Hatteras to Madeira, and considering the species dredged from the Atlantic Ocean north of this line, by all expeditions up to 1883, in water more than one thousand fathoms deep, we find that more than forty-two per cent of all the species of mollusks are found somewhere or other living in water less than one hundred fathoms deep. If we knew the littoral fauna of the tropics better, it is probable that the percentage would be much increased. A similar result has followed the study of the Blake collections, though the exact figures are not ready to be given.

If, on the other hand, we consider the larger groups, such as genera or families of mollusks, we shall find that the percentage of those peculiar to the archibenthal and abyssal regions is extremely small, though future researches are likely to enlarge it. We must regard the species which have extended their range so far beyond their littoral area of origin as having taken advantage of the uniform conditions of food and temperature offered by the deep sea. In this connection, it should be observed that the temperature limits of many species are more sharply defined on the side of cold than on that of heat. The difference between 45° and 40° F. may absolutely check the distribution of a species which would find no inconvenience in a rise of temperature from 45° to 80°. It is probable that this is connected with the development of the young, rather than the resisting powers of the adult mollusk, since it has been shown by Brooks and Ryder that a fall of a very few degrees in temperature of the water was fatal to all the floating embryos of the American oyster. A much greater rise would probably only have hastened the development of the embryos.

It is quite within the limits of probability that archibenthal species might rise to the littoral zone in some far distant locality, and by a change in the direction or temperature of an ocean current all the intervening deep-water individuals might perish, leaving two widely separated colonies of the same littoral species. The weight of probability, however, is greatly in favor of the continuous uniformity of the deep sea as compared with the shores, and it is probable that they are materially modified only by physical changes of great importance, such as raised the Isthmus of Panama above the sea.

On the steep slopes above referred to, the currents bring a great variety and amount of material, which sinks to the bottom and furnishes food or protection to the creatures which live there. Often the most diverse elements enter into the accumulations. In one haul made by

Sigsbee near Havana, but in over four hundred fathoms, quite a large number of common Cuban land shells were found, beside quantities of marsh grass, bits of rattan, bamboo, sugar-cane, dead leaves, etc., all of which were in good condition. If fossilized with the living sea shells dredged with them, the deposit, as observed by Prof. Agassiz (Bull. M. C. Z., Vol. V. p. 295), might sorely puzzle paleontologists of a future century seeking to determine the circumstances under which it was formed.

When we consider the great uniformity of texture of the deposits forming the floor of the oceanic deeps, it would seem as if the environment offered attractions for only a limited variety of forms. The bottom is generally composed of extremely fine impalpable mud, and in many portions of the abyssal area offers no stones or rugose inorganic objects for sedentary mollusks to perch upon. It is not quite destitute of such stations, however, and all are utilized by the abyssal population. In the absence of stones, many unusual selections are made. The chitinous tubes of hydroids and the irregular leathery dwellings of tubicolous annelids are occupied, after their original owners are dead or dispossessed, by various little limpets, such as *Lepetella* and *Cocculina*. The long spines of the abyssal sea-urchins or echini offer a welcome perch for species of *Capulus*, which, when they grow too large to find a satisfactory foothold, secrete a shelly pedestal which serves them for life. The carbonic acid in the water rapidly destroys the shells of such mollusks as die in the great depths, so that they do not form gravelly accumulations or "coquina" rock, as in shallower waters. A bivalve, *Modiola polita*, related to the ordinary mussel of Northern seas, spins a sort of nest of stout byssal threads, in which it is completely concealed, and which protects in its meshes, not only the young fry of the maker, but various little commensal animals of different orders, such as mollusks, worms, and crustacea.

In the evolution of animal life two classes may be recognized: those which maintain successfully the struggle for existence by facility in varying their superficial characters to meet the exigencies of their environment, — in short, by their facile plasticity; and a smaller group, which seem to have an innate strength of constitution which resists the influence of changes in the environment better by a dogged persistence in their original form. These respond little, if at all, by external variation, to the ordinary fluctuations of the physical world about them. This has been noted by Darwin in birds, in his comparison between the variations of pigeons and the "inflexible organization" of the goose. But it does not seem to have been realized among naturalists that natural selection may act, in certain cases, as successfully by confirming the inflexibility of a particular stock, as it does in others by seizing the favorable variations of the vast majority of living beings which vary indefinitely in all directions. Yet the former method may explain the long persistence with but slight modification of certain organic forms through immense periods of time and vast areas of distribution. The few mollusks which have been recognized as wellnigh world-wide in their spread, owe their uniformity, it is likely, to some such cause as this. Those mollusks which live on algæ and other vegetable matters, and are ordinarily called phytophagous, are almost absolutely wanting in the depths of the sea, where vegetation except as a sediment from near the surface does not exist. We have, then, at the bottom of the ocean, a fauna almost exclusively of animal feeders, who receive their sustenance chiefly from a constant gentle rain of dead or dying animals whose normal existence is passed near the surface of the sea. For this reason, the flesh-eaters of the deep sea, among mollusks at least, are not obliged to prey upon each other to the same extent as the shallow-water forms. The latter have to take part in a fierce struggle for existence, among the vicissitudes of tidal and storm waves, variation in elevation of land, and a vastly denser population of all sorts. In proportion to the whole number, comparatively few of the shells dredged from deep water show the drill-holes of enemies of their own kind, or the fractures and injuries so common in shells from littoral dredgings.

It will be borne in mind, that the influence of natural selection on variations in external characters, the conditions remaining about the same, is toward the production of a stable equilibrium in specific characters in any species, and the more so when the characters presented for its action are salient. For instance, if a few strong, long, sharp spines protect a certain species against the attacks of fishes, this character tends to be preserved in the species, and as a rule — confirmed by observation I may add — there will be little variation in the position and number of the spines in question. In another case, where the same end has been attained by the production of a profusion of similar spines, the presence or absence or exact position of any one or more of the spines is less important to the animal, is therefore less sharply restricted by natural selection, and the tendency to vary within a certain range is less affected, and persists. For these and perhaps other reasons also, it may be stated as a general law in animal structures, that the greater the number of similar parts in any member of an organic individual, or of similar members, the greater the tendency to vary, first, in the minor features of these parts or members as compared with each other, and, secondly, in the number of similar parts or members in any individual as compared with the average number characteristic of the species,* or presented by any other individual of the species.

What is true of minor details in a complex series — where the complexity relieves the detail of its importance as a part of the total, considered as a subject of selective action — is true of individuals of any species, if we suppose the conditions uniform, and of such a kind as to bear but lightly on specific characteristics. The latter, in mollusca, are chiefly features of external form, color, and sculpture. Now, if the form, color, and sculpture are unimportant in the struggle for existence, in any given case, it follows that selective action will cease to affect them, except so far as they may be indirectly dependent on other characters which remain important and continue to be selected. Such correlation has not been shown to be frequent in mollusks, if even its existence can be said to have been demonstrated. I believe it to be an important factor in a certain sort of cases, not however those we are considering. The deep sea is doubtless very dark, if not absolutely destitute of light. The water must be very quiet, the character of the bottom almost uniformly soft and level. Most of the enemies of mollusks there are blind, or at any rate can have little power of vision for objects not luminous. The absence of violent motion in the water removes from the category of modifying influences any mechanical effects of that medium upon the shell-fish contained in it. So it is evident that the factors which would affect the restriction of "tendencies to vary" in the above-mentioned characteristics, are almost eliminated from the environment, especially if it be compared with that of littoral species. The logical result therefore is, that we may expect in the deep sea a very wide range of variation in form and sculpture within the specific limits of the "flexible" species, and an almost complete uniformity over very wide areas of the forms which we may consider as "inflexible" species.

This is what, according to my judgment, is actually found. With

* This has been to some extent recognized by Owen in his discussion of vegetative repetition, and is illustrated by the variations of number in the teeth and phalanges of cetaceans as compared with seals or other mammals; in the number and variation of segments and segmental appendages in worms; in the teeth of the *Helicidæ*, the coils of the shell in *Polygyra*, and in the spiny processes of certain *Muricidæ* among mollusks. See American Naturalist for Sept., 1881, pp. 711, 712.

few exceptions, — which may be assumed to belong to the "inflexible" group, — in those cases where a considerable number of individuals of one species were obtained by the "Blake," the variation in form and sculpture is very wide, much more so than in most littoral forms. Owing to the absence of light, color in abyssal mollusks is almost wanting; but in the species which possess it, as in some of the Pectens and Calliostomas, the range and variety of coloration within the species is very wide. The tints are chiefly browns, pinks, and shades of yellow. The sheen and play of colored light presented by the pearly species are remarkably brilliant and fine. Among the archibenthal forms a notable number are characterized by squarish red-brown spots on a light-colored ground. I suspect that the abyssal mollusks are less active and energetic than their congeners of the shores. This is indicated by the looseness of the tissues, less favorable to prompt and violent motion than more compact muscular apparatus would be. The tenacious character of the mud forming the ocean floor, noticed by all explorers of the deeps, would also tend to make motion through it slow and difficult. The delicacy of the shells, the extreme fragility and tenuity which mark them, are inconsistent with liability to constant friction and collision, either from the motions of the animal itself or of the waters in which it lives. An exception may be noted in favor of the swimming mollusks, such as the squids and cuttlefishes, but the deep-sea representatives of these groups are far softer and less muscular than their shallow-water relatives.

Much of the sculpture which is presented by the deep-sea species is particularly beautiful from its delicacy. There seems to be an especial tendency to strings of bead-like knobs, revolving striæ and threads, and delicate transverse waves. It is particularly notable that many of the deep-sea forms, among all sorts of groups indifferently, have a row of knobs or pustules following the line of the suture and immediately in front of it. The representatives of the rock-purples, or Murices, a group which, in shallow water, frequent the rocks and stony places, and are there strongly knobbed or spinous, retain a similar character in the deeps, but the processes in question are extremely delicate or foliaceous, instead of being stout and strong. This is probably a reminiscence of the time when their distant progenitors were shallow-water animals.

The groups which subsist upon other animals with a hard covering, so that they have to bore or break their way to their food, are much less numerous in the deep sea than those which feed upon soft tissues, or kill their living prey by bites with poisonous fangs. The latter, *Toxo-*

glossa, as represented chiefly by the *Pleurotomidæ*, outnumber any other single group of mollusks in the abyssal fauna.

The groups of less specialized character, such as the tooth-shells (*Dentalium*), are rather abundant in species, more so than those of a medium character which intervene between them and the highly specialized *Pleurotomidæ*, but our knowledge of the deep-sea Mollusca is yet too imperfect to afford any important generalizations on this score. So far as yet determined, the groups systematically lowest in the scale, such as the *Chitonidæ*, or mail-shells, are rare in deep water, yet the representatives of this family found there belong to the more archaic sections of their class. Some very interesting forms of the molluscoid Brachiopoda are found in the abyssal region, among them some of the largest known species; but as a general rule the number of species is small, and bears no comparison to that afforded by the archibenthal area. In the early days of deep-sea exploration it was more or less confidently anticipated that the deeps would afford specimens of animals characteristic of remote geological ages, which might have been preserved there, little changed, while their shallow-water relatives had perished from the earth. This expectation has been disappointed. While there are numerous representatives of forms first made known from Tertiary strata and hitherto unknown from shallow water, there are not enough of these to characterize the abyssal mollusk fauna as archaic in type, — not more, perhaps, than still exist in comparatively shallow water; none so remarkable as the *Trigonia* of austral seas, the *Pleurotomaria* of the Antilles, or the *Nautilus* of the Spice Islands. There is no relation of abyssal species with fossil species of mollusks which compares with that between the land and fresh-water faunæ of to-day and those of the Carboniferous and Jurassic strata, whose Unios, Physas, and Pupas are hardly more than specifically distinct from still existing members of the same genera. I am impelled to insist more forcibly on these facts from realizing that, in the reports on the mollusks collected by the "Blake," as in the lists of those found by the Fish Commission and by foreign dredging expeditions, many species find a place, and attract general attention from intrinsic interest, which are not to be counted as true abyssal species. Such are the *Pleurotomaria*, just mentioned, of which two species were found by the "Blake" in 69–200 fathoms, and which belong to a group going back almost unchanged to the earliest fossiliferous rocks, such as the Cambrian formation. One great value of the Blake collection consists in the fact that it contains representatives of animals from all depths in the same general area, beginning near the shores and extending to the abysses, while most deep-sea dredging parties have ceased work as soon as they came into comparatively shallow water, for fear of confounding what were supposed to be two sharply differentiated faunæ. We learn from the work of the "Blake" that the differentiation is much less marked than would be anticipated, and that, in addition to the species found widely distributed over the floor of ocean, there is an important contingent of species which are probably derived from the adjacent litorale, as well as a tolerable number which are found in water of all depths, from a few fathoms on the Florida coast to two thousand fathoms in the adjacent deeps, without affecting their external characters. Further exploration in other seas will probably prove that there are local faunæ in the archibenthal areas, as there are on the shores, a conclusion which would accord well with what we learn from paleontology.

One point has been brought out by the study of the Blake collections which was foreshadowed by Pourtalès in his study of the deep-sea corals dredged by him in the vicinity of the Florida reefs. It is being confirmed by present study of the mollusk fauna of our southern coast in connection with the tertiary and quaternary fossils of the Atlantic and Gulf slopes. It is that a large proportion of the tertiary shells which have been called Pliocene, or even Miocene, in this country and in Sicily, still exist in a living condition near our shores. The tertiaries of Calabria and of localities in the South of Italy having been pretty fully studied, Pourtalès was able to identify many of his corals with those found by Italian paleontologists. Had our own tertiaries been half as well known, or had he had a good collection of the shells of the southern and West Indian tertiaries, he would have been able to recognize their relations with his dredgings as being equally close. At least this is the case with the molluscan fauna, if not with other invertebrate groups. His dredgings, it should be clearly understood, were in the archibenthal, and not the abyssal region, which last his operations never reached. There is not enough known, so far, of the strictly abyssal mollusk fauna, to afford a safe basis for generalization in connection with these tertiaries. I may observe, however, that from middle Louisiana, on the edge of the Eocene beds, I have recently received certain fossils which present every appearance of being a deep-water (archibenthal?) deposit, including *Limopsis* and several other characteristic forms. The data which have been received relating to the circumstances under which the fossils are found are as yet insufficient for a satisfactory discussion of the subject.

SYSTEMATIC LIST OF THE SPECIES.

A. MOLLUSCOIDEA.

Class BRACHIOPODA.

Order ARTHROPOMATA.

Family TEREBRATULIDÆ.

TEREBRATULA (Auct.).

Terebratula cubensis Pourtalès.
Terebratula Moseleyi Davidson.
Terebratula Bartletti Dall.
Terebratula incerta Davidson.

TEREBRATULINA D'Orbigny.

Terebratulina Cailleti Crosse.

Family EUDESIIDÆ.

EUDESIA King.

Eudesia floridana Pourtalès.

Family MEGATHYRIDÆ.

MEGATHYRIS D'Orbigny.

Megathyris (Cistella) Barrettiana, var. *rubrotincta* Dall.
Megathyris (Cistella) Barrettiana, var. ? *Schrammi* C. & F.
Megathyris (Cistella) lutea Dall.

Family PLATIDIIDÆ.

PLATIDIA Costa.

Platidia anomioides Scacchi, var. *radiata*, Dall.

Family THECIDIIDÆ.

THECIDIUM Sowerby.

Thecidium mediterraneum Sowerby ?
Thecidium Barretti Woodward.

Order LYOPOMATA.

Family CRANIIDÆ.

CRANIA Retzius.

Crania Pourtalesii Dall.

B. MOLLUSCA VERA.

Class PELECYPODA.

Family PECTINIDÆ.

PECTEN Müller.

Subgenus JANIRA Schumacher.

Janira hemicyclica Ravenel.

Subgenus AMUSIUM Schumacher.

Amusium Dalli Smith.

Section Propeamusium De Gregorio.

Amusium Pourtalesianum Dall.
Amusium Pourtalesianum, var. *striatulum* Dall.
Amusium Pourtalesianum, var. *marmoratum* Dall.
Amusium cancellatum Smith.
Amusium Hoskynsi Forbes.*
Amusium Holmesii Dall.
Amusium Sayanum Dall.
Amusium alaskensis Dall.*

Subgenus PECTEN s. s.

Pecten magellanicus Gmelin.
Pecten caurinus Gould.
Pecten nucleus Born.
Pecten dislocatus Say.
Pecten phrygium Dall.
Pecten exasperatus Sowerby.
Pecten ornatus Lamarck.
Pecten antillarum Récluz.
Pecten effluens Dall.

Section PSEUDAMUSIUM H. and A. Adams.

Pecten imbrifer Lovèn.*
Pecten reticulus Dall.
Pecten thalassinus Dall.
Pecten Sigsbeei Dall.

HINNITES Defrance.

Hinnites Adamsi Dall.

FAMILY LIMIDÆ.

LIMA Brugière.

Lima squamosa Lamarck.
Lima tenera Sowerby.
Lima inflata Lamarck.
Lima hians Gmelin.
Lima albicoma Dall.

LIMATULA S. Wood.

Limatula setifera Dall.

LIMÆA Bronn.

Limæa Bronniana Dall.
Limæa Bronniana, var. *lata* Dall.

FAMILY SPONDYLIDÆ.

SPONDYLUS Linné.

Spondylus Gussoni Costa.

PLICATULA Lamarck.

Plicatula spondyloidea Meuschen.

FAMILY DIMYIDÆ.

DIMYA Rouault.

Dimya argentea Dall.

Family AVICULIDÆ.

AVICULA Lamarck.

Avicula atlantica Lamarck.

Family MYTILIDÆ.

MYTILUS Linné.

Mytilus exustus Linné.

MODIOLA Lamarck.

Modiola polita Verrill and Smith.
Modiola opifex Say.

CRENELLA Brown.

Crenella decussata Montague.

MODIOLARIA Beck.

Modiolaria lateralis Say.

Family ARCIDÆ.

LIMOPSIS Sassy.

Limopsis minuta Philippi.
Limopsis tenella Jeffreys.
Limopsis antillensis Dall.
Limopsis cristata Jeffreys.
Limopsis aurita Brocchi.

PECTUNCULUS Lamarck.

Pectunculus undatus Linné.
Pectunculus undatus, var. *scriptus* Born.
Pectunculus pectinatus Gmelin.
Pectunculus pectinatus, var. *carinatus* Dall.

ARCA Linné.

Arca pectunculoides Scacchi.
Arca pectunculoides, var. *orbiculata* Dall.

Arca polyçyma Dall.
Arca glomerula Dall.
Arca auriculata Lamarck.
Arca lienosa Say.
Arca reticulata Chemnitz.
Arca Adamsi Shuttleworth.
Arca Noæ Linné, var. *occidentalis* Philippi.
Arca umbonata Lamarck.
Arca ectocomata Dall.
Arca barbata Linné.

MACRODON Lycett.

Macrodon asperula Dall.
Macrodon sagrinata Dall.

Family NUCULIDÆ.

NUCULA Lamarck.

Nucula ægeënsis Forbes.
Nucula cymella Dall.
Nucula crenulata A. Adams.
Nucula crenulata, var. *obliterata* Dall.
Nucula Verrillii Dall.*

Family LEDIDÆ.

LEDA Schumacher.

Subgenus YOLDIA Mörch.

Yoldia solenoides Dall.
Yoldia liorhina Dall.

Subgenus LEDA s. s

Leda Carpenteri Dall.
Leda messanensis Seguenza.
Leda solidula Smith.
Leda vitrea D'Orbigny, var. *cerata* Dall.
Leda concentrica Say.*
Leda acuta Conrad.
Leda solidifacta Dall.
Leda Verrilliana Dall.*

Leda Bushiana Verrill.*
Leda subæquilatera Jeffreys.
Leda hebes Smith.

Section SATURNIA Seguenza.

Leda pusio Philippi.
Leda quadrangularis Dall.

Section NEILONELLA Dall.

Leda corpulenta Dall.

MALLETIA Desmoulins.

Section TINDARIA Bellardi.

Malletia cytherea Dall.
Malletia Smithii Dall.*
Malletia dilatata Philippi.

FAMILY CARDITIDÆ.

CARDITA Brugière.

Cardita domingensis D'Orbigny.

FAMILY CRASSATELLIDÆ.

CRASSATELLA Lamarck.

Crassatella floridana Dall.

Subgenus ERIPHYLA Gabb (em.).

Eriphyla parva C. B. Adams.

FAMILY ASTARTIDÆ.

ASTARTE J. Sowerby.

Astarte Smithii Dall.
Astarte Smithii, var. *globula* Dall.
Astarte nana Dall.

CIRCE Schumacher.

Circe (Gouldia) cerina C. B. Adams.

Family UNGULINIDÆ.

DIPLODONTA Bronn.

Diplodonta turgida Verrill and Smith.
Diplodonta venezuelensis Dunker.

Family LUCINIDÆ.

LUCINA Brugière.

Lucina antillarum Reeve.
Lucina sombrerensis Dall.
Lucina leucocyma Dall.
Lucina funiculata Reeve.
Lucina lenticula Reeve.
Lucina scabra Lamarck.
Lucina sagrinata Dall.
Lucina quadrisulcata D'Orbigny.

LORIPES Poli.

Loripes compressa Dall.
Loripes lens Verrill and Smith.

CRYPTODON Turton.

Cryptodon orbiculatus Seguenza.
Cryptodon pyriformis Dall.
Cryptodon flexuosus Montague.

Family CHAMIDÆ.

CHAMA Brugière.

Chama lactuca Dall.
Chama sarda Reeve.

Family CARDIIDÆ.

CARDIUM Linné.

Cardium ceramidum Dall.
Cardium medium Linné.
Cardium peramabilis Dall.
Cardium muricatum Linné.
Cardium lævigatum Linné.
Cardium serratum Linné.

Family ISOCARDIIDÆ.

ISOCARDIA Lamarck.

Subgenus MEIOCARDIA H. and A. Adams.

Meiocardia Agassizii Dall.*

CALLOCARDIA A. Adams.

Subgenus VESICOMYA Dall.

Vesicomya subquadrata Jeffreys.*
Vesicomya atlantica Smith.
Vesicomya pilula Dall.
Vesicomya venusta Dall.

Family VENERIDÆ.

CYTHEREA Lamarck.

Subgenus DIONE Megerle.

Dione hebræa Lamarck.
Dione albida Gmelin.

Section Veneriglossa Dall.

Dione (Veneriglossa) vesica Dall.

VENUS (Linné) Deshayes.

Venus pilula Reeve.

Subgenus CHIONE Megerle.

Chione pygmæa Lamarck.
Chione cancellata Lamarck.

Family PETRICOLIDÆ.

PETRICOLA Lamarck.

Petricola divaricata Chemnitz.

Family TELLINIDÆ.

TELLINA Linné.

Tellina Antoni Philippi.
Tellina squamifera Deshayes.

Tellina sybaritica Dall.
Tellina tenera Say.
Tellina ? plectrum Hanley.
Tellina Gouldii Hanley.

Family SEMELIDÆ.

ABRA (Leach) Risso.

Abra longicallis Scacchi.
Abra lioica Dall.

ERVILIA Turton.

Ervilia nitens Montague.

CUMINGIA Sowerby.

Cumingia tellinoides Conrad.

SEMELE Schumacher.

Semele obliqua Wood.
Semele cancellata D'Orbigny.

Family POROMYIDÆ.

POROMYA Forbes.

Poromya granulata Nyst and Westendorp.

Section Cetoconcha Dall.

Poromya (Cetoconcha) albida Dall.
Poromya (Cetoconcha) elongata Dall.
Poromya (Cetoconcha) bulla Dall.
Poromya (Cetoconcha) margarita Dall.

Family VERTICORDIIDÆ.

VERTICORDIA Wood.

Verticordia acuticostata Philippi.
Verticordia Woodii Smith.
Verticordia perversa Dall.
Verticordia Seguenzæ Dall.

Subgenus TRIGONULINA D'Orbigny.

Trigonulina ornata D'Orbigny.

Section EUCIROA Dall.

Verticordia (Euciroa) elegantissima Dall.

Subgenus PECCHIOLIA Meneghini.

Pecchiolia argentea Mariti.*

Subgenus HALIRIS Dall.

Haliris Fischeriana Dall.

MYTILIMERIA Conrad.

Mytilimeria Nuttallii Conrad.*

LYONSIELLA Sars.

Lyonsiella insculpta Jeffreys.*

FAMILY CUSPIDARIIDÆ.

CUSPIDARIA Nardo.

Subgenus CUSPIDARIA s. s.

Cuspidaria rostrata Spengler.
Cuspidaria rostrata (? var.) *microrhina* Dall.
Cuspidaria Jeffreysi Dall.
Cuspidaria obesa Lovèn.
Cuspidaria ? arcuata Dall.

Subgenus CARDIOMYA A. Adams.

Cardiomya californica Dall.*
Cardiomya perrostrata Dall.
Cardiomya costellata Deshayes.
Cardiomya costellata, var. *curta* Jeffreys.
Cardiomya costellata, var. *corpulenta* Dall.
Cardiomya striata Jeffreys.

Subgenus LEIOMYA A. Adams.

Leiomya adunca Gould.*

Section VULCANOMYA Dall.

(? Leiomya) Vulcanomya Smithii Dall.*

Section PLECTODON Carpenter.

Leiomya (Plectodon) scaber Carpenter.*
Leiomya (Plectodon) granulata Dall.
Leiomya (Plectodon) granulata, var. *velvetina* Dall.

Section RHINOCLAMA Dall and Smith.

Leiomya (Rhinoclama) halimera Dall.*

Subgenus TROPIDOMYA Dall and Smith.

Tropidomya abbreviata Forbes.*

Subgenus HALONYMPHA Dall and Smith.

Halonympha claviculata Dall.

(Genus ?) MYONERA Dall and Smith.

Myonera paucistriata Dall.
Myonera undata Verrill.
Myonera lamellifera Dall.
Myonera limatula Dall.
Myonera laticella Dall.*

FAMILY ANATINIDÆ.

PERIPLOMA Schumacher.

Periploma fragilis Totten.*
Periploma papyracea Say.

THRACIA Leach.

Thracia Stimpsoni Dall.*
Thracia corbuloidea Blainville.*
Thracia distorta Montague.*
Thracia phaseolina Lamarck.

ASTHENOTHÆRUS Carpenter.

Asthenothærus Hemphillii Dall.

Subgenus BUSHIA Dall.

Bushia elegans Dall.

FAMILY PANDORIDÆ.

PANDORA Hwass.

Subgenus CLIDIOPHORA Carpenter.

Clidiophora carolinensis Bush.
Clidiophora trilineata Say.*
Clidiophora Gouldiana Dall.*

Subgenus PANDORA s. s.

Pandora (Kennerlia) Bushiana Dall.*

FAMILY CORBULIDÆ.

CORBULA Brugière.

Corbula cubaniana D'Orbigny.
Corbula Barrattiana C. B. Adams.
Corbula Swiftiana C. B. Adams.
Corbula Dietziana C. B. Adams.
Corbula disparilis D'Orbigny.
Corbula (Tæniodon ?) cymella Dall.
Corbula Krebsiana C. B. Adams.*
Corbula Chittyana C. B. Adams.*
Corbula Kjaeriana C. B. Adams.*

BASTEROTIA Mayer.

Basterotia quadrata Hinds, var. *granatina* Dall.

FAMILY SAXICAVIDÆ.

SAXICAVA F. de Bellevue.

Saxicava azaria Dall.

FAMILY PHOLADIDÆ.

XYLOPHAGA Turton.

? **Xylophaga abyssorum** Dall.

This Report contains twelve new subgenera or sections, and eighty-one new species. The species marked by an asterisk are introduced for purposes of illustration, etc., and were not collected by the "Blake." The total amounts to thirteen species and varieties of Brachiopods and two hundred and fourteen species and varieties of Pelecypods obtained by the "Blake," beside the thirty or more species casually mentioned but not collected.

MOLLUSCOIDEA.

CLASS BRACHIOPODA.

Order ARTHROPOMATA.

FAMILY TEREBRATULIDÆ.

GENUS TEREBRATULA AUCTORUM.

Terebratula cubensis POURTALÈS.

Terebratula cubensis, Pourtalès, Bulletin M. C. Z., I. p. 109, 1867; Dall, ibid., III. p. 3, pl. i. figs. 2, 8–16, 1871; ibid., IX. p. 103, 1881.

Habitat. Station 45, 101 fms.; Station 16, 292 fms.; Sigsbee, off Havana, 175 and 400 fms.; Lat. 26° 31′, Lon. 85° 3′, 119 fms.; Barbados, 100 fms.; Stations 231 and 232, St. Vincent, 95 and 88 fms.; Stations 193 and 202, Martinique, 169 and 210 fms.; station 155, Montserrat, 88 fms., bottom temperature 69°.0 F.; Station 167, Guadalupe, 175 fms.; Stations 249, 253, and 254, near Grenada, in 262, 92, and 164 fms.; and Stations 273, 276, 282, 293, 296, and 300, about Barbados, in 103, 94, 154, 82, 125, and 82 fms., respectively. In general, at a depth of 80–400 fms., sandy or stony bottom, with the temperature ranging from 50° to 70° and averaging about 58°.5 F.

This species has been fully described, figured, and discussed by me in the papers referred to, especially volume third of this Bulletin, and nothing more can be added to the data there accumulated except the additional localities here recorded.

Its distinctness from *T. vitrea* may be considered as fully established.

Terebratula Moseleyi DAVIDSON.

Terebratula Moseleyi Dav. Chall. Rep. Brach., p. 30, pl. xi. figs. 12–14, 1880.

A specimen sent to Mr. Davidson was identified by him as this species. It was obtained at Station 193, off Martinique, in 169 fms., sand, shell, and dark mud, the bottom temperature being 51°.0 F. The Challenger specimens were dredged west of Kerguelen Island in the Southern Ocean, at Station 148, latitude 46° 471 south, and longitude 51° 37′ east of Greenwich, on a rocky bottom in 210 fms.

Terebratula Bartletti Dall.

Terebratula Bartletti Dall, Am. Nat., Nov. 1882, p. 885.

Plate VI. Figs. 4 a-c.

Shell whitish or often with a delicate madder-brown tinge, moderately thin, ovoid, inflated, polished, with occasional traces of delicate evanescent extremely fine radiating lines, especially on the sides near the hinge line ; apex of the neural valve rather attenuated, curving over and closely appressed to the apex of the hæmal valve ; foramen complete, small, its lower margin produced into a sharp point lying over the apex of the hæmal valve and concealing it ; area short, very wide, triangular, bounded by a sharp carina on each side, concave, with a median slightly impressed line, posterior margin a little arched in a posterior direction; it is entirely concealed in the living shell, being as before mentioned closely appressed to the outer surface of the other valve; cardinal border rather pointedly arched, teeth small but stout ; margin of the valve smooth, flexuous ; it falls away a little from a point immediately in front of the teeth, then continuing forward is emarginated and its front border strongly squarely produced upward and forming two well-marked corners between which the front margin is nearly straight ; outer surface of the valve roundly convex. Hæmal valve with the margin correspondingly flexuous, generally rounded but with a more or less obtuse ridge extending toward the beak from the inner angles of the anterior flexuosity: beak rather pointed, incurved cardinal process small, semicircular, fimbriated in all cases, showing six to eight anteriorly pointing irregular denticulations ; cardinal plate divided, its lateral platforms wide, deeply concave ; tooth sockets small, narrow, close to the margin of the beak; loop large, very square, curved upward, proportionally wider and shorter than in *T. cubensis*, with a less convexity in the median line, and without the lateral notches and median prominence of *T. cubensis*. Interior of valves smooth except for the muscular impressions and certain ridges due to their changes in the development of the individual ; in the hæmal valve there is an obtuse ridge (seen through the shell it resembles a septum as in *Waldheimia*) between the abductor scars, in the neural valve there is a well-marked groove in the same place : in *T. cubensis* the anterior margin of the adductor scars is underneath and behind the anterior margin of the loop ; in this species (as in *T. vitrea*) they are considerably in advance of it, a circumstance resulting from the greater bulk of the soft parts in the latter species, compared with the size of the shell. The measurements in an adult individual are as follows. Lon. of neural valve 40.0, of hæmal do. 38.0, lat. 31.5, lat. of anterior flexuosity 22.0; beak to anterior edge of loop 8.0, to points of crura 5.5, width of anterior margin of loop 6.5; diameter 26.75 mm. The greatest width of the shell is behind its middle in *T. vitrea*, as already pointed out by me (Bull. Mus. Comp. Zoöl., III. No. 1, p. 3, 1871) ; in the present species it is anterior to the middle of the shell.

Habitat. Stations 290, Barbados, 73 fms. ; 232, St. Vincent, 88 fms.; 155, Montserrat, 88 fms. ; 253, Grenada, 92 fms. ; 273, Barbados, coral and shells, 103 fms. ; 45, in Lat. 25° 33′ N., and Lon. 84° 21′ W. Gr., 101 fms.; 177, Dominica, sand and shells, 118 fms. ; 157, Montserrat, sand and stones, 120 fms. ; 297, Barbados, stones, 123 fms. ; 258 and 254, Grenada, 159 and 164 fms. ; 193, Martinique, 169 fms. ; 291, Barbados, 200 fms. ; 139, Santa Cruz, sand and gravel, 218 fms. ; 147, St. Kitts, 250 fms. Its location, therefore, appears to be between seventy and two hundred and fifty fathoms, in water varying from 51°.0 to 69°.0 Fahrenheit in temperature.

The relations of this form appear to be with *T. vitrea*, *T. cubensis*, *T. sphenoidea*, and *T. scillæ*. Its assemblage of characters does not appear to be shared by any of those forms. The rather large number of specimens of all ages, collected as above, show its range of variation very well. Those who would unite all the above-mentioned species under one name, would doubtless include the present form within that limit, and logically so. I do not see my way clear, however, whatever may be thought to be the value of a "species," to ignore what appear to be constant differences in the organisms under consideration. It is probable that there are too many specific names in the group of *Terebratula* of which *T. vitrea* is an example, a number of additions having been recently made to the list. The present form is certainly more differentiated from either *vitrea* or *cubensis* than several which have been named and are generally accepted. The form of the loop resembles closely that of *T. siracusana* Seguenza (Bull. Malac. Ital., IV., tab. 4, fig. 13), its general form is more like *T. scillæ* Seg. (l. c., tab. 3, fig. 8), at least like the variety mentioned. Other discriminating characters may be found mentioned in the preceding description, which, with the figures, will be a sufficient means for identification. The anterior flexuosity is often, though not usually, as strong relatively in the young as in the adult. The appressed neural apex is very constant.

Terebratula incerta Davidson.

Megerlia incerta Davidson, Challenger Brach., p. 49, pl. xi. figs. 17, 18, 1880.

Plate VI. Figs. 6, 6 a.

Habitat. Challenger Expedition, Mid-Atlantic, Lat. 1° 47′ N., Lon. 24° 26′ W., 1850 fathoms. Blake Expedition, Stations 235 and 236, in 1507 and 1591 fms., oozy bottom, off Bequia, bottom temperature 39°.0 F.; and Station 16, 292 fms., off Morro Light, Havana, Cuba, bottom temperature 55°.6 F., one specimen only.

This species was obtained of adult size at the stations cited. It is readily recognizable from Mr. Davidson's excellent figures (by his kindness I compared specimens) and the peculiar and characteristic radiating filaments which surround the base of the peduncle. In all the specimens examined the loop is incomplete, or rather the crura are not united. but the soft parts, the setæ, and the shell canals are those of *Terebratulina*. It, and perhaps *T. Murrayi* Dav., may be considered Terebratulinas in which the crura do not unite.

Genus TEREBRATULINA D'Orbigny.

Terebratulina Cailleti Crosse.

Terebratulina Cailleti Crosse, Journ. de Conchyl., XIII. p. 27, pl. i. figs. 1–3, 1865; Dall, Bull. M. C. Z., III. p. 10, 1871; IX. p. 103.

Habitat. Barbados, 100 fms.; Sigsbee, off Havana, in 80, 119, 127, 240, and 450 fms.; Yucatan Strait, 640 fms.; Station 2, 805 fms.; West Florida, 30 fms.; Station 16, 292 fms.; Station 20, 220 fms.; Station 44, 539 fms.; Station 45, 101 fms.; off Morro Light, Station 16, 292 fms.; Santa Lucia, Stations 216 and 218, 154 and 164 fms.; St. Vincent, Stations 224, 231, and 232, 114, 95, and 88 fms.; Dominica, Station 177, 18 fms.; Montserrat, Stations 154, 155, and 156, in 298, 88, and 88 fms.; Grenada, Stations 246, 247, 253, and 254, in 154, 170, 92, and 164 fms.; off the Grenadines, Station 238, in 127 fms.; Barbados, Stations 272, 273, 276, 278, 281, 282, 290, 291, 292, 296, and 298, in 76, 103, 94, 69, 288, 154, 70, 200, 56, 84, and 120 fms. respectively.

As this series of localities proves, this little species is abundant and widely distributed in the Antillean region, from which it extends southward to the vicinity of Pernambuco and Rio de Janeiro. It occupies for this fauna the place taken by *T. caputserpentis* L. and its varieties in the north. It ranges between 30 fms. and 805 fms. in depth, and exists in water the temperature of which may be 45°.0 to 75°.0 F. Its favorite location, however, appears to be at a depth of between 100 and 200 fms., and in water of the temperature of 60°.0. It has been fully discussed in the papers cited.

Family EUDESIIDÆ.

Genus EUDESIA King.

Eudesia floridana Pourtalès.

Waldheimia floridana Pourtalès, Bull. M. C. Z., I. p. 127; Dall, Ibid., III. p. 12, pl. i. fig. 3, pl. ii. figs. 1-3, 1871; IX. p. 103.

Habitat. Off Sand Key, 125 fms.; Sigsbee, off Havana, 175 fms.; Lat. 26° 31′, Lon. 85° 3′, 119 fms.; Station 45, 101 fms.; Station 5, 229 fms.; Station 19, 310 fms.; Station 291, 200 fms., Barbados.

The generic name *Waldheimia* being preoccupied for a genus of insects, as heretofore pointed out, *Eudesia*, King, is the next in order of priority, and should therefore be adopted, although in its original significance it was merely a synonym of *Waldheimia* King.

FAMILY MEGATHYRIDÆ.

GENUS MEGATHYRIS D'ORBIGNY.

SUBGENUS CISTELLA GRAY.

Cistella Barrettiana DAVIDSON, var. rubrotincta DALL.

Cistella Barrettiana Dall, Bull. M. C. Z., IX. pp. 103, 104.
Argiope Barrettiana Davidson, P. Z. S., Feb. 1866, p. 103, pl. xii. fig. 3.
Argiope antillarum Crosse & Fischer, Journ. de Conchyl., XIV., July, 1866, p. 270, pl. viii. fig. 6.
Cistella (*Schrammi* var. ?) *rubrotincta* Dall, Bull. M. C. Z., III. p. 19, pl. i. fig. 6, 1874.

Habitat. Sand Key, 80 fms.; Station 2, 805 fms.; Yucatan Strait, 640 fms.; Station 45, 101 fms.; Station 20, 220 fms.; Barbados, 100 fms.; Sigsbee, off Havana, 450 fms.; Station 276, 94 fms.; Station 231, St. Vincent, 95 fms.; Tortugas, 43 fms.; Station 297, 170 fms., off Grenada; Station 132, 115 fms., Santa Cruz; Station 155, 88 fms., near Montserrat, W. I.

This pretty little species has about the same range in depth and temperature as *T. Cailleti*. The above synonymy represents the conclusions of Mr. Davidson and myself, after several years of correspondence and the study of quite abundant material.

Cistella (Barrettiana var. ?) Schrammi CROSSE & FISCHER.

Cistella (*Barrettiana* (?) var.) *Schrammi*, Bull. M. C. Z., IX. p. 104.
Argiope Schrammi, Crosse & Fischer, l. c., p. 269, pl. viii. fig. 6, 1866.

Habitat. Station 45, 101 fms.; Barbados, 100 fms.

There is much doubt as to the distinctness of this form from *C. Barrettiana*, which seems very variable in sculpture and color.

Cistella lutea DALL.

Cistella lutea Dall, Bull. M. C. Z., III. p. 20, pl. i. fig. 5, pl. ii. figs. 4–8, 1871; Ibid., IX. p. 103.

Habitat. Sigsbee, off Havana, 80 to 127 fms.; Barbados, 100 fms.; Station 21, 287 fms.; Tortugas, 30 fms.

Owing to the differences in the form of the shell and especially of the septum, Mr. Davidson was inclined to regard this as a valid species, and so stated in his last communication on this subject. It may, however, be only an extreme form of *Barrettiana*, though intermediate specimens are still wanting.

Family PLATIDIIDÆ.

Genus PLATIDIA Costa.

Platidia anomoides Scacchi.

Platidia anomoides Dall, Bull. M. C. Z., IX. p. 104.
Terebratula anomioides Scacchi, Philippi, Moll. Sicil., II. p. 69, pl. xviii. fig. 9, 1844.

Habitat. Near Morro Light, Cuba, Station 16, 292 fms.; Station 253, 92 fms.; Barbados, Station 280, 221 fms.; Grenada, Station 260, 291 fms.; St. Vincent, Station 232, 88 fms. Also San Diego, California, Orcutt; and off the coast of North Carolina in 16 fms. by the U. S. Fish Commission, 1885.

Variety radiata Dall, Proc. U. S. Nat. Mus., 1885, p. 551.

Shell radiately ribbed with small irregular ribs, apex of the dorsal valve not notched but even with a trace of flattened area; hæmal valve deeply notched; margin with rather prominent setæ lying in the grooves corresponding to the ridges; labia as usual with short brachial membrane and fringe behind them; a broad smooth area of membrane in front of them; about 25–30 single brachial processes on each lobe turned down and curled under; the point of the septum projects in front of the broad membranous area; the anterior labium and perhaps both of them, somewhat reinforced by chitine; size the same as the typical form.

Habitat. Station 139, off Santa Cruz, in 218 fms., bottom temperature 51°.0; sessile on smooth *Terebratula*. The Californian specimens are also of this variety.

This specimen was sacrificed to get at the soft parts. This is the only form in which the brachia are turned downward, and the only living form in which the hæmal valve is notched in the adult state. as far as known to me.

Family THECIDIIDÆ.

Genus THECIDIUM Sowerby.

Thecidium mediterraneum Sowerby.

? *Thecidium mediterraneum* Sowerby, Dall, Bull. M. C. Z., IX. p. 104.

Habitat. Station 241, 163 fms.

The specimens being loose dorsal valves, it is possible that they may belong to the preceding species; but Mr. Davidson thought not. No complete specimens were found in the Blake collection.

Thecidium Barretti Woodward.

Thecidium Barretti, Woodward, Dall, Bull. M. C. Z., IX. p. 104. Davidson, Geol. Mag., I. pl. ii. figs. 1–3, 1864; P. Z. S., 1866, p. 104.

Plate VI. Fig. 2.

Habitat. Barbados, 100 fms.; Station 232, St. Vincent, 88 fms.; Station 115, Montserrat, 88 fms.

This rare species was identified by Mr. Davidson after comparison with his type. It is here satisfactorily figured, so far as the interior is concerned, for the first time, acccording to that eminent authority.

Order LYOPOMATA Owen.

Family CRANIIDÆ Gray.

Genus CRANIA Retzius.

Crania Pourtalesii Dall.

Crania Pourtalesii Dall, Bull. M. C. Z., IX. p. 104; Ibid., III. p. 35, pl. i. fig. 7, 1871.

Habitat. St. Vincent, W. I., 88 fms., Station 232; Sand Key, Fla., 105 fms.; off the Sambos, 116 fms. (single valves).

This species is probably abundant in suitable places, but no satisfactory haul of them has yet been made.

MOLLUSCA VERA.

Class PELECYPODA Goldfuss.

Family PECTINIDÆ.

Genus PECTEN Müller.

Pecten Müller, Prodr. Zool. Dan., p. xxxi, 1776. Type *Pecten* (*Ostrea*) *maximus* L., l. c., p. 248.

This ancient genus has been cut up into many sections, most of which shade into one another by imperceptible gradations, or interchange characters, or would belong to different sections at different stages of post-embryonic growth. For purposes of convenience and usefulness most of these sections were better discarded, as a name without any essential characters is merely an incumbrance to workers and a stumbling-block for learners. For my own purposes I find the following arrangement convenient: 1. *Pecten*, with the subgenera *Janira*; *Amusium* and section *Propeamusium*; *Pseudamusium* and section *Camptonectes*; *Pecten* typical and the sections *Pallium* and *Lyropecten*; 2. *Neithea*; 3. *Hemipecten*; 4. *Hinnites*.

In form of shell and characters of hinge, *Dimya* is related to *Pecten*, and by its habit to *Hinnites*; in its shell structure, it is nearer the *Aviculidæ* and *Ostreidæ*; in its anatomical peculiarities it is archaic, foreshadowing the pearl-shells, the oysters, and the scallops in different degrees. It is well entitled to family rank, and for present purposes I prefer to arrange it between the *Pectinidæ* and the *Aviculidæ*, though no linear arrangement will express all its relations.

The form of the foot in typical *Pecten* is recorded as cylindrical, with or without the posterior margin grooved. In *P. caurinus* the groove is deep, the stem calibre uniform, the distal end a little swollen, with a minute slit and radiated aperture on the posterior median line, the whole extremely phallic in appearance; in *P. antillarum* the foot is grooved, subcylindrical and worm-like, with no perceptible slit at the tip, and that of *P. nucleus* Born is much the same; *P. irradians* has a beginning of a sucker-slit and hardly expanded tip; *P. magellanicus* has the tip much enlarged, solid, with a large sucker; when we get to *Amusium pleuronectes* we have a spade-shaped tip and well-developed sucker, with moderate stem; and, finally, in *A. Dalli* the sucker is large, hood-shaped, thin-walled and darkly pigmented, with a broad base abruptly enlarged from a very slender stem. Similar modifications appear in the anal extremity, which from elongate and free varies to the usual appressed type of most bivalves. Other characters seem equally interchangeable, such as the armature of the lips, which may be internally striate or smooth, externally smooth, papillose, or arborescent.

All these facts confirm me in my belief that the subdivisions of the group may advantageously be limited to a comparatively small number.

Subgenus JANIRA Schumacher.

Pecten (Janira) hemicyclica Ravenel.

Janira hemicyclica Tuomey & Holmes, Miocene Fos. S. Car., p. 25, pl. viii. figs. 1–4, 1855.

Pecten hemicyclicus Ravenel, fide T. & H. l. c.

Plate VI. Fig. 5.

Two lower valves of this species were dredged on the west coast of Florida by the Bache in 19 fathoms. It is found not very rarely on the east and west coasts of South Florida, and often identified as *P. ziczac*. The ribs on the flat valve differ greatly in different specimens, being sometimes obsolete and sometimes very strong. The color of this valve is much as in *P. ziczac*. The color of the convex valve and its sculpture are quite different from those of *P. ziczac*, which grows to a considerably larger size at present. The fossil specimens of *hemicyclica*, as figured, are larger than any recent ones I have yet heard of. The very young of this species are externally indistinguishable from the fry of *P. magellanicus* Gmelin and *Amusium pleuronectes*. The transverse rugosities or grooves of the hinge-line referred to in *Pseudamusium thalassinum* are well marked in the fry of this species, and very evident traces of them are visible in the adult. In the young they occupy a lanceolate area on each side of the cartilage pit, and are shown in the figure, considerably magnified, on Plate VI. These shells and some other young fry are not to be distinguished from young *Pecten similis* Laskey, of most collectors. I find fully half the "*P. similis*" of the Jeffreys collection to be of this character. Many of them might have grown to be that species, but many probably might not. Unusual localities, such as Korea or Jamaica, quoted for *P. similis* (genuine) on the authority of Dr. Jeffreys, should be suspected or held for more information.

Subgenus AMUSIUM (Bolten) Schumacher.

Historical Synonymy.

Amusium Rumphius, Amboinische Rariteitkamer, pp. 144, 188, pl. xlv. figs. A, B, 1705. Klein, Tent. Meth. Ostrac., p. 134, 1753. Martini, Verzeichn. Samml. Nat., 1774.

Synonymy Proper.

Amusium Bolten, Mus. Boltenianum, ed. i. p. 165, 1798; *Pecten pleuronectes* auct. (no description or type mentioned).

Amusium Megerle von Muhlfeld, Entwurf. (etc.) Mag. d. Gesellschaft f. Naturh. Freunde zu Berlin, V. i. p. 59, 1811.
Bolten, Mus. Bolt., ed. ii. p. 115, 1819 (name only).
Schumacher, Essai, p. 117, 1817; *P. pleuronectes* (full description).
ctinium b, Link, Beschr. Rostock Samml., part 3, p. 156, 1807; *P. japonicum.*
Amus..um Herrmannsen, Ind. Gen. Mal., I. p. 47, 1846; = *Amusium* Klein corr. H. & A. Adams, Gen. Rec. Moll., II. p. 554, 1858. Jeffreys, Annals and Mag. Nat. Hist., Nov. 1876, p. 424; P. Z. S. 1879, p. 561.
Pleuronectia Swainson, Malacol., p. 388, 1840, *P. pleuronectes* (description).
Chenu, Man. de Conchyl., II. p. 187, 1862; *P. japonica.* Jeffreys, in Wyville-Thomson, Depths of the Sea, p. 464, 1873.
Amusium Woodward, Manual, ed. ii. p. 412, 1866. Stoliczka, Pal. Indica, III. Cret. Pelecypoda, p. 426, 1871.

Shell smooth or very slightly sculptured externally; valves gaping at the sides, nearly equally convex, with radiating internal ribs; ears subequal, small; notch obsolete or none; hinge line straight; margin entire; shell free (byssiferous ?). Type *Pecten pleuronectes* L.

The name *Amusium* is of uncertain meaning or origin, but appears to have been in use colloquially at least two hundred years ago to denominate the "compass shell" or "flounder scallop." It was used by Rumpf in his Treasury of Rarities from Amboyna, as pointed out by Dr. Jeffreys, and probably here made its first entry into print. It was adopted by Klein, in his curious and very unequal work on shells, for one of the groups in which he placed the Pectens of Lamarck and later authors; it was referred to by Martini, and doubtless by other non-binomial writers, whom it would be profitless to search out.

Its first entry into binomial scientific literature (if an auctioneer's sale catalogue without figures or descriptions may be so called) was in the obscure pamphlet usually known as the Museum Boltenianum, of which a new edition was published in 1819. The first place where the name *Amusium* received a description entitling it to recognition was in Schumacher's Essai, in 1817, though Link had characterized the group as a section of his genus *Pectinium* (= *Pecten*) ten years previously. Apparently in ignorance of Schumacher's work, Swainson described it as a new genus in 1840, under the name *Pleuronectia*, which was adopted later by Chenu. Herrmannsen and others have suggested that the name should be spelled *Amussium*, but the uniformity of previous usage and the uncertainty in regard to its derivation seem to render this inadvisable.

The characters which separate this group from the typical genus are chiefly conchological. The byssus (if any exists, for so far I have not been able to find any) passes between the gaping valves, and the notch, which usually exists in the very young, is not found in the adult form, which would seem to have discarded the byssus entirely, and supplied its place by using the terminal sucker of the foot, which is large and expanded. The group frequents deep and temperate waters for the most part, and the prismatic structure of the shell is especially evident in the abyssal species, which in other characters differ from the type, and form a transition toward *Pseudamusium* and the more typical scallops.

A few species of *Amusium* are reported from the Cretaceous, but it appears to be rather a modern member of the *Pectinidæ*.

A living specimen of the type species, previously only known from the eastern Asiatic seas, was dredged in the Gulf of Mexico by the U. S. Fish Com. steamer "Albatross" in the winter of 1884–85, at Station 2388, in 35 fms. sand, Lat. 29° 24′, Lon. 88° 1′ W. Gr., and dead fragments at Station 2404, in 60 fms., Lat. 28° 44′, Lon. 85° 16′ W. Gr., both on a line between the delta of the Mississippi and Cedar Keys, Florida.

Amusium Dalli E. A. Smith.

Amussium Dalli Smith, Challenger Rep. Lamellibranchiata, p. 308, pl. xxii., figs. 7 a–c, 1886. (Off Bermudas, 435 fms.)

Amussium lucidum Jeffreys, var. *striata*, in part? (P. Z. S., 1879, p. 562.)

Plate IV. Figs. 1 a, 1 b.

Valves nearly equal, the right slightly more convex; the adults gaping at the sides; the young closed or almost closed; diversely sculptured; right valve nearly smooth except for growth lines, the internal liræ (7–9) marked by obscure radiating ridges of the outer surface; prismatic structure in a radiating sense, distinctly marked, visible to the naked eye; auricles sculptured only with growth lines, their upper edge denticulate in the very young, arched internally, almost exactly equal, very small; hinge line very short and straight; left valve with somewhat irregular sharpish concentric waves, hardly raised above the surface and more distant toward the periphery; prismatic structure reticulate, the prisms almost separable at the extreme margin becoming effaced toward the umbo with age; auricles flat, subequal, without byssal notch or fasciole, smooth or with faint growth-lines; interior glassy, liræ 9–10, usually 9, stouter longer and more opaquely white (in adults) in this valve than in the other; auricular crura very prominent, strong, forming the feet of a stout arch of which the cartilage pit represents the keystone; color translucent white near the margins, fuliginous in the central part which covers the viscera. Alt. 62.0, lon. 59.0, max. diam. 6.0 mm., but reaching a larger size as indicated by fragments. The shell is extremely thin and fragile, or rather brittle.

Obtained at Station 41 in 860 fms. in the Gulf of Mexico; Station 117, in 874 fms., Lat. 17° 47′, Lon. 67° 3′ W. Gr. in the Caribbean Sea; Station 147, off St. Kitts, in 250 fms. (bottom temperature 52°.5 F.); Station 150, between St. Kitts and Nevis, in 375 fms.; Station 151, in 356 fms., off Nevis; Station 153, in 303 fms., off Montserrat (bottom temperature 48°.75); Stations 161, 162, 163, and 173, off Guadalupe, in 583, 734, 769, and 734 fms.; Stations 227 and 228, off St. Vincent, in 573 and 785 fms.; Station 236, off Bequia, in 1591 fms., soft mud; Stations 245 and 268, off Grenada, in 1058 and 955 fms.; Station 275, off Barbados, in 218 fms. sand, bottom temperature 52°.5 F.

The bottom was, in all cases, sand, ooze, or mud, and the temperatures, except those above cited, varied from 39° to 47°.5 F., averaging about 41°.0 F.

Amusium meridionale Smith would appear from the figures and description closely to resemble the young of this species. Mr. Smith kindly informs me that the form differs, and the sculpture of the deeper valve is not identical; in *A. Dalli* the valve is much more glossy and the radiating liræ are hardly apparent. Mr. Smith thinks *A. meridionale* does not attain a large size.

This elegant species was obtained by the "Challenger" as well as the "Blake." It is evidently a true inhabitant of the deeps, although its range is nearly 1400 fms. It is of extreme tenuity, and all the specimens obtained were more or less broken about the margin. The adult valves are convex nearly or quite to their edges, but the lower one while young has a concave margination, as in the species of *Propeamusium*. Notes in regard to the synonymy will be found under the head of *Amusium Pourtalesianum.*

The soft parts of this species present some features of interest. The ocular papillæ or ocelli are present, but devoid of pigment. The mantle is slightly tinged with purple. The gills are long, single on each side, and furnished with long separate filaments much as in *Dimya*. There are no branchial palpi, but the lips are produced to a very unusual length, forming an arch over the space below the mouth, both upper and lower lips being equally prolonged and applied to each other in a sort of horseshoe-shaped manner. They are internally concentrically rugose in the specimen, which may be due to contraction caused by the alcohol. The ovary projects from the body between the gills in the form of a legume; from its anterior end springs the stalk of the foot, which is slender, the groove being well marked; the distal end of the foot is greatly enlarged, looking like the end of an *Anatifa* without a shell; it is dark purple, the only part of the animal so strongly pigmented; the enlargement or "cornet" is hollow, the aperture, with a stout margin, looking forward and downward; internally it is domed and radiately striate, being in fact an exaggerated and efficient sucker, by means of which the animal should be able to hold on to any flat surface, or (by expanding and contracting it like the foot of *Yoldia*) to move about on the semifluid mud of the bottom. The anus does not project from the surface to an appreciable extent.

Section PROPEAMUSIUM De Gregorio (em.), 1883.

Shell small, thin, vitreous, smooth or sculptured, the lower valve usually concentrically waved and with a byssal notch, but no pectinium or byssal serrations; when adult internally lirate; the upper valve smooth or sculptured, but usually, if sculptured, with the radiating sculpture prominent; valves closed, the lower one convex over the internal lirations, then angulated and applied to the internal surface of the upper valve, thus forming in the adult and perfect shell a concave area about the distal margin of the inferior valve. Type *Amusium fenestratum* Forbes.

The species of this section are found in deep waters, widely distributed, except in the arctic seas. It should be noted that in this group, as in many other Pectens, there are often a pair of ridges or liræ, sometimes very prominently elevated, on the inside, nearly parallel with the margin of the body of the valve and situated at or on the prominence inside which is adjacent to the auricular sulcus outside. These are not peculiar to either section of *Amusium*, and are not counted by me in enumerating the internal liræ of species of *Propeamusium*. I notice that Smith in the Challenger Report has counted them as liræ; so in the same species, when they are present, the number of liræ by my enumeration would always be two less than his. I have called them the auricular crura for distinction's sake. They are found in species of *Pseudamusium* as well as of *Propeamusium* proper, and are sometimes absent in species of either group.

Amusium (Propeamusium) Pourtalesianum Dall.

Amussium lucidum Dall, Bull. M. C. Z., IX. p. 117, 1881.

< *Pleuronectia lucida* Jeffr., Depths of the Sea, p. 464, fig. 78 b, 1873.

< *Amussium lucidum* Jeffr., Ann. Mag. Nat. Hist., XVIII. p. 425, Nov. 1876; P. Z. S., 1879, p. 562. E. A. Smith, Challenger Rep. Lamellibranchs, p. 317, pl. xxiv. figs. 2 a–c.

Plate IV. Fig. 3. Plate V. Fig. 12.

Taken at Station 2, off Morro Light, in 805 fms.; Station 5, in 229 fms.; Station 19, in 310 fms.; Station 21, in 287 fms.; Station 35, in 804 fms.; Station 44, in 539 fms.; all in the Gulf of Mexico near Cuba. Also in the Gulf west of Florida in 30 fms., and at Charlotte Harbor, West Florida, living in 13 fms.; Station 47, in 337 fms.; Stations 50, 60, and 100, off Havana, in 119, 480, and 400 fms.; Stations 162, 163, and 167, near Guadalupe, in 734, 878, and 175 fms.; Stations 176 and 177, near Dominica, in 391 and 118 fms.; at Barbados, in 100 and 154 fms.; Station 227, near St. Vincent, in 573 fms.; station 262, in 92 fms., near Grenada. The depth at which it has been found living varies from 805 to 13 fms., and the bottom temperature from 39°.5 F. to 82°.5 F. This is a remarkable range.

This species was included under the name of *lucidum* by Dr. Jeffreys in 1876, and had been well figured in 1873. The figures "a" and "b" of *lucidum* represent what are now considered as two different forms. At that early date in deep-sea work, minute discrimination as to species was less practicable, and therefore less usual, than at present, when the amount of material is so much greater.

Figure "a" of the "Depths of the Sea" is magnified nearly four times linear, and comes from the Eastern Atlantic. The other figure was taken from a specimen dredged by Pourtalès in the Straits of Florida, now in the National Museum, and was only magnified some two and a half times, linear. From among the forms at first confounded under the name of *lucidum*, and several of which have been carefully worked out by Mr. Edgar A. Smith of the British Museum in the Challenger Report, the following may be discriminated :—

1. *P. lucidum* (Jeffr. em.) Smith. Fig. "a" of 1873, E. Atlantic.

2. *P. Pourtalesianum* Dall. Fig. "b" of 1873, West Indian region.

3. *P. meridionale* Smith l. c. (*A. lucidum* Jeffr., var. *striata* Jeffr., according to localities and specimens cited P. Z. S., 1879, p. 562).

2 *a*. *P. Pourtalesianum*, var. *striatulum* Dall (agrees with Jeffreys' description of his var. *striata*, but not with his specimens).

2 *b*. *P. Pourtalesianum*, var. *marmoratum* Dall. West Indian region.

Mr. Smith has discriminated the typical *P. lucidum* (Chall. Rep. Lamellibr., p. 317, pl. xxiv. figs. 2 a–c), from which the form here called *Pourtalesianum* differs in being more oblique, longer, and of larger size when adult. The series of *A. Dalli* Smith, obtained by the "Blake," indicate that *A. meridionale* Smith is possibly the young of *Dalli*, as the differences of gape and of sculpture correspond fairly well to stages of growth observed in the Blake series. Mr. Smith, however, is confident that it is distinct. It is at all events perfectly distinct from *lucidum*. My impression is that Dr. Jeffreys derived his idea of his variety *striata* from specimens of *A. Pourtalesianum*, var. *striatulum* Dall, sent him by Pourtalès ; but that when he came to describe it he cited Challenger localities and specimens, which on a cursory examination he took to be the same thing, and omitted to mention his West Indian ones. However this may be, the var. *striatulum* above mentioned agrees perfectly with Dr. Jeffreys' rather brief description.

No specimens of the typical *A. lucidum* were obtained by the "Blake," or have been received from the Fish Commission dredgings on the American or Gulf coasts.

The *A. Pourtalesianum*, var. *striatulum*, was obtained by the "Blake" at Station 128, near Frederikstadt, in 180 fms.; Station 192, off Dominica, in 138 fms.; and Station 226, off St. Vincents, in 424 fms. The bottom temperature at these stations varied from 42°.5 to 64°.0 F.

The variety *marmoratum* (Dall, Bull. M. C. Z., IX. p. 117, 1881), with its brilliant mottling of orange, scarlet, brown, bright yellow, and opaque white dots or flecks, appeared indifferently at most of the stations in company with the pale translucent typical form.

I have examined one hundred and forty valves of this species, 64 per cent of which had ten internal ribs ; 5.7 per cent nine ribs ; and 21.5 per cent eleven ribs ; not counting the crural callosities. Six specimens had twelve ribs, and one each had eight, thirteen, fourteen, fifteen, and twenty-one ribs. The extra ribs usually appear as intercalary knobs or liræ near the outer edge of the ribbed area, and seldom extend into the body of the shell like the normal ones.

Amusium (Propeamusium) cancellatum Smith.

Amussium cancellatum Smith, Challenger Rep. Lamellibranchs, p. 315, pl. xxiii. figs. 8 a – 8 c. 1886.

? *Amussium fenestratum*, var. *cancellatum*, Jeffreys, P. Z. S., 1879, p. 561. (Porcupine Exp. 1869, Station 37, 2435 fms.)

Plate V. Figs. 1, 1 a, 2.

Obtained by the Coast Survey steamer "Bache" in Charlotte Harbor, W. Florida, in 13 fms., bottom temperature 82°.0 F.; by the "Blake," off Cape San Antonio, in 424 fms.; in Yucatan Strait, in 640 fms.; at Station 19, in 310 fms.; Stations 51 and 61, near Havana, in 450 and 243 fms.; Station 128, in 180 fms.; Stations 130 and 136, in 451 and 508 fms., near Santa Cruz ; Stations 150 and 151, near Nevis, in 373 and 356 fms., bottom temperature 45°.0 ; Station 176, in 391 fms., and Station 188, in 372 fms., near Dominica ; Stations 221 and 222, near Santa Lucia, in 423 and 422 fms.; Stations 226 and 230, near St. Vincent, in 424 and 464 fms.; Station 236, off Bequia, in 1591 fms., bottom temperature 39°.0 F. With the exception of the first and last localities, the bottom temperature at the above stations ranged from 41°.5 to 60°.5 F.

This fine species was found by the "Challenger" off Bermuda in 1075 fms., also off Culebra and St. Thomas. Many of the Blake specimens are more finely developed than those figured by Smith in the Challenger Report. It seems to have a wide geographical and bathymetrical range, and to be almost independent of temperature limits. The valves are tightly closed, the soft parts pale yellowish, with a narrow brown marginal line on the mantle edge ; there are no pigmented ocelli, the lips are wrinkled, the foot very short, deeply incised, without differentiated stem, and elongated instead of hood-shaped. The distal end of the intestine is free for a short distance. No byssus was observed. The young resemble the genuine *fenestratum* Fbs., but are more regular. Of those examined, 75 per cent had eleven liræ, and the remainder ten to fourteen liræ internally.

Amusium (Propeamusium) Hoskynsi Forbes.

Pecten Hoskynsi Forbes, Rep. Ægean Sea, p. 192, 1843 ; Jeffreys (ex parte), Lightning and Porcupine Moll., P. Z. S., 1879, p. 562.

Pecten concentricus Forbes, l. c. (ex parte ; lower valve ?).

Pecten fimbriatus et antiquatus Philippi, Moll. Sic., II. p. 61, pl. xvi. figs. 5, 6 (upper and lower valves), 1844.

Not *P. Hoskynsi* of G. O. Sars, Leche, et al., of northern seas.

This form has been obtained in the Mediterranean and the adjacent parts of the Atlantic. No authentic specimens are in the Jeffreys collection from the vicinity of America, the specimens so considered, mostly very young or imperfect, appear to belong to *A. cancellatum* Smith (non Jeffreys). The ribs are less clearly developed than in most of the species, until the individual is fully adult; in very young specimens they are absent, and the shell can hardly be distinguished from *P. imbrifer,* which has commonly been confounded with it, as mentioned under that species. The present one is characterized by the very large shelly bubbles, generally worn away, and leaving their semicircular basal edges plainly visible in fifteen to eighteen series, with intercalary ones near the margin. The umbo of the upper valve has sharp elevated concentric ridges without pustulations. There are inside near the margin of adult shells 17-21 short liræ, thickest at their distal ends usually and not extending into the hollow of the shell, except the marginal ones, and these not always. The shell is very thin, vitreous, and pale yellowish in color.

Amusium (Propeamusium) Holmesii Dall.

Plate V. Figs. 5, 11.

Shell small, somewhat oblique, thin, brightly colored (like *A.* var. *marmoratum*), the convex valve with twenty to twenty-eight faint radiating ridges, absent toward the beaks and with intercalary ridges toward the margin ; interspaces between the ribs polished, mostly smooth or with traces of concentric lamellæ which near and over the radiating ridges rise to arched scales, which in some cases are closed in front, forming spindle-shaped pustules, with the longer axis in the concentric line to which they belong ; anterior ear the larger, pectinately scaled on the margin, with obscure radiating or lamellar sculpture ; concave valve finely concentrically waved, the waves becoming crowded and scaly toward the margin ; anterior ear with three or four radiations and strong lamellæ, posterior ear lamellate, but not radiated ; anterior margin rounded, posterior ditto, produced. Alt. 12.0, lon. of shell 12.0, of hinge line 6.0, max. diam. 2.0 mm. Internal liræ eleven to fourteen, fine, with a tendency to pair, and falling considerably short of the margin in the completely adult shell.

Dredged at Station 273 in 103 fms., and in 100 fms. at Barbados, living. The bottom was yellow coral and broken shell, and the temperature 59°.5 F.

This pretty shell is nearest *A. Hoskynsi* Forbes, from which it differs by the polished umbonal region, the larger number of ribs, the smaller size and different shape of the pustular scales, by its larger size, differently proportioned and pectinated ears, and by the strength, number, and character of its internal liræ. Its form is nearest that of *A. Pourtalesianum,* var. *marmoratum,* which is also brightly colored. It is named in honor of Dr. Holmes, the author of the "Pliocene Fossils of South Carolina."

Amusium (Propeamusium) Sayanum Dall.

Plate V. Figs. 3, 9.

Shell compressed, nearly equivalve, somewhat inequilateral ; white ; with dissimilarly sculptured valves ; right valve with (near the middle) about twelve radiating ridges between which toward the base intercalary ridges rapidly appear, so that at the base, in one specimen, there are thirty-two ridges and beginnings of ridges; over the whole are set closely declining concentrically continuous lamellæ, uniform, when unbroken, over ridges and intervals; the ears are nearly equal, similarly sculptured to the rest, and with three to five radiating ridges; the cardinal line straight and the umbo not prominent; the left valve is a little smaller, smooth or not ridged, and covered with similar but less elevated and closer lamellæ, which swell up in obsolete radiating lines in sympathy with the ridges of the other valve, but which swellings do not cover any genuine ridges; ears subequal, similarly sculptured; byssal notch not deep; interior of valves with 10 to 16 radiating liræ (beside the crura) of which about 10 run home to the body of the valve; ligamental pit moderate, hinge line simple and without transversely rugose areas; max. alt. 15.5, lon. 15.0, hinge line 7.0, diam. 3.0 mm.

Soft parts yellowish white except the liver; "ocular" tubercles without pigment, but present.

Dredged off Morro Light, Havana, at Stations 16 and 100, in 250–400 fms., living, bottom temperature 55°.6 F. A single valve was obtained at Station 143, off Saba Bank, in 150 fms., bottom temperature 63°.5 F.

This pretty species is nearest to *A. squamigerum* E. A. Smith, having the same type of concentric sculpture on the right valve, but differs in the strong rectilinear character of the radiating ribs, in being proportionally wider and more inequilateral, having a wider and less oblique hinge line, and being apparently somewhat flatter. These differences, however, though strong as regards the figured specimens, might be less evident for a large series. Still, they are so marked for what we have, that I have thought it perhaps better to give the present form a separate name than to assume the existence of intermediate varieties, without any intermediate material.

Amusium (Propeamusium) Alaskensis Dall.

Pecten (*Pseudamussium?*) *alaskensis* Dall, Am. Journ. Conch., 1871, p. 155, Pl. xvi. fig. 4 a, b.

Plate V. Figs. 7, 7 a.

In order to bring together the available material relating to this group, this, the largest species yet known, and having the most numerous ribs, has been included in the figures. So far it has occurred only on the Alaskan coast, and no other species is known from there; but there are several in the waters of Japan and Korea.

Subgenus PECTEN s. s.

Pecten magellanicus Gmelin.

P. magellanicus Gmelin (*Ostrea*), S. N., p. 3317, 1788.

P. Clintonius Say ; *P. principoides* Emmons, and *P. tenuicostatus* Mighels, auctorum.

This species was not actually obtained by the "Blake," but it was found with many of the Blake species off the Carolina coast by the U. S. Fish Commission. It was thought well to note here that this species by the character of the foot and of the young shell forms a very complete link between *Amusium* and such Pectens as *P. caurinus*, etc. It has precisely the foot of typical *Amusium*.

Pecten caurinus Gould.

Pecten caurinus Gould, Moll. U. S. Expl. Exp., Proc. Bost. Soc. Nat. Hist., III. p. 345, Dec. 1850.

Plate V. Fig. 4.

The study of the group of Pectens included in *Amusium* and *Pseudamusium* was made to utilize all available material, and in several cases resulted in the identification of small specimens, supposed at first to be distinct, with the young of forms which as adult would be classified in other sections of the genus *Pecten*. Among these immature shells was the young of *P. caurinus*, which has a striking resemblance to some species of *Pseudamusium*. It is figured herewith as a matter of interest to those engaged in a study of the development of the group. The specimen was dredged at Sitka, Alaska, in 1865. This species grows to a large size and is found on both sides of the North Pacific. It has no internal liræ, and is not externally like *Amusium*, but in the character of the foot it stands midway between the sucker-footed and the typical Pectens. The foot is cylindrical, with the usual groove behind ; the tip is very slightly enlarged, glandiform, with a small incision behind, which does not look as if it could perform the office of a sucker with much efficiency. The mantle margin is broad and thick; set, in both valves, with a profusion of well-developed ocelli and tentacular processes. The lips are arborescent at their outer margin and radiately finely wrinkled inwardly.

Pecten nucleus Born.

Pecten nucleus Born, Test. Mus., pl. vii. f. 2, 1780.

Valves of this very neat little *Pecten* were found in 80–127 fms., off Havana, by Sigsbee.

The validity of this species cannot be considered settled. A dwarf form of *P. dislocatus* from southern waters seems to lead up to it by imperceptible gradations. The name of Born is of course prior to that of Say, but it is said that there are even earlier names. A larger supply of *P. nucleus* is needed before the identification can be considered conclusive, and so for the present I leave the names undisturbed.

Pecten dislocatus Say.

Pecten dislocatus Say, Journ. Acad. Nat. Sci. Phil., ii. p. 260, 1824.

Collected eight miles S. S. W. of Sand Key light, in 125 fms., by the steamer "Bache," in 1872, at Station 36, in 84 fms., and by Sigsbee, off Havana, in 182 fms. The specimens obtained were dead, and perhaps disgorged by some fish, as this species is known to prefer water of moderate depth. No living specimens were obtained. The relations of this species to *P. nucleus* Born are rather close, and it is a question I have not time at present to investigate whether Say's name is the first which has been given to this shell. Though allied to *P. purpuratus* Lam., it seems distinct from it.

Pecten phrygium, n. s.

Shell of the general form of *P. asper* Sby., flattish, oblique, both valves similarly sculptured ; left valve with about eighteen ribs with nearly equally wide interspaces ; these ribs have three sharp thin keels upon them, a median and two lateral ones, which project on the distal margin of the valve, and, with the similarly projecting points of four intercalary smaller keels, fimbriate the margin in a remarkable manner ; when perfect there are rounded scallops thrown from keel to keel close together, like the edges of a roll of coins, which hide all the keels except the extreme edge of the median keel of the ribs, which, without projecting much, forms a raphe, connecting the scalloped surface ; the material of the scallops is very fragile, and when worn away leaves a totally different surface, which in this case shows a multitude of sharp thin scales (the bases of the scallops) zigzagging from keel to keel and imbricating the keels ; the ears are moderate and subequal, there are about five distant narrow ridges on the anterior and two or three on the posterior ear of the left valve, with finer intercalary threads ; the right valve has the ridges on the posterior ear scaly, and the byssal fasciole transversely concavely ridged; there are four or five free spines to the pectinium ; the cardinal margin is straight and internally strongly vertically striate, as in very young specimens of *Janira* or *Amusium*. Height of largest valve, 36.5 ; width, 36.5 ; cardinal margin, 19.0 mm. Umbonal angle about 100°.

Dredged living at Station 32, in 95 fms., north of Yucatan Banks, in N. Lat. 23° 32′ and W. Lon. 88° 5′; bottom temperature not noted, but probably about 60° F.

Dead valves were found at Station 45, in 101 fms., bottom temperature 61°.75 F.; at a depth of 127 fms., off Havana, by Sigsbee; and off Grenada, at Station 244, in 792 fms. It is probably a dweller in about 100 fms. when living.

The very remarkable sculpture of this species sufficiently distinguishes it from any other, and specimens not fully adult may be recognized at once by the fimbriated basal margin of the valves. It is related to *P. Philippii* Récluz and *P. noronhensis* Smith, differing from both in having more numerous ribs, flatter and similar valves (the two valves are differently sculptured in the others), and in details of form and sculpture of surface and ears.

In one specimen, apparently quite adult, though not as large as one of the dead valves, there are on the interior of the valves, especially the left one, narrow liræ corresponding to grooves bounding the ribs externally, but which are hidden on the outside by the imbricated sculpture. These liræ are very distinct, and are raised at the ends into a little white prominence like the liræ of *A. alaskensis;* one more instance of the interchangeability of characters in this group.

The soft parts are streaked with purple in dots and dashes; there is an ocellus for each rib on the margin, except near the anal opening, where the mantle margin is without them, and is folded in such a way as irresistibly to suggest that it is the first step toward siphonation; there are here two very peculiar large crimson color marks on the mantle edge not duplicated elsewhere. The ocelli are of different sizes, some much larger than others. The remainder of the superficial anatomy calls for no special remark.

Pecten exasperatus Sowerby.

Pecten exasperatus Sby., Thes. Conchyl., *Pecten*, p. 54, pl. xviii. figs. 183–186, 1846.

Valves of young specimens were found in 13–19 fms., Charlotte Harbor, W. Florida, and in 640 fms., Yucatan Strait; the latter fresh, but not original to that depth, in all probability.

This species is very closely related to, if not identical with, *P. fusco-purpureus* of Conrad, which name would, if the species be identical, fall into synonymy.

The adult hinge line in perfect examples usually shows the transverse corrugations (referred to under species of *Pseudamusium*) with great distinctness.

Pecten ornatus Lamarck.

Pecten ornatus Lam., An. s. Vert., VI. p. 176, 1819.

Young specimens of this common West Indian species were obtained at Station 11 in 37 fms., off Havana in 80–182 fms., on the western coast of Florida in 50 fms., and a single valve, doubtless drifted but fresh, off Santa Lucia, at Station 220, in 116 fms.

Pecten antillarum Récluz.

P. antillarum Récluz, Journ. de Conchyl., IV. p. 53, pl. v, fig. 1, 1853.

Dead valves were found by Sigsbee off Havana, in 127 fms.

This species lives in a few fathoms of water about the Florida Keys, where it has been abundantly collected by Hemphill and others. The soft parts are about the same color as the shell, the foot vermiform, simple, and quite small.

Pecten effluens, n. s.

Shell small, high, flattened, covered all over with very fine striæ radiating from the umbo, but diverging from the middle line of the valve without reference to the other sculpture; left valve with about ten little elevated poorly defined ribs, which are most distinct in the young, rounded, smooth, separated by wider shallow interspaces, in which are from three to seven minute subequal regular threads, with small hardly elevated, regularly spaced, transverse scales on them ; anterior ear very small, obliquely cut off; posterior ear high, short, with about ten obscure radiating threads ; cardinal margin straight, simple ; right valve with faint radiating ridges most prominent near the margin, and tending to pair ; ears similar to those of the opposite valve, byssal notch small, fasciole very narrow, with four pectinium-spines beyond the edge of the ear, and a series of them overhanging the fasciole within it ; cartilage pit rather small, inner cardinal border nearly smooth ; color pale orange, lemon-yellow toward the umbo ; height of largest valve, 26.0. width 22.0 mm.; umbonal angle about 85°.

Valves were dredged in 127 fms. off Havana, by Sigsbee.

This shell seems nearest *P. furtivus* Lovèn, but has smaller anterior ears, finer striæ, and altogether different coarse sculpture, especially on the left valve. Both forms have the *Camptonectes* striation.

SECTION PSEUDAMUSIUM H. & A. ADAMS.

"*Pseudamusium* Klein, Tent. Meth. Ostracol., p. 134, 1753." Stoliczka, Pal. Indica, Cret. Pelec., III. p. 426, 1871.

Pseudamussium H. & A. Adams, Gen Rec. Moll., II. p. 553, 1858 (no type mentioned). Chenu, Man. de Conchyl., II. p. 184, 1862; *P. dispar.* Jeffreys, Ann. & Mag. Nat. Hist., Nov. 1876, p. 424.

Syncyclonema Meek, Cret. & Jur. Foss. Smithsonian Check List, 1864, p. 31 ; *P. rigida* H. & M. Stoliczka, l. c., p. 426, 1871.

Shell thin, smooth or delicately sculptured, small; valves subequal, closed except at the byssal foramen; ears unequal, the posterior ones often hardly differentiated from the body of the shell; hinge line straight; notch distinct; margin entire; interior destitute of radiating ribs; shell free, byssiferous. Types *Pecten dispar* and *P. pseudamussium* Lam.

The name *Pseudamusium* is due to Klein, but was first introduced into regular nomenclature and defined by H. & A. Adams, who, however, did not name a type, an omission which was supplied by Chenu. There do not appear to be any sound characters by which *Syncyclonema* can be differentiated from the other species here included, and it is very probable that *Camptonectes* (Agassiz Ms.) Meek, 1864, and its synonym *Eburneopecten* Conrad, 1867, should also be combined with it. These species, however, have a somewhat peculiar sculpture, and there seems to be no serious objection, considering the large number of species, to retaining the name *Camptonectes* in a sectional sense, as has been done by Stoliczka, provided it be understood that the division is not known to represent any fundamental diagnostic characters.

The peculiar sculpture, upon which alone *Camptonectes* is founded, is not, as was supposed by Stoliczka, singular to Mesozcic species, but may be found on living forms, like *P. furtivus* Lovèn, and many others. It may exist in unribbed species or in those with ribs; in the latter case being supplemental to the other ornamentation.

Pecten (Pseudamusium) imbrifer Lovèn.

Pecten imbrifer Lovèn, Ind. Moll. Scand., p. 31, 1846.
Pecten mammillatus M. Sars (ined.) fide G. O. Sars.
Pecten Hoskynsi, var. *pustulosus* Verrill, Trans. Conn. Acad., V. p. 581, pl. xlii. figs. 22, 22 a, Pl. xliv. fig. 11, July, 1882.
Pecten pustulosus Verrill, l. c., VI. p. 261, 1884.
Pecten Hoskynsi Jeffreys (ex parte); G. O. Sars, Moll. Reg. Arct. Norv., p. 20, pl. 2, figs. 1 a–c, 1878; Leche et al., not of Forbes, 1843

Plate IV. Figs. 4 a, 4 b.

Valves slightly convex; left one least so, slightly concave at its distal margin; valves diversely sculptured, right valve without perceptible prismatic sculpture, surface smoothish, with radiating series of (larger or smaller) hemispherical punctate bubbles arranged on the slightly raised concentric growth-margins; radiating sculpture of similar nature on the auricles; left valve with concentric sharp equidistant raised laminæ, wider near the margins and showing more or less prismatic texture; auricles well defined, the anterior very small, the posterior much larger with strong concentric and faint radiating sculpture; byssal sulcus very small and fasciole very narrow, passing straight along the body margin; color vitreous white often with a grayish discoloration. Alt. 12.5, lon. 12.0, max. diam. 3.3 mm.

Arctic seas and cold waters north of Europe, the Atlantic, and along the northeastern coast of the United States.

When the valves are worn, as is often the case, the sculpture on the right valve is represented by more than hemispherical loop-like lines connected by sections of the concentric lines very much as in *P. Hoskynsi*, which is, however, a smaller species. The pustules vary much in size in different specimens, and have a dotted or cellular surface.

This fine species was first described by Lovèn, and is destitute, at any stage, of the internal liræ of *Propeamusium*, and has a more vitreous and translucent texture than that of *P. Hoskynsi*, with which it has been widely confounded.

The range of variation of the external sculpture is very much as in *P. Hoskynsi*, and it is difficult to separate young and depauperated specimens of the latter from young *imbrifer;* especially when the external sculpture is worn.

After a careful study of the specimens in the Jeffreys collection, I am not surprised that he should have united them, the majority of his examples of *P. Hoskynsi* being very young and imperfect, while he had only two or three specimens of *P. imbrifer*. The latter is a cold-water species, reaching its finest development in arctic or subarctic seas; it is doubtful if it reaches as far south as the coast of France on that side of the Atlantic, unless in very cold and deep water. On the other hand, no species of *Propeamusium* has been found in the arctic seas. I have not seen *P. leptalea* Verrill, but the diagnosis reads much like a description of one of the more finely sculptured forms of *imbrifer*.

Pecten (Pseudamusium) reticulus Dall.

Plate V. Figs. 8, 10.

Left valve less convex and smaller, valves diversely sculptured; right valve with solid uniformly elevated concentric laminæ crossing thread-like rather distant radiating riblets ; where the lamina crosses a thread, especially near the margin, it rises into a minute grooved spine; auricles similarly sculptured ; surface showing the prismatic texture in a very delicate manner ; left valve also prismatic, with some strong radiating sculpture on the auricles, but the body of the valve marked with fine concentric, uniform, wavelike undulations; auricles well marked, the anterior the smaller ; byssal notch rather deep, fasciole narrow, close to the border of the valve. Alt. 7.0 ; lon. 7.25 mm.

Obtained in 82–123 fms. at Barbados. At Station 297, where the specimens were living, the bottom was stony, and the bottom temperature 56° 5 F.

This species is among the Pseudamusiums what *A. cancellatum* is among the Propeamusiums. It is differentiated from the following species by the characters mentioned under the latter, and appears to be always pure white. There were six strongly pigmented, proportionally very large, ocelli on the mantle-edge of the left valve. In the very young the reticulation in a concentric sense is sometimes looped, which at first gives it a different aspect. By accidents of growth the radiating sculpture and its spines are sometimes not rectilinear from the umbo, which also gives it for a moment an unfamiliar aspect.

Pecten (Pseudamusium) thalassinus Dall.

Amussium fenestratum Verrill, Trans. Conn. Acad., V. p. 582, 1882.
Amussium sp. Verrill, Ibid., VI. p. 261, 1884.

Left valve less convex and slightly smaller ; right valve sculptured much as in *reticulus*, but less pronounced and without spines, sometimes nearly smooth except near the margin, where traces of the radiating sculpture are always visible ; auricles as in *reticulus*, but less strongly sculptured ; left valve with concentric sculpture coarser than in *reticulus*, notch similar ; prismatic structure barely visible on extreme of the left valve only; interior of adult marked by a flat thickened margination, especially in the left valve, extending parallel with the basal margin; auricular crura elevated into a low ridge or blunt tooth on each side; hinge margin furnished with a lanceolate area on each side of the cartilage pit which is finely deeply closely grooved in a direction vertical to the hinge-line, the projections between the grooves interlocking so strongly as to cause the hinge-line of one valve sometimes to break off bodily, rather than separate from the opposite valve, when one is trying to open a pair, even when the soft parts are absent. The shell is prettily variegated with mottlings of red, brown, and yellow on a creamy ground, both valves participating, but the upper one rather the brighter in most cases. Alt. 8.5; lon. 9.0; max. diam. 2.0 mm.

This shell has been dredged by Professor Verrill in 80 to 317 fms. off Martha's Vineyard. Specimens were obtained by Sigsbee off Havana in 450 fms., and at Station 36 in 84 fms.

The figure on Plate VI. fig. 5, representing the interior of the young fry of *Janira hemicyclica*, equally well represents the very young of this species, which at this stage can hardly be distinguished from the other except by the external sculpture, which is often absent, or by the rugæ of the hinge.

Because the internal liræ occasionally fail, or are late in being deposited in certain individuals of *Propeamusium*, Dr. Jeffreys formed the opinion that they were of no importance as a specific character. In this manner he was led into several errors, from judging merely by the exterior of some of these small shells. In the present case the external sculpture is much like that of *Amusium fenestratum* Forbes, but finer and more regular. Both have similar varieties of color. Dr. Jeffreys was thus led to unite them, although they belong to different sections of the genus, as also in the case of *A. Hoskynsii* and *Pseudamusium pustulosum* Verrill, an error entailing some serious results in the matter of areal distribution. Professor Verrill followed Dr. Jeffreys until a special study of the group enabled me to call his attention to the discrepancies existing between the two species.

The peculiar arrangement of grooved and corrugated areas on the hinge-line is of interest in connection with the development of hinge characters. It is very common in the fry of various Pectens. It is well developed in the very young *P. magellanicus*. I have found traces of it in many of the minute specimens of *Pecten* I have examined, though often very faint, and in very few does it reach the development attained in the present species. It was the adult and permanent characteristic of the extinct genus *Neithea*, and traces of it are even recognizable in some species of *Janira* or *Pecten* in their adult condition. When I first discovered it in the present species, I naturally supposed I had come upon the type of a new generic division, but I have since found it in the young of Pectens of nearly all sections of the genus in its widest sense. On the other hand, in some species even the very young have hardly a trace of it.

Pecten (Pseudamusium) Sigsbeei Dall.

Plate IV. Fig. 2.

Valves rather convex, the left one most so; both apparently polished, but with microscopic silky concentric striæ; no radiating sculpture, no prismatic markings; anterior auricles well marked, very small, oblique; posterior auricles larger, with a broad shallow byssal sulcus but no fasciole or pectinium, the markings only of concentric growth lines; color brownish with opaque white splashes. Alt. 11.5; lon. 9.1; diam. max. 3.75 mm.

Two valves were obtained by Sigsbee in 158 fms., Lat. 22° 10′, W. Lon. 82° 20′, near Havana, Cuba. This little species is very recognizable by its plump oval shape, like an apricot stone, and its smooth surface destitute of radiating sculpture.

Genus HINNITES Defrance.

Hinnites Adamsi, n. s.

Plate V. Fig. 6.

Shell thin, ashy white externally, internally semi-nacreous; rounded with a comparatively short straight hinge-line; attached valve unknown; upper valve indistinctly auriculate, rather flat, irregular toward the margin with a small pointed but not prominent apex, a little to the right of the middle of the hinge-line; sculpture composed of somewhat irregular radiating costæ, not bifurcating but increasing by intercalation toward the margin, where they are much crowded; these costæ are formed by crowded overlapping rounded scales, like biscuit piled one over another, and showing sharp edges only where worn; there are about forty with a somewhat smaller number of intercalary ones; the concentric sculpture is composed of ill-defined lines of growth, and the whole surface is microscopically granulose; interior polished, silvery, reproducing the external rugulosities; muscular impressions invisible; cartilage pit triangular, distinct, hinge-line smooth, margin nearly simple. Lon. of shell, 28.0; of hinge-line, 13.0; height of shell, 30.0 mm.

Station 227, off St. Vincent, in 573 fms., fine sand and gray ooze; the bottom temperature 40°.5 Fahrenheit.

This shell has an unmistakably abyssal facies and seems to belong to the genus *Hinnites*. It is named in honor of Prof. Charles B. Adams, of Amherst, to whom so much of our knowledge of the fauna of the West Indies and Panama is due, and who was among the first of American naturalists to recognize the variability of what we call species, and the close relations which exist in nature between forms admitted by naturalists to be of "specific" value, or, in other words, which have obtained a temporary equilibrium of characters which they transmit to their descendants.

Family LIMIDÆ.

Genus LIMA Brugière.

Lima squamosa Lamarck.

Lima squamosa Lam., An. s. Vert., VI. p. 156. Sowerby, Thes. Conchyl., I. p. 84, pl. xxi. figs. 1, 18.

Young specimens, in the condition called *L. caribbæa* by D'Orbigny, were dredged in 80 fms. off Havana; in 100 fms. at Barbados; at Station 210, near Martinique, in 191 fms.; and in 640 fms., Yucatan Strait; all single valves; one living specimen at Station 292, in 56 fms., sand, off Barbados, bottom temperature 74°.5 F. It has been found in Florida by Hemphill, and is widely dispersed over the world.

Lima tenera Sowerby.

Lima tenera Sby., Thes. Conchyl., I. p. 84, pl. xxi. figs. 2, 3, 10, 11, 12, 1846.

Obtained by Sigsbee in 80 and 127 fms. off Havana; at Station 21, in 287 fms.; and at Barbados in 100 fms.; all the specimens being separate valves.

A variety which may take the name of *planulata* was obtained at the last-mentioned station. It is distinguished from the ordinary varieties by being more elongated and compressed, by finer and smoother sculpture, which wants the little spurs or spines on the radiating ribs, which are flattened and separated by narrow deeply punctate channels. In full-grown specimens the inner basal margin is smooth and thickened all round, while the margin of the gape is pouting and more marked than in the type. This variety is flatter than any form of *Lima* which has been figured, and at first was naturally supposed to be a distinct species. There seem, however, to be intermediate specimens, and I think it is quite certainly an extreme form of *L. tenera*.

Lima inflata Lamarck.

Lima inflata Lam., An. s. Vert., VI. p. 156.
Lima fasciata Sowerby, Thes. Conchyl., I. p. 85, pl. xxi. figs. 16, 17; not *Ostrea fasciata* Linné.

Valves of this species were dredged on the west coast of Florida in 19 fms., and off Sand Key in 128 fms. Fine specimens have been obtained by Hemphill at Cedar Keys and Key West on the reefs, and it extends along the Atlantic coast northward nearly or quite to Cape Hatteras.

Lima hians Gmelin.

Ostrea hians Gmel. S. N. 3333.
Lima fragilis Montague, Test. Brit. Suppl., p. 62.
Lima tenera Turton, Zoöl. Journ., V. p. 362, pl. xiii. fig. 2.
Lima aperta Sowerby, Thes. Conch., I. p. 87, pl. xxii. figs. 26–29.

One valve was obtained near Santa Cruz, at Station 127, in 38 fms.

Lima albicoma, n. s.

Shell small, short, waxen gray, very inequilateral ; sharply truncated above and roundly produced below, anteriorly ; hinge-line short, cardinal area triangular with a narrow long cartilage in a shallow sulcus overhung at the outer end by the acutely pointed umbo ; anterior edges of the cardinal and truncated areas strongly carinate ; between the carinæ the truncature is concave with one strong and two or three fine radiating threads parallel with and near to the longer carina, the rest of this area striate with lines of growth ; the anterior angle of the hinge margin hidden in the concavity, when the shell is viewed from the side; the posterior angle is visible, but not prominent, though sharp ; from this angle to the outer end of the anterior carina the base describes two thirds of a circle ; exterior smooth, finely regularly grooved with very numerous punctate grooves, at the basal margin about ten to the millimeter; these grooves radiate primarily from two imaginary lines, one of which (somewhat as in *L. tenera* and *L. scabra*) is median to the umbo and the base. The other is nearly similarly situated with regard to the former, posteriorly, as the margin of the truncature is, anteriorly; hinge-line smooth. Max. alt. 8.00; max. lon. 8.00 ; max. diam. 4.00; hinge-line 2.75 ; lon. of truncature 6.00 mm.

A valve of this interesting species was dredged at Barbados, in 100 fms. ; the type was dredged by the Fish Commission steamer "Albatross" at Station 2322, near Havana, in 115 fms.

The peculiarities of sculpture, apart from all the other characters, sufficiently separate this from any other described species.

Genus LIMATULA S. Wood.

Limatula setifera, n. s.

? *Limatula ovata* Dall, Bull. M. C. Z., IX. p. 118, 1881 (not of Wood or Jeffreys).

Shell ovate, inflated, white, with about thirty-four radiating acute ribs, strongest in the middle of the valve, with a fine sharp thread in the channel between each pair of ribs; both ribs and threads sharp, thin, and produced into a series of sharp spines, which in perfect specimens are nearly as high as the ribs which seem to connect and bisect their bases ; the intercalary threads appear only in the basal half of the valve and would be wanting in the young ; toward the sides, or rather ends, of the valve, the spines tend to widen into scales concentric to the umbo ; the anterior edges are slightly produced, and the ribs slightly oblique, so that the rib which is median to the base when traced to the umbo is a little posterior to the median line there ; there is no median sulcus ; cardinal area and ligamental sulcus wide antero-posteriorly and short in the opposite direction; cardinal margin simple, pit very shallow ; interior grooved and basal margin dentate, especially toward the middle, to correspond with the ribs ; shell nearly equilateral. Alt. 9.00; lon. 5.75; diam. 6.00; hinge-line 3.50 mm.

Valves were obtained by Sigsbee, near Havana, in 450 fms. ; Station 272, near Barbados, in 76 fms.; and by the U. S. Fish Commission at Station 2612, 31 miles S. E. by S. ¼ S. of Cape Lookout, North Carolina, in 52 fms., coarse white sand, bottom temperature 67° F.

The sculpture separates this form from *L. confusa* E. A. Smith (*ovata* Jeffreys non Wood), and from the fossil *L. ovata* Wood, which is usually much smaller. It is perhaps the prettiest species yet described.

Genus LIMÆA Bronn.

Limæa Bronniana, n. s.

Shell small, white, stout, ovate, rather short and swollen ; with 14–16 smooth subequal rounded regular radiating ribs, with nearly equal impressed channels between them ; there is a nearly smooth anterior and a smaller smooth posterior area without ribs ; the concentric lines of growth are usually faint; shell sightly produced at the anterior base ; interior smooth, grooved for the ribs, strongly dentate at the basal margin ; cardinal area narrow, longest in front of the large and strong cartilage pit ; the middle part of the hinge smooth, the angles each with four or five strong teeth, obliquely set ; alt. 3.5 ; lon. 3.1 ; hinge-line 2.0 ; diam. 2.5 mm.

Var. *lata*. Shell larger, thinner, less inflated, sculpture less prominent radially, the lines of growth more prominent, the ribs less elevated and numbering 20–26, with the posterior area radiately striate, the interspaces less channelled, the umbo nearly smooth. Alt. 5.3 ; lon. 5.2 ; hinge-line 2.5 ; diam. 3.1 mm.

The typical form was taken by the U. S Fish Commission off the coast of the Carolinas, at Stations 2596, 2612, and 2619, in 15–52 fms. ; by the "Blake," in 100 fms., near Barbados. The variety *lata* was obtained by the "Blake" off Havana, in 452 fms. ; at Station 2, in 804 fms.; and at Station 100, near Havana, in 400 fms.

This species is immediately distinguishable from *L. Sarsi* by its sculpture, and by the obliquity of the teeth on the angles of the hinge margin. The variety is evidently a more southern form and looks specifically distinct, but having only a few separate valves it seems better to wait for more material, which may prove more nearly intermediate. If distinct, it may be called *L. lata.*

Family SPONDYLIDÆ.

Genus SPONDYLUS Linné.

Spondylus Gussoni Costa.

Spondylus Gussoni Costa, Cat. Sist., p. xlii, 1829; Phil., Moll. Sicil., I. p. 87, pl. v. f. 16, 1836.

Found at Station 150, near Nevis, in 375 fms.; at Station 193, in 169 fms.; at Station 278, Barbados, in 69 fms.; at Station 262, Grenada, in 92 fms.; and in 640 fms., Yucatan Strait.

The specimens have been compared with authentic European examples, and agree precisely.

Genus PLICATULA Lamarck.

Plicatula spondyloidea Meuschen.

Ostrea spondyloidea Meuschen, Mus. Gronovianum, 1778.
Plicatula ramosa Lamarck, An. s. Vert., ed. i., VI. p. 184, 1819.
P. marginata Say, Journ. Acad. Nat. Sci. Phil., IV. p. 136, pl. ix. f. 4.

Found in 36 fms. at Station 12; in 54 fms. off Sombrero Island; and in 640 fms. in Yucatan Strait; in the last case probably ejected by a fish.

This extremely variable shell has been erected into a number of species. It varies from nearly smooth to strongly plicate; from greenish white to closely streaked with brown. The young are rather pretty, the old ones coarse and rude. The number of ribs is most numerous when the shell is attached to a flattish surface; the ribs are fewest and most coarse when the shells grow on one another like reef oysters.

Family DIMYIDÆ.

Genus DIMYA Rouault.

Dimya Rouault, Mém. Soc. Géologique de France, 2me sér., III. p. 471, 1848.
Stoliczka, Cret. Pelec. of S. India, Pal. Indica, III., ser. vi., pp. xxii, 397, 1871; (*Aviculidæ,* subfamily *Vulsellinæ*). Dall, Science, Feb. 16, 1883, p. 51.
Woodward, Man. Moll., 2d ed. by Tate, p. 408 (*Ostreidæ*), 1871.
Margariona (Dall, Ms. 1882), Kobelt, Nachr. Mal. Ges., p. 186, 1882.
Type *Dimya Deshayesiana* Rouault.

Shell inequilateral, inequivalve, closed; upper or left valve slightly smaller, lower or right valve attached to some extraneous object; external layers nacreous; inner surface porcellanous; epidermis none or very little; ligament linear, minute; cartilage inserted in a triangular pit in the cavity of the beak; hinge-line short, straight; inner margins radiatingly wrinkled; pallial line simple. Mantle completely open, margin papillose without ocelli; gills single, one on each side composed of a single row of long filaments, palpi none; anal end of intestine produced, free; sexes separate; foot none; anterior adductor single, distinct; posterior adductor double, and leaving a pair of closely approximated subequal impressions on the shell; mouth with distinct lips; visceral mass small.

Dimya Deshayesiana ROUAULT.

Dimya Deshayesiana Rouault, l. c., p. 471, pl. xv. figs. 3, 3 a, 3 b, 1848. Eocene of Bos d'Arros, France, equivalent in age to the Paris Basin eocene.
Stoliczka, l. c., p. 397, 1871.
Anomia intustriata D'Archiac, Mém. Soc. Géologique de France, 2me sér., III. p. 441, pl. xiii. figs. (9 a, 10 a ?), 11, 1848.*
Dimya Deshayesiana Tate, Woodward, Man. Moll., 2d ed., p. 408, 1871.

Dimya argentea DALL.

Plate IV. Figs. 5 a, 5 b.

Shell white, micaceous silvery outside, opaque brilliant porcellanous white inside; irregular, laterally compressed, attached by the beak of the right valve (to a dead echinus-test, etc.), which is deeper and larger than the other; exterior obscurely finely radiately striate; outline irregularly ovate, broader behind; hinge-line short, straight, without notch or auricles; in well-developed examples it has a leaf-shaped wrinkled area on each side of a small impressed triangular area, below and partly under which is a small, deep, subtriangular pit for the brown horny cartilage; ligament hardly perceptible, linear, nearly as long as the hinge-line; interior with an impressed area bounded by the

* It seems very probable that the shells described as *Anomia* by D'Archiac were all of the same species as that subsequently described by Rouault. Fig. 11 certainly represents the same shell, and it looks as if Figs. 9 a and 10 a represented attached valves of *Dimya* which had been worn through at the point of attachment of the lower valve, and the resulting accidental perforation taken to be normal by D'Archiac. The interior markings are precisely similar, as far as can be judged from the figures. In the absence of specimens, however, it is safer to preserve the specific name of Rouault, which certainly relates exclusively to the species as we now understand it. Rouault's paper was read in 1847, but seems to have been published in 1848, while the volume appeared as a whole in 1849.

pallial line, the region of which is slightly raised, the shell falling away from it toward the centre and the periphery; outside of the pallial line smooth or marked by irregularities of growth; inside with fine radiating wrinkles (due to the papillæ on the mantle-edge which are strongest at their distal ends, and which there form a narrow band of elevated waves and grooves which borders the body cavity of the shell and is strongest near the hinge); muscular impressions distinct, the double impression of the adductor more duplex in the right valve than in the other, the two parts of the muscle being slightly twisted one upon the other; the anterior adductor slightly nearer the beak than the other; margin partaking of the irregularities of the object to which the shell is attached, usually sharp, simple and very thin, as in a young oyster. Lon. of shell 10.5, lat. 12.0 mm.

Soft Parts. Mantle open throughout; its margin thickened, smooth, white, rather distantly studded with a single line of small (in their contracted state strawberry-shaped) papillæ, more elongated toward the middle; there are no ocelli, but the central portions of the papillæ often show a pronounced dusky tinge; within the line of the papillæ a thin smooth "curtain" or band of tissue at right angles to the plane of the shell extends toward the opposite valve, with a width, in its contracted state, about equal to the thickened marginal band; inner portions of the mantle thin translucent and studded with aggregations of more opaque whitish cloudy dots or nebulous markings; the margin of the mantle has its extreme edge brownish near the anal end, and is somewhat firmly attached to the shell. The adductors are composed of strong, stiff, unstriated, easily separable fibrillæ, of a greenish cream-color and very polished surface, and are provided with a thin but stout investing fascia; as before stated, the posterior adductor is composed of two subequal rounded portions slightly twisted on each other as if to admit of a slight lateral motion of the upper valve upon the lower one; they are quite round except where in contact; the anterior adductor, with an area equal to one of the halves of the posterior muscle, is more elongated and pointed toward its outer end; the alimentary canal is small, apparently simple, with one certainly and possibly two coils buried in the liver; the oral aperture, just below and behind the anterior adductor, presents a curious resemblance in its form to the epistome of a polyzoan; the form is not absolutely the same (owing to the alcohol?) in different individuals, and in the largest one examined was much more pronounced than in smaller examples; there is first a soft ovoid prominence at whose apex projects from a depression a linguiform lip or projection over which is a waved fold with a deep sulcus between; from the lateral ends of the "lip" and fold a wrinkle extends forward and then backward, the two wrinkles on each side parallel with a shallow depression continuous with the sulcus between them; the oral aperture appears at the bottom of the sulcus and will receive the end of a probe as large as a good-sized pin, but the course of the œsophagus, being lacerated, could not be continuously traced; the lip and fold in the oldest example dissected appeared to have a hard, almost cartilaginous consistency, in others they were soft like ordinary tissue; the other end of the intestine passes over the posterior adductors firmly knitted to the fascia by connective tissue and having two thin broad bands of muscle parallel with it which seem adapted to give some voluntary motion to the free end of the intestine, which projects 10.0 mm. beyond its attachments, near its end is deeply constricted, and ends in a small round centrally pierced button-like expansion. The diameter of the terminal button is about 0.37, of the constriction 0.25, of the internal tube about 0.25, and the average of the free part of the intestine 0.5–0.7 mm. The diameter of the tube is somewhat irregular, and it contained, in the specimens examined, more or less dark gray fæcal matter. In the structure of the two ends of the alimentary canal this mollusk resembles *Trigonia* and some *Pectinidæ*. The liver presented different appearances in different specimens; in younger but pretty well developed examples it presented the appearance of a number of free simple deep olive-green tubules radiating from a comparatively small plexus as a centre, through which passed the intestine; in older specimens it had acquired a more solid and compact consistency, the single tubules were no longer recognizable, the interior was brownish when cut, and the outer surface was ornamented with a few whitish dendritic branches extending over it from the generative glands below the liver; the mass of the ovaries or sperm glands occupy part of an irregular space behind the mouth and in front of the posterior adductors, the liver projects into it beneath its surface in the median line, its lower external surface is keeled, but a foot is not developed; the substance of the ovary is disposed in, proportionally, rather large ramifications, with acorn-shaped* lobules containing granular cream-colored matter irregularly distributed on the inner surface; the supposed male gland was similar, but the contents were of a finer consistency and of a more greenish color. The texture of all the viscera is extremely loose and delicate, and their disposition differed in minor details in all the animals examined. This might be partly owing to the violence necessary, even with the greatest care, to open the valves so that the soft parts could be examined, and the extreme delicacy of the visceral tissues. The organ of Bojanus was not distinctly recognized. The gills are of a very primitive type, resembling the palpi of some Acephala in form, though not in construction; there are no true palpi; the gills originate above the mouth and behind the anterior adductor; their bases extend backward in a nearly right line to the lower surface of the posterior adductors, behind which two strong bands, one to each gill, anchor the main stem of the gill to the thickened margin of the mantle above and behind the adductors; beyond the point where these muscular bands are attached, the bases of the gills curve downward, hanging free, and terminate in a point reaching to the lower posterior edge of the mantle. The aforesaid bases are broad stout bands carrying each a large vessel and sustained by a rather stiff (chitinous) framework, or fundamental tissue. From them proceed the gill-filaments, each of which is extremely long,

* Like the acorn without its cup.

slender, and composed of a central more solid rod with a tube on each side of it, and with its distal end enlarged in a somewhat hoof-shaped manner. From the blood-vessel in the base a single tube issues to the root of each rod and after continuing a short distance divides, one branch passing down one side of the rod, the other crossing to the opposite side and continuing to join the first again at the distal extremity ; it appeared as if the fluid passed down on one side and back by the other. The exterior of the filaments is abundantly ciliated, and though there is no organic connection, there is something in the character of the surface of the knobs at the ends of the filaments which makes them adhere tenaciously to each other or to any other part of the gill they may touch; I could *see* nothing peculiar, but the mechanical effect showed that something was there to produce it. The longest separate filaments were 5.0 mm. in length, the diameter of the stalk of the rods measured about 0.025, and the knobs at the end 0.050 to 0.075 mm. The general outline of the gill, as traced by the terminations of the filaments, differs in different individuals to some extent.

Habitat. Station 231 of Bartlett, in 1878–79, 95 fms., coarse sand and rock, off St. Vincent, bottom temperature 61°.5 F. Specimens on dead sea-urchin, tests and on the thin marginal expansion of the shell of *Phorus;* Barbados, in 73 fms., coarse coral sand and broken shells, bottom temperature 70°.7 F.; Station 134, off Frederikstadt, Santa Cruz, in 248 fms., coarse sand and broken shells, bottom temperature 54°.5 F. ; and Station 238, off the Grenadines, in 127 fms., fine coral sand, bottom temperature 56°.0 F. A fresh valve was dredged by the U. S. Fish Commission, 36 miles S. ½ W. of Cape Hatteras (Station 2601), in 107 fms., bottom temperature 64°.4 F. It will be seen from the above figures that the species inhabits the warmer area.

The form *argentea* above described appears closely similar to the figures of *D. Deshayesiana,* given by Rouault. So nearly identical are they, that, until I have had an opportunity of comparing the recent and fossil forms, I feel barely justified in separating them. The figure of *Ostrea tenuiplicata* of Seguenza * resembled *Dimya* so much in its exterior that I requested Professor Seguenza to examine the interior and inform me of the character of the muscular impressions. He did so, and also most kindly sent me two valves which determine the correctness of my suspicions. The shell is an undoubted *Dimya.* It differs from Rouault's figures and from the recent *argentea* in having a much stronger and coarser sculpture of divaricating radii, in its shorter hinge-line and proportionally larger cartilage pit ; the visceral area is smooth or slightly dotted, while in the recent form it is striated ; the relative position of the muscular impressions and their form also differ somewhat in the two shells. For these reasons, unless a considerable individual variation may be hereafter demonstrated, it would seem that the two species may be regarded as distinct.

* Form. Terz. n. prov. Reggio, p. 123, t. xii. figs. 1, 1 a, 16, 1880. Miocene, Aquitaniano, to Pliocene, Astiano, Calabria.

The anatomical characters above described indicate an organization of ancient and rather primitive type. The gills are especially notable. For this reason it would seem probable that, among the multitude of oysters described from strata of the Carboniferous period to those of recent seas, numerous species of *Dimya* might be discovered by a more critical examination of the interior and muscular impressions.

The systematic position of this remarkable mollusk is difficult to determine in existing classifications. Woodward, from Rouault's description, places it in the *Ostreidæ*, suggesting that the anterior adductor scar is paralleled by a small anterior scar seen in some species of *Pecten*.* Stoliczka says : " Its form and structure resemble *Placuna* or *Placenta*, but there are no hinge teeth present ; the two muscular scars separate it from all *Ostreacea*, and as there is an anterior muscular scar indicated in most of the *Mytilacea*, the classification of the genus may be more correct in this place. If this should not be the case, the only other classification admissible would be near *Myochama* in the *Anatinidæ*."

The genus is peculiar in having but one single gill on each side, nearly all others with which it can be said to have relations being provided with two, though one of these may be nearly obsolete ; nor does any genus occur to me as having gills composed of rod-like filaments free from organic connection except at their base. The free lamellæ of *Pecten* are perhaps the nearest analogue. The mantle, except in the absence of ocelli, resembles that of *Pecten* ; from which, however, the nacreous shell, absence of the foot, and many details of structure strongly separate it. We are too ignorant, however, of the adult anatomy of mollusks in general (though the fact is very generally ignored), to dogmatize on assumptions which the discoveries of twenty-four hours may overthrow. Two things, however, appear reasonably certain : first, that the genus *Dimya* occupies a sort of middle place between the *Mytilacea* and *Ostreacea* without being admissible into the families of either group as at present constituted ; secondly, that the total rejection is necessary of the ordinal groups founded on the number of muscles (i. e. *Monomyaria*, *Heteromyaria*, and *Dimyaria*), which have been so long in vogue. Stoliczka's remarks, in his introduction to the Cretaceous Pelecypoda of India, are worthy of note in this connection, and appear to the writer to be full of sound common-sense. Even the proposition by Gill of the order *Heteromyaria*, in 1871, was an indication of the crumbling of the old-fashioned classification, which can only be replaced in a satisfactory manner by a great advance in our knowledge of the anatomy of animals which have been carelessly lumped together on the unwarranted assumption that the characteristics of the soft parts of one would suffice to classify several hundred others by their shells.

Since the above was written, Dr. Paul Fischer, in his excellent Manuel de Conchyliologie, finding, as I have done, that the features heretofore taken as bases for ordinal subdivisions of the Pelecypods are insufficiently important for

* This is, however, due to the mantle, not to an adductor muscle.

such a purpose, has proposed a division based on the number of branchiæ, those with two branchiæ on each side composing his order *Tetrabranchia*, as opposed to the *Dibranchia* with one gill on each side. But to this arrangement *Dimya* does not lend itself; *Ostrea*, *Mytilus*, etc., to which it is certainly most nearly allied, having four branchial leaves, to say nothing of the additional accessory plates which may be taken as representing a third pair. Moreover, some species of *Arca* (ex. *A. ectocomata* Dall) have but a single pair, while others have two or three. All the evidence points to the conclusion that the *Pelecypoda* comprise but a single order, knit closely together by inter-ramifying characters.

The genus *Dimyodon* Munier Chalmas (1886), of the great Oölite, appears to differ from *Dimya* by the projection of the wrinkled hinge-areas so as to form striated teeth, recalling those of *Plicatula*, and by its single posterior adductor scar. It has not been reported in a recent state.

Family AVICULIDÆ.

Genus AVICULA Lamarck.

Avicula atlantica Lamarck.

Avicula sp. indet. Dall, Bull. M. C. Z., IX. p. 117.

Habitat. Station 26, 116 fms.

Two very young living specimens were obtained here, and worn fragments were found from other localities. It is spread over the whole Antillean region, and northward in suitable localities at least as far as Hatteras.

Family MYTILIDÆ.

Genus MYTILUS Linné.

Mytilus exustus Linné.

Mytilus exustus Linné, Dall, Bull. M. C. Z., IX. p. 117.

Habitat. Sigsbee, off Havana, 158 fms.; Barbados, 100 fms., etc.

This is spread over all the shores of the Antilles, and the specimens obtained from more than a few fathoms are drifted or disgorged by fishes into the deeper water. The species does not live in deep water.

Genus MODIOLA Lamarck.

Modiola polita Verrill and Smith.

Plate VI. Fig. 3.

Modiola polita V. & S., Am. Journ. Sci., XX. pp. 392, 400, Oct. 25, 1880. Verrill, Proc. U. S. Nat. Mus., III. p. 402, 1881; Dall, Bull. M. C. Z., IX. p. 116, 1881; Verrill, Trans. Conn. Acad. Sci., V. p. 578, July, 1882.
Mytilus luteus Jeffreys, Rep. Brit. Assoc. Adv. Sci., 1880 (name only), Ann. Mag. Nat. Hist., Oct. 1880, p. 315 (name only).
Modiola lutea Fischer, Journ. de Conchyl., Jan. 1882, p. 52 (described).
Modiolaria polita Verrill, Trans. Conn. Acad., VI. p. 281, pl. xxx. f. 12, 1884.
Modiella polita Monterosato, Nom. Conch. Medit., p. 12, 1884.
Modiola (*Amygdalum*) *lutea* Fischer, Man. Conchyl., p. 968, 1885.

Habitat. North Atlantic. Mediterranean (Monterosato); Gulf of Gascony, and Marocco coast, Bay of Biscay (Fischer); New England coast (Verrill); Gulf of Mexico and Antilles (Blake Exp.), Station 43, 339 fms., off Tortugas, bottom temperature, 45°.0 F.; Station 47, 321 fms., bottom temperature, 46°.5; on the European side to over 1000 fms. The young were obtained rather abundantly at Station 2644, near Cape Florida, in 193 fms., by the U. S. Fish Commission.

This very elegant mollusk attains a length of 50.0 mm. (2 inches) without marked change of proportions from the very young to the adult stage. The smallest are waxen translucent; as they grow older, some of them may be prettily maculated with sagittate opaque white spots, radiating in a reticulate manner from the beak. As they attain maturity, they take on a magnificent golden brown color, especially deep toward the anterior end. The shell is pearly white, all these colors being situate in the epidermis, which, usually very polished and smooth, in rare cases may be somewhat irregularly radiately striate with the finest striæ.

The soft parts of this species are delicate, and contain but little solid matter compared with the capacity of the valves. The four labial palpi are moderate and lamellated; the gills, two on each side, extend the whole length of the animal, the inner lamina on each side being somewhat shorter than the outer one; the mantle margin is thin, smooth, and simple; the single branchial opening has (in alcohol) one hardly perceptible row of inconspicuous rounded papillæ; the mantle behind the commissure of the branchial orifice is completely open; the muscles are slender, the posterior adductor the largest, then the pedal and the anterior adductors, in that order; the foot is nearly half as long as the shell, longitudinally wrinkled, digitiform, very slender; the pointed tip is grooved, the byssal socket at the base is strongly marked. This long and slender foot is well adapted for nest-weaving, in which this species excels.

When dredged, the washed contents of the trawl may present several bodies looking like wads of fine flax soaked in mud, and having various dead shells or worm-tubes entangled therein. In this unpromising nidus is hidden our gem of the sea. Long continued gentle washing under a stream from the water-cock finally removes most of the mud. Immersed in water, we see that the nest is composed of the finest and most silky threads, inextricably interlaced and of great strength. Among them the young nestle until they are ready to spin for themselves. Many of the threads centre at and are connected with the byssal sinus, from which much force is necessary to detach them.

It will be seen from the notes on the soft parts that this mollusk is most nearly related to *Modiola*, and not to *Modiolaria*, as before examination I suspected. I have compared it with the chief types, and there is no doubt of this. If we separate the polished species from the bearded mussels, this species, according to Fischer, may be referred to *Amygdalum* Megerle (1811), from which it hardly differs. Monterosato proposed the name *Modiella* for it; but this had been used a year earlier by James Hall (1883) for a different group.

Modiola opifex Say.

Modiola opifex Say, Journ. Acad. Nat. Sci. Phil., IV. p. 369, pl. xix. figs. 2, 2 a, 2 b, 1825; Phil. Abbild. und Beschr. n. Conchyl., III. Modiola, p. 21, t. ii. fig. 7.

One valve was dredged from 640 fms. in Yucatan Strait, a depth which it doubtless reached in some accidental manner. This species was described by Say as attached to *Pecten nodosus*, and found in a mass of sand grains of its own collecting. Kroyer had it from Brazil, and the U. S. Fish Commission has dredged it to within a few miles of Cape Hatteras, but only as separated valves. It forms a transition, conchologically, between *Modiolaria* and the group typified by *Modiola semen*, sometimes called *Botula*.

Genus CRENELLA Brown.

Crenella decussata Montagu.

Crenella decussata Montagu, Dall, Bull. M. C. Z., IX. p. 116.
Nuculocardia divaricata D'Orbigny, II. p. 311, pl. xxvii. figs. 56–59, 1845.

Habitat. Barbados, 100 fms. (Alaska, California, New England, British seas, Norway, etc.).

This little shell is proportionately a little more solid and strong than northern specimens, and the crenulations which exist in both, and from which the group takes its name, partake of this difference. I have seen nothing, however, in the few specimens I have been able to examine, which would authorize the separation of the southern form from the northern one.

Genus MODIOLARIA Beck.

Modiolaria lateralis Say.

Modiolaria sp. indet., Dall, Bull. M. C. Z., IX. p. 117.
Mytilus lateralis Say, Journ. Acad. Nat. Sci. Phil., II. p. 264, 1822.

Plate VI. Figs. 7, 8.

Habitat. West Florida, 30 fms., living. East coast of the United States, from Florida nearly to Cape Hatteras, at various depths, but mostly in comparatively shallow water.

Another southern species of *Modiolaria*, but which is not reported from our coasts as far as the books indicate, is *M. lignea* Reeve, which I have received from C. W. Johnson, of St. Augustine, and from Charles T. Simpson, who collected it at Tampa, thus occurring on both coasts of the peninsula. It is notable for having no radiating striæ, and for its rich chestnut-color, bluish black on the umbones and toward the margins. It grows over an inch in length and spins a fibrous nest. *M. cinnamomea* Chemn. is another Florida species which almost or quite reaches the latitude of Cape Hatteras.

Family ARCIDÆ.

Genus LIMOPSIS Sassy.

Limopsis minuta Philippi.

Limopsis minuta Philippi, Dall, Bull. M. C. Z., IX. p. 119.

Habitat. Gulf of Mexico, west of Florida, 30 fms.; Station 36, 84 fms.; Barbados, 100 fms.; Bache, April 22, 1872, Lat. 21° 14′ N., 100 fms.; Sigsbee, off Cuba, 119 fms.; Station 20, 220 fms.; off Morro Light, 292 fms.; Station 19, 310 fms.; Sigsbee, off Havana, 450 fms.; Yucatan Strait, 640 fms.; Station 2, 805 fms.; Station 253, near Grenada, in 92 fms.

This species is named *minuta* on the authority of Dr. Jeffreys, it having been impracticable for the writer to compare with the various fossil forms of south Europe. It seems to agree sufficiently well with the material I have been able to examine, and which has been named *minuta* by other naturalists.

Limopsis tenella Jeffreys.

Limopsis tenella Jeffreys, Dall, Bull. M. C. Z., IX. p. 118.

Habitat. Station 44, 539 fms.; Station 41, 860 fms.; Station 56, 888 fms.; Station 33, 1568 fms.

This seems to be an excellent species. The width of the area varies more, however, than one would suppose from Jeffreys' description. It is sometimes wider than in *L. aurita*, but the hinge-line is longer and the corners more nearly rectangular than in that species.

Limopsis antillensis Dall.

Limopsis antillensis Dall. Bull. M. C. Z., IX. p. 119.

Plate VIII. Figs. 7, 7 a.

Habitat. Sigsbee, off Havana, 80 fms.

No more specimens of this species have been found in the collection. I suspect it to attain a considerably larger size when adult.

Limopsis cristata Jeffreys.

Limopsis cristata Jeffreys, Dall, Bull. M. C. Z., IX. p. 119.
Limopsis minuta var.?

Habitat. Yucatan Strait, 640 fms.

On further study I am somewhat in doubt whether these three poor valves do not belong to a young stage of *L. minuta*. The specimens in the Jeffreys collection are all so small, or in such poor condition, that I cannot regard them as affording sufficient evidence of a species different from *minuta*, though perhaps those in the British Museum may be better preserved.

Limopsis aurita Brocchi.

Limopsis aurita Brocchi, Dall, Bull. M. C. Z., IX. p. 118, 1881.

Habitat. Gulf of Mexico, west of Florida, 30 fms.; Station 36, 84 fms.; Station 20, 220 fms.; Gulf Stream, 447 fms.; Stations 253 and 264, in 92 and 416 fms., near Grenada ; Station 269, near St. Vincent, in 124 fms.; Station 176, off Dominica, in 391 fms.; and Station 163, off Guadelupe, in 769–878 fms. The bottom temperatures varied from 39° to 70° F., the average being about 55° F.

Var. *paucidentata*. Shell thinner, smoother, with narrower margin, smaller and fewer (4 + 4) teeth, ends of valves less expanded, less oblique ; radiating sculpture reduced to rows of small scars ; concentric sculpture obsolete. Alt. 9.0 ; max. lat. 9.0 mm.

Two valves at Station 117, in 874 fms., gray ooze, near Jamaica; bottom temperature 40°.0 F.

Genus PECTUNCULUS Lamarck.

Pectunculus undatus Linné.

Arca undata Linné, S. N., ed. xii., p. 1142; Hanley, Shells of Lin., p. 97
Pectunculus undulatus Lam., An. s. Vert., VI. p. 50, 1819.
Pectunculus lineatus Reeve, Conch. Icon., pl. v. fig. 25, 1843.
Pectunculus scriptus (Born) Reeve (young shells).
Pectunculus hirtus Phil. Zeitschr. für Mal., 1846, p. 191.
? *Pectunculus angulatus* Lam.
? *Pectunculus pennaceus* Lam. (= *decussatus* Linn.).
Pectunculus passus Conrad, Tert. Foss. U. S., p. 64, pl. xxxv. fig. 3, 1844; Tuomey & Holmes, Plioc. Fos. S. C., p. 48, pl. xvii. fig. 3 (good), 1855.
Pectunculus quinquerugatus Conrad, Ann. Journ. Sci., IV. p. 346; T. & H., l. c., p. 49, pl. xvii. fig. 4, 1855.
Pectunculus carolinensis Holmes, Post Pliocene Fos. S. C., p. 15, pl. iii. fig. 4, 1858. (Not of Conrad "1838" = 1844.)
Pectunculus tricenarius Conrad, Tert. Fos. U. S., p. 63, pl. xxxv. fig. 1, 1844.
Pectunculus parilis Conrad, l. c., p. 64, pl. xxxvi. fig. 2, 1844.

A single valve of the *scriptus* variety at Station 127, Santa Cruz Island, in 38 fms.

I have been unable to examine any specimen of *P. pennaceus* Lamarck (= *P. decussatus* L. sp.), or at least none of the specimens so named which I have been able to examine have had at one end of the beaks the heart-shaped area described by Lamarck and Hanley. I am therefore unable to say whether it and its synonyms should find a place here, as suggested by D'Orbigny and Krebs, both good judges. For the rest, it is evident that an absurd number of species have been made of this group, especially in fossils, where a man is allowed to describe a species from one valve without adverse comment.

A careful examination of a large number of good specimens of this species of *Pectunculus* will show any competent observer, — 1st, that the reticulated sculpture is always present on the umbones of a perfect shell, and its greater or less extension and uniformity over the valves in the adult varies with the individual; 2d, that the hinge in this group is very mutable within certain limits, and undergoes great changes with age, and the number of teeth is greater in the adult than in the young; 3d, that a certain lateral expansion and angulation, which are very marked in some specimens, are variable characters; 4th, that, as one goes south, the shells of this species become more brightly colored, more inflated, more purely porcellanous, and show a tendency to equalizing the strength of the radiating and concentric sculpture, thereby producing reticulation, which governs the disposition of the pilose epidermis and alters the aspect accordingly; they are also rather smaller when full grown. I have come to this opinion through the study of a large series collected by the U. S. Fish Commission, and another existing in the Jeffreys collection, covering

P. undatus and *P. pilosus*. The *carolinensis* form of Holmes is little cancellated, and grows very large ; 10 cm. is not an uncommon length. It is abundant in rather deep water as far north as Cape Hatteras, but not common inshore. In the Antilles the *lineatus* form is not uncommon, and averages smaller than the preceding. The strength of the radiating undulations is very variable ; they may be very evident, numerous, and even a little keeled in the middle, or flat, rounded, and strongest in the middle part of the valve, or altogether obsolete ; they are rarely discernible in cancellated specimens, but many which are not cancellated are entirely without them.

Pectunculus pectinatus GMELIN.

Pectunculus variegatus? D'Orb., Bull. M. C. Z., IX. p. 118.
Arca pectinata Gmel., S. N. 3313, 1790.
Pectunculus pectinatus Lam., Hanley, Rec. Sh. p. 165. Reeve, Conch. Icon., fig. 28.
Arca pectunculus minor Chemnitz, VII. t. 58, figs. 570, 571, 1784.
? *Pectunculus oculatus* Reeve, Conch. Icon., fig. 38, 1843.
Pectunculus pectiniformis D'Orbigny, Moll. Cuba, p. 313 (? not of Lamarck).
P. aratus Conrad, Tuomey & Holmes, Pliocene Fos., p. 50, pl. xvii. figs. 6 a, 6 b.
P. charlestonensis Holmes, Post Pliocene Fos., p. 16, pl. iii. fig. 5, 1858.

Habitat. Gulf of Mexico, west of Florida, 30 fms. ; Charlotte Harbor, Florida, 13 fms.; off Sombrero in 54 fms.; Sigsbee, off Havana, 80–119 fms.; off Gordon Key in 68 fms.; Station 10, off Cuba, in 37 fms.; Station 32, Lat. 23° 32′ and Lon. 85° 5′ W. Gr., in 95 fms.; Stations 36 and 45, off Cuba, in 84 and 101 fms.; Station 56, in 175 fms., off Havana ; Station 117, 874 fms. (one valve); and Station 278, in 69 fms., Barbados.

Var. *carinatus* Dall, at Station 247, near Grenada, in 170 fms., ooze, bottom temperature 53.°5 F. (living), and at Barbados in 100 fms.

The shell before us is with certainty the *pectinatus* of the best authorities ; one of its varieties seems to have been identified with the East Indian *Arca pectunculus* of Linné (*Pectunculus pectiniformis* Lam., not D'Orb.), which I have not found authenticated from the West Indies. It is probably the *oculatus* of Reeve, and certainly the *aratus* of Conrad. The different forms observed by me are three.

The first one has fewer ribs (about 20–30), about sixteen plications of the basal margin inside ; very square channels between the ribs ; close set, elegant concentric wrinkles over the whole ; and in many specimens a (sexual ?) peculiar truncation of the shell behind the hinge-line with a consequent angulation more or less pronounced ; the colors pink or rosy, or white with pinkish blotches, with dark pink or brown blotches, or, oftener, variegated tracery of lines. The above is most like the Linnean species, and is probably what has been so named.

The second or typical form has the ribs either more numerous (30–40) or wider with shallow hardly channelled interspaces ; is whitish with brown tracery, usually white inside, but occasionally very dark brown, this character being apparently local; the concentric wrinkles are close but less strong, a little wear makes them seem absent, and the shell smooth ribbed ; the same differences exist as to truncation ; this character is probably sexual.

The variety *carinatus* has the same number of ribs as the typical form, but they are carinated, and the interspaces toward the margin, owing to impressed radiating lines, seem to have several small threads in them between the ribs ; the concentric wrinkles are more distant, and take a lamellate aspect, forming, with the ribs, a reticulation which seems very characteristic ; the shell is a little more globose than the ordinary form, but not much ; otherwise it seems precisely the same, and all the gradations, from flat wrinkled ribs to keeled and reticulated ones, may be seen in the series before me. A single one taken by itself would certainly appear distinct from the ordinary form, and this gives us a hint of what we may expect when large numbers of specimens come to be studied scientifically and with due regard to their geographical distribution.

Genus ARCA Linné.

Arca pectunculoides Scacchi, var. orbiculata.

Arca pectunculoides Scacchi, var. *orbiculata*, Dall, Bull. M. C. Z., IX. p. 121.

Plate VIII. Fig. 5.

Habitat of the variety : Gulf of Mexico, Station 33, 1568 fms. (one valve).

Typical form : Sigsbee, off Havana, in 480 fms.; Station 16, near Havana, in 292 fms., living, bottom temperature, 56° ; Station 176, near Dominica, in 391 fms.; Station 211, near Martinique, in 357 fms.; and Station 230, off St. Vincent, living, in 464 fms., bottom temperature 41°.5 F.

Examination of a large number of specimens in the Jeffreys collection has convinced me that the single valve described as variety *orbiculata* is merely an extreme variety of the typical *pectunculoides*, and not distinct, as I suspected then. It is, however, certain that all the American specimens are shorter and rounder than those from farther east in the Atlantic sea-bed and the Norwegian and arctic seas.

Arca grenophia Risso may be this species, but it was not figured, and the description is quite insufficient. *Arca pectunculoides*, var. *crenulata* Verrill, appears to have the form of var. *orbiculata*, the teeth of the Gulf specimens above mentioned, the marginal crenulations of *glomerula*, and the sculpture of the type of *pectunculoides*. I have only seen one right valve of *crenulata*, but both valves seem to be sculptured alike.

By a slip of the pen, in treating of *Arca glacialis* Gray, Prof. Verrill (Trans. Conn. Acad., V. 576, 1882) represents me as recording *A. glacialis* from the Gulf of Mexico. This is an error ; as, in mentioning it in the Blake Preliminary

Report (l. c., p. 121), I reported the *pectunculoides* (with which Prof. Verrill had seemed disposed to unite *glacialis*) from the Gulf, but expressly objected to its identification with *glacialis*, which I do not know from that region.

Arca polycyma Dall.

Arca polycyma Dall, Bull. M. C. Z., IX. p. 122.

Plate VIII. Figs. 3, 3 a.

Habitat. Barbados, 100 fms., three valves ; a single valve at Station 262, near Grenada, in 92 fms.

Only one more valve of this interesting little species has turned up since the original specimens were described.

Arca glomerula Dall.

Arca glomerula Dall, Bull. M. C. Z., IX. p. 121, 1881.
Arca (*Scapharca* ?) *inæquisculpta* E. A. Smith, Chall. Rep. Lam., p. 267, pl. xvii. figs. 8 a - 8 c, 1885.

Plate VIII., Figs. 9, 9 a.

Habitat. Barbados, 100 fms.; Bache, April 22, 1872, Lat. 21° 14′, 100 fms.; Station 20, 220 fms.; Station 19, 310 fms.; Sigsbee, off Havana, 450–480 fms.; Station 100, off Havana, in 400 fms.; Stations 206 and 211, in 170 and 357 fms. off Martinique, bottom temperature 49°.0 F. to 62°.0 F. The Challenger specimens were obtained from off Culebra Island, West Indies, at Station 24, in 390 fms., pteropod ooze.

The specimens described by me in 1881 were separated valves, and the differences of sculpture, noted at the time, were set down to individual variation. Mr. Smith has, however, shown that the difference is between the two valves of the same specimen. There is generally a single more prominent rib on the posterior slope of the right valve, but nothing of the kind in the left valve.

Arca auriculata Lamarck.

Arca auriculata Lam., An. s. Vert., VI. p. 43, 1819.

Habitat. Station 142, in 27 fms., Flannegan's Passage; and at Station 12, off Havana, in 36 fms.

A single living specimen of this species was obtained in each case. The foot is of good size and deeply grooved, the byssus small. A sort of bridle of tissue from below the mouth passes under the anterior adductors and thence to the interior of the umbones, where it is strongly attached and then sweeps back toward the lower edge of the posterior adductor. On this band between the adductors are the gills, two on each side. There are three long filaments and several granulations and pigmented dots on the mantle edge near the anal orifice. The rest of the edge is nearly smooth. On each side of the anus is a prominent whitish lobule, from which a tube seems to pass back over the adductor and a shorter one toward or into the anal tube near its orifice.

Arca lienosa Say.

Arca lienosa Say, Am. Conch., IV. pl. xxxvi. fig. 1, 1832.

One young specimen was dredged in 19 fms., west of Florida. The Fish Commission has dredged in deeper water dead valves of this species measuring 115.0 mm. long., 65.0 mm. high, and 35.0 mm. in diameter (or 70.0 mm. for the whole shell). These had about 38 ribs, narrow and sharply grooved on top except in the older third where they were entire and uniformly closely transversely waved. The epidermis is soft, profuse, moderately long, and dark brown. The teeth are small, vertical, uniform and close set. The young are sometimes sharply auriculate. The anterior outer margin of the area is not covered with the black cartilage, which creeps up more and more in the middle line, as the shell grows; thus producing a marked difference between young and old.

Arca reticulata Chemnitz.

Arca auriculata Chemnitz, Conch. Cab., VII. p. 193, t. 54, f. 540, 1784; Gmelin, S. N., p. 3311, 1788; Dillwyn, Cat., I. p. 237, 1817; Lamarck, An. s. Vert., 2d ed., VI. p. 475.
Arca squamosa Lam., An. s. Vert., 1st ed., VI. p. 45, 1819.
Arca domingensis Lam., l. c., p. 40, 1819; E. A. Smith, Chall. Rep., p. 265.
Arca clathrata Lam., l. c., p. 46, 1819, fide Deshayes.
Arca clathrata Defrance, 1816, fide Nyst, Cat. Arc., 1848.
Arca gradata Broderip & Sowerby, Zoöl. Journ., IV. p. 365, 1829.
? *Arca congenita* E. A. Smith, Chall. Rep., p. 265, pl. xvii. figs. 6, 6a.
Byssoarca divaricata Sowerby, P. Z. S., 1833, p. 18; Reeve, Conch. Icon., pl. xvi. fig. 108.
? *Arca donaciformis* Reeve, Conch. Icon., pl. xvi. fig. 104, 1844.

Dredged at Stations 65 and 66, off Havana, in 80–127 fms.; at Station 21, off Cuba, in 287 fms., dead; at Station 32, in 95 fms., in the Gulf of Mexico, living; and at Station 262, near Grenada, in 92 fms., fine sand, bottom temperature 62°. It has not been found living from more than 100 fms. This well-known species, usually named *gradata* or *domingensis*, appears quite variable in outline, especially in the young. Some of my specimens approach so closely to the figure of *A. congenita* that it has suggested the idea that that may be merely an extreme form of *reticulata*. In the absence of specimens for comparison, however, the question cannot be fairly settled. It is a shallow-water species, and the material obtained by the "Blake" was all immature or dead.

Arca Adamsi SHUTTLEWORTH.

Arca lactea C. B. Adams, non Linné.
Arca cælata Conrad, Tert. Form. U. S., p. 61, pl. xxxii. fig. 2 (1844), not of Reeve.

Dredged by Sigsbee off Havana in 80 fms.; and at Station 220, near Santa Lucia, in 116 fms.

This species is very common in shallow water throughout the West Indies, and extends northward nearly or quite to Cape Hatteras. Its simulated ribs of trailing blisters give it a remarkably similar appearance to *Arca lactea*, which however has real ribs. There is a dwarf, very short squarish variety, which from its greater proportional diameter (though not otherwise different) would at first be separated as distinct, and which may be called *Arca Adamsi* var. *Conradiana*.

Arca Noæ LINNÉ.

Arca barbadensis D'Orbigny, II. p. 321, as of Petiver.
Arca occidentalis Philippi, and C. B. Adams.

A valve of this common form appears in the collection from Charlotte Harbor, Florida, in 13 fms. It is common in shallow water throughout the West Indies. It is possible that the Antillean form may be separable from that of the Mediterranean, but I have not been able to examine the matter critically as yet.

Arca umbonata LAMARCK.

What appears to be a dead valve of this species was dredged at Station 282, near Barbados, in 154 fms. It may have been disgorged by a fish.

Arca ectocomata, n. s.

Plate VI. Figs. 9, 10.

Shell white, compressed, elongate, equivalve, very inequilateral; covered with a long, soft, silky red-brown epidermis projecting in ribbon-like strips, which may be broken up into narrow flat filaments, and project especially at the lower posterior angle of the shell; valves gaping slightly for the large stout byssus; external sculpture of narrow, somewhat irregular, minutely nodulous concentric waves; the interspaces sparsely radiately striate; these striæ and little nodules correspond to thickened radii in the ribbon-like epidermis which are seated on them; these radii in old shells remain after the flattened web which connected them is worn away, and so give to the older shells the aspect of having a different kind of epidermis; shell extremely inequivalve, not one sixth of its surface being anterior to the beaks; hinge line straight; area very narrow, its section forming a V-shaped figure, the black part of the ligament entirely posterior, generally beginning to show about as far behind the beaks as the beaks are behind the anterior end of the hinge line; hinge peculiar, teeth transversely grooved, anterior end of the hinge with a few (4–6) teeth, irregular or tending to trend with the longest axis of the valve; posterior end with four or five elongated teeth nearly parallel with the hinge line; between these the hinge is edentulous or faintly irregularly granulous; lon. of figured type 26.0; max. alt. of do. 14.0; diam. 9.5 mm. A specimen obtained by the Fish Commission measures 46.0 mm. in length exclusive of the epidermis.

Dredged living at Station 193, near Martinique, in 169 fms., sand, bottom temperature 51°; and at Station 300, off Barbados, in 82 fms., bottom temperature 60° F.

Foot small, split in the median line; byssal groove large and deep; palpi none; a single gill on each side with the broad margin of insertion curled downward into a spiral at its posterior end; mantle margin thick, smooth, plain, dotted with black posteriorly, otherwise (in spirit) whitish. The dots are single, at regular intervals, and look much like ocelli.

This fine species does not closely resemble any I find described; it is most like a form I find in the collection named *Arca* (*Barbatia*) *Listeri* Phil., but which is dark colored, very much smaller, less compressed, and otherwise different in various details. The present species belongs to the subgenus *Barbatia*, and for those who give this group a generic value its name would be *Barbatia ectocomata*.

Arca barbata Linné.

Arca barbata Linné, Gmelin, Syst. Nat., p. 3306, 1788.

Young specimens of this well known form were dredged near Barbados, at Stations 290 and 292, in 56–73 fms.; and by Sigsbee off Havana in 127 fms. (dead valves). It is a shallow-water species and probably does not live in more than 100 fms.

Genus MACRODON Lycett.

Macrodon asperula Dall.

Macrodon asperula Dall, Bull. M. C. Z., IX. pp. 20, 1881.

Plate VIII. Figs. 4, 4 a.

Habitat. Station 33, 1568 fms., in the Gulf of Mexico, bottom temperature 40°.5 F.; Station 19, 310 fms., off Cuba; Cape San Antonio, 1002 fms., this specimen too young to be certain of the identification.

Arca (*Barbatia*) *pteroessa* E. A. Smith seems very similar externally to our shell, but the hinge is different and the shell more produced behind; the manner in which the black ligament is placed would seem to be similar in both.

An allied species with an outline almost precisely similar to *A. culebrensis* Smith (Chall. Rep., pl. xvii. fig. 9 a) was obtained (a single valve) N. W. of the N. W. end of Cuba in 80 fms. by the U. S. steamer "Albatross" in 1885. It has a hinge much like that of *M. asperula*, but its external surface is entirely different; there are numerous concentric grooves, with wider interspaces covered everywhere with an oblique shagreened ornamentation; beside this there are obsolete radiating series of minute scales, probably stronger in some specimens, and on and behind the ridge from the umbo to the posterior angle of the margin are four well defined and two or three obsolete nodulous radii. The valve is about six millimeters long and quite inflated; the umbones must nearly touch in perfect specimens, as the area is extremely narrow and the beak well developed. It may take the name of *M. sagrinata*.

Professor Verrill's *Arca profundicola*, though not very characteristically figured, is, from a typical specimen, more finely striated, the lower posterior region less patulous and its hinge margin not so high. The front teeth are more, and the hind teeth less, oblique than in *Macrodon*. It may be observed that the gap between *Macrodon* and certain forms of *Barbatia* is not very wide.

Family NUCULIDÆ.

Genus NUCULA Lamarck.

Nucula Lamarck, Prodrome d'une Nouv. cl. des Coquilles, p. 87, no. 104, 1799. Type *Arca nucleus*, L.

Nuculana Link, Beschr. Rost. Samml., p. 155, 1807.

I take this opportunity of mentioning, for students who cannot get access to the rare work of Link, that his *Nuculana* is an exact synonym of *Nucula* Lamarck, and was intended merely as a modification of that word; while the diagnosis, "shell smooth, closed all round," will not apply to the group separated by Schumacher, afterward, under the name of *Leda*. That the only species of the group in the collection was *N. rostrata* was merely an accident, and it was evidently not intended as a type, for it does not agree with his diagnosis.

A. *With smooth margin.*

Nucula ægeënsis (Forbes) Jeffreys.

Nucula tenuis Montagu, Dall, Bull. M. C. Z., IX. p. 123.
Nucula ægeënsis Jeffreys, P. Z. S., 1879, p. 581.

Habitat. Sigsbee, off Havana, 175 and 450 fms.; off Morro Light, 292 fms.; Station 20, 220 fms.; Station 3, 450 fms.; and Station 230, near St. Vincent, in 464 fms.; all mostly dead valves.

In examining specimens dredged off the Carolinas by the Fish Commission, I was struck by the fact that only *N. proxima* and not a single *N. tenuis* had been secured. This led me to review the specimens identified for me by Dr. Jeffreys as *N. tenuis*, and so named in the preliminary report, as above. I have compared them with all the varieties of *tenuis*, and with all the specimens of *ægeënsis* in the Jeffreys collection. The Blake specimens, nearly all being separated valves, agree in form and general appearance with the flatter forms of *tenuis*, the only external differences being that the former are a little more pointed and pinched dorsally behind, and that two moderately distinct ridges enclose a very narrow elongated area along the upper posterior margin. Symptoms of such an area were visible occasionally in individuals of genuine *tenuis*, but not so clearly defined. Inside, the hinge line of *tenuis* is narrower, the teeth more delicate and perhaps fewer, the cartilage pit a little smaller. These are just the differences which separate *tenuis* from *N. ægeënsis*, and it is probable that the Blake specimens should be referred to the latter species. It is by no means clear to me that *ægeënsis* is anything more than a geographical race of *tenuis;* but so far, though the hinge characters are slight, I have not found many intermediate specimens. The West Indian specimens are larger than those from the Mediterranean, and consequently the number of teeth is greater, but the proportion is about the same in all. The largest specimen measures 10.7 max. lon., 8.0 max. alt., and 4.7 mm. max. diam., with 8 anterior and 15 posterior teeth.

Nucula cymella, n. s.

Shell small, white, rather thick, rounded, triangular, moderately convex; beaks somewhat anterior, not prominent; exterior sculptured with evenly distributed concentric waves or narrow liræ separated by wider interspaces; an obscure flexuosity in front of the beaks indicates, without sharply defining, a lunule over which the concentric sculpture passes; a faint ridge extends backward from the beaks half as far as the teeth, but becomes obsolete without enclosing an area; inside, the shell is brightly pearly, the margin plain, with seven anterior and eight or nine posterior rather stout teeth, separated by a good-sized cartilage pit, directed vertically downward from the beaks, not, as usual, oblique; both ends rounded, the anterior rather the more angular. Max. lon. 5.1; max. alt. 4.0; max. diameter about 3.9 mm.

Habitat. Yucatan Strait, in 540 fms., two right valves, one of which was a little more triangular than the other.

This little shell, which probably grows to a larger size, resembles a little *Corbicula* or *Astarte* in its concentric, without any radiating sculpture. I have not been able to find anything to which it might be referred, and, though the material is scanty, have concluded to give it a name.

B. *Margin crenulated.*

Nucula crenulata A. Adams.

Nucula crenulata A. Adams, Dall, Bull. M. C. Z., IX. p. 123, 1881.

Nucula culebrensis E. A. Smith, Chall. Rep. Lam., l. c., p. 228, pl. xviii. figs. 11, 11 a, 1885.

Plate VII. Fig. 2.

Habitat. 20 miles west of the Florida coast, in 30 fms.; Station 36, 84 fms.; Barbados, 100 fms.; Sigsbee, off Havana, 158, 182, and 450 fms.; Station 20, 220 fms.; Station 19, 310 fms.; Yucatan Strait, 640 fms.

Nucula crenulata A. Adams, var. obliterata Dall.

Nucula crenulata, var. *obliterata* Dall, Bull. M. C. Z., IX. p. 123, 1881.

Plate VIII. Fig. 2.

Station 44, 539 fms.; Yucatan Strait, 640 fms.; Station 2, 805 fms.; Station 226, 424 fms., near St. Vincent; Station 236, near Bequia, in 1591 fms.; and at Station 262, near Grenada, in 92 fms.; bottom temperatures ranging from 39°.0 to 62°.0 F.

This species is very variable, and presents sometimes an almost smooth surface (as in the var. *obliterata*), and at others either a series of regular concentric waves or a more or less broken and irregular concentric sculpture, the whole being united by every variety of transitional features. The most nearly allied species is *N. sulcata* Bronn (not A. Adams), which is however less trigonal, grows much larger, and yet has a finer and more irregular sculpture, in which the concentric element is less dominant. The *N. culebrensis* of Smith agrees so well with young, regularly sculptured specimens of *crenulata*, that, taking the locality into consideration, I feel quite confident of their practical identity. The ordinary adult and many young *crenulata* are more coarsely and roughly sculptured, but this is not invariable, and the large number of specimens I have examined have given an excellent opportunity for comparison.

The var. *obliterata* is as a rule more trigonal and more compressed than the typical form. In some specimens the beaks are very prominent vertically. Its faint sculpture will always enable it to be distinguished from *N. Verrillii* (*N. trigona* Verrill, Trans. Conn. Acad., VI. p. 438, 1885, not of Bronn or Seguenza, 1877), which has a smooth margin, while the smoothest *obliterata* always show minute crenulations. Extreme specimens of the type and variety would be taken by any one as distinct species without the connecting series. *N. cancellata* Jeffreys is more globose, smaller, and more delicately sculptured.

Family LEDIDÆ.

Genus LEDA Schumacher.

Subgenus YOLDIA Mörch.

Yoldia solenoides Dall.

Yoldia solenoides Dall, Bull. M. C. Z., IX. p. 127, 1881.

Plate IX. Figs. 2, 2 a.

Habitat. Station 49, 118 fms. Lat. 28° 51′.5 and W. Lon. 89° 1′.5, in the Gulf of Mexico, no temperature noted.

No additional specimens have turned up.

Yoldia liorhina Dall.

Yoldia liorhina Dall, Bull. M. C. Z., IX. p. 127, 1881.

Plate IX. Figs. 1, 1 a.

Habitat. Sigsbee, off Havana, 182 fms.; Station 23, 190 fms.; Station 33, 1568 fms.

The cartilage is large and black, and inserted on a wide triangular space directly below the beaks, but in the dead valve from Station 33 the place of the cartilage is very small, though the shell is otherwise identical with the others. The only living specimen, from 182 fms., shows no external ligament, but the dead valve referred to might almost be taken for a *Solenella* or *Malletia*.

Subgenus LEDA Schumacher (s. s.).

Leda Carpenteri Dall.

Leda Carpenteri Dall, Bull. M. C. Z., IX. p. 125, 1881.

Plate VIII. Fig. 11; Plate IX. Fig. 3.

Habitat. Barbados, 100 fms. ; Station 5, 229 fms. ; Station 9, 111 fms., bottom temperature 55°.0 F. ; Station 21, 287 fms.; Station 128, 180 fms., off Frederikstadt ; off the Carolina coast, U. S. Fish Commission, 1885.

Since describing this species I have been able to compare it with specimens dredged by the Fish Commission in some abundance farther north, and with *Leda clavata* Calcara, a Sicilian fossil which is its nearest relative. *L. Carpenteri* differs from *clavata* in its greater smoothness and in having the hinge-line narrower, the teeth smaller, more delicate, and less numerous, especially the anterior series ; the ligamental pit is much smaller, and the series of teeth are straighter and with much less margin between them and the edge of the dorsal crest. The raised line inside the rostrum is in *clavata* nearly in the middle of the shell; in *Carpenteri* it is invariably nearer the dorsal edge, thus making the dorsal channel distinctly narrower than the ventral one.

In fresh specimens of *L. Carpenteri*, especially youngish shells, the pale green epidermis is marked by a beautiful radiating series of arched striæ, only visible with a glass except in very marked cases, or near the ventral edges of the valves where the striation is strongest. It is absent in decorticated specimens, and so would appear to be purely a character of the epidermis.

Leda clavata has been erroneously united with *L. cuspidata*, which differs both in shape and sculpture. I have not seen any recent specimens of *clavata* or *cuspidata*. Some marked as such in the Jeffreys collection were *L. Carpenteri*.

Leda messanensis Seguenza.

Leda messanensis Seguenza, Dall, Bull. M. C. Z., IX. p. 124, 1881.

Habitat. Station 19, 310 fms. ; Station 20, 220 fms. ; Barbados, 100 fms.; Sigsbee, off Havana, 450 fms.

This species, which I have compared with specimens received from the author, varies in sculpture much like the others, being sometimes almost wholly smooth, and at others with well developed concentric sculpture; it also varies remarkably in proportional length, some specimens being very short and high. In considering these variations, one cannot help surmising that the present number of nominal species of these little shells will eventually require to be diminished.

Leda solidula E. A. Smith.

Leda solidula E. A. Smith, Chall. Rep. Lam., p. 233, pl. xix. figs. 6, 6 a, 1886.

One valve was found from 1002 fms., near Cape San Antonio; another from 640 fms., near by, in Yucatan Strait; both were inadvertently included among the varieties of *L. messanensis* at the time the preliminary examination was made. The type was dredged by the Challenger expedition at Station 120, off Pernambuco, in 675 fms., red mud.

Leda vitrea D'Orbigny, var. cerata Dall.

Leda vitrea (?) D'Orb. 1846, var. *cerata* Dall, Bull. M. C. Z., IX. p. 126, 1881.

Plate VIII. Figs. 12, 12 a.

Habitat. Barbados, 100 fms.; Sigsbee, off Havana, 450 fms.; Station 206, near Martinique, in 170 fms.

Among the species of *Ledidæ* from our southern coast, recent and fossil, are several closely allied to each other and to foreign forms, which have been in a state of more or less confusion. These are as follows, in order of publication.

Leda (*Nucula*) *concentrica* Say, Journ. Acad. Nat. Sci. Phil., IV. 141, pl. x. fig. 6, 1824.
Leda (*Nucula*) *acuta* (Say ?) Conrad, Am. Mar. Conch., p. 32, pl. vi. fig. 3, 1831; Tert. Fos., p. 57, pl. xxx. fig. 2, 1845.
Leda cuneata Sowerby, P. Z. S., 1832, p. 198; Thes., p. 128, fig. 92.
Leda commutata Philippi, Zeitschr. Mal., p. 101, Jan. 1844.
Leda vitrea D'Orbigny, Moll. Cuba, II. 262, pl. xxvi. figs. 27–29, 1846.
Leda jamaicensis D'Orbigny, l. c., p. 263, pl. xxvi. figs. 30–32, 1846 (= *acuta* + *cuneata*).
Leda (*Nucula*) *eborea* Conrad, Proc. Acad. Nat. Sci. Phil., III. p. 24, pl. i. fig. 4, 1848 (= *concentrica* Say).
Leda unca Gould, Proc. Bost. Soc. Nat. Hist., VIII. p. 282, 1862.
Leda Bushiana Verrill, Trans. Conn. Acad., VI. 229, 1884.
Leda unca Verrill, l. c., p. 260, 1884.

Leda concentrica Say, described as a fossil, is without doubt the same as the recent *eborea* Conrad, which I have from Conrad's original collection. It is distinguished by its strong sculpture and long straight rostrum. It ranges from Florida to Texas.

Leda acuta was poorly described, and very badly figured. I have not been able to compare with the figure in the Am. Marine Conchology, but his figure in the "Fossils of the Tertiary Formation" is much more slender and recurved than the species which American writers have regarded it as intended to represent. This may probably be the fault of the figure, and it will save a good deal of trouble, and give us a clear way out of the confusion, to adopt

Conrad's name as it has been traditionally applied. I find the next name in order, to be *Leda cuneata* of Sowerby, which from specimens identified by Hanley (and coming from Catalina Island, California) is quite evidently the same as *L. jamaicensis* D'Orbigny. The latter author described and figured a young specimen, so that the magnified figure he gives agrees only with specimens of the same age; but, for them, it is very exact. I have examined a large number of *L. commutata* Phil., and, while it is very similar, I cannot convince myself that it is the same. The *commutata* generally has one very strong anterior rib, and the *acuta* has a shallow groove bordered by two faint ribs. This is the most obvious character, though there are others. The *L. unca* of Gould was not figured and the description is brief. It is described as having the dorsal area keeled and smooth, characters not appropriate to any of the just mentioned forms, though shared by the proportionally more elongate *L. Bushiana* Verrill, which is not "acutely rostrate." The *vitrea*, *acuta*, and second *unca* of Verrill all have the dorsal area strongly sculptured, even when worn; more so, generally, than the rest of the shell. None of these therefore should be identified with *unca* Gld. Verrill's second *unca* (l. c., p. 260), which seems distinct from either *vitrea* or *acuta*, may take the name of *Verrilliana*. The variety *cerata* is united with the typical *vitrea* by intermediate forms.

Leda acuta Conrad.

Nucula acuta Conrad, Am. Mar. Conch., p. 32, pl. vi. fig. 3, 1831.
Leda jamaicensis D'Orbigny (1846), Dall, Bull. M. C. Z., IX. p. 124, 1881.
Leda cuneata Sowerby, P. Z. S., 1832, p. 198.
Leda inornata A. Adams, fide Hanley, from type.
Leda unca Verrill, Trans. Conn. Acad., V. p. 572, 1882, pl. lviii. fig. 41 (not VI. p. 260.)

Plate VII. Figs. 3 a, 3 b, 8.

Habitat. Sand Key, 80 fms.; off Sombrero, 54 and 72 fms.; Jamaica, Santo Domingo (D'Orb.); off southern New England, 85–155 fms. (Verrill). Florida (Hemphill).

The relations of this species to the others have been considered under the preceding species. I have not been able to consult Conrad's original publication, but Binney (Bibl. N. Am. Conch.), citing from it, refers the species to Say. In other places Conrad puts his own name after it.

The specimens from Yucatan Strait cited in the preliminary report under this species, on further study, appear to be *L. messanensis* Seg. *L. commutata* Phil., as before mentioned, appears to be different from this, though a closely allied form. The *fragilis* of Chemnitz, a badly figured and described shell, to which Dr. Jeffreys would refer *L. commutata*, is much larger than any known *commutata*, and is referred by Hanley to a Chinese species. Doubtless Chemnitz would have included *commutata* in his species. The *Lembulus deltoideus* of Risso, briefly described and supposed to be this species, is better figured, and, if the identification could be confirmed, is the oldest stable name for *L. commutata*, although the latter had been referred to *L. minuta* of Müller in 1792. Risso's figure and description, however, are hardly evidence enough taken without corroborative information.

The *L. acuta* is abundant off the Carolina coast at moderate depths.

Leda solidifacta Dall.

Leda solida Dall, Bull. M. C. Z., IX. p. 126, 1881. (Nom. preoc. ?)

Plate VII. Figs. 7 a, 7 b.

Habitat. Station 21, 287 fms.

This species is nearest *L. concava* Bronn, but is less rostrate, and has the anterior side proportionally longer. The name *solida* is said to be preoccupied in this group, though I have not been able to lay my finger on the place. If this be so, the specific name may be modified to *solidifacta*. No additional specimens have been found.

Leda subæquilatera Jeffreys.

Leda subæquilatera Jeffreys, P. Z. S., 1879, p. 579, pl. lvi. fig. 3.

A single valve of this small and rare species was dredged at Station 253, near Grenada, in 92 fms. It agreed very well with Dr. Jeffreys' types, with which it has been compared.

Leda hebes E. A. Smith.

Leda intermedia Sars, Dall, Bull. M. C. Z., IX. p. 127, 1881.
Leda hebes E. A. Smith, Chall. Rep. Lam., p. 234, pl. xix. fig. 7, 1885.

Habitat. Station 2, 805 fms.

The opportunity of comparing the valves referred in my preliminary report to *L. intermedia*, with authentic specimens of the latter, has shown that, though similar, they are not identical. It would seem likely that they are adult specimens of what Mr. Smith has described as *L. hebes*, from the same region. The adults are more convex laterally and below, and somewhat more rostrated than the young as figured by Smith. Than *L. intermedia* they are less inflated, less rounded behind, less polished, and have more hinge-teeth, especially before the ligament pit. The striation confined to the middle part and basal margin of the valves, and very distinct there, forms its most remarkable characteristic.

SECTION SATURNIA SEGUENZA.

Leda (Saturnia) pusio PHILIPPI.

Nucula pusio Phil., Moll. Sic., II. p. 47, pl. xv. fig. 5, 1844.
Leda pusio Jeffreys, P. Z. S., 1879, p. 578.

Two specimens exactly agreeing with Jeffreys and Seguenza's specimens were dredged dead at Station 236, near Bequia, in 1591 fms.

This species has a gap in the tooth line, but no internal ligament. There is a pit under the beaks, exterior to the line of the teeth, which may have had a ligament in it. Mediterranean specimens show the same. Seguenza places it in his section *Saturnia* as type. There is a gradual change from shells with an internal cartilage set in a spoon-shaped process, and an outside ligament, to those where the two seem to have come together, coalesced, and finally become entirely external. It does not seem possible to draw hard and fast lines. *Yoldia* and *Malletia*, *Leda* and *Tindaria*, approach each other by insensible, or rather undefinable degrees. The extremes of the series are very distinct, the passage from one to the other very gradual. I do not regard any of the divisions of *Leda* as more than sectional; at least, until more is known about the soft parts, I prefer to regard them so.

Others may be able to decide definitely what constitutes a genus, a subgenus, or a section, and measure all these groups by that standard. I find myself unable to do more than point out relative values, as they appear to me, in a single series, and even in this I find it often difficult to satisfy myself that the correct proportion between them has been attained.

Leda (Saturnia) quadrangularis DALL.

Leda (*Jeffreysi* Hidalgo, var. ?) *quadrangularis* Dall, Bull. M. C. Z., IX. p. 124, 1881.

Plate VIII. Fig. 6.

Habitat. Station 33, 1568 fms.

This turns out on comparison with specimens to be entirely unlike *L. Jeffreysi*, and I have not found anything like it. It is nearest *pusio*, and has the same concentrically finely undulate surface, but the basal pout and longest slope of hinge-line are posterior here, while, in *pusio*, both are anterior. I have not been able to satisfy myself that there was any ligament pit inside. There is a smooth interval between the two sets of teeth, but no pit, and no evidence that any ligament was attached there. It would belong to Seguenza's section *Saturnia*. The valve is 4.6 mm. in length, 4.0 mm. high, and the pair were probably 3.0 mm. in diameter.

Section NEILONELLA Dall.

Neilonella Dall, Bull. M. C. Z., IX. p. 125, 1881.

Shell like *Tindaria* Bellardi, with a single ligament directly between the beaks, chiefly external, but its base dividing the hinge-line, while its upper surface extends about equally before and behind the beaks. Type *Leda* (*Neilonella*) *corpulenta* Dall.

This section is almost exactly intermediate between *Leda*, with an inner and outer ligament, and *Tindaria*, with a purely external one.

Leda (Neilonella) corpulenta Dall.

Leda (*Neilonella*) *corpulenta* Dall, Bull. M. C. Z., IX. p. 125, 1881.

Plate VII. Figs. 1 a, 1 b.

Habitat. Station 23, 190 fms., living, bottom temperature 64°.0 F.; Station 21, 287 fms.; Station 47, 331 fms.; Sigsbee, off Havana, 450 fms.

No additional specimens of this interesting form have turned up in the collection ; it probably lived at all the stations mentioned, though valves only were obtained except at Station 23. There is nothing like it, recent or fossil, in the Jeffreys collection.

Genus MALLETIA Desmoulins.

Section TINDARIA Bellardi.

Malletia (Tindaria) cytherea Dall.

Nucula (*Tindaria ?*) *cytherea* Dall, Bull. M. C. Z., IX. p. 123, 1881.
Malletia veneriformis E. A. Smith, Chall. Rep., p. 246, pl. xx. figs. 9, 9 a, 1885.

Plate VIII. Figs. 1, 1 a.

Habitat. Off Cape San Antonio, 413–424 fms.; Yucatan Strait, 640 fms.; Station 226, near St. Vincent, in 424 fms.; and Station 2392 of the U. S. Fish Commission in the Gulf of Mexico, Lat. 28° 45′, Lon. 87° 30′ W., in 724 fms., mud, living, bottom temperature 40°.7 F.

The original specimens from which this species was described were single valves, subiridescent with decay. The supposed minute pit proves pathological. The reception of two magnificent specimens from the Fish Commission dredgings enables me to correct my erroneous reference of the species to *Nucula*, which I regret the more since it may have led my friend Mr. Smith into a redescription of the species.

The shell when living is of a brilliant white, covered with a fine smooth but not polished straw-colored epidermis. The ligament is wholly external, delicate, and nearly hidden in a groove just behind the beaks. There are twelve anterior and twenty-eight posterior teeth, which dwindle to a spot just under the beaks, below which is a little flat or subconcave space very like a shelf for a cartilage, which, however, does not exist. The measurements of the fully adult form are, max. lon. 15.0 ; max. alt. 11.2 ; max. diam. 9.0 mm. There is a polished space in front of the beaks where the concentric waves fade out, faintly margined by an obsolete radius or two, but not otherwise differentiated ; and immediately in front of and close to the beaks is a very small rounded area, over which the epidermis is of a darker color than elsewhere, but apparently not marked by sculpture. The pallial line is entirely simple, and the interior of the shell brilliantly polished, with a tendency to iridescence, though not pearly.

Malletia (Tindaria) Smithii Dall.

Malletia cuneata E. A. Smith, Chall. Rep. Lam., p. 247, pl. xx. figs. 10, 10 a, 1885.
Not *M. cuneata* Jeffreys (1876), P. Z. S., 1879, p. 586, pl. xlvi. fig. 10.

A dead valve of this species was dredged by Sigsbee in 450 fms., off Havana. The Challenger specimens were taken in 390 fms., off Culebra Island. A specimen was dredged by the U. S. Fish Commission at Station 2119, near Grenada, in 1140 fms., bottom temperature 39°.5 F. This measured 7.75 mm. in length, and had nine anterior and twenty-two posterior teeth, counting all the small ones.

As my friend, Mr. E. A. Smith, in his valuable report on the Challenger Lamellibranchs, has overlooked the prior use of his specific name by Jeffreys, it gives me much pleasure to propose the name of *Smithii* for this very elegant little shell.

Section NEILO Adams.

Malletia (Neilo ?) dilatata Philippi.

Leda dilatata Philippi, Dall, Bull. M. C. Z., IX. p. 125, 1881.
Neilo dilatata Seguenza, Nucul. Terz., 1877, p. 1184.

Habitat. Off Morro Light in 292 fms., two right valves.

This agrees exactly with the Italian fossils. There is no cartilage pit, but a wide subtriangular gap in the line of teeth, and a groove for an external ligament. I cannot see that the hinge without the soft parts offers decisive evidence of the place to which this species should be referred. It is probably a *Malletia*, and belongs in the vicinity of *M. arrouana* Smith, in which the gap in the line of teeth would seem to have become closed.

Family CARDITIDÆ.

Genus CARDITA Brugière.

Cardita domingensis D'Orbigny.

C. Dominguensis D'Orbigny, Moll. Cuba, II. p. 291, pl. xxvii. figs. 27–29, 1845.

Habitat. Station 12, in 36 fms. off Cuba; off Sombrero, in 54 fms. Extends northward to the Carolina coast.

D'Orbigny's figure is of a very young shell; adult specimens are twice as large and have more ribs.

Family CRASSATELLIDÆ.

Genus CRASSATELLA Lamarck.

Crassatella floridana Dall.

Crassatella antillarum (?) Reeve, var. *floridana*, Dall, Bull. M. C. Z., IX. p. 131, 1881.

Plate VI. Fig. 12.

Habitat. Gulf of Mexico, west of the Florida coast, 30 fms.

The single young specimen obtained as above, and represented by the figure (11.0 × 6.75 mm.), is the only one in the Blake collection. The U. S. Fish Commission have since dredged off the southeastern coast of the United States and in the Gulf of Mexico a considerable number of adult valves of the same species, the description of which I am thus enabled to complete. The largest of these valves measured 78.0 mm. in length and 57.0 mm. in height, the complete shell must have had a diameter of 31.0 mm. When fresh it is covered with a fine bright brown epidermis, which becomes fibrous after death and maceration, or in very aged specimens; the whole shell in front of the anterior rostral carina is covered with rather even concentric grooves, about 1.0 mm. wide. The figure gives a good idea of the somewhat flattened tip of the beaks; the anterior and posterior areas are depressed, smooth, narrow, and subequal; the anterior is larger in the left, and the posterior in the right valve; the grooves do not continue behind the flexuosity which marks off the rostrum, the area between that and the dorsal area or corselet is merely concentrically striated; the interior is pinkish chocolate, pink, or white, darker behind; the muscular scars are rounded, strong, but rather small; the pedal scar is close behind the upper corner of the anterior adductor, and is strongly marked.

When I first received these valves I supposed that they would turn out to be identical with some one of Conrad's Tertiary species; but after comparing with them all, I found that none of them agreed sufficiently well with the recent species to render it desirable to refer it to either of them. The nearest of the fossil forms to the *C. floridana* is the *C. undulata* Conrad (not Sowerby), of the variety figured by him on Plate XI. of his Fossils of the Tertiary Formations of the United States, which (though dated 1838 on the title-page), excepting the first few pages, was not issued until 1845. From this *C. floridana* differs in being more pointed anteriorly and less so behind; in having flatter and less pointed beaks; in having a more pronounced flexure below the rostrum, and the latter proportionately shorter, higher, and more ridged above; the cardinal teeth are more oblique, and the anterior lateral does not run up in front of the cardinals, but ceases near their lower extremity. I find these differences to hold good through a large series, and consequently conclude that the recent species is distinct. It is entirely different from the *C. antillarum*, until now the only recent species of *Crassatella* proper known to inhabit the Antilles.

The margins of *C. floridana* are smooth at all stages, but the outside grooving in aged specimens becomes obsolete near the margin.

Subgenus ERIPHYLA Gabb.

Eriphyla Gabb, Pal. Cal., I. p. 180, 1864; Stoliczka, Pal. Indica, III. p. 156, 1871 (but not pp. 181, 182, pl. vi.; = *Dozia* Bosquet, 1868). Type *E. umbonata* Gabb.

Eriphylopsis Meek, Inv. Pal. Upper Missouri, p. 125, 1876. Type *E. gregaria* Meek and Hayden.

The genus *Eriphyla* of Gabb was poorly figured, and hastily, or at least imperfectly, described by its author, for whom, however, allowance should be made on account of his isolated position in California, far from well-equipped museums or libraries. Meek, who was one of the most careful and exact paleontologists, examined into the subject, and found that there could be little doubt that the differences between the type of *Eriphyla* and the small Crassatelloids formerly included under *Gouldia*, and best known by that name (and for his purposes best typified by *C. mactracea* Linsley), were essentially these. The teeth appeared to be reversed as regards the valves, and there was a little furrow behind the beaks which by Gabb and himself was supposed to indicate the presence of an external ligament, the internal cartilage when absent, as in dead valves or fossils, leaving no evidence of its existence. In 1871 Stoliczka complicated the problem by referring to *Dozia lenticularis* Goldfuss as the type of *Eriphyla*; and by describing that group from the peculiarities of the aforesaid *Dozia* (which probably belongs near *Dosinia*). This error has been copied from Stoliczka into Tryon's Structural and Systematic Conchology, Vol. III. p. 226, under *Eriphyla*, and of course gives an entirely wrong idea of *Eriphyla*, which has no pallial sinus, or at least none has ever been shown; and in the *E. gregaria* there is a perfectly simple pallial line, as in the recent species I have referred to.

Now it is well known that in *Astarte* it occasionally happens that the teeth may be reversed with regard to the valves. In the allied *Eriphyla* it appears to be a common occurrence. I find the Antillean shells presenting absolutely the same arrangement of teeth as the *E. gregaria* or *E. umbonata*. *E. mactracea*, however, seems to have the teeth the other way generally; but not invariably, if I have correctly identified some valves from the Florida coast. A little groove behind the beaks is often there, too, but it does not carry any external ligament, and as the existence of an external ligament was based merely on the presence of this feature (which varies more or less between different specimens), it is evident that there is no warrant for claiming an external ligament for *Eriphyla* any longer. Meek, both in his publications and in conversation, was confident of the identity of *Eriphyla* with the so-called *Gouldia*, if it could be shown that the teeth in the latter were reversible; but at that time, just before his death, we had but a few specimens of the recent forms which did not seem conclusive, as they were all of the *C. mactracea*. So, in his last revision of his Paleontology, he suggested that, if the Californian and Missouri fossils did not agree, the latter might take the name of *Eriphylopsis*. The recent Antillean forms, as I have said, agree perfectly with *Eriphylopsis*, and there is every reason to think that they agree with the original *Eriphyla*; which, until a difference is definitely shown by renewed observations, I prefer to retain. Should any differences be found, the recent forms would follow the Missouri fossil and be included in the subgenus *Eriphylopsis*.

That these little shells present a recognizable facies sufficient to enable one to decide instantly whether any one of the species is an *Eriphyla* or a typical *Crassatella* is, I think, undeniable. Whether this facies — of which the important features are the small size, triangular form, inequality of the valves, absence of rostration, and the angulated posterior extremity — is sufficient to entitle the group to a name, I am quite willing to leave to others to decide for themselves. It seems to me they are, and that the distinctions are just as clear between *Eriphyla* and say *Crassatella nana*, as if one of the larger Crassatellas had been chosen.

The fact of the inequality of the valves has been questioned, but I have never seen a perfect pair in which, looking forward over the beaks, the right valve did not advance above the other; the contrary being the case in looking the other way, though not so well marked. In convexity they are about equal. This is also true, but much less perceptible, in *Crassatella* proper.

I have gone into the matter at this length because, it seems, I was insufficiently detailed in my previous statement; not making myself fully understood by some, who were unfamiliar with the errors of Gabb and Stoliczka.

Crassatella (Eriphyla) parva C. B. Adams.

Crassatella (Eriphyla) parva (C. B. Adams, 1845), Dall, Bull. M. C. Z., IX. p. 131, 1881.

C. Martinicensis D'Orbigny + *C. guadalupensis*, D'Orbigny, 1846.

Habitat. Martinique, Jamaica, St. Domingo, Cuba, St. Thomas (D'Orb.); Cuba (Pfr.); Jamaica (Adams); Station 21, 287 fms. (Blake exp.).

After the examination of a great many specimens from all parts of the Antilles, I am driven to the conclusion that both of D'Orbigny's species are identical with the present one, the distinctions being entirely within the range of its variation. Krebs, an excellent observer, came to the conclusion, a good many years ago, that the two species of the Mollusques de Cuba were the same.

Family ASTARTIDÆ.

Genus ASTARTE J. Sowerby.

There are several species referable to this genus in the Gulf of Mexico and adjacent waters, mostly quite small, and having a tendency to coloration in the inside of the valves. The viviparous subgenus *Parastarte* is also indigenous to the shallower waters of this latitude. It too is brightly colored, and has a vernicose epidermis.

Two species or forms were obtained by the "Blake," one abundantly and at various depths; the other, in but one haul, and only one or two specimens. Of the latter, however, the U. S. Fish Commission has obtained valves at numerous stations, and not any of the other species; so curiously checkered is the luck of the dredger. In connection with the identification of the species I have carefully examined the large series in the Jeffreys collection, and have had the advantage of the criticism of Mr. E. A. Smith, who recently monographed this difficult group. I have decided to give names to these Gulf forms, not because I am certain that they represent permanent immutable entities, if such things exist, but because they differ in a diagnosable way from anything I can find named. The most hardened believer in the immutability of species, after an encounter with a large collection of Astartes, would probably be content with permission to retire in good order from the field, with bag and baggage, without any request that drums or fifes should announce his movements to the rest of mankind.

Astarte Smithii, n. s.

Plate VII. Figs. 5 a, 5 b.

Shell small, belonging to the group of *A. sulcata*, having a squarish globose form, crenated margin, and pale brownish epidermis. The exterior is concentrically sculptured with (in the adult) usually 15–20 ribs, rather narrower than their interspaces, and generally with, toward the middle of the shell, a duplicated appearance, caused by a faint wave immediately above the main one ; the ribs in all cases fail about the beginning of the last third of the shell, which portion is merely striated or even smooth ; in some specimens the whole surface is nearly smooth, or has about double the usual number of faint subequal close-set ribs over the anterior two-thirds ; in these cases it sometimes happens that the fine ribbing will extend over the greater part of the area usually smooth, but, after comparing all the specimens, I am unable to regard these differences as more than varietal ; the lunule is lanceolate, sometimes subcordate, smooth, somewhat depressed and bounded rather by the change in the sculpture than by any line of demarcation ; the ligament is short, immediately behind the beaks ; the posterior area is elongated, bounded by two faint ridges, from which the surface slopes to the hinge-margin ; the interior is smooth, with the muscular scars small and situated rather close to the margin ; the crenulations of the edge are rounded, minute and close-set; they are noticeable at all ages ; the right valve has one strong cardinal tooth with a pit on each side of it, the anterior hinge margin slightly grooved, the posterior sharp-edged ; the left valve has two strong teeth and the anterior margin sharp, while there is a long groove in the posterior margin to receive the edge of the right valve. Lon. of shell 7.0 ; alt. 6.0 ; diam. 4.0 mm.

Habitat. Off Sombrero, 54 fms. ; Station 36, 84 fms.; Sigsbee, off Havana, 100–450 fms.; Barbados, 100 fms.; Station 5, 229 fms.; Station 44, 539 fms.; Station 274, Barbados, in 209 fms., sand, bottom temperature 53°.5 F.; Station 206, near Martinique, in 170 fms., bottom temperature 49°.0; Station 132, near Santa Cruz, in 115 fms., bottom temperature 65°.0 ; Station 33, in 1568 fms., one valve, perhaps drifted. Dredged in 200 fms., on Campeche Bank, by Dr. W. H. Rush, U. S. N.

The strongly sculptured form, which may be taken as the type of the species, has a shorter and more cordate lunule, a much more sunken and sharply defined dorsal area, and a shorter ligament, than the variety with less pronounced sculpture, which may take the name of *Astarte Smithii*, var. *globula*. The two varieties occur indifferently together, the type, however, being much the more numerous. I need hardly add that the specific name is given in honor of Mr. Edgar A. Smith, of the British Museum, who has monographed this genus, and to whom I am indebted for many useful criticisms and kindly furnished bits of information.

The figure, drawn before the specimens had been finally studied, does not show the apparent duplication of the riblets in the middle part as well as many of the specimens do, but it is a fair representation of the one from which it was made.

A small species of *Gouldia*, which I took to be *Venus cubaniana* D'Orb., being mixed with these Astartes, they were hastily taken to be all one species, causing some confusion of localities in the preliminary report. This species is related to *Astarte lens* Stm., which is referred to by Jeffreys as a variety of

A. crenata. But the *lens*, or *crenata*, of the same size as *A. Smithii*, is longer, much flatter, and usually not crenate; the waves or ribs are of a different form, and the color is a more ruddy brown.

Astarte nana, n. s.?

? *Astarte nana* Jeffreys, Smith, Obs. on the Genus Astarte, Leeds Journal of Conchology, p. 213, 1881. (Gulf of Florida, 60 fms., Pourtalès.)

Plate VII. Figs. 6 a, 6 b.

I have not been able to find, as yet, in the Jeffreys collection, any specimens of his *Astarte nana*; nor have I seen anything more in the way of description than the four and a half lines given by Mr. Smith. The locality is suggestive, the specimens were collected by Pourtalès, and the features mentioned by Smith, as far as they go, agree with the present form, though insufficient for identification. I prefer to use the name *nana*, and if hereafter it should prove that it is not Jeffreys' *nana*, another name can be applied to it. The shell is well represented by the figure; it is about the same color as *A. Smithii*, but somewhat larger, flatter, with the beaks more erect and more prominent; it has about thirty uniform concentric ribs separated by equal intervals and covering the entire shell except the lunule: the latter is smooth, but not circumscribed by a line; there is a depression along the dorsum, but hardly a dorsal area as distinguished from the rest of the shell. The inner margins are smooth at all ages observed; the muscular scars are proportionally larger, and the pallial line further from the margin than in *A. Smithii*; the lunular region is longer and not so deep; the teeth, though larger, are the same as in that species. Lon. of shell 8.2; alt. 7.8; diameter 4.1 mm.

Habitat. Sombrero, 54 fms.; Station 36, Gulf of Mexico, Lat. 23° 13′, Lon. 89° 16′ W., 84 fms., bottom temperature 60°.0 F. Off the Carolina coast nearly to Cape Hatteras, valves at various depths, U. S. Fish Commission.

This shell *may* be crenulate at some age; it is not, however, like the preceding species, crenulate at all ages. Some of the Fish Commission specimens, apparently of the same species, have the interior of a rose pink or light yellowish brown color.

Genus CIRCE Schumacher.

Subgenus GOULDIA C. B. Adams.

<*Gouldia* C. B. Adams, Cat. Coll., p. 29, 1847.
< *Thetis* C. B. Adams, Proc. Bost. Soc. Nat. Hist., p. 9, 1845, *non* Sowerby.
Lioconcha Mörch, Cat. Yoldi, pt. ii. p. 26, 1853.
Gouldia Dall, P. Z. S., 1879, p. 131; Bull. M. C. Z., IX. p. 128, 1881.
< *Circe* E. A. Smith, Chall. Rep., pp. 221–223, 1885; P. Z. S., 1881, p. 489.

In 1879, in a discussion of the claims of the name *Gouldia* to retention, I showed, while two forms were included by Prof. Adams in his genus, that

G. cerina was his first species ; that a species altogether similar was cited as an example by the brothers Adams in their revision of the genera of recent Mollusca and adopted as a type by Stoliczka ; that the only other reviser of the genus, Dr. Carpenter, took a similar view, and postulated the elimination of the incongruous element of the genus typified by Prof. Adams's second species; that a group admitted by all to be separable from the genus *Circe* (in a sectional or subgeneric sense at least capable of retaining a name) had been separated by Mörch under the name of *Lioconcha* and generally adopted; that this group *Lioconcha* was essentially similar to *Gouldia* as revised by H. & A. Adams, Stoliczka, and Carpenter; that *Gouldia*, having been properly defined by Prof. Adams some eight years before the publication of Mörch's undefined name, was therefore entitled by all the laws and usage of biological nomenclature to take precedence of *Lioconcha* if they be considered (as they are) practically synonymous. I referred to *Gouldia* as a genus, a proceeding which my friend Smith of the British Museum has objected to in a lively manner, and which, after due consideration, I do not feel disposed to insist upon. The group is closely related to *Circe*, as typified by *C. scripta* and *C. divaricata*. The differences in the soft parts are, that in *Circe* proper the narrow branchiæ hang between the dome of the shell and the adductor, while in *Gouldia cerina* they are suspended between the two adductors ; also that *Circe* has short but distinct siphons, while in *Gouldia* there are only orifices between which the mantle edge is tacked together. These characters, like the conchological ones, are evident enough, but probably in a long series of species would pass by insensible degrees from one to another. But the general acceptance which *Gouldia* has received under the name of *Lioconcha* indicates sufficiently that it represents for the majority an assemblage of characters sufficiently recognizable. The value of the group, as in other cases, will depend upon the view of the individual naturalist. I shall be quite content to regard it as merely a subgenus. But Mr. Smith would go further, and, disregarding the work of the revisers and the obligations of the nomenclature, would overthrow *Gouldia* altogether by a plan which would practically result in putting an undefined subsequent name in the place of a properly defined prior one. In this I cannot follow him. In the case of a compound genus not revised by its author, it is a sound rule to hold by the revision of the first reviser, when not on other grounds objectionable. As to following the workings of an author's mind beyond the point where he has seen fit to publish them, I think it will be as well to wait until the theosophists have their machinery in better working order.

Some other notes on this subject will be found under the head of *Crassatella*.

As to the place which *Circe* should occupy, I naturally was disposed to accept without question the views of M. Deshayes, who has studied the Pelecypoda so long and well. But on examining the soft parts of *Circe* I found myself obliged to differ from his verdict that they were essentially those of *Meretrix*. On the other hand they are quite as near *Astarte*, if not closer, and the shell is certainly nearer *Astarte* than it is to *Meretrix*, deduction being made of heterogeneous species. I have therefore, awaiting further information, followed the acute and accurate Woodward in referring *Circe* and its subdivisions to the *Astartidæ*, where they seem to me more at home than in the position assigned them by the learned French malacologist.

Gouldia cerina C. B. ADAMS.

Gouldia cerina C. B. Adams, Dall, Bull. M. C. Z., IX. p. 130, 1881.

Plate VII. Figs. 4 a, 4 b.

Habitat. Charlotte Harbor, Florida, 13 fms.; Barbados, 100 fms.; Station 5, 229 fms. U. S. Fish Commission at various depths northward to Hatteras, abundantly.

Gouldia (*Circe*) *bermudensis* E. A. Smith is more globose, the hinge is different, and the lunule shorter, but the sculpture is essentially the same in both, at least so far as reticulation is concerned. *C. cerina* is variable, and some specimens are faintly and others very strongly reticulated. *C. bermudensis* is very much like *C. metastriata* Conrad, a tertiary fossil.

FAMILY UNGULINIDÆ.

GENUS DIPLODONTA BRONN.

Diplodonta venezuelensis DUNKER.

Diplodonta venezuelensis Dunker, Dall, Bull. M. C. Z., IX. p. 136, 1881.

Habitat. Yucatan Strait, 640 fms., one valve and fragments; Sigsbee, off Havana, 80 fms.; West Florida, 19 fms.; all disunited valves.

Diplodonta turgida VERRILL & SMITH.

D. turgida Verrill & Smith, Trans. Conn. Acad., V. p. 569, pl. lviii. fig. 42 (1881).

Habitat. Station 247, in 170 fms., off Grenada, one fresh valve.

This differs from the preceding species by its much greater inflation; the hinge teeth are also much more delicate, longer, and of a somewhat different shape.

Family LUCINIDÆ.

Genus LUCINA Brugière.

Lucina antillarum Reeve.

Lucina antillarum Reeve, Dall, Bull. M. C. Z., IX. p. 136, 1881.

Habitat. Charlotte Harbor, Florida, 13 fms.; Sigsbee, off Havana, in 182 and 450 fms.; Yucatan Strait, 640 fms.

This species is closely related by some of its varieties to *L. costata* Conrad, of the Florida coast.

Lucina sombrerensis, n. s.

Shell white, stout, nearly equilateral, very globular, small, covered with sharp elevated thin concentric lamellæ, separated by wider interspaces and becoming crowded and less prominent toward the basal margin; beaks prominent, full but not inflated ; lunule very small, wider than long, situated directly under the front of the beaks and bounded by a fine groove; posterior flexuosity present but inconspicuous, and not modifying the sculpture, which is the same over the whole shell except as above specified; outer surface not polished, interior the same; lateral teeth, especially the anterior one, prominent ; cardinal teeth small, nearer the anterior lateral, two in each valve ; ligament in a deep groove above the hinge-line, which groove extends nearly to the posterior lateral; interior of the margin finely crenulate. Lon. 6.5 ; alt. 6.5; diam. 6.0 mm.

Habitat. Off Sombrero in 72 fms., two valves; West Florida, 50 fms., one small valve.

This little shell has been known to me for some years from various parts of the Antilles, and as, after most thorough search, I have been able to find nothing like it described, I am driven to the conclusion that it is still without a name.

Lucina leucocyma, n. s.

Shell in size, form, and concentric sculpture strongly recalling *L. sombrerensis*, from which it differs in being shorter and higher, in having the concentric lamellæ thicker and closer together, and especially five broad radiating sulcations, sharper toward the beak and becoming less marked toward the margin, except the anterior one which is strong throughout; these have the effect of producing on the surface four broad rounded and gradually widening ribs which give the shell an unmistakable character. There is no other radiating sculpture ; the shell is pure white, the beaks considerably enrolled and bent forward with a minute lunule under them; the interior is white, with a very finely crenulated margin, with two anterior and one posterior flexure due to the sulcations; the hinge is very strong, the lateral teeth, especially the anterior one, strong; the ligament in a deep groove must be entirely concealed. Lon. of shell 5.6, alt. 6.5, diam. 6.0 mm.

Habitat. One valve from off Sombrero in 72 fms.; others were collected in South Florida by Henry Hemphill, and in 6 fms., living, off Turtle Harbor, Bahamas, by Dr. W. H. Rush, U. S. N.

The strong and salient characters of this small species render it recognizable at once. A somewhat similarly sculptured species is found at Cape St. Lucas, but that one has a very deep cavity for the lunule, projecting into the interior.

Lucina funiculata Reeve.

Lucina funiculata Reeve. Dall, Bull. M. C. Z., IX. p. 136, 1881.

Habitat. Station 2, 805 fms., one valve.

There is strong reason for doubting the distinctness of this form from *L. jamaicensis*. The thinner character of the shell and the more delicate sculpture seem to be the differences.

Lucina lenticula Reeve.

Loripes icterica Dall, Bull. M. C. Z., IX. p. 135, 1881.
Lucina lenticula Reeve, Conch. Icon. *Lucina*, pl. xi. fig. 67, 1850.

Habitat. Station 21, 287 fms.; Yucatan Strait, 640 fms.; Station 36, 84 fms., Gulf of Mexico, living, bottom temp. 60°.0 F.; Barbados, 100 fms.; Sigsbee, off Havana, 127 fms.; Station 220, near Santa Lucia, in 116 fms., bottom temp. 58°.5 F.; Station 264, 92 fms., near Grenada, bottom temp. 42°.5 F.

On more careful study these detached valves seem more likely to prove a true *Lucina*, and probably Reeve's *L. lenticula*, than to belong to the genus *Loripes*, which in most characters they very much resemble. The material is too poor and insufficient for a satisfactory determination, at any rate. It may be that the species should properly be called *L. Candeana* D'Orbigny, but that is referred to by Guppy as a *Diplodonta*.

Lucina scabra Lamarck.

Lucina scabra Lamarck, Reeve, Conch. Icon. *Lucina*, pl. viii. fig. 45, 1850.

Habitat. Sigsbee, off Havana, in 182 fms.

Lucina sagrinata, n. s.

Shell small, white, subovate, inequilateral, compressed, sculptured with numerous not very close concentric moderately elevated sharp laminæ, between which are radiating flutings, not continuous, but each set between each pair of laminæ, independent of those preceding or following it, thus giving a very pretty shagreened effect to the sculpture; the flutings are fine and little raised, not as high as the laminæ; beaks not prominent, somewhat posterior; ends of the shell rounded, anterior slope depressed by the narrow lanceolate smooth lunule bounded by ridges slightly scalloped by the ends of the laminæ; dorsal slope convex, dorsal area narrower and longer than the lunule, but otherwise similar to it; teeth stout; inner margins smooth; muscular scars large, elongated. Lon. of shell 7.6, alt. 5.4, diam. 4.0 mm.

Habitat. Sigsbee, off Havana, in 182 fms.; Station 21, in 287 fms., Gulf of Mexico, one valve.

Lucina (Divaricella) quadrisulcata D'Orbigny.

Lucina quadrisulcata D'Orbigny, Voy. Am. Mér., p. 584, 1846; Moll. Cuba, II. p. 294, pl. xxvii. figs. 34–36, 1853.
Lucina americana C. B. Adams, Contr. Conch., p. 243, 1852.

Habitat. Station 36, 84 fms., Gulf of Mexico; Station 137, 38 fms., near Santa Cruz.

Genus LORIPES Poli.

Loripes compressa Dall.

Loripes compressa Dall, Bull. M. C. Z., IX. p. 135, 1881.

Plate XIV. Fig. 2.

Habitat. Off Cape San Antonio, 413 and 424 fms.; off Sombrero, one valve, 72 fms.

After describing this species I was for a time much in doubt as to the value of it. Since then I have had an oppportunity of examining the large series comprised in the Jeffreys collection, which shows that none of the varieties of *L. lacteus* at all nearly approach it. *L. lens* of Verrill seems to me perfectly distinct from *L. lacteus*, and bears much the same relation to it that *Lucina filosa* Stm. does to the British *L. borealis.*

Loripes lens Verrill & Smith.

Loripes lens Verrill & Smith, Trans. Conn. Acad., V. p. 569, VI. p. 259 (1880).

Habitat. Station 47, in the Gulf of Mexico, 321 fms. (living), bottom temp. 46°.75 F.; Station 230, 464 fms., off St. Vincent, bottom temp. 41°.5 F.; Station 256, 370 fms., near Grenada, bottom temp. 44°.5 F.; Station 264, 416 fms., near Grenada, bottom temp. 42°.5 F.; and many stations of the U. S. Fish Commission off the coast of New England.

The specimens are smaller, on the whole, and somewhat less rude, but otherwise do not differ from those from more northern stations.

Genus CRYPTODON Turton.

Cryptodon orbiculatus Seguenza.

Verticordia orbiculata Seguenza, Mon. Vert., p. 9, 1876.
Axinus orbiculatus Jeffreys, P. Z. S., 1881, p. 703, pl. lxi. fig. 5.

A shell (one valve) which seems to agree with Seguenza's description was dredged at Station 220, in 116 fms., near Santa Lucia, but I cannot make out such a sculpture as is figured by Jeffreys on the plate referred to. There are extremely fine radiating rows of dots, and a powdery surface over them, but I cannot make out riblets and pores such as are figured.

Cryptodon flexuosus Montagu.

One valve occurred at Station 262, in 92 fms., near Grenada.

Cryptodon pyriformis, n. s.

Cryptodon ? obesus Verrill, Dall, Bull. M. C. Z., IX. p. 136, 1881.

Shell thin, white or flesh-color, subtranslucent, not very convex, when fresh with an appearance as of white dust on the exterior surface, beaks high, narrow, rather pointed, more or less recurved, with a depressed lanceolate lunule in front of them; anterior dorsal slope concave, steep, terminating about half-way between the umbo and the base in a rounded angle; posterior slope shorter, slightly convex, then inflexed to meet the posterior rib which has its steepest side posterior and anteriorly passes into a wider flexure of the surface which lies between the rib and the middle part of the shell; the base is rounded and produced in the middle line, the curve extending from the rib to the anterior angle; the outer surface is marked by faint lines of growth and obscure malleations; the interior is smooth, exhibiting the flexuosities; the hinge-line is narrow and flattened under the beaks, perfectly edentulous; the muscular impression faint and elongated. Lon. 11.2, alt. 14.0, diam. 6.5 mm. A larger but imperfect specimen must have been 17.0 mm. high.

Habitat. Yucatan Strait, 640 fms. (broken valves); also at the Fish Commission Stations 2646 and 2678, off the Florida and Carolina coasts, in 85 and 731 fms.

This fine species was doubtfully referred to *C. obesus* in my preliminary report. Since then I have had the opportunity of examining an unparalleled series of this genus comprised in the Jeffreys collection, besides a good series of the *C. obesus,* and find nothing closely resembling it, either among the specimens or in the literature. It is very much flatter and thinner than *C. obesus;* its texture is of a less earthy and solid character; the base is more produced in the middle and less evenly rounded. The flattish high and pointed beaks are also noteworthy. It is nearer *C. obesus* than to any other form, and consequently other comparisons are hardly needed. I had formed the idea that this genus was marked by great variability, but my study of the Jeffreys series has convinced me that it is much less so than I had supposed. The species do vary in breadth and in the sharpness of their flexures, but the identification of the species is not especially difficult.

Family CHAMIDÆ.

Genus CHAMA Brugière.

Chama lactuca, n. s.

Shell attached usually by the left valve ; valves differently sculptured ; free valve orbicular, moderately convex, tip not greatly enrolled ; sculptured with radiating and concentric series of very small short spines, each grooved underneath, generally only the marginal series raised so as to appear spiny and these only slightly so, the rest look like little radiating nodulations of which the radii are discontinuous with each new period of growth; attached valve inflated, smooth, polished, gyrate like a much enrolled *Capulus,* with indistinct lines of growth and a succession of flat, wide, very thin, sharp concentric lamellæ, separated by rather wide and gradually increasing interspaces ; the lamellæ nearly complete the circuit of the valve, and are interrupted only near the dorsal margin, are slightly recurved, their margins usually irregular from small fractures ; their anterior or, rather, distal faces, are microscopically radiately shagreened, and just in front of each lamella is a narrow band with stronger and more distant radiations ; interior smooth, the cavity of the left valve extending to the tip of the enrolled beak ; the color is usually white, or marked with concentric rings of pale livid brown corresponding to periods of growth ; margin smooth ; muscular impressions narrow, marginal ; hinge weak, of two lamellar teeth in each valve, the anterior the larger; ligament hidden in a deep groove so as to be practically internal ; longest diameter about 25.0, shorter about 15.0 mm.

Habitat. Barbados, 80–100 fms., dredged by the "Hassler."

The apical portion of the valve is shaped like *Tellimya,* polished and claret-colored. It may be well to call attention to the fact that the very young *Chama* (*macrophylla*) has a shell shaped like *Cypricardia,* with similar hinge teeth and a simple pallial line ; the adults have very similar characters in the soft parts, except such as are more or less dependent on the habitus. There can be no doubt of the near relation of the two.

Chama sarda Reeve.

One specimen from 38 fms., at Station 127, near Santa Cruz, living.

Family CARDIIDÆ.

Genus CARDIUM Linné.

Cardium ceramidum, n. s.

Cardium sp. indet. Dall, Bull. M. C. Z., IX. p. 132, 1881.

Plate IV. Fig. 6.

Shell related to and doubtless the descendant of *Cardium haitense* Sowerby,* from the Miocene of Jamaica and Santa Domingo, but much smaller; with eighteen ribs instead of twenty-four; the four middle ribs much larger in proportion to the others; the granules on the ribs smaller; the anterior slope fuller and rounder; the posterior more oblique and less elevated; the shell not so high in proportion to its length; the hinge-margin narrower; the teeth more delicate, and the beaks not so elevated. Alt. of largest valve 8.2; lon. do. 8.2; double diameter of same 8.0 mm.

Habitat. Off Havana, Sigsbee, in 182 fms.; Samana Bay, Dominica, Couthouy; St. Thomas, living near the shore, U. S. Fish Commission steamer "Albatross," in 1884.

This lovely little shell is yellowish; the foot is extremely long and subcylindrical with a very narrow serrated margin behind; the palpi are large and lamellate, the gills broad, the mantle near the orifices at the posterior end, furnished with a multitude of long stout tentacular processes.

Cardium medium Linné.

Cardium medium Linné, Dall, Bull. M. C. Z., IX. p. 132, 1881.

Habitat. Sigsbee, off Havana, 80 fms.; Barbados, valves in 100 fms.

This common West Indian shell probably inhabits shallow water, and the valves dredged as above were drifted or disgorged by fishes.

Cardium (Fulvia) peramabilis Dall.

Cardium (*Fulvia*) *peramabilis* Dall, Bull. M. C. Z., IX. p. 132, 1881.

Plate IV. Fig. 7.

Habitat. Sigsbee, Station 50, 119 fms.; U. S. S. Bache, April 22, 1872, 100 fms.; Barbados 76–100 fms.; Station 9, 111 fms.; Station 177, 18 fms., off

* Quarterly Journal Geol. Society, Vol. VI. p. 52, pl. x. figs. 11 a, 11 b, 1849.

Dominica; Station 36, 84 fms.; Lat. 23° 18′, Lon. 89° 10′, 84 fms.; off Sombrero, 54–72 fms.; west of Florida, 50 fms.; off Sand Key, 80 fms.; Station 132, in 115 fms., off Santa Cruz; Station 220, in 116 fms., off Santa Lucia; Station 154, 164 fms., off Grenada.

Var. *tinctum.* Stations 272 and 287, in 7½ to 76 fms., sand and coral, also in 100 fms., all near Barbados, and living specimens; also at Station 127, off Fredrikstadt, Santa Cruz, in 38 fms.

The U. S. Fish Commission has dredged this species off the New England coast, at Station 861, in 115 fms., and thence southward at many intervening stations to the West Indies, the deepest being off Hatteras, in 124 fms., living.

This extremely lovely shell seems to live in from 50–125 fms., and in water at a temperature ranging from 40° to 80° Fahrenheit. It is related to and perhaps descended from the Eocene *C. Nicoletii* Conrad, which attains a vastly greater size. *Cardium parile* and *semiasperum* Deshayes, of the Paris Basin, are similar in their general features while differing in detail. The *Fulvia modesta* of Adams and Reeve, a North Pacific (Japan to California) species is, so far as I can learn, its nearest living relative.

A more exquisitely beautiful shell than a perfect specimen of the variety *tinctum* I have never seen; figures can give no adequate idea of its delicacy, its color, or its elegance.

The small spines are rarely perfectly preserved and often gone entirely, which makes quite a different-looking shell of it.

Cardium muricatum Linné.

A few valves of this well-known Antillean species were dredged by Sigsbee in 187 fms., off Havana.

Cardium lævigatum Linné.

Young valves apparently of this species were dredged off Sand Key, in 80 fms.; off Sombrero, in 72 fms.; and at Station 2, in 805 fms. As with the preceding species, they were probably drifted from shallower water, or dropped by fishes, since the species is known to live at comparatively moderate depths.

Cardium serratum Linné.

Cardium serratum Linné, Dall, Bull. M. C. Z., IX. p. 131, 1881.

Habitat. West of Florida, living, in 30 fms., Bache; Barbados, 100 fms.; Sigsbee, off Havana, 127 fms.; and, living, in Havana Passage at Station 152, in 27 fms.

This extremely common shell lives to about 100 fms. in depth; the genuine deep-water specimens are pale, or with a few pink flecks, without any of the usual brown or yellow markings; have the umbones of a deep pink, fading off on the dome of the valves, and a little more elevated than in specimens from shallow water; they do not exceed 15.0 mm. in height, and may be considered as forming a variety *sybariticum.*

FAMILY ISOCARDIIDÆ.

GENUS ISOCARDIA LAMARCK.

SUBGENUS MEIOCARDIA H. & A. ADAMS.

Meiocardia Agassizii, n. s.

Shell subquadrate, widest at the gently arched base, polished, moderately inflated, whitish or yellowish; beaks small, incoiled away from the hinge margin, with a depressed but not circumscribed area in front of them; from the beak proceeds a strong but moderately sharp-edged keel to the lower posterior end of the shell, which is produced in a rather sharp angle; on the posterior area thus separated near its inner edge is another keel, less sharp, which extends from the beak to the somewhat rounded upper posterior angle of the shell, from which the margin obliquely descends with a slight concavity first, and then a little convex, to the lower angle; between the two keels and nearer the anterior one is a single rounded rib extending to the margin, over which the concentric sculpture is continuous and unmodified; the entire surface is sculptured with fine even concentric rugæ, somewhat obsolete toward the umbo and a little stronger behind the principal keel; toward the margin are occasional impressed lines indicative of changes in the rate of growth and presumably varying with the individual; the anterior end of the shell descends toward the base, where it is somewhat pointedly rounded, and from which the base extends in an easy outward curve to the posterior angulation; pallial line faint, simple, margin of the shell plain; hinge much as in *M. vulgaris* Reeve, the cardinal tooth in the right valve rounded behind, gently indented on each side; ligament external, in a groove with raised edges, continued under the beak as in other species. Lon. of shell 22.0; max. alt. 17.0; diam. of right valve 8.0; of whole shell, probably 16.0 mm.

One right valve dredged off Trinidad by the U. S. Fish Commission in 117 fms., bottom temperature 64°.5 F.

The great interest attaching to this species, not only on account of its appearance in a new faunal region for the genus, but on account of the very small number of recent species known, has led me to insert it here, though not obtained by the "Blake." It is dedicated to the memory of my teacher, the late Prof. Louis Agassiz, whose work in the molluscan subkingdom is familiar to all. "*Cypricardia*" *isocardioides* of Deshayes (Inv. Bas. Paris) would, from the figure, fall into line with *M. Agăssizii.* It is certainly not a *Cypricardia.*

Genus CALLOCARDIA A. Adams.

Subgenus VESICOMYA Dall.

Shell small, smooth or concentrically striate; hinge of *Meiocardia* but without lateral teeth; epidermis polished, umbones moderately prominent; lunule circumscribed by a groove; otherwise as in *Meiocardia*. Type *Callocardia atlantica* Smith (Chall. Rep. Lam., p. 156, pl. vi. fig. 8).

In his excellent work on the Lamellibranchiates of the Challenger expedition, Mr. Edgar A. Smith has pointed out that the dentition of these shells differs from the single valve of *Callocardia* known, and, while retaining the name, calls attention to similarities with *Kelliella*. I have carefully studied the hinge of *Kelliella*, using specimens received from Prof. G. O. Sars, and also the hinge of *C. atlantica* and of *Pecchiolia subquadrata* Jeffreys. They are very difficult objects, owing to their minuteness, shape, and fragility, but I have been able fully to confirm the accuracy of the excellent figure of the hinge of *Kelliella* given by Professor Sars in his Moll. Reg. Arct. Norvegiæ (pl. 19, fig. 15). The hinge of the *Callocardia atlantica*, if I have rightly identified my little shell, of which I feel pretty confident, is destitute of the angular arrangement noticeable in *Kelliella miliaris*, and resembles that of *Meiocardia*, deduction being made of the posterior (and only true?) lateral tooth existing in that genus and in *Bucardium* or *Isocardia* (*cor*). In the Jeffreys collection I find two lots of specimens labelled *Pecchiolia subquadrata*. One comprises two small and mutilated valves; the other, three fresh specimens, all of which were obtained by the Porcupine expedition. Judging by these, the figure (P. Z. S., 1881, pl. lxx. fig. 3) of this species is poor; the shell is usually higher in proportion to its length, more as in *Lyonsiella abyssicola* Sars. The two largest valves measure 4.0 and 4.0 mm. high against 4.5 and 5.0 mm. long. Only one approximates to the figure, and the cause is evidently pathological. Dr. Jeffreys calls attention to the thickness of the hinge-line, compared with the size of the shell, and describes it as edentulous. This probably arose from the fact that the extremely thin and fragile lamellar teeth snap off even with the hinge-line if the shell be forced open after drying with valves closed, or at most but one tooth remains.

To get the dentition, which I saw was mutilated in the specimen which seems to have served Dr. Jeffreys for his description, I sacrificed the best perfect specimen, breaking away the ventral margins without opening the valves, and in this way found it perfect. When closed the left short cardinal is in front of and above the right short cardinal, and the left long cardinal in front of and below the right-hand equivalent tooth, as in *Isocardia*. The external ligament is visible inside when the valves are closed, for there is a slight gape under its posterior end, but its attachments and position are strictly marginal and external. The yellowish suffusion of the surface is a little more darkly clouded on the upper posterior part, and is divided here by a pale ray from the umbones to the lower posterior margin. The sparsely set microscopic tubercles can only be observed with a magnifier; to the eye the surface looks shining and smooth, not unlike that of *Kellia suborbicularis*. Taking it for granted that the specimens labelled by Dr. Jeffreys are really the same as his type in the British Museum, and authentic, it follows that *Lyonsiella* or *Pecchiolia subquadrata* Jeffreys is a congener of the *Callocardiæ* of Smith, though, as Smith himself indicates, not of the original *Callocardia*. They have a hinge much nearer the original *Isocardia* than *Kelliella* has, but different from either; and, if they were two inches in diameter, would be unanimously accorded separate names. As the element of size can hardly, on reflection, be considered in systematic work as opposed to definite characters, I have taken the responsibility of separating them, leaving to my more "conservative" friends the usual option of disregarding the distinctions if they prefer.

Through the extreme courtesy of Mr. Smith, I have received from him an enlarged drawing of the type of *Callocardia* showing the hinge. It is impossible without a figure to exhibit clearly the marked differences which exist between the hinges of *Callocardia* and *Vesicomya*. This I hope, later, to supply.

The species then comprise *Callocardia* (*Vesicomya*) *subquadrata* (Jeffr.) Dall, and *C.* (*V.*) *atlantica*, *C.* (*V.*) *pacifica*, and *C.* (*V.*) *Adamsi* Smith; *C.* (*V.*) *pilula* and *venusta* Dall.

Lest there should be a question as to the species, I retain the description I had prepared before the publication of the Challenger report, and which I should have otherwise (as in other cases) suppressed in this paper.

Callocardia (Vesicomya) atlantica Smith.

Callocardia (?) *atlantica* Smith, Chall. Rep. Lam., p. 157, pl. vi. fig. 8, 1885.

Shell small, extremely fragile, rotund, polished, whitish, with a pale filmy epidermis; sculptured evenly all over with fine close-set concentric rounded lines or threads; the margin of the valves is nearly circular, above which rise the small prominent, inflated beaks; they are nearly median as regards the ends of the valves, but extend a little forward of the median line; both ends and the base are subequally rounded; a ridge extends (as in *Cetoconcha*) from the beaks backward, including between itself and the hinge margin a narrow inbent area; the ligament is wholly external, long linear, black; there is no internal cartilage; in each valve is a thin short rectangular lamellar cardinal tooth parallel with the hinge-line and immediately contiguous to a lamellar elongated tooth, between which and the margin is a sharply cut groove extending far behind the tooth; interior polished, white; muscular scars invisible. Lon. of shell 4.5, alt. 4.5, diameter about 4.0 mm.

A single specimen was obtained living, at Station 236, off Bequia, in 1591 fms., fine ooze, bottom temperature 39°.0 F.

The specimen agrees well in every way with Mr. Smith's descriptions and figures.

Callocardia (Vesicomya) pilula Dall.

Diplodonta pilula Dall, Bull. M. C. Z., IX. p. 136, 1881.

Plate VIII. Fig. 13.

Habitat. Station 43, 339 fms., one specimen.

This little shell when submitted to higher powers, and especially when compared with the *V. atlantica*, was recognized as a *Vesicomya*. Its very minute size and the difficulty of opening it without breaking it led to its reference in the preliminary work to *Diplodonta*, while the doubt attending the reference was at the same time expressed. I am of the opinion that it is really a young specimen of the species afterward named *atlantica* by Mr. Smith, but I do not feel certain of it. Should it turn out to be so, I should prefer to waive my name in favor of Mr. Smith's, for the reason that there was not information enough in my description to enable any one to recognize it as a *Vesicomya*.

Callocardia (Vesicomya) venusta, n. s.

Shell pale straw-color, elongate-ovoid, inflated, equivalve, inequilateral, thin, chalky in consistency, fragile ; beaks full, near but not touching each other, lunule large, marked by a sharply cut groove or line ; outer surface polished, uniformly concentrically sculptured with fine not very regular wrinkles ; interior polished ; anterior scar high, rather narrow, rounded below and pointed above ; posterior scar much shorter, rounder and broader; pedal scar small, round, strongly marked, under the anterior tooth; hinge that of the subgenus, teeth flat and thin, the anterior cardinal of the left valve the larger, its edge waved ; inside margin of the valves, close to the edge, sculptured with a few not quite parallel sharp grooves, much as in *Transennella ;* anterior ends of the valves rounded, posterior more pointed especially toward the lower posterior part of the margin. Max. lon. of shell 19.0; max. alt. 14.0: double diameter of largest valve 11.5 mm.

Habitat. One valve dredged at Station 1, in 801 fms., mud, bottom temperature 39°.5 F., off Havana. Also several valves by the U. S. Fish Commission at Station 2678, in 731 fms., off Cape Fear, North Carolina, bottom temperature 38°.7 F.

The presence of a very young valve shows that the elongated shape is constant. The shell in shape a good deal resembles *Meiocardia Agassizii*, but the sculpture is less regular, there are no lateral teeth or radiating keels or ridges, and the substance of the shell is more earthy.

Family VENERIDÆ.

Genus CYTHEREA Lamarck.

Subgenus DIONE Megerle v. Muhlfeldt.

Cytherea (Dione) hebræa Lamarck.

Cytherea hebræa Lamarck, An. s. Vert., VI. p. 308, 1818.

Habitat. West of Florida 30 fms.; off Gordon Key 68 fms.; Barbados, 100 fms.

These specimens are all very young, and yet seem to show the characters of this species sufficiently. Most of them show traces, outside of the smooth colored surface, of a chalky layer which is very soon worn off and leaves no trace in the adult.

Cytherea (Dione) albida Gmelin.

Dione albida Reeve, Conch. Icon. *Dione*, pl. x. fig. 39.

A number of very small and immature valves, dredged at Stations 247 and 262, near Grenada, in 92–170 fms., may belong to this or some allied species. They are not in a condition to be accurately determined.

Cytherea (Veneriglossa) vesica, n. s.

Shell thin, inflated, rounded ovate, white, uniformly concentrically grooved, polished; no differentiated dorsal area; lunule wide, short, marked by a fine inscribed line; beaks tumid, involved, as in *Isocardia*, twisted away from the hinge-line so that their tips are widely separated; margins thin, simple; hinge with the teeth arranged much as in *Cytherea Sayana* Conrad, but with the depressions prolonged into pits, the ends of the teeth sharp and pointed, and the ventral margin of the hinge-shelf upturned; ligament long, in a deep groove, passing away from the hinge-line under the beaks as in *Isocardia;* muscular impressions small, near the margin; pallial line with a shallow wide wave just before the posterior adductor scar. Lon. of shell 22.0; alt. 21.0; diam. 17.0 mm.

Habitat. Station 36, 84 fms., in the Gulf of Mexico; Station 167, near Guadelupe, in 175 fms.; Barbados, 100 fms., by the "Hassler"; all dead valves.

This is a very singular shell. In the absence of the soft parts I am at a loss to place it. If it were not for the slight wave in the pallial line, I should, in spite of its Venerid teeth, have placed it in the *Isocardiidæ*. The very young shells, though more elongated and less tumid, resemble *Vesicomya atlantica* Smith; the adults are more like it on a larger scale. The dentition is altogether different from *Circe*, and those forms of *Cytherea* which have somewhat similar teeth have the beaks and ligament different, and an angular pallial sinus. It seems to be worthy of a section to itself.

Genus VENUS Linné.

Venus pilula Reeve.

V. pilula Reeve, Conch. Icon. *Venus*, pl. xv. fig. 58, 1863.

Valves were obtained by Sigsbee, off Havana, in 80 fms., and at Station 272, in 76 fms., Barbados, which appear to be referable to this species.

Subgenus CHIONE Megerle v. Muhlfeldt.

Venus (Chione) pygmæa Lamarck.

Venus pygmæa Lam., An. s. Vert., 2me ed., VI. p. 337. Desh. Cat. Biv. Brit. Mus., p. 129.
Venus inæquivalvis D'Orbigny, Moll. Cuba, p. 277, pl. xxvi. figs. 38–40, 1846.
Venus trapezoidalis Kurtz, Cat. N. and S. Car., p. 5, 1860 (fide Stm.).

Habitat. Station 26, 110 fms., in the Gulf of Mexico; Yucatan Strait, 640 fms. (valves).

The shell is found living in Charleston Harbor and southward.

Venus (Chione) cancellata Lamarck.

V. cancellata Lam., An. s. Vert., V. p. 588, 1818. (? = *V. dysera* Linné.)

Habitat. Gordon Key, 68 fms.; off Havana, in 127 fms., drifted valves.

It is abundant on the Floridian and Antillean coasts in moderate depths of water.

Family PETRICOLIDÆ.

Genus PETRICOLA Lamarck.

Petricola divaricata Chemnitz.

Petricola divaricata (Chemn.) D'Orbigny, Moll. Cuba, II. p. 265, 1853.

One valve was obtained by the "Bache" in 68 fms., near Gordon Key. The species is not rare, in proper places, in South Florida and through the whole Antillean region.

Family TELLINIDÆ.

Genus TELLINA Linné.

Tellina Antoni Philippi.

Tellina Antoni Philippi, Dall, Bull. M. C. Z., IX. p. 134, 1881.

Habitat. West of Florida, 19 fms. [Bache]; Carolina coast, young valves, U. S. Fish Commission.

Tellina squamifera Deshayes.

T. squamifera Deshayes, P. Z. S., 1854, p. 365; Reeve, Conch. Icon. *Tellina*, pl. lv. fig. 325, 1869.

Habitat. Off Sombrero, valves, in 54–72 fms.

Only one valve of this elegant little shell appears to have been known to Reeve.

Tellina sybaritica Dall.

Tellina sybaritica Dall, Bull. M. C. Z., IX. p. 134, 1881.

Plate VI. Fig. 11.

Habitat. Yucatan Strait, 640 fms., one valve.

I have not been able to find any more specimens of this very lovely little shell, but I doubt if it lives in the depth of water from which it was dredged. Its brilliant crimson color would be rather anomalous in that depth of water, and the shell seems very solid for such a habitat.

Tellina tenera Say.

T. tenera Say, Journ. Acad. Nat. Sci. Phil., II. p. 303, 1822. Tryon, Am. Marine Conch., p. 148, fig. 349.

Habitat. East coast of the United States and the Antilles; off Sand Key, 80 fms.; off Sombrero, 72 fms.; west of Florida, in 30 fms.; and at Station 287, near Barbados, 7–50 fms.

The southern specimens have a tendency to be brighter colored.

Tellina plectrum (?) Hanley.

Tellina plectrum (?) Hanley, Dall, Bull. M. C. Z., IX. p. 134, 1881.

Habitat. Yucatan Strait, 640 fms., one valve.

I have not been able to learn anything more about this specimen.

Tellina Gouldii Hanley.

Tellina Gouldii Hanley, Dall, Bull. M. C. Z., IX. p. 134, 1881.

Habitat. Yucatan Strait, 640 fms.

This is not *Angulus Gouldii* Carpenter, of the west coast of America, which has the aspect of a small *Macoma*. Whether it is the true *T. Gouldii* of Hanley I have no means of deciding, but it resembles the figure of that species. I have it also from South Florida, collected by Hemphill.

Family SEMELIDÆ.

Genus ABRA Risso.

Abra Risso, Hist. Nat. Eur. Mer., Moll., p. 370, 1826.
Syndosmya Récluz, 1843.
Abra (Leach Mss.) Gray, 1852.

In using *Syndosmya* of Récluz for the following species I followed Deshayes, who adduces some weighty reasons for not adopting the name *Abra* (Leach Mss.) quoted under the synonymy of certain species in 1818 by Lamarck, and not published by or for Leach until 1852. But it seems that Risso used the name in 1826, and, without having time thoroughly to investigate the question, I have concluded to follow Adams and Verrill in the present case.

Abra longicallis Scacchi.

Syndosmya longicallis Scacchi, Dall, Bull. M. C. Z., IX. p. 133.

Habitat. Station 41, Gulf of Mexico, Lat. 23° 42′, Lon. 83° 13′ W., living in 860 fms.; Stations 136 and 137, near Santa Cruz, in 508 to 625 fms., bottom temperature 42°.5 F.; also Stations 161, 163, 221, 227, 228, 230, and 264, in 416 to 769 fms.

This is a really abyssal species, and ranges from moderate depths to at least 1500 fms. It is very widely distributed.

Abra lioica Dall.

Syndosmya lioica Dall, Bull. M. C. Z., IX. p. 133, 1881.

Plate IV. Fig. 8.

Habitat. 20 miles west of Florida, 30 fms.; off Sombrero in 54 and 72 fms.; off Sand Key, 30 fms.; Station 36, 84 fms.; Station 9, 111 fms.; Station 5, 229 fms.; Station 2, 805 fms. Stations 128, 167, 206, and 247, in 170 to 180 fms.; valves, etc.

This species is more oblique and inequilateral, more rostrated and quadrangular, than *A. æqualis* Say, as figured and described by him. It does not gape behind, as that is said to do, nor is its pallial sinus as irregular as in *A. æqualis*, but it is more ovate and does not rise as high; the teeth also appear to be stouter and wider in *A. lioica*. It has been obtained at many stations of the Fish Commission off the Carolinas, and even to the New England coast. It does not seem to live in more than 180 fms.; all found at greater depths were dead valves.

Genus ERVILIA Turton.

Ervilia nitens Montagu.

One valve of this common West Indian shell was dredged in 7 to 50 fms., at Station 287, near Barbados.

Genus CUMINGIA Sowerby.

Cumingia tellinoides Conrad.

Cumingia tellinoides Conrad, Journ. Phil. Acad. Nat. Sci., VI. p. 258, pl. ix. figs. 2, 3, 1830.
Lavignon Petitiana D'Orbigny, Moll. Cuba, II. p. 236, pl. xxv. figs. 33–35, 1846.
Lavignon antillarum D'Orbigny, l. c., p. 236, pl. xxv. figs. 36–38, 1846.

Habitat. Station 10, in 37 fms., Gulf of Mexico, living.

The species is variable in form. The artist has reversed one of D'Orbigny's figures, so that his two figures look more unlike than they would otherwise. It is a common shell on the coast of the United States in comparatively shoal water, and from its nestling habit is generally deformed.

Genus SEMELE Schumacher.

Semele obliqua Wood.

Tellina obliqua Wood, Gen. Conch., t. 41, figs. 1–2, 1815.
Amphidesma variegata Lamarck, An. s. Vert., lère éd., V. p. 490, 1818.

One valve dredged by the "Bache," May 13, 1872, in 63 fms. S.W. of Garden Key.

Semele cancellata D'Orbigny.

Amphidesma cancellata D'Orbigny, Moll. Cuba, II. p. 241, pl. xxv. figs. 42–44, 1846.

Valves were obtained in 30 fms. west of Florida. It is not rare on the shores of South Florida and the Antilles.

Family POROMYIDÆ Dall.

Genus POROMYA Forbes.

Poromya Forbes, 1844; *Embla* Lovèn, 1846. Type *P. anatinoides* Fbs. (= *P. granulata* Nyst.)

Shell gaping a little behind, granulose externally under a thin epidermis, internally with an internal cartilage in a stout posteriorly directed fossette over which a linear external ligament extends from under the beaks backward over the cartilage to the posterior end of the hinge-line; before the cartilage in the right valve is a stout cardinal tooth, generally notched in front; in the left valve is a small sunken triangular tooth in front of the fossette, and a long distant posterior lateral tooth lies behind the beak. There is a very slight indentation of the pallial line, the foot is long and cylindrical, the siphons rather short, surrounded with a fringe of rather stout tentacles. There is no ossicle. Gills as in *Cetoconcha*, with no free branchiæ. The interior of the shell is faintly pearly under a wash of non-perlaceous substance.

Section CETOCONCHA Dall.

Shell differing from *Poromya* proper by the cartilage being almost external and the fossettes diminished in size and upturned, the external ligament consequently nearly obsolete; the dentition obsolete except the cardinal tooth of the right valve, which itself is sometimes absent in the adult, though observable in the young shells; other shell characters much as in *Poromya*. The foot is compressed and hatchet-shaped, grooved behind; the mouth has two large superior palpi and two (or none) small inferior palpi not modified as gills. The foot stands in a socket as in *Verticordia* and *Cuspidaria*. On the ventral surface of the body, behind the foot, are two (sometimes four) rows of less than semicircular lamellæ closely adjacent to each other and firmly fixed to the surface by the whole base of each lamina. There is one row on each side with a shorter supplementary outer row in other cases. They radiate forward in a curve from a point a little distance behind the foot, and may quite or not quite meet at this point. In *C. elongata* I found no inferior palpi, a state of things perhaps due to injury, though the specimen seemed perfectly preserved; the other species had them. In all there was a row of similar lamellæ to those above described, starting on each side from behind or under the inferior palpus of that side, or the place in front of which it should have been, and extending backward in such a curve as would, if prolonged, have joined its posterior end to the anterior end of the row coming from behind the foot. The lamellæ are not connected by a raphe. These lamellæ represent the branchiæ of ordinary Pelecypods, and if even these are absent, as seems possible, in *Cuspidaria*, it is difficult to doubt that we have a progressive series: in *Cuspidaria* none; in

Cetoconcha the ventral body wall externally gathered along a line into pinched-up laminæ which develop at opposite ends of a lateral line, with a supplementary second line corresponding to the branchial appendix; finally, the posterior consolidation of the series into a small gill free from the ventral surface except at its proximal extremity, as in *Lyonsiella* and *Verticordia*.

The incurrent siphon is long, retractile into the cavity between the sides of the mantle, the excurrent siphon much shorter; around their bases is a series of stout (in *C. elongata* arborescent?) darkly pigmented tentacular appendages, with smaller papillæ inside from them, but no visible ocelli; the mantle from below the mouth backward is open for two thirds the distance to the siphons, a marked distinction from *Verticordia* and its congeners; its margin is plain and not very stout; the intestine passes through the heart, below which are two glandular brown feather-shaped renal organs; the liver, ovaries, and muscles are well developed, but a large part of the body cavity is vacant, and its walls are sustained by mesenteric bands or fibrillæ attached to the adductors or the dome of the shell. Type *Lyonsia bulla* Dall.

The remarkable characters of this group will be sufficiently evident to those who have a fair knowledge of the macroscopic anatomy of the Pelecypods. Especially do the gills attract attention, and enforce the lesson of the mutability of these breathing organs, and their unfitness for use in fundamental classification.

To *Poromya* as restricted belong *P. granulata* Nyst, *P. sublævis* Verrill, *P. neæroides* Seguenza, and *P. australis* and probably *P. lævis* Smith.

To *Cetoconcha* belong *C. bulla* Dall, *C. tornata* (*Pecchiolia*) Jeffreys, *C. nitida* (*Thracia*) Verrill, and *C. elongata*, *albida*, and *margarita*, new species.

The shells grouped by Deshayes, in his discussion of the molluscan fossils of the Paris basin, under the name of *Poromya*, form a very heterogeneous assembly, which, in the absence of typical material, would be difficult to assort properly.

Poromya granulata Nyst and Westendorp.

Poromya granulata Nyst and West., Dall, Bull. M. C. Z., IX., p. 108, 1881.
Corbula granulata Nyst and West., Nouvelles Res. des Coq. Foss. d'Anvers, p. 6, pl. iii. fig. 3, 1839.
P. anatinoides Forbes, Ægean Rep., 1844, p. 103.

Habitat. Sand Key, 15 fms.; Station 36, 84 fms.; Station 9, 111 fms.; Station 5, 229 fms.; off Sombrero, 72 fms.; temperatures at bottom 49°.5 to 60°.0 F.

Variety *P. australis* Smith.*

Habitat. Barbados, 100 fms.; off Sombrero, 54 fms.; Station 20, off Bahia Honda, Cuba, in 220 fms., living, bottom temperature 62°.0 F.; Station 262, off Grenada, in 92 fms., sand, same temperature.

* *Poromya australis* Smith, Chall. Lam., p. 54, pl. xi. figs. 2 a, 2 b, 1885.

A further study of these specimens, together with those of the Jeffreys collection, has confirmed me in the opinion I expressed in my preliminary report as to the remarkable variability of this species, the modifications being so gradual that I am in doubt as to whether more than one species exists in our seas, unless the *P. sublævis* Verrill be different, as from the figure would seem likely, if it be normal. *P. neæroides* has a surface similar to that of *P. sublævis*, but is at the opposite extreme of form. *P. rotundata* has a sparse or close granulation indifferently, if one may judge by the few specimens I have seen. I find among the specimens collected some small, inflated, and triangular, compared with the average of the others, in which the granulation is composed of beautiful minute spheres, perfectly transparent and closely set in quincuncial arrangement with the greatest regularity. They agree in most details with the description given by Smith of his *australis*. The granulation is coarser than in the average *granulata*, and the effect of the light upon the transparent spherules, under a glass, gives them the appearance of little cups or tubes. I cannot feel positive that they are the same as the form described by Mr. Smith without a comparison of specimens; but they agree too closely to warrant giving any other name to them until a comparison can be made. I have seen one alcoholic specimen of *P. granulata* in which the soft parts showed no essential differences from *Cetoconcha*. The lower palpi were present and the siphons not very long.

Poromya (Cetoconcha) albida, n. s.

Shell not pearly externally, white, thin, punctate and polished toward the beaks, toward the margin with rather sparse granules covered with a thickish, wrinkled, straw-colored epidermis; beaks slightly nearer the anterior end, not contiguous, rather high, small, inflated, but less so than in *C. tornata;* both ends rounded, the posterior a little less inflated and more produced; base evenly rounded; interior strongly radiately striate; muscular impressions high, narrow, impressed; right valve with the hinge-line obtusely arched, the centre under the beaks with a solid triangular thickening; the anterior end of this supports a stout, short, round-topped cardinal tooth, behind which the callus supports on its dorsal surface a stout triangular cartilage, the anterior end of which probably appears between the anterior bifurcation of the external ligament, but the posterior apex of which is internal and covered by the ligament; the ligament, as in all this group, turns away from the hinge-line and is lost under the beaks; above its course is an elevated narrow ridge which extends posteriorly to the end of and very close to the hinge-line. Lon. 21.5; alt. 19.5; diameter of the valve 8.5, and of the whole shell probably 17.0 mm.

A single right valve was obtained by the Fish Commission at Station 2159, in 98 fms., near Havana, Cuba. The shell resembles *Poromya sublævis* Verrill, but has twice or three times the size; otherwise, until the hinge is critically examined it would pass for that species. It is, however, larger than any known *Poromya*.

Poromya (Cetoconcha) elongata, n. s.

Shell whitish, not pearly, somewhat resembling the preceding, but much more elongated; surface more densely and minutely granulate, the granules being in even radiating series for the most part; the lines of growth are stronger and the surface not so smooth; the epidermis is similar, but apparently thinner; the beaks are contiguous, and are less elevated, less spiral, and less prominent; the hinge-line, though longer, is thinner; the cardinal tooth more acute and much smaller; the shelf for the cartilage weaker, longer, and narrower; the ridge extending backward from the beaks is not so near the hinge-margin, and the area between is wider and obliquely cut off at its posterior end, forming a more decided angle than in *C. albida;* the anterior end and base are elegantly rounded, but the posterior end is somewhat rostrated with an obscure impression extending from the beaks to the lower posterior rounded angle of the rostration; the beaks are nearly equidistant from the ends, but probably a little behind the median line; the hinge-margin in the right valve is a little expanded before the beak. Lon. 22.5; alt. 17; diameter of right valve 6.25; of shell, probably, 12.5 mm.

A single right valve was obtained by the "Blake" at Barbados, in 100 fms.; and a living specimen by the U. S. Fish Commission at Station 2337, northwest of Cuba, in 199 fms. It has somewhat the shape of *Poromya neæroides* Seguenza, but the hinge differs. The soft parts are described in the sub-generic diagnosis with some additional notes under the next species. The lower palpi are absent, and the gill rows one on each side, adjacent, but not touching, at the point of origin without any appendix.

Poromya (Cetoconcha) bulla Dall.

Lyonsia bulla Dall, Bull. M. C. Z., VI. p. 61, 1878; IX. p. 107, 1881.
(?) *Thracia nitida* Verrill, Trans. Conn. Acad., VI. p. 221, pl. xxxii. fig. 22, 1884.

Habitat. Station 31, Gulf of Mexico, in Lat. 24° 33′ N., Lon. 84° 23′ W., 1920 fms., living, bottom temperature 39°.5 F.; U. S. Fish Commission (as *Thracia nitida*), off Chesapeake Bay, in 1917 fms.

The agreement between Professor Verrill's figure and description on the one hand, and the Blake specimens on the other, is so close, that I can hardly doubt they are the same species, though I have not examined specimens of his shell. The soft parts of this species are much the same as in *C. elongata*, except that the retractile siphon is proportionately longer, and the gill series consists of two short rows (5–7 lamellæ) on each side radiating forward from a point immediately behind the foot. The lower palpi are present but not branchial; but on the body surface near them are two short rows (8–10 sections or lamellæ), one on each side, diverging backward, the anterior end of each being under or behind the lower palpus of that side. The trend of these is such that, if continued, they might join endwise with the inner series, corresponding to the gills coming from behind the foot, and form a single row.

The young shell has the teeth of *Cetoconcha*, the adult loses them entirely, having only the usual enlargement of the hinge-line to support the now nearly external cartilage, the linear filmy ligament proper outside of the former being hardly perceptible, though present. It was on this account, even in the absence of an ossicle, that I was led provisionally to describe this as a *Lyonsia*, and perhaps Professor Verrill to call it a *Thracia*. On further study I found in some cases, under the epidermal fibres noted in the original description, calcareous granules, especially toward the ends of the shell, while in other places there seemed to be no granules. The posterior slope shows more epidermis than the rest; the outer surface of the shell is faintly iridescent where polished, as is the interior. The tendency to rostration at the posterior end seems more marked in the older than the younger shells, but differs in different individuals. It is not very marked in any.

The measurements of the largest specimen in my possession are 13.0 mm. long, 10.0 mm. high, and 9.0 mm. in maximum diameter. There seems to have been an error in recording or in printing the dimensions of the specimen used for the original description.

Poromya (Cetoconcha) margarita, n. s.

Plate VIII. Fig. 10.

Shell small, white, inflated, slightly inequivalve and inequilateral, subrostrate posteriorly. The right valve a little the smaller ; the lateral outline of the valves viewed from within recalls *Poromya granulata*, but the shell is much more inflated ; granulations faint or obsolete except behind, as in the last species ; teeth of the hinge obsolete in the adult ; anterior and basal margins rounded ; behind is a slight concave wave in the margin below, while the upper posterior margin descends more rapidly than the anterior one, and is subtruncate, and the rostration thus produced gapes slightly ; the beaks are inflated, but do not rise very high above the hinge-line. Max. lon. 7.3 ; alt. 5.5 ; diam. 6.6 mm.

Soft parts as in the last species, but the retractile siphon much shorter ; the respiratory laminæ nine on each side anteriorly, the posterior series about eight, and the appendix with about six lamellæ. The lower palpi present, small ; the foot slender, grooved behind, and the other features as in the description of the subgenus.

Habitat. Station 44, off Tortugas, in 539 fms.; Station 221, near Santa Lucia, in 423 fms., ooze ; and Station 176, off Dominica, in 391 fms., ooze; living at all the stations; the bottom temperature ranged from 39°.5 to 43.°5 F. The fragility of the shell is such that nearly all the specimens were broken in the trawl.

This little species was overlooked in my preliminary examination and taken for the young of the preceding. A more careful study shows they are absolutely distinct.

Family VERTICORDIIDÆ Seguenza.

Genus VERTICORDIA Wood.

Verticordia (Wood Ms. 1844) Sowerby, Min. Conch., pl. 639, Aug. 1844.
Verticordia (Wood Ms.?) Gray, Syn. Brit. Mus., 1840 (sine descr.).
Hippagus Philippi, Sowerby, not of Lea.
Iphigenia O. G. Costa, 1850, not of Schumacher, 1817.
Verticordia Seguenza, Journ. de Conchyl., 1860, p. 286; Fischer, l. c., p. 295; Seguenza, Rendic. R. Accad. delle Scienze, 1876. Dall, Bull. M. C. Z., IX. p. 105, 1881.

Since my examination made in 1881 of the specimens of this group, I have been able to examine alcoholic specimens of *V. acuticostata* and additional specimens of other species, beside those contained in the Jeffreys and U. S. Fish Commission collections. I have therefore reviewed the whole subject, and have the pleasure of being able to add several facts of interest, and especially to determine positively the relations of the animal and the character of the soft parts in the species referred to, and therefore probably for the whole group. I have found also that the shells which have been referred to this group differ among themselves in regard to characters of hinge and dorsal margin, so as to require separation into different subgenera or sections.

Verticordia (s. s.). Shell small, more or less convex, with a deeply impressed lunule and a large, arched, bridge-like ossicle attached below the beaks to an internal cartilage in each valve; this ossicle is expanded outward at its posterior end, and, in the most typical species, is much broader than long; the right valve has a strong conical tooth behind the internal convexity due to the impressed lunule, and no lateral tooth; the left valve has the lunular edge produced to fit in front of the cardinal tooth of the right valve, and has the upper surface of the posterior hinge-margin bevelled away so that that edge may fit under the opposing edge of the right valve; the cardinal tooth in young specimens is grooved axially, but when adult is conical; the line of the external ligament is continued under the spiral of the beaks. Soft parts (in *V. acuticostata* Phil.) having the mantle-edge thick and fleshy, corresponding in form to the sulcations of the valves, but not fringed with papillæ; united on the ventral surface, with a simple very short slit opposite the foot; with a papillose siphonal opening posteriorly (the anal siphon probably present as in *Lyonsiella*, but, on account of contraction from the spirits in which it had been preserved, not clearly made out) with about four ranks of papillæ, the innermost ones largest, but in the specimen much contracted. Mouth axially striate, opening *below* the anterior adductor, without palpi ; foot cylindrical, large for the size of the animal, distinctly grooved behind ; laterally somewhat compressed near the acute tip ; base set as it were in a socket, which, when cut open, shows a chamber of considerable size well suited for a marsupium ; in this specimen the aperture of this chamber fitted closely around the foot, which stood like a stopper in a bottle ; on each side of the foot and attached to the margin of this opening was a single lanceolate, small stout fleshy gill laterally longitudinally sulcate, and very small for the size of the animal ; * the posterior side of the foot was distinctly grooved, but no byssus was present.

It will be noted that these features agree essentially with the soft parts of *Lyonsiella abyssicola* as described by Sars, and vindicate the judgment of Jeffreys, who approximated the two groups.

The type of *Verticordia* as restricted is *V. cardiiformis* Sowerby (Min. Conch., pl. 639, 1844).

To this group I refer *V. acuticostata* Philippi ; *V. Deshayesiana* Fischer (+ *Japonica* A. Ad.) ; *V. Woodii* Smith ; *V. tornata* Jeffreys ; *V. flexuosa* and *V. granifera* Verrill, the former described as a *Mytilimeria* by that naturalist ; *V. parisiensis* Deshayes ; *V. perversa* and *V. Seguenzæ*, n. s.

The type of this group resembles *Trigonulina* in its narrow form and external sculpture, but not in hinge characters.

Trigonulina (D'Orbigny, 1845, + *Trigoniluna* Chenu, 1862, + *Hippagus* (sp.) Adams and Reeve, not Lea).

Shell compressed laterally ; ossicle long, narrow, rectangular, flat ; right valve as in *Verticordia*, but with a long lateral tooth ; left valve as in *Verticordia*. Type *T. ornata* D'Orbigny. Cuba.

To this group belong *V. novemcostatus* Ad. & Rve., and *V. cœlata* Verrill ; all of which appear to be specifically identical with the type, which is found in Japan, California, the West Indies, and on the eastern coast of the United States. I have not been able to find the ossicle in all the specimens of this species examined, even when the dry remains of the animal were in the shell. But this may be accounted for by its form and extreme narrowness, which, added to its position on a ligament which must be broken to open the shell, render its loss extremely probable except under peculiarly favorable circumstances.

(?) Euciroa (Dall, 1878, Bull. M. C. Z., IX., 1881). Shell large, thick, Cythereæ-form, with a true lunule and corselet ; ossicle triangular, wider behind ; soft parts unknown. Type *V. elegantissima* Dall.

This species is separated chiefly by its form, the hinge being essentially like that of *Trigonulina*, except as regards the ossicle, which from the arrangement of the ligamentary scars must have been of a wide subtriangular shape. The

* These are probably what A. Adams took for palpi in his description of the soft parts of *V. Japonica* or *Deshayesiana*.

fragments indicate that it must reach the largest size of any member of this group.

PECCHIOLIA (Meneghini, 1851, Cons. sulla Geologia Stratigr. della Toscana, p. 180). Shell destitute of lunule; much inflated; beaks much coiled and widely separated; line of the external ligament passing under and coiled with the beaks; ossicle (not seen, but must have been enormous and like that of *Verticordia*, but flatter); right valve, hinge as in *Verticordia* except for the depressed lunular space; left valve ditto, but with an obtuse thickening of the cardinal margin to fit behind the large cardinal tooth of the right valve. Type *P. argentea* Mariti, fossil in the Vienna basin and Italian tertiaries. No recent representative known.

This and other sections of *Verticordia* have been referred to *Hippagus* (Lea, 1834). But from a study of authentic specimens received from Dr. Lea, I find the type of *Hippagus* to belong to the *Mytilidæ*. The external sculpture, the position of the muscular scars and ligament, and the general form and texture of the shell in *Hippagus* agree perfectly with *Crenella*, from which *Hippagus* differs only in having the beaks slightly more twisted than the common recent species of *Crenella*, and in having the shell thicker, so that the external sculpture does not crenulate the edge. Compare the original figure of *Hippagus* with *Modiola cinnamomea* Chemnitz, or a specimen with a shell of equal size of *Crenella decussata*, and it is easy to come to a conclusion.

I have been able to study a fine series of *Pecchiolia* in the Jeffreys collection, and observe that one must be certain of the perfection of the specimen if he would avoid being led into error, for the fossil shell scales off in such a way as to alter the hinge entirely, and yet not appear defective. The scars of the internal cartilage are wonderfully large and deep, and if, as is probable, it bore an ossicle, this must have been enormously large.

HALIRIS Dall. Shell globose, ossicle short, squarish; lunule present, not deep; right valve with hinge teeth as in *Trigonulina;* left valve with (in the adult) a small but distinct cardinal tooth and a short stout lateral tooth near the umbo; lunule not produced; adolescent or young shells with the dentition obscure or imperfect. Type *Verticordia Fischeriana* Dall. Gulf of Mexico in deep water.

To this group belong *V. trapezoidea* Seguenza, and perhaps his *V. granulata*, which I have not seen, and which has not been well figured. These have been perhaps too hastily united by Dr. Jeffreys.

The genus *Mytilimeria*, whose position has been somewhat debated, unquestionably belongs in this family. The mantle is closed except for the two large siphonal openings, which are, on a large scale, similar to those of *Lyonsiella*, and a minute slit for the very small phalliform foot, which has a shallow posterior sulcus and a slightly enlarged glandiform tip. The mantle margin is thick and plain except about the siphons. There are two rather good-sized branchiæ, but the palpi are small, or perhaps obsolete; on this point my specimen, which had been dried and soaked out, was not conclusive. The internal cartilage bears a large ossicle as in *Lyonsiella;* the beaks are subspiral, and the external ligament coils under them away from the hinge-margin, as in *Cetoconcha* and other *Verticordiæ.* The same uncircumscribed lunular depression and puckering of the adjacent hinge-margin is observable in *Mytilimeria*, which normally should have, from appearances, a tooth-like projection of the twisted margin as in *Plectodon*, but which is usually masked by the ligament. The sedentary habit of this mollusk, as in other cases of the kind, has resulted in veiling some of its original characters. It is said to "burrow in sponge," but the spongy substance in which it is found is of its own manufacture, and consists of sand grains, etc., entangled in a solidified mucus, which is secreted by the animal, and which, like the byssus, is not affected by water. It is probable that in life the foot is susceptible of much extension.

The surface of the valves in *Mytilimeria* is not granulated, but is covered by an epidermis not unlike that of *Cetoconcha.* It may be recalled that sundry species of *Verticordia, Poromya*, etc., have a habit of attaching sand grains to themselves by a sort of mucous secretion. The pallial line is barely sinuated, and the shell is thin and internally pearly, though the iridescence is veiled as in *Cetoconcha* by a non-pearly stratum. It is quite certain that some of the species referred to *Mytilimeria* would be better placed elsewhere.

LYONSIELLA M. Sars (1872; *Pecchiolia* G. O. Sars after Jeffreys; *Lævicordia* Seguenza, 1876). Shell small, thin; lunule faint or none; ossicle semicylindrical, forked behind; external ligament almost none; right valve edentulous, lunular edge a little produced and thickened; left valve with an elongate obscure thickening of the hinge-margin under the beak. Soft parts described by Sars (Rem. Forms of Animal Life, p. 25, pl. iii. figs. 21–43, 1872). Type *L. abyssicola* Sars. North Atlantic.

To this group belong *L. insculpta* Jeffreys (1875 + *L. gemma* Verrill, 1880), and probably the following species, known to me only by single valves or by description: *L. angulata* Jeffreys (as *Pecchiolia*), *L. mytiloides* and *axinoides* Seguenza (1876). The identification of *L. gemma* with the earlier described *insculpta* is from authentic specimens; the figure of *insculpta* in P. Z. S., 1881, is not very characteristic.

The following species form part of the Blake collection.

Verticordia acuticostata Philippi.

Hippagus acuticostatus Phil. Moll. Sicil., 1844.
Verticordia acuticostata Dall, Bull. M. C. Z., IX. p. 105, 1881.

Habitat. Station 31, in 84 fms.; living, at Station 5, in 152–229 fms., coral ooze, off Cuba, in the Gulf of Mexico, bottom temperature 49°.5 F.; Barbados, 100 fms.

Fine and very large specimens of this species have been dredged by the Fish Commission in the Gulf of Mexico.

An account of the soft parts will be found under the discussion of the generic characters.

Verticordia Woodii Smith.

Verticordia Woodii Smith, Chall. Rep. Lam., p. 168, pl. xxv. figs. 7–7 b, 1885.

A fragment, probably belonging to this species, was dredged in 100 fms. at Barbados by the "Hassler" in 1871.

Verticordia perversa Dall.

Shell translucent, thin, small, very much the shape of *Arca pectunculoides*, but with the beaks turned toward the larger end, equivalve, inequilateral, waxen white ; surface covered with excessively minute shining elongated granules radiating from the beaks in single series with equal interspaces; there are also between twenty-five and thirty radiating lines, on which extraneous matter, especially sand grains, seems to stick, though I can perceive no epidermis or special formation which should induce the sand to stick on these lines and not between them; there are no ribs under them. All these lines curve forward with an even sweep; if we consider the hinge-line as horizontal the anterior margin will be nearly vertical, and their junction evenly rounded, with no trilobate appearance in the general outline; the highest part of the shell is anterior; from the rounded anterior basal edge the posterior basal edge rises at an angle of 45°, or so, toward the rounded junction with the hinge-margin ; the beaks are rather low, the area about them is full but not inflated; there are no keels on the shell; the lunule is small but indented, and its inner edge in the right valve is convex and fits into a concavity in the opposite valve; behind it in the right valve is a short but stout squarish tooth, on the other side of which is the ossicle longer than wide, and indented behind; there are no teeth in the left valve; the interior is polished, the granules showing through the shell. Max. lon. 5.0; max. alt. 5.0; diam. 3.0 mm.

Habitat. Dredged by the U. S. Fish Commission steamer "Albatross" at Station 2678, off Cape Fear, North Carolina, in 731 fms., bottom temperature 38°.7 F.

This little shell is remarkable for having its height and maximum diameter thrown forward, as in *Lyonsiella gemma* Verrill, but even more so, without being lobed as are several species in which a similar tendency is indicated but not carried out; it is so rounded withal that it looks like a short *Modiola* with the beaks turned the wrong way. I have seen no other species which resembles it at all.

Verticordia Seguenzæ Dall.

Shell having nearly the form of *V. australiensis* Smith (Chall. Lam., p. 167, pl. xxv. figs. 6–6 b), with thin rather convex valves, greenish color, and about forty radiating posteriorly convexly curved faint sulci, the interspaces between which are gently rounded but little elevated, and hardly to be called ribs, and have intercalary groovings toward the margin. The surface is covered with minute glassy grains arranged with some regularity in radiating and concentric series. As compared with *V. australiensis* the anterior dorsal margin is more elevated and rounded up; the posterior margin is less curved. *V. trapezoidea* Seguenza has the posterior dorsal margin much more curved, the anterior more oblique, and the hinge is different, putting it in another section of the genus. In *V. Seguenzæ* the ossicle is very small, flatter than in the typical species, rectangular, and wider behind; the length of the most perfect valve is 5.0, the altitude 4.0, and the diameter, taken as twice that of the single valve, would be 3.5 mm. A large dead valve, perhaps of this species, was found at Station 2602.

Habitat. Yucatan Strait, 640 fms., one valve; U. S. Fish Commission, thirty-six miles south of Cape Hatteras, at Station 2602, in 124 fms., and about the same distance southeast of Cape Lookout, North Carolina, at Station 2614, in 168 fms., bottom in both cases sand, and bottom temperature about 61° F, (three valves).

Although there is but little material, yet the species does not come very close to any of those with which I could compare it, and it seemed worthy of a name. The hinge, though delicate and with small teeth is that of the typical *Verticordia*.

Verticordia (Trigonulina) ornata D'Orbigny.

Verticordia ornata Dall, Bull. M. C. Z., IX. p. 105, 1881.
Trigonulina ornata D'Orb., Moll. Cuba, II, p. 292, pl. xxvii. figs. 30–33, 1846.
Verticordia cœlata Verrill, 1884; Trans. Conn. Acad., V. 566; VI., pl. xxx. figs. 9, 9 a.

Habitat. Barbados, 100 fms.; Station 19, 310 fms. (Catalina Island, Cal., 16 fms., Dall; Jamaica, W. I., D'Orb.; China Seas, Adams; east coast of the United States off the Carolinas, and northward as far as Station 949, off Martha's Vineyard, in 100 fms., U. S. Fish Commission).

The sculpture of this elegant species is composed of curved ribs, radiating from the umbones and crowded in front with two or more gaps behind. There may be a posterior rib forming the extreme margin, or the hindermost rib may be within the margin, two cases figured by D'Orbigny; or the posterior ribs may fail altogether, forming the variety *cœlata* Verrill. The ribs may all or in part be grouped in pairs, or the pairs may resemble a wide rib deeply grooved along its summit. The ribs may be high and strong, or low and uniform; in the latter case they are usually more numerous; the number of ribs may be from eight to twelve; I have not in over one hundred and fifty valves found more or fewer. The interspaces may be irregularly granulose or finely radiately striate. The degree of compression varies somewhat, and the posterior end may be more or less angulated below. The extremes seem very unlike, but are perfectly connected by intermediate specimens. The average specimen has six to eight anterior ribs, a gap, one or two ribs, a wider gap, and one or two more ribs near or at the posterior margin. The commonest form has A 6, 0, 1, 0, 1 P, for its rib formula.

Verticordia (Euciroa) elegantissima Dall.

Verticordia elegantissima Dall, Bull. M. C. Z., IX. p. 106, 1881.

Plate II. Figs. 1 a, 1 b.

Habitat. Station 16, 292 fms. (fragments), off Havana, Cuba, and Station 18, in Lat. 23° 7′ and Lon. 82° 43′ 30″ W., off Muriel, Cuba, 756 fms. (a single valve); bottom temperature 55°.7 and 40°.0 F. respectively.

A little more material in regard to this large and elegant species has come to hand. The perfect valve represented in the figure was carelessly cracked by the artist under the object-glass of his instrument. It has been tolerably repaired, but fresh and perfect specimens ought to be found by somebody. The Fish Commission has dredged some imperfect valves (winter of 1885–86) at Stations 2659 and 2660, off Cape Canaveral, in 509 and 504 fms., bottom temperature 45°.2 and 45°.7 F. respectively. The best of these is 40.0 long, 38.0 high, and $\frac{35}{2}$ mm. in diameter, showing a more rounded form than in the young valve figured, and being the largest known species of the family. The interior is strongly radiately striate toward the pallial line, and the scar of the pedal muscle strongly marked.

Verticordia (Haliris) Fischeriana Dall.

Verticordia Fischeriana Dall, Bull. M. C. Z., IX. p. 106, 1881.

Plate II. Figs. 4 a, 4 b.

Habitat. Barbados, 100 fms.; Sigsbee, off Cuba, 119 fms.; and, living, at Station 36, Lat. 23° 13′ N., Lon. 89° 16′ W. Gr., in the Gulf of Mexico, in 84 fms., bottom temperature 60°.0 F. A single valve was dredged off Rinaldo's Chair in 160 fms. by the Porcupine expedition, 1870, and was found mixed with specimens of *V. trapezoidea* Seg., in the Jeffreys collection. It has also been dredged by the U. S. Fish Commission at Stations 2600, 2601, and 2602, in 87–124 fms., about thirty-six miles off Cape Hatteras.

The ribs of this species vary in sharpness, and when very sharp are serrate by the granulations which on the keel of the ribs become more prominent than elsewhere. This would seem to be nearest to *V. granulata* Seguenza, in my opinion unwisely combined by several authors with *V. trapezoidea*. *V. granulata* is as yet but imperfectly known, but seems to have only about half as many ribs as the present species.

Family CUSPIDARIIDÆ Dall.

Genus CUSPIDARIA Nardo.

Cuspidaria Nardo, Revue Zoologique, Jan. 1840, p. 30. (In report of the meeting of the Congrès Scientifique at Pisa, paper read Oct. 11, 1839.) Type *Tellina cuspidata* Olivi.

Neæra Gray, in Griffith's Cuvier, legend to plate xxii. fig. 5 (dated 1833, whole volume issued in 1834. Type *N. chinensis* Gray, in Index, p. 598); Synops. Brit. Museum, 1840, fide Gray in P. Z. S., 1847.

Not *Neæra* Robineau-Desvoidy, Essai sur les Myodaires, 1830.

Valves with one or more teeth.

The name *Neæra* being preoccupied in entomology, the next name, *Cuspidaria*, must necessarily be adopted. The longer an untenable name is retained, the more inconvenience results to science when it is, as it always will be, eventually overthrown. Gray's name at any rate has a very slender claim to priority, as the genus is not mentioned in the text or described anywhere, the generic name is misspelled in the index of plates to Griffith's edition of Cuvier, and we are left to conjecture who is its author. Gray himself, in Agassiz's Nomenclator, only claimed it from the Synopsis, which I have not been able to examine, and which was quite likely subsequent to the publication of Nardo's diagnosis in the January number of the Revue.

The group has been reviewed by Arthur Adams, who has proposed several generic or subgeneric names and eliminated some incongruous species. Dr. Jeffreys has also made a division into sections based on the sculpture of the shell. Lastly, Mr. Edgar A. Smith has most carefully investigated the characters of a large number of species, especially with regard to the hinge, arranged them in lettered sections pending further study, and tabulated the results. To this I am much indebted for help. It will not be necessary for our purposes to review the entire group, but merely those sections of it which contain species represented in the Blake collection, or which are in some way affected by this investigation.

The new subdivisions here instituted appear as proposed by Dall and Smith; a course taken with Mr. Smith's permission, and which I have felt to be due to him, owing to the assistance I have derived from his valuable observations on this group.

The shells of *Cuspidaria* possess an internal ligament, received in each valve in a more or less differentiated groove or fossette, which may project from the umbonal angle of the hinge-margin, or be more or less adherent to the anterior or posterior slope of this angle. They may have one anterior and one posterior cardinal and lateral tooth in each valve, any one of which (or all in the genus? *Myonera*) may be entirely absent. Beside the teeth the hinge is reinforced in many cases by a buttress extending in a direction vertical to the valve from the hidden surface of the hinge-margin, posterior to the umbonal angle. This buttress may consist of the vertical plate above mentioned and a thickened rib curving round in front of the posterior muscular scar, and then directed posteriorly, becoming almost immediately obsolete. Or the posterior muscular insertion may be elongate and narrow, and the buttress take the form of a "clavicle" or myophore, elongated, parallel with the posterior hinge-margin and separating the two posterior muscular scars. The muscles are not always inserted *upon* the buttress, but may be above and in front of it. Its purpose would seem to be that of strengthening the valve, almost always thin and fragile, against sudden contractions of the muscles, and to support the cardinal border, and especially the strong posterior lateral tooth found in many species. When this tooth is found in a species which has no posterior lateral in the other valve, the valve which has a tooth shows the buttress stronger than the other, indicating its function as a support for the tooth; but when elongated and clavicular there is little difference between the buttresses of opposite valves, indicating that in such cases the function is the strengthening of the valve itself. The presence of the buttress is, in my opinion, important only in a minor degree, except when it takes the clavicular form; as in different species of the same group, and even in individuals of the same species, its size and prominence vary very greatly. Adriatic specimens of the typical species, *C. cuspidata*, show a strong buttress; British specimens of the same species often show it faintly or not at all, while otherwise well developed. The names *Neæra*, *Rhinomya*, *Aulacophora*, *Spathophora*, and *Tropidophora*, among those which have been applied to members of this group, by Gray, Adams, and Jeffreys, are all preoccupied in zoölogical nomenclature, some of them several times over.

The characters of radiating and concentric sculpture in this group have no more than a specific value; there are few species where they are not more or less combined in the external ornamentation. The surface may be polished, smooth, wrinkled, sulcate, or granulous. The anterior muscular scar is double or single, the posterior scar double, in all the specimens I have seen where the scars could be made out.

The outer part of the scar in each case is due to the adductor of that end of the animal, the other part to the insertion of the sphincter-like muscular band described under *Myonera paucistriata*, further on. The observations made on the anatomy of several species will be found at the same place. If the writer has not been misled by contraction of the parts under the action of alcohol, the group comprising *Cuspidaria* and *Myonera* would seem to be destitute of gills or palpi, at least in the normal form of such organs. This, however, may not be true of all species, for the gills of mollusks are largely mere modifications of the cutis and very mutable structures.

Since the publication of my preliminary paper on the Blake Mollusks, I have had the advantage, for the Pelecypods especially, of being able personally to examine the species comprised in the Jeffreys collection, including specimens of the deep-water forms known to me previously only by description. In this way, and by the aid of the valuable labors of Mr. E. A. Smith, published in the Challenger report, I have been able considerably to improve upon previous work, in a manner which would have been impracticable under other circumstances. Otherwise, in many cases I could express opinions, on the present group especially, only with reserve not unmixed with doubt.

The sections or subgenera represented in the Blake collection now follow.

Subgenus CUSPIDARIA, s. s.

Shell usually concentrically sculptured, with or without a buttress; fossette posteriorly inclined and attached to the hinge-margin by its posterior edge; one posterior lateral tooth in the right valve.

The following species in addition to those examined by Smith belong here: *C. arctica* Sars, *C. glacialis* Sars, *C. lamellosa* Sars, *C. exigua* Jeffreys, *C. Jeffreysi* Dall. *C. limatula* Dall (*contracta* Jeffreys) has no teeth. *C. arcuata* Dall, being described from a toothless left valve, is still in doubt.

A valve of *C. glacialis* Sars, dredged in 1467 fms. in the Gulf of Mexico by the U. S. Fish Commission, is 45.0 mm. long, 28.0 mm. high, and the complete shell must have been about 30.0 mm. in diameter.

Cuspidaria rostrata Spengler.

Neæra rostrata Spengler, Dall, Bull. M. C. Z., IX. p. 111, 1881.

Habitat. Barbados, 100 fms.; Station 36, 84 fms.; Sand Key, 80 fms.

No additional specimens of this species have turned up in the Blake collection since the above were noted. It has been dredged in from about 65–500 fms. in various localities from the West Indies northward. Among the Museum specimens are two very large dead and rather worn valves from Stations 2659 and 2660 of the U. S. Fish Commission, off Cape Canaveral, in 509 and 504 fms., bottom temperature 45°.2 and 45°.7 F. respectively. They differ from the typical form in having the rostrum proportionally more slender, shorter, and curved, the dorsal margin being quite concave, and especially in having the dorsal surface very wide and with a wide strongly marked depressed area extending from the beak to the tip of the rostrum, smooth or longitudinally striate. The surface of the valves was dark brown apparently, and strongly concentrically striate. The valves are proportionally much more compressed than in the usual form of *C. rostrata.* The dimensions of the best preserved valve are as follows: — Lon. of shell 45.0; of rostrum 16.0; max. alt. of shell at right angles to the average plane of the hinge-line 26.0; alt. of rostrum at its middle part 4.0; double diameter of valve 18.0; of rostrum 8.0; of rostral area 4.5 mm. For this variety (which may well prove with better material to be a distinct species) I would propose the name *microrhina*. The valves are extremely thick and internally radiately striate, the pallial sinus, muscular scars, and buttress well marked, and fossette strong, ovoid and nearly vertically directed.

Cuspidaria Jeffreysi Dall.

Neæra Jeffreysi Dall, Bull. M. C. Z., IX. p. 111, 1881.

Plate III. Fig. 2.

Habitat. Off Cape San Antonio, a fragment in 1002 fms.; Station 44, 539 fms.; Yucatan Strait, 640 fms.; Station 136, in 508 fms., off Santa Cruz ; and Station 230, off St. Vincent, in 464 fms., living, bottom temperature 41°.5 to 42°.0 F.

This species is characterized especially, and distinguished from *rostrata* and its other close allies, by the straightness of the hinge-margin and the consequent elevation of the anterior dorsum, by the minute fossette, and by the greatest ventral expansion being almost directly under the beaks. The proportional length of the rostrum varies in different specimens, but it is less than in *obesa*, and usually less than in *rostrata*.

Cuspidaria obesa Lovèn.

Neæra obesa Lovèn (1846), Verrill, Trans. Conn. Acad., V. p. 563, pl. xliv. fig. 10c, 1882.

N. pellucida Stimpson, Inv. Grand Manan, 1853.

Habitat. Barbados, 100 fms.

A single specimen was found as above, and seems conspecific with the more northern specimens dredged by the Fish Commission. I have also dredged this species in 16 fms., mud, near Catalina Island, off Santa Barbara County, California: in company with *Plectodon scaber* Cpr. and *Cardiomya californica* Dall.

The valve figured (Plate III. fig. 1) is supposed to belong to this species, though showing some points of difference on which more material is needed to decide.

Cuspidaria (?) arcuata Dall.

Neæra arcuata Dall, Bull. M. C. Z., IX. p. 113, 1881.

Plate III. Figs. 3, 4.

Habitat. Yucatan Strait, 640 fms.

As only a single left valve of this species was obtained, it has been impracticable to determine to what section it belongs, but the general aspect is that of *Cuspidaria*, or a *Halonympha* without a clavicle.

Subgenus CARDIOMYA A. Adams.

Similar to the preceding, but with radiating sculpture and the fossette more vertical and prominent. Type *Neæra Gouldiana* Hinds.

C. multicostata V. & S., *C. perrostrata* Dall, and *C. ornatissima* D'Orbigny (+ *costata* Bush) belong here, as do *N. pectinata* Cpr. (1865, + var. *behringensis* Leche, 1883, from types), and *C. californica* Dall.* (See Plate III. fig. 6.)

Cuspidaria (Cardiomya) perrostrata Dall.

Neæra (*ornatissima* D'Orb. var.?) *perrostrata* Dall, Bull. M. C. Z., IX. p. 110, 1881.
Neæra perrostrata Verrill, Trans. Conn. Acad., V. p. 561, 1882.

Plate II. Figs. 3 a, 3 b.

Habitat. Station 43, 339 fms., off Tortugas, bottom temperature 45°.0 F.; Station 264, in 416 fms., gray ooze, near Grenada, bottom temperature 42°.5 F.

Desiring to be as cautious as possible in describing new forms based on very little material, I referred to this and D'Orbigny's *C. ornatissima* as possibly identical, in my preliminary descriptions. That there is a good deal of variation in this group is clear, when plenty of material is accessible; but I am the more confirmed in the belief that this one is specifically distinct by Professor Verrill's opinion, and by the fact that the Fish Commission has obtained off the Carolinas, and Miss Bush has described (as *Neæra costata*), a form which seems to be identical with D'Orbigny's, and is certainly distinct from the

* *Cuspidaria* (*Cardiomya*) *californica* Dall. Shell differing from *C. pectinata* by its smaller size and proportionally greater length; larger number of ribs (16–20, while *pectinata* averages 12–14); its straighter, longer rostrum with but two strong radiating liræ extending to the lower extreme (*pectinata* has none, or only several fine ones near the body of the valve); its less inflated shape and paler more delicate epidermis. Lon. of shell 7.0; of rostrum 2.5; alt. of shell 3.6; diam. 2.75 mm. Color yellowish white; ossicle as usual; buttress present in the right valve.

Habitat. Catalina Island, California, dredged in 16 fms., mud; Dall, and previously Cooper, who confounded it, following Carpenter, with *pectinata*.

present one. Had Miss Bush in her excellent paper had more material, she would probably have hesitated to give a name to the pretty species she has called *costata.* Her distinctions from *ornatissima* are that the ribs are less numerous, more curved, and the shell less convex in the Carolina specimens. I find in her figure eight visible ribs; in seven valves from the Carolina coast I find the ribs varying from five to seventeen; the strong ones extending to the beaks number from five to eight; their curvature varies somewhat. The diameter of D'Orbigny's figure relative to its height is as 11 : 14, while in Miss Bush's specimens it is, she states, as 4 : 4, so that her specimens were really more convex than D'Orbigny's, rather than less so. But his figures, made in 1840 or so, and much magnified, must not be construed too literally, as they are on the face of them a little formal, though excellent for the time.

Cardiomya costellata Deshayes.

Corbula costellata Desh. Expl. Sci. Morea, Géol., p. 86, pl. vii. figs. 1–3, 1837.
Neæra costellata Jeffreys, Brit. Conch., III. p. 49; V. p. 191, pl. xlix. fig. 3; P. Z. S., 1881, p. 944.
Neæra curta Jeffreys (name, no description), Valorous Moll., Ann. Nat. Hist., 1876, p. 495; P. Z. S., 1881, p. 943, pl. lxxi. fig. 10.
Sphena alternata D'Orbigny, Moll. Cuba, II. p. 286, 1846; Atlas, pl. xxvii. figs. 17–20, 1845.
? *Neæra alternata* (D'Orbigny) Dall, Bull. M. C. Z., IX. p. 110, 1881.

A fine series of specimens in the Jeffreys collection, especially from the Mediterranean, is sufficient to convince the most sceptical of the great variability of this species. It varies from smooth, or with but two or three radiating costæ, to completely radiated all over; the rostrum varies in actual and in relative length and direction; the amount of inflation, its direction, and consequently the outline of the shell, vary considerably. The European specimens sometimes have a smooth interval between the end of the rostrum and the radiating sculpture of the body, and sometimes the whole is covered with radii. The most common form seems to be that in which there are comparatively few and rather strong radii on the posterior part of the shell, with the rest smooth or faintly radiated, and the rostrum smooth, except a few radii on its dorsal side, and rather long. This form has been collected by Hemphill in two fathoms at Marco, Florida, and has been dredged by the U. S. Fish Commission at Stations 2597, 2602, and 2614, off the Carolina coast. These are all small, Jeffreys' finest British specimens being about 10 mm. long, and the average length of those from all localities being about 6–7 mm. The form named *curta* by Jeffreys (which may rank as a variety though connected by indefinite gradations with the type) is also small, and has the rostrum short and recurved, the striation strongest posteriorly but varying, as in the type. Some of the specimens dredged by the U. S. Fish Commission at Station 2602 were of this variety.

Cardiomya costellata, var. corpulenta Dall.

Plate III. Fig. 9.

The variety *corpulenta* Dall is like a giant *curta* striated all over, and about 15.0 mm. long. A valve was dredged at Station 5, in 229 fms., and a fragment at Station 228, near St. Vincent, in 785 fms. It differs from *C. striata* Jeffreys in the shorter and less differentiated rostrum and the alternately larger and smaller radii, which are also more distant and sharper, while the concentric striæ are much less evident. Still, in the type these characters intergrade, as they might be seen to do here if we had specimens enough to compare.

Cardiomya striata Jeffreys.

Neæra striata Jeffreys, Valorous Moll., Ann. Nat. Hist., Dec. 1876, p. 495; P. Z. S., Nov. 1881, p. 944, pl. lxxi. fig. 11, 1882.

? *Neæra alternata* D'Orb., var., Dall, Bull. M. C. Z., IX. p. 110, 1881.

Neæra multicostata Verrill and Smith, Trans. Conn. Acad. Sci., V. 559, pl. lviii. fig. 40; Proc. U. S. Nat. Mus., III. p. 398, 1880.

Plate III. Fig. 10.

Habitat. Station 36, 84 fms.; Station 5, 152 fms.; U. S. Fish Commission, off the Carolina coast, Station 2601; off Martha's Vineyard, Station 1038, etc.; off Newport, Rhode Island, Station 874, and others.

This fine shell differs from some of the varieties of *C. costellata* only in size. It bears the same relation to them that the var. *corpulenta* does to the var. *curta*. But taken by itself it seems so distinct that I have concluded to leave it separate for the present. It should be stated that Dr. Jeffreys' remark as to the radiation not being coarser posteriorly, is correct only for the one or two specimens first obtained, and even in them it is only partially exact. The vast majority have the sculpture decidedly stronger toward the rostrum. I may also add, that none of the specimens in the Jeffreys collection at Washington have the rostrum quite as straight as in the figure in the P. Z. S. It is a little upturned in all of them, though the particular specimen figured may not have had that peculiarity.

There is every probability of the correctness of Prof. Verrill's observation: " Perhaps all these forms may eventually prove to be varieties of one species." (Trans. Conn. Acad. Sci., V. p. 560, 1882.)

Subgenus LEIOMYA A. Adams.

Leiomya A. Adams, Ann. Mag. Nat. Hist., 1864, p. 208.

An anterior prominence or cardinal tooth in each valve, anterior and posterior laterals in the right valve, left valve without laterals. Cartilage in a posteriorly directed groove or fossette; surface smooth or concentrically sculptured. Type *Neæra adunca* Gould.

This is equivalent to Smith's Section F. It would include, according to his description, *Neæra Brazieri* Smith. I have compared specimens of *N. adunca* Gould, received from Drs. Arthur Adams and Gould, which agree perfectly with Adams's description of *Leiomya*. The cardinal tooth in the right valve is bifid at the tip and very small; hence Adams in his diagnosis ascribed two cardinal teeth to this valve, but I think they should be counted as one.

What the shell is, described by my friend Smith as type of his Section J, under the name of *Neæra adunca* Gould, I do not know. He has evidently been misled by a wrongly named shell. It is certainly an entirely different species and section from *Leiomya*. It has no cardinal teeth, a small central fossette, a small thickish anterior and posterior lateral in the right valve, and a similar anterior lateral (only) in the left valve; the surface is finely ridged. It appears to be the only species with these characters, and I would suggest the name of *Vulcanomya Smithii* for it in default of any other legitimate designation. Its external characters and size closely resemble those of the genuine *N. adunca* Gld., which would account for the error, in the absence of types.

Mr. Smith kindly informs me that he has re-examined the specimens, and finds nothing to change in his description of them. They were received at the British Museum with Gould's name attached by some one unknown.

Section PLECTODON Carpenter.

Plectodon Carpenter (Suppl. Rep. Brit. As., p. 638, Aug. 1864) is closely related to *Leiomya*. It differs in the insertion of the cartilage behind and under the beaks, instead of on the hinge-margin or in a fossette; in having, rather than a true tooth upon the margin, a tooth-like prominence formed by the spiral twisting under the beaks of the hinge-margin itself, upon and over which, in *P. scaber*, there is a minute external ligament; lastly, in *Plectodon* there is a granulated surface much as in *Poromya*. The pallial sinus appears to be about the same in both, and the tips of the siphons are protected, in both groups, as in *Schizothærus*, by a leathery ring, flattened and broadened at the sides. Until recently only two right valves of *Plectodon* were known, but in 1873 I dredged at Catalina Island, California, in 16 fms., mud, some half a dozen living specimens, which have enabled me to make a careful comparison with my *Neæra granulata*. There can be no doubt of their generic identity, and even considered as species they are very similar, the intwisting of the margin being less marked in *granulata* and the supposed external ligament obsolete. I regard *Plectodon*, therefore, as a mere section of *Leiomya*, which might also include *Rhinoclama*, which is of about equal value with *Plectodon*.

Leiomya (Plectodon) granulata Dall.

Neœra granulata Dall, Bull. M. C. Z., IX. p. 111, 1881.

Plate III. Fig. 8.

Habitat. Off Sombrero, 54 and 72 fms.; Barbados, 100 fms.; Station 177, off Dominica, in 118 fms., sand, bottom temperature 65°.0 F., and a fragment at Station 272, in 76 fms., coarse sand, off Barbados, bottom temperature 64°.75 F.

The longest specimen measured 18.0 mm., and is pure white. A variety *velvetina* has finer and much closer set granules, more recurved rostrum, and less sinuated posterior ventral margin; the concentric striæ are also a little more prominent.

The granules are arranged along the lines of growth, and sometimes are elongated in that sense.

Section RHINOCLAMA Dall and Smith.

Like the last, but without cardinal teeth. *Rhinomya* A. Adams, not Desvoidy or Geoffroy. Sections F and G, Smith. Type *Neœra philippinensis* (A. Adams) E. A. Smith.

Neœra notabilis Jeffreys and *Neœra semistrigosa* Jeffreys, not *lamellifera* Dall, belong here. The last, which is closely simulated as to external characters by *semistrigosa*, proves on comparison to have different hinge characters.

Neœra teres Jeffreys, *inflata* Jeffreys, and *gomerensis* Smith, in so far as they represent this type of hinge, belong hereabouts; though Dr. Jeffreys in his collection had mixed these with other forms not closely related.

Leiomya (Rhinoclama) halimera Dall.

This species, represented by two right valves, is probably correctly placed here. It may best be described comparatively.

Though larger than any specimen of *L. notabilis* Jeffreys, in our collection, it is of exactly the same shape and proportions; except that, instead of being sculptured like *L. notabilis*, it has the finely concentrically striate and wrinkled surface of *L. teres* Jeffreys. The hinge has the high and squarish laterals and other features of *L. teres*, but the anterior lateral is a little longer, the space between the laterals longer, the groove for the cartilage less marked, and the buttress less strong. Lon. 10.0; alt. 6.5; diameter of largest valve about 3.0, and of the valves when perfect probably 6.0 mm.

The specimens were dredged by the U. S. Fish Commission steamer "Albatross," at Station 2678, in 731 fms., ooze, off Cape Fear, North Carolina, bottom temperature 38°.7 F., in the winter of 1885–86.

The valves are of a yellowish white, and one of them shows remnants of a thin but rather tough greenish epidermis.

Subgenus TROPIDOMYA Dall and Smith.

An anterior cardinal tooth in each valve; no lateral teeth; cartilage as in *Leiomya*. *Tropidophora* Jeffreys, not Troschel nor Thompson. Type *Neæra abbreviata* Forbes.

This is Section I of Smith. The type has the buttress fairly developed and chiefly concentric sculpture.

Subgenus HALONYMPHA Dall and Smith.

An acute cardinal tooth in right valve; no other teeth in either valve; a clavicular rib extending posteriorly in both valves, fossette small, central; surface concentrically striate or smooth. Type *Neæra claviculata* Dall. Section K of Smith, who places here *Neæra inflata* Jeffreys and *N. congenita* Smith.

The latter appears different from anything I have seen. *N. inflata* has been in some confusion. The specimens so marked in the Jeffreys collection in Washington are of two kinds. One valve from "Porcupine expedition, 1870, St. 16, 17 a," is a left valve of *Halonympha claviculata* Dall, fitting almost exactly the right valve which served as my type. Those from "off Gomera, Chall. exp.," and "Porcupine exp. 1869, St. 39," are *Rhinoclama teres* Jeffreys. Whether there is an *inflata* not represented in the Washington series I do not know; the figures in P. Z. S., 1881, pl. lxxi. figs. 2, 8, in which the differences seem a little strained, might both have been made from varieties of *teres* in the collection. Smith notes something of the same kind in his description of *N. teres* (*N. gomerensis* of references to Plate X.) in the report on the Challenger bivalves, p. 50.

Halonympha claviculata Dall.

Neæra claviculata Dall, Bull. M. C. Z., IX. p. 112, 1881. Smith, Chall. Rep. Lam., p. 52, *not* pl. ix. figs. 8 – 8 b.

Neæra inflata, Jeffreys, P. Z. S., 1881, p. 942, 1882; (partly).

Plate II. Figs. 2, 2 a.

Habitat. Station 44, 539 fms., one valve; Sigsbee, off Havana, 450 fms. (?) fragment; Porcupine expedition, Atlantic Ocean, Station 16, or 17 a, 1870; Challenger expedition, Station 33, in 435 fathoms, coral mud, near Bermuda.

In the Porcupine specimen it is clearly to be seen that the posterior muscle was planted on the upper surface of the clavicle, which is therefore in this case a myophore as well as a buttress.

Smith in his text correctly describes the peculiarities of this species, but the figures on Plate IX., referred to as *Neæra claviculata,* though intended as representations of this species, have not a clavicle ! It seems that the "artist," though warned, took it upon himself to omit this feature (!), and succeeded, in spite of Mr. Smith's instructions to the contrary.

(Genus ?) MYONERA Dall and Smith.

Shell without cardinal or lateral teeth in either valve; with or without a buttress; fossette vertical or posteriorly directed, attached to the hinge by either edge; sculpture radiating or concentric. Type *Neæra paucistriata* Dall.

Neæra sulcifera and *angularis* Jeffreys, *lamellifera* Dall, *limatula* Dall (+ *contracta* Jeffreys), *laticella* Dall, *undata* Verrill, and *fragilissima* Smith, belong here. The group comprises Sections L and M of Smith, the difference between which, judging by the figure of *fragilissima,* does not seem to be very great.

The absence of gills or palpi, if confirmed by the study of fresh specimens, is a very remarkable feature of this and the preceding groups.

Myonera paucistriata Dall.

Neæra paucistriata Dall, Bush, Trans. Conn. Acad., VI. p. 473, 1885.

Shell closely resembling *Tropidomya abbreviata* Forbes, externally, but deeper, larger, with the anterior concentric sculpture more pronounced, and two strong keels posteriorly, one a little before and the other a little behind the place where the single keel of *abbreviata* is placed. The concentric sculpture ceases just before the anterior keel; the space between and behind the keels is smooth except for lines of growth or a few faint radiating striæ. The epidermis is pale, filmy, and polished, except on the dorsal margin and toward the end of the gaping rostrum, where it seems to concentrate a little; umbones rather prominent, whole shell plump, thin, extremely fragile; interior polished; rib faint; no distinct buttress; fossettes good-sized, extending obliquely posteriorly; attached by most of the posterior edge to the margin above; ossicle linguiform, smooth, narrow; hinge smooth and edentulous in both valves. Max. lon. 10.0; max. alt. 8.5; max diam. 6.5 mm.

Habitat. Stations 226 and 230, near St. Vincent, in 424 and 464 fms., sand, bottom temperature 42°.5 and 41°.5 F. Specimens living, but smashed. Also at Station 43, near Tortugas, in 339 fms., bottom temperature 45°.0 F., living but broken.

This very lovely species resembles externally *T. abbreviata,* which has one keel; *Myonera angularis* Jeffr., which has two keels more posterior than in this species; and *Myonera undata* Verrill, which has no keels, and is much larger. In *M. angularis* the posterior keel runs from the umbones to the posterior ventral angle of the rostrum; in *paucistriata* the rostrum is posterior to both the keels.

The shell of the present species is so fragile as to give way under the slightest pressure. The soft parts hardened by alcohol were stronger than the shell, and offered some observations of interest. They were apparently in a perfect state of preservation.

The outer edge of the mantle was plain, with a covering of epidermis as in *Mya*. Around the siphonal opening, which externally is single, were numerous tentacular filaments and several ocelli. The opening for the foot is very small, a mere short slit without ornamentation. On looking from above at the animal deprived of its shell, we see a globular body corresponding to the cavity of the valves, divided by a membranous and fleshy horizontal partition into upper and lower halves or subequal portions. The lower half constitutes the peripedal chamber into which the pedal and siphonal orifices open. The upper half contains the viscera, which, however, do not fill it, and the muscles. From above we see the floor or septum between the two chambers surrounded by a strong muscular band attached by its edge to the thin mantle and by upward radiating fibres like a drumhead *inside* of a drum; this muscular band resembles a sphincter, and is produced to the ends of the shell, where it is attached inside of each adductor; the course of its roots being vertical, while the adductors lie in a horizontal plane immediately outside of the former, so that, when visible, the adductor scars and the others adjoin. In the middle line of the back are visible the œsophagus and alimentary canal, passing as usual through the heart, and through a small dark greenish liver-mass on whose dorsal surface are two small bunches of oval tubules, perhaps genitalia, and a whitish superficial subdendritic layer, probably the organ of Bojanus. From the centre of the visceral mass a mesenteric band descends to the centre of the floor or septum. In advance of this is the base of the foot, with a slender pedal muscle.

Reversing the animal we see the septum has a sparsely tuberculous surface (smooth in *C. glacialis* Sars). Anteriorly is the mouth, simple, without palpi or gills, opening between two vertical mesenteric bands of tissue. Immediately behind the oral orifice is the foot, small, subcylindrical, set in an excavation in the septum on a very short constricted peduncle and without any byssal groove or byssus. Posteriorly is the cylindrical opening of the siphons which are not separated from one another except by a delicate protrusile septum, pierced for the two openings and situated within the single orifice of the mantle. No gills are visible anywhere unless the fleshy tuberculous ventral surface of the horizontal septum fulfils that office. A similar state of things in the main was observed in *Cuspidaria glacialis* Sars, and *C. obesa* Lovèn, in which, however, the foot was thorn-shaped, not cylindrical, and the visceral mass filled or nearly filled the upper chamber.

Myonera undata Verrill.

Neæra undata Verrill, Trans. Conn. Acad. Sci., VI. pp. 223, 277, June, 1884.

Habitat. Off Chesapeake Bay in 2221 fms. (Verrill); fragments were obtained by the "Blake" in 450 fms. near Havana; at Station 175, near Dominica, in 611 fms., ooze, bottom temperature 40°.0 F.; and at Station 230, near St. Vincent, in 464 fms., bottom temperature 41°.5 F.

This species must attain a considerable size and remain extremely fragile. The pieces obtained by the "Blake" indicate its place to be with *Myonera*, but there is no buttress or appearance of an internal rib.

Myonera lamellifera Dall.

Neæra lamellifera Dall, Bull. M. C. Z., IX. p. 113, 1881.

Plate III. Fig. 7.

Habitat. Station 36, 84 fms.; a single right valve.

A comparison of figures will show that Mr. Smith's *Neæra consociata* is wholly distinct from this species. *N. semistrigosa* Jeffreys, is less oblique in form, and the concentric rugæ are mere threads, not rising clear and sharp from the shell as in *M. lamellifera*. Moreover they belong to entirely different groups, *semistrigosa* being a typical *Cuspidaria*. The present species has a faint rib leading to an obsolete buttress, but no teeth, while the fossette lies posteriorly directed in a narrow groove on the hinge margin.

Its nearest relative seems to be the next species.

Myonera limatula Dall.

Neæra limatula Dall, Bull. M. C. Z., IX. p. 112, 1881.
Neæra contracta Jeffreys, P. Z. S., 1881, p. 941, pl. lxxi. fig. 4, 1882.

Plate III. Fig. 5.

Habitat. Station 44, 539 fms., off Tortugas; bottom temperature 39°.5 F. Two perfect and two broken valves.

None of the specimens of *Neæra contracta* in the Jeffreys collection at Washington show any tooth whatever in either valve. The posterior cardinal margin of the right valve is bevelled off a little, to fit in under the edge of the left valve, but it is not a tooth in any ordinary sense.

It differs from the preceding species in its smaller size with equal length, finer and less elevated sculpture, and less evident posterior ventral sulcus. In one right valve there is a point extending forward and downward from underneath the middle posterior hinge-line, but this seems clearly pathological. There is no buttress or rib internally.

Myonera laticella, n. s.

Shell large, thin, inflated, rather short, white with a pale brown epidermis; beaks full, prominent, their apices touching over the cartilage; right valve a little the larger; sculpture of concentric, elevated, thin, but not sharp-edged lamellæ, more distant on the beaks, higher and more crowded toward the basal margin, failing at the anterior boundary of the rostrum where they are represented by the fine incremental striæ, if at all; radiating sculpture consisting of somewhat irregular distant sharp elevated lines, which are most abundant between the middle of the shell and the rostrum; these rise up under but do not cut through the concentric lamellæ, which by them are thrown into waves, like loose cloth lying over several cords stretched taut, which waves grow obsolete toward the base; there are also extremely fine radiating striations on the smooth rostral areas, which are bounded by an imaginary line extending obliquely from the beaks to the lower extreme of the rostrum; these striations bear elevated lines of epidermis ; there is a very narrow depressed area along the cardinal margin behind the beaks; the margin of the right valve fits over the posterior part of the rostral margin of the left valve; the rostrum itself is short, slightly recurved and obliquely rounded off from below, and in a less degree from above, to form a gaping rounded tip; the hinge-line is simple, with a rather large posteriorly directed fossette for the cartilage in each valve, and without buttresses; the cartilage is reddish brown, and carries a subrectangular ossicle; approximate length of shell (broken) 20.0; of young shell (taken from lines of growth) lon. 8.0, alt. 5.0, diam. (about) 5.0 mm. From the tip of the rostrum to the beaks at the cartilage measures in the adult 13.5 mm., and the diameter when perfect must have been at least as much.

Habitat. Near Curaçoa, at U. S. Fish Commission Station 2126, in 1701 fms., yellow mud, bottom temperature 39°.3 F. One living but broken specimen of which the base and anterior end were gone.

This very elegantly sculptured species is so different from any of those described that I felt justified in characterizing it from the imperfect specimen. Apart from its sculpture it somewhat resembles *M. undata* Verrill in general form, though the rostrum in that species is shorter and the fossette proportionally smaller.

Family ANATINIDÆ.

Genus PERIPLOMA Schumacher.

In the region covered by the investigations of the "Blake" several species of this genus are indigenous. *P. inæquivalvis*, the type, is often found on sandy beaches, but usually only the convex valve, destitute of its ossicle. The most common species on our Southern coast is the *P. angulifera* Phil., described from Texas, but not rare in West Florida; the *P. papyratia* of Say (not of Gould's Inv.) is rare.

Two other small and apparently rare species exist on the coast, one of which, *P. fragilis* of Totten, a northern form, has long been considered as Say's species, although the shell in question does not agree with Say's in measurement, in habitat, or with his description. But being the only one at all well known, and Say's type apparently being lost, it seems to have been supposed that Say's name must apply to it. This error was corrected by Conrad. The other species (yet undescribed unless it be the *undulata* of Verrill, which I have not seen) is close to *papyratia* in size, and chiefly differs in proportions.

Periploma papyracea (Say em.) Stimpson.

Anatina papyratia Say, Journ. Acad. Nat. Sci. Phil., II. p. 314, 1822; Binney's Say, p. 104, 1858.

Periploma papyracea Conrad, Am. Journ. Conch., II. p. 70, pl. iv. fig. 9 (poor); Ibid., p. 281, pl. xv. fig. 6, 1866.

Habitat. Station 128, off Frederikstadt, Santa Cruz, in 180 fms.; one living specimen.

Totten's species is larger, flatter, more equivalve, rounder, and those I have seen are destitute of the faint rib extending backward and downward from the beaks. I should have been disposed to consider, from Say's description, that he had under his eyes a very young *P. angulifera*, in which the discrepancy of the two valves is greater and the rib is strong. But as Conrad has fixed upon the shell which is in our hands, and figured it under Say's name, and there is no means of absolutely settling the question by reference to a type, it seems better to let Conrad's arrangement stand unmodified.

In this species the siphons are wholly disunited and retractile, the foot very small, clavate; the labial palps enormous, lamellate, and far exceeding in size the single gill on each side. In *P. fragilis* the palps are smaller, but of similar character, while the gills are proportionally larger and the siphons separate and unequal. The prop to the fossette in *fragilis* is conchologically a step toward *Anatina* proper; but the others are without it.

Genus THRACIA (Leach Ms.) Blainville.

This genus is a synonym of *Rupicola*, Fleurian de Bellevue (1802), which is nearly a quarter of a century older, but the name *Rupicola* was used by Brisson for a genus of Birds in 1760. Now Brisson did not use the binomial nomenclature in the modern sense, and strictly speaking should have no standing. Nevertheless his generic names are adopted by ornithologists, and on this ground we may consider the name *Rupicola* preoccupied in a certain sense. It should, however, be rejected entirely, and not used in a subgeneric or sectional sense, as has been done by some conchologists; since, if it has the right to be used at all, it is entitled to take precedence of *Thracia* as the primary name of the group.

There are several species of *Thracia,* not including the plaited *Cyathodonta* of Conrad, formerly referred to *Thracia,* which inhabit the southern and south-eastern coasts of the United States and adjacent waters. Most of them have not been definitely recognized hitherto. They are: —

Thracia Stimpsoni, n. s.
Thracia corbuloidea Blainville.
Thracia distorta Montagu.
Thracia phaseolina Lamarck.

Thracia Stimpsoni, n. s.

Thracia Stimpsoni is a magnificent species, nearly as large as *T. Conradi,* and of which but one right valve has yet been obtained, between Tampa and Tortugas in 28 fms. in the Gulf of Mexico. It differs from *T. convexa* Wood, which is its nearest relative, in its whiter and much more coarsely granulose surface, in its more horizontal posterior hinge-margin not rounded off at its posterior end, and by two strong ribs, one of which extends parallel with the posterior hinge-line, bounding a narrow smooth depressed marginal area, and having a wider depressed broad ray on the outer and lower side; the other rib extends from the beak to the lower posterior angle of the rostrum; in front of it the shell is much depressed, behind it elevated for a space extending to the depressed ray above mentioned; the middle basal margin is more produced than in *T. convexa,* and the pallial sinus is shallower and less angular. The other proportions are about the same as in *T. convexa.*

The specimen in the National Museum is 65.0 mm. long, and is named in honor of the late Dr. William Stimpson.

Thracia corbuloidea Blainville.

Thracia corbuloidea Blainville, comparing excellently well with the series in the Jeffreys collection, has been obtained by the U. S. Fish Commission in from 15 to 50 fms. off the coast of North and South Carolina, generally about twenty miles from shore. I have it also from Key West, collected by Hemphill.

Thracia distorta Montagu.

Thracia distorta Montagu, has been sent me from Honduras by Mr. Charles T. Simpson, who was formerly resident there. It does not exactly agree with any particular specimen from British seas, but differs from most of them less than they differ among themselves. It is possible that this may be the same shell described by D'Orbigny as *T. rugosa* "Conrad," but which Conrad had never described. I have not seen D'Orbigny's figure.

Thracia phaseolina Kiener.

(?) *Thracia phaseolina,* Kiener, Dall, Bull. M. C. Z., IX. p. 110, 1881.

Habitat. Yucatan Strait, 640 fms., one valve.

The comparison of this specimen with the fine series of this species in the Jeffreys collection has confirmed the original identification.

Genus ASTHENOTHÆRUS (Cpr. em.) Dall.

Asthenothœrus Carpenter, Ann. Mag. Nat. Hist., XIII. p. 311, 1864.

Shell inequivalve, inequilateral, truncate and slightly gaping behind, resembling *Periploma* in shape; beaks not fissured; no external ligament; hinge linear, toothless and without fossette; a wide X-shaped ossicle attached to the posterior slopes of the domes of the beaks above and behind the hinge-margin. Pallial sinus deep; gills like *Periploma,* siphons separated ? foot small. Type *A. villosior* Cpr., Cape St. Lucas.

This group differs from *Lyonsia* in its *Periploma*-like shell, in having a transverse wide ossicle instead of a longitudinal narrow or triangular one; in being anteriorly prolonged instead of posteriorly extended, and probably in the character of the soft parts, which could not be well studied in the single dry specimen available. It would, indeed, seem to be a *Periploma* or *Anatina,* destitute of the fossettes and their contained cartilage; in which the transverse ossicle remains and the beaks are unfissured. The brown ligamentary basis on which the divaricating feet of the bridge-like ossicle are planted, is visible on each side through the shell, the brown lines simulating in position and appearance, to a hasty glance, the fissures of *Periploma.* It is sufficiently separated from *Alicia* by the edentulous hinge.

The original and not very clear diagnosis of Dr. Carpenter does not mention the ossicle, though the latter is still adhering (though not in its place) to one of the valves of the type in the National Museum. The "spongy ligament" he refers to, is the brown cementum which originally held the ossiculum. The original publication was to be followed by detailed notes, which remained unpublished at the time of the author's death, which took place all too soon for science.

Asthenothærus Hemphillii, n. s.

Shell small, yellowish white, concentrically striate, with a filmy epidermis, left valve slightly smaller than the right, subovate, posteriorly truncated and slightly gaping; beaks in the posterior third of the shell, the anterior part rounded like the small end of an egg-oval; base rounded, rising toward the truncation about as much as the posterior cardinal margin falls toward the upper angle of the same; truncation vertical, but hardly angulated; a faint ridge running from the beaks to the upper corner, more marked in the smaller valve; sculpture of fine not very regular concentric undulations, coinciding with the lines of growth; surface finely granular, but appearing nearly smooth; interior polished; the sinus deep and rounded; margins very thin, smooth, and plain; not interrupted under the beaks; ossicle bridge-shaped, wide, short, concave behind in the middle line, very large for the size of the shell; points of insertion not perceptibly raised; extreme length of shell 6.25; length of anterior part 4.75; max. alt. 6.0; diameter 2.75 mm., of which the deeper valve takes about 1.50 mm.

Habitat. West of Florida in 17 fms., one specimen; Marco, Florida, in 2 fms., H. Hemphill.

This unpretending little shell has the aspect of a very young *Periploma* or *Thracia.* It is only when the interior is examined that its peculiarities become manifest. It is possible that, among the innumerable fossil genera or sections which have been proposed, some one may eventually turn out to include the present form, but none of those I have been able to examine agree with it. *Corimya* Agassiz is perhaps the nearest, but has submedian beaks with one or two internal ribs, the posterior cardinal margin slightly thickened as if for an external ligament, and there is no evidence of a pallial sinus, or rather the position of the posterior adductor scar would indicate that there was no sinus.

The Californian species differs from the Floridian in having the beaks less posterior, and, though a larger shell, in having a more slender and delicate ossicle, which resembles, in some sort, a very long-winged butterfly with its wings spread.

It is interesting to add to the links connecting the East and West American faunæ, and pleasant in so doing to be able to clear up the obscurity which has somewhat interfered with the relegation of this genus to its proper place in the system.

Subgenus BUSHIA Dall.

Shell inequivalve, inequilateral, truncated behind, but not gaping; porcellanous; concentrically sculptured; hinge toothless, with a large U-shaped ossiculum fitting in the apices of the beaks, which are filled with solid shelly matter; a strong external ligament, but for which the hinge-line is not bent or thickened.

This differs from the typical *Asthenothærus* in its porcellanous, instead of earthy, shell-substance, destitute of granulations; its completely closed valves; in possessing an external ligament; and in the filling of the apices of the beaks with a solid shelly mass on which the extraordinarily large and strong arched ossiculum is planted, as on two pedestals.

It is dedicated to Miss Katharine J. Bush, of New Haven, whose excellent work on Mollusca I have had frequent occasion to refer to.

Bushia elegans, n. s.

Shell white, thin, inequilateral, the left valve a little the smaller, and the basal edge of the right valve projecting beyond the other; apices of the beaks touching each other; shell posteriorly sharply truncate; anterior part of the shell forming sixteen twenty-fifths of the whole length; the anterior margin rather pointedly rounded, and the extreme anterior point nearer to the level of the base than to that of the hinge-line; beaks not much elevated but moderately full; the surface evenly concentrically deeply grooved all over, about three interspaces to the millimeter, the grooves narrower than the interspaces; a short external ligament behind the contiguous beaks; a keel extends from the beak to the upper posterior angle of the truncation of the posterior side (which is almost as abrupt as in *Mya truncata*) parallel with the descending hinge-margin; over this keel the raised interspaces form threadlike ribs; within the keel is a narrow nearly smooth lanceolate depressed area, wider in the left than in the right valve; the angle at the end of the keel where the truncation begins is abrupt; the basal angle is very bluntly rounded; interior smooth, with some radiating striæ; the beak, inside its tip, is filled with a solid transparent deposit, on which the feet of the arched ossicle are attached by a layer of cartilage; the hinge is toothless, thin, and weak; the imprint of the mantle invisible; but the pallial sinus is moderately deep and rounded; there is no visible epidermis; the surface is smooth, but not brilliant; the posterior hinge-margin, looked at from above, is seen to be somewhat flexuous laterally. Lon. of shell 12.5; alt. 10.0; diameter 6.0 mm.

Habitat. Station 272, near Barbados, in 76 fms., hard sand, bottom temperature 64°.75 F. (one right valve). U. S. Fish Commission, Station 2639, 56 fms., in the Straits of Florida, one living specimen and one valve.

The possession of a living specimen in a good state of preservation has enabled me to fix the position of this elegant little shell, which from only the single valve obtained by the "Blake" would have been a little doubtful.

The soft parts (in alcohol) afford the following notes. Siphons not very long, entirely separated; mantle closed, except in front of the foot; ends of both siphons papillose; mantle simple, smooth along the edge; gills large, lamellæ dorsally much crumpled, both sides united at the tips behind; palpi very small, narrow; foot small, rather hatchet-shaped, not grooved behind; posterior adductor the larger; the inner gill on each side much the shorter and narrower of the two; the gills together envelop the whole body except the foot and a passage-way to the excurrent siphon. The ossicle forms a U-shaped arch, its feet a little enlarged and divaricating backward; the hinge margin is normally entire; but, with the ossicle in place, it is impossible to separate the valves without breaking a little notch, just below the beak where the ossicle crosses, in the valve which does not retain the ossicle, or in both; the outer surfaces of the mantle and the soft parts in general, except the liver. are not pigmented.

The peculiarity of the filling up of the tips of the beaks does not consist in there being mere pedestals or sockets for the feet of the ossiculum. The whole cavity seems evenly filled, and the ossicle stands, as it were, on a sort of floor; this is quite visible from without, through the translucent shell. It is a common thing to find the early whorls of Gastropods filled solid with shelly matter, but such cases are rare among the Pelecypods, if we leave out of account the usual thickening due to growth.

Family PANDORIDÆ.

Genus PANDORA Hwass.

Subgenus CLIDIOPHORA Carpenter.

Of the *Pandoridæ* the southern coasts and the Antilles have several species: *Clidiophora trilineata* Say; another form, of which one valve was described but not named by Miss Bush; *Pandora* (*Kennerlia*) *glacialis* Leach, which passes Hatteras, its southern limit not yet known; *P. carolinensis* Bush, described from near Hatteras, probably entering the Gulf of Mexico, and *P. Bushiana*, received from West Florida. This group, being chiefly composed of shallow-water species, is represented in the Blake dredgings only by worn left valves of one species.

I may add, that in this genus, as in others, I regard anterior and posterior, right and left, from the anatomical standpoint. A singular discrepancy exists among authors in treating of this genus, as we find the rostrated or siphonal end of the shell frequently treated as anterior. As a matter of fact, it is posterior, as in other Pelecypods.

Pandora (Clidiophora) carolinensis Bush.

Pandora carolinensis Bush, Trans. Conn. Acad., VI. p. 474, 1885.
Pandora oblonga? Sowerby, Dall, Bull. M. C. Z., IX. p. 109, 1881.

Plate VIII. Figs. 8, 8 a.

Habitat. Charlotte Harbor, Florida, 13 fms.; Yucatan Strait, 640 fms., detached valves only.

I presume that the valves above mentioned should rightly be referred to Miss Bush's species. Whether both are referable to *P. oblonga* is a question on which opinions may differ, as the type of *oblonga* is said to be lost.

They are not referable to *P. trilineata* Say (not Gould, etc.), which is a much elongated, slender, narrowly rostrated species with the beaks more anterior even than *P. brevifrons* Sby.; the base roundly arcuated, the posterior cardinal margin concave, the anterior rounded from the beaks to the base, the impressed line of the left valve concave forward as it sweeps in a broad curve from the small blunt beaks to about the middle of the base. Its surface is very finely concentrically striated without radiating sculpture except the fine raised lines which extend from the beaks to the tip of the rostrum, which is a little deflected to the left. The shell is almost flat and nearly equivalve, of a waxen white, pearly within, and with a few radiating striæ. The hinge is that of *Clidiophora*, and it is a much more slender shell than *P. carolinensis*, being only 8.0 mm. in height to 20.0 mm. in length, and less than 2.0 mm. in maximum diameter; the anterior part is only 3.5 mm. long. The anterior cardinal area is linear, the posterior grooved out and bordered especially in the right valve by a broad rib. This is the widest part of the whole shell. Numerous valves were obtained at Stations 2592 and 2597, U. S. Fish Commission, off Hatteras.*

This species was dredged alive in 6 fms. at Tampa, Florida, by Mr. Chas. T. Simpson. With it was found a smaller species, belonging to the *Pandora* or *Kennerlia* section of the genus. This, to which I propose to give the name of *P. Bushiana*, differs from all the known species of the group in having the posterior cardinal margin convex, and the rostrum bent downward instead of upward. The beaks are very anterior, and the anterior cardinal margin, marked with a sharp keel setting off an almost linear area, descends from the beaks in a straight line, the curve of the base commencing suddenly at a rather obtuse angle, and following an even curve, is slightly inflexed only near the posterior tip, below the short square-ended rostrum; the shell is very thin, the left valve somewhat convex, the right one concave, both sculptured with silky concentric striæ; the margins of the two valves coincide; the beaks are small, hardly rising above the long arch of the back; the right valve has a strong keel on its upper posterior margin, and no other radiating sculpture; the left valve has an impressed line from the beaks to the base a little behind them, but which does not indent the basal margin ; there is also a sharp thread from the beak to the lower angle of the rostrum; above this thread, as usual,

* As this species is clearly different from the form figured in Binney's Gould under the name of *trilineata*, and generally so called by American conchologists, I had thought it new, and intended to name it *P. (C.) floridana* ; but referring to Say's original description and figure, I found that the southern form which he described and figured (poorly) is the one he named *trilineata*, and, as far as I can discover, the northern form has had no name given to it which it can retain. Specimens in the British Museum were labelled *nasuta* Sowerby, but they are not the true *nasuta* of Sowerby according to Reeve, who had the advantage of Carpenter's monographic determinations, and figures the genuine *nasuta*, which in any case would be a synonym of the southern form. The *tabacea* of Meuschen (Mus. Gronovianum) is known only by a very poor figure ; the *P. depressa* of Sowerby, which has been identified with it, according to Deshayes, is a native of the Pacific Ocean. I would therefore propose for the high, concentrically undulated New England shell the name of *Pandora (Clidiophora) Gouldiana*, in honor of the late Dr. A. A. Gould.

the lines of growth are coarser. The shell is 11.5 mm. long; 5.5 mm. high, about 1.0 mm. in diameter, and with the anterior portion 2.0 mm. long.

FAMILY CORBULIDÆ.

GENUS CORBULA BRUGIÈRE.

The following notes on the species of *Corbula* are not as complete and final as the study of a larger series and collection from a wider area would have afforded.

The species of this group are very variable, and would doubtless be much reduced in number after a comprehensive examination of the recent and fossil forms.

By the kindness of Prof. John Tyler, of Amherst, custodian of the Adams collection, I was able to examine various types of the ten species of *Corbula* from Jamaica, described by Prof. Adams in his Contributions to Conchology, 1852. As far as I know, they have remained unfigured up to the present time, and it occurred to me that it would be desirable to figure them. So the figures of the *Corbulidæ*, with one exception, accompanying this paper, are camera-lucida sketches from the original types of Prof. Adams, instead of specimens of the same species collected by the "Blake." There are still a few of Adams's species unfigured, and it would be of much use to science if some Amherst student would avail himself of the opportunity to illustrate as many as possible of the types contained in the Adams collection. Such expense as might be connected with the task would be no more than a reasonable and proper tribute to her devoted Professor from the College of which he was so great an ornament.

Corbula cubaniana D'ORBIGNY.

Corbula cubaniana D'Orb. (1846), Dall, Bull. M. C. Z., IX. p. 114, 1881.
Corbula Knoxiana C. B. Adams, Contr. to Conch., p. 238, 1852.

Plate I. Figs. 3, 3 a - 3 c.

Habitat. Sigsbee, off Havana, 100 fms., one valve.

The figures are drawn from C. B. Adams's type of *C. Knoxiana*. Lon. of shell 12.7 mm.

Corbula Barrattiana C. B. ADAMS.

Corbula Barrattiana C. B. Adams, l. c., p. 237, 1852; Dall, Bull. M. C. Z., IX. p. 114, 1881.

Plate II. Figs. 7, 7 a - 7 c.

Habitat. West coast of Florida, 30 fms.; Station 21, 287 fms.

Identified and figured from the types. Lon. of shell 8.9 mm.

Corbula Swiftiana C. B. Adams.

Corbula Swiftiana C. B. Adams, l. c., p. 236, 1852; Dall, Bull. M. C. Z., IX. p. 114, 1881.

Plate II. Figs. 5 a - 5 c.

Habitat. Sigsbee, off Havana, 182 and 450 fms., living; off Sombrero, 72 fms.

Identified and figured from the types. Lon. of shell 10.4 mm.

Corbula Dietziana C. B. Adams.

Corbula Dietziana C. B. Adams, l. c., p. 235, 1852; Dall, Bull. M. C. Z., IX. p. 114.
Corbula Blandiana C. B. Adams, l. c., p. 234 (= young stage of *C. Dietziana*, Ad.).

Plate I. Figs. 5, 5 a, 5 b.

Habitat. West coast of Florida, 30 fms.; off Sombrero, 72 fms.; Barbados, 100 fms.; Gordon Key, 68 fms.

Identified and figured from the types. Lon. of shell 10.7 mm.

Corbula disparilis D'Orbigny.

Corbula disparilis D'Orb., 1846; Dall, Bull. M. C. Z., IX. p. 115, 1881.
Corbula Philippii Smith, Chall. Rep., p. 33, pl. vii. figs. 4, 4 a, 4 b, 1885.
Corbula operculata Philippi, Zeitsch. Mal., V. p. 13, 1849.

Plate I. Figs. 4, 4 a, 4 b.

Habitat. Off the west coast of Florida, 30 and 50 fms.; Station 12, 36 fms.; off Sombrero, 72 fms.; Station 36, 84 fms.; Barbados, Station 287, etc., 7½ to 100 fms.; Sigsbee, off Havana, 127 and 450 fms.; Station 2, 805 fms.

This species closely resembles several exotic and fossil forms; among the former may be mentioned *Corbula nucleus* L.; among the latter, *C. oniscus* Conrad (Eocene of the United States) and *C. parsura* of Stoliczka, from the Trichinopoly beds (Cretaceous of India), as well as some from the Danish ligniferous strata.

Those who consult D'Orbigny's figures will observe that they differ from the shell figured by my friend Smith in representing the valves as nearly equal, and also in the absence of the epidermal radiations on the smaller valve and the carina on the larger one. But I infer from D'Orbigny's remarks, that he had only separated valves, and probably those which had lost their epidermis; and it is probable that the artist represented two valves together which did not belong together. The carina is a variable feature in this species, as in *C. nucleus*. At all events, the specimens I have are certainly the same as *C. Philippii* Smith, and I believe them to be the species described by D'Orbigny.

The species extends northward to Cape Hatteras, and the smaller valve is frequently of a pink color or pinkish brown. It reaches a length of 8.0 mm., and is very variable in its proportions and sculpture. I have no doubt that it is the *operculata* of Philippi, but the *C. Krebsiana* of C. B. Adams is a different and more delicate species.

Corbula (Tæniodon?) cymella Dall.

Corbula cymella Dall, Bull. M. C. Z., IX. p. 115, 1881.

Plate I. Figs. 7, 7 a.

Habitat. Gordon Key, 68 fms., one living specimen, 13.5 mm. in length.

The accidental fracture by the draughtsman of one valve of the unique specimen enabled me to get at the hinge. I found it very delicate, the right valve with a single small slender tooth, behind which is a very small cartilage set in a short groove in the hinge-margin, and continuous above with a darker-colored linear substance, which may have been a bit of thicker epidermis than ordinary, but looked like a linear external ligament covered only by the coil of the umbo. The left valve had a smooth edentulous hinge margin, with the cartilage entirely on top of the small thin horizontal process behind the beak.

Another feature omitted in the original diagnosis is, that the very fine radiating lines, which cover the shell and are most noticeable on the posterior supra-carinal area, are minutely granular. The thin and hardly unequal valves, and the marginal, if not exposed, cartilage of this species, suggest a modification in the direction of *Tæniodon*.

The following three species were not represented in the collection, but, in view of their not having been figured and thus being placed in doubt in the catalogues, it was thought worth while to include the camera-lucida sketches of the types and a synopsis of the remarks of Professor Adams in regard to each of them.

Corbula Krebsiana C. B. Adams.

C. Krebsiana Ad. Contr. to Conch., p. 234, Oct. 1852.

Plate I. Figs. 1, 1 a, 1 b.

Shell trigonal, very inequivalve, inequilateral, with the large valve rostrated; the ventral margin rounded anteriorly, nearly straight posteriorly; white, often tinged with pink, except posteriorly; small valve finely concentrically striated; large valve finely and closely furrowed; beaks prominent, much involuted, umbones very convex; with small posterior angles, one on the small valve and two on the other; teeth small. Lon. 6.1; alt. 5.1; diam. 3.8 mm.

Kingston, Jamaica, in three or four fms., mud, C. B. Adams. Probably resembles *C. operculata* Philippi. [It is quite distinct from *operculata* (= *disparilis* Orb.). — W. H. D.]

Corbula Chittyana C. B. Adams.

C. Chittyana Ad. Contr. to Conch., p. 238, 1852.

Plate II. Figs. 6 a - 6 d.

This species resembles *C. Barrattiana*, but differs in being very thick and solid, very wide, and in having two periods of growth, like *C. Dietziana:* it is also more inequivalve. Lon. 8.5; alt. 5.75; diam. 5.5 mm.

Habitat. Kingston Harbor, Jamaica, in 4–5 fms., mud, rare; Adams.

Corbula Kjoeriana C. B. Adams.

C. Kjoeriana Ad. Contr. to Conch., p. 237, 1852.

Plate I. Figs. 6, 6 a, 6 b.

This species differs from *C. Swiftiana* in being less distinctly rostrated though usually a little more elongated behind; the concentric ridges are stouter and are continued into the lunule; both valves are sculptured alike; the umbonal angle is more acute and distinct, and is a little more distant from the posterior dorsal margin. Lon. 12.0; alt. 7.5; diam. 4.5 mm.

Habitat. St. Thomas, Bland; Jamaica, 4-5 fms., mud, Adams.

Genus BASTEROTIA Mayer.

Basterotia quadrata, var. granatina, Dall.

< *Corbula quadrata* Hinds, Reeve, Conch. Icon , Corbula, fig. 40, 1843.
Poromya ? granatina Dall, Bull. M. C. Z., IX. p. 109, 1881.
? *Basterotia corbuloides* Mayer, Hörnes, Wiener Beck., p. 40, pl. iii. fig. 11, 1856.

Plate I. Figs. 2, 2 a, 2 b.

Habitat. Yucatan Strait, 640 fms., one valve.

After further investigation it became evident that the shell above referred to was only one of the rather numerous varietes of *Corbula quadrata* Hinds. This form belongs to the genus *Eucharis* Récluz, 1850, not of Latreille in 1804, or of Péron or Eschscholtz of later, but still prior dates. I believe Mayer's name is the first which has been applied to it which is valid. Mayer's species appears (as he admits) hardly different from the living West Indian and Pacific shell, which I have seen even from Korea!

Family SAXICAVIDÆ.

Genus SAXICAVA Fleurian de Bellevue.

Saxicava azaria Dall.

Saxicava azaria Dall, Bull. M. C. Z., IX. p. 116, 1881.

Plate IV. Figs. 9 a, 9 b.

Habitat. Off Charlotte Harbor, Fla., 13 fms.; Station 39, Gulf of Mexico sixteen miles north of the Jolbos Islands, in 14 fms.

In spite of the variability of this group, I am pretty confident that this is not one of the varieties of the northern *S. rugosa.* The second specimen shows the surface more perfectly, and is covered with a closely adherent red-brown epidermis under which the shell is finely wrinkled in a manner different from any of the ordinary species I have been able to compare with it.

Family PHOLADIDÆ.

Genus XYLOPHAGA Turton.

Xylophaga abyssorum, n. s.

Plate IX. Figs. 7, 7 a.

Shell minute, wedge-shaped and nearly closed behind, inflated and more than half open in front; anterior area concentrically sharply striate, reflected at the dorsal edge, and covering in somewhat less than half (on each side) of the anterior face of the animal; beaks small, not prominent, but sharply defined, giving rise to two somewhat nodulous keels, which extend to the opposite edge of the valve, where they are doubled in forming a kidney-shaped callus inside the edge; the anterior keel is less prominent than the second one, and the space between them is slightly depressed and smooth except for incremental lines; there is a narrow smoothish margin with oblique striations between the first keel and the hinder edge of the anterior area; this widens out below the lower edge of the anterior area and forms a sort of margin to the central keeled part of the valves; it is rounded off at the ventral angle formed by the ventral and anterior edges; behind the keels the posterior area is roundly arched behind the two ends of the posterior keel; the surface is concentrically striate, but less closely than is the anterior area; the posterior margins close perfectly; the shell is pure white, and exhibits no accessory pieces or any place of attachment for any. Lon. of shell 4.0; alt. 3.0; diam. 4.0 mm.

Habitat. One specimen in soft coral nodule at Station 215, in 226 fms., off Santa Lucia, bottom temperature 51°.0 F.

I am somewhat uncertain whether this shell properly belongs in the genus *Xylophaga*, but it may be immature, and the accessory laminæ may be later in developing. At all events the form and sculpture of the shell are so much more nearly like that of *Xylophaga*, as figured by Chenu, than like any other Pholad, that I prefer to place it here awaiting other information. Some years ago what appeared to be exactly the same species was shown me burrowing in the hempen covering of part of the first Atlantic cable; said to have been recovered from the North Atlantic at a depth of over 1500 fms. The siphons were simple, and it showed no accessory plates.

PLATE I.

Fig 1. *Corbula Krebsiana* C. B. Adams ; 6.1. Page 315.
" 1 a. " "
" 1 b. " "
" 2. *Basterotia quadrata* Hinds ; 10 0; left valve. Page 316.
" 2 a. Same, hinge seen from above.
" 2 b. " " " below.
" 3. *Corbula Knoxiana* C. B. Adams ; 12.7; front. Page 313.
" 3 a. " " back of left valve.
" 3 b. " "
" 3 c. " "
" 4. *Corbula disparilis* D'Orbigny ; 9.0. Page 314.
" 4 a. " "
" 4 b. " "
" 5. *Corbula Dietziana* C. B. Adams ; 10.7. Page 314.
" 5 a. " "
" 5 b. " "
" 6. *Corbula Kjoeriana* C. B. Adams ; 12. Page 316.
" 6 a. " "
" 6 b. " "
" 7. *Corbula cymella* Dall ; 13.5. Page 315.
" 7 a. " "

All the above, except figures 2 a, 2 b, and 4, 4 a, 4 b, are drawn from typical specimens of the describer.

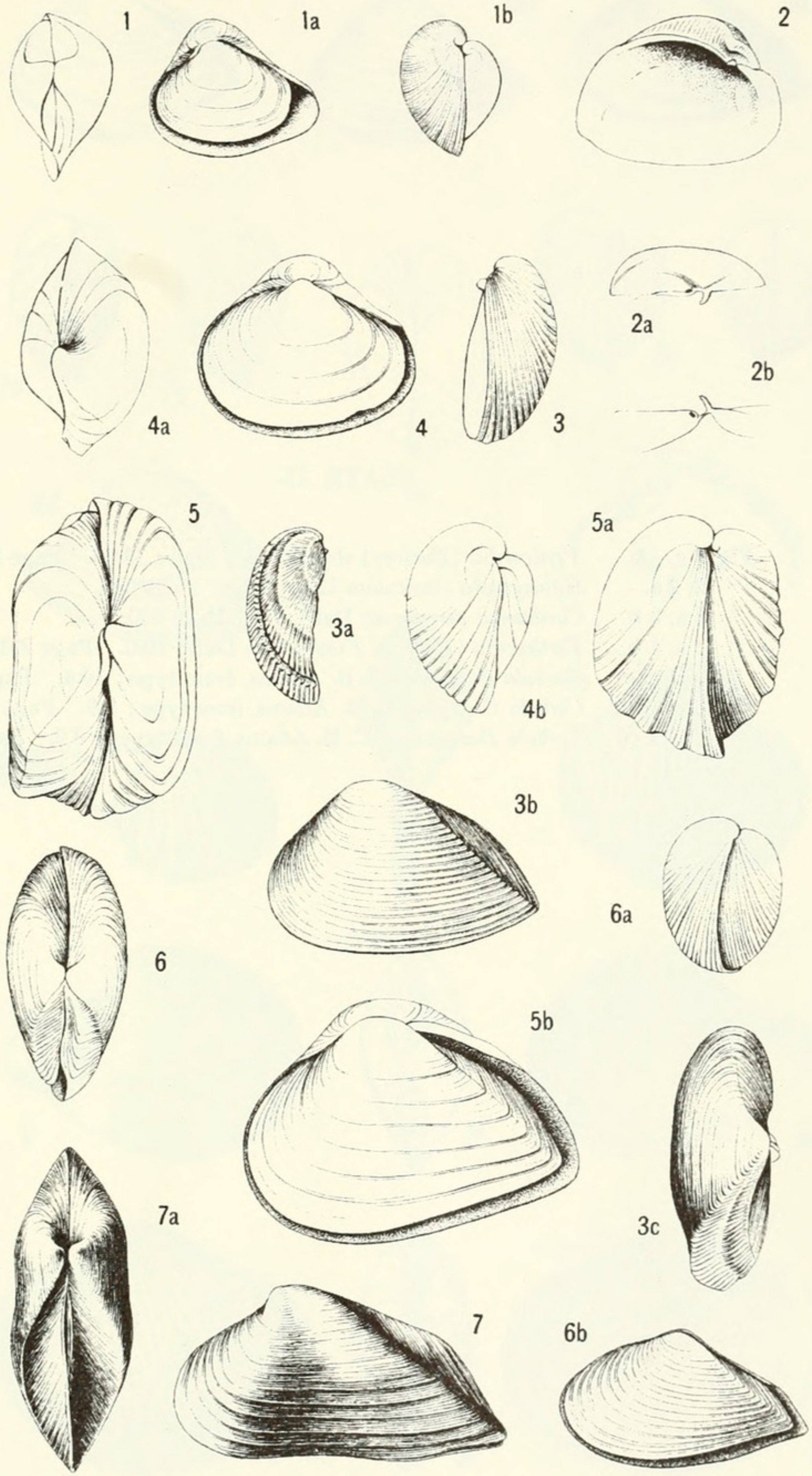

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PLATE II.

Fig.	1 a, 1 b.	*Verticordia* (*Euciroa*) *elegantissima* Dall; 13.25. Page 291.
"	2, 2 a.	*Halonympha claviculata* Dall; 12.0. Page 301.
"	3 a, 3 b.	*Cardiomya perrostrata* Dall; 8.0. Page 296.
"	4 a, 4 b.	*Verticordia* (*Haliris*) *Fischeriana* Dall; 10.0. Page 291.
"	5 a - 5 c.	*Corbula Swiftiana* C. B. Adams, from type; 10.4. Page 314.
"	6 a - 6 d.	*Corbula Chittyana* C. B. Adams, from type; 8.5. Page 316.
"	7, 7 a - 7c.	*Corbula Barrattiana* C. B. Adams, from types; 8.9. Page 313.

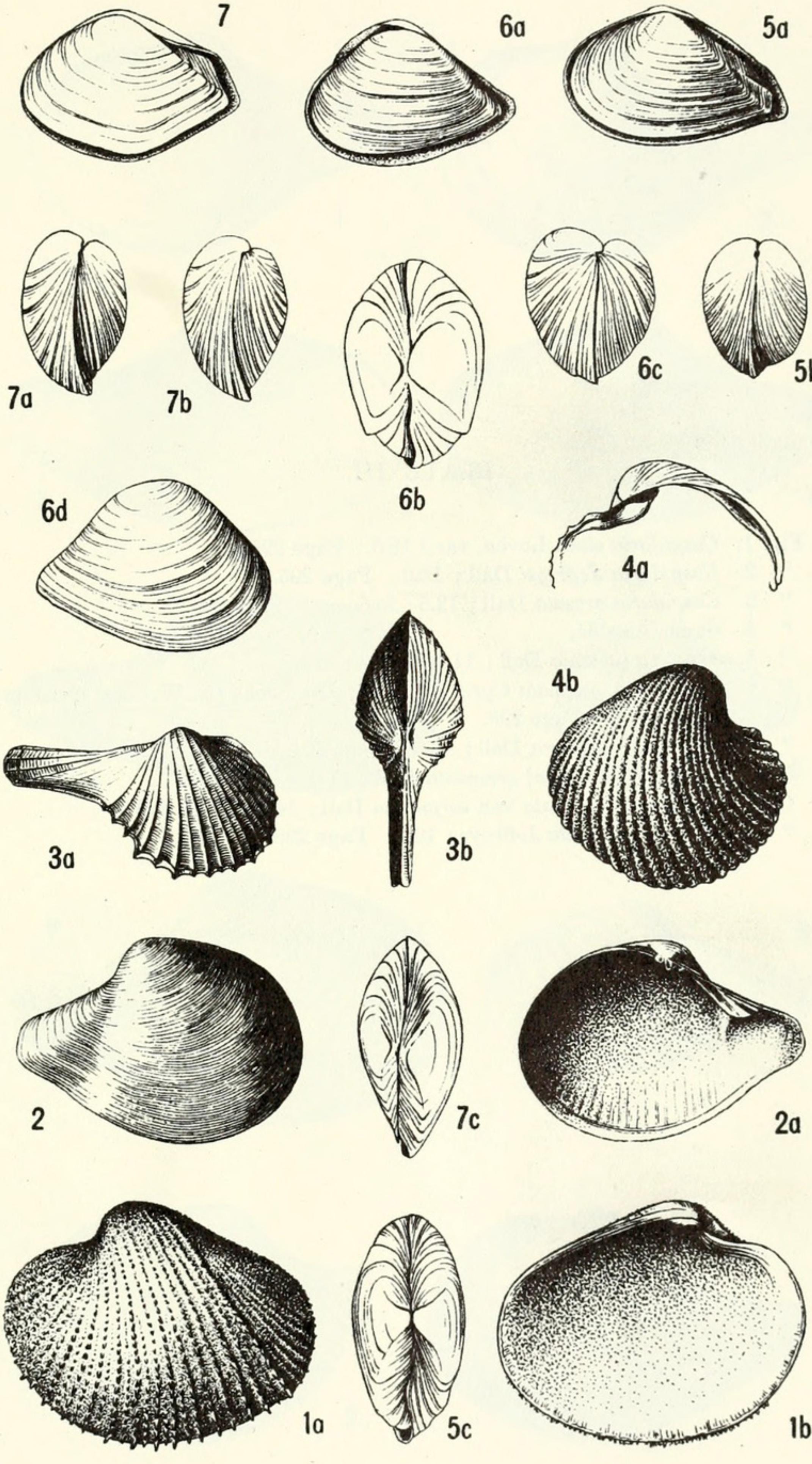

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PLATE III.

Fig. 1. *Cuspidaria obesa* Lovèn, var.? 13.0. Page 295.
" 2. *Cuspidaria Jeffreysi* Dall ; 15.0. Page 295.
" 3. *Cuspidaria arcuata* Dall ; 12.5 ; inside. Page 296.
" 4. Same, outside.
" 5. *Myonera limatula* Dall ; 11.15. Page 304.
" 6. *Cardiomya pectinata* Cpr., var. *beringensis* Leche [N. W. coast of America], 6.0. Page 296.
" 7. *Myonera lamellifera* Dall ; 12.5. Page 304.
" 8. *Leiomya* (*Plectodon*) *granulata* Dall ; 11.0. Page 300.
" 9. *Cardiomya costellata* var. *corpulenta* Dall ; 14.0. Page 298.
" 10. *Cardiomya striata* Jeffreys ; 19 0. Page 298.

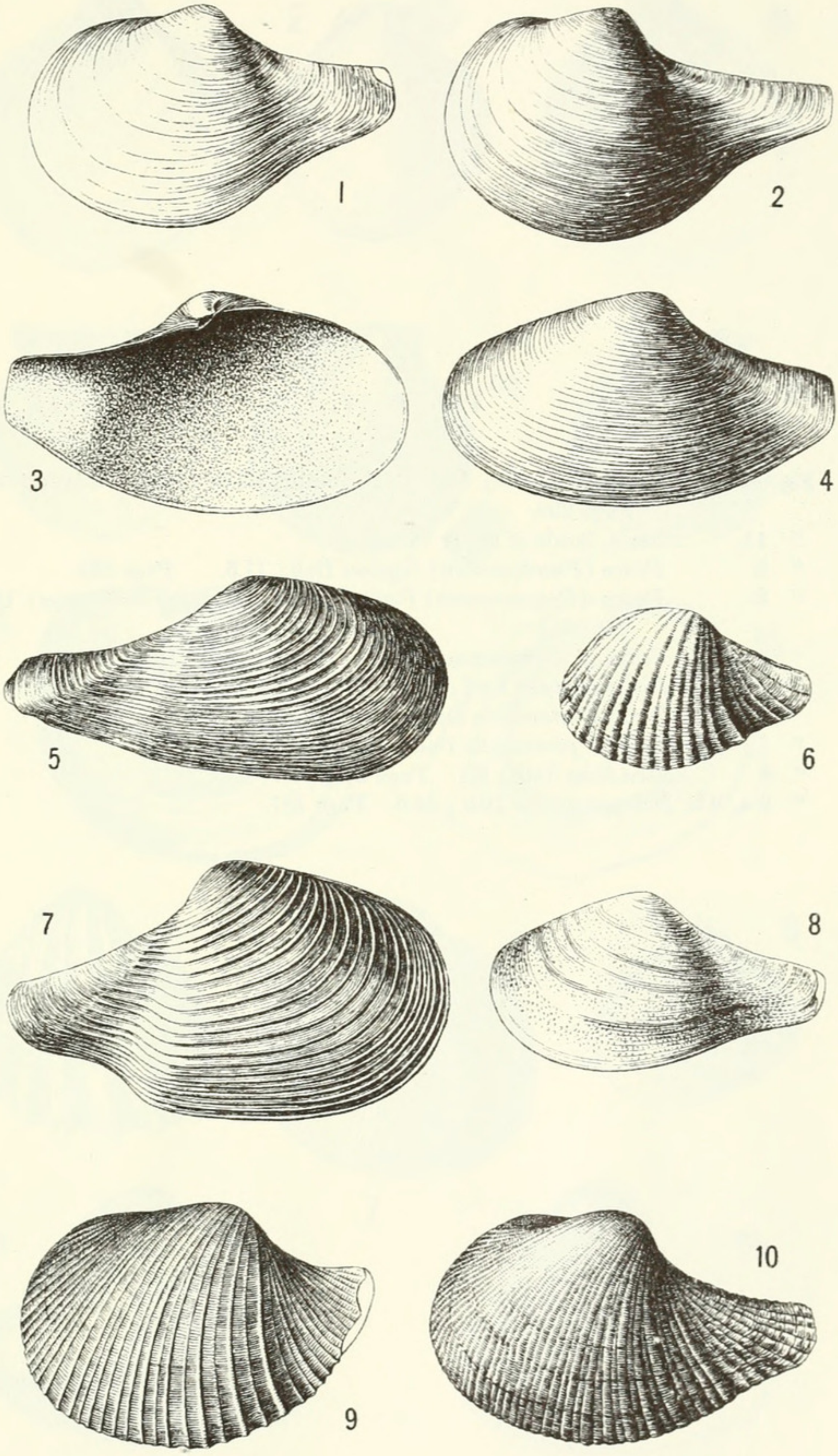

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PLATE IV.

Fig. 1 a. *Pecten* (*Amusium*) *Dalli* E. A. Smith; 62.0; inside of lower valve. Page 209.
" 1 b. Same, inside of upper valve.
" 2. *Pecten* (*Pseudamusium*) *Sigsbeei* Dall; 11.5. Page 223.
" 3. *Pecten* (*Propeamusium*) *Pourtalesianus* Dall, var. *marmoratus*; 13.5. Page 211.
" 4 a, 4 b. *Pecten* (*Pseudamusium*) *imbrifer* Lovèn; 12.5. Page 220.
" 5 a, 5 b. *Dimya argentea* Dall; 12.0. Page 228.
" 6. *Cardium ceramidum* Dall; 8.2. Page 269.
" 7. *Cardium peramabilis* Dall; 12.5. Page 269.
" 8. *Abra lioica* Dall; 8.1. Page 278.
" 9 a, 9 b. *Saxicava azaria* Dall; 25.0. Page 317.

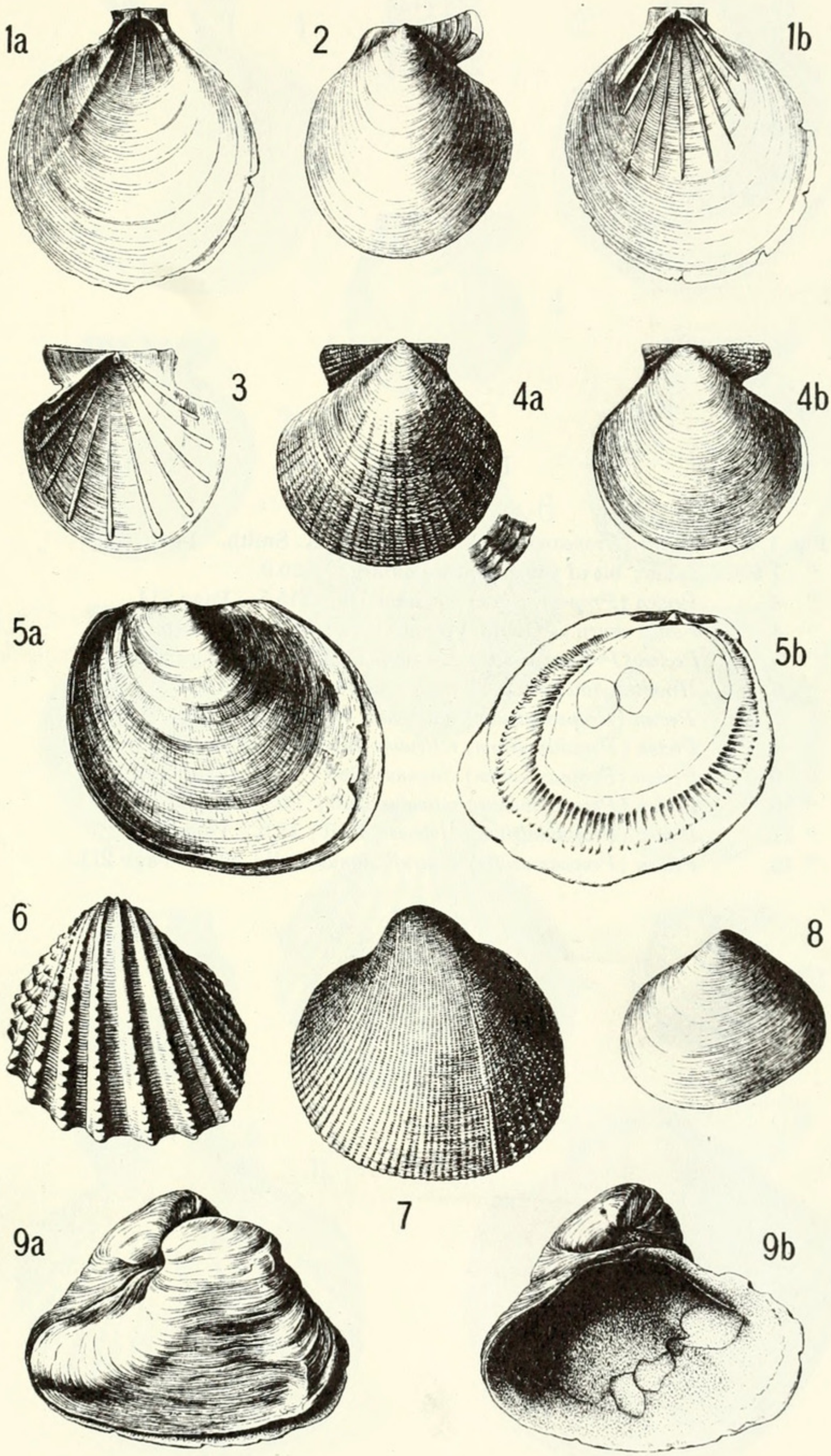

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PLATE V.

Fig. 1, 2.	*Pecten* (*Propeamusium*) *cancellatus* E. A. Smith. Page 213.
" 1 a.	Same; bit of the sculpture enlarged; 26.0.
" 3.	*Pecten* (*Propeamusium*) *Sayanus* Dall; 15.5. Page 214.
" 4.	*Pecten caurinus* Gould, young valve; 6.0. Page 216.
" 5.	*Pecten* (*Propeamusium*) *Holmesii* Dall; 12.0. Page 214.
" 6.	*Hinnites Adamsi* Dall; upper valve; 28.0. Page 223.
" 7, 7 a.	*Pecten* (*Propeamusium*) *alaskensis* Dall; 22.8. Page 215.
" 8.	*Pecten* (*Pseudamusium*) *reticulus* Dall; 7.0. Page 221.
" 9.	*Pecten* (*Propeamusium*) *Sayanus* Dall; 15.5. Page 214.
" 10.	*Pecten* (*Pseudamusium*) *reticulus* Dall; 7.0. Page 221.
" 11.	*Pecten* (*Propeamusium*) *Holmesii* Dall; 12.0. Page 214.
" 12.	*Pecten* (*Propeamusium*) *Pourtalesianus* Dall; 13.5. Page 211.

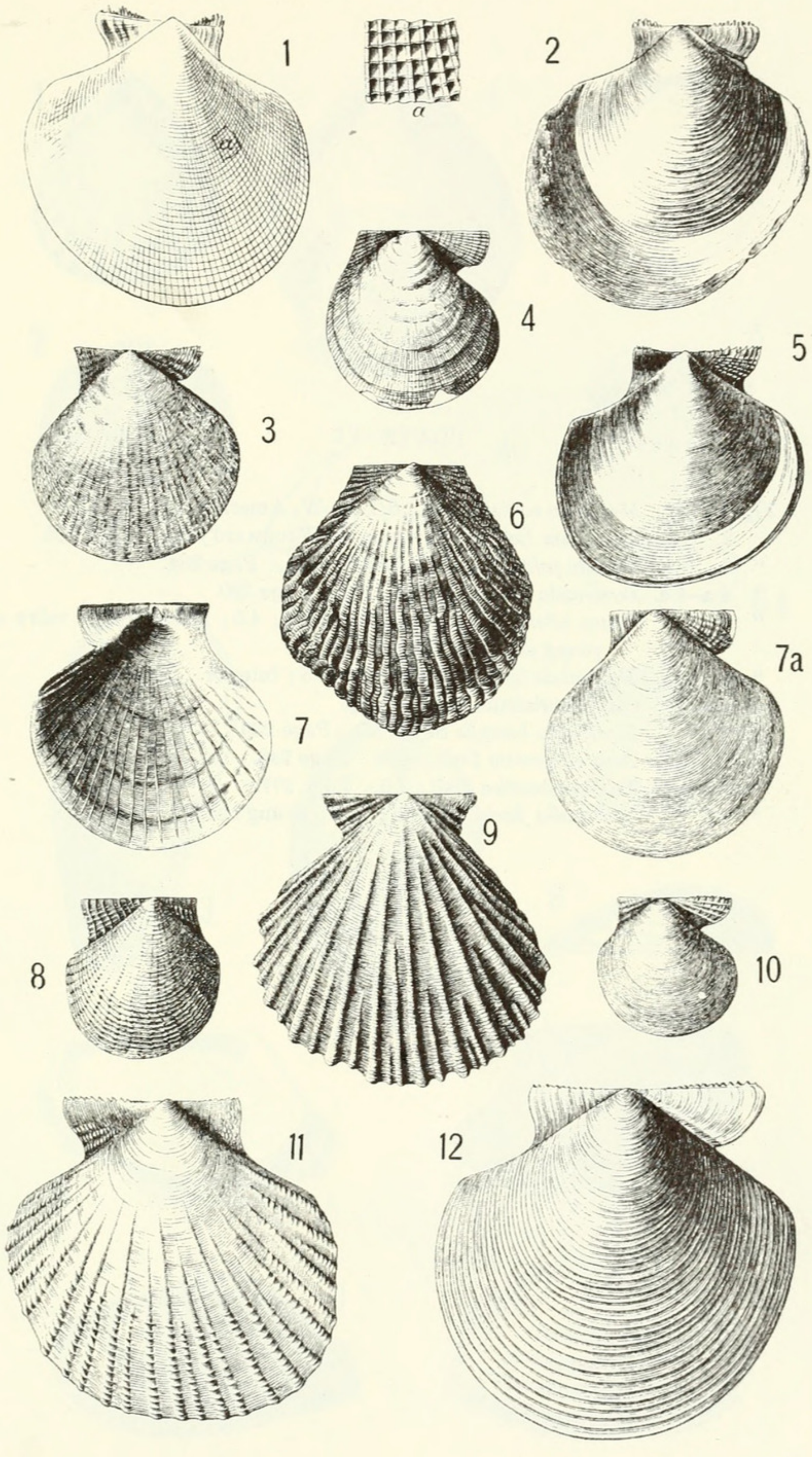

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PLATE VI.

Fig. 1. *Magasella radiata* Dall ; 6/1 [N. W. America].
" 2. *Thecidium Barretti* Davidson ex Woodward ; 5.1. Page 205.
" 3. *Modiola polita* Verrill & Smith ; 42.5. Page 234.
" 4 a–4 c. *Terebratula Bartlettii* Dall ; 40.0. Page 200.
" 5. *Pecten* (*Janira*) *hemicyclica* Ravenel ; 4.0 ; inside upper valve of young shell. Page 207.
" 6. *Terebratula incerta* Davidson ; 11.5 ; interior. Page 201.
" 6 a. Same, horizontal view of loop.
" 7, 8. *Modiolaria lateralis* Say ; 7.5. Page 236.
" 9, 10. *Arca ectocomata* Dall ; 46.0. Page 243.
" 11. *Tellina sybaritica* Dall ; 7.0. Page 277.
" 12. *Crassatella floridana* Dall ; 11.0 ; young shell. Page 256.

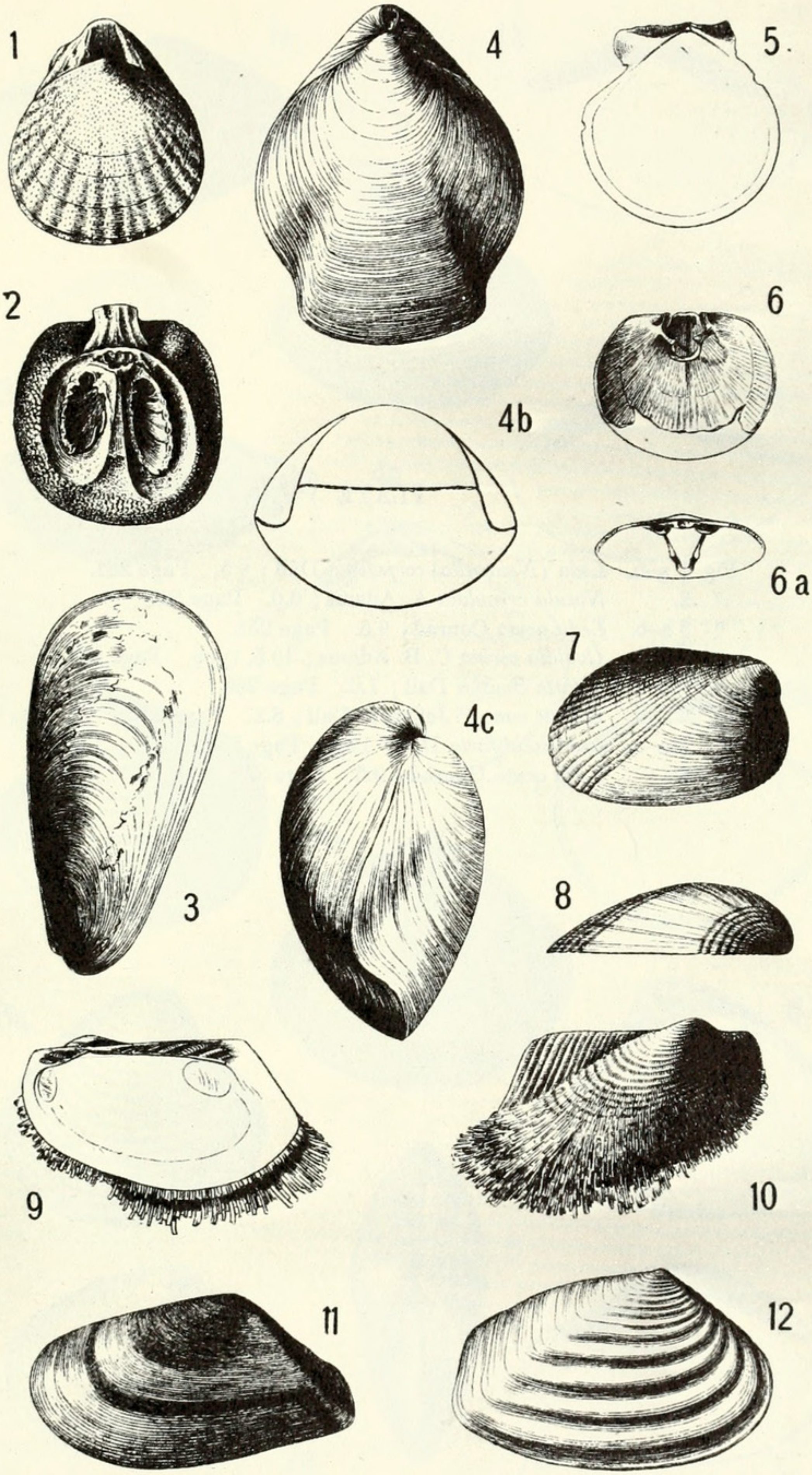

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PLATE VII.

Fig. 1 a–b. *Leda (Neilonella) corpulenta* Dall ; 9.5. Page 254.
" 2. *Nucula crenulata* A. Adams ; 6.0. Page 247.
" 3 a–b. *Leda acuta* Conrad ; 9.5. Page 251.
" 4 a–b. *Gouldia cerina* C. B. Adams ; 10.5, type. Page 263.
" 5 a–b. *Astarte Smithii* Dall ; 7.0. Page 259.
" 6 a–b. *Astarte nana* (? Jeffreys) Dall ; 8.2. Page 261.
" 7 a–b. *Leda solidifacta* Dall ; 12.5. Page 252.
" 8. *Leda acuta* Conrad ; 9.5. Page 251.

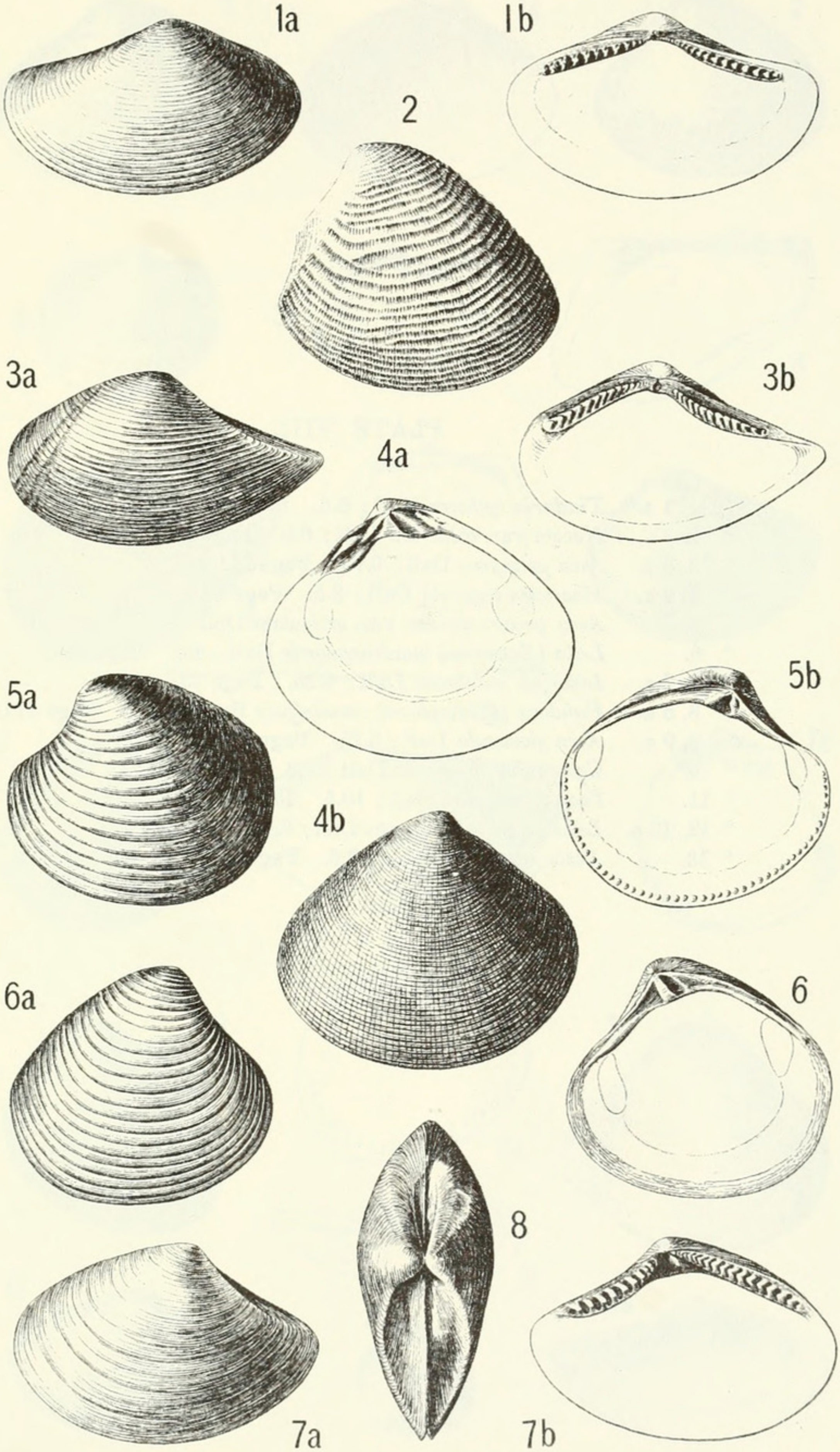

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PLATE VIII.

Fig. 1, 1 a.	*Tindaria cytherea* Dall ; 8.6. Page 254.
" 2.	*Nucula* var. *obliterata* Dall ; 6.0. Page 247.
" 3, 3 a.	*Arca polycyma* Dall ; 9.75. Page 241.
" 4, 4 a.	*Macrodon asperula* Dall ; 8.5. Page 244.
" 5.	*Arca pectunculoides,* var. *orbiculata* Dall ; 8.0. Page 240.
" 6.	*Leda* (*Saturnia*) *quadrangularis* Dall ; 4.6. Page 253.
" 7, 7 a.	*Limopsis antillensis* Dall ; 4.25. Page 237.
" 8, 8 a.	*Pandora* (*Clidiophora*) *carolinensis* Bush ; 14.2. Page 311.
" 9, 9 a.	*Arca glomerula* Dall ; 5.75. Page 241.
" 10.	*Cetoconcha margarita* Dall ; 7.3. Page 284.
" 11.	*Leda Carpenteri* Dall ; 10.5. Page 249.
" 12, 12 a.	*Leda vitrea,* var. *cerata* Dall ; 6.5. Page 250.
" 13.	*Vesicomya pilula* Dall ; 2.6. Page 274.

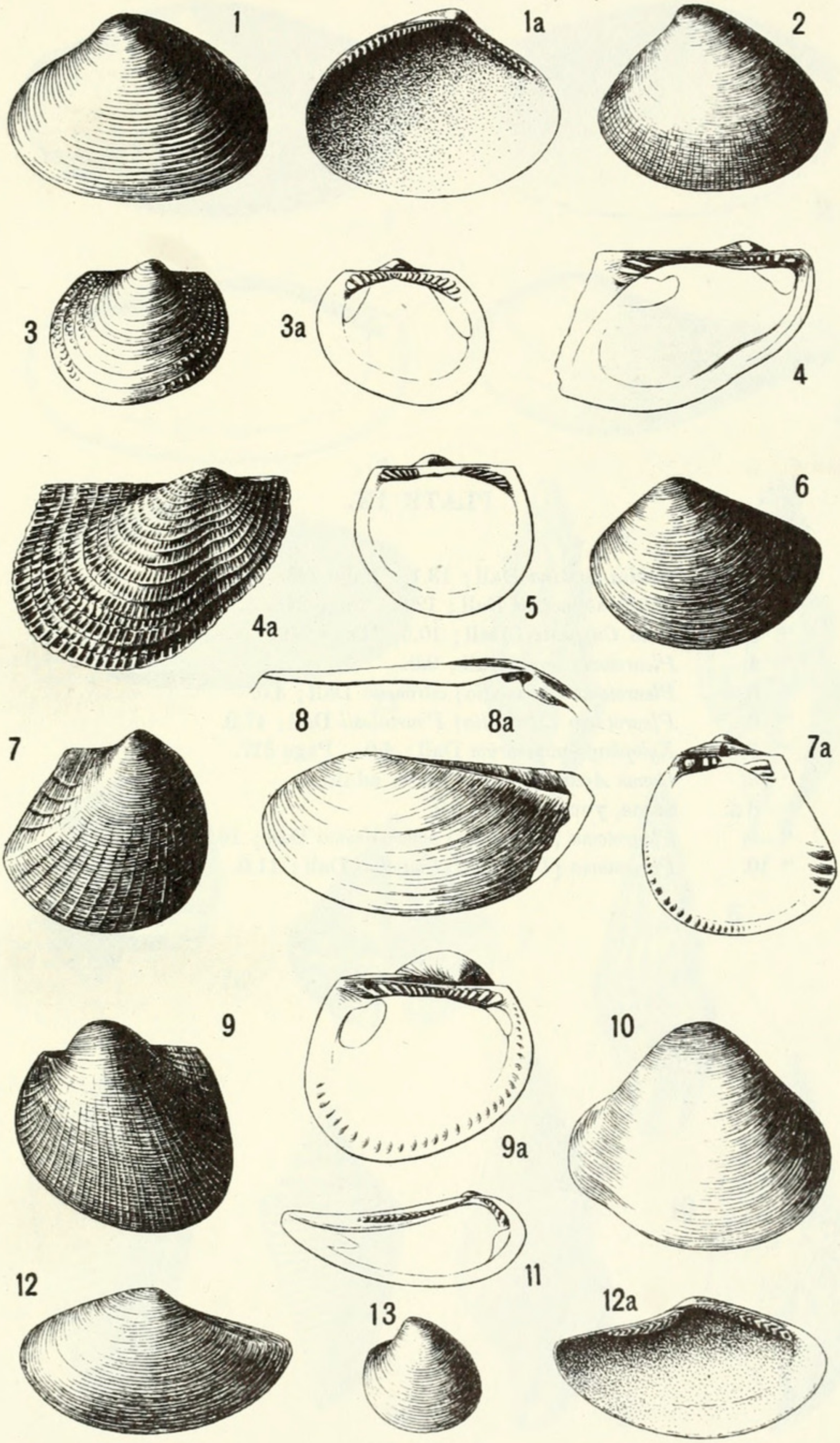

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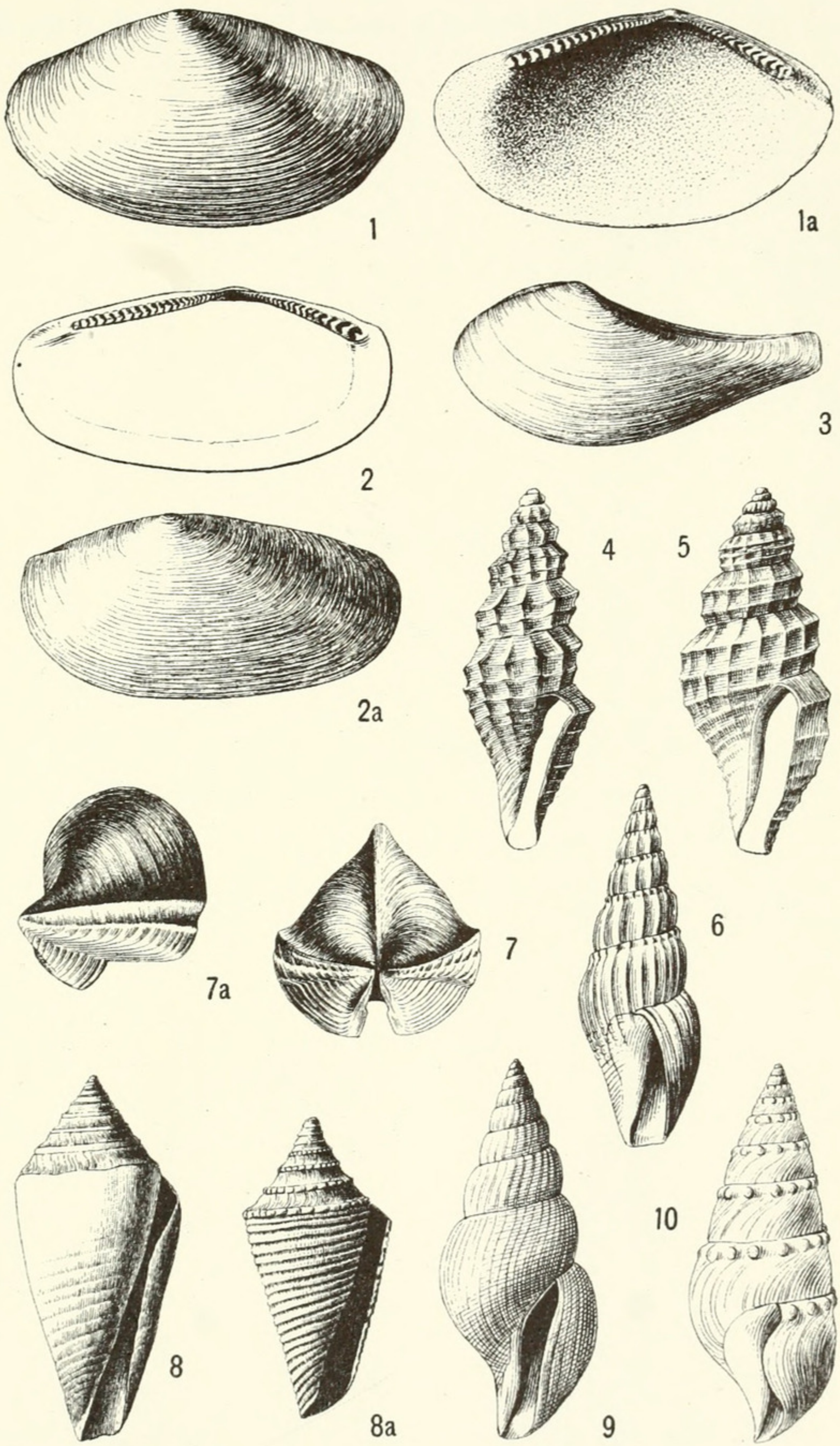
PLATE IX.

Fig. 1, 1 a. *Yoldia liorhina* Dall; 13.1. Page 248.
" 2, 2 a. *Yoldia solenoides* Dall; 12.5. Page 248.
" 3. *Leda Carpenteri* Dall; 10.5. Page 249.
" 4. *Pleurotoma serga* Dall; 9.0.
" 5. *Pleurotoma* (*Mangilia*) *citronella* Dall; 4.0.
" 6. *Pleurotoma* (*Mangilia*) *Pourtalesii* Dall; 17.0.
" 7, 7 a. *Xylophaga abyssorum* Dall; 4.0. Page 317.
" 8. *Conus Agassizii* Dall; 30.0; adult.
" 8 a. Same, young shell; 9.0.
" 9. *Pleurotoma* (*Daphnella*) *leucophlegma* Dall; 10.25.
" 10. *Pleurotoma* (*Daphnella*) *limacina* Dall; 11.0.



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