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EAST COAST MARINE SHELLS



"I have seen
A curious child, who dwelt upon a tract
Of inland ground, applying to his ear
The convolutions of a smooth-lipp'd shell;
To which in silence hush'd, his very soul
Listeh'd intensely and his countenance soon
Brightened with joy: for murmurings from within
Were heard,--sonorous cadences, whereby,
To his belief, the monitor express'd
Mysterious union with its native sea."

Wordsworth

EAST COAST MARINE SHELLS

*Descriptions of shore mollusks together with many living
below tide mark, from Maine to Texas
inclusive, especially Florida*

With more than one thousand drawings
and photographs

By

MAXWELL SMITH



EDWARDS BROTHERS, INC.

ANN ARBOR, MICHIGAN

1937

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Ann Arbor, Michigan 1937*

INTRODUCTION

Who has not felt the urge to explore the quiet lagoon, the sandy beach, the coral reef, the isolated sandbar, the wide muddy tidal flat, or the rock-bound coast? How many rich harvests of specimens do these yield the collector from time to time? This volume is intended to answer at least some of these questions.

From the viewpoint of the biologist, artist, engineer, or craftsman, shellfish present lessons in development, construction, symmetry, harmony and color which are almost unique. To the novice an acquaintance with these creatures will reveal an entirely new world which, in addition to affording real pleasure, will supply much of practical value.

Life is indeed limitless and among the lesser animals this is particularly true. A mighty pattern is being woven into which significantly fits the smallest organism, which under the microscope reveals for a moment its importance in the lengthy chain. Some of these units may disappear from the surface of the earth and be replaced by others. This constant weaving, building up a little here and tearing down some there, constitutes what some may designate as evolution. Adaptation does not necessarily express the conformity of a species to its environment. Local conditions influence the mode of life to a very marked extent. Sustenance, pigmentation, and amount of lime available for shell building are reflected in succeeding generations. Different conditions in various localities often result in abnormal size, stunted growth or peculiar color patterns. Allowance should be made for these influences where peculiar conditions prevail. Giants or dwarfs may readily be recognized.

Each individual reader or student may actually assist in adding to the knowledge of American shells. With the span of human life comparatively short it is better for individuals to specialize, more or less, rather than attempt to cover a very broad field. Intensive and regular local observations will prove more productive than those carried on some distance away. The English realize this and their tiny island has not yet revealed all of its secrets. The broad American continent needs naturalists in every community to complete the census of animals and plants. Long stretches of coastline upon the Atlantic and Gulf have never been intelligently worked for shells. The collector will eventually wander into new fields and find the opportunities for recording data endless. This service consists, in one way, of making careful records of the habits of even the common species. A well-known authority estimates that eventually a hundred thousand mollusks will be known, against the sixty thousand odd species which have already been described. These figures are given not to discourage the beginner but to suggest the work in which he may assume a share.

It will be noted that not all the species of a given genus appear together in the illustrations contained in this volume. With a shell in hand for comparison it will be best to run through all the plates, at first, until a figure approximating the specimen is found. Then reference to the text will permit comparison with the diagnoses of the group. The individual species may be studied in turn the last of all. With a little knowledge and practice it should soon be possible for the reader to assign the larger shells fairly close to their actual position in the text.

Juvenile shells often exhibit the characters of their elders and, therefore, can be identified. At times, species are encountered which present in the young stages quite a different aspect from the adult. Then connecting series are necessary to show the correct relationship.

A number of years have passed since the appearance of a work covering the shells of the American east coast. Many recent additions to the fauna have led the author to compile for his use check lists of local material secured in New England and the various southern states. With these lists as a nucleus it has been necessary to prepare descriptions of the various species and the families under which they are grouped. Some of the descriptions were obtained from the source, the original author's work often contained in some obscure journal or monograph. A considerable number of photographs of east coast shells have been taken personally by the writer for the present volume. Many of these subjects are in his private collection, others in museums in various parts of the country. The majority of the specimens illustrated were collected upon the mainland of the United States and verified by the finders. Most of the deep water forms are housed in the National Museum. No doubt errors occur, both in the identifications of the little-known species and in certain nomenclature. The aid of students is sought in the correction of mistakes. Only with the assistance of all may the truthful mirror of life be presented.

The author is deeply grateful to many friends for helpful suggestions together with the loan and donation of specimens, especially to: Dr. Henry A. Pilsbry of the Academy of Natural Sciences, Philadelphia; Prof. William J. Clench of Harvard University; Joshua L. Baily, Jr., of San Diego, California; Dr. Paul Bartsch and Dr. H. A. Rehder of the National Museum, Washington, D.C.; Dr. Louise Perry of Sanibel, Florida; Dr. George A. Waterman of Palm Beach, Florida; Paul P. McGinty and his sons Paul L. McGinty, and Thomas L. McGinty, of Boynton, Florida; Mr. and Mrs. Frank Lyman and Jack Lyman, of Lantana; and Albert Pflueger of Miami, Florida. The writer is particularly indebted to Thomas L. McGinty for many fine drawings which accompany the text, also the map of Florida which he so painstakingly prepared, and to Miss Elizabeth Pilsbry, daughter of the distinguished malacologist Dr. Henry A. Pilsbry for the illustration accompanying the Wordsworth quotation. Without the coöperation of these and many other earnest workers the records within these pages would be far less complete.

Lantana, Florida, November 15, 1936.

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EAST COAST MARINE SHELLS

The term CONCHOLOGY is derived from a combination of two Greek words "A Shell Fish" and "Science of." It is usually applied to the study of both animal and shell. Another word, MALACOLOGY has been accepted by many societies and individuals to supersede the earlier one and refers also to the study of the entire organism.

The MOLLUSCAN PHYLUM comprises those animals with soft fleshy bodies covered by a muscular sac, commonly called the mantle, and which usually secretes a shell composed of carbonate of lime which in turn affords protection to the vital organs of the body.

POSITION OF THE MOLLUSCA. Dr. Robert W. Hegner in "College Zoology" places the Phyla of the Mollusca between the Annelida (a group to which belong the jointed worms) and the Arthropoda (which includes the crabs, insects, etc.). The three share one character in common, they are, or originally were, mostly bilaterally symmetrical organisms.

DIVISIONS OF THE MOLLUSCA. There are five great classes indicated by the variations of the foot or locomotive organ and named: CEPHALOPODA, GASTROPODA, SCAPHOPODA, PELECYPODA, and AMPHINEURA.

CEPHALOPODA¹ or CEPHALOPODS. Animal with foot lacking or rudimentary, possibly modified to arms of which there are eight to ten; individual, unisexual; animal free, crawling or swimming in the sea, propelled by water from the siphonal tube. Examples: Octopus or Devil Fish, Nautilus, Loligo or Squid.

GASTROPODA² or GASTROPODAE. Distinguished by the presence of a sole-like locomotive foot underneath. By its wavelike expansions and contractions the animal progresses. The well-known term UNIVALVE refers to the one piece shell. Examples: Helix (snail); Littorina (periwinkle); Buccinum (whelk).

Originally bilaterally symmetrical organisms the influence of environment has often resulted in radical readjustments of internal organs with consequent modifications in the shell.

PELECYPODA³ or BIVALVES. Entirely aquatic and predominately marine forms. The term bivalve indicates a two-piece shell. LAMELLIBRANCHIATA, which is also frequently applied to this group, refers to the lamellar or leaf-like character of their branchial gills. The tongue-like foot used for ploughing through mud or sand is characteristic, also the elastic ligament which binds the valves together, and the interlocking teeth or denticles at the hinge. Examples: oyster, scallop, and clam.

SCAPHOPODA⁴ or TUSK SHELLS. Animal with long filaments appearing from lobes about the neck and enveloped, with the head, by the mantle. Shell tubular, not spiral. Example: Dentalium (Elephant's Tusk Shell).

AMPHINEURA⁵. Sometimes placed under the Gastropoda. The Chitons or coat-of-mail shells are externally bilaterally symmetrical. They usually are provided with a shell of eight transverse calcareous plates.

SUMMARY. A superficial examination reveals little in common to the preceding classes. However, there are several structures shared by all, notably the foot. With this organ the snail creeps, the clam and tusk shell dig, the squid seizes its prey. Also in each is a space known as the mantle cavity, between the main body and the mantle or enclosing envelope. This mantle is peculiar to the Mollusca, as is also the Radula which is used for the rasping of food and as a tool for boring into other shells.

DEVELOPMENT. In the development of the molluscan egg there is the TROCHOPHORE stage, Fig. 1, which in turn becomes a VELIGER LARVA (so named because of a band

1. Gr. kephale, head; pous, foot.
2. Gr. gaster, the belly; pous, foot.
3. Gr. pelekos, hatchet; pous, foot.

4. Gr. skaphe, a boat; pous, foot.
5. Gr. amphi, on both sides; neuron, nerve.

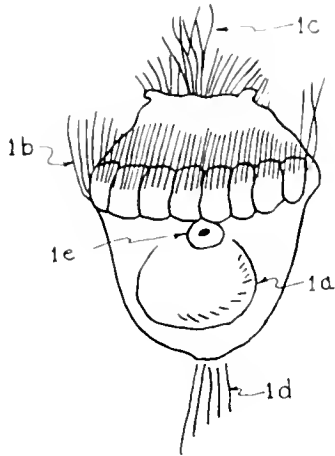


Fig. 1
Trochophore stage in Patella. 1a Foot, 1b Velum, 1c Flagellum, 1d Postanal cilia, 1e Mouth

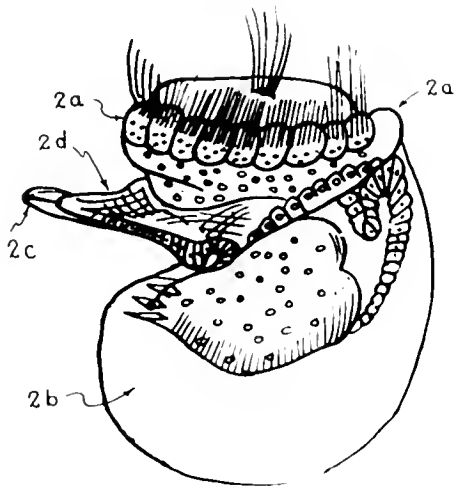


Fig. 2
Veliger stage, 130 hours old, in Patella. 2a Velum, 2b Shell, 2c Operculum, 2d Rudimentary foot

Where to Collect

Almost every individual has the desire to explore the unknown and discover for himself at least a few of the remaining hidden things upon the universe. In this quest the greatest satisfaction comes in sharing the knowledge gained with others. Thus the great scientists faithfully describe and record the results of their lab-

of cilia, the velum in front of the mouth) Fig. 2. The velum is an organ of locomotion and helps in the dispersal of the species, assisting the larva to travel long distances. It may be that the Mollusks, Annelids, and other organisms, which employ the trochophore stage, have descended from a common ancestor.

So too the beginner among shell collectors may, by the observance of certain rules, contribute definite knowledge to the subject. The beach searcher may at first be attracted by flashing colors or spectacular forms but many humble creatures should also be carefully observed. Possibly some of the latter have never been reported from the particular places to which the collector has access. Here is an opportunity for definite service, simply putting the species on record.

The opportunity for travel to distant places is denied to many but that need not deter the student of shells for often they are to be found within a few miles from home. It may be upon the shores of some muddy bay in Florida, a sandy stretch of beach on Long Island or upon the rock-bound coast of Maine.

It must be admitted that, for various reasons, there are limitations put upon individuals with respect to the amount of truth and beauty which they may have time to observe. Obviously it is better to train faculties upon objects close at hand rather than to strain vision in attempting to discern characters far away upon the horizon. Familiarity with humble beings living near-by will immeasurably enrich life. Long journeys afield are often too hurried to accomplish much in the way of collecting when the time factor must be reckoned with. It is often best to select one good locality and concentrate there. A single base from which short excursions can be made in various directions will be found more lucrative and satisfactory than a series of brief halts.

To examine shells, even superficially, from the viewpoint of architect, engineer, or artist is fascinating in itself. When the breathing animal, be it active or sluggish, is also observed both wonder and satisfaction are increased. The casual observer cannot but admire the dexterity of a minute organism as seen under a lens, or held in the hand after being removed from a bit of coral, rock, or sand.

The present revival of interest in collecting shells has led to certain abuses which already have had a profound effect in Florida. The beautiful Liguus, or tree snails, are already doomed to destruction. Forest fires have taken their toll in destroying the hammock lands where the snails live. Many of the few survivors have been

ruthlessly collected. The time has passed when the taking of additional specimens can make even the slightest contribution to science. Buying specimens from Indians is as bad as taking them from the trees. Thoughtless souvenir hunters are completing their destruction.

A real scientist should also realize that many of the marine shells are not quickly produced and often only in small numbers. Entire colonies should not be cleaned out. The excuse that "someone else will take them if I don't" is about as cheap and poor a subterfuge as there is. These remarks apply to living shells, not dead ones.

Sanibel Island is an excellent center for collecting marine shells in Florida. It is situated off the lower west coast, in the Gulf of Mexico and near Fort Myers. Here, probably, is the richest spot in the country for marine shells and is indeed a veritable happy hunting ground. Years ago, according to the late Dr. Simpson, it would have been possible to fill a train of freight cars with shells from the beaches of Sanibel. Today not so many individual shells are obtainable but a sufficient number to attract and gladden visitors to the island. Even now the beach is often strewn with countless Pinna shells.

In order to secure a goodly number of the hundreds of species known to occur at Sanibel it is necessary to learn something about their habits, particularly if they are to be taken alive. Dead specimens are preferable to none, especially if fresh, but only should be retained until living ones are obtained. Where are these living forms? Many are in plain sight including some of the largest ones. The majority, however, are hidden away in all sorts of places and must be sought for at the lowest tides.

As the automobile in which the collector may ride rolls along the beach innumerable specimens are crushed beneath the wheels. If time permits it is best to hike down the beach to the lighthouse. There it is easy to observe and obtain two little shells which make tracks in the sand and live in close proximity to each other, *Terebra* and *Olivella*. In the tidal pools are scallops (*Pecten*) of several species, the giant *Fasciolaria*, countless numbers of the paper fig shell (*Ficus*), left-handed *Busycon*, giant cockles (*Cardium*), and

glistening clams (*Dosinia*). Together with these, especially in the direction of Captiva Island, are hosts of the various rock shells (*Murex*) and quantities of little forms clinging upon the backs of Pinnae, corals, and elsewhere. One could remain here indefinitely, constantly adding new species to his list and enjoying varied experiences.

Upon the mud flats inside Sanibel and Captiva Islands, on the bay side, live many species which are totally different. In some places a small black *Cerithium* occurs literally in millions. They are so close together that it is impossible to step without treading upon them. Here too, quite abundant at times, is the gracefully formed *Melongena corona*. It actually is crowned with many spines which are better seen after the mud is removed. At various depths, in mud or sand, is an assemblage of interesting shellfish, some of them borers and including the marvelously beautiful angel-wings (*Barnea*) for which Florida is justly famous. Tarpon Bay, with its muddy bottom is a rich spot, especially for minute forms which find protection in its quiet waters. There occurs the tiny opal *Marginella*, truly a gem of the first water but only one of the jewels which live their allotted span immersed in ooze. The bay shores also teem with life and are easily reached at low tide.

The larger bay, in the direction of the lighthouse, is also classic ground and may readily be worked with a small dredge and operated from a fishing boat. Outside in the Gulf the many reefs and diversified bottom afford a rich territory for anyone with time and energy to explore. Almost every haul with the dredge brings up a host of beauties, both large and small, obtainable in comparatively shallow water.

There are other rich fields upon the west coast of Florida, Tampa Bay, Boca Ceiga Bay, the Sarasota area, Marco, Naples, to mention a few. Off Cape Romano the author dredged in about six feet of water with highly gratifying results.

On the east coast of Florida, north of the Keys, some of the Sanibel species also occur but individuals are not nearly so plentiful. From the Gulf Stream, however, come many unusual shells which rarely or never are seen on the west coast of the state. The violet shell (*Janthina*) is a good example. After winter storms it is

often washed ashore in large numbers. Many rock loving shell fish, also quite different, are present and extend well down on the Keys.

The middle Keys of Florida, those midway between Miami and Key West, are especially rich in shells. There in quiet waters the numerous sponges serve as hosts and afford protection to a multitude of small forms which cling beneath them. To wade about in the shallow water at low tide is a revelation. The number of forms and their beauty cannot but excite admiration. The task of turning over sponges becomes an easy one when the speculative urge is added. Keen delight is also found in operating the water glass in shallow water. By this means many handsome little shells may be detected clinging to weeds and grasses. Lignumvitae Key was found a particularly good place for these observations. Where Angel Fish Creek joins lower Biscayne Bay live, upon weeds, the highly decorative *As-traeas*, two sorts, one with long prominent spines.

The Key West area is commended on account of its harboring many West Indian shells which do not penetrate much farther north. Saddle Bunch Key, upon the ocean rocks, is a favorable station. Sand Island close to the entrance of Key West harbor provides shelter for a number of limpets and forms not seen upon the mainland. The Marquesas and especially the Tortugas are extremely rich in shells and well repay the visitor. Upon the latter the Carnegie Institute of Washington maintains a biological station where much valuable work is accomplished by the scientists stationed there at certain times of the year.

The beginner is advised to study carefully the stations where mollusks live. Repeated visits under varying tidal and weather conditions are essential for success. Marine organisms are constantly shifting, as a rule, and only disabled ones are thrown upon the beach when certain factors combine to force such an occurrence. Some shells may line the beach one day and not be seen again in years. A person favorably situated may watch carefully a chosen spot and from time to time the inhabitants of distant shores may come to him. Regular patrols of the shore line will richly reward the persistent seeker of specimens.

In New England, and the north generally, conditions under which mollusks live

are not so different as at first might be supposed. The rocky coast of Maine, however, affords shelter to many species which could not possibly exist farther south. Individuals are often very numerous in the colder waters but the number of species is much reduced. Many of the fine small deeper water shells may be obtained from the stomachs of fish.

Instructions for Collecting Mollusks

In 1892 Dr. William H. Dall of the United States National Museum prepared a very valuable paper dealing exhaustively with this subject. Unfortunately this publication is unavailable to the average student and the following data should prove of value.

Mollusks live practically everywhere. The loftiest mountains, the broadest prairies, the most remote oceanic islets and even deserts shelter and sustain their lives. Intelligent and thorough search will reveal them in limited or great numbers.

Marine Mollusks

Many of our most eminent scientists assert that all life originated in the sea. There is no question but that the oceans existed continuously since the earliest development of life on the globe. Naturally there persist in the great depths of the sea conditions which have remained practically unchanged since the beginning of the world. There are to be found forms of incalculable antiquity. These organisms are of course obtainable only through costly dredging operations but the literature pertaining to these animals is available to everyone who has access to a good library.

DEEP SEA DIVISIONS. There are several divisional names applied to the various Molluscan regions of the sea. They refer to differences of latitude and temperature.

The Littoral Region. All are familiar with this. It may in a general way extend from the shore to a depth of 100 fathoms. Here abundant light and vegetation usually exist except as the poles are

approached. Beyond the littoral region light does not penetrate.

The Archibenthal Region. Here the various continents slope sharply to the bottom of the sea and, there being no light, there is no vegetation. Upon the upper portions of this region, however, conditions are peculiarly adapted to the development of molluscan life. Ocean currents, such as the Gulf Stream, bathe the animals in clean warm water and also bring abundant food to the organisms in their path.

The Benthal or Abyssal Region. This refers to the cold dark depths of the sea. The animals there originated elsewhere but have succeeded in adapting themselves to the strange conditions. Thus many deep-sea shells show affinity with those from shallow water. They are invariably colorless and thin, due probably to the tranquility of the water and absence of disturbances.

The enormous pressure at these depths, which may amount to several tons to the square inch, necessitates the free permeation of water to all tissues in order that equalization may result. How organisms can function under these circumstances is the greatest mystery of abyssal life.

The collections made aboard the U. S. Steamer Blake, over a period of years, on the southeastern coast of the United States show 28 per cent of the species obtained from the abyssal fauna belong to three families, namely TURRIDAE, NUCULANIDAE, and DENTALIIDAE.

Littoral Zone Collecting

Shore collecting is more or less familiar to all. Littorina, Thais, Acmaea, and Chiton live upon rocks. Upon sandy beaches live many bivalves such as Donax, Pecten, and Venus, while among the univalves are Oliva, Olivella, and Busycon. In sheltered bays upon mud flats exposed by receding tides are countless Cerithium and Nassa. Where rocks, sand, and mud meet the greatest number of species congregate, especially when there is an abundant food supply.

Tides and winds should be carefully studied and advantage taken of extreme low tides which greatly facilitate collecting expeditions. An offshore breeze, after a protracted blow, often will furnish ideal conditions.

Almost every species has peculiar preferences with respect to its place of lodgment or attachment and it is almost useless to seek certain species except in specific places. Stones should be turned over; sponges, grasses, old dead shells, wooden piles and other surfaces carefully examined; crevices peered into and all out-of-the-way spots thoroughly scrutinized.

Shells like limpets and Chitons should be approached carefully and detached with a small case knife before they become alarmed. Otherwise it will be impossible to dislodge them without injury to the shell. It would be well to carry a few small wide-mouthed glass jars in which may be placed the medium-sized living forms. After studying the movements of these in salt water they may be preserved by covering with denatured alcohol. With a little practice and experience the novice will soon attain the necessary technique in acquiring and caring for field specimens.

Certain mollusks must be sought for imbedded in the tissues of fish, starfish, sea urchins, in the stomachs of fish, in sponges, and upon the shells of other mollusks. Certain of the parasitic shells are singularly beautiful and not well known.

Fossil Mollusks

Often the collector has an opportunity to obtain fossil shells, especially when washed out by heavy rains or when construction of dikes or roads necessitate the removal or uncovering of the soil. In many parts of the south there are exposures of fossil beds in river banks or bluffs.

The shells from the most recent deposits are usually identical with or closely related to those living on adjacent coasts today. These and those of greater antiquity are extremely valuable for comparison with the living species. The French, in their museums, place recent and fossil specimens side by side.

The richest fossil beds in the United States are adjacent to and upon the banks of the Caloosahatchee River, Florida, and belong to the Pliocene Period. These shells are remarkable for their size, perfect preservation, and beauty. Recent construction of dikes adjacent to Lake Okeechobee, particularly near Clewiston, has made available to students and collectors a very

rich field. These have been buried for millions of years yet often show considerable color and lustre. Many of the species were the progenitors of those living in Florida today. The opportunity for acquiring this material is without parallel and specimens doubtless will be available upon the dikes for several years to come. For additional information pertaining to these shells the reader should refer to Dall's monumental work on the Tertiary Mollusca of Florida which was published by the Wagner Free Institute of Philadelphia and is still for sale by that institution.

The Dredge

In Woodward's Manual of the Mollusca a practical small dredge is described and illustrated. It is built of wrought iron with movable joints which permit folding and it may be carried in the hand. It consists of two long narrow parallel pieces each with a cutting edge. On the insides these are provided with eyeholes for the attachment of a net and fastened with copper wire. At the ends are fastened two pieces of rawhide and at their extremities a pair of rings. The towing rope in turn is attached to the rings. The ends and bottom of the rawhide are connected by the net made of cod-line which permits the water to escape. The opening between the blades is kept narrow to prevent the entrance of large objects. There are various variations of this dredge which give good results.

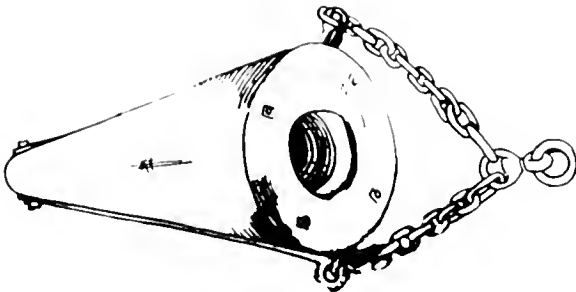


FIG. 3
Bucket dredge

The bucket type dredge was designed and very successfully used by Dr. Hedley of the Australian Museum, Fig. 3. It is fool-

proof and according to its designer never fails to deliver a load from the bottom. It may be used in the forty-pound size at a depth of 500 feet or more. It consists of a cone-shaped piece of rolled steel with reinforced sides to which are attached the ropes. There is no opening at the bottom. Fitted in the top is a flange with 3/4" bolts. After bringing up a load the flange is removed and the contents removed with a trowel and sifted through trays which have been fitted with screen wire of various sizes. An important adjunct to any dredge is a strong swivel which should be placed where the ropes meet. This prevents the rope from spinning about while being brought up and consequent loss of the dredge. The flange is essential to holding the material inside which otherwise would be affected by swirling eddies during its transit to the surface. With a calm sea it is not difficult to empty the bucket dredge when swung from a davit and controlled from the dingy. In rough water the bucket operates equally well but must be emptied on the deck. The author's first bucket dredge weighed forty pounds and required two men to operate on his boat the "Dusty." Upon a cruise to the Gulf of Mexico he also carried a twenty-pound bucket which operated equally well in comparatively shallow water. Still smaller sizes were experimented with and found too light in weight. The small light dredge first described is more suitable for ordinary use.

In operating any type of dredge the length of towline required is usually double the depth of the water. If too short nothing will be obtained; if too long it will be in danger of getting fast. On rocky or unknown bottoms a safety device is advised in order to prevent loss. A float consisting of a life preserver or small water-tight keg may be fastened by a light line to the dredge and towed in rear. In the event that the main rope breaks the dredge may readily be recovered.

A very simple and inexpensive dredge consists of a piece of ordinary iron sewer pipe, roughly 3 feet long and about 9 inches in diameter. One end is fitted with a removable wooden plug, the other end bored with 2 to 3 widely-spaced holes for attaching the ropes. Several of these dredges may be carried in a comparatively small space and if lost are easily replaced.

The various types of diving helmets,



Crew Bringing Aboard One of the Bucket Dredges on the Author's "Dusty" in the Gulf of Mexico



Near Mouth of New River, Ft. Lauderdale, Florida



Close-Up of Sanibel, Florida Beach after a "Blow"



Littorina littorea--Living in Great Numbers upon Rocks in Tidal Pools South of Boston, Massachusetts

now growing in popularity, are chiefly useful in locating suitable places to dredge rather than for the actual collection of specimens.

Preserving the Catch

Specimens of intermediate size should be placed immediately in glass jars, labeled with the date, exact station, nature of bottom and other data. Records of the water temperature and depth are important. A liberal supply of denatured alcohol in clean containers should be readily available for covering the material in the jars. Immediate attention and storage will prevent material from becoming mixed.

The smallest siftings or "trash" is extremely valuable in that it often contains quantities of small or minute shells. It should be handled with great care, placed in sacks and dried in the sun or close to the engine. Once thoroughly dry this material yields a surprising variety of beautiful forms. The fresh shells stand out with great clarity against the dead fragments alongside them. With the aid of "magnifying spectacles" this material may be sorted over at leisure and is almost certain to contain novelties for the collection.

Every shell enthusiast, with access to the sea, should have some type of dredge constructed and operate from a rowboat or a chartered craft if not from his own. Even a strong colander held in the hand is better than nothing. The expense and trouble entailed, along these lines, will be richly rewarded.

The Net

This is a simple contrivance which is merely a conical bag of netting, preferably bobinette, fastened to a circular piece of strong brass or copper wire which has been coiled. Three additional pieces of small wire fastened to the circular opening serves to hold three attached fish lines; the latter unite and the towing line completes the outfit. It is most successfully used when only a small portion of the circular frame protrudes above the water while being towed. It can only be used in very calm weather. At sunset or on moon-

light nights many of the wonderful pelagic or surface creatures, such as *Janthina* and *Cavolina*, may be obtained in great numbers, especially a few miles off shore and in the Gulf Stream. It may be advisable to keep the net out for several hours or even all day in the temperate regions where individuals are less plentiful.

Cleaning Shells

After acquiring specimens the next step is to prepare them for the cabinet. This may be tedious at times, especially after a long field day, but is not necessarily a laborious process.

In field work, especially in the tropics, it is desirable to immediately preserve the catch in spirits. When traveling by car or boat a series of jars and bags will be found indispensable. Field notes will prove as valuable as the specimens themselves and aid others in further searches. However, upon returning home a certain proportion of the specimens must be prepared for the cabinet. Soft parts in the preserved shells may be removed in the usual manner with a pin or wire. The living ones should be boiled in sea or fresh water for a few minutes, the time depending upon the size, removal of the soft parts being by the same method. Giant mollusks, like *Fasciolaria*, may have to boil for twenty minutes or more in a laundry boiler. Large shells like *Cassis* may be placed upon the ground face up and partially covered with soil or sand. In Florida the insects will rapidly clean them out. The operculum should be saved whenever present. Very small shells should simply be left to dry out, the operculum being in position.

Hermit crabs often inhabit dead shells which it may be desirable to retain. They may be drowned in a closed container of fresh water and removed with a piece of bent wire. The hermit crabs are not constructive and by their constant motion may wear away a portion of the assumed abode. When the shelter becomes too small the crab deserts it for one of larger size.

The Cabinet

The most practical type, for both institutions and individuals, consists of a

case containing shallow drawers together with a front door to exclude light and dust. The outer case may be an ordinary packing box or a handsome piece of mahogany. Square drawers or those longer than wide are preferable. The depth of the individual drawers may be 2-3 inches, in any event of a uniform depth which will make them interchangeable. The height of the entire cabinet should be determined with regard to available space. The author's cabinets range from 6 feet high to ceiling height.

Upon each side of the case are placed galvanized metal runs, bored for screws, at various distances apart to accommodate different sized specimens. These runs support the drawers, extending about 2 inches horizontally both above and below each drawer, the screw supports being attached to the vertical side. With this system it is a simple matter to rearrange the runs at any time to suit the collection.

With both drawers and paper trays for the individual lots the expansion of the collection proceeds in an orderly manner. The writer's drawers are painted a soft green; the trays painted dull black or covered with black glazed paper. He uses the 2 X 3 inch size which can be homemade or else procured at a paper-box factory. The larger sizes are multiples of the small trays. Very small specimens are often mounted in circular or rectangular glass-topped boxes which are filled with black wool. Less expensive and also quite satisfactory are the "shell tubes" of various dimensions which are obtainable from glass makers. Imported tubes, marked at the end with the place of origin, should be avoided. The black wool may be used effectively in both the boxes and tubes, corks being usually unnecessary.

Labels

These are a problem. The writer's are typewritten upon unruled library cards and separated with a photographic trimming board. Each label should indicate the name, author, locality, collector, and catalog number. When enclosed in a tube the reverse side of the label may have been previously painted a dull black in order to furnish a background for the specimens.

Catalog

Every collector should keep a record of his findings and additions. The double entry is one of several systems used. With this, acquisitions are first entered as received, each bearing a number which is placed also upon the label and when possible upon the specimens themselves. Separate localities are indicated by letters which are added to the numbers. The second book in this system is arranged systematically, according to families and genera, with spaces left for future entries. The numbers are entered opposite the individual species but of course are not consecutive. A looseleaf book should be employed for the second book.

Packing and Transport

Glass jars for shipment should be packed with excelsior. For very small or medium specimens individual containers may be made readily with a small round stick, say half an inch in diameter. Around this may be pasted old letters or blank books. When dry the covering may be removed and the hollow tube cut into short lengths. A bit of cotton in each end will prevent the contents from dropping out. Data may be written on the outside of each paper tube.

Reference Books

There is a large amount of literature pertaining to natural history. Many of the molluscan species were described in obscure journals of learned societies and ordinarily are inaccessible to the average student.

The four best libraries, from the viewpoint of the malacologist, in this country are in The American Museum of Natural History in New York, the Academy of Natural Sciences in Philadelphia, the National Museum or Library of Congress in Washington, and the Museum of Comparative Zoology at Harvard University, Cambridge, Massachusetts.

The study of mollusks, and kindred subjects, proceeds at such a rapid pace that no Manual or Monograph can possibly present simultaneously adequate descriptions of all the 60,000 or more shellfish

known. When such a work appears gradually over a period of years the result is that upon completion the earlier portion becomes antiquated. There is no single work extant which describes all mollusks, or even all from a given region.

There are a number of elementary books available to the beginner, some of them excellent. Edward Step's "Shell Life" although covering British mollusks is recommended for its lucid style and copious illustrations. Augusta Foote Arnold's "Sea Beach at Ebb Tide" published by the Century Company in 1903 is about the only popular book which includes east coast shells. It was reprinted in 1935.

Professor Josiah Keep's books, covering west coast shells, have been popular for many years in California. His last work "West American Shells" was recently revised by Joshua L. Baily, Jr., of San Diego, California and published by Stanford University under the title "West Coast Shells." It is very accurate.

Julia Roger's "Shell Book" has been a popular one in the Nature Library published by Doubleday Doran and Company. It treats of shells from various parts of the world. Only a small number of American species are included.

The volume entitled "Mollusks" belonging to the Cambridge (England) Natural History series will be found extremely valuable and interesting, especially in connection with the geographical distribution of land shells. Although out of print it may easily be obtained through a dealer in used books. The author, Rev. A. M. Cooke, presents information obtained from many sources together with excellent figures and valuable regional maps.

Pelseneer's Volume V of the Oxford Natural History is also commended.

Woodward's "Manual of the Mollusca" another British publication, easily obtained through similar channels, will be found accurate, and comprehensive. One of the later editions should be chosen, preferably the reprint of the fourth edition (1880) which appeared in 1890.

More difficult to obtain is the French work by Fischer and known as the Manual de Conchyliologie. This appeared in 1887 and is an excellent work. The illustrations are exceptionally fine.

Dr. Henry A. Pilsbry, of the Philadelphia Academy of Natural Sciences, is

the present author of the "Manual of Conchology," begun by George W. Tryon and now being published by the Academy. It is sold by subscription and in the various volumes every species, in the groups covered, is described and illustrated. The purchaser may select black and white or colored illustrations.

The late Dr. William Healy Dall, of the U. S. National Museum, was the greatest authority on American marine shells and from his pen appeared some of the most brilliant, scholarly, and valuable treatises pertaining to his favorite subjects. His check list of East Coast Mollusks, "A Preliminary Catalog," Bulletin 37 of the U. S. National Museum and published in 1889 supplied a long-felt need. Although there are no descriptions the more than one thousand figures and tables showing range in depth, distribution and measurements add much to its usefulness.

Plates 60-74, in this work, have been taken from Bulletin 37.

Dr. Dall also reported upon the "Blake" expeditions into southeastern waters and these findings are well covered in the Bulletins of the Museum of Comparative Zoology at Harvard, during the years 1886-1889.

In 1934 the Boston Society of Natural History published Charles W. Johnson's "List of Marine Mollusca of the Atlantic Coast from Labrador to Texas." This excellent list has been a pattern for the arrangement of the various families in the present volume. It is intended that the two shall be used together, each one to supplement the other.

The reader should subscribe to "The Nautilus," the only regular periodical, published in this country, devoted to mollusks. Its pages are replete with good articles, scientific but frequently presented in popular form. The early volumes of this publication are among the writer's most cherished possessions. A complete digest, to date of its issuance, has appeared and another is in prospect. With these keys to "The Nautilus" a veritable treasure-chest becomes available to shell enthusiasts.

In addition to the foregoing there are several foreign periodicals. Of most interest might be mentioned the Proceedings distributed to members of the Malacological Society of London and also those of the Conchological Society of Great Britain. The

dues, for corresponding members, are nominal.

The monumental monographs of Reeve, Sowerby, Tryon, Pilsbry, and others, lavishly illustrated with hand-colored plates, may be consulted in the libraries, also many other works which have appeared in various languages.

Some years ago and far from the western centers of learning, a Japanese founded in his country at Kyoto a museum which was the first exclusively devoted to shells. Y. Hirase, the founder, with great personal sacrifices succeeded in turning up many new or little-known shells within the borders of his Empire and adjacent territory. He published a small magazine, printed in both English and Japanese, well illustrated and entirely devoted to his chosen subject. His later "Shell Illustrations" published separately reflect in their composition the rare taste and ingenuity of his countrymen. In a country where all art is inspired by nature we find a deep appreciation of its various manifestations. Even among the most humble and the very young there is a keen realization of the beautiful and an intelligently directed urge toward its appreciation and application to the practical everyday affairs of life.

Shell Hunting With a Camera

Of particular value to the active naturalist is the miniature camera. In field work it obviates the necessity of carrying bulky and cumbersome equipment into inaccessible places.

The author uses an instrument of German manufacture and all of the photographs which accompany these pages were secured with it. The various accessory lenses permit copying portions of rare reference books, both text and plates, with comparative ease and rapidity. Many libraries issue permits to bona fide students who desire to undertake this work.

The shell collector should obtain close-ups of life in tidal pools and upon rocks. The telephoto lens may aid in certain undertakings. Motion pictures of active mollusks are often very instructive and valuable. Microphotographs are not difficult to take and together with notes open new worlds of pleasure and satisfac-

tion. Once used in connection with shell work the camera will be found indispensable.

Drawings of Shells

Those possessing artistic ability will find their own sketches of living mollusks accurately done, particularly in out-of-the-way places, often real contributions to science. The delicate and beautiful nudibranchs, or naked sea mollusks which lack shells make splendid subjects. These quickly shrink and deteriorate when preserved in alcohol. Paintings of these alive, the subjects immersed in sea water, often later permit more complete descriptions than otherwise would be obtainable. The camera lucida drawings are also worthy of mention.

The Microscope

The most suitable type for examining small or minute shells, radulae and for dissection is the binocular. Using a small electric spotlight focused upon the subject many hours can be spent comfortably. The various interchangeable eyepieces and objectives permit a wide range of magnification and area covered. The chief objection to this instrument is its cost, between one and two hundred dollars when new. These microscopes are manufactured in Buffalo, New York, and also are imported from Germany.

The well-known one-tube microscope, if sufficiently low-powered, may be used for infrequent work but the resultant eye strain will be found detrimental.

Shell Clubs and the National Society

Two flourishing local clubs, doing serious work, are in Boston and Los Angeles, respectively. Others are needed in various sections of the United States.

Clubs conducting informal gatherings afford opportunities for discussion and comparison of specimens. An occasional field meeting adds zest and a leader may conduct members to the richest and most interesting stations for shells. New recruits soon are enlisted in the cause.

The American Malacological Union, founded in 1931, holds an annual meeting

somewhere in the United States. The present financial secretary, Mrs. Imogene C. Robertson, Buffalo Museum of Science, Buffalo, New York will receive the nominal annual dues of one dollar. All readers are urged to join, attend the meetings if possible and aid in the work the Union is doing for all. It is backed by the most eminent specialists and shell workers in the country.

Nomenclature

The international adoption of the binomial (two name) system as applied to every distinct species corresponds exactly to the use by mankind of the Christian and surname, as for instance the generic *Neritina* (equal to the family name of Smith) and *reclivata* (its counterpart John). The relative position of the two in usage, however, is reversed. Thus we have *Neritina reclivata* Say; the proper name following, often abbreviated, representing the author who first described the species.

In order to recognize the further variations of a given species the various forms which require names are described and we have, for example, *Neritina reclivata sphaera* Pilsbry, a geographical race which exhibits discernible characteristics but of insufficient character to deserve separate specific identity. A long series of specimens from scattered localities would connect the latter race with the typical form. Thus, striking colors and forms, within a given species, are, for convenience, named and placed upon record. This system is known as TRINOMIALISM. Certain schools have carried this method to excess, creating entirely too many names, with resultant confusion.

von Linné was not the originator of the binomial system but the first to apply it to the entire animal and vegetable kingdom and, in consequence, nomenclature takes its origin in the tenth edition of "Systema Naturae" in which work he first applied generally the binary system of naming to all specimens. That was in 1768.

Names of genera and species are words from the classical languages, Greek and Latin, (or Latinized forms of words in other languages); names of families and subfamilies are formed from those of their principal or typical genera, by omitting

the last syllable of the genitive case of the generic name and adding the terminations "idae" or "inae"; for example, *Volutidae* indicates the family, and *Muricinae* the subfamily, of which the genera *Voluta* and *Murex* are typical.

SYNONYMY. On account of the vast quantity of literature pertaining to natural history, in various languages, it is inevitable that species are described many times over, with resultant confusion. Frequent revisions, therefore, become necessary. This state of affairs is one which almost immediately affects the novice but, unfortunately, is unavoidable. The rules of priority are rigidly enforced, sometimes to the exclusion of long-established and well-known names.

UNIVALVES--POSITION FOR STUDY

In order to study a univalve or spiral shell correctly it should be held with the apex (point or place of beginning) upward and with the opening toward the observer. In this position the aperture will usually be found upon the right side. Such shells are DEXTRAL. See Fig. 4.

When the opening, with apex upward, is on the left-hand side the shell is described as SINISTRAL. See Fig. 5.

The length of the tube, its convolution and form, require certain terms of expression which are embodied in the individual descriptions of the various species. When these terms can be defined in a few words they will be found in the glossary, otherwise in the following explanations.

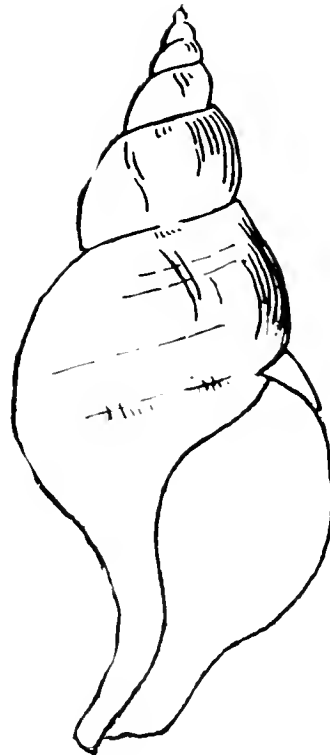


Fig. 4
Dextral univalve, *Fasciolaria tulipa*

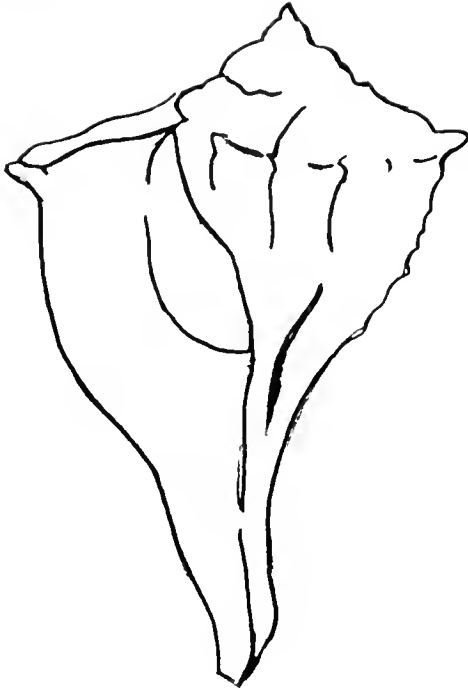


Fig. 5

Sinistral univalve, *Busycon perversum*

The Shell. In classification the shell, which actually is an organ of the molluscan body, plays a very important part.

Shells are EXTERNAL when containing all or a portion of the animal, INTERNAL when enclosed by the mantle.

The calcareous portion of the shell always has an organic base, first secreted by the animal and then impregnated with carbonate of lime which is obtained in the food supply. It is well known that vegetables derive their elements from the mineral kingdom (air, water, and earth) while the animals obtain their elements from the vegetables. When there is a deficiency of lime the shells are thin and delicate, while on the other hand an abundance produces massive or abnormally thickened specimens.

The organic base is called CONCHYOLIN and maintains the utility of the shell during the life of the owner. After death of the occupant the shell soon becomes brittle and unattractive in appearance. When fresh the specific gravity of the concholin exceeds that of Carrara marble.

The disposition of the shelly matter in thin layers, which extend over one

another, diffract the light and cause the iridescent effect; the thinner or more transparent plates affording a beautiful lustre.

The texture of shells varies considerably, some presenting a dull lustre like marble; these are called PORCELLANOUS. Others are pearly, fibrous, horny, or glass-like.

The NACREOUS shells, or pearly ones, when polished supply the "mother-of-pearl." This is the most perishable type and consequently among fossils only fragments usually remain.

Among the FIBROUS shells are layers of prismatic cells. When very thick they break up vertically into pieces.

The oyster with its LAMINATED structure separates into horizontal plates or pieces.

The Epidermis, or periostracum is an outer skin which frequently covers the surface of the shell and acts as a protection against external destructive agents such as acids in the water. It is extremely

variable in form.

Often it is very thin, thus revealing the color pattern beneath, or it may be thick and opaque.

Certain species possess a silky covering while others are hairy or with the appearance of coarse cloth. *Trichotropis borealis*, shown in Fig. 6, has a yellowish epidermis which rises like a bristly fringe along



Fig. 6

Bristly epidermis

the keels of the shell. A bearded aspect is assumed by other species. In *Cypraea* the epidermis, when present, is covered by an additional layer of shell.

The epidermis soon fades and drops off the shell after the death of the animal.

Whorls of Univalves. A whorl is one complete revolution of the shell around the axis, the last one which completes the shell being the BODY WHORL. The number of whorls vary greatly in different species.

Sculpture. This is a very important character. A shell is STRIATE when parallel lines are fine and close together.

It is **SPIRALLY STRIATE** when the stronger lines revolve with the whorls and **AXIALLY STRIATE** when they cross the whorls more or less parallel with the lines of growth. A **CANCELLED** surface is shown in Fig. 7. Often when all other characters fail the sculpture of the nucleus will determine the position of a given species.

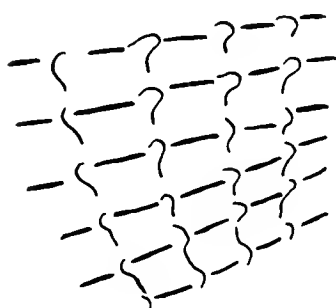


Fig. 7

Cancelled surface

The Umbilicus.

At the base of the shell, corresponding to the navel, there is often present a cavity known as the umbilicus. It may be **WIDE** as in Fig. 8, **CRENULATED** as in *Architectonica*, **NARROW** as in *Littorina*, or **DEEP** as in *Natica*.

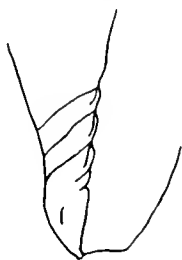
Fig. 8
An umbilicus,
in center

Occasionally the previous whorls are visible; the shell is then called **UMBILICATE**. If the opening is small it is

PERFORATE, when a mere fissure **RIMATE** but when columella is solid and no opening apparent it is **IMPERFORATE**.

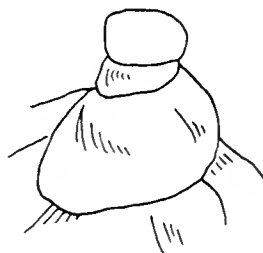
The Columella.

This central pillar is that portion around which the spiral shell revolves; plaits or folds are shown in Fig. 9. The walls adjacent to the columella are sometimes broken down by absorption of internal partitions thus affording more space in a single cavity. When the columella is **TRUNCATE** or notched at its base, it usually indicates carnivorous propensities.

Fig. 9
Plaits on
columella

The Nucleus is that portion of the shell which emerged from the egg or ovum. It may consist of one or several whorls and usually can be recognized on account of

the different character of its surface. In many species it is glassy. The distinctive sculpture has already been referred to. An example of a bulbous nucleus in *Voluta mamilla*, from Australia, is shown in Fig. 10. See also descriptions of Volutidae, p. 127.

Fig. 10
Bulbous nucleus

The Apex. The tip or beginning of the shell which is the top of the univalve illustrations shown in this volume, Fig. 11a. Only the French figure shells with the apex pointed downward.

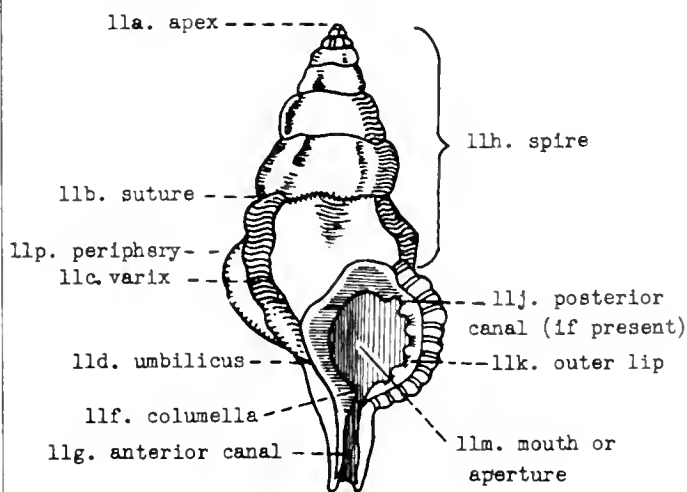


Fig. 11

Illustrating the technical terms applied to the various parts of a univalve shell

The Spire. This embraces the entire univalve shell with the exception of the final whorl, Fig. 11h. It may be **DISCOIDAL**, resembling a disk, as in *Skenea*, elongated as in *Terebra*, or one of almost endless intermediate stages.

Base of Shell. The opposite extremity to apex; also called anterior end of univalves or most recently built portion.

Periphery is that portion of each whorl which is most outwardly developed and usually midway between suture and base, Fig. 11p. It may be more or less rounded

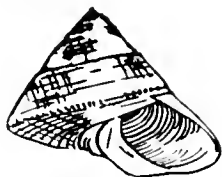


Fig. 12
Calliostoma,
showing carina

or keeled. When very sharp the edge is known as the CARINA, Fig. 12 in the accompanying figure of Calliostoma harisi, a fossil species from the southern states.

Several of the Astraeas are strongly carinated species.

Suture is that portion where the whorls join; see Fig. 11b. It is largely influenced by the convex or planate characters of the whorls. It may be CANALICULATE or CHANNELLED when a broad and deep channel follows close to the junction of the whorls. This is well illustrated in Busycon canaliculatum, Fig. 13.



Fig. 13
Channelled suture in
Busycon canaliculata

It is CRENULATED when the suture is interrupted by indentations which break the continuity. An example of this is Pyramidella crenulata, from Florida.

The Aperture is the last portion formed and through which the animal emerges. It may be ROUND, NARROW, or another shape, Fig. 11m. Sometimes it is greatly contracted with folds or teeth which it would seem almost impossible for the animal to pass without injury (see Pedipes mirabilis, Pl. 55, Fig. 8). The OUTER LIP is shown in Fig. 11k, the round peristome in Pl. 32, Fig. 3.

In describing the component parts of the aperture the length of the same is considered parallel with the length of the shell, the width transversely to this. The various terms used in connection with the aperture will be found explained in the glossary.

Varices. In certain families there is a tendency for the animal to indicate rest periods in shell building by periodic thickenings of the lip. At each of these stages the shell in consequence assumes a mature aspect. When full growth is attained these early thickenings of the lip are often still apparent. There may be one or more of these. One is known as a VARIX, Fig. 11c, but this term is never applied to

the final or most recent lip. Several are known as VARICES. Examples: Epitonium and Gyreneum. In certain cases the varix may assume the form of a hump.

Position When Active. The Gastropod mollusk when crawling, foot downward, usually carries the shell in such a manner that the apex points backward. The operculum, when present, is pushed to one side.

Canals. When present in the shell these may be observed adjacent to the aperture. Holding a shell with the spire upward the POSTERIOR CANAL is the upper one, Fig. 11j; the ANTERIOR CANAL the lower, Fig. 11m. When the animal is moving forward the former is in the rear, the latter in front and closest to the head of the mollusk.

The Operculum. The door which closes the aperture of many spiral shells is attached to the animal. When a mollusk possesses this appendage it is OPERCULATE. When absent it is INOPERCULATE. The material used in its construction is usually horny but in some species it is shelly or calcareous.

The operculum is formed in the embryo, within the egg, as is the first or several whorls of the shell. The point from which growth starts in the operculum is called the NUCLEUS. While many of these doors fit with accuracy others only partially block the entrance. Conus, having developed a poisonous bite, is less dependent upon an operculum for protection against intruders and in consequence the door has, in certain species, degenerated greatly in size.

The various forms of the operculum may be expressed in these terms:

- CONCENTRIC--When it increases equally all around the nucleus, Fig. 16.
- ARTICULATED--When projections correspond to teeth in the shell, as in Nerita, Fig. 14.
- CLAW-SHAPED or UNGUICULATE--As in Strombus, Fig. 18.
- PAUCISPIRAL--Few whorled as in Littorina.
- EXCENTRIC--When nucleus is at edge and development one-sided; Fig. 17.
- SPIRAL--When growth is only on one side and revolutions are made with growth, Fig. 15.

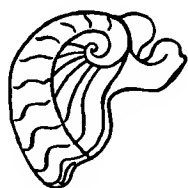


Fig. 14

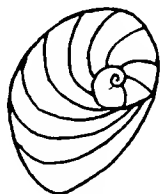


Fig. 15

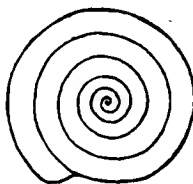


Fig. 16

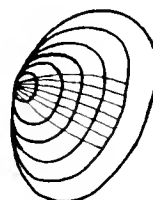


Fig. 17

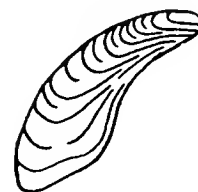


Fig. 18

Forms of the operculum

MULTISPIRAL--When there are numerous whorls, often as many as twenty.

In dextral, or right-handed spiral shells, the operculum when spiral itself is sinistral or left-handed. In left-handed shells the spiral operculum is naturally the reverse. There are a few exceptions to this rule in the Pilidae and Spiratellidae.

The number of turns in the operculum is not affected by the revolutions of the shell but rather by the form of the aperture with which it must keep pace.

The operculum is of considerable interest and always should be preserved with specimens. Not too much importance, however, should be accorded it as an aid to classification. In Naticidae and Pilidae both horny and shelly operculums occur within the respective families.

BIVALVES

The PELECYPODA are entirely aquatic mollusks, although sometimes remaining for

long periods out of water, and rank next to the Gastropoda in variety of forms. The bivalves individually, however, are much more plentiful.

Normally the Pelecypod shell consists of two valves, distinct and separate, usually covering the right and left sides of the animal.

Margins of Shell. The hinge line, along which the valves are united by the ligament and interlocking teeth, is placed upon the dorsal region of the animal and forms the upper or DORSAL MARGIN of the shell, Fig. 19a. The opposite side is the VENTRAL or LOWER MARGIN, Fig. 19b, and is often thin and sharp. The POSTERIOR or SIPHONAL END, Fig. 19d, refers to the end upon which the ligament is situated, at the opposite extremity is the ANTERIOR MARGIN or ANTERIOR END; Fig. 19e.

Right and Left Valves. The valves are right or left depending upon the side of the animal. To identify these the shell should be placed in position as when crawling, the ligament upward and toward the observer, the anterior or opposite end pointing forwards. The right or left valves then agree with the student's right or left hands. On Pl. 54, Fig. 8, representing a large clam, the ligament is shown distinctly. In this illustration the right-hand point is the anterior end, the lower valve the right valve.

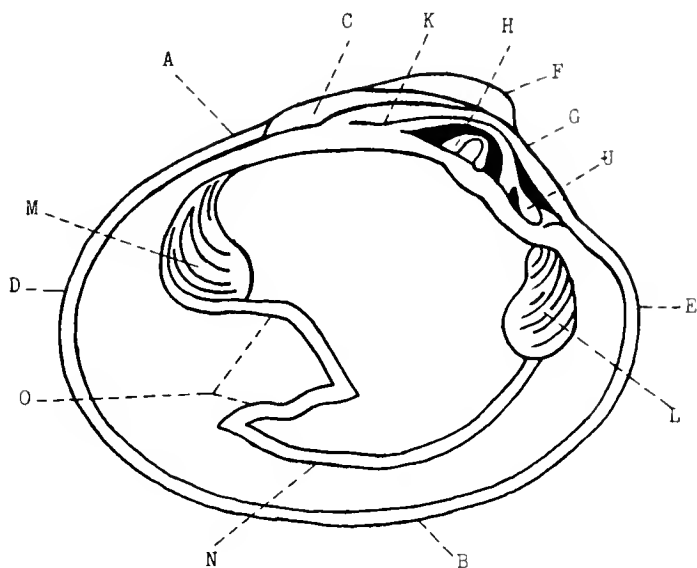


Fig. 19

Parts of bivalve shell, 19a Dorsal margin, 19b Ventral margin, 19c Ligament, 19d Posterior end, 19e Anterior end, 19f umbo, 19g Position of lunule, 19h Cardinal teeth, 19j Anterior lateral tooth, 19k Posterior lateral tooth, 19l anterior adductor, 19m Posterior adductor, 19n Pallial line, 19o Pallial sinus

Relative Size of Valves

Bivalves generally are EQUIVALVE, the right and left valves corresponding in form and size. INEQUIVALVE forms are occasionally met with, for example Pl. 60, Fig. 5a.

The majority are INEQUILATERAL, more or less unequal sided, with the umbo toward one end and the anterior side usually the shortest, Fig. 19. When the umbo is situated near the center of a symmetrically formed shell, with corresponding area of anterior and posterior side, the shell is called EQUILATERAL, Pl. 54, Fig. 3.

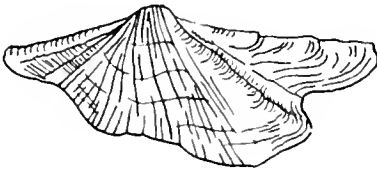


Fig. 20

Alate or winged shell, *Arca wagneriana*, Florida Pliocene

larger, Fig. 20.

The term CLOSE is applied when the shells fit accurately together at the margins and appear to seal the shell. When open spaces are present, the fit not accurate or complete, the shell is GAPPING.

The Umbones. One of the pair is called the UMBO, Fig. 18f. This term is used to designate the prominent part or "apex" of each valve. It is formed around the embryonic shell. As growth progresses the umbones naturally become wider apart. They frequently possess totally different sculpture than the subsequent growth and offer important and dependable characters in the arrangement of species in natural groups.

The umbones usually point forward but there are a few exceptions in which they point backward (*Donax* and *Semele* among others).

The Rostrum or Beak. This is the produced posterior end of bivalve shells, often accentuated by bluntly angular ridges which follow to the umbones, Pl. 60, Fig. 6b.

The Lunule. The lunule is an oval,



Fig. 21
Lunule, heart-shaped area

often heart-shaped, indented space in front of, or anterior to, the umbones, Fig. 21. In separated valves this space is called the ANTERIOR SINUS but it is present in both valves. Many species do not possess the lunule.

The Hinge and Its Parts. The active bivalves usually have the strongest hinges; the sluggish forms, or those which are fixed during life, the weakly formed or toothless ones.

The hinge itself is on the margin and composed of chitinous ligament and teeth (denticles) which closely interlock.

There is great variation among the HINGE TEETH. Juveniles show well-defined characters and are better for study. Old individuals often partially cover the teeth with shell deposit and they are consequently ill defined. The CARDINAL TEETH are placed immediately below or between the umbones, Fig. 19h. On each side of the central teeth, or cardinals, are the LATERAL TEETH which often are well apart from the others. The ANTERIOR-LATERAL, Fig. 19j, is the one in front of the shell, while the POSTERIOR-LATERAL, Fig. 19k is the one in the rear. While the cardinals are sometimes very small, or absent altogether, it is more frequent to find the lateral teeth not present. In *Arca* the usual teeth are lacking and are replaced with a large number of regularly arranged small teeth. The latter are usually feeble toward the umbo. The hinge of *Cardium* is shown in Fig. 22.



Fig. 22
Hinge of *Cardium*, exhibiting arched teeth

All sorts of combinations and developments occur among the hinge teeth. Upon these depend, to a large extent, the identifications of many species.

The Muscular Impressions. These indentations inside bivalves often indicate the condition and position of the locomotive and respiratory functions of the organism. The two most prominent are known as the ADDUCTOR MUSCLES. The ANTERIOR ADDUCTOR is shown in Fig. 19l, the POSTERIOR ADDUCTOR in Fig. 19m. The line connecting

these two is the PALLIAL LINE, Fig. 19n, while the notch in the same line is called the PALLIAL SINUS, Fig. 19o.

The Ligament. This is an ^{wavy} uncalcified part of the shell, often attached to ridges along the dorsal margin, posterior to the umbones and uniting the valves, Fig. 19c. It is dark brown and very prominent in *Tellina alternata*. It is plainly shown in *Macrocallista*, Pl. 54, Fig. 8. When the ligament is inside the shell it is called the RESILIUM. The black resilium of *Spisula*, a common clam, is a good illustration. When fresh and wet the ligament is flexible but when dry must be broken to open the valves. A little glycerine applied to cabinet specimens will facilitate examination. The FOSSETTE is a receptacle for the ligament.

Sculpture. The external sculpture of bivalves is often smooth but it may be otherwise. Growth lines indicate successive stages in the development of the shell. CONCENTRIC RIBS run parallel with the margin of the shell. They are prominent in *Anatina canaliculata*, Pl. 26, Fig. 3. CONCENTRIC LINES are much finer and closer together. FOLIACEOUS refers to a surface resembling overlapping leaves of a plant. RADIATING RIBS are those which emanate from the umbones and cross the concentric sculpture.

The INTERNAL SURFACE is usually white, polished, frequently iridescent and also sometimes beautifully tinted. In some cases there are ribs present which strengthen the shell and are not visible outside.

The Byssus, when present, is used for attachment to some solid object. It may be of coarse texture or silky as in *Pinna carnea* which is shown on Pl. 5, Fig. 1. Always there is an opening in one of the valves for its passage, as may be seen in *Pecten*.

Methods of Reproduction

Among mollusks no cases of asexual reproduction have been recorded. Usually the sexes are separate although one large subclass of the Gastropoda are hermaphroditic. In the most highly organized mollusca the sexes are distinct. The develop-

ment of a sexual arm in the male *Argonauta* is significant.

In some of the simpler types the spermatozoa are simply discharged into the sea and are inhaled with the respiratory currents by the opposite sex.

The oyster is said to lay about 10,000,000 eggs. Certain other mollusks deposit very few eggs, especially among the land and fresh-water forms. Some species normally hatch eggs within the body of the parent. Others deposit the eggs upon the shells of their own kind.

The development of the trochophore stage has already been explained (page 1).

The eggs themselves are individual units, often arranged in clusters within a protective case shaped like a long narrow tape or ribbon.



Fig. 23
Egg cases of *Busycon perversum*

An example of this may be seen in *Busycon perversum* (Fig. 23). The globular-shaped eggs, arranged in clusters, of the apple snail, *Pomacea paludosa*, are frequently seen in May upon grasses just above the watermark of Florida canals and lakes, Fig. 50a, page 128.

The Radula. After passing through the jaw the food of the gastropod mollusk comes in contact with the adjacent radula. The latter is coiled like a watch spring, near the jaw, and is used to scratch, tear, or bore rather than to bite. Only a small portion is used at a time and food passing over it is carded small. It is also utilized as a tool for boring into other shells in order to extract their contents. Evidences of this work are frequently found in empty shells which have been neatly drilled, see Fig. 22, page 16.

The radula is often like a flat ribbon of varying length and breadth, often colored yellow or red in front. Upon the upper surface are teeth of various sizes, number and arrangement, usually in symmetrical rows. In the center of the ribbon the

teeth are usually normal, those in front often much worn by use, while at the opposite end are in an undeveloped state.

The radula is very narrow in *Littorina* and several times the length of the entire animal. It is entirely absent in certain families including the *Coralliophilidae* whose members live upon coral and are nourished by their exudations. In parasitical mollusks, as for example those living upon sea urchins, the radula has degenerated on account of disuse. Another genus, *Melanella*, with similar habits lacks both radula and jaw.

Some of the peculiarities worthy of mention explain certain irregularities. For example, young examples are not always like their parents. In some adults the radula is absent but present in juvenile specimens of the same species (*Harpa*, a Pacific shell, for example). In *Voluta* the lateral teeth often are lost in the adult form but the young exhibit normal ribbons.

Like the longitudinal rows of color in a length of ribbon, with a central stripe, every band of color is duplicated in the same relative position on the opposite side.

The radula may readily be removed from large mollusks by cutting near the mouth but with small or minute species a special process is necessary. The entire animal, fresh or dried, is placed in a test tube containing nearly a tablespoon of caustic potash which has first been allowed to liquefy in the air. It should boil gently over a flame but the contents not allowed to boil over. The material should not be permitted to lodge upon the side of the tube. When the solids are fully dissolved the contents are poured out quickly upon a watch glass which may be stirred with a rotary motion revealing the radula in the center. A piece of white paper under the glass will make the search easier. The curved and elongated radula, unless microscopic, may be removed with a needle point. Placed in a drop of water it is ready for examination under a cover glass. A low objective in the microscope or a good magnifying glass will suffice.

On account of their transparency many of the radulae, especially among the small species, require staining which will not injure the delicate teeth. Shields Warren recommends for the marine forms a saturate aqueous solution of potassium bi-

chromate which may be allowed to act for from five to fifteen minutes. An indefinite period of immersion does no injury. Land and fresh-water species cannot be treated in the same manner and for these a 5-per cent solution of chromic acid works well. The radula is placed on a slide, covered with four or five drops of the acid, and heated until the acid precipitates at the edge of the drop. If overheated the teeth may become separated from the lingual ribbon. A thorough washing is necessary after either process. The ribbons may then be mounted in balsam which is the most satisfactory medium. Glycerine jelly makes a suitable temporary mounting material but the staining process should be used first.

The MEDIAN or RACHIDIAN tooth of the radula is the central one.

The LATERAL or ADMEDIAN teeth lie between the other two sets and are less numerous but usually larger and more variable. When one of these is more prominent it is called the MAJOR LATERAL, and others are the MINOR LATERALS.

The MARGINAL TEETH or UNCINI, near the margin, differ sufficiently in character to separate them from the others. They are small, simple, and very much alike.

The radula is bilaterally symmetrical. Any series of the teeth may be absent, the median often being absent in certain species. The cusps, when they are present, are very brittle and break readily under the pressure of a cover glass. Abnormal or deformed radulae occur and from these the student should not draw incorrect conclusions. It is advisable to prepare several specimens simultaneously and at least one perfect example will likely result.

The DENTAL FORMULA is used to express the number and situation of the teeth. For example:

$$8 : 3 : 1 : 3 : 8$$

indicates one median tooth in the center; three lateral teeth adjoining; eight uncinial teeth upon the outside.

When any of the series is absent a cipher is employed to indicate this. Thus:

$$3 : 3 : 0 : 3 : 3$$

shows that the median tooth is absent, that there are three lateral and three uncinial

teeth upon each side. The radula being bilaterally symmetrical the last formula may be abbreviated to read:

$$0 : 3 : 3$$

Further study may reveal that the cusps are denticulated or toothed, and where there are no lateral or uncinal teeth and the median is reduced to a tricuspid series the condition is expressed:

$$0 : 0 : \frac{1}{3} : 0 : 0$$

Drawings of the radulae are very useful for reference.

The radula affords aid in the distinction of genera and species. As a basis for classification it has been used in dealing with the Gastropoda, particularly the order PROSOBRANCHIATA. The latter, when using this system, is divided into the MONOTOCARDIA and DITOCARDIA. Dealing first with the Monotocardia there are the following divisions:

(a) TOXOGLOSSA. Three families, all represented on the east coast, Terebridae, Conidae, and Cancellariidae belong to this group. The radula consists merely of large marginal teeth on each side, no central tooth and no laterals. In *Conus* the teeth attain great size and are provided with a poison gland.

(b) RACHIGLOSSA. It includes among others the Olividae, Marginellidae, Volutidae (Fig. 24), Mitridae, Pyrenidae, Muricidae, (Fig. 21) Coralliophilidae. Most or all of these have been or are carnivorous. The radula consists of a central tooth with one to fourteen cusps, a single lateral with more or less cusps, the outer being the largest. Teeth mostly sharp, hooked and with a broad cutting edge. In *Fasciolaria* they are toothed like a comb.

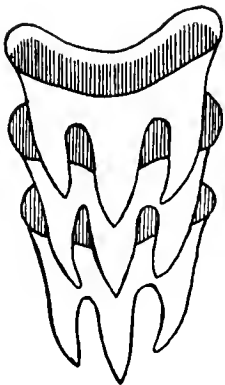


Fig. 24
Radula of Voluta

(c) TAENIOGLOSSA. Here are grouped about forty-six families including the Cassididae, Cypraeidae, Strombidae,



Fig. 25
Radula of Murex

Cerithidae, Littorinidae (Fig. 26), and Naticidae. The central tooth is very variable, usually multicuspid,



Fig. 26
Radula of Littorina

the central cusp being dominant; a single lateral, more or less cusped; two uncini, singly hooked or a little cusped. The

normal formula of the Taenioglossa is 2.1.1.1.2.

(d) PTENOGLOSSA. This group includes the Janthinidae and Epitoniidae. The radula possesses an indefinite number of hooked teeth, the outside being the largest. In *Janthina* the central tooth is absent, the ribbon being of two large divisions with a gap between them down the center.

(e) GYMNOGLOSSA. Both jaw and radula being absent it is difficult to identify the two families, Melanellidae and Pyramidellidae, which are placed here.

Under the Ditocardia, already referred to, there are three groups:

(f) RHIPIDOGLOSSA. About seventeen families are included, among them the Neritidae, Turbinidae, Trochidae, and Fissurellidae (Fig. 27). The radula is remarkable in the development of the uncini or outer teeth. They are long, hooked, often cusped, ar-



Fig. 27
Radula of Fissurella

anged like a fan's ribs, curving backward as they diminish in size. In only a few cases are they countable. The average number of lateral teeth is five. In the Neritidae the lateral is especially large

and known as the CAPITULIFORM TOOTH, often shaped like the blade bone of a shoulder of mutton. The central tooth is present and often small.

(g) DOCOGLOSSA. Compared with the Rhipidoglossa the members of this group possess a radula with a few strong teeth.

Only three families, Acmaeidae, Patellidae (Fig. 28) and Lepetidae are placed here. The number of teeth in a row range from two to twelve. The ribbon is often very long, the teeth heavy, deep-horn color, and somewhat opaque. The arrangement is somewhat complicated with a multiplication of identical centrals. In some cases there is no true central tooth. Lateral and marginal teeth may be lost, when present they are few in number.

Outside of the Gastropoda, which have just been discussed, the radula occurs in the Amphineura or coat-of-mail shells. In these it is unique, being composed of thick and deeply colored teeth, greater in number

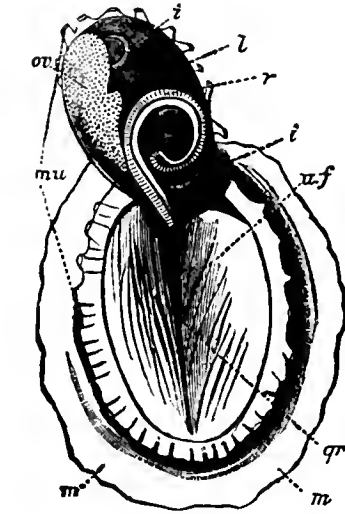


Fig. 28

Radula of Patella

Patella vulgata L., showing the normal position of the radula, which is doubled back in a bow; the shell has been removed, and the whole visceral mass is turned forward, exposing the dorsal surface of the muscular foot; gr, longitudinal groove on this surface; i, i, intestine; l, liver; m, m, mantle edge; mu, muscles (cut through) fastening the visceral mass to the upper sides of the foot; ov, ovary; r, radula; u.f, upper or dorsal surface of the foot.

than in the Docoglossa. In the Scaphopoda, or tusk shells, the radula is large and peculiar. It occurs in Dentalium with a broad plate representing the central tooth. The one lateral tooth is robust, arched, and a little cusped; the marginal a large quadrangular plate, quite simple. The formula for the Scaphopoda would be

1.1.1.1.1. Among the Cephalopods the radula is of a singular uniformity. It is always small, with a central tooth, a few marginal and very few lateral teeth.

Localities

In the descriptions of the various species the range indicated is in each case inclusive; thus Maine to Florida indicates that an individual species has been recorded from both Maine and Florida, besides intermediate points. (See Map of Florida, page 301.)

A solitary beach specimen, without the living animal, might easily be carried by the sea a long distance. The presence of several beach specimens together usually indicates that the species is living somewhere nearby.

The temperature of the sea water largely affects mollusks. The species living in shallow water of Maine or Canada, at a given temperature may occur in the south in much deeper water where the temperature is similar.

It will be noted that the figures include a number of shells from distant localities. These species also occur upon the coasts of the United States. It has been impossible to illustrate local material in every case but usually the figures will make identifications possible.

Dimensions of Specimens

The size of individuals is an important matter in making comparisons of the various species. Many are very constant in the over-all length of the shell and the dimensions often furnish a clue in making an identification. However, the size is often influenced by the temperature of the water and the food supply. These matters should be taken into consideration and due allowance made. For example West Indian specimens often are larger and more brilliantly colored than the same forms living well up the continental coast.

The figures on the plates are drawn or photographed to different scales. In the explanations of the plates, and in the text, the figures refer to the greatest dimension, length or width of the shell, not the animal. One millimeter is about one twenty-fifth,

or four one-hundredths of an inch. In the plates of drawings, 60-73, derived from Dall's Bulletin 37 of the U. S. National Museum, the figures are life size, otherwise the magnification or reduction is shown on the plate itself.

The length or width of specimens, appearing on Plates 1 to 59 is indicated in many cases by a line, corresponding in length to the over-all dimension of the

shell. The presence of a line indicates that the illustration is enlarged. The absence of a line indicates that the figure is approximately natural size or else reduced.

The term "Fig." together with a numeral and no plate number indicates a reference to a figure in the text and not upon a plate.

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CLASS AMPHINEURA

The Amphineura are one of the five primary divisions of the Mollusca and in many respects the most primitive of all.

The Chiton consists of eight plates bound together by a leathery girdle of connecting tissue. Fig. 29 shows the details of the plates.

They are bilaterally symmetrical; the anus is posterior and median; the head without tentacles or eyes. Upon the outside or dorsal surface, of certain species, are minute black eyes in great numbers which appear to refract light.

They may be sought for on all except sandy coasts. Some are found upon rocks at or near high tide, others between tides and at varying depths clinging to shells, stones or solid objects. A blunt knife is useful in detaching them from rocks. They should be tied to a flat stick, after capture, to prevent curling and bound with soft twine. This will support them until the tissues are relaxed when they may be placed in alcohol. As an alternative

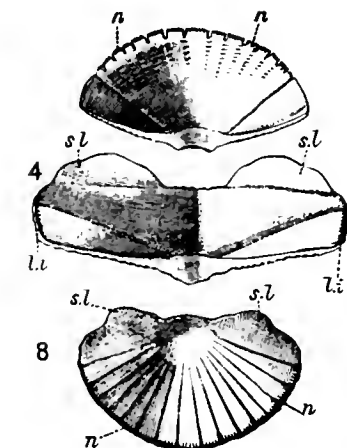


Fig. 29

Plates of Chiton First, fourth, and eighth valves of a Chiton, showing l.i, laminae of insertion; n, n, notches; s.l, s.l, sutural laminae. X2

they may be boiled and the soft parts removed but in the tropics it is better to preserve them in spirit.

The descriptions and illustrations covering the coat-of-mail shells are largely derived from Pilsbry's work in the Manual of Conchology.

ORDER POLYPLACOPHORA

Family Lepidopleuridae

GENUS LEPIDochITON Gray 1821
(PRETTY CHITONS)

LEPIDochITON ALBA Linné. White Chiton. Shell small, under a microscope the surface beautifully granulated, covered with bluish-black color which easily rubs off; valves slightly keeled, a feeble ridge often dividing each side into two triangles; about twelve marginal teeth upon anterior valve; margin yellowish, membranous and with beaded granules as a covering. Length 13 mm. Range in depth 1-337 fathoms.

Pl. 56, Fig. 6

Greenland to Massachusetts Bay

LEPIDochITON MARMOREA Fabricius. Marbled Chiton. Shell brownish or yellowish red variegated with angular whitish lines, also whitish points along the posterior edge of valves, minute granules upon surface, margin pubescent (hairy). Length 35 mm.

Pl. 56, Fig. 7

Greenland to Massachusetts; Circumboreal

LEPIDochITON RUBER Lowe. Red Chiton. Shell small, oval, keeled, elevated lines of growth visible upon valves; light brick-red or flesh color with streaks of crimson upon one or more valves, often incrustated with a black foreign substance; margin with red and white dust arranged in alternate stripes; interior bright red. Length 20 mm.

Found mostly adhering to stones, 1-80 fathoms.

Pl. 56, Fig. 8

Pl. 70, Fig. 9

Labrador to Connecticut; Circumboreal

Family IschnochitonidaeGENUS ISCHNOCHITON Gray 1847
(SLENDER CHITONS)

ISCHNOCHITON FLORIDANUS Pilsbry. Florida slender Chiton. Shell elongated, narrow; valves roughly arched, not keeled; whitish or delicate green, mottled with olive or gray; interior pink, blue, and white, or rarely all white or rosy. Girdle delicately marbled with bluish and gray, clothed with rounded scales. Length 41 mm.

Pl. 56, Fig. 5

Southern Florida to Key West

ISCHNOCHITON LIMACIFORMIS Sowerby. Shell elongated and narrow elevated; buff, gray, or greenish, occasionally blotched with red; interior stained with bright pink and blue-green; anterior valves with eleven slits, central valves with one, posterior valves nine slits; teeth sharp, eaves solid and grayish. Length 35 mm.

Lives under stones at low water.

Pl. 56, Fig. 9

Florida Keys; West Indies

ISCHNOCHITON PAPILLOSUS C. B. Adams. Pimpled Chiton. The smallest of the Florida or West Indian Ischnochitons. It is uniformly granulated, the lateral areas very indistinctly defined; shell wide, greenish, closely spotted with whitish and black; girdle finely scaly, alternately greenish and white. Length 7 mm.

Dredged by the writer off the Florida west coast, clinging to shell fragments, in about 2 fathoms and near Cape Romano.

Pl. 56, Fig. 3

Marco; No Name Key; Key West, Florida

GENUS CHAETOPLEURA Shuttleworth 1853

CHAETOPLEURA APICULATA Say. Bee Chiton. Shell convex, subcarinated, grayish or pale chestnut; three to four concentric lines upon anterior valve and many elevated distant dots arranged in regular lines along edge; six following valves with elevated point like beads which attain greater height than the dorsal triangles; posterior valve with dots similar to dorsal triangles, a middle knob and the

remainder with dots like those on anterior valve. Length 1 inch. Range 3-12 fathoms.
Pl. 57, Fig. 6
Pl. 70, Fig. 10
Vineyard Sound, Massachusetts to Florida

GENUS CERATOZONA Dall 1882

Valves strong, exposed; girdle tough, bearing peculiar corneous spines similar to itself and generally bunched at sutures.

CERATOZONA RUGOSA Sowerby. Wrinkled Chiton. Shell oblong, back broadly arched; surface green olive or slate on sides, central areas whitish along middle; tail valve with broad pink ray behind; interior blue-green; girdle horny yellow, very tenacious, wide, yellowish with long pointed spines, most numerous around edge, slender flexible beards scattered among spines. Length 40 mm.

Pl. 57, Fig. 1

Pl. 56, Fig. 4

Jupiter Inlet, East Florida to West Indies

Family ChitonidaeGENUS CHITON Linné 1758
(COAT OF MAIL SHELLS)

CHITON TUBERCULATUS Linné. Swollen Chiton. Color varying from light olive to dark olive brown, sometimes unicolored but generally speckled on side areas and end valves, often clouded on central areas; some valves with dark stripe on the ridge. Interior blue-green, very smooth; girdle buff, white or light green, with patches of blackish or dark green. Scales coarse, convex, polished. Length 2.5-3.5 inches.

Pl. 56, Fig. 1

Florida Keys to Texas; West Indies

CHITON MARMORATUS Gmelin. Marbled Chiton. Shell oval, rather high; surface smooth, polished; color variable, usually greenish or brown, with darker spots, streaks and lines; interior blue-green, each valve often with darker posterior rays; anterior valve with eleven to fourteen, central valves one, posterior valve thirteen to seventeen slits; eaves and slit-rays very porous. Girdle touched with green and

light blue. Length 56 mm.

Pl. 57, Fig. 2

Florida Keys; Texas; West Indies

GENUS ACANTHOPLEURA Guilding 1829

ACANTHOPLEURA GRANULATA Gmelin. Grained Chiton. Shell oblong, surface usually eroded, dull; generally a patch of brown on ridge of each valve; interior sea-green, varying to lead blue, or on plates fading to nearly white; girdle thick and fleshy, covered with short little spines which in turn are black or white and calcareous. Length 2.5 inches. The common Chiton of the West Indies.

Pl. 56, Fig. 2

West Florida; Key Vacca; West Indies.

Family Acanthochitidae

GENUS ACANTHOCHITES Risso 1826

Valves partially buried in, or covered by, girdle; exposed part consisting of a smooth or striated band; side areas granulated but this feature sometimes lacking; five slits on anterior valve, middle valves with one slit on each side; posterior valve with two or more slits. Girdle variable, ranging from hairy to naked but always with four bristle bearing pores around head valves and a single series at sutures.

ACANTHOCHITES FLORIDANUS Dall. Narrow and long; black, purple-black or light brown with white lined space at top of each valve; valves entirely covered with exception of round dot at apex of first and a narrow band along ridge of other seven valves, band slightly swollen at apex of each valve.

Valves when separated are white, pink, or purple; girdle wide, leathery and naked, when fresh the color and texture of a moist prune; each suture with minute bristle-pore and four pores around head valve, also with some short bristles upon

each pore.

This species is separable on account of the dark glistening girdle and long white strokes along median line like exclamation points without the dots. It lives upon the reefs and is procurable at low tide. Length 21 mm., breadth 7.5 mm. (dried).

Pl. 57, Fig. 4

Cape Florida; Key Largo; Key West; Tortugas, Florida

ACANTHOCHITES HEMPHILLI Pilsbry. Elongated, valves of dried examples exceeding one-third of total width; valves elevated, keeled, red and spotted with white; interior light green at sides, rose-red in middle and at posterior end of each valve; usually two slits in posterior valve together with six to eight unequal slits or niches between; girdle rusty brown with short microscopic spicules, fringed ones at periphery and eighteen small tufts of whitish bristles. Length 24 mm., breadth 11 mm.

Pl. 57, Fig. 16

Key West, Florida

ACANTHOCHITES PYGMAEUS Pilsbry. Allied to *A. spiculus* but much smaller and with a high roof-like form, tufts also smaller. Length 8 mm., breadth 4 mm.

The smallest species of the genus, often found in shallow water adhering to bits of shell or on rock.

Pl. 57, Fig. 5

Cedar Keys to Key West, Florida

ACANTHOCHITES SPICULOSUS ASTRIGER Reeve. Shell oblong, depressed, not carinated; valves of varying shades of green, often touched with brown on sides, frequently with wide white stripes on sides; interior blue-green; notch deep and wide; girdle velvety, green and with eighteen large greenish-white tufts or spicules, the same also on periphery. Length 20-22 mm., breadth 9 mm.

Pl. 57, Fig. 3

Florida Keys; West Indies

CLASS PELECYPODA

To this class belong the oysters, clams, scallops, mussels, and similar organisms, usually with bilateral symmetry. The shell is usually of two valves and mantle of two lobes. Many of these live buried in mud or sand but often are attached to rocks, shells, sponges, or other foreign objects.

The shell, in two parts, is often externally held together with an elastic hinge and internally bound by the strong muscles which must be severed to entirely separate the valves. It is a defensive covering against enemies and irritation from without.

As will be noted from the descriptions of the respective families there is wide diversity in form, size and sculpture which result from the nature of the environment, external influences and hereditary traits.

ORDER PRIONODESMACEA

An ancient group which has retained many early features through long periods of Geologic time. Lobes of mantle generally separated; shell nacreous and prismatic, rarely porcellanous.

Family Solemyidae

Shell equivalve, elongated; epidermis heavy and shining, extending far beyond margin.

GENUS SOLEMYA Lamarck 1818

SOLEMYA BOREALIS Totten. A much larger shell than *S. velum*. The valves are less convex, more solid; grayish-blue or lead colored interior; fifteen or twenty radiating lines upon epidermis which is of a brown



Fig. 29a
Solemya borealis
2 inches

or tan color; ends of lobes rolled back.

It has been collected on Chelsea Beach, Massachusetts and off the coast of Maine. Length 2 inches.

Fig. 29a

Nova Scotia to Connecticut

SOLEMYA VELUM Say (Awning Shell). Shell extremely thin and fragile; epidermis pale brown with radiating lines; interior purplish white; cartilage support arched.

The epidermis hanging over the edge like a veil at once distinguishes it. Length 1 inch.

Pl. 2, Fig. 3

Pl. 73, Fig. 3

Nova Scotia to Florida

Family Nuculidae

Shell transverse; no area for ligament between umbones; a straight series of teeth on each side, making an angle at a spoon-shaped pit which separates them.

GENUS NUCULA Lamarck 1799 (Nut Shells)

NUCULA PROXIMA Say. Near Nut. Shell small, thick, solid, very oblique in shape; anterior end perpendicular to base; surface sculptured with minute radiating lines; epidermis dark green; interior pearly; margin of shell crenulated; twelve teeth before, eighteen behind umbones. Length 12 mm. or less.

Often taken in stomachs of fish in New England. Dredged abundantly in shallow water off Cape Romano, west Florida, by the writer in August 1933.

Pl. 2, Fig. 1

Nova Scotia to Charlotte Harbor, Florida

Family Nuculanidae (Lecidae)

Line of teeth interrupted by an oblique pit for the ligament; most of the teeth behind the pit; shell much produced behind.

Most of the species occur below low tide mark.

GENUS NUCULANA Link 1807
(Leda Schumacher 1817)

NUCULANA ACUTA CONRAD. Pointed Nut. Shell inflated, oval, anterior end rounded and somewhat drawn out, ridged from umbones to anterior base; sculpture of well-defined ridges which are mostly concentric; interior shining; color greenish olive. Length 9 mm. Depth range 2-225 fathoms.

A variable little shell. It is quite common in a few feet of water off the Florida west coast.

Pl. 2, Fig. 2
Off Martha's Vineyard to West Indies

GENUS YOLDIA Muller 1842;
Portlandia, Morch 1853

Shell compressed, posterior end pointed; sculpture fine; covered with a varnish-like epidermis; slightly pearly inside.

YOLDIA LIMATULA Say. Shiny Yoldia. Very smooth and shining; umbones near center; twenty-two teeth on anterior, eighteen on pointed side. Length 48 mm. or less.

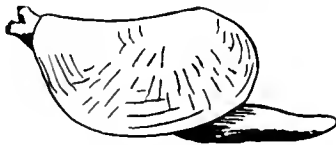


Fig. 30
Yoldia limatula
PANDORA

A series from Raritan Bay, New Jersey which was dredged around the year 1875. It probably is extinct there now.

The animal is very active and will leap to an astonishing height, in this respect exceeding the scallop (Pecten) shells, Fig. 30.

Pl. 2, Fig. 4
Gulf of St. Lawrence to North Carolina

YOLLIA SAPOTILLA Gould. Pale yellowish green, translucent, thin, about sixteen teeth on each side. Range 4-100 fathoms.

It lives chiefly off Cape Cod and

may be obtained by dredging or in the stomachs of fish. Length 23 mm.

Pl. 2, Fig. 5
Labrador to North Carolina.

Family Arcidae

Foot of animal deeply grooved.

Shell with numerous comb-like teeth, arranged in a line following hinge margin and upon each valve. It is a very ancient family, there being many fossil species.

GENUS ARCA Linné 1758

Shell elongated, strongly ribbed or cancellated; umbones separated by a lozenge-shaped area for the ligament.

In India Arca scaphula lives in the Upper Ganges a thousand miles from the sea. The largest species lives at Panama. (Pacific.)

ARCA AURICULATA Lamarck (A. deshayesii Hanley). Eared Ark. Shell with about twenty-seven strong rounded ribs which are crossed by concentric threads; oblong in shape, inflated; high umbones separated by a narrow area; angle in front at hinge line; color whitish with a silky-brown epidermis. Length 65 mm.; height 45 mm.; diam. 45 mm.

Pl. 3, Fig. 8
Florida Keys and West Indies

ARCA CAMPECHIENSIS Gmelin. Environment influences this species and its varieties to a very marked degree. It is largest and coarsest at Cape Cod. There is diversity in the outline. The ribs on the left valve are often narrower, flatter and less conspicuous than upon the right. The typical form is the rounded southern one. No very sharp line should be drawn in separating the various races. The average length is around 2 inches.

Pl. 4, Fig. 8
Massachusetts to Texas

ARCA CAMPECHIENSIS PEXATA Say. Combed Ark. Oblong, umbones large, pitted below them; inside margin deeply scalloped; epidermis shaggy. Length 2.25 inches.

It is known locally as the "bloody clam" on account of the red fluid which exudes from the tissues when the shell is

violently opened.

Pl. 2, Fig. 11

Massachusetts to North Carolina

ARCA CAMPECHIENSIS AMERICANA Wood. American Ark. Ribs about thirty-five, each with a median impressed line, spaces between ribs deeply cut; anterior end very short and contracted; epidermis blackish brown; ligament area extremely narrow; umbones anterior and almost touching each other.

This elongate form is common in Carolina waters.

Pl. 2, Fig. 13

North Carolina to Florida and Texas

ARCA INCONGRUA Say. Shell inequivalve, rather short and much inflated; umbones well separated; ligament area wide and excavated; about twenty broad low ribs upon surface and ten more behind the posterior ridge, these ribs with concentric elevated ridges upon their summits which are less distinct toward the posterior end; ribs clearly visible inside shell and strongest toward the margin; numerous erect, graduated teeth upon hinge margin, becoming smaller toward the center. Length 2 inches.

This very striking shell may readily be separated by its curved outer margin, which in shape resembles a weakly-defined letter S, when the shell is viewed toward the posterior end. The plump shape is also characteristic. Mr. F. S. Webber, whose specimens are figured, reports beach shells plentiful at Wilbur, south of Daytona Beach, Florida.

Pl. 3, Fig. 2

Cape Hatteras, North Carolina to Texas

ARCA TRANSVERSA Say. Transverse Ark. Shell transversely oblong, about thirty-five ribs; umbones separated by a long narrow space and situated at one third the length of the hinge margin. Length 1.5 inches.

Not infrequent near the sands of Nantucket and Martha's Vineyard, also in shallow water off the west coast of Florida.

Pl. 4, Fig. 4

Cape Cod to Key West

ARCA SECTICOSTATA Reeve. Cut-rib Ark.

Shell large, somewhat elongated; umbones full and high, situated one fourth distance between ends but closest to anterior end; about thirty-five ribs which are grooved in the middle and at anterior end of shell, posterior ribs rounded, all except those upon the posterior slope somewhat beaded; hinge long and with many low teeth; margin strongly toothed; color white, with brown shaggy epidermis. Length 3.5 inches.

This fine large Arca is not rare at Sanibel. A shell similar to this species is found in the fossil beds west of Palm Beach.

Pl. 3, Fig. 5

Pl. 2, Fig. 10

North Carolina to Florida and west to Texas

ARCA CHEMNITZI Philippi (A. orbigny Koelt). Shell a little inequivalve, triangular but irregular; very high incurved umbones; about twenty-five nodulous ribs which are often flattened; epidermis in grooves of anterior half inclined to be spiny; hinge short, teeth distinct, inner margin strongly toothed; color white under the epidermis. Length 1.25 inches.

Pl. 3, Fig. 6

Florida to Texas and West Indies

SUEGENUS NAVICULA Blainville 1818

ARCA OCCIDENTALIS Philippi (A. noae of authors) Western Ark. Shell oblong, posterior end wider and cut off, solid, inflated; epidermis shaggy; at base a long narrow gap through which passes the attachment byssus; surface plainly ribbed, largest ribs in the middle and smaller ones between them; lozenge-shaped area between umbones covered with a dark colored ligament; pallial line inside often slightly indented. Color brown, ornamented with zebra-like stripes of brown. Length 2.5-3 inches.

Pl. 3, Fig. 7

North Carolina to the Gulf of Mexico and West Indies

ARCA UMBONATA Lamarck. Beaked Ark. Shell solid, inflated; posterior ridge sharp and with fine radiating ribs in front of it; about eight stronger nodulous ridges behind the posterior ridge; base gaping in front;

lozenge-shaped zone between umbones; color purplish brown inside and out; epidermis shaggy, extending outward on posterior ridge. Length 1-2 inches.

Pl. 3, Fig. 1

North Carolina to Gulf of Mexico;
West Indies

SUBGENUS BARBATIA Gray 1847

ARCA BARBATA Linné. Bearded Ark. Shell oblong, usually with rounded ends, slightly gaping below; umbones one fourth distance back from anterior end; surface closely sculptured by different sized radiating ribs which are crossed by ridges as in *A. candida*; epidermis shaggy at base and posterior end; hinge teeth few in number and feeble; color chestnut brown with white rays near umbones and sometimes extending to margins, these rays visible inside as well. Length 1-2 inches.

In Florida this is a much commoner species than *A. candida*.

Pl. 4, Fig. 2

Cape Hatteras, North Carolina to
Texas; West Indies

ARCA CANDIDA Guilding. Bright Ark. Shell compressed, gaping toward anterior base, posterior end pointed; umbones elevated; surface covered with fairly strong rough irregular growth lines and ridges which give a cancellated and beaded appearance, this sculpture strongest upon the posterior slope; epidermis heavy brown and shaggy; teeth indistinct; ground color and interior white. Length 2-2.5 inches.

The beauty of this shell is enhanced by the often golden-brown epidermis which is darker at the back of the shell, where it extends like a fringe. Double, fresh shells have been taken at the Yamato rocks, Florida.

Pl. 4, Fig. 3

North Carolina to the West Indies

SUBGENUS ACAR Gray 1847

ARCA RETICULATA Gmelin. Net-work Ark. Shell small, inflated; posterior ridge ending in point at posterior base; strong radiating ridges crossing stronger concentric ones, some ridges scaly; hinge short, teeth medium; edge of shell toothed; color whitish with yellowish-brown epidermis. Length 18 mm. often less.

This species and the following live chiefly under sponges and coral rock in shallow water, especially in the south.

Pl. 3, Fig. 4

North Carolina to the West Indies
and Texas

ARCA ADAMSI E. A. Smith. Adams Ark. Shell inflated, rounded in front; hinge and basal line parallel; umbones moderately full, turned forward; teeth few, rather strong. Color whitish or brown.

This appears very close to the European *A. lactea* but may be distinguished by the fact that its radial riblets are formed by rows of trailing blisters, or hollow ones, which are very friable and often entirely worn off, leaving the shell smooth. Length 12 mm., height 7.5 mm., diam. 7.5 mm.

Pl. 3, Fig. 3

North Carolina to the West Indies

GENUS NOETIA Gray 1847

NOETIA PONDEROSA Say. Ponderous Ark. Shell heavy, swollen; umbones well separated, about two-fifths from posterior end; hinge area wide, flat, very dark brown; about thirty-two radiating flattened ribs; close-set undulating concentric sculpture, strongest between and becoming obsolete on the ribs, weaker toward the umbones; ground color yellowish white, dark brown shaggy epidermis most persistent toward lower margin; interior yellowish white in center, dull, becoming white and glossy toward the scalloped edge; hinge teeth numerous, turned backward at posterior end. Length 2 inches.

Single valves are usually taken upon the New England beaches. The species is abundant at Sanibel, Florida.

Pl. 4, Fig. 1

Massachusetts to Florida and Texas

GENUS GLYCYMERIS Da Costa 1778;

Pectunculus Lamarck 1799

(BITTER SWEET SHELLS)

Shell solid, equivalve, convex, epidermis velvety; hinge wide, curved, bearing a series of equal-sized teeth which are faintest under the umbones, arranged fan-shaped; muscular impressions sub-equal; pallial line simple.

- - - - -

Foot of animal crescent shaped; margins simple, with minute eyes.

GLYCYMERIS AMERICANUS DeFrance (*G. undatus* of authors). American Bitter-sweet. There are two sorts of modifications present in this species. One is due to variation, the other correlated with growth and senility. Very young shells show indistinct sculpture, half-grown ones ribs well marked and teeth delicate. In adults the ribs become obscure distally, the cardinal tooth area enlarged. In senile individuals the cardinal tooth area is very large, only the teeth at the extremities of the arch remaining and these enlarged, the concentric sculpture strong. With these facts known the apparent great variation of the shells can be explained. Diam. 29 mm. Depth range 15-65 fathoms.

Pl. 2, Fig. 12

Cape Hatteras, North Carolina to the West Indies

GLYCYMERIS AMERICANUS LINEATUS Reeve. Lined Bitter-sweet. This, the Antillian form is not uncommon and averages smaller than the preceding typical one.

In all forms of *G. americanus* the reticulated sculpture is always present upon the umbones of a perfect shell, the extension of the reticulation varying with the individual. Specimens from southern waters are more swollen and brightly colored than northern examples. Length 1.5 inches.

Pl. 2, Fig. 6

North Carolina to the West Indies and west to Texas

GLYCYMERIS PECTINATUS Gmelin. Comb Bitter-sweet. Shell fan-shaped, solid, hardly inflated; usually about twenty-four rounded, curved, ribs, sometimes as many as forty, crossed by fine striae; teeth feeble or absent near umbones; margin of shell crenulated; color white, spotted with brown, sometimes in zigzag pattern. Length 20 mm. Depth range 2-175 fathoms.

Pl. 2, Fig. 8

Pl. 64, Fig. 16

Cape Hatteras, North Carolina to West Indies and west to Texas

GLYCYMERIS PENNACEUS Lamarck. Feathered Bitter-sweet. Shell solid, somewhat swollen, umbones high and full; ligament strong;

surface with wide, low, radiating ribs which together with the spaces between are covered with fine radiating lines; concentric growth lines fine and variable, forming a latticed surface; velvety epidermis often lacking around umbones or on dead shells.

In Florida the shells attain a length of about 29 mm. The species may be separated from the others by the almost smooth surface and angular outline.

Pl. 8, Fig. 7

Pl. 2, Fig. 7

Florida and the West Indies

Family Pinnidae

Shell wedge shaped, gaping on posterior end; hinge teeth present. Animal spins a powerful byssus and is fastened by large triple muscles to middle of each valve.

The Pinnae with knife-like ends pointed upward and, almost buried in mud or sand, are a menace to bare-footed shell collectors. When young the shells are extremely thin, brittle, translucent, and consist almost entirely of prismatic layers. Gloves have been manu-

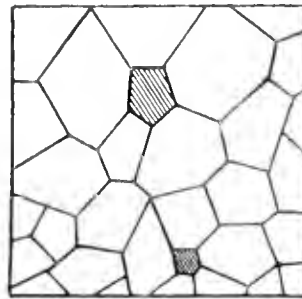


Fig. 31
Cellular Structure
of Pinna

factured by combining the byssus with silk and specimens are on exhibition in the British Museum.

Some of the species attain a length of two feet. A small crab lives in the gills and mantle and was noted by Aristotle who named it the Pinna guardian. The cellular structure is shown in Fig. 31.

GENUS PINNA Linné 1758 (SEA PENS)

Shell sulcate longitudinally or with a middle keel.

PINNA CARNEA Gmelin. Flesh Pen. Each valve has about eight strong ribs and less distinct ones between; color orange or

reddish.

An exceptionally beautiful specimen in Dr. Perry's collection, taken on the Tortugas, measures 180 mm. in length. The byssus, which is unusually silky, is 80 mm. long and in two contrasting shades of brown. Single valves have been taken at Sanibel.

Pl. 5, Fig. 1

Cape Hatteras, North Carolina to the West Indies

GENUS ATRINA Gray 1840

Valves unsulcate or without a mid-way keel; the internal nacreous layer entire.

ATRINA RIGIDA Dillwyn (*Pinna muricata* of authors). Stiff Sea Pen. Shell somewhat triangular, thickened; hinge line straight or curved inward; mostly covered with low radiating ribs which are smooth or with scales, the scales elevated and often tubular in shape; ventral area smoother and often with prickly scales; inner layer dull brown and a little iridescent; color dark brown or blackish. Length 6-9 inches.

Dall has pointed out that the variations are rarely associated, by the collector, with the station where obtained. They are short and wide when taken on hard and stony ground, also with coarse irregular spines and distorted edges. On soft bottom they are longer, spiny, or almost smooth. The handsomest ones occur on clean fine sand being beautifully developed and perfectly preserved.

Pl. 5, Fig. 2

North Carolina to South America

ATRINA SERRATA Sowerby (*Pinna seminuda* of authors) Saw-toothed Pen. Ribs very close together, scales much smaller and more numerous than in the preceding, also diminishing in number toward umbones. Length 6-9 inches.

Pl. 5, Fig. 3

Cape Hatteras, North Carolina to the West Indies

Family Pteriidae

Shell very inequivalve, right valve with opening for attachment byssus.

The "pearl oysters" which belong to this family are found in Ceylon, Panama,

and other warm seas. They are chiefly exported from Manila. They afford both the mother-of-pearl and the "oriental" pearls of commerce. The Hope's Pearl, said to be the finest in the world, measures 2 inches long and 4 around and weighs 1,800 grains. From the days of Pliny the pearl fisheries of Ceylon and the Persian Gulf have been celebrated and furnish the most lucrative trade.

GENUS PTERIA Scopoli 1777;
Avicula, Lamarck 1799 (PEARL OYSTERS)

PTERIA COLYMBUS Roeding (*A. atlantica* Lam.). Shell fairly solid, convex; wing broadly notched; smooth, usually brown, rayed with light narrow bands with brown arrow-headed spots. Length 3.5 inches.

Pl. 5, Fig. 7

Cape Hatteras, North Carolina to West Indies

GENUS PINCTADA Roeding 1798;
Margaritifera Humphrey 1797 (PEARL OYSTERS)

Less oblique than the other Pteriae, the valves flatter and nearly equal; right valve with byssal notch and sinus near its upper anterior part; valves winged; ligament elastic.

PINCTADA RADIATA Lamarck. Shell thin, inflated, somewhat oblique, winged at both ends; surface ornamented with strong raised rows of elongated scales, variegated with colors; lateral teeth single in left valve and double in right; interior nacre bright, surrounded by a prismatic wide border. Length 40 mm.

Often the surface lacks the scales referred to. These shells are sometimes brought in by the Greek sponge divers of Tarpon Springs, Florida.

Pl. 5, Fig. 6

Georgia to the West Indies and Gulf of Mexico

GENUS PEDALION Solander 1770;
Melina Katz 1788; Perna Brug. 1799

Variable in form like Pteria; right valve with byssal sinus; muscular impressions inside double; hinge straight; no teeth but with grooves where ligament is fastened.

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PEDALION ALATA Gmelin. Winged-tree oyster. Shell greatly compressed, right valve almost flat, the left slightly convex; hinge line short, left valve heavier below hinge, right valve with small sinus for byssal attachment opposite the swelling outside; surface smooth or scaly; interior pearly layer not extending to margin; brown, purple or blackish in color; young examples often rayed. Length 3 inches.

The "tree oyster" attaches itself to mangroves or any solid object in shallow water. It is gregarious, many shells often being fastened together. The writer observed it living in Angel Fish Creek on the Florida Keys.

Pl. 5, Fig. 4

Florida; Bermuda; West Indies

PEDALION LISTERI Hanley. Usually a high elongated shell; well developed at base; three to seven pits in each tongue-like process of porcellaneous material in base; color variable, often rayed with a lighter shade. Height 35 mm.

Pl. 5, Fig. 8

Florida Keys and West Indies

PEDALION SEMIAURITA Linné. Shell small, solid, very irregular, large pits in hinge line of each valve; byssal notch obscure. Height 16 mm.

It lives in the crevices of rocks and corals. As variable as the oyster it largely conforms to the surface and other local conditions. At the Blowing Rocks, near Jupiter, Florida, it is plentiful not far from the high-tide mark.

Pl. 5, Fig. 5

Southern Florida and West Indies

Family Ostreidae

Shell irregular, inequivalve, the larger valve adhering to some solid object, the outer moving forward as the shell matures; excessively variable according to the position during life and for this reason difficult to differentiate the species.

GENUS OSTREA Linné 1758 (OYSTERS)

OSTREA CRISTATA Born. Crested Oyster. Shell solid, very irregular, upper valve concave or convex; valves with long tubular clasping processes for attachment to

mangroves or other solid objects; edge of valves sharply plicate-serrate, forming interlocking teeth; interior border with wart-like ridge; umbones irregular, one in lower valve the longer, its hinge area grooved in middle; color brown, reddish or purple. Largest examples about 3.5 inches.

A more variable shell than *O. virginica*.

Pl. 14, Fig. 9

Tampa, Florida to the West Indies

OSTREA EQUESTRIS Say. Horse Oyster. Shell small, six to twelve teeth of larger valve received into corresponding cavities of the smaller valve; large valve depressed but a little folded; other valve convex and attached to some foreign object; hinge narrow and curved.

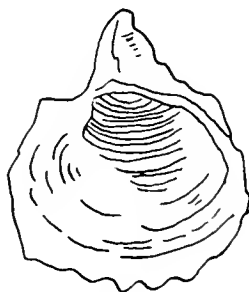


Fig. 32

Ostrea equestris

Fig. 32

Cape Hatteras,
North Carolina to Florida

OSTREA FRONS Linné. Leafy Oyster. Shell thin, broad, adhering to roots by shelly lobes, purple-brown; hinge of left valve small; generally attached crosswise to some external object.

Johnson reported this species from St. Augustine attached to a sea-fan (*Gorgonia*). Length 45 mm.

Pl. 6, Fig. 3

Jupiter Inlet, East Florida to Barbados

OSTREA PERMOLLIS Sowerby. Shell more or less four sided, the two edges next to umbones comparatively straight; compressed, subequivalve, somewhat golden colored and bluish-white inside, with tendency toward greenish at edges; hinge narrow; upper valve slightly convex and with a soft brownish epidermis; concentric sculpture wavy and irregular. Height 1.5 inches.

It has been taken in the bread sponge at Sanibel, Florida.

Pl. 6, Fig. 2

Florida

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OSTREA VIRGINICA Gmelin. Virginia Oyster. Upper valve smaller, flatter and smoother than the lower; leaf-like scales upon surface; muscular impression central.

In northern waters this oyster attains a length sometimes of a foot, being long, narrow and tongue-like in shape. The swinging aerial roots of the mangrove afford it support in the West Indies. When living under flat stones and on timber it often assumes a circular shape.

Pl. 6, Fig. 4

Prince Edward Island to the West Indies

Family Dimyidae

Shell inequilateral, inequivalve, closed; upper or left valve slightly smaller, lower attached to some object; ligament minute; hinge short, straight.

GENUS DIMYA Ronault 1848

DIMYA ARGENTEA Dall. Shell white, silvery outside; interior white, brilliant, porcelainous. Length 10.5 mm.; height 12 mm. Range 73-248 fathoms.

Pl. 62, Fig. 5a-b

Off North Carolina to West Indies

Family Spondylidae

GENUS SPONDYLUS Linné 1758
(SPINY OYSTERS)

Shell irregular, attached by right valve; ribbed, spiny or foliaceous surface; umbones far apart; lower valve with triangular hinge area; hinge of two curved interlocking teeth in each valve.

The lower valve is usually spiny and less colored. Some of the species are found half embedded in coral reefs. The Gulf of California is the home of many ornate forms but the species are never strictly local and are widely dispersed. They are popularly known as *Chrysanthemum* shells on account of the form and vivid red or yellow color.

SPONDYLUS AMERICANUS Hermann. (*S. spathuliferus* Sby. and *S. echinatus* Martyn). Shell brown, purple, white, or red with well-defined border inside; scales of principal ribs narrow and erect at base, ribs between with smaller scales; umbones often varie-

gated with red. Length 2-6 inches.

The largest examples occur in the Gulf of Mexico. The frequent crimson color is very striking and single valves, in consequence, are conspicuous objects upon the beaches.

Pl. 6, Fig. 1

Pl. 54, Figs. 1, 4

Cape Hatteras, North Carolina to the West Indies

GENUS PLICATULA Lamarck 1801
(PLAITED SHELLS)

Shell irregular; attached by umbo of right valve; two hinge teeth in each valve locking into corresponding hollows in each valve; muscle scar simple.

PLICATULA GIBBOSA Lamarck (*P. ramosa* Lamarck) Humped Plait Shell. Shell solid, with pale yellow or white raised folds; sometimes with short gray or red lines; fan-shaped, with strong radiating and often dividing plications which terminate in a saw-toothed margin. Length 1 inch.

The dark venous lines are sometimes replaced with a brownish blush.

Pl. 6, Fig. 5

Cape Hatteras, North Carolina to the West Indies

Family Pectinidae

Animal with mantle quite open, double margined, inner pendant-like curtain finely fringed, at its base a row of conspicuous round black eyes.

The young *Pecten* spins a byssus which is used as an attachment to some stationary object. The notch or opening in shell permits manipulation of the byssus without opening of the valves.

Adults, usually, are free swimmers and the same applies to the fry. They propel themselves through the water by rapidly opening and closing the valves.

A Mediterranean form *P. jacobaeus*, St. Joseph's shell, was worn by pilgrims to the Holy Land as a badge of several orders of Knighthood.

More than two hundred and fifty recent species are known, twice that number fossil.

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GENUS PECTEN Osbeck 1765 (SCALLOPS)

Generally large heavy shells with valves very unequal; right valve strongly convex, left valve flat or concave; radial ribs interlocking on margin.

PECTEN RAVENELI Dall (*P. hemicyclica* of authors; *P. medius* of authors, not Gmelin). Ravenel's Scallop. Shell mostly white and pinkish color, frequently with brown lines in grooves of lower valve; usually white inside with color around margin; about twenty-five low rounded ribs; ears subequal. Height 30-45 mm.

Often confused with *P. ziczac* but smaller, also color of convex valve and sculpture quite different. Single valves are not rare in Florida. Living examples have been taken near the S. Inlet in Lake Worth. It also occurs in the Pliocene of Florida.

Pl. 55, Fig. 20

Pl. 22, Fig. 10

North Carolina to West Indies

PECTEN ZICZAC Linné. Upper or left valve slightly concave, with about thirty-five radiating ribs and areas at sides where same are lacking; lower valve radiated with twenty-three grooves and additional lightly impressed ones at sides, fine radiating lines between these grooves; ears nearly equal; interior upper valve mostly smooth except at edge where ribs are distinct, purple brown except for light muscle area of attachment; right valve white except for portion adjacent to ears. Height 3 inches.

The description is based upon a specimen from Bermuda in the writer's collection. It has been taken living in Lake Worth, Florida, during the summer months.

Pl. 7, Fig. 1

Pl. 22, Fig. 11

Southern Florida; West Indies

SUBGENUS CHLAMYS Roeding 1798

PECTEN ISLANDICUS Muller. Iceland Scallop. Valves equal, upper slightly more convex, covered with fifty to one hundred radiating ridges, bearing scales; the ridges in groups forming ribs most noticeable inside shell; valves closed except at notch; col-

or orange or dark brown, lower valve lightest; interior white and shining, left valve with rose-colored spot near umbones. Height 3.5 inches. Range 10-179 fathoms.

Pl. 7, Fig. 2

Greenland to Cape Cod, Massachusetts

PECTEN ORNATUS Lamarck. White, thinly spotted with purple or red, ribs strong but often worn, covered with frail cup-like imbricating lamellae which are rarely intact; ribs twenty, several unaffected by purple; posterior ear almost obsolete.

The largest example in the United States National Museum measures about 1 inch across.

Pl. 8, Fig. 4

Florida to West Indies

PECTEN EXASPERATUS Sowerby. Rough Scallop. Valves uniform in color, usually rose or soft red; about twenty-one prominent ribs which are cut by beautiful sculpture and forming squarish projections when worn; ears ornamented with wave-like imbrications; ear adjacent to opening usually the most prominent; scallop edge distinct. Length 31 mm.

A beautiful form often found living upon the Sanibel beach in shallow pools left by the receding tide. The adult hinge line shows transverse corrugations with great distinctness.

Pl. 8, Fig. 5

Pl. 9, Fig. 4

North Carolina to Florida and Texas

PECTEN SENTIS Reeve. Thorn Scallop. Valves usually alike in color, commonly bright scarlet, sometimes purple, rarely white. Often confused with *P. ornatus* this form has about forty ribs in the adult with erect low scales connecting the ribs. These scales, which bridge the interspaces are often damaged but seldom entirely lacking in beach specimens. Interior white, with grooves corresponding to those outside; notch wide and shallow. Average length 33 mm.

This is one of the commonest forms upon the beaches but only single valves as a rule are seen. It lives imbedded in corals.

Pl. 7, Fig. 3

Southern Florida and West Indies

PECTEN IMBRICATUS Gmelin. Very flat, trigonal in shape; hollow imbricated tubercles regularly placed upon nine alternating ribs; shell white, touched with pink or red, interior margin and hinge area purple, center yellow. Length 35 mm.

Single valves have been taken near the Yamato rocks, south of Palm Beach, Florida and it apparently lives off the Florida Keys.

Pl. 8, Fig. 2

Florida Keys and West Indies

SUBGENUS AEQUIPECTEN Fischer 1886

PECTEN HELIACUS Dall. Shell of moderate size, mottled and zoned with pink or crimson upon a white surface; ribs about twenty, narrow, nearly keeled, interspaces wider; valves equal, inequilateral, notch wide and shallow; right valve paler than left; pointed scales on top of ribs visible under a glass; interior clouded with brownish purple and grooved to match outside ribs. Length 40 mm.

Pl. 9, Fig. 5

Southern Florida to West Indies

PECTEN ACANTHODES Dall. Shell subcircular, olive brown with paler mottlings; twenty-two minutely spinose ribs, the spines in three subequal rows, with two to three smaller prickly threads in the narrow interspaces; ears subequal, the anterior slightly larger, both with about five threads; hinge line cross-striated; height 32 mm., width 32 mm.

Compared with *P. exasperatus* this shell is less inflated, wider and with less prominent spines.

Pl. 9, Fig. 3

Southern Florida to West Indies

SECTION PLAGIOCTENIUM Dall 1898

PECTEN IRRADIANS Lamarck. A large thin-shelled form, gray and white, rarely yellow brown or red, generally purplish near hinge; ribs seventeen to twenty; acutely scalloped upon basal margin; ears two thirds length of the shell, notch forming acute angle or narrow slit. Height 2.5 inches.

Most abundant in the north, especially on the New Jersey coast where large numbers are gathered for the markets.

Pl. 7, Fig. 7

Pl. 72, Fig. 11

Nova Scotia to Florida and Texas

PECTEN IRRADIANS CONCENTRICA Say. More inflated and solid than the preceding; ribs seventeen; lower valve yellowish, upper blue-gray; interior of valves white, sometimes with brown blotches. Length of adult, parallel to hinge line, slightly under 1 inch.

New Jersey to South Carolina

PECTEN NUCLEUS Born. Nut Scallop. A thin, small shell variegated with gray, white and dark brown; twenty-one to twenty-three ribs. It attaches itself to soft objects rather than hard ones. Length 30 mm.

Pl. 9, Fig. 1

Florida Keys to Venezuela

PECTEN GIBBUS Linné. Humped Scallop. The ribs range from eighteen to twenty-three and are rather rough; lower valve more ventricose than the upper; ears nearly equal in size, striated and obtuse.

The color forms are; a delicate pink mottled with brown, light blue mottled with dark brown and touches of white and yellow, also other combinations. Red examples are infrequent. 1.5 inches.

An abundant shallow water form, very variable in its color manifestations but never attaining the size of its northern brethren.

Pl. 9, Fig. 2

Pl. 7, Fig. 6

North Carolina to the West Indies

PECTEN GIBBUS AMPLICOSTATUS Dall. Many-ribbed Scallop. A larger and heavier shell than the preceding one; ribs twelve to fifteen; lower valve white, the upper gray.

Pl. 8, Fig. 1

Texas to Columbia, South America

SUBGENUS LYROPECTEN Conrad 1862; Nodopecten Dall 1898

PECTEN NODOSUS Linné. Knotty Scallop. Valves nearly equal in size; entire surface covered with whitish radiating ribs, divided into about ten raised knob areas with smaller zones between; interior with excavated channels corresponding to elevated areas outside, reddish brown within

and shading to white in the lower centres. Height 4.5, length 4.75 inches.

A very handsome shell not infrequently brought in by the Greek sponge fishers at Tarpon Springs on the west coast of Florida.

Pl. 8, Fig. 3

Pl. 28, Fig. 5

Pl. 9, Fig. 6

North Carolina to Gulf coast of Florida

PECTEN NODOSUS FRAGOSUS Conrad. Differs from the preceding in having fewer and much larger ribs, narrower interstices with transverse laminae and in flatness of inferior valve; ribs eight, of which six are very large. Length 2 inches, height the same.

Cedar Keys, Florida to West Indies

PECTEN ANTILLARUM Recluz. Antillian Scallop. Shell equivalve, convex-depressed; ribs ten to eleven, color variable, greenish inside; ears subequal, old ones abbreviated. The young shell is thin and glistening, the old worn and resembling *P. sulcatus*. The nodes are often absent.

This species was described from a Guadeloupe specimen. Range 0-127 fathoms; recently obtained in shallow water off the Florida Keys. Height 15 mm.

Pl. 8, Fig. 6

Pl. 9, Fig. 7

Florida Keys and West Indies

SUBGENUS *PLACOPECTEN* Verrill 1897

PECTEN GRANDIS Solander (*P. magellanica* Gmelin). Giant Scallop. A strong opaque shell when mature, thin and translucent when young; lower valve nearly flat, white; upper valve moderately convex, brown or flesh color; valves gaping near hinge; sculptured with radiating lines or grooves, crossed by lines of growth, upon convex valve scalloped over the radiating lines; ears equal, notch in lower valve rounded; interior white, smooth, shining, with small radiating lines not equal to those outside. Length 5-6 inches, height slightly more.

It is most plentiful off the coast of Maine but fresh complete specimens were taken by the writer at Rockaway Beach, New York City. Range in depth 10-100 fathoms.

Pl. 7, Fig. 4

Labrador to North Carolina

SUBGENUS *PSEUDAMUSIUM* Morch 1853

PECTEN IMBRIFER Loven. A vitreous white little shell, often with a grayish discoloration. Alt. 12.5 mm.

Pl. 62, Fig. 4a, b

Arctic Seas; N. E. United States

PECTEN SIGSBEEI Dall. A plump, oval little shell; shaped like an apricot stone; surface without radiating sculpture. Alt. 11.5 mm. Depth 158 fathoms.

Pl. 62, Fig. 2

Florida Strait

SUBGENUS *AMUSIUM* Roeding 1798

Shell smooth or slightly sculptured outside; radiating ribs inside; valves gaping at sides; ears small; shell free (byssiferous?).

The name *Amusium* has been in use more than two hundred years. Its first binomial appearance (1798) was in an illustrated catalog following the Bolten system with references by Roeding who is now recognized as the author of the species enumerated.

AMUSIUM DALLI E. A. Smith. An extremely thin, fragile and brittle snell. Alt. 62 mm., lon. 59 mm., diam. 6 mm. Taken in 218-860 fathoms.

Pl. 62, Figs. 1a, 1b

Gulf of Mexico; West Indies

AMUSIUM POURTALESIANUM MARMORATUM Dall. The typical form is pale and translucent; the variety with brilliant mottling or orange red, yellow or brown and combined with opaque white flecks. Alt. 12.5 mm. Range 13-805 fathoms.

Pl. 62, Fig. 3

Florida Strait; Gulf of Mexico

Family Limidae

Shell equivalve, white or yellowish, compressed; anterior end straight; posterior end rounded, usually close; umbones separated, eared; valves smooth, ribbed or imbricated; muscle impression large and double.

The Limas are free or spin a byssus for attachment; some when adult mix together sand, coral fragments and shells forming an artificial burrow several times the length of the shell and closed at both ends.

GENUS LIMA Roeding 1798 (FILE SHELLS)

LIMA INFLATA Lamarck. Inflated File. Shell very oblique, thin, inflated, gaping at both ends so that valves only touch at hinge and base; ligament wide, triangular; low, delicate ribs on surface, often with finer riblets between, their edges roughened; inner margin serrate and showing traces of ribs. Length 32 mm.

The writer observed several nests, under stones, in Biscayne Bay, Florida, off Arch Creek. The animal is of a brilliant orange color and provided with long tentacular filaments. When disturbed this Lima rapidly opens and closes its shell, at the same time ejecting a stream of water upward. According to Johnson it propels itself rapidly through the water by a quick movement of the valves but in the opposite direction than Pecten. The Biscayne Bay specimens, although removed from the water, sensed danger and instinctively went through the motions of swimming.

Pl. 13, Fig. 14

Cape Hatteras, North Carolina to
Trinidad, West Indies

LIMA LIMA Linné (L. squamosa Lam.). Original File. Shell thick, oblique, gaping a little on both sides; ribs twenty to twenty-four, thick, rounded, with sharp erect imbrications. Length 1-1.5 inches.

This delicately beautiful shell has a wide distribution. It has been reported from the Red Sea and Mediterranean.

Pl. 10, Fig. 5

Southern Florida to Barbados

LIMA HIANS Gmelin. Gaping File. Shell thin, smooth at sides, minutely striated in the center of valves; slightly gaping at posterior end, widely so at anterior end; cardinal tooth area small. Length 44 mm.

A deeper water species, living in 15-38 fathoms.

Pl. 10, Fig. 3

Florida Strait and West Indies

LIMA SCABRA Born. Rough File. Shell thick, rather straight, posteriorly slightly gaping, anteriorly more so; roughened with fine radiating ridges which are scaly; margin of shell toothed by the sculpture; hinge area triangular; epidermis brown. Length 2-2.75 inches.

This large and distinctive Lima is frequently obtained by the sponge divers on the Florida west coast.

Pl. 10, Fig. 1

Cape Hatteras, North Carolina to
Trinidad, West Indies

LIMA TENERA Sowerby. Delicate File. Closely related to L. scabra. The notched ribs are much finer, when perfect they exhibit small erect terminations to the notches. Length 1-2 inches.

This species may prove to be only a variety of L. scabra.

Pl. 10, Fig. 14

Florida and West Indies

GENUS LIMATULA Wood 1839

LIMATULA SUBAURICULATA Montagu (L. sulcatus Leach). Little Ear File. A minute form with very faint costae and a broad hinge margin. It has been taken on the British coast. Length 14 mm. Depth range 15-50 fathoms.

Pl. 10, Fig. 4

North Atlantic; Labrador to Porto Rico

Family Anomiidae

Shell translucent, slightly pearly inside; attached to oysters or any solid

object by a plug passing through a hole or notch in left or lower concave valve; upper valve smooth and convex; interior with four muscular impressions and sub-marginal pit.

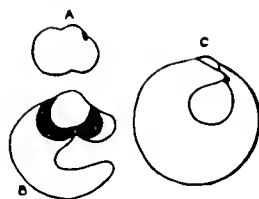


Fig. 33
Shell development
of Anomia

The Anomias, which have become fixed during life, have practically lost their foot. The development of the shell is shown in Fig. 33.

GENUS ANOMIA Linné 1758 (JINGLE SHELLS)

ANOMIA ACULEATA Linné. Thorny Jingle. Much smaller than *A. simplex*; surface roughened by prickly scales; lower valve very thin; perforation almost circular. Diam. 12 mm. Range 1-80 fathoms.

Pl. 72, Figs. 5-8

Arctic Ocean to Cape Hatteras, North Carolina

ANOMIA SIMPLEX Orbigny. Plain Jingle. The most plentiful species and the largest of the genus on the Atlantic coast. It is irregular in shape, conforming to the surface upon which it lives; surface of shell waved or undulated. Diam. 1-3 inches.

Single valves, almost invariably the upper without hole, are frequently found upon the beaches. They are very fragile, brightly colored and have a peculiar sheen. This *Anomia* was dredged by the writer in large numbers off Cape Romano, west Florida

Pl. 10, Fig. 6

Pl. 72, Figs. 1, 2

Nova Scotia to West Indies

GENUS PODODESMUS Philippi 1837

Left valve with only two muscular impressions, otherwise like *Anomia*.

PODODESMUS DECIPIENS Philippi (*Placunanomia rudis* Brod.). Shell irregular, varying from oval to somewhat elongate; lower valve flatter than upper; byssal opening round-oval or partially closed in old individuals; fine ridges crossed by scaly growth lines; inside lustrous, a brown spot often in center of lower valve. Color greenish or white. Length 40 mm.; diam. 6 mm.

There is one large muscular impression and a smaller one below it.

Pl. 10, Fig. 13

Cedar Keys, Florida to West Indies; Bermuda; Argentina

Family Mytilidae

Shell equivalve; hinge ligament marginal and internal, very long; anterior muscular impression narrow and small, posterior one large and obscure.

The mussels are marine or fluvia-

tile, attached by a byssus. They sometimes spin a nest from bits of shells and sand, or burrow in soft wood or other substances. Certain of them are concealed in burrows of other shells.

GENUS MYTILUS Linné 1758 (SEA MUSSELS)

Shell wedge shaped; umbones terminal; hinge usually without teeth; muscular impression club shaped.

MYTILUS EDULIS Linné. Edible Mussel. Anterior margin usually straight, convex or excavated; distinct opening for byssus; violet color; epidermis glossy blue-black; interior white, silver in centre, edge dark.

When the epidermis is removed four teeth may be observed under the umbones. Length 2.5 inches.

Many sizes and colors occur, some beautifully rayed, smooth, dingy, the juveniles often bearded. They live in countless numbers attached by the byssus on rocks and timbers in shallow water and not far from the high-tide mark. In Europe this species is used extensively as food for man and is said to be quite palatable.

Pl. 11, Fig. 1

Greenland to North Carolina

MYTILUS RECURVUS Rafinesque. (*M. hamatus* Say). Bent Mussel. Surface densely striated, color dark; twisted below umbones. Length 1-2 inches. An abundant shell in Florida.

Pl. 10, Fig. 8

Rhode Island around coast to Texas; West Indies

MYTILUS EXUSTUS Linné. More or less fan-shaped, strongly longitudinally striated; often rayed with ochre color, or blotched with black-brown or red inside and out. It is known as the "Scorched Mussel." Length 32 mm.

Pl. 11, Fig. 5

North Carolina around coast to Texas; West Indies

GENUS MODIOLUS Lamarck 1799;
Volsella of authors (HORSE MUSSELS)

Wedge shaped; umbones very close to anterior end. They burrow or make nests.

MODIOLUS MODIOLUS Linné. Horse Mussel. A large coarse solid shell; epidermis deep chestnut color; groove for ligament deep; animal dark orange or red. Length 4-6 inches. Usually a deep water shell.

Pl. 11, Fig. 6

Arctic Sea to Cape Hatteras, North Carolina

MODIOLUS TULIPUS Linné. Tulip Mussel. Shell smooth, bright yellowish or brown in color with dark rays upon the posterior portion; epidermis covered with scaly growth and bristly hairs. Length 1.25 inches.

Possibly the handsomest representative of the family in this country.

Pl. 11, Fig. 7

Cape Hatteras, North Carolina to West Indies

MODIOLUS DEMISSUS Dillwyn. Shell somewhat pinched toward center. Interior purplish brown; otherwise similar to the following subspecies. Length 2-3 inches.

Virginia to Florida

MODIOLUS DEMISSUS PLICATULA Lamarck. Humble Mussel. Shell brittle, with numerous radiating ribs becoming fine upon anterior portion; rather dingy; epidermis thin and with a varnished-like surface, variegated with yellow-green. Length 3 inches.

Inhabits tide waters of small streams, often imbedded in soil of banks near high-water mark.

Pl. 12, Fig. 1

Prince Edward Island to South Carolina

MODIOLUS ABORESCENS Dillwyn. (*M. papyria* Conrad). Paper Mussel. Shell cylindrical-ly oblong, thin, smooth, sides rounded; color yellowish white or green, portions of surface more or less iridescent. Length 32 mm.

Pl. 12, Fig. 6

Florida to Texas and West Indies

MODIOLUS OPIFEX Say. Artist's Mussel. An oval, reddish-brown shell; base contracted behind center but not deeply so; between this portion and the umbones the surface blackish and wrinkled; iridescent inside, brilliant; edge crenulated. Length 13 mm.

Pl. 11, Fig. 2

North Carolina to the West Indies

GENUS *BOTULA* Morch 1853

BOTULA CASTANEA Say. Chestnut Mussel. Hinge elevated; anterior margin rounded at tip; posterior margin large; base with a dilated but slightly impressed contraction before center; epidermis wrinkled; bluish inside. Length 15 mm.

South Carolina to Florida; West Indies

BOTULA FUSCA Gmelin (*M. cinnamomea* Lam.). Dusky Mussel. Shell small, almost smooth, inflated, epidermis dark brown; umbones high; hinge line curved. Length 10 mm.

Pl. 11, Fig. 4

North Carolina to Florida; West Indies

GENUS *LITHOPHAGA* Roeding 1798
(DATE SHELLS)

Shell cylindrical, epidermis thick; umbones low and near rounded anterior end; posterior end wedge-shaped; hinge line without teeth; ligament internal. They are borers.

LITHOPHAGA ANTILLARUM Orbigny (*L. corrugata* Phil.). Antillian Date. Shell wedge-shaped when viewed from above; many concentric furrows upon surface, particularly near posterior end; base with fine ribs fading out at anterior end; epidermis a rich chestnut brown becoming almost black in certain parts. Length 25-60 mm.

Pl. 12, Fig. 3

Southern Florida and West Indies

LITHOPHAGA NIGRA Orbigny (*L. caribaea* Phil.). Black Date. Length 23 mm.

Pl. 12, Fig. 4

South Carolina to Brazil.

SECTION *DIBERUS* Dall 1898

LITHOPHAGA BISULCATA Orbigny (*L. appendiculata* Phil.). Two-furrowed Date. A mostly smooth and shining shell except for two faint radiating sulcations, one above and the other below the low rounded posterior section; epidermis light chestnut color but surface of shell usually covered with a calcareous incrustation. Upon the latter

are wrinkles and corrugations. Length 30 mm.

Pl. 12, Fig. 2
North Carolina to Gulf of Mexico;
West Indies

SECTION MYOFORCEPS Fischer 1886

LITHOPHAGA ARISTATA Dillwyn (L. caudigera Lam. and L. forficata Rav.). Erect Date. A white, thin, fragile shell; posterior end with a third valve, a narrow projection; color light salmon inside. Length 31 mm.

It has been taken alive in pieces of coral at Charleston bar, South Carolina.
Pl. 8, Fig. 8
North Carolina to West Indies;
Mexico

GENUS MODIOLARIA Beck 1838;
Musculus Roeding 1798, not Martyn 1787

Shell inflated, often with three areas on disk; surface ribbed or smooth; umbones incurved, placed near anterior end.

MODIOLARIA CORRUGATA Stimpson. Shell oval, heart-shaped when viewed in front, upper margin compressed and arching; sixteen or more ribs on anterior compartment, those in posterior compartment more crowded and distant; minute wrinkles of epidermis crossing ribs and middle section visible under a microscope; epidermis yellowish green; interior silvery, edge toothed by the ribs. Range 2-100 fathoms. Length 12 mm.

Pl. 12, Fig. 9
Pl. 72, Fig. 9
Greenland to North Carolina; Circumpolar

MODIOLARIA NIGRA Gray. Shell thin; umbones prominent, scarcely touching each other, placed far from anterior end; surface with network of minute growth lines; many fine radiating lines or ridges; epidermis rusty brown; interior livid with silvery lustre and fine radiating lines. Length .75-1 inch. Depth range 1-60 fathoms.

Pl. 13, Fig. 11
Greenland to North Carolina

MODIOLARIA LATERALIS Say. Ends sculptured

with fine beaded ribs; fine concentric growth lines throughout; inner margin toothed except in middle and ligament area. Length 6 mm. to over an inch.

The shell is remarkable for its rich chestnut color, becoming almost black toward the umbones. It spins a fibrous nest.

Pl. 11, Fig. 8
Delaware Bay to Florida; West Indies

GENUS CRENELLA Brown 1827

Epidermis thick; umbones straight; ligament small. These small mussels spin a nest or else hide among roots of seaweeds and corals. They range in depth from 0-300 fathoms.

CRENELLA DIVARICATA Orbigny. Shell small, equilateral; umbonal region high; delicate ray-like ribs, a few of them curved; concentric sculpture also delicate causing the ribs to appear slightly beaded; inner edge crenate throughout; color brownish yellow. Length 3 mm.

North Carolina to West Indies

CRENELLA GLANDULA Totten. Shell rounded oval, rather swollen; umbones small, separated; minute concentric growth lines, crossed by minute close together radiating lines; epidermis brown or yellow; margin toothed inside, pearly within. Length 12 mm. Range 3-60 fathoms.

This is a mud dweller and is often found in the stomachs of fish off Mass. It is a pretty and oddly shaped little shell.

Pl. 12, Fig. 8
Pl. 72, Fig. 10
Labrador to North Carolina

Family Dreissenidae

GENUS MYTILOPSIS Conrad 1857;
Congeria Partsch 1835

Mantle of animal closed; byssal opening small. Inhabits brackish water.

MYTILOPSIS LEUCOPHAETA Conrad. Shell very rough, incurved; epidermis brownish; anterior end much depressed; hinge margins dug out and with faint teeth. Length 18 mm.

Pl. 11, Fig. 3
Chesapeake Bay to Florida; West
Indies

ORDER ANOMALODESMACEA

A much specialized order, the members mostly of a burrowing nature. This habit has shielded them from many vicissitudes and as a result the perfecting processes of selection have been retarded. The members have lagged behind those of other orders and thus indicate more clearly the character of the ancient types from which they sprang.

Family Periplomatidae

GENUS PERIPLOMA Schumacher 1817
(SPOON SHELLS)

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

PERIPLOMA ANGULIFERA Philippi. Angulated Spoon. Easily separable on account of the very short posterior end. There is a sharp keel ending in a projecting angle on lower border of right valve. Length 21 mm.

Pl. 6, Fig. 7

Georgia to Florida Keys and Texas

PERIPLOMA FRAGILIS Totten. Frail Spoon. Shell thin, fragile, whitish and pearly, right valve most convex, surface marked by lines of growth. Length 15 mm., rarely much larger. Depth range 4-29 fathoms.

Labrador to New Jersey

PERIPLOMA INAEQUALVIS Schumacher. Inequal Spoon. Shell thin, fragile, twisted, pearly inside; concentric lines numerous and distinct; angular ridge moderately impressed; tooth prominent and broad.

A recent specimen from Sanibel, Florida, measures 16 mm. A fossil from Clewiston, Florida, is 34 mm. in length.

Pl. 12, Fig. 5

West Florida; Texas?; West Indies

PERIPLOMA POPYRATIA Say. Paper Spoon.

Shell thin and fragile; one valve more convex than the other and extending slightly beyond; umbones inconspicuous; angular ridge extending from umbones to posterior margin; outside surface minutely wrinkled; tooth long, narrow, with an accessory process below; color white and pearly. Height 12 mm., breadth 17 mm.

It is quite a variable species and a rare one.

Pl. 26, Fig. 5

South Carolina to Gulf of Mexico

PERIPLOMA UNDULATA Verrill. Wavy Spoon. A small, thin shell obtained in 541-816 fathoms. Length 15 mm.

Pl. 4, Fig. 6

Off New Jersey to North Carolina

SUBGENUS COCHLODESMA Couthouy 1824

Shell inequivalve, gaping a little at ends, umbones small; spoon-shaped process in each valve forming hinge, held by an oblique rib.

COCHLODESMA LEANUM Conrad. Shell thin and brittle, rib bent backward, surface wrinkled by growth lines, interior dull white. Length 35 mm., height 25 mm.

The foot of the animal is broad, compressed; siphons long, narrow, separate.

This species inhabits sandy beaches of Cape Cod and Nantucket; also reported south of Casco Bay, Maine. It appears to be more plentiful in the south. It has been dredged in 3-16 fathoms.

Pl. 22, Fig. 1

Gulf of St. Lawrence to North Carolina

Family Thraciidae

GENUS THRACIA Blainville 1824

Shell inequivalve, a little gaping at both ends; umbones prominent, one perforated.

THRACIA CONRADI Couthouy. Shell thin, smaller extremity truncated or chopped off; exterior pale ashy-white and pearly underneath; hinge toothless; interior chalky-white. Length 3-4 inches.

When found entire, with both valves, the difference in the size of the valves is

at once apparent. It has been found abundantly off the Maine coast and Rhode Island. It probably lives in sand at low-water mark. Reported depths range from 3-16 fathoms.

Pl. 12, Fig. 7

Labrador to North Carolina

Family Pandoridae

Shell irregular, compressed, pearly.

GENUS PANDORA Hwass 1795
(GRECIAN EVE)

Shell inequivalve; right valve flat, left convex; two diverging teeth in right valve and grooves in the opposite one.

PANDORA GOULDIANA Dall. A large rough species in contrast to *P. trilineata*. Length 25 mm. Range 0-30 fathoms.

Pl. 13, Fig. 7

Nova Scotia to Cape Hatteras, North Carolina

PANDORA TRILINEATA Say. Shell white, often with iron-like deposit near hinge line; brilliantly nacreous internally.

Often confused with the preceding species. It is much more fragile and beautiful. Length 20 mm.

Great Egg Harbor, New Jersey, to Gulf of Mexico

Family Lyonsiidae

Shell inequivalve, subtriangular, fragile, pearly; hinge provided with a narrow ledge inside each valve to which the ligament is attached and against which adheres a four-sided plate.

GENUS LYONSIA Turton 1822

LYONSIA FLORIDANA Conrad. Shell narrower and often smaller than *L. hyalina*, ends somewhat pointed. Length 8-15 mm.

Pl. 13, Fig. 1

Florida and Gulf of Mexico

LYONSIA HYALINA Conrad. Glassy Lyonsia. A translucent, pearly, fragile shell, covered with ray-like wrinkles; plate a trun-

cated wedge. Length 18 mm. Animal with slender foot which is deeply grooved, Fig. 29.

The radiated wrinkled surface is unique among shells of the New England coast. It is a form of epidermis. The pearly lustre is equally beautiful. It is a shallow water species.

Pl. 13, Fig. 2

Nova Scotia to Texas

SECTION PHILIPPINA Dall 1901

LYONSIA BEANA Orbigny. Shell small, rather thin, surface shining, decidedly inequilateral, gaping below. Length 17 mm.

This is the only representative of the family, in these waters, which exhibits color. It was originally collected by M. Beau but the name misspelled in the description.

Pl. 13, Fig. 3

North Carolina to Florida; West Indies

Family Cuspidariidae

GENUS CUSPIDARIA Nardo 1840
(Naera Gray 1834)

Shell small, rostrate, sculptured or smooth; radial sculpture most prominent.

CUSPIDARIA GEMMA Verrill and Bush. Shell thin, quite small, fragile, bluish white; rostrum distinct; umbone smooth; ventral margin broadly rounded with slight angle at termination of each radial rib; three of these ribs upon posterior half and one less distinct at about the center, the latter rib rudimentary in left valve, none of the ribs reaching the umbones; hinge margin thin and delicate; right valve with small long lateral tooth separated from minute cartilage plate by a distinct notch; lateral tooth supported by a small buttress. Length 5 mm., height 3 mm.

This striking little shell was described from specimens dredged in 16-17 fathoms off Cape Hatteras. The writer found it in shallow water near Jupiter Light and upon the bay side at Sanibel, Florida. It doubtless will turn up in other localities.

Pl. 13, Fig. 5

Cape Hatteras, North Carolina to Florida

CUSPIDARIA ORNATISSIMA Orbigny. Range 2-124 fathoms. Length 9.5 mm.

Pl. 65, Fig. 21

North Carolina to West Indies

CUSPIDARIA PERROSTRATA Dall. Length 8 mm. Range 58-416 fathoms.

Pl. 61, Figs. 3a, 3b

South of Martha's Vineyard to West Indies

GENUS LEIOMYA A. Adams 1864

SUBGENUS HALONYMPHA Dall and Smith

Sharp cardinal tooth in right valve; no other teeth in either valve; rib extending posteriorly in both valves; surface striated or smooth.

LEIOMYA CLAVICULATA Dall. Length 12 mm. Range 100-339 fathoms.

Pl. 61, Figs. 2, 2a

Florida Keys; Bermuda; West Indies

Family Verticordiidae

GENUS VERTICORDIA Wood 1844

SECTION EUCIROA Dall 1881

VERTICORDIA ELEGANTISSIMA Dall. Length 13-40 mm. Range 292-756 fathoms.

Pl. 61, Figs. 1a, 1b

Off Cape Canaveral, Florida, to Cuba

SUBGENUS HALIRIS Dall 1886

VERTICORDIA FISCHERIANA Dall. Length 10 mm. Range 84-229 fathoms.

Pl. 61, Figs. 4a, 4b

North Carolina to West Indies

ORDER TELEODESMACEA

Animal with reticulate gills, mantle lobes more or less connected; shell porcellanous, or slightly prismatic, never nacreous; seldom inaequivalve.

Habits: Active or nestling; rarely sedentary burrowers; often imbedded but mostly occupying excavations of other organisms. Many of them live buried in the surface of the sea bottom, including the

Astartidae, and are more or less migratory.

Family Pleurophoridae

GENUS CYPRINA Lamarck 1818

Shell large, heavy; no lunule but a slight pit in its place; epidermis brown, thick, wrinkled; edge simple.

CYPRINA ISLANDICA Linné. A large thick shell with umbones pointed forward and inward so that they almost meet; ligament strong and prominent; epidermis shining and sometimes almost black; three cardinal teeth in each valve; marginal tooth blunt and rather indistinct; interior white. Length 3.5 inches.

An abundant shell in northern waters, especially near the mouths of rivers. Young examples are frequently taken in the stomachs of fish caught in Massachusetts waters.

It is one of our largest northern shells and might only be confused with *Venus mercenaria*. The black epidermis and lack of purple border easily separate it from that shell.

Pl. 13, Fig. 9

Arctic Ocean to Cape Hatteras, North Carolina

Family Corbiculidae

GENUS POLYMESODA Rafinesque 1820; *Cyrena* of authors, not Lamarck

Shell oval, often with rough epidermis; three hinge teeth in each valve; two lateral teeth in each valve.

Foot of animal strong, tongue-shaped.

They are inhabitants of brackish or fresh water near the sea.

POLYMESODA CAROLINENSIS Bosc. Shell swollen, covered with rough shining epidermis; shell deeply eroded toward umbones; hinge teeth small. Length 1.75 inches.

The erosion upon these shells is due to their living in brackish or almost fresh water where acids are prevalent. It is abundant on marshes, subject to tides.

Pl. 16, Fig. 2

South Carolina to Florida and Texas

POLYMESODA FLORIDANA Conrad. A much thinner and smaller shell than the preceding one and not so swollen; surface dull; interior touched with purple at margins as in *C. carolinensis*. Length slightly under 1 inch.

Pl. 13, Fig. 4
Big Pine Key, Florida, northward
and westward to Texas

POLYMESODA FLORIDANA SARASOTAENSIS Hender-
son.

Pl. 25, Fig. 8
West Florida

Family Astartidae

A family of ancient origin. Ligament external; surface of shell often dull but soft parts brilliantly colored, usually yellow orange or vermillion.

The conditions of life favor many individuals rather than number of species with consequent extreme variation. For this reason many of the species are difficult to identify.

They live partly covered by mud or sand, mostly in boreal seas, and form a large proportion of the food consumed by walrus and many fish.

There are a number of deep water species: the following are those which occur in comparatively shallow water and are most likely to be found dead upon the beaches.

GENUS ASTARTE Sowerby 1816

ASTARTE CASTANEA Say. Chestnut Astarte. The typical form is smooth, polished, of a rich reddish chestnut brown color. Margins sharply crenulated. Length 23 mm.

Pl. 13, Fig. 10
Pl. 73, Fig. 7
Nova Scotia to Cape Hatteras, North
Carolina

ASTARTE CASTANEA PICEA Gould. Pitch-pine Astarte. This variety possesses a blackish tarry epidermis.

Chelsea Beach, Massachusetts to
New Jersey

ASTARTE CASTANEA PROCERA Totten. Epidermis dull yellowish brown.

Provincetown Harbor, Massachusetts

ASTARTE QUADRANS Gould. A small quadrate species with a glossy shell; anterior end longest; umbones not inclined to either side, pointed: surface smooth; small lateral tooth on left valve and corresponding groove on right valve. Length 6 mm. Depth range 5-104 mm. It has been found in fish stomachs.

Pl. 22, Fig. 6
Pl. 73, Fig. 4
Labrador to Chesapeake Bay

ASTARTE UNDATA Gould. Shell dark brown, variable in outline, ten to twenty-five concentric ripples. Depth range 5-104 fathoms.

Pl. 73, Fig. 1
Greenland to Massachusetts Bay and south in colder water to Chesapeake Bay

Family Crassatellidae

Shell solid, slightly inequivalve, inequilateral; posterior end longer; three cardinal teeth in right valve, two in left; only concentric sculpture and that often present only near umbones.

GENUS CRASSATELLA Lamarck 1801, not 1798

CRASSATELLA GIBBSII T. and H. (*C. floridana* Dall). Concentric grooves about 1 mm. wide, covered with fine bright brown epidermis; tip of umbones flattened; interior pinkish chocolate, pink or white; margins smooth in all ages. Length 65 mm. Range 3-100 fathoms. Fossil in the Pliocene marl near Clewiston, Florida.

Pl. 10, Fig. 10
North Carolina to West Indies

GENUS CRASSINELLA Guppy 1874

Shell equivalve, often three-sided; lunule distinct; two cardinal teeth in one valve, one cardinal on other valve; two anterior marginal teeth on each valve.

CRASSINELLA MACTRACEA Linsey. Shell small, almost quadrant-shaped; fine concentric waves upon surface and minute radiating lines between them; lunule long and deep; color pale yellowish green. Diam. 6 mm.

The peculiar shape and striae radiating from the umbones separate this

shell from others. Range 3-100 fathoms.

Pl. 13, Fig. 6

Pl. 73, Figs. 11, 13

Massachusetts to Florida

Family Carditidae

Hinge with a short, strong, erect tooth under umbones and an oblique one extending along margin.

GENUS CARDITA Bruguiere 1792

CARDITA FLORIDANA Conrad. Shell with seventeen to eighteen heavy ribs with bluntly raised scales upon them; ligament external; color yellowish white, young shells touched with purple. Length 1 inch.

This species lives mostly in protected bays. It is quite common upon Florida beaches.

Pl. 13, Fig. 12

Florida to Texas

CARDITA GRACILIS Shuttleworth. A long and narrow shell which is rarely found on the beaches.

Pl. 11, Fig. 9

Tampa Bay to West Indies

GENUS VENERICARDIA Lamarck 1801

Shell rounded-trigonal, radial ribs the strongest, the ribs often beaded especially in the young; hinge with two cardinal teeth in the left and three in the right valve.

VENERICARDIA BOREALIS Conrad. Shell thick; about eighteen rounded radiating ribs with narrow spaces between; epidermis brown or black; margin crenulated; lunule small and deep; ligament small and sunken; interior white. Length 1 inch. Range 3-250 fathoms.

Pl. 13, Fig. 13

Pl. 73, Figs. 9, 10

Labrador to Cape Hatteras, North Carolina

VENERICARDIA TRIDENTATA Say. Shell minute but ponderous, thick, about eighteen convex ribs crossed by elevated concentric lines; margins inside deeply crenulated; two diverging teeth, with large cavity between, in one valve; in other valve a sin-

gle triangular tooth which fits into the cavity opposite. Length 6.5 mm. Range 36-124 fathoms.

Fresh examples are not uncommon upon the Florida beaches.

Pl. 14, Fig. 5

North Carolina to Florida; Gulf of Mexico

Family Chamidae

Shell inequivalve, irregular, thick, attached to some solid object or its own kind; the free valve on right or left side, fixed valve more convex and of greater size than the other; hinge thick, with anterior groove and with an oblique arched cardinal tooth and a straight furrow.

The shell consists of three layers; external layer with oblique lines of growth; middle layer of opaque white; inner layer translucent and membranous.

GENUS CHAMA Linné 1758

CHAMA MACROPHYLLA Gmelin (*C. macrophylla* Gmelin). Shell with many prominent foliations which are pointed and sometimes compressed; color varying from purple to yellow; interior margins conforming to exterior color; central and tooth areas whitish; margin of shell minutely crenulated.

This species is often gregarious, several individuals being fastened together. A chisel and hammer are handy in separating them from rocks. Finely colored individuals live near Jupiter Inlet, Florida. Length 43-65 mm.

Pl. 14, Fig. 2

East Florida; Tampa, Florida to Curacao, West Indies

CHAMA CONGREGATA Conrad. Usually a smaller form than the preceding, also with finer foliations. Length 21 mm.

An inhabitant of Upper Biscayne Bay, Florida, where it may be found under stones.

Pl. 14, Fig. 4

Cape Hatteras, North Carolina to Yucatan

CHAMA SARDA Reeve. Shell small, attached valve deepest of the two; surface with wavy scales; upper valve often with reddish rays

on the white ground; ligament short, not straight; teeth blunt and rounded; left valve with tooth forward and pit behind; right valve with pit in front and tooth behind; border indistinctly crenulated. Length 27 mm., height 30 mm.

A much smaller species than *C. macerophylla*, also separated by the ornate color patterns and red stains of the free valve.

Pl. 14, Fig. 3

Florida Keys and West Indies

GENUS ECHINOCHEMA Fischer 1887
(SPINY CHAMA)

ECHINOCHEMA ARCINELLA Linné. Shell inflated, solid; umbones curved forward over a large wide lunule; ligament partly inside, surface covered with coarse granulations or small pustules, arranged in series and with eight to twenty curved ribs; large cardinal tooth in right valve which fits into pit in left valve, left valve with one curved cardinal tooth; color white outside, white or purplish within. Height 55 mm. including spines.

The young shell is attached by the right valve in front of the umbone but later in life becomes free although always carrying the attachment scar. Sometimes they are found in clusters. When first freed from the egg the animal is unattached, the shell being crimson or brown.

Single valves are often common upon the west Florida beaches including Marco. Living examples are obtainable by dredging in a few feet of water off Sanibel.

Fine fossil specimens have been taken in the Pliocene beds near Clewiston, Florida.

Pl. 14, Fig. 1

Cape Hatteras, North Carolina to West Indies

Family Thyasiridae

Lunule minute, usually deeply impressed; mostly minute shells.

THYASIRA GOULDII Philippi. Shell minute, almost equilateral; interior with minute radiating lines; very small cardinal tooth and no lateral ones; ligament rather large, partly concealed. Length 6 mm. Depth range 5-400 fathoms.

Gould reports it as taken from codfish stomachs and its preference for sandy bottoms.

Pl. 73, Fig. 2

Greenland to Connecticut; Pacific

THYASIRA OBESUS Verrill.

Pl. 73, Fig. 12

Family Ungulinidae (Diplodontidae)

Animal like Lucinidae except in development of the gills; shell hinge with lateral teeth obscure or absent, margin of valve plain, subcircular in shape.

GENUS TARAS Risso 1826
(Diplodonta Bronn 1831)

TARAS VENEZUELENSIS Dunker (*T. punctata* Say). Shell squarish, orbicular, valve slightly longer than high; exterior and interior somewhat dull; short radiating striae not always visible; cardinal teeth minute, one in each valve bifid. Length 11.5 mm., height 10.5 mm., thickness of both valves 7 mm. Depth range 0-180 fathoms.

Pl. 22, Fig. 12

Gulf of Mexico and Florida Strait

Family Cyrenellidae

GENUS CYRENOIDA Joannis 1835;
Cyrenella Deshayes 1835

CYRENOIDA FLORIDANA Dall. Shell rounded, small, thin; epidermis pale yellow, silky; surface almost smooth; interior margin polished, smooth; pallial line indistinct, often broken; ligament short, external. Length 10-13.5 mm., alt. 12.5 mm., diam. 8 mm.

The shell resembles *Diplodonta*; the animal is much like *Lucina*, the foot being long and slender.

It has been taken abundantly in the outer edge of mangrove swamps, skirting the bay, in the vicinity of Miami, Florida.

Pl. 16, Fig. 11

Brunswick, Georgia south to the Everglades, north to Charlotte Harbor, west Florida

- - - - -

Family Lucinidae

Shell usually white; umbones depressed; edge smooth or minutely crenulated.

Foot of animal often twice the length of shell but folded back upon itself and concealed between the gills.

GENUS LUCINA Bruguiere 1797;
Phacoides, Gray 1824

LUCINA PENNSYLVANICA Linné. Pennsylvania Lucina. Shell inflated, solid; high sharp umbones turned forward; epidermis raised into numerous elevated laminae; color white throughout but old individuals brownish. Diam. 2 inches.

The beautiful light brown epidermis is peculiar and characteristic of this Lucina. It may be recognized by touch.

Pl. 15, Fig. 1

Cape Hatteras, North Carolina to Florida; West Indies

LUCINA JAMAICENSIS Lamarck (L. pectinatus Gmel.). Jamaica Lucina. Shell scarcely inflated, rather solid, sculptured with variable ridges; muscle scars narrow, long and rather smooth; color dirt white or pale salmon both inside and out. Diam. 2 inches.

A shallow water shell, quite frequent in Florida waters.

Pl. 16, Fig. 1

St. Augustine, Florida to West Indies; Uruguay

SECTION CAVILUCINA Fischer 1887

SUBGENUS LUCINISCA Dall 1901

LUCINA NASSULA Conrad. Woven Lucina. Surface beautifully sculptured with about twenty raised concentric lines and a larger number of radiating ribs; tooth-like projections upon surface recognizable by touch; margin of shell crenulated. Length 11 mm.

It was taken by the writer at Sanibel and in Lake Worth, Florida, in quite shallow water. The usual depth reported is from 7-200 fathoms.

Pl. 16, Fig. 8

Cape Hatteras, North Carolina to Cuba and west to Mobile, Alabama

LUCINA MURICATA Spengler (L. scabra Lam.). Scaly Lucina. Concentric sculpture very indistinct; numerous spinous radial ribs; right anterior cardinal tooth obsolete. Length 18 mm. Depth range 6-12 fathoms.

The very striking radial ribs separate this species from all others of the group.

Pl. 15, Fig. 3

Florida Keys and West Indies

SUBGENUS PSEUDOMILTHA Fischer 1887

LUCINA FLORIDANA Conrad. Florida Lucina. Surface with rough concentric growth stages and pale epidermis; shell also much compressed and heavy. Diam. 34 mm.

Pl. 15, Fig. 2

West coast of Florida to Texas

SUBGENUS LUCINOMA Dall 1901

LUCINA FILOSA Stimpson. Shell compressed, white, thick; hinge margin straight; umbones small, extending forwards over a small smooth lunule; numerous separated raised concentric ridges, between these rounded thread-like lines; sometimes minute radiating lines; cardinal tooth in left valve; no marginal teeth. Length and height 2.5 inches. Depth range 16-528 fathoms.

A rare deep-water shell. Single valves have been taken upon the beaches after severe storms.

Pl. 14, Fig. 8

Pl. 73, Fig. 14

Casco Bay, Maine to Cape Florida

SUBGENUS CALLUCINA Dall 1901

LUCINA RADIANS Conrad. Rayed Lucina. Concentric sculpture fine and evenly placed; radial lines faint; exterior scarcely shining; internal margin crenulate; pallial line punctated, muscle scars large; lunule wedge-shaped, shallow. Length 17 mm. Depth range 5-85 fathoms.

Pl. 20, Fig. 10

Beaufort, North Carolina to Florida; Porto Rico

SUBGENUS PARVILUCINA Dall 1901

LUCINA CRENELLA Dall. Shell small, rather strongly inflated, marked with feeble

cancellate ornamentation by the intersection of the concentric lamellae and weaker radial threads. The posterior slope is weakly depressed in front of the margin. Length 4-6 mm. Depth range 2-124 fathoms.

Pl. 23, Fig. 14

Cape Henry, Virginia to Cuba

SECTION BELLUCINA Dall 1901

LUCINA AMIANTUS Dall. Shell small, solid, white; about twelve strong low ribs which are crossed by strap-like threads; inner margin finely crenulate. Length 6 mm. Depth range 2-640 fathoms.

This is an extremely elegant little shell and can hardly be confused with any other. First found on the west coast of Florida it has since turned up in scattered localities.

Pl. 15, Fig. 5

Cape Lookout, North Carolina to West Indies

GENUS DIVARICELLA V. Martens 1880

Somewhat rounded semi-glossy shells with peculiar sculpture.

DIVARICELLA DENTATA Wood. Larger than *D. quadrisulcata*, also distinguished by the toothed dorsal margin and the lateral teeth inside the shell. There is a tendency in old individuals toward obsolescence of these, particularly the lateral teeth. The small and deep lunule is present in all ages. Diam. 1.5 inches. It lives in 10-50 fathoms but single valves sometimes are found on the beaches.

Pl. 16, Fig. 4

Pl. 73, Fig. 6

North Carolina to West Indies

DIVARICELLA QUADRISULCATA Orbigny. Shell white, surface glossy, sculptured with grooves bent obliquely downward at both sides; lateral teeth obsolete; margin of shell toothed, hinge margin almost straight; one very small tooth in right valve, two small diverging ones in left; ligament almost concealed. Length 1 inch.

Found on every Atlantic shore and remarkable for its wide dispersion; also frequent in fossil form. Range 10-50 fathoms. Much commoner upon beaches than the preceding species.

Pl. 16, Fig. 5

Massachusetts to Brazil

GENUS CODAKIA Scopoli 1777

Shell large and heavy with more or less reticulate surface sculpture; exterior white; color, when present, chiefly upon interior and near margins.

CODAKIA ORBICULARIS Linné. Shell large, rather solid, narrow sharp umbones; numerous radiating ribs or narrow furrows which cut the surface into ridges of varying widths; growth lines elevated making surface cancellated; color whitish or yellowish, often touched with purple on border, chiefly above. Length 80 mm.

Very abundant on sandy bottom at depth of a foot or so, or among algae in the Florida Keys. A very fine species.

Pl. 19, Fig. 5

Florida; Gulf of Mexico; West Indies

SUBGENUS JAGONIA Recluz 1869

CODAKIA ORBICULATA Montagu. Shell of moderate size, covered with rather broad radiating ribs, concentric lines not so strong, often with several growth and rest lines; umbones nearest anterior end; shape oblique, moderately impressed; hinge inconspicuous; lunule large and wedge shaped; two pointed lateral teeth in each valve. Length 13 mm.

Dredged in shallow water of Barnes Sound, Florida.

Pl., 15, Fig. 6

Pl. 14, Fig. 8

North Carolina; Florida; West Indies

CODAKIA COSTATA Orbigny (*L. antillara* Rve.). Large and small radial ribs alternating or in pairs; concentric sculpture least prominent; lunule well impressed, narrow, almost heart-shaped; muscle scar not deep, pallial line narrow. Length 13 mm. Depth range 13-85 fathoms.

Pl. 15, Fig. 9

North Carolina to Brazil

GENUS LORIPINUS Monterosato 1883

LORIPINUS CHRYSOSTOMA Philippi. Shell large and recognizable by its "mellow

orange suffusion." In early days it was called "The Apricot." The area of the rudimentary teeth is indicated outside by a peculiar extension of the shell with sharp diagonal fold upon opposite side. Diam. 1.5-2 inches.

It is taken in moderate depths and is easily obtainable upon tidal flats of bays and protected waters.

Pl. 15, Fig. 7

Florida and West Indies

LORIPINUS SCHRAMMI Crosse (L. philippiana of authors, not Reeve). A large, rotund, chalky-white shell. It is more inflated, larger, with smaller lunule than L. chrysostoma with which it is often confused. Diam. 3 inches.

Examples have been reported from Sanibel, Florida.

Pl. 15, Fig. 4

Pl. 16, Fig. 3

North Carolina to Gulf of Mexico

GENUS MYRTAEA Turton 1822

MYRTAEA LENS Verrill and Smith. Shell much compressed; well separated concentric lines becoming raised near fold; exterior dull, often with thin greenish epidermis; lunule deeply excavated and forming a notch in margin; cardinal teeth degenerate. Length 10.5 mm. Depth range 50-464 fathoms.

Pl. 16, Fig. 6

Pl. 11, Fig. 10

Cape Cod, Massachusetts to Brazil

Family Leptonidae

GENUS ROCHEFORTIA Velain 1876;
Mysella Angas 1877

ROCHEFORTIA PLANULATA Stimpson (Kellia rubra Gould not Montagu). Shell thick, minute; umbones prominent and touching each other; lunule in front distinct; anterior end white with thin purple epidermis. Length 4 mm. Range 0-48 fathoms.

When containing the dried remains of the animal the shell has a ruddy tinge and pale brown epidermis which are lost in beach valves.

Pl. 24, Fig. 7

Nova Scotia to Texas

GENUS MONTACUTA Turton 1822

MONTACUTA FLORIDANA Dall.

Pl. 14, Fig. 10

Pl. 4, Fig. 7

West Coast of Florida

GENUS KELLIA Turton 1822;

Lasea Leach 1827

All the known forms are nestlers, adhering by a byssus to barnacles, calcareous algae and similar organisms. The young Kellia are long retained within the parent shell.

KELLIA RUBRA Montagu. Varying from pale greenish yellow to purplish red. Under a microscope the epidermis appears very coarse. No two individuals exhibit the same characters in the teeth. In the left valve there is a minute "cardinal" tooth and two diverging laminae; in the right valve a similar "cardinal" and each side a pair of laminae between which the single teeth of the opposite valve are received, the so-called "cardinal" often being absent. Height 3 mm.

This very variable shell has long been known from Bermuda, also southern California and Europe. At the Lake Worth Inlet, Florida it was found nestling in barnacles. It may have been carried to the Pacific by ocean currents when a passage across the American isthmus was open.

Pl. 20, Fig. 9

Florida; Bermuda; Europe

Family Cardiidae

Valves with serrated (toothed) margins, frequently gaping behind; hinge teeth arched (Cyclodont), hinge plate obscure or undeveloped; ligament external and posterior.

GENUS CARDIUM Linné 1758 (COCKLE SHELLS)

SUBGENUS TRACHYCARDIUM Morch 1853

CARDIUM ISOCARDIUM Linné. Narrow Cockle. Shell of elongated heart-shape; twenty-seven to thirty radiating ribs; brown, stained with darker shades; interior salmon color or purplish pink. Height 3 inches; breadth 2.75 inches.

Pl. 17, Fig. 3

Cape Hatteras, North Carolina to
West Indies

CARDIUM MURICATUM Linné. Ribs thirty to forty, each with a row of solid oblique low scales; color whitish, buff or brownish, sometimes variegated; interior light, often marked or streaked with purple. Height 35 mm.

A common shell on the Florida west coast beaches.

Pl. 17, Fig. 1

Cape Hatteras, North Carolina to
West Indies

SUBGENUS *CERASTODERMA* Morch 1853

CARDIUM CILIATUM Fabricius (*C. islandicum* Lam.). Iceland Cockle. A rather large thin shell; anterior end shortest and narrowest; umbones prominent, pointing inward and almost touching each other; about thirty-six sharp three-sided ribs; epidermis yellowish brown with a bristling fringe; interior straw colored, portion covered by mantle pearly; inside grooves corresponding to ribs without, margins strongly notched; ribs well separated and with a tendency toward angularity. Height 2 inches; breadth 1 inch.

A plentiful shell in moderate depths off the New England coast. It is often found in the stomachs of fish.

Pl. 17, Fig. 6

Arctic Sea to Cape Hatteras, North
Carolina

CARDIUM PINNULATUM Conrad. Pointed Edge Cockle. Shell small, fragile, thin, obliquely orbicular; about twenty-six ribs which become convex at base, crossed by evenly placed flattened scales; umbones a little raised and inclined inwards; color dirty white or yellowish. Length 12 mm.

Pl. 20, Fig. 11

Pl. 73, Fig. 5

Labrador to Cape Lookout, North
Carolina

SUBGENUS *DINOCARDIUM* Dall 1900

CARDIUM ROBUSTUM Solander. (*C. magnum* L.) Strong Cockle. Ribs thirty-three to thirty-seven, regularly arranged; color yellowish brown with rows of chestnut or pur-

ple spots; posterior area brownish purple. Height 4 inches or more.

The largest and handsomest of our eastern cockles and an abundant one on the Florida west coast.

Pl. 17, Fig. 2

North Carolina to Brazil

GENUS *PAPYRIDEA* Swainson 1840

PAPYRIDEA SPINOSUM Meuschen. Spiny Paper Cockle. Shell elongate, compressed, often gaping, characterized by ribs which are inconspicuous in the center of the valves but raised and provided with spines toward the extremities, some of the spines extending over the margin; ligament area provided with deep grooves; exterior and interior mottled with lavender or yellow.

This delicately beautiful shell is sometimes taken at Sanibel where it attains a length of 1 inch. At Yamato, on the Florida east coast, specimens are smaller.

Pl. 17, Fig. 8

Cape Hatteras, North Carolina to
Brazil

PAPYRIDEA SEMISULCATA Gray. Shell whitish yellow with broad, low, radiating ribs, about twenty of these prominent, additional and less conspicuous ribs toward anterior end; posterior end with beautifully indented margin, the portion adjacent to the ligament finely so; exterior dull, the interior glossy and showing the external ribs. Length 8-14 mm.

It has been taken in drift in Palm Beach County, Florida.

Pl. 17, Fig. 9

Pl. 10, Fig. 15

Palm Beach County, Florida; elsewhere?

GENUS *TRIGONICARDIA* Dall 1900

A genus confined to Middle America, both coasts. The name indicates the peculiar form of the shell.

TRIGONICARDIA ANTILLARUM Orbigny. Shell trigonal in shape, bluntly keeled behind; about twenty-three broad, low radiating ribs which are more or less nodulous, the interspaces much narrower; lateral teeth strong, the cardinals small. Length 20 mm.,

often less. Depth range 2-182 fathoms.

A frequent shell upon the West Indian beaches, especially in the Bahamas.

Pl. 17, Fig. 10

Florida Strait and West Indies

TRIGONICARDIA CERAMIDUM Dall. Ribs eighteen in number, the four middle much larger in proportion to the others. Alt. of large example 8.2 mm. Color yellowish. Off Havana it was taken in 182 fathoms.

Pl. 62, Fig. 6

Florida Strait; West Indies

SUBGENUS AMERICARDIA Stewart 1930

TRIGONICARDIA MEDIUM Linné. Shell inequilateral, solid; about thirty-five strong almost smooth ribs; ten ribs upon posterior end rounded and with deep grooves between, the remainder overhanging the deep grooves; teeth strong; color white or buff, touched with brown or purple. Height 85 mm. Florida examples 1 inch.

A young example was dredged in shallow water of Card Sound, Florida. It usually prefers deeper water but single valves are often found on the beaches of the Florida Keys.

Pl. 17, Fig. 5

Cape Hatteras, North Carolina to the West Indies

GENUS LAEVICARDIUM Swainson 1840

LAEVICARDIUM SERRATUM Linné. Saw-toothed Cockle. Surface nearly smooth, polished, creamy white, suffused with a golden tint, often pink toward umbones; faint traces of ribs; posterior edge less curved than anterior; scarcely gaping, delicately toothed on margin; lateral teeth high and prominent, cardinal teeth small. Height 1-2 inches.

A specimen dredged by the author in Lower Biscayne Bay, Florida, by wielding its powerful foot suddenly leaped from its captor's hand.

Pl. 17, Fig. 7

Cape Hatteras, North Carolina to the West Indies.

LAEVICARDIUM SERRATUM LAEVIGATUM Lamarck. Shell rather large, usually but not always faintly ribbed, ribs numerous when present but most apparent toward margin of shell, areas at ends smoother often than remainder

of shell and emphasized by a lunule-like area outlined with a shallow groove; anterior lateral teeth strongest; interior margin of shell toothed. Color whitish, cream or pale brown with touches of brown. Height 2 inches.

Usually larger than the typical form, not so polished, brown bands more prominent. Upon the Florida west coast this is an outstanding form.

Florida; West Indies

LAEVICARDIUM MORTONI Conrad. Morton's Cockle. A comparatively smooth little shell with a purple spot on posterior margin; interior bright yellow. Height 1 inch or less.

Most plentiful in Long Island Sound and region of Martha's Vineyard. It lives in 1-5 fathoms of water in the north. Brilliantly colored examples were dredged in the muddy waters of Tarpon Bay, Sanibel, Florida. The colors of this species appear to fade rapidly in the cabinet.

Pl. 17, Fig. 4

Pl. 73, Fig. 8

Nova Scotia southward to Brazil

GENUS SERRIPES Beck 1841;
Aphrodite Lea 1834, not Hubner 1816

SERRIPES GROENLANDICUS Bruguiere. Shell large, surface with many radiating ridges which are coarsest at the posterior end; margin extending beyond the ligament; umbones insignificant, curved inward and a little forward, almost in center of shell; epidermis thin, pale brown, shining; cardinal teeth almost absent, lateral teeth small but distinct. Length under 3 inches.

The serrated margin of the animal's foot has suggested the name for the genus. The shell is remarkable for a decided gape at the posterior end, also for its resemblance to Mactra. Depth range 2-260 fathoms.

Pl. 16, Fig. 7

Greenland to Cape Cod, Massachusetts

GENUS PROTOCARDIA Beyrich 1845

PROTOCARDIA PERAMABILIS Dall. A small plump shell with high subcentral umbones; anterior end evenly rounded, the posterior somewhat truncate; surface with numerous radiating lines crossed by concentric

lines of equal intensity, forming beads at their intersection, the concentric lines becoming obsolete upon the posterior half, becoming spinous at that end; internal margin serrate. Length 14 mm., height 14.5 mm. Depth range 18-164 fathoms.

Pl. 62, Fig. 7

Rhode Island to the West Indies

Family Vereridae

This family represents the culmination of bivalve evolution so far as a single family is concerned. In beauty of color and delicacy of pattern, variety of sculpture, wide distribution plus depth range, they equal if not surpass all other bivalve groups.

The animals are fully as beautiful as the shells "leading one to wonder why parts which are always covered by mud or sand should develop such beauties."

The Lascar crews of ancient Spanish galleons used certain Venus for trade in the Orient and consequently erroneous habitats were often recorded. The common Venus, or hard-shelled clam, of our east coast was used by the Indians for making wampum and ceremonial belts.

GENUS DOSINIA Scopoli 1777

Animal with large foot, siphons closely united. Valves of shell usually compressed; ligament strong and placed in groove; lunule small; sculpture usually consisting of elegant concentric grooves; epidermis thin and lustrous; color usually pale, many of the species white.

DOSINIA CONCENTRICA Born. Shell rotund, partly compressed, white, grooved; umbones prominent. Length 2 inches.

A smaller shell than *D. elegans*, more convex, sculpture less conspicuous on center and base of shell; lunule much larger.

It is rather rarely found on the Florida Keys.

Pl. 19, Fig. 6

Florida Keys to Brazil

DOSINIA DISCUS Reeve. The most compressed of our east coast *Dosinias*, also distinguished by the finer and closer concentric grooves. The darker yellowish-brown epi-

dermis, often in shaded areas, is distinctive. Height 2.5 inches. It is a rare shell.

Pl. 19, Fig. 2

Cape May, New Jersey to Vera Cruz, Mexico; apparently absent from the Antilles

DOSINIA ELEGANS Conrad. A handsome flat shell with uniformly placed concentric grooves. It is often confused with *D. concentrica*. The warm off-shore water is its favorite habitat. Double fresh shells are often abundant on the Sanibel beach. Length 2.5 inches.

Pl. 19, Fig. 1

Pl. 18, Fig. 3

Cape Hatteras, North Carolina to Yucatan; West Indies

GENUS TRANSENNELLA Dall 1883

Shell small, with the general form of *Tivela*; hinge with three cardinal teeth in each valve, the middle left cardinal bifid; an elongated lateral tooth on left valve which corresponds to a socket in opposite valve; lunule defined; peculiar sculpture upon inner margin of valves which are tangentially grooved.

One of the Pacific coast species produces its young alive.

TRANSENNELLA CONRADINA Dall. Surface shining, concentric lines not very pronounced, crossed by finer radiating lines. Length 12 mm.

Pl. 19, Fig. 7

Pl. 26, Fig. 6

St. Andrew's Bay, Florida to Florida Keys and northward to Palm Beach

TRANSENNELLA STIMPSONI Dall. Shell white, variegated with brown lines or spots; orange or deep purple inside, particularly toward middle of valves. Length 14 mm.

Easily the handsomest member of the genus. It lives in from 8-30 fathoms and was first found off Egmont Key, Florida.

Pl. 26, Fig. 4

Cape Hatteras, North Carolina to Egmont Key, west Florida

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GENUS TIVELA Link 1807

Shell porcellanous, smooth outside, color variable but with tendency toward brown or purple; valves subequilateral, closing tightly, more or less convex, devoid of sculpture; umbones prominent; ligament short; teeth of hinge variable in the respective species.

TIVELA ABACONIS Dall. Shell subtranslucent, white, rose or purple and a portion passing into white; only three small cardinal teeth in each valve. Length 11 mm., smaller in Florida.

It was first described from Abaco, Bahamas. Entire fresh specimens are often abundant in Palm Beach County, Florida.

Pl. 25, Fig. 1

Florida; Bahamas; Vera Cruz, Mexico

TIVELA MACTROIDES Born. Shell oval, valves trigonal, rayed with chestnut, intervening white spaces narrower; umbones of adults more tumid and pointed than the juveniles. Length 2 inches.

Pl. 18, Fig. 1

Florida Keys; Bermuda; West Indies

GENUS GAFRARIUM Roeding 1798

GAFRARIUM CERINA C. B. Adams. Shell small, triangular, furrowed; hinge similar to Astarte, lateral teeth present; pallial line without sinus. Length 13 mm. Range 1-95 fathoms.

Pl. 18, Fig. 6

North Carolina to Brazil

GENUS MACROCALLISTA Meek 1876

Shell ovate, large, with microscopic radial lines; coloration vivid; lunule well defined; three cardinal teeth in each valve; right posterior tooth bifid.

MACROCALLISTA MACULATA Linné. Surface porcellanous with violet brown blotches or waves; epidermis shining; interior white. Length 2.5-3 inches.

A very handsome species. It has been dredged, in shallow water, on the Florida west coast. Single valves are sometimes taken in Palm Beach County but it is rather rare on the east coast. Dr.

J. H. Beal reports it from Santa Rosa Island, N. W. Florida.

It occurs in the Pliocene beds of Florida and Costa Rica. During the frigid Miocene age it migrated to warmer waters but returned with the Pliocene and has survived living well up the east coast.

Pl. 20, Fig. 1

Cape Hatteras, North Carolina to Gulf of Mexico; West Indies; Brazil

MACROCALLISTA NIMBOSA Solander. Shell porcellanous, oblong, rather flat, smooth, pinkish fawn color with lilac spots arranged in rays; interior white; anterior end short, narrowed at end; posterior end long, squared; ligament long. Length 4 inches.

The most showy of the American Veneridae and the largest of the genus. It is plentiful at Marco and other points on the Florida west coast.

Pl. 20, Fig. 2

Pl. 54, Fig. 8

Cape Hatteras, North Carolina to Cuba; west to Mobile, Alabama

GENUS PITAR Romer 1857;

Pitaria of authors

Shell plump, striate or rippled; middle cardinal tooth stout, the other slender.

PITAR FULMINATA Menke. Normally white with zigzag painting of bright yellow under a chalky epidermis; a purple spot close to umbones. Length 30 mm.

Pl. 19, Fig. 3

Pl. 20, Fig. 3

Cape Hatteras, North Carolina to West Indies; Brazil

PITAR MORRHUANA Gould. Shell thin, chalky, concentrically striated; pallial sinus very indistinct; lunule feeble, not impressed. Length 2 inches.

Pl. 20, Fig. 4

Prince Edward Island to Cape Hatteras, North Carolina

PITAR SIMPSONI Dall. Shell trigonal, rather solid, painted with brown outside and purple within. Occasionally it is pure white. Range 0-26 fathoms in Tampa and

Sarasota Bays, Florida. Length 18 mm.
Pl. 19, Fig. 10
West Florida

SUBGENUS HYSTEROCONCHA Fischer 1887

Shell plump, concentric lines prominent and a portion sharply upright; lunule and escutcheon in an impressed area, marked by deeply cut line; concentric laminae forming spines near edge of posterior area; tinted with color but not in patterns; inner edge smooth; pallial sinus tongue-shaped; hinge as in Pitar.

HYSTEROCONCHA DIONE Linné. This very striking shell was the species selected by Linné upon which he based the technical terms used in describing the genus Venus. It was widely known, years ago, as the "true Venus shell." There are two rows of spines, one more prominent than the other. Length 35 mm. Color pinkish violet.

Pl. 18, Fig. 4

Texas and West Indies

GENUS ANTIGONA Schumacher 1817;
Cytherea Bolten 1798, not Fabricius 1794

Shell strong and rotund, convex, sculpture strong, ligament deep-seated; left anterior lateral tooth the larger and with socket in right valve opposite; posterior right cardinal tooth broad and bifid; pallial sinus small and triangular.

ANTIGONA LISTERI Gray. Shell oblong, hinge line nearly straight, concentric and radial sculpture strong. Length 2-3 inches.

This well-known West Indian shell occurs at intervals in Lake Worth, Florida. It is more frequent in Biscayne Bay and still more so among the lower Keys.

Pl. 21, Fig. 11

Lake Worth, Florida to West Indies;
Marco, west Florida

GENUS CYCLINELLA Dall 1902

Three cardinal teeth in each valve; lunule circumscribed; siphons of animal separated.

CYCLINELLA TENUIS Recluz. A rather delicate, white, shell which somewhat resembles Dosinia. It lives in sand at a depth

of about 2 fathoms. Height 1 inch.

Pl. 21, Fig. 1

Cedar Keys, west Florida south
through the West Indies to Brazil

GENUS CHIONE Megerle von Muhlfield 1811

Attractive, trigonal, solid shells; three cardinal teeth in each valve (except in a few degenerate forms); valve margins scalloped; sinus always triangular; ligament inset but always visible outside; sculpture variable, often with leaf-like processes.

The concentric sculpture, rather than the radial, is usually dominant.

CHIONE CANCELLATA Linné. Shell almost heart-shaped, gray, triangular, thick, crenulated, varices at regular intervals; dorsal area excavated and flat; generally with a patch of purple inside. Length 1 inch.

A very common and variable species which lives in shallow water. It is abundant in Lake Worth, Florida. Larger examples live near Beaufort, North Carolina.

Pl. 21, Fig. 5

Pl. 7, Fig. 5

Cape Hatteras, North Carolina to
Brazil

CHIONE INTAPURPUREA Conrad. Shell moderately pointed at posterior end; umbones small and low; lunule prominent and often dark brown; concentric ribs strong, radial lines weaker; margin of shell toothed; exterior variously marked with brown; umbones, margin and a portion of interior purplish. Length 35 mm.

Pl. 54, Fig. 2

Pl. 57, Fig. 8

Cape Hatteras, North Carolina to
Florida Keys and mainland to Texas;
Honduras

CHIONE MAZYCKII Dall. The quadrate form and bright rose colored interior are the most prominent characters of this pretty species. Length 12 mm. It lives in 15-127 fathoms.

Pl. 20, Fig. 6

Cape Hatteras, North Carolina to
Brazil

CHIONE PUBERA Valenciennes. A fine large

shell with concentric sculpture forming deep grooves; umbones well elevated; hinge strong; ends somewhat pointed. Length 3 inches.

Pl. 20, Fig. 8

Florida Keys; Texas; West Indies

CHIONE SUBROSTRATA Lamarck (C. beau Recl.). Concentric ridges more numerous than in C. cancellata and more truncated; zigzag markings of darker shade than ground color. Length 25 mm.

Pl. 20, Fig. 7

Southern Florida to Brazil

SECTION TIMOCLEA Brown 1827

Radial sculpture the strongest, concentric lines faint; middle left and two posterior right cardinal teeth grooved.

CHIONE GRANULATA Gmelin. Radiating ribs crossed by scales which are not continued in the interstices; markings dark and variegated; interior purplish at posterior end and near margin. Length 25 mm.

Pl. 18, Fig. 12

Florida Keys to Brazil

CHIONE PYGMAEA Lamarck. Shell compressed, oval, resembling a miniature C. reticulata but longer and flatter; hinge area wide, hollow, smooth in one valve and marked with prominent black transverse lines; lunule impressed. Length 13 mm.

Pl. 20, Fig. 5

Florida Keys (reefs); West Indies

SECTION LIROPHORA Conrad 1863

Broad concentric waves very prominent, radially striate; ligament not covered by edge of valve.

CHIONE LATILIRATA Conrad (C. paphia Linné). Shell triangular, swollen, solid; lunule sunken so that portion of shell enclosing it is incurved; strong concentric ribs furrowed on upper side and almost smooth over anterior three fourths of shell; color dirty white, marked with brown and with an indication of rays; very small pallial sinus. Length 1.5 inches.

Both old and fairly fresh valves have been taken in Palm Beach County, Florida. Frequent in the Pliocene beds of Florida.

Pl. 21, Fig. 10

Palm Beach, Florida to the West Indies

GENUS VENUS Linné 1758

Shell large, earthy, trigonal in shape; lunule well marked; interior margin crenulate; ligament strong and exposed.

VENUS MERCENARIA Linné. Shell solid; umbones far forward and projecting nearly to front of shell, also elevated and curved; lunule rough and heart-shaped; blunt point at posterior end of shell; ridges crowded and most conspicuous at ends; interior white, often deep violet outside the muscular impressions; basal and interior margin crenulated. Length 3 inches or more.

This the common hard-shell clam of commerce is known "down east" as Quahog. From the purple edge of the shell the aborigines made their purple wampum while the white was manufactured from various other species.

There are many mutations of this species, some of the forms hardly deserving separate names. These are produced by various agencies among which might be mentioned the temperature, food, kind of bottom and salinity of the water.

In the Pleistocene fossil beds of Sankoty Head, Nantucket Island there are shells remarkable for their variety. Some of these are without parallel among the recent species.

Pl. 21, Fig. 6

Nova Scotia to Yucatan

VENUS MERCENARIA NOTATA Say. In addition to the usual characters this form exhibits zigzag brown painting and usually lacks the purple coloring inside.

Pl. 21, Fig. 3

Massachusetts to Florida

VENUS MERCENARIA ALBA Dall. Purple coloration absent, no brown markings as in the preceding form.

VENUS MERCENARIA SUBRADIATA Palmer. The smooth middle portion of the disk shows fine and even radial lines between the concentric ones.

The two latter forms are found associated with the typical.

VENUS CAMPECHIENSIS Gmelin. A larger, rounder, much thicker shell than *V. mercenaria*, usually white both inside and out; lower posterior angle of the pallial line more acute, scalloping of inner margin finer, arrangement of cardinal teeth less fan-like. Length 4 inches.

The juvenile shell is less convex than in the other species, lunule and escutcheon brown with fine pale zigzag lines.

Inside the margin is invariably white but occasionally in the umbones cavity a pale purple tinge is present. The latter is entirely absent in *V. mercenaria*. The brown zigzag marks are in the form of lines which in *V. mercenaria* are broader and inclined to be blotchy.

The mutations are similar to those in *V. mercenaria* except that the center of the disk is never entirely smooth. Sometimes a trace of purple may be found at the margin which may suggest interbreeding with *V. mercenaria*.

Beyond the Mississippi delta and especially in Texas this is the persistent type. It is also abundant in Yucatan.

Pl. 21, Fig. 2

Chesapeake Bay to Cuba; Texas; Yucatan

VENUS CAMPECHIENSIS ALBORADIATA Sowerby. Brown rays on a pale ground characterize this race.

Gulf of Mexico

VENUS CAMPECHIENSIS QUADRATA Dall. Shell thin, small, subquadrate, uncolored.

VENUS CAMPECHIENSIS TEXANA Dall. Concentric lines toward center of disk coalescent, the ribs flat-topped with polished tops; valves usually extremely convex.

Texas

GENUS *ANOMALOCARDIA* Schumacher 1817

Valves rostrate or pointed at end; inner edge crenulate; ligament exposed; three cardinal teeth in each valve; concentric sculpture the strongest.

ANOMALOCARDIA BRASILIANA Gmelin. Umbones elevated and angulated; major portion of surface smooth; posterior angle beaded in upper portion.

The common *Anomalocardia* of the

West Indies. It is very variable both in form and color pattern. Length 21 mm.

Pl. 21, Fig. 8

Cape Hatteras, North Carolina to West Indies; Brazil

ANOMALOCARDIA CUNEIMERIS Conrad. Similar to the preceding but surface smooth and with rather round concentric ribs; lunule and dorsal area livid color. Length 17 mm.

Pl. 21, Fig. 7

Lake Worth, Florida; southward on shores of continent to U. S. of Columbia

GENUS *GEMMA* Deshayes 1853

Shell minute, animal characterized by viviparity. The young are carried for a considerable time before being produced alive.

The shells are usually purple but sometimes white. They live in mud or sand on both of our coasts, Atlantic and Pacific, and have not been taken in any other regions.

GEMMA GEMMA Totten. Rounded-trigonal in shape, external sculpture irregular, spaces between sulci varying in width.

Southern examples show relatively strong and regular sculpture. Length 4 mm.

Pl. 18, Fig. 7

Labrador to North Carolina

GEMMA PURPUREA Lea. More compressed than adult *G. gemma*, generally paler and often white, more triangular, less full, not so elongated, white instead of purple. Length 2.8 mm.



Fig. 34
Gemma purpurea
2.8 mm.

Fig. 34

Massachusetts to Texas

GENUS *PARASTARTE* Conrad 1862

Shell minute, heavy, umbones prominent and elevated; shell equilateral, equivalve; lunule large, ligament short; surface smooth; color purple and white, inner margin toothed; one strong and two faint cardinal teeth in right valve; two strong cardinal teeth in left valve.

It appears superficially near

Astarte but is more related to Gemma on account of being viviparous. The genus is entirely American in distribution.

PARASTARTE TRIQUETRA Conrad. A genuine Florida type, confined to the peninsula, both recent and fossil. Length 3 mm.

Pl. 21, Fig. 9

Palm Beach Inlet, east Florida, to the Florida Keys and northward to Cedar Keys, west Florida

Family Petricolidae

Shell elongated, rounded in front, narrowed in rear; hinge almost toothless; ligament external.

GENUS PETRICOLA Lamarck 1801
(STONE DWELLERS)

PETRICOLA LAPICIDA Gmelin. The juvenile specimens are characterized by a zigzag striation to which are added in the adults, on the posterior end, coarse radiating ridges. Length 20 mm.

It bores in coral and is well distributed in the Florida Keys.

Pl. 25, Fig. 11

South Carolina to the West Indies

SUBGENUS PETRICOLARIA Stoliczka 1870

PETRICOLA PHOLADIFORMIS Lamarck. Shell chalky white, sharply rounded in front, covered with raised radiating lines and ribs; each valve equipped with two teeth, the one in left valve deeply cleft. Length 2.25 inches.

Animal with two tubes or siphons extending from rounded end of shell and united at their bases. The orifice of one of these is used for imbibing water.

This shell is usually found boring into hard clay on marshes at low tide mark, frequently in large numbers. It has been taken at Far Rockaway, New York City.

Pl. 27, Fig. 2

Pl. 25, Fig. 6

Prince Edward Island to West Indies

PETRICOLA PHOLADIFORMIS LATA Dall. Shorter and broader than the preceding; radiating lines more numerous, about sixteen in number, not so much raised; teeth shorter and grooved, large middle tooth folded. Length 1.75 inches.

Pl. 25, Fig. 6

Maine to South Carolina

GENUS RUPELLARIA Fleuriau 1802;
Choristodon Jonas 1844

RUPELLARIA TYPICA Jonas. Shell well rounded in front, moderately produced and gaping in rear; about forty strong radiating ribs which are finer toward the front and rear of the shell, growth lines between the ribs undulating, margins irregularly crenulate, one strong upright tooth in right valve. Length 25 mm.

This species bores in soft rock between tides and is not rare. There is a colony inside the N. Inlet at Palm Beach and in Biscayne Bay, off Arch Creek, Florida.

Pl. 25, Fig. 7

North Carolina to Florida; West Indies

GENUS CORALLIOPHAGA Blainville 1824
(CORAL DWELLERS)

CORALLIOPHAGA CORALLIOPHAGA Gmelin. Shell thin, cylindrical, gaping slightly behind; two hinge teeth in each valve, also a posterior tooth; pallial sinus wide and shallow.

It lives in the burrows of other mollusks. Often several dead specimens together with the original inhabitant are found in a burrow. Length 1.5 inches.

Pl. 25, Fig. 14

West coast of Florida to Texas;
West Indies; Mediterranean

Family Tellinidae

Shell compressed, rounded in front, angular and slightly folded posteriorly; ligament external, prominent. Animal with slender diverging tentacles, foot broad. On account of the great diversity and scope of the family it is a difficult one to define in a few words. There are about five hundred species known, some living at considerable depths. Tellina often almost approximates Verus in beauty of coloring and form.

GENUS TELLINA Linné 1799
(TELLIN SHELLS)

TELLINA INTERRUPTA Wood. Shell oval r

oblong, solid, not polished, surface with strong concentric lines; color white with crowded narrow zigzag streaks of brown or purple; interior tinged with yellow. Length 3 inches.

A peculiar narrow form, with purplish spots, lives at Pass au Grille and elsewhere on the Florida west coast.

Pl. 22, Fig. 5

North Carolina to Brazil.

TELLINA LAEVIGATA Linné. Shell solid, glossy, nearly smooth; anterior end slightly longer, rounded and swollen; posterior end less angulated; umbones prominent; ligament sunken; lateral teeth strong.

There are two color varieties:

a. White or flesh colored with orange rays.

b. White with bright orange-red on margins, umbones and interior touched with yellow.

The umbones are often worn where they meet. Length of shell 35 mm.

Pl. 23, Fig. 2

Florida and West Indies; Bermuda

TELLINA LINEATA Turton. Lined Tellin. Height two-thirds of length; umbones high and sharp; ridge at posterior end with a short sharp ridge above. Color buff, white or pink; umbonal region generally deeper colored. Surface with close concentric ridges; valves flexed to the right; right valve with two cardinal teeth, the posterior one widely bifid, two strongly developed lateral teeth. Length 30 mm. or less.

Pl. 9, Fig. 8

Florida; West Indies; Brazil.

TELLINA RADIATA Linné (Rising Sun Shell). Shell solid; surface white, smooth, polished, with zones of pale yellow color and broad rosy rays; ligament short; interior yellowish. Length 2-4 inches.

Pl. 23, Fig. 3

South Carolina to West Indies and Texas

TELLINA RADIATA UNIMACULATA Lamarck. Shell the same as the preceding but without the pink rays, usually of a uniform yellow.

Pl. 23, Fig. 16

South Carolina to West Indies

SUBGENUS ACROPAGIA Leach 1827

SECTION CYCLOTPELLINA Cossmann 1886

TELLINA FAUSTA Donovan. Favored Tellin. Shell solid, dull whitish, vertical deep interrupted lines; fold fairly distinct; ligament large, projecting; interior glossy, white or tinged with yellow. Length 2-3 inches.

It appears to be plentiful in the vicinity of Key West, Florida.

Pl. 22, Fig. 9

Off North Carolina to West Indies

SECTION MERISCA Dall 1900

TELLINA AEQUISTRIATA Say. Shell ovate-orbicular with an elevated ridge or fold upon anterior margin; surface with fine raised and numerous concentric striae, grooved between; cardinal teeth deeply grooved; two lateral teeth. Length 22 mm., usually less.

Pl. 13, Fig. 8

North Carolina to Brazil

TELLINA CRYSTALLINA Wood. Crystal Tellin. Shell white, exterior dull, interior glossy; right valve flat, the left convex and larger; posterior end ridged and forming a projection beyond margin; teeth inconspicuous. Length 25 mm.

Pl. 19, Fig. 8

South Carolina to West Indies;
Pacific coast of North America

TELLINA LINTEA Conrad. Lined Tellin. Length 25 mm.

Pl. 23, Fig. 7

North Carolina to Gulf of Mexico

SECTION FURYTELLINA Fischer 1887

TELLINA ALTERNATA Say. Shell rather solid, compressed, glossy opaque white or yellowish white; ligament conspicuous; sculptured with rather wide concentric ridges; umbones slightly behind center; left valve with two cardinal teeth (one bifid) and two faint lateral teeth; right valve with a strong bifid cardinal tooth and a narrow anterior one, also a remote posterior lateral tooth. Length 2 inches.

Sometimes the shell assumes a deep pink color. Single valves are rather frequent upon the beaches.

Pl. 22, Fig. 4

North Carolina to Gulf of Mexico

TELLINA ANGULOSA Gmelin. Angulated Tellin. Umbones nearly central, ligament rather prominent, both ends ridged, the furrows near the outside margins; concentric lines fine and distinct, radiating lines less prominent but visible in a strong light; surface white, touched with rose color, interior deep rose, whitish between adductor muscle areas and at margin. Length 42 mm.

Pl. 20, Fig. 12

Pl. 18, Fig. 9

Florida Keys to Brazil

SUBGENUS MAERELLA Fischer 1887

TELLINA MARTINICENSIS Orbigny. Martinique Tellin. Shell small, anterior end rounded, the posterior pointed; external surface covered with regularly placed but rather distantly spaced raised lines which appear to be a form of epidermis; a single distinct, distant, lateral tooth on each side of each valve and well removed from the umbo. Length 10 mm., height 8 mm., thickness of both valves 5 mm.

Pl. 18, Fig. 11

Tampa Bay, Florida, to West Indies

SUBGENUS ANGULUS Megerle von Mohfeld 1811

TELLINA MAGNA Spengler. Great Tellin. A large, smooth, polished shell with a pale series of orange rays near the umbones; anterior end the longer, rounded; posterior end narrow and angulated; fold distinct; ligament sunken; interior whitish, touched with orange.

Young shells are often deep orange outside with narrow pink rays; some adults uniformly orange outside. Fine large examples have been collected on Santa Rosa Island, northwest Florida. Single valves are occasionally found in Palm Beach County. Length 2.5 inches.

Pl. 23, Fig. 1

Cape Hatteras, North Carolina to West Indies

TELLINA MERA Say. Pure Tellin. Shell small, thin, regularly striated transversely; umbones forming an angle; ligament reddish; hinge with two teeth in each valve; posterior tooth small and triangular; anterior teeth thicker and blunt; a single large triangular lateral tooth in left

valve; pallial sinus very large. Length 15 mm.

Pl. 10², Fig. 10

South Carolina to the Bahamas

TELLINA PROMERA Dall. Similar to *T. tampaensis* but larger, the lateral teeth feeble and without definite projections, exterior duller and with a yellowish epidermis, concentric lines farther apart. Length 20 mm.

Pl. 22, Fig. 3

Tampa Bay, Florida, to Curaçao; Bermuda

TELLINA SAYI Dall (*T. polita* Say). Say's Tellin. Ligament edge straight and lesser extremity acute, also wedge-shaped. Surface shining, no concentric sculpture. Length 18 mm.

Pl. 23, Fig. 4

North Carolina to Gulf of Mexico

TELLINA TAMPAENSIS Conrad. Tampa Tellin. Shell white or slightly pinkish, surface often iridescent when fresh, anterior end rounded, the posterior end slightly pointed; concentric lines very fine; radiating sculpture rough and indistinct; ligament prominent; central cardinal tooth distinct; one anterior lateral tooth. Length 14-16 mm.

It has been reported from the vicinity of Tampa and Sanibel, Florida.

Pl. 23, Fig. 17

Florida to Texas

TELLINA TENERA Say. Delicate Tellin. Shell small, delicate, thin, white, iridescent; concentric growth lines fine; marginal fold distinct; ligament short and conspicuous; two cardinal teeth in each valve; lateral tooth, at longer end, distinct; other lateral tooth, nearest to ligament, very feeble. Length 12-15 mm., height 8-10 mm.

This attractive little shell sometimes is tinged with rose color.

Pl. 18, Fig. 10

Fig. 34a

Prince Edward Island to Gulf of Mexico

TELLINA TENELLA Verrill. As in *T. tenera* this species varies from white to pinkish color. The epidermis is often thicker than in that species, giving the shell a yellowish

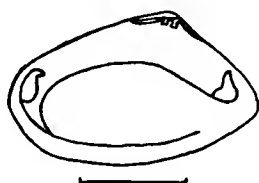


Fig. 34a
Tellina tenera

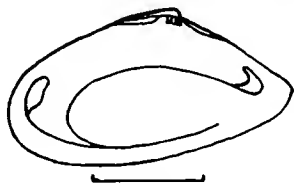


Fig. 34b
Macoma tenta



Fig. 34c
Tellina tenella

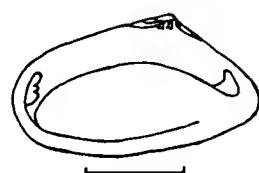


Fig. 34d
Tellina versicolor

cast. The hinge teeth are more equal in size than in the preceding species. The largest specimen in a lot is 12 mm. long, 7 mm. high.

Fig. 34c

Southern Massachusetts to New York

TELLINA VERSICOLOR Cozzens. The color is opalescent white, usually with rows of pink which widen toward the margin. Pallial line close to adductor muscle scar as shown in illustration. Length of large example 14 mm., height 8 mm. Range 15-50 fathoms.

The four drawings of these small Tellinas, together with a portion of the descriptions, are from a paper by C. W. Johnson (*Nautilus* XLV, p. 109).

Fig. 34d

Connecticut to West Indies

SECTION SCISSULA Dall 1900

TELLINA SIMILIS Sowerby. Similar Tellin. Shell convex, glossy, white inside and out but rayed with pink; few concentric lines and minute oblique sculpture, replaced before reaching the umbonal ridge by close striae; ventral edge somewhat straight; anterior end the longer, rounded; ligament short; lateral teeth prominent. Length 20 mm.

One of the most beautiful of the small Tellinas of Florida. Specimens not infrequently occur in lower Biscayne Bay.

Pl. 22, Fig. 8

Palm Beach County, Florida, to West Indies

TELLINA CANDEANA Orbigny. Concentric lines fine, crossed by oblique striae which is most persistent toward the posterior end; anterior ridge not prominent; exterior glossy; cardinal tooth minute, lateral teeth feeble. Length 14 mm.

Pl. 11, Fig. 11

Florida Keys; West Indies; Bermuda

TELLINA IRIS Say. Shell fairly strong; white inside and out, yellow indistinct ray at umbones; front extremely rounded; posterior end short and wedge shaped. Length 12 mm.

Pl. 23, Fig. 15

North Carolina to Florida Keys

GENUS *MACOMA* Leach 1819

Shell oval; hinge with small cardinal teeth, no lateral teeth; ligament external.

MACOMA BALTHICA Linné. Shell slightly triangular, thick, white or pale flesh color; interior usually rosy, smooth not glossy; anterior end rounded; posterior end angulated but with tip rounded; ligament large and prominent; teeth small. Length 23 mm.

Pl. 23, Fig. 8

Arctic Seas to Georgia

MACOMA CONSTRICTA Brug. Growth lines very fine; posterior end pointed and with a fold in shell forming a notch below; posterior end pushed to one side and giving a distorted appearance; ligament long and narrow; surface dull white, epidermis yellowish. Length 2 inches.

Pl. 2, Fig. 9

North Carolina to Brazil

MACOMA TENTA Say. Shell small, white, thin, oval; much narrowed, twisted and gaping; outer surface shining but not polished; inside white, tinged with yellow and with a covering of fine radiating lines which indent the edge of the shell; hinge extremely delicate, two cardinal teeth on right valve and one on left valve; one lateral tooth nearest the ligament on the right valve and a groove opposite it on the left valve. Length 20 mm.

The lines inside the shell are characteristic, also the widely gaping posterior end. It appears to be a mud

dweller, living in the harbors along the New England coast.

Pl. 6, Fig. 6

Fig. 34b

Maine to Florida

MACOMA CALCAREA Gmelin. A thin, white shell with a greenish or dusky epidermis; anterior end rounded, posterior end angular; two hinge teeth in each valve, lateral teeth absent; umbones very indistinct. Length 1.25 inches.

It has been found in the stomachs of fish caught north of Boston and as far as Eastport, Maine. Depth range 5-40 fathoms.

Pl. 16, Fig. 10

Greenland to Long Island Sound,
New York

SECTION CYDIPPINA Dall 1900

MACOMA BREVIFRONS Say. Shell thin, fragile, very slightly convex; color white, touched with pale pink on umbones, interior deeper pink; umbones anterior to center, two cardinal teeth in left valve, one in right valve, lateral teeth absent. Length 35 mm.

Pl. 23, Fig. 9

New Jersey southward to Brazil

GENUS STRIGILLA Turton 1822

Surface arranged in two or three sculptured areas in which the ridges diverge or otherwise; posterior end not flexed; hinge as in Tellina.

STRIGILLA CARNARIA Linné. "Recognizable by the fact that the upper part of the pallial sinus connects the adductor scars." Sculpture often obsolete upon the umbonal angle. Length 20 mm.

The rose color, or reddish shade, is characteristic of this species.

Pl. 19, Fig. 4

North Carolina to Brazil

STRIGILLA ROMBERGI Morch. In this species the pallial sinus does not touch the adductor muscle in front. Length 20 mm.

Pl. 18, Fig. 8

Florida to Brazil

STRIGILLA FLEXUOSA Say. Shell white, anterior end longest and less obtusely round-

ed; umbones behind center; surface sculptured with regular parallel impressed lines, no longitudinal striae, transverse wrinkles minute. Length 11 mm.

There is a fold on the anterior margin. It is striking on account of the zigzag course of the oblique sculpture over it.

Pl. 18, Fig. 2

North Carolina to the West Indies

STRIGILLA PISIFORMIS Linné. Shell small, rather solid; a distinct lunule in front of the rather high umbones which are nearer to the forward end; series of upturned ridges variable, some coarse and corrugated; left valve with a high, bifid, cardinal tooth and a small one back of it; two cardinal teeth in right valve; two lateral teeth in each valve. Color pink, the umbones and a portion of interior red. Length 9 mm.

Pl. 19, Fig. 9

Florida Keys and Antilles

GENUS TELLIDORA Morch 1856

Delicate white, compressed, shells with a portion of the margin serrated.

TELLIDORA CRISTATA Recluz. Left valve flatter than the right, while the reverse is the case of the Pacific *T. Burneti*. Length 25 mm. This exceptionally beautiful form, with its saw-tooth edge, cannot possibly be confused with any other. The author dredged it alive in Tarpon Bay, Sanibel. Dr. Perry has taken it there also at low tide, the animal's position being indicated by a small slit in the mud or sand.

Pl. 54, Fig. 6

West Florida to Trinidad, West Indies

GENUS APOLYMETIS Salisbury 1929; Metis H. and A. Adams 1853, not Philippi 1843

Shell oval, thin; ligament external. Siphons of animal long, slender. Found living buried 5-6 inches deep, in a vertical position, in the mud of streams affected by the tide and near the sea.

APOLYMETIS INCASTRATA Say. A rather large, thin, twisted shell, strongly folded; cardinal teeth extremely small for size of

shell, lateral teeth obsolete. Length 3 inches.

Single valves, in the writer's cabinet, were collected in Florida at Sanibel and in Lake Worth. This shell is often confused with *Macoma constricta*.

Pl. 22, Fig. 2

East Florida southward from Lake Worth; West Florida southward from Sanibel; West Indies

Family Semelidae

Shell somewhat rounded, umbones turned forward; fold upon posterior end; two cardinal, two lateral teeth, the latter long and distinct in right valve; outside ligament short, inside one long and oblique; pallial sinus well excavated, rounded.

Some of these mollusks live deep in mud or sand, the powerful foot being used for creeping. They have been observed ascending the sides of a vessel after being captured.

GENUS SEMELE Schumacher 1817

SEMELE BELLASTRIATA Conrad. Surface covered with distinct radiating ribs and rather strong concentric ridges; shell compressed, anterior end the longer; color yellow, ochre or purple, often rayed or spotted with violet inside. Length 25 mm.

It has been dredged in 19 fathoms off Key West, Florida. Beach specimens are infrequent at Sanibel.

Pl. 21, Fig. 4

North Carolina to Gulf of Mexico and West Indies

SEMELE PROFICUA Pulteney. Shell slightly longer than high, nearly equilateral; ligament small and placed in escutcheon; lunule in front of umbones; concentric growth lines strong, sometimes elevated into ridges giving a wrinkled appearance to surface; color white, straw or purple, often variegated. Length 30 mm.

Specimens have been taken at Palm Beach, Marco and Sanibel in Florida.

Pl. 23, Fig. 11

Virginia to Gulf of Mexico; West Indies

SEMELE NUCULOIDES Conrad. Shell ovate,

convex; concentric lines very minute and regularly placed; anterior extremity acutely rounded; umbones near the posterior extremity; basal margin arcuate; lateral teeth obsolete. Length 4.5 mm.; height 3 mm. diameter 1.5 mm.

Pl. 10, Fig. 7

North Carolina to Gulf of Mexico; West Indies

SEMELE PURPURASCENS Sowerby. Shell oval, posterior end angled, anterior end rounded; color usually light yellowish; umbones purple; indistinct variegations of purple upon surface also; interior often deep purple; concentric lines moderately impressed, radial lines of similar strength. Length 40 mm.

Fresh double specimens have been taken by the writer in Lake Worth, Florida, near the North Inlet. Single valves, brilliantly colored, are not rare on the shores of Hobe Sound where possibly it may live.

Pl. 26, Fig. 12

North Carolina to Gulf of Mexico; West Indies

GENUS ABRA 'Leach' Lamarck 1818;
Syndosmya Recluz 1845

Shell small, whitish, rather compressed; posterior end shortest.

ABRA AEQUALIS Say. Shell orbicular, a little oblique, rather thin, white, scarcely shining; minute concentric wrinkles near margin and which become absent near umbones; no lateral teeth; one cardinal tooth and a vestige of a second on left valve; one cardinal tooth and a feeble one behind in right valve. Length 10 mm., height 3 mm., diameter 4 mm.

Pl. 25, Fig. 10

Connecticut to Florida; Texas

ABRA LIOICA Dall. Shell small, thin, umbones prominent; growth lines faint; smooth and shining; umbones nearest to posterior end, opposite end rounded; left valve with one prominent cardinal and one small tooth behind; right valve with two strong cardinals; lateral teeth absent in both valves. Length 7 mm. Depth range 14-860 fathoms.

It has been reported upon the shore at Captiva Island, Florida.

Pl. 23, Fig. 13
 Pl. 62, Fig. 8
 North Carolina to the West Indies

GENUS CUMINGIA Sowerby 1833

Shell gaping and pointed behind;
 concentrically laminated.

CUMINGIA TELLINOIDES Conrad. Surface dull except region of umbones, white or yellowish; two lateral teeth very long; two cardinal teeth small and with cup-shaped depression between them; concentric lines irregular and rather prominent. Length 14 mm.

Pl. 23, Fig. 6
 Cape Cod to Gulf of Mexico; West Indies

CUMINGIA COARCTATA Sowerby. Shell oval, concentrically lamellated; anterior end high, rotund; margin dorsally declining. Often found in sponges. Length 20 mm.

These two Cumingias are apparently of common descent, the young being almost identical.

Pl. 23, Fig. 5
 Florida Keys and West Indies

Family Donacidae

Shell wedge shaped, closed; posterior end produced, more or less rounded, anterior end short and straight; edge usually crenulated; ligament external; umbones pointing backward.

The Donacidae live in clean sand upon the ocean beaches.

GENUS DONAX Linné 1758 (WEDGE SHELLS)

DONAX DENTICULATA Linné. Toothed Wedge. Shell solid, long triangular; anterior end narrow and rounded; base line a little curved and with faint angulation in center; fine radiating ridges on surface, peculiarly serrate on their edges; strong oblique ridges on posterior slope, with fine threads between them; inner margin of shell toothed; pallial sinus deeply impressed. Length 28 mm.

The color range is considerable. Yellow, brown and violet tinted shells occur, often beautifully rayed. It is a common shell in the West Indies.

Pl. 25, Fig. 3
 Florida Keys; Texas; West Indies

DONAX FOSSOR Say. Digging Wedge. Often an olive-colored shell with bluish rays. Posterior end rounded; sides not angular; radiating sculpture covered by a thin layer so that surface of shell is smooth. A slight magnification shows the radiating lines. This species is thinner than *D. variabilis* with consequent smaller crenulations upon the margin. Length 12-15 mm.

It is the most plentiful shell on the New Jersey coast. Johnson reports "At Anglesea I once saw them washed out of the sand in pools around the stanchions of a wrecked vessel, almost a bushel of living shells being present in each pool." Wood recounts the results of a quantitative study, counting one thousand five hundred and ten live Donax in one square foot. These were in Cape May County, New Jersey.

Pl. 10, Fig. 12
 Long Island, New York to Florida Keys

DONAX TUMIDA Philippi. (*D. obesa* Orb.). Inflated wedge. Shell small, very stout, polished, more rounded than *D. variabilis*, shell also more inflated; striae only visible under a glass. Length 10-12 mm.

Pl. 10, Fig. 9
 St. Augustine, Florida, to Texas

DONAX VARIABILIS Say. Variable wedge. Posterior end obliquely truncate, the sides decidedly angular; the little ribs with interspaces of almost equal width being plainly visible to the naked eye. Length 20-25 mm.

This, the commonest east coast wedge shell occurring in the south, is often used in the preparation of broth. There are almost countless color combinations on the shells.

Pl. 25, Fig. 10
 Cape Hatteras, North Carolina to Texas; West Indies

GENUS IPHIGENIA Schumacher 1817

Shell almost equilateral; two hinge teeth in each valve, one bifid, the other minute; lateral teeth far apart, obsolete in left valve; margins smooth. It inhabits estuaries and quiet brackish water.

IPHIGENIA BRASILIANA Lamarck. Shell solid, umbones a little closer to posterior end; surface showing faint radial lines from umbones; epidermis smooth, worn off in old specimens; interior white or purplish, the teeth frequently purple. Length 3 inches.

This species is common in Lake Worth, Florida, where it is sometimes taken for food. It prefers inland waters but subject to tidal influence.

Pl. 24, Fig. 2

Indian River, Florida, to Brazil

Family Sanguinolaridae

Shell rather convex, mostly transparent, inequilateral; often finely concentrically striated; somewhat pointed at posterior end; each valve provided with two erect subbifid close together teeth; muscular impression with a triangular sinus.

GENUS SANGUINOLARIA Lamarck 1799

Shell of fair size, usually inclined toward rose or red color.

SANGUINOLARIA SANGUINOLENTA Gmelin. Shell rather solid, inequilateral, convex; decussately striated; whitish, tinged with rose adjacent to umbones; hinge external and prominent. Length 2.75 inches. Some specimens are uniformly rose colored.

Pl. 25, Fig. 13

Southern Florida and the West Indies

GENUS GARI Schumacher 1817;

Psammobia Lamarck 1818

GARI VAGINOIDES Reeve. Shell oblong, rather convex, ends rounded; finely decussately striated; dull white with touches of pinkish yellow near umbones; straw-colored epidermis near margin. Length 32 mm.

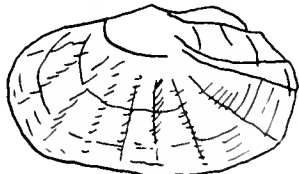


Fig. 35

Gari vaginoides
32 mm.

Fig. 35

Charlotte Harbor,
Florida

GENUS HETERODONAX Morch 1853

Shell oval in shape, rather flat, thin, with fine concentric lines.

HETERODONAX BIMACULATUS Linné. A spotted shell, diverse in coloring, white and purple being the most usual pattern. Length 18 mm.

Pl. 25, Fig. 9

Fernandina, Florida to West Indies;
Pacific

GENUS ASAPHIS Modeer 1793;

Corbula Roeding 1798

Shell transverse, subequilateral; umbones rather prominent; hinge with two cardinal teeth in each valve, anterior in left valve and posterior in right valve bifid; ligament heavy.

ASAPHIS DEFLOREATA Linné. (*A. coccinea* Martyn). Shell somewhat inflated; surface covered with numerous wavy ribs which are most apparent on posterior slope, the ribs cancellated at both ends by crossing of growth lines, sometimes inclined to be scaly at rear of shell; pallial sinus large and rounded. Color varying from white through various shades of yellow, orange, red, violet; portions of interior deep violet.

This very striking and beautiful shell is abundant in the Bahamas and elsewhere in the West Indies. It is rare in Florida but has been taken near Miami. Length 3 inches but usually less.

Pl. 25, Fig. 12

Miami, Florida, to the West Indies

GENUS TAGELUS Gray 1847

Shell elongated, equivalve, margins nearly parallel, ends abruptly rounded; hinge with two to three cardinal teeth in each valve; ligament prominent.

TAGELUS DIVISUS Spengler. Shell oblong, with reddish stripe from umbones passing slightly backward and indicating presence of obsolete rib inside; epidermis yellowish; interior smooth and shining, thickened by age. Length 1.5 inches.

Pl. 25, Fig. 17

Cape Cod, Massachusetts to Florida
and Texas

TAGELUS GIBBUS Spengler. Shell subcylindrical, thick, rounded at posterior end and with umbones near extremity; hinge with two awl-shaped cardinal teeth in each valve, curved, ascending; interior white, thickened. Length 4 inches.

A much stronger shell than *T. divisus*.
Pl. 25, Fig. 4
Cape Cod, Massachusetts to Florida
and Texas

Family Solenidae

Shell equivalve, much elongated, gaping at both ends.

GENUS ENSIS Schumacher 1817
(RAZOR SHELLS)

Sides of shell almost parallel; cardinal teeth small, rounded; valves more or less curved.

ENSIS DIRECTUS Conrad. Shell curved, scabbard shaped; epidermis light yellowish green; length of shell six times the width; one tooth on hinge and sharp plate of one valve entering between; two teeth and double plate upon other valve. Length 6 inches.

This species is almost identical to the European one. It lives on sandy beaches at low water mark, projecting a little above the level of the sand. When disturbed it rapidly disappears. The animal is much larger than the shell, the foot club-shaped.

Pl. 24, Fig. 8
Pl. 72, Fig. 4
Labrador to the Florida Keys

GENUS SOLEN Linné 1758

Umbones almost anterior; exterior polished; valves usually straight.

SOLEN VIRIDIS Say. Green Solen. Shell oblong, compressed; hinge margin almost straight; lower margin curved; posterior end obliquely cut off, slightly reflected and rounded near base; anterior end rounded; surface almost smooth; epidermis pale green. Length 2 inches.

Pl. 24, Fig. 3
Rhode Island to west coast of
Florida

GENUS SILIQUA Megerle von Muhlfeid 1811
(POD SHELLS)

Shell compressed, moderately gaping; umbones minute.

SILIQUA COSTATA Say. Ribbed Pod. Shell thin, fragile, smooth, diaphanous; epidermis shining and smooth, light yellow-green blended with violet, rather iridescent; internal ribs white, bending backward two to three over valves. Length 2 inches.

A shallow water species, abundant upon sandy beaches. It is one of the handsomest shells found in New England. Than the following it is much smaller and more delicate. There are two arrangements of color in both rays and zones.

Pl. 25, Fig. 5
Pl. 72, Fig. 3
Gulf of St. Lawrence to North
Carolina

SILIQUA SQUAMA Blainville. Scaly Pod. Shell rounded at both ends; umbones very small; white but covered with strong, shining yellowish-green epidermis which is roughened at posterior end; prominent rib inside extending from umbones about halfway across shell. Length 2.5 inches.

It is often found in the stomachs of fish caught at the Banks and off the New England coast.

Pl. 16, Fig. 9
Banks of Nova Scotia and New England

Family Mactridae

Shell equivalve, close or slightly gaping; ligament external or internal and contained in a deep pit; epidermis heavy; hinge with two diverging cardinal teeth, lateral teeth present or absent.

GENUS MACTRA Linné 1767
(BEACH CLAMS)

Foot of animal strong, bent, tongue-shaped, adapted to life in the surf and sands.

MACTRA FRAGILIS Gmelin. Frail Clam. Shell white, thin, covered with a light yellowish brown epidermis; decidedly gaping; concentric sculpture closely placed. Length 2 inches.

Pl. 24, Fig. 3
North Carolina to Gulf of Mexico;
Brazil

GENUS SPISULA Gray 1838

SPISULA SPILISSIMA Dillwyn. This giant and strong clam measures 4-7 inches in length; cardinal tooth small, fragile,

V-shaped; lateral teeth long, thin, striated on receiving surfaces; spoon shaped cavity large, broad, housing internal ligament which is dark colored.

This *Spisula* is easily found upon the northern beaches. It is esteemed as food and is the largest bivalve upon the Atlantic northeast coast.

Pl. 57, Fig. 7

Labrador to Cape Hatteras, North Carolina

SPISULA SOLIDISSIMA SIMILIS Say. Less heavy than the preceding and smaller, also brighter although not glossy. Length 4.5 inches.

The most abundant bivalve mollusk of large size upon the west coast of Florida. From Cape Hatteras southward it replaces the typical form.

Pl. 24, Fig. 4

Massachusetts to Florida and Gulf of Mexico

SPISULA POLYNYMA Stimpson (*M. ovalis* Gld.). Shell large; a little shorter in front of the umbones which are slightly elevated; lateral teeth short and not striated; V tooth strong; pallial sinus deep; epidermis tough, yellowish brown or dusky; interior bluish white. Length 3.5 inches.

At Eastport, Maine, and Grand Menan these clams have been found plentiful at low water mark. It also occurs on Georges Bank.

Pl. 25, Fig. 15

Hudson Bay to Massachusetts

GENUS *MULINIA* Gray 1857

MULINIA LATERALIS Say. Shell small, triangular, distinctly convex, apparently smooth but with minute wrinkles; base white, covered with brown epidermis; umbones nearly central, prominent; hinge strong, V-shaped marginal tooth. Length 12-18 mm.

An extremely common form living on salt marshes and near the mouths of rivers. Southern examples are the smoothest.

Pl. 24, Fig. 5

New Brunswick to Texas; West Indies

MULINIA LATERALIS NUCLEUS Conrad. 12 mm.

Pl. 3, Fig. 9

New England

MULINIA LATERALIS CORBULOIDES Desh.

Pl. 3, Fig. 10

Beaufort, North Carolina to Texas

GENUS *RANGIA* Desmoulins 1832

(*GNATHODON* GRAY)

Shell equivalve; epidermis prominent; umbones far apart; two small cardinal and two lateral teeth in right valve; one cardinal and two lateral teeth in left valve; ligament in trigonal internal pit.

RANGIA CUNEATA Gray. Wedge *Rangia*. Shell thick and heavy; epidermis olive green and thick; anterior end short; umbones elevated; posterior end angular, beaked at end. Length 2 inches or more.

In 1870 this was first taken in Lake Ponchartrain, New Orleans, and described at that time. The city of Mobile is said to be built upon soil containing the "bones" of countless *Rangia*. More recently it has been collected near Jacksonville, Florida and in Georgia. It usually lives in the mud banks of brackish water streams.

Pl. 24, Fig. 1

Georgia; Florida; Gulf of Mexico

RANGIA CUNEATA ROSTRATA Petit. Beaked *Rangia*. In this variety the point at the posterior end is very pronounced.

Pl. 18, Fig. 5

Texas; Gulf of Mexico

GENUS *ANATINA* Schumacher 1817

(*LABIOSA* MULLER 1832)

Marginal teeth feeble; no lateral teeth.

ANATINA CANALICULATA Say. Channeled Duck. Shell pure white, thin and fragile; ornamented with beautiful raised concentric ribs; inflated and slightly gaping; shining white inside. Length 2.5 inches.

Single valves are common upon windswept beaches from Cape Hatteras to Mexico. The author has never seen or heard of a living example.

Pl. 26, Fig. 3

New Jersey to Gulf of Mexico

ANATINA LINEATA Say. Lined Duck. Surface with fine regular growth lines, white or

yellowish, exterior dull; anterior end wing-like, pointed, flaring so that shell gapes; pallial line, inside shell, glossy against an otherwise dull surface.

Pl. 26, Fig. 2

New Jersey to Texas; Brazil

Family Mesodesmatidae

GENUS MESODESMA Deshayes 1830;
CERONIA GRAY 1855

Shell oval, wedge-shaped, cut off at posterior end; lateral teeth compressed and furrowed.

MESODESMA ARCTATA Conrad. Shell very inequilateral, wedge-shaped; epidermis yellow and shining; umbones slightly elevated; deep spoon-shaped cavity in hinge for the cartilage: cardinal tooth V-shaped and placed at an angle; straight lateral teeth on each side with striated surfaces. Length 1.5 inches or more.

It is not infrequently found upon the beaches in considerable numbers, especially upon the outer shores of Cape Cod.

Pl. 6, Fig. 8

Pl. 26, Fig. 9

Gulf of St. Lawrence to New Jersey

GENUS ERVILIA Turton 1822

ERVILIA CONCENTRICA Gould. Shell small, white or yellowish, compressed, umbones close together and not prominent; concentric sculpture weak. Length 5 mm.

Specimens in the National Collection were collected near Loggerhead Key, Florida.

Pl. 26, Fig. 11

Cape Hatteras, North Carolina to the Florida Keys and at Pensacola, Florida

ERVILIA NITENS Montagu. Shell small, whitish, tinted with pink inside and out, especially toward the centers; ends somewhat rounded; concentric lines distinct, evenly placed, at anterior end slightly broken by radiating sculpture. Length 7 mm.

Pl. 26, Fig. 10

South Carolina; Florida Keys; West Indies

Family Myidae (from Myax, a Mussel)

Hinge with spoon-shaped tooth in one valve and corresponding opening in opposite valve, joined by a cartilage.

GENUS MYA Linné 1758
(SOFT SHELL CLAMS)

Shell gaping at both ends, erect tooth in left valve.

MYA ARENARIA Linné. Sand Clam. Shell chalky white; epidermis wrinkled, thin dirty brown; tooth inclined backwards and downwards, with oblique ribs in back. Normal length 3.5 inches.

The soft-shell clam is familiar to everyone residing near the sea. It lives between high-tide and low-tide marks and exposed to the air a portion of the time.

Pl. 26, Fig. 7

Pl. 54, Fig. 3

Arctic Seas to North Carolina

MYA TRUNCATA Linné. Short Clam. Shell oblong, rounded at anterior end, truncated at posterior end, widely gaping; color dingy white, covered with a yellowish epidermis which extends over edges of the shell. The truncated edges are slightly flaring while the rear of the shell is wide open. Length 2.75 inches.

The chopped off end is peculiar and readily separates the shell from others. After violent gales it is sometimes thrown upon shores but is most abundant at Georges and the Grand Banks where it is a favorite food of codfish.

Pl. 26, Fig. 8

Greenland to Massachusetts; Circumpolar

Family Corbulidae

GENUS CORBULA Bruguiere 1797
(BASKET SHELLS)

Valves unequal, the right often the larger; single large tooth below umbo in right valve, deep pit behind it but no lateral teeth, the pit a repository for tooth of right valve; elevated process in front of pit and sometimes a rudimentary tooth behind it; umbones conspicuous, the one upon the right valve usually the strongest; no pallial sinus.

CORBULA BARRATTIANA Orbigny. Barratt's Little Basket. Posterior end broadly truncated, posterior slope well defined; wide and undulating concentric ribs; numerous distinct radial lines, especially upon slope; umbones close together and of moderate size. Length 8.9 mm.

Dredged by the writer off Tiger Key, west Florida, in shallow water. Depth range 2-287 fathoms.

Pl. 61, Figs. 7a, b, c
Cape Hatteras, North Carolina to Jamaica

CORBULA CHITYANA C. B. Adams. Resembles *C. barrattiana* but thick and solid, very wide; two periods of growth like *C. dietziana*. Length 8.5 mm. Range 4-5 fathoms, rare. Included for comparison.

Pl. 61, Figs. 6a, 6d
Kingston Harbor, Jamaica

CORBULA CONTRACTA Say. Squeezed Basket. Shell white, covered with many concentric raised lines or ribs; anterior end rounded; somewhat pointed behind; basal margin contracted in middle; hinge tooth slender, erect. Length 5-12 mm. Range 3-63 fathoms.

Abundant about Rhode Island and Martha's Vineyard. It also is plentiful upon the Florida east coast.

Pl. 8, Fig. 9
Pl. 60, Figs. 6a, 6b
Cape Cod, Massachusetts to Jamaica, British West Indies

CORBULA CUBANIANA Orbigny. Length 12.7 mm. A deep-water shell.

Pl. 60, Figs. 3a, b, c
Florida Strait to Jamaica

CORBULA CYMELLA Dall. A rare shell which has only been taken in 68-75 fathoms at one station. Length 13.5 mm.

Pl. 60, Figs. 7, 7a
Gordon Key, Florida Keys

CORBULA DIETZIANA C. B. Adams. Length 10.7 mm. Range 14-100 fathoms. Off west Florida it has been taken in 30 fathoms.

Pl. 60, Figs. 5a, b
North Carolina to West Indies

CORBULA DISPARILIS Orbigny. A species variable in its proportions and sculpture.

The smaller valve is often pink, or pinkish brown. Length 8 mm. Range 5-805 fathoms.

Pl. 60, Figs. 4a, b
North Carolina to West Indies

CORBULA KJOERIANA C. B. Adams. Differs from *C. swiftiana* in being less rostrated, also more elongated behind; both valves sculptured alike. Length 12 mm. Range 4-5 fathoms. Introduced for comparison.

Pl. 60, Figs. 6, 6a, 6b
St. Thomas; Jamaica

CORBULA KREBSIANA C. B. Adams. Shell triangular, very inequivalve, inequilateral; large valve rostrated; white, often tinged with pink; large valve closely and finely furrowed; umbones very convex; teeth small. Length 6.1 mm.; alt. 5.1 mm. Range 3-85 fathoms.

Pl. 60, Figs. 1a, b
Florida to the West Indies

CORBULA NASUTA Sowerby. Length 8.5 mm. Range 4-63 fathoms.

Pl. 61, Figs. 6a, b, c, d
North Carolina to the West Indies

CORBULA SWIFTIANA C. B. Adams. Swift's Basket. Shell triangular, inequivalve; posterior ridge sharp and distinct in both valves, terminating in sharp beak at base; surface of juvenile specimens almost smooth; concentric lines becoming stronger with age and showing feeble radial ribs; color whitish. Length 9 mm.

The most plentiful *Corbula* in Florida waters. It may easily be procured in Tarpon Bay, Sanibel. Range 0-450 fathoms.

Pl. 57, Fig. 9
Pl. 61, Figs. 5a, b, c
Cape Hatteras, North Carolina to Venezuela

GENUS BASTEROTIA

BASTEROTIA QUADRATA GRANATINA Dall. Length 10 mm. Range 6-640 fathoms.

Pl. 60, Figs. 2a, b
North Carolina to Texas; West Indies

Family Saxicavidae

Shell slightly gaping at each end, elongate, irregular; hinge toothless or with a rudimentary tooth in each valve;

ligament long and well developed.

GENUS SAXICAVA Fleuriau de Bellvue 1802
(STONE BORER)

SAXICAVA ARCTICA Linné. Arctic Stone Borer. An excessively variable shell, conforming to its place of attachment; rosstrate in front; diagonal ridge spinous. Length 1 inch.

Often fastened by a silk-like byssus coming from inside of base. Foot of animal bright orange color. Range 1-100 fathoms.

Pl. 10, Fig. 11
Greenland to West Indies

SAXICAVA AZAREA Dall. Length 1 inch.
Range 13-14 fathoms.

Pl. 62, Figs. 9a, 9b
Charlotte Harbor, Florida to Texas

GENUS PANOPE Menard 1807

PANOPE BITRUNCATA Conrad. Oblong Panope. Shell short, contracted, obliquely cut off at anterior end; small cardinal tooth in right valve; compressed and flattened on posterior end; pallial sinus widely and bluntly rounded. Length 5.25 inches; width 3 inches.

The individuals living in easily movable material such as sand or fine mud are thinner, longer, less distorted than those associated with gravel.

P. floridana Dall, a Pliocene fossil frequent in Florida, is identical. One of the fossil shells is represented in the present illustration.

Pl. 4, Fig. 5
North Carolina to Mobile Point,
Mississippi

GENUS PANOMYA Gray 1857

Shell equivalve, gaping unequally at base and sides; a small upright tooth in each valve.

PANOMYA ARCTICA Lamarck. Shell strong, both ends gaping; anterior end rounded, other end truncated; three wave-like ridges cutting surface into three equal portions; covered with a thick, dusty, wrinkled epidermis. Length 2.5 inches.

This species is plentiful in the

fossil beds of Europe and America but is rather rare in the living state. It inhabits the Banks of Newfoundland and the Arctic Seas of Europe. Range 25-115 fathoms.

Pl. 26, Fig. 1
Arctic Ocean to Georges Bank

Family Gastrochaenidae

GENUS GASTROCHAENA Spengler 1783

Shell equivalve, widely gaping, umbones at anterior end; concentric sculpture faint and forming flask-shaped burrows (mostly in corals and shells) lined with calcareous material or forming a tube, when burrow is absent, to which the extraneous matter is fastened.

GASTROCHAENA CUNEIFORMIS Spengler. The giant hiatus, nearly as long as the shell, separates this form, also the blunt and wide extremity of the valves. Length 23 mm.

Pl. 14, Fig. 7
North Carolina to West Indies

GASTROCHAENA OVATA Sowerby. A narrower shell than the preceding; interior of each valve with a long sharp projecting ridge which is placed in the middle; concentric sculpture closely set and irregularly arranged. Length 30 mm.

The shell of *Spondylus* is a favorite host for these mollusks which have been found abundant in the Gulf of Mexico.

Pl. 14, Fig. 6
South Carolina to West Indies

Family Pholadidae

Shell gaping at both ends and with teeth-like sculpture in front; no ligament or hinge; sometimes reinforced with additional valves.

GENUS PHOLAS Linné 1758
(ANGEL WINGS)

Hinge margin rolled out and toothless; tooth emerging from beak cavity very prominent.

PHOLAS CAMPECHIENSIS Gmelin. Campeche Wing. Shell elongated, open anteriorly, rayed all over with rounded rather distinct ribs; two accessory valves covering

umbones. Length 3.5 inches.

Pl. 27, Fig. 3

Cape Hatteras, North Carolina to
Central America

GENUS BARNEA 'Leach' Risso 1826

BARNEA TRUNCATA Say. Truncated Angel Wings. Shell white, very delicate, oblong; anterior portion triangular and pointed; posterior end truncate; surface coarse with lines and small ribs; one dorsal accessory shell plate. Length 3 inches.

Animal dark smoky color, siphon tapering. At New Bedford, Massachusetts, this species was taken in mud at a depth of two feet.

Pl. 25, Fig. 16

Nahant, Massachusetts, to Florida
Keys

BARNEA MARITIMA Orbigny. Length 35 mm.

Pl. 27, Fig. 4

West Florida to Texas

BARNEA COSTATA Linné. Ribbed Angel Wings. Shell large, white, covered with radiating ribs with coarse growth lines producing tooth-like elevations and corresponding indentations within shell.

Animal yellow, tips of siphons stippled with reddish-brown; foot narrow and long; extra valve cartilaginous and spear-shaped. Length 6 inches.

This species burrows several feet below the surface. Single valves are frequent upon the beaches of St. Augustine, Cape Sable and Marco, Florida.

Pl. 27, Fig. 6

Pl. 54, Fig. 7

Cape Cod, Massachusetts to West
Indies

GENUS ZIRFAEA 'Leach' Gray 1847

Valves of shell divided into two areas by a radial sulcus; accessory shell plates lacking or rudimentary; gape in front large.

ZIRFAEA CRISPATA Linné. Shell widely gaping at the ends but touching at center of the base; radiating toothed ribs present in front of a furrow which extends from the umbones across the center of valves; exterior with many coarse concentric ridges. Length 2 inches.

Fine specimens have been taken at Nahant Beach, Massachusetts, and years ago it was common in Charleston Harbor, South Carolina.

Pl. 27, Figs. 5, 7

Labrador to South Carolina

GENUS MARTESIA Leach 1825

Valves lengthened behind; when adult characterized by a plain border; umbonal valves one or two in number; margins often with narrow accessory valves.

MARTESIA CUNEIFORMIS Say. Shell small, closed, divided obliquely by a serrated canal; marginal shields three, not uniform in size. Length 14-18 mm.

This form bores in soft rock or wood.

Fig. 36

Connecticut to Trinidad

MARTESIA STRIATA Linné. Shell closed, obliquely divided in middle; extremely produced; one ventral shield, two dorsal ones. Length 18-23 mm.

It burrows in hard, often floating timber which accounts for its wide distribution. Specimens varying greatly in size were collected at Oceanus, Florida. It is frequently found at Sanibel.

Fig. 37

South Carolina to West Indies;
Europe; Pacific

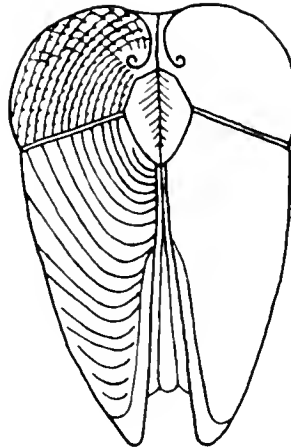


Fig. 36
Martesia
cuneiformis

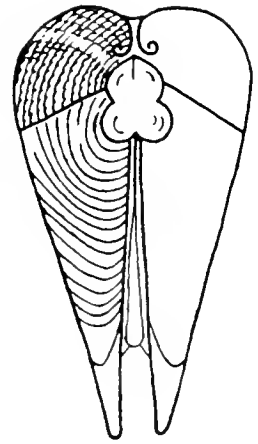


Fig. 37
Martesia
striata

MARTESIA CARIBAEA Orbigny. Shell broadly wedge-shaped, inflated at anterior end

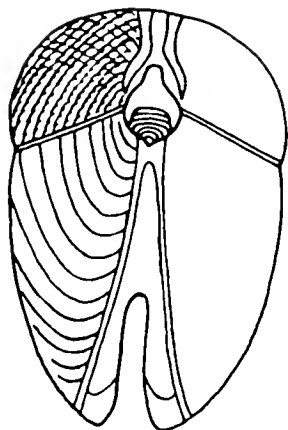


Fig. 38
Martesia
caribaea

which has fine wavy lines; posterior half marked by small concentric undulations and growth lines. Length 9-17 mm.

In 1904

C. W. Johnson collected this shell in soft artificial limestone off the water battery in St. Augustine. It has only been recorded from limestone, or boring into other shells, while the other *Martesia*s are more frequently taken in wood. The illustrations of the three species are from Johnson's drawings.

Fig. 38

New York to Florida; Texas; Cuba

Family Teredidae

Shell globular, open in front and rear; valves three lobed with one transverse furrow.

Animal worm-like, foot sucker-like; siphons very long, united almost to end.

GENUS *TEREDO* Linné 1758
(SHIP WORMS)

TEREDIO NAVALIS Linné. Usually one foot long but sometimes over two. It destroys soft wood quickly, even oak and teak do not escape, therefore is one of the greatest enemies to industrial mankind. The "ship Teredo" invariably bores in the direction of the grain unless it meets the tube of another *Teredo* or encounters a knot.

In the Pacific another *Teredo* burrows in the husks of floating coconuts and other woody fruits. The tube of the giant *Teredo arenaria* attains a length of 3 feet and a diameter of 2 inches; a cross section presents a radiating prismatic structure.

Pl. 27, Fig. 1

Arctic Ocean to Florida, Europe

DIPLOTHYRA Tryon

This genus is allied to *Martesia*, but differs in the double or divided dorsal valve. Shell short, ovate, divided in the middle by an oblique impressed line, posterior to which the surface is covered with growth lines only, but anteriorly it is finely and sharply transversely sculptured and obsolete radiately ribbed in some specimens.

The umbonal plates are generally much distorted so that no particular form can be traced throughout all specimens though the more perfect approach to that depicted in the magnified figure above.

Length: 6"; height and breadth: 4"; habitat: Tottenville, Staten Island, burrowing in oyster shells. "The shells were all dead, and I have found as yet no evidence of the oysters being imported ones."

Specimens in collection of National Museum from Philadelphia; Crisfield, Md.; Staten Island; St. Augustine, Fla.; Isle of Palms (Long Island); South Carolina; Morehead City, N. C.

Quoted from: Tryon, Geo. W. 1863, "Description of a new genus and species of Philadidae." Proceedings of the Academy of Nat. Science of Philadelphia, 1862, 2d Series, Vol. VI, p. 449-451.

CLASS SCAPHOPODA

This class includes the marine mollusks commonly known as tooth or elephant-tusk shells. The crescent-shaped shells taper in size and both ends are open. From the larger end the foot is operated and used for digging in mud or sand. The head is not well defined but a radula is present. The sexes are separate. There are comparatively few species known but individuals exist in great numbers.

Family Dentaliidae

Foot of animal conical and pointed, surrounded by a process like a wing-shaped sheath, which in turn has a slit like a break in a fold on one side. The shell characters include more or less sculpture. There is only one genus.

GENUS DENTALIUM Linné 1758 (TOOTH SHELLS)

Shell a tube opening at both ends, almost straight to curved, sculpture varying from faint indications to as many as sixty prominent ribs. Often the senile portion of the shell is smooth. There are also frequently intermediate transverse lines. The embryonic portion of the apex (smaller end) is fragile and minute. It is usually lacking in adult specimens. Usually there is a notch or slit in the smaller or apical opening.

The Dentaliums vary from needle-like forms to heavy shells 5 inches in length. Some are very fragile. The surfaces vary from chalky to porcellanous or glassy. White is predominant but greenish, reddish or yellowish species also occur. They may be translucent, opaque, dull or with glistening surfaces.

The animal conforms in shape to the shell it occupies. The cylindrical foot may be protruded or almost completely withdrawn. Tentacles or eyes are absent. Foraminifera and other minute organisms are supposed to be caught by a cluster of thread-like appendages just back of the mouth. The sexes are separate.

DENTALIUM ANTILLARUM Orbigny. Shell small, moderately curved; tip when present pointed and slender; surface white; opaque, with bands of translucent gray; texture hard, porcellanous but not shining; nine primary ribs, also secondary ribs; wide, shallow apical notch usually on convex side. Length 22 mm., without tip.

This very variable form is the commonest shallow water species in the West Indies and adjacent waters. The writer dredged it in shallow water off Tiger Key and Lossman's River, Florida, in the Gulf of Mexico.

Pl. 55, Fig. 18

Miami, Florida to the West Indies

DENTALIUM CALLITHRIX Dall. Shell gradually increasing in diameter; white porcellanous but not shining; nine major ribs, as many as three secondary ribs between these. The sculpture is sometimes not continuous along the shell. Length 24-38 mm.

A deep-water shell; sometimes taken upon the beach at Sanibel.

Pl. 63, Fig. 10

Pl. 55, Fig. 21

Cape Hatteras, North Carolina to Florida; Brazil

DENTALIUM CALLIPEPLUM Dall. Strongly and evenly curved like a scimitar; ivory or cream white, sometimes salmon tinted on tip; highly polished; no sculpture; a faint shallow notch. Length 62 mm. Range 25-169 fathoms.

Pl. 63, Fig. 12b

Gulf of Mexico; West Indies

DENTALIUM CARDUUS Dall. Sixteen narrow longitudinal ribs; elevated transverse ribs producing a rasp-like surface; pure white, not polished. Length 77-87 mm. Range 100-338 fathoms.

Pl. 63, Fig. 3

Bahamas; St. Lucia.

DENTALIUM EBOREUM Conrad (D. matura Dall). Color salmon pink or yellowish; curved, slender, thin but strong; surface highly shining, vitreous but often with milky

patches; about twenty raised fine lines on tip only, remainder of shell mostly smooth; deep narrow notch on convex side of tip. Length 25-35 mm. Range 2-87 fathoms.

Pl. 65, Figs. 18, 18a

Cape Hatteras, North Carolina to west Florida; West Indies

DENTALIUM ENSICULUS Jeffreys. Shell fairly strongly arched, slowly increasing in diameter; keel on both convex and concave sides; aperture flattened oval; grayish white, oily in appearance rather than polished; no sculpture; notch wide. Length 19-30 mm. Range 193-1813 fathoms.

Pl. 63, Fig. 12

Georges Bank to West Indies

DENTALIUM ENTALE STIMPSONI Henderson. Moderately curved; section round; surface dull ivory white, more or less discolored; tips much eroded; apical notch present. Length 33-38 mm.

The American form is more chalky and shows the faint sculptural features more clearly than the European *D. entale* of Linnaeus.

Pl. 55, Fig. 14

Maine to Cape Cod, Massachusetts

DENTALIUM GOULDII Dall. Shell six sided; slightly curved, regularly tapering; surface shining; six pinched up rod-like ribs, microscopically fine lines between flat spaces; hexagonal section less apparent at aperture or larger end. Length 29 mm.

Allied to *D. texasianum*. In Florida it lives in shallow water or moderate depths. The variety *obscurum* is illustrated.

Pl. 63, Fig. 4

Florida; edge of Gulf Stream off the Carolinas and Georgia

DENTALIUM LAQUEATUM Verrill. Primary ribs nine to twelve, intercostal sculpture of latticed design. Length 45-62 mm. Range 10-133 fathoms.

Abundant in sandy mud along edge of Gulf Stream in Florida Keys region, especially off Fowey Light.

Pl. 63, Fig. 31

Cape Hatteras region to Barbados; Gulf of Mexico

DENTALIUM OCCIDENTALE Stimpson. Color dirty white, occasionally ivory; surface lus-

treous; sixteen sharply defined riblets, better developed upon posterior portion; apical notch often obscure. Length 34 mm.

Found in cold off shore water in depths varying from 20-1,000 fathoms.

Pl. 55, Fig. 16

Newfoundland to Cape Hatteras, North Carolina

DENTALIUM PERLONGUM Dall. Extremely long and slender, slightly arched or almost straight; long needle-like tip, opaque white, porcellanous but not highly polished; no sculpture, a smooth cylinder; notch variable. Length 54-90 mm. Range 11-1,181 fathoms.

Fresh specimens have been taken in shallow water in west Florida.

Pl. 63, Fig. 6

Cape Hatteras to Gulf of Mexico, south to Rio de la Plata

DENTALIUM SEMISTRIOIATUM Guilding. Translucent white with milky patches, highly polished, often reddish toward apex; slender, regularly curved; fine regularly spaced grooves upon portions of shell, remainder smooth; long narrow slit near apex not present in all individuals. Length 25-34 mm.

An abundant shore species especially in the Lesser Antilles and the west coast of Florida.

Pl. 55, Figs. 13, 17

Florida; West Indies

DENTALIUM TEXASIANUM Philippi. Shell slowly increasing in diameter; hexagonal in section; color dull grayish white, opaque, strong and solid; tip hexagonal, angles becoming rod-like ribs with flat spaces between; one to two, rarely three riblets between major ribs. Length 11 mm. without tip (a Sanibel specimen).

This shell has not been reported from the Florida east coast or Florida Keys, nor the Antilles.

Pl. 55, Fig. 19

Beaufort, North Carolina; West Florida; Louisiana; Texas

Family Siphonodentaliidae

GENUS CADULUS Philippi 1844

Small white shells, lacking sculpture, often swollen or with a bulging area;

opening at smaller end small when compared with Dentalium, simple or with two to four slits; section flattened or circular; often with a rounded rib within the smaller opening.

Cadulus lives in sandy and muddy stations. Individuals are very numerous.

CADULUS ACUS Dall. A small slender shell, slightly curved; growth lines forming densely packed circular ribs; surface variegated by bands. Length 8 mm. Range 25-294 fathoms.

These little shells resemble Dentalium tips and lack many of the Cadulus characters.

Pl. 63, Fig. 11

Off Fernandina, Florida; Porto Rico

CADULUS AEQUALIS Dall. Shell large, little swollen; no apical features observable. Length 15 mm. Depth 339 fathoms.

Pl. 63, Fig. 9

Off east Florida

CADULUS AGASSIZII Dall. A moderately curved, fairly solid shell; four broad shallow slits forming indistinct lobes comprise the apical features. Length 9 mm. An abundant species in its depth range, 17-233 fathoms.

Pl. 63, Fig. 12c

Off Chesapeake Bay to Florida Keys

CADULUS AMIANTUS Dall. A dubious species which is not represented in the National collection. Length 5.75 mm. Depth 310 fathoms.

Pl. 63, Fig. 7

Off Bahia Honda, Cuba

CADULUS CAROLINENSIS Bush. Medium sized, no swelling; smooth rounded lip; apical opening very small, equipped with four shallow slits or notches, producing four lobes which are often damaged. Length 9.5 mm.

Abundant in shallow water near Hatteras but rarer farther south. Taken in 3-107 fathoms.

Pl. 65, Fig. 19

Pl. 55, Fig. 22

Cape Hatteras, North Carolina; Florida

CADULUS CUCURBITA Dall. Depth 310 fathoms.

Pl. 63, Fig. 12d

Off Bahia Honda, Cuba

CADULUS LUNULA Dall. Depth 805 fathoms.

Pl. 63, Fig. 8

Off Havana, Cuba

CADULUS QUADRIDENTATUS Dall. Shell regularly and gradually increasing in diameter; moderately curved; four deep slits in apex, leaving lobes. Length 7-10 mm. Depth range extends from 2 fathoms off Miami to 50 fathoms near Fowey Light, Florida.

Pl. 65, a variety.

Pl. 63, Fig. 5

Pl. 65, Fig. 20

Cape Hatteras, North Carolina to West Indies; Gulf of Mexico

CADULUS WATSONI Dall. A highly polished shell which is slightly curved. Length 13 mm Range 382-413 fathoms

Pl. 63, Fig. 12a

Off Cuba and Bahamas

- - - - -

CLASS GASTROPODA

To this class belong the snails, limpets, slugs, nudibranchs (without shells), whelks, and those provided with a more or less spiral shell. All in this class possess a foot, a mantle, and a mantle cavity similar to those of the clam or mussel but assuming quite different characters and habits.

Three characteristics stand out with prominence: (1) asymmetry, (2) the well-developed and consequently differently functioning head, and, (3) the spirally coiled shell which is in one piece.

The groups into which the Gastropoda have been divided are based upon the structure of the nervous system, together with the respiratory and sexual organs.

SUBCLASS PROSOBRANCHIA

ORDER ARCHAEOGASTROPODA

Family Acmaeidae

Shell dish-shaped, conical, apex more or less at one end. The shells may be separated from the Patellidae, a large family living mostly in tropical seas, by the less distinct border around the aperture, also by the fact that they are never iridescent. The Acmaeas live upon seaweed or adhere to rocks often exposed to the surf. Like other sedentary mollusks they are very variable, the shells ten being modified to conform to the environment. While a few are from deep water the majority live between high-tide and low-tide marks. There are many more species upon the Pacific than the Atlantic coast of the United States. A radula of Patella is shown in Fig. 28, page 20.

GENUS ACMAEA Eschscholtz 1830

ACMAEA CANDEANA Orbigny. Shell gray or buff, depressed, with radiating black lines, often combined with seven to nine broad rays; interior white, brown tinted; wide edged with gray and close set brown lines. Length 1 inch.

Pl. 40, Fig. 15
Pl. 30, Fig. 14
Pl. 29, Fig. 1
Florida; West Indies

ACMAEA CANDEANA ANTILLARUM Sowerby. An elevated form, rayed with narrow light blue stripes on a light ground, interior bluish white; body mark deep brown in young shells, covered with white in the adult, border dark and articulated with white. Length 20 mm.

Pl. 29, Fig. 2
Florida Keys; West Indies

ACMAEA CUBENSIS Reeve. Surface outside with narrow riblets, often obsolete; black lines upon a white ground, also blotched with black; edge of shell smooth. Length 21 mm.

It probably will be found living or dead upon the Florida Keys and is included here for comparison.

Pl. 29, Fig. 5
Bahamas; West Indies

ACMAEA LEUCOPLEURA Gmelin. Shell solid, conic or depressed, apex near center; about twelve strong ribs and twenty to thirty around base; ribs white, spaces between dark brown or black; interior white, bordered with black dots, brownish in middle. Length 23 mm.

This species is more coarsely ribbed than *A. cubensis*.

Pl. 29, Fig. 13
South Florida and West Indies

ACMAEA PUNCTULATA Gmelin. Apex near center; surface sculptured with low riblets, every third or fourth rib more prominent; delicate pink or yellowish with reddish dots between riblets; epidermis lacking; interior whitish, border narrow and gray in color. Length 1 inch, usually less.

A very variable shell, the young thinner and presenting quite a different aspect. Florida examples are thinner and narrower than those from the West Indies.

Pl. 29, Fig. 14
Florida Keys; Bermuda; West Indies;
Mexico

ACMAEA TESTUDINALIS AMAENA Say. Shell oval, apex almost in middle; color yellowish gray with dark brownish stripes and a somewhat broken pattern; interior white with a large dark central area; border tessellated with white and brown. Length 35 mm.

It is plentiful upon rocks exposed to surf, particularly upon the coast of Maine. The largest and finest examples in that state are taken at Eastport. South of Boston it is much smaller and less plentiful. American specimens are usually much larger than the typical European *A. testudinalis* of Muller.

Pl. 30, Fig. 8

North Atlantic and Arctic Oceans, southward to Long Island Sound, New York

ACMAEA TESTUDINALIS ALVEUS Conrad. A very small, thin, shell with a sharp and slightly hooked apex; striped with brown, interior showing exterior pattern. Length 8 mm.

This subspecies lives upon seaweed or the fronds of *Zostera*, exactly matching the background.

Pl. 29, Fig. 17

Pl. 79, Fig. 7.8

Arctic Ocean southward to Cape Cod, Massachusetts

Family Fissurellidae

Shell limpet-shaped, with perforation or anterior slit, sometimes a notch, for passage of excretions; horseshoe-shaped impression of adductor muscle inside shell; bilaterally symmetrical.

GENUS FISSURELLA Bruguiere 1791 (LITTLE CHINK)

Mantle edge of animal crenulated above and below. The development of the shell is shown in Fig. 39.

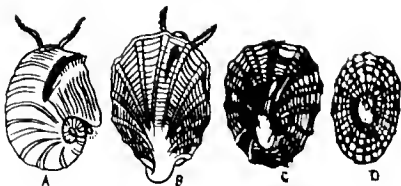


Fig. 39

Development of shell in *Fissurella*

FISSURELLA BARBADENSIS Gmelin. Barbados Chink. Shell conical, orifice almost round or oval; about eleven of the ribs most prominent; color gray, green or pink with purplish brown blotches between the ribs. Interior with alternating green and white rings, interior orifice callus green and usually bounded by brown; edge of shell crenulated. Length 35 mm.

An extremely common species in the West Indies and an excessively variable one.

Pl. 30, Fig. 2

Charlotte Harbor, Florida to West Indies

FISSURELLA FASCICULARIS Lamarck. Bundle Chink. Orifice cross-shaped; margin waving; shell elevated in front and rear; saddle-shaped like *F. pustula* but the forty-seven radiating riblets coarser; color usually red, whitish between ribs; interior white, tinged with pink; opening upon inside sometimes tinged with red; edge crenulated. Length 20 mm.

Pl. 30, Fig. 1

Florida Keys and West Indies

FISSURELLA NODOSA Born. Knotty Chink. Shell elevated, base oval, about twenty-three strong ribs with nodes upon them; orifice oblong, contracted in center and consequently dumb-bell shaped, opening one seventh to one ninth length of shell. The color ranges from brown to white, interior white, edge toothed. Length 29-35 mm.

Pl. 30, Fig. 12

Florida Keys and West Indies

FISSURELLA PUSTULA Lamarck. Blistered Chink. Shell depressed, elevated in front and behind; orifice cross-shaped, toward the front, bounded by red; color buff, white, or crimson with white; riblets separated by narrow grooves; interior white with red near opening; edge crenulated. Length 1 inch.

A well-known and interesting shell.

Pl. 30, Fig. 4

Cape Hatteras, North Carolina to West Indies

GENUS LUCAPINA Gray 1857

Orifice rather large, oval; surface cancellated; edge of shell uniform and not raised at ends; margin finely crenulated.

Shell imbedded in mantle of animal.

LUCAPINA ADSPERSA Philippi. Shell oblong, riblets of various size crossed by raised threads; orifice oval with seven to nine broad rays of varying color and often broken into dots and spots; interior bluish white, outside pattern showing through the thin shell; exterior of orifice callus often with a greenish streak on each side; edge crenulated. Length 21 mm.

Taken by the writer under stones in Upper Biscayne Bay and beneath sponges off Lignumvitae Key, Florida. The animal is very bulky and the shell high above and far from the foot.

Pl. 30, Fig. 10

Florida Keys and West Indies

LUCAPINA CANCELLATA Sowerby. Shell oblong, often stained with bluish black around orifice and interior of hole callus; color greenish or grayish; orifice oval, about one eighth length of shell. Length 23 mm.

A single beach specimen, quite fresh, was taken at Boynton, Florida.

Pl. 29, Fig. 15

Florida Keys and West Indies

GENUS LUCAPINELLA Pilsbry 1890

Shell oblong, perforation large; animal with fleshy foot much too large for shell but the latter not imbedded in mantle.

LUCAPINELLA LIMATULA Reeve. Orifice oblong, corresponding to shape of shell; large and small alternating riblets; interior white, edges thickened at sides and crenulated front and rear. Length 13 mm. Depth range 0-20 fathoms.

Pl. 30, Fig. 3

Cape Fear, North Carolina; Key West, Florida; West Indies

GENUS DIADORA Gray 1821;
Fissuridea Swainson 1840

Internal callus of orifice truncated or pitted behind; animal capable of being contained in the shell. Often confused with Fissurella.

DIADORA ALTERNATA Say. Elevated conical surface latticed by ribs, every fourth rib a little larger; shell gray or yellow,

striped with black or brown (eight stripes); summit curved forward; opening keyhole shaped; interior white; margin crenulated; pit deep. Length 25 mm.

This shell is sometimes washed upon the beach at Cape May, New Jersey.

Pl. 30, Fig. 5

Chesapeake Bay to West Indies; Mexico

DIADORA LISTERI Orbigny. Shell elevated, solid, summit slightly in front of middle; slope straight in front, rear slope convex; sculptured with strong ribs crossed by cords and cutting the interspaces into quarish pits.

The color is grayish white or buff, sometimes with black stripes; ribs alternating in size, both large and small; opening keyhole shape; interior white; border crenulated and with the teeth arranged in pairs. Length 40 mm.

It lives under stones in Upper Biscayne Bay near Arch Creek and the Sunny Isles bridge.

Pl. 30, Fig. 16

Florida Keys and West Indies

DIADORA MINUTA Lamarck. Shell small, oblong, depressed, summit position one third length of shell; fine riblets crossed by sculpture forming beads; shell thin, yellow or white; seven to eight broad black rays visible also from inside; border crenulated; sides arched so shell rests upon ends only when placed upon a plane surface. Length 10 mm. Fresh beach shells have been taken in Palm Beach County.

Pl. 30, Fig. 13

Florida Keys and West Indies

GENUS EMARGINULA Lamarck 1801

Shell obliquely conical, apex recurved backward; deep incision in margin.

EMARGINULA CANCELLATA Philippi. Apex half-way between center and posterior end; sixty-two to sixty-eight close ribs; interior white; slit one fourth length of shell; color white or yellow. Length 12 mm. Depth range 100-287 fathoms.

Pl. 30, Fig. 11

Off North Carolina; Florida Strait; West Indies

GENUS RIMULA DeFrance 1819

Like *Emarginula* but with slit closed and forming a hole.

RIMULA FRENULATA Dall. Apex small, sharp; finely sculptured with radiating threads and with finer ones between each pair; sculpture running across not forming nodules; interior glossy. Length 6.25 mm. Range 6-52 fathoms.

A beautiful little shell.

Pl. 30, Fig. 9

North Carolina to Florida Keys

GENUS SUBEMARGINULA Blainville 1825
(CHINK SHELLS)

Rounded, oval shells; surface radially ribbed; notch short, continued upward inside as a groove; muscle scar inside peculiar, its ends recurved and pushed inward in direction of apex cavity.

SUBEMARGINULA EMARGINATA Blainville. Chief ribs ten, the three double in front the strongest; interior and exterior white; edge of shell with about thirty-five teeth of various sizes; ends elevated. Length 25 mm.

Pl. 30, Fig. 6

Florida Keys and West Indies

SUBEMARGINULA OCTORADIATA Adams. Shell conical, oval; apex inclined toward rear and to the right side, slope at back straight; eight evenly placed larger ribs, eight lesser ribs and also, in large specimens, smaller riblets; all of the ribs nodulous; interior greenish, groove in front narrow and deep; margin toothed. Length 24 mm.

The ribs have no inclination to double as in the following species.

Pl. 30, Fig. 7

Florida Keys to the West Indies

SUBEMARGINULA PUMILA Adams (*S. rollandi* Fischer). Shell small; anterior fissure three times as long as wide; front slope convex; twenty-two to twenty-eight radiating, often beaded, riblets; smaller riblets between the latter; apex recurved, color varying from white to green or pale flesh; interior similarly colored but showing white rays. Length 9.5 mm.

Pl. 29, Fig. 16

Southern Florida and the West Indies

GENUS PUNCTURELLA Lowe 1827

Shell conical, elevated, apex recurved; opening in front of apex and with an elevated border inside; exterior surface cancellated.

PUNCTURELLA PRINCEPS Mighels (*P. noachina*).

Shell decidedly conical, bluish white; about twenty-two ribs on surface with, in addition, smaller intermediate ribs; diamond-shaped slit in summit, communicating with interior through a circular aperture; margin crenulated. Length 5 mm.



Fig. 40

Puncturella princeps,
5 mm.

This strange little shell is often

taken from the stomachs of fish. Range 25-310 fathoms.

Fig. 36

Labrador to North Carolina

Family Stomatellidae

Shell varying from spiral to depressed, sometimes *Haliotis* shaped or non-spiral and limpet form; interior of large aperture pearly.

GENUS STOMATELLA Lamarck 1819
(LITTLE MOUTH SHELLS)

Shell oval, spire short; aperture longer than wide; operculate.

STOMATELLA PICTA Orbigny. A minute ear-shaped shell; surface shining, many fine unequal spiral threads which cut surface into granules; flesh colored, spotted with opaque white; columella white; whorls 2.5, last large; aperture spotted inside. Greatest length 4 mm.

Dall and Simpson reported this from the Florida Keys.

Pl. 30, Fig. 15

Florida; Cuba; St. Thomas

Family Scissurellidae

Very minute shells, not pearly,

aperture rounded, slit in the margin; operculate. Slit absent in juvenile specimens. They have been found in Piedmont on seaweed.

Animal with long tentacles, usually pale and translucent. The group is related to the large slit shell (*Pleurotomaria*) which lives in the West Indies, a member of a family which is almost extinct.

SCISSURELLA CRISPATA Fleming. Length 4 mm. Range 4-790 fathoms.

Pl. 68, Fig. 15

Greenland to New Hampshire

Family Haliotidae

Shell spiral, often ear-shaped; aperture very large, nacreous; holes or notch upon outer lip; operculum lacking.

GENUS HALIOTIS Linné 1758

Shell ear-shape, spire small, aperture iridescent and very wide; exterior dull, perforated by a series of holes, the earlier ones closed; horseshoe-shaped muscle impression.

Foot very large, powerful and suited to clinging on rocks.

Haliotis is abundant on the Pacific coast of the United States, also Japan, the Channel Islands and elsewhere. Only one species is known from the east coast and that from deep water.

HALIOTIS POURTALESII Dall. "Shell longer than wide, holes seventeen, the last five open; surface sculptured with fine spiral lines developing gradually into waving spiral threads, with finer threads appearing and continuing to edge of aperture; color wax-yellow with deeper patches of orange; nacreous shining within." Length 11 mm.

In 1869 a series of shells were obtained by the U. S. Fish Commission Ship Bibb, under the direction of Count Pourtales, in the Straits of Florida. When this material was sent to the National Museum in Washington Dr. Dall was surprised to find a Haliotis in the lot. The specimen was sent to Chicago and destroyed in the great fire there. Twenty years later Dr. Dall described it from memory. In 1913 John B. Henderson, while dredging from his boat the *Eolis* along the inner edge of the Pourtales Plateau, secured a small and somewhat imma-

ture Haliotis. Dr. Dall pronounced this identical with the example taken so many years before. The illustration herewith represents the second specimen. Obtained at a depth of 90 fathoms.

Pl. 29, Fig. 3

3 miles off Sand Key, on edge of Pourtales Plateau, Florida

Family Trochidae

Shell nacreous inside; aperture entire; lip generally not continuous. Operculum thin, entirely corneous and multi-spiral.

GENUS TEGULA Lesson 1832; *Chlorostoma* Swain. 1840 (ROOF TILE)

Distinguished by a prominent callus which extends from the inner lip to and often covering the umbilicus. There are from one to several teeth at the base of the columella.

TEGULA FASCIATA Born. Differs from others in the genus by the smooth surface and lack of sculpture; ground color yellow with red, black or brown arranged in diverse patterns; two teeth at base of columella with white callus above. Length 16 mm.

Taken by the writer in six feet of water upon weeds on Featherbed Bank, Lower Biscayne Bay, Florida; also off *Lignumvitae* Key. It is an abundant and well-distributed form on the Florida Keys.

Pl. 31, Fig. 4

Florida Keys; West Indies

TEGULA SEMIGRANOSA A. Adams. Shell conical, umbilicate; sutures not impressed; ground whitish with irregular flames, lines and dots of yellow; whorls five to six, encircled by many close-set spiral lines which are irregularly crenulated, ten to twelve of these on last whorl above periphery; base a little convex and with eight lines similar to those above; aperture oblique; umbilicus deep, large, edge ending in a tooth at base of columella, two additional smaller teeth below. Diameter 16 mm.

Pl. 29, Fig. 4

Palm Beach, Florida to West Indies

GENUS LIVONA Gray 1842

Shell large, solid, surface spotted.

Radula very peculiar, possessing a great number of lateral teeth. Operculum shining brown inside and with twelve whorls; green portion attached to foot of animal.

LIVONA PICA Linné. Umbilicus deep, shell solid, dull black above with spots or zigzag flames of white; folds upon shell oblique; interior of lip often edged with black. Diameter 2.75 inches, length slightly less.

Mr. Miller of the National Museum has observed this frequently in Indian burying grounds on the Florida Keys. Unless the species was much more plentiful during the days of the Indians, it may have been brought from the Bahamas. Dead specimens are occasionally taken in Palm Beach County.

Pl. 31, Fig. 7

West Florida; West Indies; Palm Beach County; Florida Keys

GENUS CALLIOSTOMA Swainson 1840

Shell conical, columella simple; operculum thin and corneous.

CALLIOSTOMA JUJUBINUM Gmelin. Shell solid, heavy, spire elevated; umbilicus narrow and funnel shaped, white inside; surface color brown with white streaks, base dotted with white; whorls ten. Length 33 mm. or smaller.

Dead shells are frequent on the middle Florida Keys and northward on the west coast to Sanibel.

Pl. 31, Fig. 8

Cape Hatteras, North Carolina to the West Indies

CALLIOSTOMA JUJUBINUM PERSPECTIVUM Philippi. Broader than the preceding, fewer ribs and all of them beaded; often white at the periphery. Length 22 mm.

Georgia; Florida; East Honduras

CALLIOSTOMA ROSEOLUM Dall. Base-like strings of beads, upon the spire every third bead crimson, alternating with rosy threads; eight whorls, first five rounded, last three flattened.

This very beautiful shell has been taken in 15-200 fathoms. Altitude 9.5 mm.

Pl. 31, Fig. 12

Off North Carolina; Straits of Florida; West Indies

CALLIOSTOMA OCCIDENTALIS Migh. and Ad. Shell solid, imperforate, subtranslucent; raised spiral ridges light brown; suture distinct; outer lip crenulated by spiral ridge terminations. Length 13 mm. Depth range 25-980 fathoms.

This beautiful shell is sometimes taken in fish stomachs.

Pl. 31, Fig. 16

Nova Scotia to south of Martha's Vineyard, Massachusetts

CALLIOSTOMA EUGLYPTUM A. Adams. Shell imperforate; whorls six to five, convex; about eight rows of beaded ridges between periphery and suture; basal ridges about ten in number and not so high as the others; color white, clouded with red or brown, white streaks showing through the color. Length 15-20 mm. Depth range 15-50 fathoms.

This attractive shell is not infrequently found upon the beaches adjacent to Sarasota, Florida.

Pl. 31, Fig. 18

Pl. 32, Fig. 9

North Carolina to Florida; Gulf of Mexico

GENUS SOLARIELLA S. Wood 1842
(LITTLE SUN)

SOLARIELLA OBSCURA Couthouy. Shell solid, small; two to three revolving ridges upon whorls; axial growth lines coarse; aperture round; pearly inside; umbilicus broad and deep; operculum horny. Length 7 mm. Depth range 6-35 fathoms.

When the epidermis is removed the surface is iridescent. The shell is not infrequently found in fish stomachs.

Pl. 31, Fig. 19

Pl. 71, Fig. 16

Labrador to Martha's Vineyard, Massachusetts

GENUS MARGARITES Leach 1819

Shell small, rather conical, few whorled; aperture rounded; lip acute; umbilicus deep.

MARGARITES CINEREA Couthouy. An ash-colored shell of pyramidal shape with five to six prominent spiral ridges and numerous lesser ones; umbilicus rather broad and deep; lines inside aperture corresponding to external ridges. Length 9 mm. Depth range 5-200 fathoms.

A somewhat rare shell which is sometimes taken in fish stomachs.

Pl. 31, Fig. 19

Greenland to Massachusetts Bay

MARGARITES GROENLANDICUS Gmelin (*M. undulata* Sowerby). Shell small, dark flesh color with regularly placed spiral lines which alternate in size, both large and small; base of paler color and smoother; umbilicus funnel-shaped; aperture oblique, interior pearly, reflecting green and gold colors; operculum multispiral. Length 3.5 mm., breadth 6 mm.

This beautiful little shell, much resembling a tropic form, is abundant in the stomachs of fish. It has been taken living on the beaches. Very fresh examples are rose-red but usually it is brownish red. Depth range 7-50 fathoms.

Pl. 31, Fig. 13

Labrador to Massachusetts Bay

MARGARITES HELICINUS Phipps. Shell small, depressed, translucent, light brown; fine spiral lines below; aperture round. Breadth 5 mm.

A deep sea form which some years is abundant upon the beaches, especially on the large leaves of *Laminaria*. The iridescent shell, reflecting a bronze lustre, is characteristic. In contour it much resembles a land or fresh-water shell.

Greenland to Massachusetts Bay

MARGARITES OLIVACEA Brown. (*M. argentata* Gld.) Shell small, umbilicated; four to five convex whorls, covered with minute spiral lines; interior pearly and iridescent; aperture round; suture well marked; surface dull. Length 6 mm. Depth range 7-80 fathoms.

Abundant in fish stomachs north of Boston.

Pl. 38, Fig. 26

Labrador to Massachusetts Bay

Family Cyclostrematidae

About sixty species, members of this family, live mostly in deep water off the Atlantic coast. The majority are very small and are not well known. The following have been taken in shallow water.

GENUS *COCHLIOLEPIS* Stimpson 1858

COCHLIOLEPIS PARASITICA Stimpson. Shell

thin, concave below, umbilicated, convex above; lip thin and acute; three whorls, rapidly enlarging; operculum flexible, pellucid and thin. Animal blood-red, tentacles long and slender.

Parasitic on *Acoetes lupinus* Stimpson, living under the scales of this large annelid. Diameter 2.5 mm.

Pl. 31, Fig. 17

Charleston, South Carolina; Florida Keys

COCHLIOLEPIS STRIATA Dall. This little shell has two whorls, the globular nucleus being almost enveloped by the last whorl. The umbilicus is very wide. Average width about 6.5 mm., length 1.5 mm.

It was taken years ago by Colonel Jewett at Egmont Key near Tampa, Florida. Recently, fresh examples were obtained after a September "blow" on a sandbar near the Palm Beach north inlet. The shell much resembles a miniature *Sinum*.

Pl. 31, Fig. 14

Florida

GENUS *VITRINELLA* C. B. Adams 1850

VITRINELLA MULTICARINATA Dall. Shell minute, translucent, polished, keeled; four to five whorled; umbilicus deep, not very wide, its walls vertical. Lip margin simple, sharp. Epidermis thin and yellowish. Maximum diameter 3 mm.

Smaller than *V. gemma* Holmes, an allied species, also more keeled and depressed.

Off North Carolina (15 fathoms); Florida

Family Liotiidae

GENUS *LIOTIA* Gray 1842

LIOTIA VARIABILIS Dall. A minute shell of surpassing beauty. The star-like projections upon the periphery, the close set wrinkles upon the surface and the curious projections within the umbilicus are characteristic features. Diameter 4 mm. Depth range 22-220 fathoms.

Pl. 32, Fig. 8

North Carolina to the West Indies

Family Phasianellidae

GENUS PHASIANELLA Lamarck 1804
(PHEASANT SHELLS)

Shell generally imperforate; epidermis lacking; surface porcellanous, usually polished and varied with brilliant color patterns; operculum shelly, solid, externally white and convex.

PHASIANELLA TESSELLATA Potiez and Michaud. Checkered Pheasant. Whorls four to five, the last large and bluntly angled at periphery; apex blunt; columella with white callus; umbilical area excavated, often perforate; color white, yellow or red, clouded with white, red or brown; encircled with narrow orange or red lines. Length 5.5 mm.

This shell lives at low-tide mark upon seaweed attached to rocks. It is rather frequent at Palm Beach, Florida and for some distance southward.

Pl. 29, Fig. 18

Florida and West Indies

PHASIANELLA AFFINIS C. B. Adams. Often found associated with *P. tessellata* this shell differs in the possession of close and regular punctations of pink or orange and white instead of the encircling lines, suture also more impressed; apex acute and rose color. Length 8 mm.

Pl. 29, Fig. 19

Florida and West Indies

PHASIANELLA UMBILICATA Orbigny. Whorls five, very convex, sutures deeply impressed; umbilicus narrow but distinct; shell white with red punctations and longitudinal flames of red and white. Length 5 mm.

Pl. 29, Fig. 20

Florida and Cuba

PHASIANELLA BELLA Pilsbry (*P. pulchella* C. B. Adams). Pretty Pheasant. A very small shell, usually less strongly angular than the example figured. Often the angles are absent altogether but the general form and absence of gloss are the same. Length 2.5 mm.

Pl. 31, Fig. 20

Biscayne Bay to Florida Keys

Family Turbinidae

Shell top-or pyramid-shaped; interior nacreous; marine, feeding upon seaweeds; exterior brilliantly pearly beneath the epidermis. Many of the shells are used for ornamental purposes.

GENUS TURBO Linné 1758 (WHIPPING TOP)

The diversity of form is considerable. Juvenile shells are not keeled so strongly and the spines when present are differently arranged. Operculum calcareous.

TURBO CASTANEUS Gmelin. Chestnut Top. Shell orange, brown, or gray, often banded with flame-like white spots; suture partly channelled; whorls five to six with numerous spiral lines; aperture white, heavy callus upon columella. Length 30 mm.

Not infrequent upon grasses in shallow water of the Florida Keys. Range 0-25 fathoms.

Pl. 31, Fig. 11

North Carolina to West Indies; Gulf of Mexico

TURBO CASTANEUS CRENULATUS Gmelin. Ribs provided with less conspicuous tubercles.

North Carolina to West Indies

TURBO SPENGLERIANUS Gmelin. Shell large, imperforate, white, spotted with brown, spire sharp, whorls six to seven, rounded; sutures widely channelled; seventeen smooth encircling ribs, as wide or wider than the spaces between; aperture white, outer lip sharp, broad white callus reflected over axis and below umbilicus, callus also extending upon inner wall. Length 2.5 inches.

Operculum pale brown inside, three to four whorls, exterior white and convex.

Pl. 40, Fig. 14

Gulf of Mexico and West Indies

GENUS ASTRAEA Roeding 1798, Astralium Link 1807 (STAR SHELLS)

ASTRAEA LONGISPINA Lamarck. Long-Spined Star. Shell low, almost flat below; whorls six to seven; periphery sharply keeled, with strong triangular flattened spines which extend over the suture almost to apex of

shell, sixteen spines on final whorl; area of umbilicus often excavated but usually imperforate; interior silvery. Exterior whitish or light brown. Length 16-20 mm., diameter 30-60 mm. It lives upon grasses.

Pl. 31, Fig. 2

Pl. 43, Fig. 9

Florida Keys and West Indies

ASTRAEA LONGISPINA SPINULOSA Lamarck. Spiny Star. Shell conically elevated, whorls flattened above; keel usually with spines or knobs; exterior of operculum white or brown, very convex and smooth. Diameter 65 mm.

Pl. 31, Fig. 1

Florida Keys and West Indies

ASTRAEA BREVISPIA Lamarck. Short-spined Star. Shell sharply keeled, short triangular spines which decorate the suture and project there as well. Ten to fourteen spines upon the last whorl; area of umbilicus excavated, whitish and surrounded by an orange-red area. Diameter 1.5 inches.

Pl. 31, Fig. 9

Pl. 43, Fig. 6

Florida Keys and West Indies

SUBGENUS LITHOPOMA Gray 1850

ASTRAEA TUBER Linné. Humped Star. Shell dull white or green, spotted above with brown; whorls six, the upper two smooth; base almost smooth, aperture silvery. Diameter 2 inches. It lives upon rocks near shore.

Disabled specimens are frequent upon the east Florida beaches after storms.

Pl. 31, Fig. 3

Jupiter Inlet, Florida to Martini-
que

ASTRAEA CAELATA Gmelin. Carved Star. Shell, imperforate, solid, whorls slightly convex, periphery subcarinate; below the suture a series of strong ribs which are oblique, finer ribs between them, rest of surface with strong revolving ridges; aperture very oblique; columella curved. Color greenish or white, presenting a soiled appearance. Operculum oval, convex outside and white or brown with a granulose surface. Length 3 inches, diameter the same.

Pl. 31, Fig. 10

Florida Keys and West Indies

ASTRAEA AMERICANA Gmelin. American Star. Shell elevated, whorls seven, the last whorl with thirty-six folds which terminate in knobs upon the keel of adults or spines in young specimens; outer lip generally crenulated. Operculum convex outside, white and with a granulose surface, interior of operculum dark. Length 1 inch.

Abundant among weeds on sandbars of Card Sound, Florida.

Pl. 31, Fig. 6

Florida Keys and West Indies

ASTRAEA IMBRICATA Gmelin. Shell solid, imperforate, light brown or greenish in color, whorls seven; eighteen to twenty folds on last whorl, excavated at their centers, forming square descending spines on the sharply keeled periphery; base flattened, radiately striate, also four to six concentric lines; aperture oblique, wide, scalloped at outer angle; columella two toothed below, its face a little grooved. Length 40 mm.

Pl. 31, Fig. 5

Florida Keys and West Indies

Family Neritidae

GENUS NERITA Linné 1758 (NERITES)

Animal with broad, short, muzzle and long slender tentacles.

Operculum calcareous with projecting lobes upon the surface, the inner margin of aperture corresponding to the same. Aquatic, although some species live out of the water near the sea.

NERITA VERSICOLOR Gmelin. Variegated Nerite. Ribs upon surface broad and round with narrow grooves between, sometimes these almost absent; marked with zigzag stripes of red and black or spiral bands of one of these colors or both; interior white, outer lip toothed within, three to four distant strong teeth upon columella margin. Diameter 15 to 30 mm.

Pl. 29, Fig. 11

Florida; West Indies

NERITA PELORONTA Linné. Bleeding Tooth. Ribs broad and flatly rounded, marked with red and black; aperture white; outer lip feebly toothed inside, columellar margin with one to two strong central teeth, this

region more or less stained with red. Diameter 1-1.75 inches. The operculum is shown as per the second figure reference below.

Pl. 29, Fig. 10

Pl. 29, Fig. 21

Florida; West Indies

SECTION THELIOSTYLA Morch 1852

NERITA TESSELLATA Gmelin. Checkered Nerite. Ribs ten to twelve, deep narrow groove between them; numerous teeth within lip, larger ones above and below; columellar area with small teeth in center, flattened and with few granules. Diameter 18-24 mm. A common shell.

All the *Neritas* live in rocky ocean stations, often partially concealing themselves in crevices. They usually are abundant and easily collected well above low-tide mark.

Pl. 29, Fig. 8

Florida; West Indies

NERITA FULGURANS Gmelin. Lightning Nerite. Shell with many rounded ribs which are separated by cut lines, crossed by black, white creamish yellow or gray; aperture white, among the numerous teeth inside lip the two above and two below are not prominent; columellar area flattened with two minute middle teeth; adjacent area flattened. Length 1 inch.

Pl. 40, Fig. 16

Boca Raton, Florida to West Indies

GENUS *NERITINA* Lamarck 1809

(*NERITINES*)

These are mostly fluviatile although some inhabit the sea or brackish water. A few exotic species are terrestrial, clinging to foliage overhanging water. Others are amphibious, attached to the roots of Nipah and other palms.

NERITINA RECLIVATA Say. Shell light brown or dark green, often with zigzag black lines; interior and columellar region white. Diameter 15-23 mm.

Pl. 29, Fig. 6

Florida and Gulf of Mexico

NERITINA VIRGINEA Linné. Virgin Neritine. A species excessively variable in color ornamentation. Fresh dead shells are very attractive and suggest various patterns of

textile fabrics. The longitudinal darker color lines are covered partly with spots of the ground color. Diameter 6-20 mm.

Pl. 29, Fig. 9

Florida; West Indies; Brazil

SECTION SMARAGDIA Issel 1869

NERITINA VIRIDIS Linné. Green Neritine. The smallest species and a brilliant green or yellowish, more or less interrupted with white or black; area of columella greenish white. Diameter 7.5 mm.

It is frequently found in "drift" upon sandbars in protected waters.

Pl. 29, Fig. 7

South Florida; West Indies; Europe

SECTION PUPERITA Gray 1857

NERITINA PUPA Linné. A smooth, white, opaque shell, striped or finely reticulated with black lines; interior light orange brown. Diameter 8-13 mm.

Pl. 29, Fig. 12

West Florida to West Indies

ORDER MESOGASTROPODA

Family *Epitoniidae* (*Scalidae*)

Shell usually pure white, lustrous, many whorled, whorls rounded and often separated, frequent transverse ribs representing rest periods; operculum horny.

The animal exudes a purple fluid when disturbed.

The "staircase shells" are among the most beautifully formed mollusks.

GENUS *EPITONIUM* Roeding 1798,

Scalaria Lamarck

Animal predaceous. Dr. Gould fed them raw beef which they ate voraciously. There are about two hundred known recent species and about the same number fossil.

SUBGENUS *NITIDOSCALA* De Boury 1909

EPITONIUM ANGULATUM Say. Angled Staircase. Shell white, six to eleven separated whorls; nine to ten varices or ribs upon each whorl, angular above. Length 15-20 mm.

Pl. 32, Fig. 1

Connecticut to Texas

EPITONIUM CENTIQUADRA Morch. Shell white, thin, surface decussated by fine growth lines and spiral striae, the latter alternating in size; eight whorls, ten to eleven varices. Length 15 mm.

Pl. 32, Fig. 13

Off Cape Hatteras, North Carolina

EPITONIUM CLATHRUS Linné. Trellis Staircase. Shell pyramidal, eleven varices on each whorl, distant and subexpanded at suture, oblique on apical whorls; aperture oval; varices white but spaces between uniformly yellow or spotted with that color, bands when present blackish. Length 10-27 mm.

Pl. 32, Fig. 19

Palm Beach, Florida, to West Indies

EPITONIUM EBURNEUM Potiez and Michaud. Ivory Staircase. Shell thin, delicate; twelve to thirteen erect, sharp varices; whorls nine, very convex, separated; suture well defined; color yellowish white. Length 20 mm.

Pl. 32, Figs. 2, 8

Palm Beach, Florida, to West Indies

EPITONIUM FRAGILIS Gray. Frail Staircase. Shell minute, imperforate; about twelve varices; nucleus glassy, bulbous, consisting of three to five whorls; five additional rounded, regular whorls; suture well impressed; color white. Length 4.5-6 mm.

Pl. 32, Fig. 15

Palm Beach and Punta Rassa, Florida

EPITONIUM DENTICULATUM Sowerby. Toothed Staircase. Shell pyramidal; minutely spirally striated; varices numerous and with tooth-like angle on each varix near suture. Length 7 mm.

One fresh beach shell has been reported from Sanibel.

Pl. 40, Fig. 17

Off Cape Hatteras, North Carolina; west Florida; West Indies

EPITONIUM HUMPHREYSII Kiener (S. sayana Dall). Humphrey's Staircase. Spaces between the ribs polished smooth and with occasional faint microscopic spiral striae. The largest specimen examined by Dall had nine whorls and was 18 mm. in length.

Pl. 32, Fig. 6

Pl. 69, Fig. 10

Massachusetts to Texas

EPITONIUM KREBSII Morch. Kreb's Staircase. Umbilicate, but narrowly so; surface polished; spiral striations irregularly placed; color white, often light yellowish above center of whorls; five to six convex whorls which are hardly joined; varices ten, slightly toothed near suture. Length 7 mm.

Pl. 32, Fig. 5

Boynton, Florida to West Indies

EPITONIUM LINEATUM Say. Shell white, whorls eight, sixteen to eighteen delicate ribs; upon the last whorl an encircling raised line and one or more brown bands; strong rounded lip; umbilicus absent.

It is a rather variable shell, especially with respect to the number of ribs. Length 12 mm.

Pl. 32, Fig. 3

Vineyard Sound to Gulf of Mexico

EPITONIUM MITCHELLI Dall. Shell yellowish white with basal area and band above the periphery dark reddish brown; thin; numerous spiral ridges crossed by about eighteen distant vertical threads; base bordered by a low keel, imperforate; aperture higher than wide; decollate shell showing eight whorls, possibly three to four lost. Length 36 mm.

The finest shallow water Epitonium on the Gulf coast.

Pl. 32, Fig. 14

Matagorda Island, Texas

EPITONIUM MULTISTRIATA Say. Apex pointed, pale glassy few-whorled nucleus, followed by a few faintly sculptured turns, varices becoming close and flattened over strong spiral sculpture; one to two varices may be distinctly larger upon the final whorl; aperture more than one quarter length of entire shell. Length 12 mm.

Stimpson collected this species at Beaufort, North Carolina and reported the animal as "hyaline bluish white, spotted with opaque white, the tentacles very slender and front edge of foot double."

Pl. 32, Figs. 11, 18

Vineyard Sound, Massachusetts to Florida Keys

EPITONIUM PERMODESTUM Dall. Length 38 mm.

Pl. 32, Fig. 17

North Carolina to West Indies

EPITONIUM SCIPIO Dall. Depth range 12-30 fathoms.

Pl. 32, Fig. 7

North Carolina; Gulf of Mexico

EPITONIUM TOLLENI Dall. Shell narrow, whorls nine, gradually increasing in size; about seven lustreless varices on each whorl; suture well impressed; height of aperture greater than width; surface shining. Length 10-15 mm.

Pl. 32, Fig. 4

North Carolina to West Indies

EPITONIUM TERES Bush. Range 14-16 fathoms.

Pl. 65, Fig. 8

Off Cape Hatteras, North Carolina

EPITONIUM TURRICULUM Sowerby. Umbilicus partly covered, white, rather thin, often with two faint chestnut bands; very close spiral sculpture; whorls eight to nine with twelve to thirteen ribs some of which are varicose. Length 18 mm. Range 16-22 fathoms but not infrequently found upon the beaches after storms.

Pl. 32, Fig. 10²

North Carolina to West Indies

SUBGENUS BOREOSCALA Kobelt 1902

EPITONIUM GROENLANDICUM Perry. Shell elongated; whorls gradually increasing, ten in number, closely contacted, a little convex, eight to fifteen stout flattened oblique ribs, the spaces between filled with six to eight rounded ridges and revolving lines; lip slightly expanded and producing an angle above. Length 1 inch.

It is found in the stomachs of fish caught in Massachusetts Bay and upon the beach at Nahant, Massachusetts Range 10-109 fathoms.

Pl. 35, Fig. 15

Greenland to off Block Island, Rhode Island

SUBGENUS OPALIA H. and A. Adams 1853

EPITONIUM CRENATUM HOTESSIERIANUM Orbigny. Shell thick, white, spirally striated; twelve low, close spiral ribs, less distant on center of last whorl, forming crenulations at suture.

The variety differs from the typical West Indian shell in being much narrower. Length 11 mm.

A rather rare species.

Pl. 33, Fig. 14

Florida Keys and West Indies

SUBGENUS CYCLOSCALA Dall 1889

EPITONIUM DUNKERIANUM Dall. Shell minute, texture glassy, about five lightly attached whorls, each rounded, about eight indented varices to each whorl; circular aperture, peristome free from wall of shell; umbilicus large. Length 4.5 mm.

A very distinct and beautiful little shell.

Pl. 32, Fig. 10

Palm Beach to Florida Keys; West Indies

Family Janthinidae

Fragile, whitish or purplish shells of graceful form; no operculum. Animal

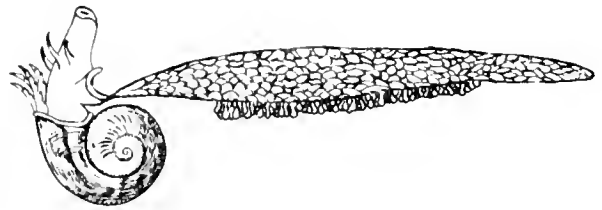


Fig. 41

Egg float of *Janthina*. Now life size

pelagic, living some miles from land, fastened to float in which eggs are attached; float composed of vesicles filled with air, Fig. 41. Radula with a great number of elongated teeth, no central ones. Carnivorous and like *Epitonium* secretes a purple fluid when disturbed.

GENUS JANTHINA Roeding 1798

(VIOLET SHELLS)

Eyes invisible, tentacles forked so that each appears like a pair. Float found in both sexes, some species viviparous (producing young alive).

JANTHINA JANTHINA Linné (*J. communis*, *J. fragilis* Lam.). Whorls sloping, convex, violet white above, solid color below. Diameter 1.5 inches.

This the largest *Janthina* upon our coast is sometimes blown ashore in considerable numbers after violent storms. When

the float is punctured the animal supposedly drops from its host, violet-colored *Velellae* and similar soft animals, and is washed ashore.

Pl. 33, Fig. 1

Nantucket, Massachusetts to the West Indies

JANTRINA EXIGUA Lamarck. Upper portion of whorls slightly flattened, blunt peripheral angle, surface closely striate; decided notch on outer lip, light violet color, banded at suture. Diameter 12-18 mm.

Apparently lives in the Gulf Stream off Florida. Quite common upon the east coast beaches, freshly dead.

Pl. 33, Fig. 2

Florida, Pacific, etc.

JANTHINA GLOBOSA Swainson. A rounded, whitish shell, dark violet toward base; spire short; whorls rounded. Diameter 12 mm.

Pl. 33, Fig. 3

Florida and most warm seas

Family Melanellidae

Small shells, usually elongated, shining, polished; spire often curved to one side or distorted; outer lip simple, inner margin partly thickened. Mouth of animal without jaw or radula.

These mollusks are generally parasitic, living upon sea urchins and similar organisms. On account of their small size and lack of sculpture it is somewhat difficult to separate the various species.

GENUS MELANELLA Bowdich 1822

Many-whorled, polished shells with corneous operculum.

MELANELLA CONOIDEA Kurtz. A conical white shell with about thirteen whorls. Length 9 mm.

Pl. 33, Fig. 10

Cape Hatteras, North Carolina to Florida

MELANELLA INTERMEDIA Cantraine. Rather solid, smooth, semipellucid, white touched with light brown, whorls thirteen, aperture narrow. Length 7.5 mm.

Pl. 33, Fig. 11

Pl. 71, Fig. 14

New Jersey to West Indies; Europe

MELANELLA FUSUS Dall. A deep-water species included for comparative purposes.

Pl. 33, Fig. 9

Off Havana Light, Cuba

MELANELLA SUBCARINATA Orbigny. Shell pyramidal; whorls eight, flat, the last bluntly carinated; suture margined. Length 3.5 mm.

Pl. 42, Fig. 11

North Carolina to Florida and West Indies

GENUS LIOSTRACA H. and A. Adams 1853

Shell minute, usually long and narrow, whorls a little flattened on side, polished, often banded with color, aperture narrow, inner lip thickened and slightly curved in center, outer lip sharp.

LIOSTRACA ACUTA Sowerby. Shell elongated, dull white, twelve rather flattened whorls, aperture narrow; apex blunt. Length 8 mm. Range 2-100 fathoms. (Marco, Florida 2 fathoms.)

Pl. 33, Fig. 15

Off North Carolina to West Indies

LIOSTRACA BILINEATA Alder. A narrow thin shell with a pair of bands in center of whorl and an indistinct one below suture; some examples with a blotch of color at base. Length 8 mm.

Pl. 33, Fig. 12

Cape Hatteras, North Carolina to West Indies; Europe

LIOSTRACA HEMPHILLII Dall. Length 3 mm.

Pl. 68, Fig. 11

Cedar Keys to Marco, Florida

GENUS STYLIFER Broderip 1832

Shell almost transparent, smooth, polished, apex sharp, often bent; inner lip smooth, outer slightly curved in center, no operculum.

Parasitic upon sea urchins.

STYLIFER STIMPSONII Verrill. A white, broad shell with a short spire and only four to five whorls, the last of generous size and with a revolving cut line just below the suture. Length 3.75 mm. Depth range in the north 13-60 fathoms.

Pl. 33, Fig. 4

George's Bank southward to Florida Keys

GENUS NISO Risso 1826

Shell deeply umbilicated, many whorled, apex acute, last whorl angulated at periphery, operculum present.

NISO INTERRUPTA Sowerby. A white, polished shell, often spotted upon the varices. A narrow band at the suture and periphery is usually characteristic. The varieties include one which is tri-colored. Length 19 mm. A variety is shown on Pl. 65.

Pl. 33, Fig. 17

Pl. 65, Fig. 10

Cape Hatteras, North Carolina to Gulf of Mexico

NISO SPLENDIDULA Sowerby. Surface smooth, whitish, highly polished; brown banded and sometimes spotted in center of whorl, also above and below suture. There are broad zones of yellow in the middle of the early whorls and both above and below the periphery on body whorl. Length 1-1.5 inches.

The specimen figured was taken by the U. S. Fish Commission in 111 fathoms, mud, between the Mississippi Delta and Cedar Key.

Pl. 33, Fig. 16

Off Cape Fear, North Carolina to Gulf of Mexico

Family Pyramidellidae

GENUS PYRAMIDELLA Lamarck 1799

Distinguished by an elevated shell with sharp-pointed spire and numerous whorls; columella straight, with strong spiral plications; operculum horny, semi-circular, notched to fit plaits on columella.

PYRAMIDELLA CRENULATA Holmes. Suture distinctly crenulated; shell rarely light colored; columella brown and plaits on the same dark, even in pale specimens.

Animal pale, tentacles flat, black eyes close together; movements sluggish. Length 14 mm.

On the west coast of Florida it lives in from low water to 2 fathoms and prefers seaweed or muddy flats.

Pl. 33, Fig. 8

South Carolina to west Florida; West Indies

PYRAMIDELLA DOLABRATA Linné. A smooth white shell with three to four chestnut spiral lines on body whorl and two on upper whorls; outer lip often toothed inside. Length 1 inch.

A very distinct and striking shell on account of its shining surface. It is quite frequent in the Bahamas and probably lives among the Florida Keys. Dead shells are sometimes found on the mainland beaches.

Pl. 34, Fig. 18

Southern Florida and West Indies

PYRAMIDELLA CANDIDA Morch. Shell pure white, sometimes with an opaque white spiral line on middle of whorl and one to two small teeth in throat. Both toothed and toothless individuals occur, possibly on account of local influences. Length 7 mm.

Dr. Rush dredged this shell at 6 fathoms in Turtle Harbor, Florida; the writer off Tiger Key, Florida. It extends to a known depth of 200 fathoms. Fresh dead specimens have been taken on the beaches at various points.

Pl. 34, Fig. 7

North Carolina to Gulf of Mexico and West Indies

PYRAMIDELLA FUSCA C. B. Adams. Shell light brown, semitranslucent; sutures well marked; base inflated; aperture large and ear-shaped, outer lip thin; columella slender, reflected portion forming narrow umbilicus; oblique fold below insertion of columella; operculum very thin. Length 5.5 mm.

Pl. 34, Fig. 21

Pl. 71, Fig. 15

Prince Edward Island to Florida

PYRAMIDELLA PRODUCTA C. B. Adams. Shell light yellowish brown, translucent, suture well impressed, periphery of last whorl well rounded; outer lip thin; columella oblique, twisted and with a strong fold anterior to its insertion. Length 5.1 mm.

Pl. 34, Fig. 15

Pl. 71, Fig. 13

Massachusetts Bay to New Jersey

PYRAMIDELLA WINKLEYI Bartsch. Shell semi-translucent, light yellow; whorls eight, the postnuclear ones moderately rounded with summits marked by growth lines and fine microscopic striations; periphery and base of final whorl somewhat inflated; aperture

ear-shaped, outer lip thin; columella twisted with an oblique fold slightly above its insertion. Length 5.8 mm., diameter 2 mm.

The unique holotype was taken at the following locality.

Pl. 34, Fig. 1

Branford River, Connecticut

PYRAMIDELLA ENGONIA TERES Bush.

Pl. 65, Fig. 9

GENUS TURBONILLA Risso 1826

Many whorled, usually slender, single fold upon columella, outer lip continuous; usually larger than *Odostomia* and smaller than *Pyramidella*.

TURBONILLA CURTA Dall. Shell waxen white, nine to ten inflated whorls; nucleus sinistral; last whorl with about twenty-five close-set rounded ribs, extending from suture to suture, but little curved; no spiral sculpture; base almost smooth; surface polished; suture distinct. Length 8.3 mm.

Dead but fresh examples are not rare upon the Sanibel beach. Range 15-640 fathoms.

Pl. 34, Fig. 5

North Carolina to Gulf of Mexico

TURBONILLA AREOLATA Verrill. "Shell obelisk-shaped, light yellow, nuclear whorls very small; postnuclear whorls almost flat, crossed by strong low axial ribs, ranging from twenty on the first to twenty-six upon the penultimate turn. The spiral sculpture consists of five rows of pits which cross the spaces but not the ribs; periphery of last whorl smooth, except faint continuations of ribs; outer lip thin, showing external sculpture within; columella slightly curved." Length 5.1 mm. Range 2-8 fathoms.

Pl. 34, Fig. 8

Vineyard Sound to Long Island Sound

TURBONILLA RETICULATA C. B. Adams. Smaller than *T. interrupta*; spiral sculpture with aspect of threads rather than grooves; twenty-six to thirty ribs stopping at periphery, sometimes faintly visible in front of it; columella simple, twisted and straight, often with distinct plait. Length 2.5 mm.

North Carolina to West Indies

TURBONILLA CONRADI Bush. Shell waxen gray or yellowish; regularly coiled; twelve whorls in addition to the flattened nucleus which is transverse to the axis; suture distinct, a little undulating; transverse ribs twenty-two, broad, rounded, slightly oblique, spaces between ribs wider and shallower, the latter crossed by conspicuous incised lines, the lines becoming deep grooves above suture; base well rounded with three incised spiral lines and other smaller ones; columella straight, thickened, well reflected. Length 8.5 mm.

Pl. 34, Fig. 3

Tampa Bay to Tarpon Bay, Florida

TURBONILLA HEMPHILLI Bush. Allied to *T. dalli* but more slender, longer, apex more pointed, whorls less convex, nucleus smaller, ribs more numerous; twelve whorls in addition to the small nucleus; transverse ribs about twenty, nearly perpendicular, rounded, equally wide deep spaces between; base rounded and smooth; surface covered with fine striae. Length 9 mm.

Pl. 34, Fig. 6

Sarasota Bay to Sanibel, Florida

TURBONILLA INTERRUPTA Totten. "Shell slender, pale wax yellow; postnuclear turns quite high between sutures; low axial ribs a little wider than the spaces between, ribs increasing from twenty to twenty-four upon the penultimate turn, also 11-14 deep spiral lines, all except the one upon the periphery equal in strength and spacing, the one immediately above periphery much heavier and forming a line of deep pits; peripheral band of last whorl free from sculpture except for faint continuations of the axial ribs, well rounded; base short, well rounded, with eight equally-spaced and strong cut spiral lines; aperture subquadrate, outer and basal lip thin; columella slightly curved and weakly reflexed." Length 5.7 mm. Range 2-107 fathoms.

Pl. 34, Fig. 2

Casco Bay, Maine to West Indies

TURBONILLA WINKLEYI Bartsch. "Shell wax yellow; axial ribs twenty-two on the first, increasing to twenty-two upon the penultimate turn; spaces between of varying width; base short, rounded, marked by feeble continuations of the axial ribs and about fifteen feeble wavy striations; columella

slender, curved." Length 7.9 mm.

A very variable form and the most abundant *Turbonilla* on our Atlantic coast. The yellow color and the shape are the most constant characters. Range 4-10 fathoms.

Pl. 34, Fig. 183

Salem to Wood's Hole, Massachusetts, Branford, Connecticut; off Penfield Reef, Long Island Sound

TURBONILLA DALLI Bush. A large, stout, bluish white, transparent shell with dull lustre; suture deep; whorls very convex; nucleus of two projecting whorls, followed by twelve usual whorls; ribs about sixteen to each whorl, often opaque, very strong, a little oblique; wide spaces between ribs, concave, with squarish ends often just above suture; base short, smooth; outer lip thin, turning to meet the straight, thickened, not reflected axial lip; surface entirely covered with fine microscopic striae. Length 8.4, diameter 2.2 mm.

A rather frequent beach shell on the bars of Lake Worth Inlet Palm Beach, Florida.

Pl. 33, Fig. 20

Off Cape Hatteras, North Carolina; Palm Beach, Florida; Sarasota Bay, Florida

TURBONILLA BELOTHECA Dall. Shell white, shining; whorls thirteen or more, gradually increasing in size, only slightly rounded, suture well impressed; broad prominent oblique ribs extending on upper whorls from suture to suture, closer together and more numerous on body whorl; growth lines apparent on base, columellar pillar almost straight. Length 11 mm.

Pl. 34, Fig. 4

Palm Beach; Florida Keys; West Florida; West Indies

TURBONILLA VINEAE Bartsch. Shell wax yellow, nuclear whorls very small, two in number; axial ribs broad and low, about twenty-two upon each whorl; intercostal spaces as wide as ribs, between sutures marked by fine growth lines and seven to eight deeply cut spiral lines of pits; aperture large, outer lip thin, showing external sculpture inside. Length 6.3 mm.; diameter 2.9 mm.

Pl. 34, Fig. 11

Wood's Hole, Massachusetts to Branford, Connecticut

TURBONILLA MIGHELSEI Bartsch (*T. costulata* Verrill). Whorls with eighteen to twenty-six strong axial ribs, spiral sculpture of coarse line of pits at periphery and twenty fine incised lines; the spiral markings passing up sides of ribs but not crossing them. Periphery of last whorl rounded; ten feeble wavy lines on base. Length 3.8 mm.

Pl. 34, Fig. 20

Wood's Hole, Massachusetts

TURBONILLA ELEGANTULA Verrill. Range 2-10 fathoms.

Pl. 71, Fig. 6

Vineyard Sound to off New Haven, Connecticut

GENUS COUTHOUYELLA

TURBONILLA STRIATULA Couthouy. "Shell strong, milk white; nucleus of about one and one fourth smooth dextral turns, faint incremental lines covering entire surface of shell; low spiral cords upon early whorls which later become weak; sutures well impressed; base with eight spiral cords; outer lip thick inside, curving to sharp edge; columella curved." Length 13.6 mm.

Practically all the adults lose the early whorls.

Pl. 34, Fig. 9

Nova Scotia to Buzzard's Bay

SUBGENUS PARTHENIA Lowe 1840

TURBONILLA CEDROSA Dall. Length 5.5 mm.

Pl. 68, Fig. 4

Cedar Keys, Florida

GENUS PERISTICHIA Dall 1889

PERISTICHIA TORETA Dall. Shell slender, yellowish white, whorls thirteen; nucleus minute, glassy, set on edge, with but two whorls; suture distinct, with plain or waving thread behind it; behind this a strong nodulated spiral, then an interval and two more spirals close to each other and suture behind them; about thirty-four nodules on circuit of last whorl; base with one strong cord and a deep sulcus outside it; pillar of columella straight, three strong internal lirae on outer edge; outer lip swollen, varicose; callus joining pillar and outer lips distinct and continuous. Length 11 mm.

This very distinct and attractive shell has been taken at Sanibel, Florida. In Charlotte Harbor it has been dredged in 2 fathoms. At Key West it has been collected between tides.

Pl. 34, Fig. 22

West Florida to Key West

GENUS OSCILLA A. Adams 1867

OSCILLA BISERIATA Gabb (T. nivea Morch). Shell white, slender, three spiral ribs on each of the flattened whorls; two plain ribs below the nodulous ones on body whorl; three encircling ridges beneath the periphery forming folds on columella; about twenty-one nodules upon circuit of last whorl; nucleus glassy, rounded. Length 8.5 mm.

A single specimen was dredged by the author on Featherbed Bank, Card Sound, Florida. Fresh examples occurred in drift taken near the Shark Factory on Big Pine Key, Florida.

Pl. 33, Fig. 13

Pl. 68, Fig. 2

Card Sound to Key West, Florida

GENUS ODOSTOMIA Fleming 1817

Few whorled, minute, usually short shells; columella fold single, outer lip entire. In Florida they may be sought for under oyster shells.

ODOSTOMIA IMPRESSA Say. "Shell elongate, conic, milk white; nuclear whorls small, about half immersed in first succeeding turns; postnuclear turns flattened, shouldered above, marked by three strong deeply cut spiral grooves, the grooves cut by spiral threads; spaces between spiral grooves rounded on sides and obliquely flattened on top; sutures channelled, periphery marked by deep channel, like those above it; base well rounded marked by seven spiral grooves like spaces between sutures; outer lip thin, slightly sinuous at edge, showing external sculpture within; columella very stout with strong oblique fold at insertion." Bartsch. Length 4.8 mm.

Pl. 34, Fig. 16

Pl. 71, Fig. 11

Massachusetts Bay to Gulf of Mexico

ODOSTOMIA SEMINUDA C. B. Adams. "Shell very elongate-ovate, milk white, at least two nuclear whorls; postnuclear whorls well

rounded, somewhat shouldered at summit; nodular axial ribs increasing from eighteen upon second to twenty-four upon the fourth and penultimate whorl; also four low spiral ridges which divide the space between sutures into four equal areas; spaces between spiral ridges about one-sixth as wide as ridges. The nodules are formed by the junction of the spirals and axial ribs; sutures channelled; base of last whorl with about seven incised spiral grooves; aperture irregular, ear-shaped; outer lip thick inside but edge thin; columella strong, twisted and reflexed, provided with oblique fold." Length 3.8 mm.

Pl. 34, Fig. 17

Pl. 71, Fig. 10

Prince Edward Island to Gulf of Mexico

ODOSTOMIA TRIFIDA Totten. "Shell elongate-ovate, shining white; nuclear whorls small, almost immersed in the first of the succeeding turns; postnuclear whorls almost flattened, shouldered at summit, crossed by three deeply cut spiral lines and a faint one; these channels crossed by weak axial threads; sutures faintly impressed; base rounded, marked by about ten feebly cut spiral lines which are irregular in strength and spacing; outer lip thin, showing external sculpture within; columella short, with strong oblique fold at insertion; seven postnuclear whorls." Length 4 mm.

Pl. 34, Fig. 14; Pl. 71, Fig. 8

Maine to New Jersey

ODOSTOMIA BISUTURALIS Say. "Shell conic, milk white; nuclear whorls at least two, more than half immersed in the succeeding turns; postnuclear whorls moderately rounded, somewhat shouldered at summit; spirally marked by a deeply incised channel a short distance above the summits of the whorls; deep channel crossed by many fine axial threads; aperture large; outer lip thin, columella slender, strongly reflexed, with an oblique fold at insertion which is not visible when aperture is viewed squarely; whorls eight postnuclear." Length 4.7 mm. Range 1-2 fathoms.

Pl. 34, Fig. 19

Pl. 71, Fig. 7

Gulf of St. Lawrence to Delaware Bay.

ODOSTOMIA BISUTURALIS OVILENSIS Bartsch.

A larger shell than the typical, whorls more inflated and rounded, fine spiral sculpture more developed. Length 5.6 mm.

Pl. 34, Fig. 12

Sheepscott River, Wiscasset, Maine

ODOSTOMIA MODESTA Stimpson. A shining, yellowish white shell; sutures well impressed; base inflated; rounded fine growth lines and faint spiral striations. Length 3.2 mm., diameter 1.8 mm.

Pl. 34, Fig. 10

Wood's Hole, Massachusetts

Family Carinariidae

Shell very delicate, symmetrical, glassy.

Animal large, translucent, granulated; tentacles long and slender, eyes near their base. It is an oceanic swimmer, very agile, and propelled with a ventral fin.

GENUS *CARINARIA* Lamarck 1801
(KEELED PAPER SHELLS)

CARINARIA MEDITERRANEA Peron and Le Sueur. The animal is a gelatinous mass, swollen, transparent but with a well-developed head. It is provided with a sucker for attachment to any solid object when at rest. The cup-shaped shell, much smaller than the animal, is known as the "Glassy Nautilus" but is not related to the genuine *Nautilus*. Length of shell about 2 inches but variable.

Pl. 35, Fig. 1

New Jersey to West Indies; West Indies

Family Atlantidae

GENUS *ATLANTA* Le Sueur 1817

Shell fragile, transparent, whorls separated with distinct carina or keel; aperture oval; operculum subtriangular; Pelagic.

ATLANTA PERONII Le Sueur. Early whorls elevated into a low spire on upper side, later whorls openly coiled but connected by keel; surface with fine growth lines, glassy. Diameter 12 mm.

Pl. 33, Fig. 22

Pl. 66, Figs. 4, 4a

Pl. 74, Figs. 110, 110a

Cape Hatteras, North Carolina to West Indies; tropics

ATLANTA GAUDICHAUDI Eudoux and Souleyet
Pl. 74, Fig. 111

Family Naticidae

The animal is conspicuous on account of its voluminous foot which cannot always be entirely withdrawn into the shell. The latter is partially or entirely covered by the animal when active.

Shell more or less globular in shape; aperture semilunar, sometimes very large.

GENUS *NATICA* Scopoli 1777

Operculum calcareous (shelly); open umbilicus spirally ribbed.

NATICA CANRENA Linné. Shell brown, ornamented with longitudinal zigzag brown streaks becoming darker upon the bands; umbilicus filled and covered with a white callus; length 1 inch.

Pl. 35, Fig. 7

North Carolina to West Indies; Gulf of Mexico

NATICA LIVIDA Pfeiffer (*N. jamaicensis* C. B. Adams). Shell small, whorls five and five tenths, nucleus always minute and generally dark brown; heavy brown callus extending partially over umbilical area and upon wall above; usually one wide dark color zone, whitish below suture and at base, band apparent inside. Length of a Jupiter, Florida, specimen 13 mm.

Generally more elevated than *N. maroccana*, coloring like *N. triseriata*.

Pl. 35, Fig. 6

North Carolina to West Indies

NATICA MAROCCANA Dillwyn. Similar to *N. livida* but chiefly distinguished by the operculum with a double marginal rib, the outer half of which is higher than the inner. The nucleus of the operculum is overlaid by a thin irregular callus often of a dark color. Length 35 mm.

Pl. 35, Fig. 16

North Carolina to West Indies

SUBGENUS TECTONATICA Sacco 1890

NATICA PUSILLA Say. A very small suboval shell, sometimes with one to two faint bands; callus pressed laterally into the umbilicus which is almost closed. Length 6 mm. Range 2-15 fathoms.

The smallest Floridian Natica. Often taken alive at Sanibel.

Pl. 35, Fig. 11

Pl. 69, Fig. 21

Casco Bay, Maine to Gulf of Mexico

NATICA CLAUSA Brod. and Sby. Shell small, tinged with brown; whorls four to five, suture distinct; outer lip sharp, thickened; interior white; operculum calcareous.

Length 16 mm. Depth range 16-1537 fathoms.

Pl. 42, Fig. 15

Labrador to off North Carolina

GENUS POLINICES Montfort 1810

Shell generally smooth; umbilicate or closed by a callus; operculum corneous.

POLINICES BRUNNEA Link. Shell conic, deeply umbilicated and with broad entering callus; color brownish or orange-brown, base and callus white. Length 30 mm.

Pl. 35, Fig. 2

Palm Beach County to Florida Keys; Texas; West Indies

POLINICES LACTEA Guilding. Shell ovate; epidermis when present thin and yellowish; umbilicus of moderate size, partly filled with entering callus. Length 1 inch.

It lives in Lake Worth, Florida.

The normal operculum is yellowish but occasionally claret colored.

Pl. 35, Fig. 13

Palm Beach to Florida Keys; Texas, West Indies

SUBGENUS NEVERITA Risso 1826

Operculum simple, corneous.

POLINICES DUPLICATA Say. Shell solid, ovate, compressed above so as to give a pyramidal outline; whorls five or more; spire rather prominent; aperture ovate, very oblique; lip thin and sharp; callus upon the parietal wall very heavy and wide; interior generally of a pearly lustre; umbilicus deeply grooved inside. Length 2 inches,

breadth slightly more.

Pl. 35, Fig. 9

Pl. 70, Fig. 12

Massachusetts Bay to Gulf of Mexico

SUBGENUS EUSPIRA Agassiz in Sowerby 1838; Lunatia Gray 1847

POLINICES HEROS Say. Shell globose-ovate, thick ash-colored, shining when epidermis is removed; growth lines distinct; whorls five, very convex; suture well marked; aperture ovate, lip sharp above, gradually rounded, thickened and expanded near the umbilicus; thin layer of enamel upon parietal wall; umbilicus large, round and showing the whorls to summit; operculum horny. Average length 2.5 inches, breadth 2 inches.

A voracious mollusk which devours dead fish. It plows through the sand, a little below the surface, the position often being indicated by a heap of sand at the end of a trail.

The eggs are deposited in clusters which in shape and thickness resemble an orange peel, easily bent without breaking when damp. When held up to the light the individual cells may clearly be seen. Each of these contains a gelatinous egg, with a yellow nucleus which is the embryo shell.

Range 0-238 fathoms. Animal Pl. 70, Fig. 1.

Pl. 35, Fig. 14

Pl. 70, Fig. 11

Gulf of St. Lawrence to North Carolina

POLINICES TRISERIATA Say. Whorls five, usually with three series of dark spots on lower whorl, one on upper ones; umbilicus quite small, almost free; color yellowish white, epidermis also yellowish. Length 17 mm.

An ivory-white callus is the most constant character. It is a variable form found on mud flats at low tide. Range 1-63 fathoms. The early stages of growth are shown on Pl. 69.

Pl. 35, Fig. 8

Pl. 69, Figs. 18, 19

Gulf of St. Lawrence to North Carolina

POLINICES GROENLANDICA Moller. Shell sub-oval, ash colored; umbilicus partially covered; surface glossy; spiral lines microscopic; whorls four, convex; suture deep;

callus and interior white; operculum horny. Length 18 mm. Depth range 70-80 fathoms.

It has been taken from fish stomachs in the vicinity of Massachusetts Bay. Pl. 35, Fig. 17
Greenland to North Carolina

POLINICES IMMACULATA Totten. Range 5-110 fathoms.

Pl. 69, Fig. 20
Gulf of St. Lawrence to North Carolina

GENUS *AMAUROPSIS* Morch 1857

AMAUROPSIS ISLANDICA Gmelin (*N. helicoides* Johnston). Shell dingy white, almost smooth and with dark yellow epidermis; whorls four, suture channelled; umbilical opening very small; operculum horny. Length 1 inch or slightly more. Depth range 27-80 fathoms.

Pl. 42, Fig. 14
Labrador to Georges Bank

GENUS *SINUM* Roeding 1798
(*Sigaretus* Lamarck 1789)

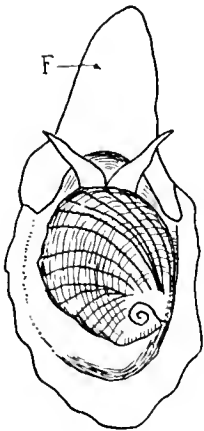


Fig. 41a
Sinum, showing animal, F. Foot

Shell depressed, spire minute, aperture extremely large; revolving striae upon exterior; white, epidermis when present very thin; operculum minute and horny.

The mantle of the animal is highly developed and covers the shell into which it is incapable of withdrawing entirely, Fig. 41a.

SINUM PERSPECTIVUM Say. Flatly convex, ground white, epidermis yellowish; covered above with waved spiral striae; base flattened. Diameter

1.5 inches.

This *Sinum*, the commonest on the east coast, lives upon the beaches.

Pl. 35, Fig. 4
New Jersey to West Indies

SINUM MACULATUM Say. Chestnut yellow at the suture, two series of spots or maculations upon the spire. Diameter 1.25 inches.

A rare shell, more convex than the last.

Pl. 35, Fig. 5
North Carolina to West Indies

SINUM MARTINIANUM Phil. A rather solid chestnut-brown shell; growth lines rough; epidermis thin, fading to white on base; interior dark brown. Length 1-1.5 inches.

This species is very closely related to *S. maculatum*. A living example has been collected in Lake Worth, Florida.

Pl. 53, Fig. 18
Pl. 35, Fig. 18
Southeast Florida to West Indies

GENUS *EUNATICINA* Fischer 1885

EUNATICINA SEMISULCATA Gray (*Natica fordiana* Simp.). Umbilicus deep and wide, bounded by an angle; whorls slantingly flattened above; color white, shining; five to six grooves encircling the shell. Length 14 mm.

Pl. 35, Fig. 3
Pl. 42, Fig. 17
Jupiter Inlet and Sarasota Bay, Florida to West Indies

Family Lamellariidae

Shell small, thin, last two whorls rapidly enlarging; lip thin, aperture very large; surface sometimes covered with a velvety epidermis; no operculum; animal carnivorous.

GENUS *LAMELLARIA* Montagu 1815

LAMELLARIA PELLUCIDA Verrill. Shell white, very delicate, transparent, smooth; interior of spire visible only when viewed endwise. Length 12-16 mm.

Pl. 41, Fig. 9
South of Martha's Vineyard to off Delaware Bay; east Florida

GENUS *VELUTINA* Fleming 1822

VELUTINA LAEVIGATA Linné. Shell very fragile, transparent, whorls three, the last much expanded; epidermis brownish, arranged in regular spiral folds; interior smooth and shining; aperture almost circular. Diameter 16 mm.

It may be sought for among seaweed upon the beaches and also in the stomachs of fish. Depth range 3-50 fathoms.

Pl. 35, Fig. 12
Labrador to Cape Cod, Massachusetts

Family Xenophoridae

Shell trochiform; periphery carinated; surface dull, soldering broken dead shells, stones and foreign objects to its upper surface; aperture very oblique, outer lip thin; operculum horny.

These mollusks frequent rough bottoms and scramble over the ground like *Strombus* instead of gliding evenly.

GENUS XENOPHORA Fischer der Waldheim 1807
(CARRIER SHELLS)

ZENOPHORA CONCHYLIOPHORA Born. Upper portion of shell well covered with large bits of various shells and stones; face concave, strong curved growth lines and low narrow ridges; no umbilicus but a mere chink in young specimens; base brown in color. Diameter 2 inches, often larger.

This remarkable shell is well camouflaged with its attachments. It carries a heavier load than the species from deeper water. Often living coral is found upon its back. Depth range 0-250 fathoms.

It has been collected living in Lake Worth, Florida, during the summer months.

Pl. 36, Fig. 1
North Carolina to Florida; West Indies

XENOPHORA CARIBAEA Petit. In this species there are few if any attachments. The umbilical perforation is often a mere chink or absent in some individuals. It has been taken in 14 fathoms.

Pl. 59, Fig. 4
Florida Keys and West Indies

XENOPHORA LONGLEYI Bartsch. A remarkable shell which has only been obtained in deep water. Depth range 98-125 fathoms. Breadth about 4 inches.

Pl. 59, Fig. 3
Off Loggerhead Key, Tortugas, Florida

Family Capulidae

GENUS CAPULUS Montfort 1810
(LITTLE CAP)

Shell conical; apex forward, spi-

rally curved; aperture somewhat circular; muscle impression horseshoe-shaped.

CAPULUS UNGARICUS Linné (*C. hungaricus* of authors). Shell cornucopia-shaped with curved apex; white or dull brown under a thin epidermis; finely ribbed, the ribs less conspicuous or absent near the margin; interior pink or white. Length 27 mm.

It ranges from shallow water to 85 fathoms, attached to rocks and shells, particularly oysters and scallops. In certain tertiary fossil beds it is very abundant. *Radula* Pl. 68, Fig. 8.

Pl. 36, Fig. 15
Greenland to Florida

CAPULUS INTORTUS Lamarck. Shell white, epidermis light brown, thin, very obliquely spiral; surface faintly decussated by the sculpture. Length 17 mm.

Pl. 36, Fig. 4
Florida Keys and West Indies

Family Hipponicidae

Shell thick, non-spiral; apex forward and pointed backwards; surface variable; muscular impression horseshoe-shaped.

GENUS HIPPONIX De France 1819,
Amalthea Schumacher 1817 not Montfort 1810

HIPPONIX ANTIQUATA Linné. Shell white, apex forward; roughly and closely laminated, epidermis with short hairs. Length 19 mm.

Pl. 36, Fig. 3
Florida Keys and West Indies

Family Calyptraeidae

Shell limpet-like, with usually a discernible spiral apex; interior simple or partitioned by a shelly process to which are attached the adductor muscles. These "bonnet limpets" cling to stones or other shells and apparently remain fixed for life.

GENUS CHEILEA Modeer 1793,
Mitrularia Schum. 1817

Shell conical, often irregular; apex somewhat posterior and directed backwards; muscular impression horseshoe-shaped.

CHEILEA EQUESTRIS Linné. Almost orbicular or irregular, solid or thin, exterior closely rayed with ridges or striations, edge

often crenulated; plate dish-shaped with puckered edge. Diameter 32 mm.

This species will either excavate a cavity for adherence or else secrete a shell-like support corresponding to the operculum. Range 0-189 fathoms.

Pl. 36, Fig. 7

North Carolina to Texas; West Indies

GENUS CALYPTRAEA Lamarck 1799

Shell conical; apex posterior; half cup-like appendage upon posterior side and fastened to apex, open in front. Exterior surface roughened or cancellated.

CALYPTRAEA CENTRALIS Conrad. Shell very small, thin, rounded, spire well elevated; growth lines rough, white. Breadth 5 mm. Depth range 1-52 fathoms.

This little shell lives in the shallow water of Tarpon Bay, Sanibel, Florida.

Pl. 36, Fig. 9

North Carolina to Gulf of Mexico;
West Indies

GENUS CRUCIBULUM Schumacher 1817
(CRUCIBLE SHELLS)

Internal process of shell cup-shaped with margin entire and attached at one side of shell.

CRUCIBULUM STRIATUM Say. Shell oval, convex, with many slightly elevated, equal, equidistant radiating lines; summit inclining toward the left side; inner process attached to shorter side of the shell. Length 1 inch. Range 3-189 fathoms.

Pl. 36, Fig. 8

Pl. 69, Figs. 27, 28

Nova Scotia to Florida Keys

CRUCIBULUM AURICULA Gmelin. The typical *C. auricula* is depressed and with fine radiating lines upon the outer surface. Diameter 1 inch or more.

In Florida this species lives in fairly deep water off shore and rarely if ever has been found upon the beaches. In the West Indies it occurs in much shallower water and is frequently collected upon the shore. The typical shell and its varieties may easily be collected in the Pliocene fossil beds of Florida. Depth range 25-100 fathoms.

Pl. 59, Fig. 7

Florida and the West Indies (living)

CRUCIBULUM AURICULA IMBRICATUM Sowerby. Like the preceding but with fine radiating ribs upon the ribs. Occurs in the Caloosahatchie fossil beds of Florida.

Pacific coast from Lower California to Panama (living)

CRUCIBULUM AURICULA SPINOSUM Sowerby. Shell with radiating riblets, these provided with tubular spines or tubercles. It occurs in various tertiary beds of the southern states.

Pl. 55, Fig. 4

Monterey, California to Panama
(living)

CRUCIBULUM AURICULA COSTATUM Say. Radiating ribs strong but without fine sculpture upon them.

West Indies (living)

Family Crepidulidae

Shell oval, boat-shaped, spire imperfect; cavity partially divided within by a horizontal partition.

GENUS CREPIDULA Lamarck 1799
(QUARTER DECK, SLIPPER SHELL)

CREPIDULA FORNICATA Linné. Boat Shell. Shell obliquely oval, apex turned to one side, generally close to margin of aperture; epidermis yellowish; diaphragm white, occupying about one-half of opening, one side marked by a distinct line, the other compressed against wall and united to it; free edge of diaphragm waving, one-half extending beyond the remainder. Length 32 mm. Animal shown on Pl. 68, Fig. 16.

Pl. 36, Fig. 5

Pl. 69, Figs. 23, 24

Prince Edward Island to Texas; West Indies

CREPIDULA GLAUCA Say. Gray Slipper. Shell of a glaucous or grayish-green color, freckled with dots of a lighter color; apex pointed, projecting and central; interior dark brown or mottled, diaphragm white, margin yellowish. Length 14 mm.

Common on the ocean shore of Rhode Island.

Pl. 36, Fig. 6
Nova Scotia to Florida; Texas

CREPIDULA GLAUCA CONVEXA Say. Convex Slipper. Apex obliquely beaked; shell convex or high backed, otherwise as in *C. glauca*. Length 14 mm. or more.

C. glauca and its variety are very closely related to *C. fornicata*.

Pl. 69, Fig. 125
Nova Scotia to Florida; Texas

CREPIDULA PLANA Say (*C. unguiformis* Lam.). Flat Slipper. Shell ovate, flat, concave, or convex, thin, transparent, white; apex minute, turned a little to one side; interior brilliantly polished and iridescent; diaphragm less than one-half length of shell. Length 30 mm. The radula is shown on Pl. 68, Fig. 12.

This mollusk lives attached often inside dead shells inhabited by hermit-crabs. It is frequently curved to conform with the substance to which attachment is made. The size and shape vary accordingly.

Pl. 36, Fig. 14

Pl. 69, Fig. 26

Prince Edward Island to Texas

CREPIDULA ACULEATA Gmelin. Thorny Slipper. Exterior covered with radiating prickly or spiny ridges; often with brown rays upon a white or yellowish base; interior frequently spotted or rayed with brown; shelf white. Length 25-37 mm.

Pl. 36, Fig. 2

Cape Hatteras, North Carolina to West Indies, California

Family Truncatellidae

Foot short and rounded; head bilobed. Shell minute, shining, cylindrical, apex truncated; operculum subspiral.

These little shells are found under stones, wood, and seaweed between tide marks. They often remain weeks out of the water.

GENUS TRUNCATELLA Risso 1826
(LOOPING SNAILS)

TRUNCATELLA BILABIATA Pfeiffer. Whorls 4.5-5, convex, the last one no longer than the others; peristome double, outer one white and heavy. Length 5.5 mm.

Pl. 36, Fig. 13

Florida; Cuba; West Indies

TRUNCATELLA CARIBAEENSIS Sowerby. Shell subcylindrical in adult state; amber color with delicate barely curved ribs, often becoming fainter in center of whorls; 3.5-4 whorls, slightly rounded, the last indistinctly keeled; aperture oval, inner lip thickened and pressed into the last whorl, outer lip reflexed. Length 7 mm.

Pl. 36, Fig. 11

Florida; West Indies

TRUNCATELLA CARIBAEENSIS PULCHELLA Pfeiffer. Light horn or amber color; lightly ribbed, ribs not elevated; whorls 4-4.5, peristome simple, expanding with slight ridge at right extremity. Length 5 mm.

Pl. 36, Fig. 12

Florida; West Indies

Family Rissoiidae

Shell small, often minute, more or less umbilicated; lip rounded; sculpture variable. These little mollusks live upon algae, oysters, Pinna shells and beneath sponges.

GENUS RISSOA Fremenville 1814

Shell more or less oblong, often thick, white or yellowish; operculum corneous. In this and the genus *Rissoina* the animal is remarkably active and bold. It is provided with long, slender tentacles, the eyes being placed near their bases. They quickly spin a byssal thread to use as a ladder when detached from some solid object.

There are hundreds of known species and probably as many more awaiting discovery. They range to a depth of 100 fathoms but are most abundant in shallow water.

RISSOA EXARATA Stimpson. Shell minute, imperforate; whorls five, evenly spaced; axial ribs elevated; lip thickened; aperture small. Length 2.7 mm. Depth range 3-107 fathoms.

Bay of Fundy to North Carolina

Family Rissoinidae

Shell turriculated; many, somewhat convex, whorls; apex mammillar; peristome interrupted by canal below.

GENUS RISSOINA Orbigny 1840

RISSOINA BRYEREA Montagu. Shell solid, somewhat shining, white or yellowish; whorls seven, conspicuously ribbed. Length 5.5 mm.

Frequent upon both of the Florida coasts and the Keys.

Pl. 37, Fig. 19

Florida; West Indies

RISSOINA CANCELLATA Philippi. Shell white; ten convex whorls cancellated with sixteen to eighteen upright ribs and four to five revolving ridges, many ridges on base; outer lip strong, notch at base pronounced; a faint encircling rib at base of shell. Length 8 mm., diameter 3 mm.

Pl. 37, Fig. 17

Florida Keys; West Indies

RISSOINA CHESNELII Michaud. Shell white, shining; whorls eight, slightly convex; about fourteen strong ribs to each whorl with interspaces which are scarcely spirally sculptured; oblique ridge at base of shell. Length 3.5-4 mm., diameter 1.5 mm.

Pl. 37, Fig. 18

Florida; West Indies

RISSOINA DECUSSATA Montagu. A solid, white, shining shell with about twelve flat whorls; twenty-five to twenty-eight delicate ribs crossed by fine spiral lines; outer lip heavy, almost semi-lunar, canal indistinct. Length 5-6 mm.

Pl. 37, Fig. 25

Florida; West Indies

RISSOINA FENESTRATA Schwartz. Solid, white; twelve to fourteen longitudinal ribs to each whorl which are crossed by spiral ones, five on last whorl; lip varicose. Length 4.3 mm.

Florida; West Indies

RISSOINA LAEVIGATA C. B. Adams. Shell somewhat shining, white or pale amber color; outer lip well thickened, often dentate; nucleus of several whorls and peculiar shape. Length 4 mm. Depth range 1-22 fathoms.

Taken fresh after a September "blow" near the North Inlet, Palm Beach, Florida.

Pl. 33, Fig. 6

Pl. 37, Fig. 16

Cape Hatteras, North Carolina to Gulf of Mexico; West Indies

GENUS ONOBA H. and A. Adams 1854

ONOBA ACULEUS Gould.

Pl. 71 Fig. 12

Bay of Fundy to Long Island Sound

Family Amnicolidae

GENUS HYDROBIA Hartmann (Paludestrina Orbigny 1840)

HYDROBIA MINUTA Totten. A thin, smooth shell with a blunt apex; suture distinct; color varying from yellow-brown to iron color when fresh; whorls five, surface finely striate. Length 3.5-4 mm.

Pl. 37, Fig. 12

New England to Florida

HYDROBIA SALSA Pilsbry. A gray or greenish little shell; surface with lustre like dull silk, finely striated; whorls 5.5. Length 3.1 mm.

It is more broadly conic in shape than *H. minuta*, the sutures less deep, aperture and last whorl larger. The first specimens were collected at Cohasset, Massachusetts living with *H. minuta* and *Odo-stomia impressa*. It delights in salt-marsh pools.

Pl. 71, Fig. 17

Rowley, Massachusetts to Ocean County, New Jersey

Family Litiopidae

Shell minute, pointed; slight notch in front of aperture; outer lip thin and simple, inner one reflected; operculum spiral.

GENUS LITIOPA Range 1828

(SIMPLE MOUTH SHELLS)

LITIOPA BOMBYX Rang (*L. melanostoma* Rang). About nine whorls, slightly convex; color light brown, often bordered internally with black. Length 5 mm.

Pilsbry writes "To ascend through the water this little pelagic animal emits an air bubble enclosed in a glutinous secretion, which draws out a thread as it rises, and finally attaches itself to floating seaweed."

Fresh seaweed, taken upon the beach, often contains this shell. By placing the weeds in fresh water the living shells immediately detach themselves and drop to the

bottom of a container. All over the world, in warm seas, this species occurs.

Pl. 37, Fig. 10

Off Martha's Vineyard to the West Indies

GENUS ALABA H. and A. Adams 1853

Shell elongated, pointed; many rounded whorls; irregularly placed varices; aperture oval, lip barely thickened. Smooth inside.

ALABA TERVARICOSA Adams. Whorls about thirteen, gradually increasing, often bulging and giving shell a distorted appearance; first five to six whorls darker, remainder with delicate revolving threads which are crossed by growth lines; several varices on each whorl. Length 6 mm.

This beautiful little shell is often very thin, the interior partitions showing through the shell. It is rather frequent among drift along the beaches of Florida.

Pl. 37, Fig. 11

Tampa Bay; Southern Florida; West Indies

Family Skeneidae

Shell minute or small, depressed, few whorled; peristome continuous. Animal similar to Rissoa. Found living under stones, on algae and among roots of Corallina.

GENUS SKENEA Fleming 1828

Shell nearly discoidal, few whorled.

SKENEA PLANORBIS Fabricius. Shell very minute, thin, opaque, brown or yellow in color; spire a little elevated; whorls four, suture deep; umbilicus wide. Diameter 1.4 mm.

Pl. 71, Fig. 18

Greenland to Florida; Europe

GENUS ADEORBIS Wood 1842

Shell depressed, base flattened, white and often subtranslucent; aperture rounded, lip simple. Operculum corneous, smooth externally, the spire visible in middle of inner side.

ADEORBIS BEAUI Fischer. Shell white, acutely keeled at periphery, an equally strong keel below; about six fairly strong spiral ribs above periphery on last whorl with three to four much finer ones between these; upper surface dull but ribs usually shining; nucleus glassy; umbilicus wide and deep; base shining and with numerous fine spiral lines. Breadth 9 mm.

Beautiful examples have been taken at Sanibel and Palm Beach, Florida, upon the beaches. It is a rather rare shell.

Pl. 44, Fig. 9

Cedar Keys, west Florida to West Indies; Palm Beach, Florida

ADEORBIS SUPRANITIDUS Wood. A small edition of the preceding species; upper surface more shining, also an additional keel near the umbilicus. Breadth 2.5 mm. Depth range 15-25 fathoms but also sometimes found on the beaches.

Pl. 65, Figs. 7, 7a

North Carolina to Gulf of Mexico

Family Architectonicidae (Solaridiidae)

Shell widely and remarkably umbilicated, the umbilicus bordered with a crenulated keel; solid, depressed; nucleus sinistral, oblique and with sculptured whorls; columella vertical; operculum horny and with a tubercle upon its inner side.

GENUS ARCHITECTONICA Roeding 1798
Solarium (SUNDIAL)

ARCHITECTONICA BISULCATA Orbigny. Double-furrowed Dial. Shell small, umbilicus wide; spire hardly raised; whorls flat and with revolving grooves cut by furrows into granules, the rows nearest the suture being the strongest, also two rows on periphery; about same sculpture on base. Color dirty white. Diameter 10 mm. Range 55-440 fathoms.

All of the four species described have been taken upon the Florida beaches.

Pl. 37, Fig. 1

Cape Cod to West Indies

ARCHITECTONICA GRANULATA Lamarck (S. verrucosum Phil.). Granulated Sundial. Whorls spirally sulcate, four prominent sulcations and traces of others; growth lines of spire breaking surface into granules; umbilicus

contracted, crenulations very strong; color brown or livid flesh with a band of brown spots next suture and elsewhere on surface; many ribs and crenulations upon base, ribs touched with brown. Diameter 2 inches, usually less.

Many specimens have been taken alive in Lake Worth, Florida.

Pl. 37, Fig. 4

Pl. 36, Fig. 10

North Carolina to West Indies; Pacific

ARCHITECTONICA DELPHINULOIDES Orbigny.
Dolphin Dial. Shell depressed, twelve grooves on body whorl, four on other whorls; margin slightly crenulated; aperture rounded. Diameter 7.5 mm.

Pl. 37, Fig. 3

Yamato, east Florida to West Indies

ARCHITECTONICA CYCLOSTOMA Menke. Round Mouth Dial. Spire of shell elevated; color red or greenish black, often with broken white bands above suture and on periphery; whorls longitudinally striated; ten spiral ribs, the three above periphery the most distinct. Length 13 mm.

Pl. 37, Fig. 2

Palm Beach, Florida to West Indies

Family Littorinidae

Shell without umbilicus, colored; aperture rounded, no notch in lip; operculum horny, paucispiral, nucleus of operculum peculiar.

GENUS *LITTORINA* Ferussac 1822

(PERIWINKLES)

Shell thick; whorls rounded, usually few in number; outer lip acute, the inner flattened; aperture entire; operculum spiral. Radula is shown in Fig. 26, page 19.

Certain of the species rarely, if ever, enter or are covered by the sea. *Littorina* frequently lives upon bushes and trees well back from the shore and Dr. Cooke suggested that it may eventually become a land shell. *Cremnoconchus*, practically a *Littorina* in anatomy and radula, exists in India upon rocks 30-50 miles from the sea.

LITTORINA LITTOREA Linné. Shore Periwinkle. Shell solid, slightly glossy; color red,

black or brown; rarely ridged but hardly smooth; aperture not so filled up as in *L. saxitile*; area of columella usually white; whorls six to seven; apex somewhat acute. Length 1 inch.

This European species is persistently pushing its way southward in this country. It was first reported from Nova Scotia in 1863. It is a rock dweller and although the New Jersey beaches afford no foothold it had reached the jetties at Cape May, New Jersey in 1927.

Pl. 37, Fig. 13

Labrador to New Jersey

LITTORINA OBTUSATA Linné (*L. palliata* Say). Blunt Periwinkle. Shell small, thick, smooth; spire small; usually of one color but sometimes with stripes and spots of varying shades; suture faint; outer lip acute. Length 21 mm.

The animal's head is orange colored, darker above. It prefers a station exposed to the open sea and clings to rocks and seaweed.

Pl. 37, Fig. 22

Pl. 70, Fig. 5

Labrador to New Jersey

LITTORINA IRRORATA Say. Lined Periwinkle. A chalk-like shell of rather heavy build, yellowish white with tinges of purple upon the apex and elsewhere, columella touched with orange. There are blunt elevated, encircling lines, a white thick lip inside but with a thin edge. The interior is white.

It prefers a quiet protected station, such as a brackish water estuary, where it often climbs upon the grasses. On the Indian River near Coronado Beach, Florida, it lives in abundance. Length 1 inch.

Pl. 37, Fig. 20

Massachusetts to Gulf of Mexico

LITTORINA GUTTATA Philippi. Spotted Periwinkle. Shell thin, flesh color or dirty white, smooth, usually covered with a network of fine brown lines arranged in an oblique pattern. Length 8 mm.

Pl. 38, Fig. 19

Florida Keys and West Indies

SECTION *LITTORIVAGA*

LITTORINA SAXITILE Olivi (*L. rudis* Maton). Rock Periwinkle. Shell yellowish, ash,

greenish or orange color, usually one uniform color but sometimes banded with white; surface marked with distinct revolving lines and grooves; whorls four to five, convex. Length 12 mm.

Separated from *L. obtusata* by the higher spire, the striated surface and the angle of the lip in front. It is also a rock shell preferring the open coast.

Pl. 37, Fig. 23

Pl. 70, Fig. 6

Labrador to New Jersey

SUBGENUS MELARAPHE "Megerle von Muhl-
feld" Menke 1828

LITTORINA ANGULIFERA Lamarck (*L. scabra* of authors). Keeled Periwinkle. Shell quite thin, whorls well rounded, spire sharply produced; surface covered with fine engraved lines and slightly decussated by the growth lines; aperture oval; periphery usually carinated. The color varies greatly. Gray, purple, yellow or red examples occur, often with darker oblique markings which are sometimes very faintly present. Length 1.25 inches.

In Angelfish Creek, on the Florida Keys, this species occurs in great numbers, living upon mangrove branches above but not distant from the water. It often lives upon old piles and wharfs in protected places.

Pl. 37, Fig. 5

St. Augustine, Florida to West Indies; west to Texas; Central America; Pacific

LITTORINA ZICZAC Gmelin. Striped Periwinkle. Whorls hardly rounded, well-marked keel near base of final whorl; entire surface covered with lightly imposed and widely spaced grooves; lip projecting above the keel; aperture small. Color whitish, wavy stripes of brown color. Sometimes there is present a faint band; interior dark. Length 6-12 mm. The commonest rock *Littorina* in Florida.

Pl. 37, Fig. 24

Southern Florida and West Indies

LITTORINA ZICZAC LINEATA Lamarck. Whorls more convex than the preceding, keel less distinct and color pattern less pronounced; grooves strong. Length 12 mm.

Pl. 37, Fig. 15

Jupiter, east Florida to West Indies

GENUS TECTARIUS Valenciennes 1833

Solid, subconic shells with spines or tubercles; operculum paucispiral.

TECTARIUS MURICATUS Linné. Shell perforate; eight rounded whorls which are slightly shouldered above; surface sculpture of about four rows of sharp nodules, five to eight on the base and fading out near the umbilicus; color grayish white or yellowish, interior light chestnut; outer lip strengthened, groove down columella from umbilicus. Length 1 inch or less.

Near Boca Raton, Palm Beach County, this species lives shortly above to 25 feet above high-tide mark in coral-rock cup-shaped depressions, possibly excavated by the *Tectarius*.

Quoy reports the radula as being seven times the length of the shell. Pilsbry records a specimen of this species which revived after being isolated in a cabinet for a year.

Pl. 37, Fig. 6

Jupiter Inlet, east Florida around Keys to west Florida; Bermuda; West Indies

TECTARIUS TROCHIFORMIS Dillwyn. Shell imperforate; eight whorls; sculptured with revolving rows of sharp nodules; two more distinct rows on upper whorls, one below suture and another lower forming a shoulder. On the last whorl there are three more prominent rows, the two lower forming a double keel on the periphery. In addition to these there are revolving threads. The color is usually lead, the nodules lighter, interior dark, striped below. Length 18 mm.

The dark epidermis, covered with algae, make these little mollusks rather difficult to see on the rocks where they usually live near the high-tide mark. They are often very common and associated with the preceding species although nearer the water where touched by the spray. It lives chiefly upon the lower Florida Keys.

Pl. 38, Fig. 20

Lower Florida Keys

GENUS ECHINELLA Swainson 1840

ECHINELLA NODULOSA Gmelin. Often confused with the preceding but provided with a multispiral operculum which in *T. trochiformis* is paucispiral. It is abundant on rocks at Boca Raton, Florida, and elsewhere.

Length 18 mm.

Pl. 37, Fig. 9

North Carolina to the West Indies
and Gulf of Mexico

Family Lacunidae

Shell thin, few whorled; inner lip
oblique; umbilicus forming a groove.

GENUS LACUNA Turton 1827
(CHINK SHELLS)

LACUNA VINCTA Montagu. Superior Chink.
Shell small, whorls five; four to five
bands; suture well impressed; outer lip
thin; operculum horny. Length 6-12 mm.

Often found among roots of Lami-
naria and other marine plants, also on
rocks and shells thrown on the beaches by
storms. It lives in 1-120 fathoms.

Pl. 31, Fig. 15

Pl. 71, Fig. 19

Labrador to New Jersey.

LACUNA VINCTA FUSCA Gould. Dark Chink.
Shell shorter, darker, stronger and more
uniform in color than the typical; some-
times with one to two bands or dark areas;
the revolving ridges more prominent.

It is often yellowish or purple in
color.

Maine to Connecticut



Fig. 42
Lacuna pallida
neritoidea,
5 mm.

LACUNA PALLIDULA NERITOI-
DEA Gould. Pale Chink.
Whorls 3.5, the last very
large; epidermis rough,
greenish yellow; outer lip
sharp, the inner like a
rounded white rib, twisted
behind; umbilicus deep.
Length 5 mm.

Found on seaweed floated ashore,
near Swampscott, Massachusetts and else-
where. Fig. 42.

Greenland to Connecticut.

Family Turritellidae

Spire of shell very long, many
whorled; lip not thickened; operculum spi-
ral.

GENUS TURRITELLA Lamarck 1799
(TURRIT SHELLS)

SECTION HAUSTATOR

TURRITELLA VARIËGATA Linné. Variegated
Turrit. Shell solid, apex acute, color
white or purplish brown, often with reddish
striations; whorls fifteen to sixteen,
spirally lined; suture deep, subchannelled,
aperture quadrangular, lip simple. Length
80-90 mm.

Pl. 37, Fig. 14

Texas and West Indies

SECTION TORCULA Gray 1847

TURRITELLA EXOLETA Linné. Plain Turrit.
Shell white or yellowish white, flamed with
brown; whorls sixteen to seventeen, a por-
tion concavely excavated; suture well
marked; lower rib upon body whorl double;
lip simple. Length 50-60 mm. Depth range
45-170 fathoms.

Pl. 28, Fig. 3

Florida Keys; Gulf of Mexico; West
Indies

TURRITELLA SUBANNULATA ACROPORA Dall. Length
1 inch. Depth range 3-413 fathoms. It
has been taken, rarely, on the Sanibel
beach.

Pl. 28, Fig. 8

North Carolina to Gulf of Mexico;
West Indies

GENUS TURRITELLOPSIS G. O. Sars 1878

TURRITELLOPSIS ACICULA Stimpson. Shell
small, white, thin; longitudinally striate
and surrounded by transverse ribs, three of
these being the strongest; aperture round-
ed, lip acute. Length 6 mm. Depth range
1-50 fathoms.

Pl. 33, Fig. 5

Labrador to Massachusetts Bay

GENUS TACHYRHYNCHUS Morch 1868

TACHYRHYNCHUS EROSA Couthouy. Shell pale
brown; ten whorls, grooved with three to
five blunt furrows; apical whorls often
eroded or broken off; aperture almost cir-
cular. Length 25 mm. The animal is shown

on Pl. 68.

Young specimens may be separated from *T. acicula* by the less convex whorls and weaker ribs. Depth range 7-60 fathoms.

Pl. 33, Fig. 21

Labrador to Massachusetts Bay

Family Vermetidae (Worm Shells)

Shell often spiral when young, attached or free, irregular in adult; aperture round; operculum corneous.

These animals live in sponges, mud, upon shells or coral and are very variable in growth, sculpture, size and color.



Fig. 43

Vermetus nigricans

GENUS VERMETUS "Adanson" Daudin 1800

VERMETUS NIGRICANS Dall. Shell brownish violet, irregularly convoluted.

According to Johnson this is the species forming reefs of the so-called "worm rock."

Fig. 43

West coast of Florida to Florida Keys

GENUS SERPULORBIS Sassi 1827

SERPULORBIS DECUSSATUS Gmelin. Shell rather solid; solitary; whorls rounded, longitudinally sculptured; decussated by incremental lines, color yellowish white, streaked with brown. Depth range 10-22 fathoms.

Pl. 46, Fig. 4

North Carolina to Florida; West Indies

GENUS VERMICULARIA Lamarck 1799

A thin membranous portion, surrounding the operculum, permits the animal

to close its shell at the aperture and withdraw far inside for safety.

VERMICULARIA SPIRATA Philippi. Shell chestnut brown or lighter in color; longitudinally carinated and striated. Length 6-9 inches.

This well-known shell is sometimes a violet-brown. Depth range 0-175 fathoms. The writer found it abundant in shallow water, with muddy bottom, in Cortez Bay, near Sarasota, Florida.

Pl. 70, Fig. 4

Vineyard Sound, Massachusetts to West Indies and Texas

Family Caecidae

Minute shells which develop through three growth stages. In the first the young shell is spiral, this portion being discarded after the formation of the second stage. The second, or adolescent stage, comprises a curved tube which, in turn, is subsequently lost. In the

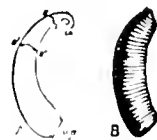


Fig. 44

Development of
Caecum

adult stage the tube is of a similar curved shape and again closed by a septum or plug. Protruding from the latter there is sometimes a mucro, or horn, formed by the apex of the cone. Development of shell is shown in Fig. 44.

Certain of the species are beautifully sculptured. On account of their small size they are frequently overlooked by collectors. A Frenchman, De Folin, specialized on these years ago and many of the species were described by him.

They often live in large numbers under stones or inside sponges. Once a colony is discovered many individuals may easily be obtained. Fresh dead specimens, belonging to several species, are often taken in "drift" on the beaches.

GENUS CAECUM Fleming 1817

CAECUM PULCHELLUM Stimpson. Adult shell with about twenty-five rounded ribs and somewhat equal spaces between them; plug rounded; operculum concave and with eight whorls; young specimens with few well separated ribs. Length 2.5 mm. Depth 1-52 fathoms.

Pl. 69, Fig. 22

New Hampshire to the Florida Keys



Fig. 45
Caecum
coronel-
lum,
4 mm.

CAECUM CORONELLUM Dall. Shell thin, not much tapered; twenty-four equal, only slightly raised, threads; interspaces wider than threads; the tube near adult aperture suddenly enlarging in size; plug hemispherical; mucro small; surface glistening when perfect; young shell with much flattened plug. Length 3.75-5.5 mm. Fig. 45. Off North Carolina (14-18 fathoms); Egmont Key, Florida

CAECUM CAROLINIANUM Dall. When living covered with a thin yellow epidermis; white or translucent underneath or streaked with white; shell stout, thick arched; lines very faint; aperture simple; posterior end simple; plug conical, mucro formed by apex of cone. Length 4.75 mm.

Pl. 54, Fig. 10
Off North Carolina (15 fathoms);
Egmont Key, Florida

CAECUM COOPERI S. Smith. About twenty-four rounded longitudinal ribs crossed by numerous rings, the latter not so distinct at extremities of tube where ribs become obsolete. Plug mucronate with apex inclining to left; lateral profile concave; operculum concave. Length 3.5 mm.

The color is white, shell not very thin, moderately curved.

Pl. 66, Fig. 8
Vineyard Sound, Massachusetts to
Florida

CAECUM FLORIDANUM Stimpson. In the adult stage it is recognizable by its comparative-

ly large size and numerous annulations (those nearest the aperture being most distant and strongest); fine longitudinal striae, particularly between the rings. The plug has a slender mucro, set to the right and projecting from an almost flat surface. Length 2 mm.

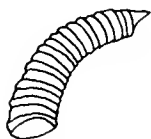


Fig. 46
Caecum flori-
danum, 2 mm.

This species lives in shallow water and usually is the most plentiful Caecum in "drift" on the Florida beaches. Depth range 0-18 fathoms. Fig. 46

North Carolina to Florida

GENUS MEIOCERAS Carpenter 1858

MEIOCERAS NITIDUM Stimpson. Shell minute, shining, whitish or pale brown; swollen in center, contracted near aperture; plug convexly rounded; aperture concave. Length 2.5 mm.

Pl. 54, Fig. 9
Tampa, Florida to West Indies; Palm
Beach, Florida; Newport, Rhode
Island

Family Trichotropidae

GENUS TRICHOTROPIS Broderip and
Sowerby 1829

Shell thin, keeled, umbilicated; epidermis horny, extending like hairs at angles of shell; operculum horny.

TRICHOTROPIS BOREALIS COSTELLATUS Couthouy. Whorls four, suture deeply channelled; several rounded ribs or keels; umbilicated. Length about 18 mm. Epidermis shown in Fig. 2.

Damaged specimens are often taken in the stomachs of fish. Depth 7-60 fathoms. Pl. 55, Fig. 15
Labrador to Massachusetts Bay

Family Planaxidae

Shell imperforate, spirally sulcate; epidermis thick; spire sharp; oval aperture notched below; border of columella with a ridge of tubercle above; operculum oval, paucispiral, nucleus almost terminal.

GENUS PLANAXIS Lamarck 1822 (FLAT AXIS)

PLANAXIS LINEATUS Da Costa. Shell small, solid, whorls a little convex; sculptured with well-separated spiral grooves, most conspicuous upon the upper portion of spire and at base; outer lip heavy and slightly deflected above; notch below rounded; color yellowish or whitish with revolving brown or whitish bands, sometimes entirely yellow. Length 7 mm.

This little shell is beautifully variable in color ornamentation. The ground color ranges from white to almost black and the lines are often absent from the final whorl.

Inside the Inlet at Palm Beach it lives under stones, between tides, especially in May or June. Often hundreds of individuals are gathered together under one small stone.

Pl. 37, Fig. 8

Southern Florida and West Indies

PLANAXIS NUCLEUS Lamarck. Much larger than the preceding; color dark reddish brown or light chocolate, sometimes almost black both inside and out; cut with widely spaced grooves; notch at base well defined and deep. Length 12 mm.

Found at the same station as *P. lineatus* but deep under piles of rock and well above the low-tide mark.

Pl. 37, Fig. 7

Southern Florida and West Indies

Family Modulidae

Shell umbilicate, solid, sculptured; aperture rounded; columella with a sharp tooth at base.

GENUS *MODULUS* Gray 1842 and 1847

MODULUS MODULUS Linné. Spire low, periphery sharply keeled; last whorl descending at aperture; strong ribs and less prominent ridges upon surface; deep grooves between five to eight ridges at base; inside of lips with distinct ridges. Color white, spotted with brown; at the base the color pattern extending over the ribs. Diameter 15 mm.

The animal has long cylindrical tentacles with eyes placed at about one-half their length.

This species lives upon weeds in shallow protected water and may easily be observed with a water glass. It is very abundant in lower Biscayne Bay, Florida.

Pl. 37, Fig. 21

North Carolina to West Indies

MODULUS MODULUS FLORIDANUS Conrad. Instead of the whorls being nearly flat as in the preceding this variety has them somewhat convex and radiately ribbed.

North Carolina to Gulf Coast of Florida

MODULUS ANGULATUS C. B. Adams (*M. catenulatus* Philippi). Shell solid with a high, sharp-pointed spire; whorls flat or a lit-

tle concave; base swollen, somewhat dug out adjacent to the umbilicus; fine encircling cords upon surface which cross the lines of growth and form little knobs. Color gray or brown, with touches of white on the ribs; base lighter. Length 15 mm.

This species also lives at Panama and northward in Central America.

Pl. 38, Fig. 18

Florida Keys and the West Indies

Family Triphoridae

Shell minute, elongated, sinistral (left handed), many whorled; aperture small, canal short.

In addition to the sinistral form these shells are remarkable for their retention of the larval characters when almost fully adult. The nucleus should be carefully studied.

GENUS *TRIPHORA* Deshayes 1824

TRIPHORA DECORATA C. B. Adams. Shell white with large brown spots; three equal rows of beads and deep channels between; whorls sixteen, suture deeply grooved. Length 14 mm.

Key West, Florida and Gulf of Mexico

TRIPHORA PERVERSA NIGROCINCTA C. B. Adams. Shell dark brown, whorls thirteen to fifteen; suture excavated; four rows of tubercles upon body whorl, two to three ridges below them; dark brown basal canal. Length 10 mm. Depth range 1-30 fathoms.

Pl. 38, Fig. 3

Massachusetts to Florida

TRIPHORA MELANURA C. B. Adams. Shell slender, whorls about fourteen, with three revolving rows of nodules arranged in slightly oblique rows; groove at suture the deepest; aperture small; canal short, inclining a little to the right. Color white except the dark brown apex. Length 5 mm.

Pl. 38, Fig. 4

North Carolina to the West Indies

TRIPHORA TURRIS-THOMAE Dillwyn. Shell with about sixteen whorls, slowly increasing; suture indistinct; two revolving rows of nodules, upper row whitish, the lower brown; the two rows covering entire surface of whorls and divided from each other by a

groove; final whorl smaller than the previous one; aperture very small; two canals which are open only at ends. Length 6 mm.

Pl. 38, Fig. 5

Pl. 65, Fig. 6

North Carolina to the West Indies

Family Cerithiopsidae

Shell small, cylindrical, narrow, not varicose; whorls numerous; aperture small, canal almost straight. Mostly living in temperate seas.

GENUS CERITHIOPSIS Forbes and Hanley 1829

CERITHIOPSIS GREENII Adams. Shell small, reddish black; whorls ten to twelve; last whorl with twenty to twenty-five folds or ridges; canal slightly turned, short and deep. Length 5 mm.

It lives upon marine plants, shortly below low-tide mark. Compared to the similar *Bittium alternatum* the shell bulges more, the whorls extend out and the canal is more impressed. It is also a smaller shell but the color is very similar.

Pl. 38, Fig. 6

Pl. 71, Fig. 2

Massachusetts Bay to the West Indies

CERITHIOPSIS VIRGINICA Henderson and Bartsch. Shell minute, brown except for yellowish apex; sixteen to eighteen strong axial ribs and three strong spiral cords on each whorl, forming tubercles where ribs and cords join; rectangular pits between ribs and cords on all except last whorl where they are rounded; periphery of last whorl keeled; two spiral cords on base, outer lip thin. Length 2.9 mm., diameter 1 mm.

It was dredged in Virginia on eel-grass.

Pl. 38, Fig. 23

Bay at Chincoteague, Virginia; Maryland

SECTION METAXIA Monterosato 1884

CERITHIOPSIS METAXAE Della Chiaje. Whorls narrow, convex; nodules placed so that longitudinal ribs are visible; three spiral series of nodules on the upper and four on lower whorls; last whorl keeled at periphery, base smooth; lip cut out at base. Color varying from light brown to red. Length 8 mm. Range 2-220 fathoms.

This little shell also lives in the Pacific and upon European shores.

Pl. 38, Fig. 1

North Carolina to the West Indies

SUBGENUS LASKEYA Iredale 1918

CERITHIOPSIS SUBULATA Montagu (*C. emersonii* C. B. Adams). Light or brown, usually darker at suture; whorls flat and divided into three rows of granules by spiral sculpture, the middle row less prominent; suture deeply grooved; base smooth with cord-like ridges. Length 12 mm. Depth 2-15 fathoms.

Pl. 38, Fig. 2

Pl. 71, Fig. 1

Massachusetts to the West Indies

GENUS SEILA A. Adams 1861

SEILA ADAMSII H. C. Lea (*C. terebralis* C. B. A.). Ten flat whorls with sharp elevated ridges; base short, smooth, bounded by a ridge; color chocolate brown or yellowish. Length 10 mm.

This shell was taken by the author under sponges at Lignum Vitae Key, Florida, in shallow water. Dead examples may be found almost everywhere among minute shells.

Pl. 38, Fig. 22

Pl. 71, Fig. 5

Massachusetts to Florida

Family Cerithiidae

Shell elongated, many whorled, often varicose; aperture channelled in front with an inconspicuous posterior canal; operculum horny and spiral.

GENUS CERITHIUM Bruguiere 1789
(HERALD'S HORN)

Shell turreted, varices not pronounced; aperture small.

CERITHIUM ALGICOLA C. B. Adams. Centers of whorls angulated; longitudinal ribs with more or less sharp knobs where they cross the angle; fine revolving raised threads covering surface; aperture rounded; columella concave; color white variegated with yellow. Length 20 mm.

Pl. 38, Fig. 10

Southern Florida and West Indies

- - - - -

CERITHIUM EBURNEUM Bruguiere. Shell tuberculated or granose; one row of tubercles larger and making an angle on center of upper whorls; often pure white and with few varices. Length 25 mm.

Pl. 38, Fig. 13

Southern Florida to West Indies

CERITHIUM FLORIDANUM Morch. Shell usually larger and broader than *C. atratum*, three to four strongly incised lines between principal pair of nodules, aperture often more shouldered; outer lip thick and marked by the terminations of the ribs which also are indicated inside the aperture. Length 30-35 mm.

Pl. 38, Fig. 7

North Carolina to West Florida

CERITHIUM ATRATUM Born. Shell with two rows of nodules, one of small nodules at suture and another of larger ones below and upon body whorl; four rows of indistinct granules and also close lines; gray with dark brown shades or entire covering of chocolate brown; aperture blue or violet when shell is dark. Length 25 mm.

Pl. 38, Fig. 15

Southern Florida and West Indies

CERITHIUM LITERATUM Born. White, with granular interstices spotted with brown; shouldered by a row of tubercles just below the suture, another just above base of body whorl; a wide low varix on body whorl almost opposite the lip; outer lip thickened, extending above upon previous whorl; canal short. Color white, spotted with black, color pattern of exterior showing through inside. Length 20 mm.

Pl. 38, Fig. 11

Southern Florida and West Indies

CERITHIUM VARIABILE C. E. Adams. Shell small, solid; whorls indistinctly rounded, three rows of tubercles and seven to eight on final whorl; varices scattered and always one opposite outer lip; small aperture. Color dark, sometimes variegated with white. Length 12 mm.

Pl. 38, Fig. 8

South Carolina to Florida Keys;
Gulf of Mexico; West Indies

CERITHIUM MINIMUM Gmelin. Jet black or ashy, often with a white sutural band or white with a black band; low longitudinal

ribs and indistinct revolving ridges which cut the ribs into nodules; between the revolving ridges also faint threads; aperture fairly large with canal below turned well to the left. Length 15 mm.

An excessively variable shell sometimes confused with *C. variabile*. It is not so solid as the latter and more glossy, the aperture usually larger and canal more decidedly turned to the left. Some specimens, however, are difficult to identify. Length 13 mm.

Pl. 38, Fig. 21

Tampa to Florida Keys; West Indies

CERITHIUM MINIMUM SEPTEMSTRIATUM Say. The name applied to specimens with a white sutural band.

Tampa to Florida Keys; West Indies

CERITHIUM MINIMUM NIGRESCENS Menke. Uniformly dark colored specimens.

Tampa to Florida Keys; West Indies

CERITHIUM MUSCARUM Say. Convex whorls crossed by rounded ribs; white or brown with minute chestnut punctations. Length 20 mm.

Pl. 38, Fig. 12

Southern Florida to West Indies

CERITHIUM LUTOSUM C. B. Adams. Whorls seven, suture moderately impressed, about seven rows of encircling nodules upon color zones which alternate from brown to yellowish and with finely incised lines between, all on the final whorl; only four rows of nodules on earlier whorls; interior whitish but showing external color pattern. Length 9 mm.

Pl. 38, Fig. 24

Palm Beach, Florida; West Indies

GENUS *CERITHIDEA* Swainson 1840

Aperture channelled in front; operculum corneous.

CERITHIDEA AGUAYOI Clench (*C. varicosa* Sowerby). Each whorl marked with a varix; these previous lips irregularly placed; whorls ten, about twenty-one vertical ribs on each whorl; surface dark brown with lighter colored varices and band at periphery. Length 22 mm.

Pl. 38, Fig. 17

Texas and Cuba

CERITHIDEA COSTATA Da Costa. Shell narrowly elongated, many rounded longitudinal ribs, beaded more or less by spiral riblets; suture well marked; color dark brown and often white banded. Length 15 mm.

Pl. 38, Fig. 9

Tampa Bay to Florida Keys

CERITHIDEA IOSTOMA Pfeiffer. Strongly ribbed and varicose, spirally striate, chocolate brown with narrow white central band. Length 22 mm.

A narrower shell than *C. scalariformis*.

South Carolina to Texas; West Indies

CERITHIDEA SCALARIFORMIS Say. Color varying from whitish through light fawn to chocolate, with contrasting dark or light lines; suture well impressed and marked by a narrow thread; riblets closely placed, spiral riblets less distinct. Upon the base of the last whorl there are exclusively spiral riblets. Length 1 inch. It is a rather common shell on the Florida Keys, living near high-tide mark.

Pl. 43, Fig. 7

Georgia to Florida and Texas

CERITHIDEA TURRITA Stearns. A rather thin little shell, varying from white to chocolate color with a feeble central line; ribs numerous upon the convex whorls; suture deeply grooved. Length 10 mm.

Pl. 38, Fig. 16

West coast of Florida to Texas

GENUS BITTIUM Leach 1847

Shell elevated and with granular whorls; inner lip simple; outer lip not reflected. Small shells living mostly in temperate seas.

BITTIUM ALTERNATUM Say (*Bittium nigrum* Totten). Shell small, covered with a network of raised lines; color gray or slate; upon upper whorls, lower ones usually much lighter; whorls six to eight; aperture oblique, rounded and flaring, canal a mere notch; operculum horny with four to five spiral turns. Length 5-10 mm.

Common on eelgrass at Nantucket and New Bedford, elsewhere on seaweed and stones. The young are sometimes so plentiful that the sand is not visible between them. These are very dark in color and ap-

parently reach maturity the second season.

Pl. 38, Fig. 14

Pl. 71, Fig. 34

Prince Edward Island; Massachusetts Bay to North Carolina

SECTION DIOSTOMA Deshayes 1850

BITTIUM VARIUM Pfeiffer. Thin, diaphanous, grayish brown; plications lacking upon lower portion of body whorl, that portion somewhat varicose. Length 5 mm.

It has been taken abundantly in the Metacumbe region of the Florida Keys; also at Palm Beach, Florida.

Pl. 38, Fig. 27

Virginia to Florida, Texas; West Indies

SECTION STYLIFERINA A. Adams 1860

BITTIUM ADAMSI Dall. Opaque white with a brown tint on early whorls; nine rounded whorls; nucleus acute and sculpture reticulate; varices few, base imperforate, no trace of notch anteriorly. Length 3 mm.

North Carolina to Florida and West Indies

SECTION ALABINA Dall 1902; Elachista Dall 1901

BITTIUM CERITHIDIODES Dall. Smaller than the preceding and more elegant; nucleus of three whorls and seven more following; translucent with delicate brown painting; nucleus pale and glassy; at least thirty fine regular concavely arched riblets arranged transversely.

Dall states in his description that it suggests a minute *Cerithidea* with an imperfect lip and a faint varix. Length 3 mm.

Pl. 38, Fig. 25

North Carolina to the West Indies

Family Aporrhaidae

GENUS APORRHAIIS Dillwyn 1823 (PELICAN'S FOOT)

Spire long; aperture long and narrow, ending in a straight canal in front and a channel extending up the spire; outer lip dilated and heavily thickened.

APORRHAIIS OCCIDENTALIS Beck. Western Pelican's Foot. Easily recognized by the

remarkably expanded lip. The sutures are well impressed, whorls numerous, ribs frequent.

In perfect specimens the fine raised spiral lines are perfectly distinct but often less so upon the spire.

The typical form lives in the deeper waters of the Gulf of Maine and Gulf of St. Lawrence. It varies in size from 50-70 mm. and has been dredged in from 20-88 fathoms.

Pl. 39, Fig. 8
Northeast coast

APORRHAIIS OCCIDENTALIS LABRADORENSIS Johnson. Labrador Pelican's Foot. Much smaller than the typical form, spire more slender, lines more numerous and lip less expanded. Length of holotype 52 mm., taken by Owen Bryant in 7 fathoms.

Pl. 41, Fig. 4
Egg Harbor, Labrador

APORRHAIIS OCCIDENTALIS MAINENSIS Johnson. Maine Pelican's Foot. Separated on account of its more slender spire and fewer longitudinal costae, about eighteen on body whorl and fourteen on the previous whorl.

The original lot described was dredged by Dr. C. W. Townsend off Northeast Harbor, Maine, in 5-6 fathoms. Growth stages are shown in Pl. 39, Fig. 6 and represent specimens secured by William Procter of Bar Harbor.

Pl. 39, Figs. 5, 6
Maine; Nova Scotia

Family Strombidae

Shell with an expanded lip, deeply notched near the canal. Operculum, in the typical forms, claw-shaped, serrated on the outer edge, strengthened by a mid-rib.

Animal with large, well-developed eyes, placed on thick pedicels, tentacles small, rising from the middle of eye-pedicels; foot narrow, not adapted to creeping. Radula teeth single, three uncinat on each side.

Shells cut to show the interior sections exhibit remarkable elevated and complex plaits at the posterior end of aperture, especially in young examples with a narrow aperture. These are caused by a posterior expansion of the animal's mantle.

Strombus is a very active and predatory animal. It progresses by a series of

jumps, turning the shell from side to side. When placed upon its back it can right itself by a somersault. It is usually plentiful in shallow water and the habitat range of the individual species is quite extensive.

GENUS *STROMBUS* Linné 1758 (*STROMBS*)

STROMBUS BITUBERCULATUS Lamarck. Double-knobbed Stromb. Two large tubercles, upon the back of the shell, distinguish this species; shell gray, banded with chestnut, aperture yellowish-white and rose color; both edges of operculum entire and smooth. Length 3 inches.

Often this species is associated with *S. pugilis*, living in shallow inland waters connected with the sea but not far from it.

Pl. 39, Fig. 1
Jupiter Inlet, Florida to West Indies

STROMBUS COSTATUS Gmelin. Ribbed Stromb. A large white or yellowish, short, thick shell with a single large tubercle upon the back of the final whorl and a smaller one between it and the margin; aperture whitish, lip and columella touched with orange-brown. Length 4.5 inches.

Pl. 59, Figs. 1, 2
Florida and West Indies

STROMBUS GIGAS Linné. Giant Stromb. Shell strong, spire small, spines large and long; epidermis yellowish brown, shell buff underneath; interior polished rose color. Length 8-12 inches.

The fountain shell is one of the largest living gastropods, often weighing five pounds. The earlier whorls, including apex and spines, are, in old individuals, filled with solid material. From the Bahamas great numbers of this species are exported to Great Britain for manufacture into cameos and porcelain.

In the Florida Indian shell mounds various implements, including chisels, made from this shell have been found.

It may be sought for in about ten feet of water with a bottom of sand.

Pl. 39, Fig. 2
Lake Worth, Florida to West Indies

STROMBUS PUGILIS Linné. Fighting Stromb. Shell deep orange-brown or purple with a

thin epidermis; body whorl sharply spinose; lower portion of body whorl spirally striate; anterior extremity truncated. Length 4 inches.

A very abundant and well-known shell. It is especially characterized by the liration of the outer lip. The zigzag pattern is more frequent in northern specimens. West Indian examples usually are of a uniform color. A freak specimen is shown on Pl. 58, Fig. 3

Pl. 39, Fig. 7

Florida to Texas; West Indies

STROMBUS PUGILIS ALATUS Gmelin. Winged Stromb. This, the spineless form, appears to be more common in Florida and the Antilles.

The example figured is from the Pliocene fossil beds at Loxahatchee, Florida.

Pl. 39, Fig. 4

North Carolina to Florida; Gulf of Mexico

STROMBUS GALLUS Linné. Cock Stromb. Notable for the remarkable extension of the aperture which is clearly shown in the illustration. The species is included for comparison with the Florida species.

Pl. 59, Fig. 5

West Indies

Family Ovulidae

Shell brightly colored, usually long and narrow, conforming in hue and shape to the foreign object to which it is attached. All the American species live upon Gorgonias or sea fans.

GENUS CYPHOMA Roeding 1798

CYPHOMA GIBBOSA Linné. Spire of shell entirely concealed under a heavy callus, solid, narrower above; aperture full length of shell, contracted above, wider below; outer lip thick, smooth inside and out, arched above where there is a slight canal; dorsal ridge slightly above center and extending squarely across it; suggestion of canal at base; color whitish, the extremities and sides of shell buff or cream color. Length 1 inch.

Living examples have been taken in Lake Worth, Florida and also in Biscayne Bay.

Pl. 40, Fig. 1

North Carolina to West Indies

GENUS SIMNIA "Leach" Risso 1826

SIMNIA ACICULARIS Lamarck. Shell varying from yellow to purple, thin, smooth, narrow, ends rather blunt; lip evenly margined; callous margin on columella. Length 15 mm.

This and the following Simnia match in color the sea fans to which they may be attached.

Pl. 40, Fig. 2

Off Cape Fear, North Carolina to West Indies

SIMNIA UNIPLICATA Sowerby. Shell yellowish white to purplish in color, rather thin; polished; transversely and minutely incised with lines; narrow, with ends bluntly produced; lip narrowly margined; posterior pli-cations prominent. Length 15-18 mm.

Pl. 40, Fig. 3

North Carolina to West Indies

Family Cypraeidae

Shell varying from cylindrical to pyriform, inflated, ribbed, or pustulate but generally smooth and covered with brilliant enamel; aperture elongated, narrow, more or less toothed; short canal at each end.

The young Cypraea is quite different from the adult. It begins in a Bulla-like form, thin and with an unfinished lip; in the adolescent stage there is some thickening of the shell but the teeth are indistinctly formed. Upon reaching maturity the final color pattern is applied. The mantle of the animal almost completely covers the shell when active, and deposits the calcareous substance which distinguishes the various species. When the two unequal lobes of the mantle meet upon the back of the shell they form the "dorsal line," an area quite noticeable upon many Cypraea.

The animal is shy and often feeds upon coral animals. It has the power to dissolve the interior partitions of the shell when more space is desired.

The Cypraeas, or cowries as they are commonly called, are favorites with shell collectors. In India they are used for various trappings upon elephants and horses. Cypraea moneta, the money cowry, has been used for centuries as a medium of

exchange, chiefly in countries near the Niger. Marco Polo observed them in use in Yunnan in the thirteenth century while in the Baltic region they have been found in prehistoric graves.

GENUS CYPRAEA Linné 1758

Surface brilliantly polished; spire concealed by last whorl, or abbreviated and covered with enamel.

CYPRAEA CINEREA Gmelin. Shell brown, sometimes ornamented with jet black dashes; sides purplish-flesh colored; base cream white or like sides; interstices of teeth purplish. Length 1-1.75 inches.

This species has been collected alive under stones on the Tortugas.

Pl. 40, Fig. 4

Florida; West Indies

CYPRAEA EXANTHEMA Linné. A rather inflated pale chocolate-colored species with large round whitish spots and often with rings; teeth very dark brown; dorsal line whitish and straight. Length 3-4 inches.

Pl. 40, Fig. 5

North Carolina to Florida Keys;
Gulf of Mexico; West Indies

CYPRAEA EXANTHEMA CERVUS Linné. Shell brown with small white spots, base usually dark brown.

Shell more inflated, not so long, spots not ringed as in the typical *C. exantema*, also usually smaller.

Pl. 40, Fig. 19

North Carolina to Florida Keys;
Gulf of Mexico; West Indies

CYPRAEA SPURCA Linné. Shell spotted with yellow-brown upon a whitish ground; base buff or white; aperture slightly curved; teeth strong, short; sides pitted and mottled with yellow, often with brown spots on pits and sides. Length 30 mm.

Fresh dead specimens are frequently found upon the lower east coast of Florida, living under rocks at low tide in May.

Pl. 40, Fig. 6

Florida; Mediterranean; East Atlantic

GENUS TRIVIA Gray 1832

Shell generally small, subglobular;

ridged above with dorsal furrow; surface scarcely shining; aperture narrow and long; canal above and below very indistinct.

Animal quite different from *Cypraea*.

TRIVIA CANDIDULA Gaskoin. Globosely ovate; ribs strong, rather conspicuous. Length 9 mm.

Pl. 40, Fig. 12

Cape Hatteras, North Carolina to Barbados

TRIVIA NIVEA Gray. Globose, extremities very obtuse; ribs narrow, wrinkled. Length 12 mm.

Florida Keys to Barbados

TRIVIA PEDICULUS Linné. Marbled with purplish brown upon a flesh-white ground; dorsal furrow deep and straight, from which radiate coarse ridges over shell and into aperture; dark spot each end of furrow and another each side in centre. Length 15 mm.

The largest of our east coast *Trivias* and a rather common one.

Pl. 40, Fig. 7

St. Augustine, Florida to Barbados

TRIVIA QUADRIPUNCTATA Gray. Color purplish pink, often darker at ends, two darker spots each side of furrow, the four forming a zigzag row; ribs fine. Diameter 5 mm., length 8 mm.

Pl. 40, Fig. 9

Jupiter Inlet, east Florida to Barbados

TRIVIA SUBROSTRATA Gray. Globose, dark chocolate-brown color; extremities slightly beaked; dorsal line well marked. Length 7 mm.

Pl. 40, Fig. 13

Florida Straits to Barbados

TRIVIA GLOBOSA Gray. Shell white, rounded like a pea; aperture narrow; dorsal line well incised and extending to ends of shell. Length 11 mm. Depth range 23-640 fathoms.

Pl. 40, Fig. 8

Cedar Keys, west Florida to West Indies

TRIVIA SUFFUSA Gray. Shell pinkish, ends touched with dark pink; ribs five and not very distinct; variegated with brown, base of a lighter shade. Length 9 mm.

Pl. 40, Fig. 10

Cedar Keys, west Florida to West Indies

GENUS ERATO Risso 1826

Shell minute, lips minutely crenulated; animal similar to Trivia. This group is related to Marginella, being intermediate between that and Trivia so far as the shell characters are concerned.

ERATO MAUGERIAE Gray. Gray or flesh color, shining. Length 5-6 mm.

Taken alive by the writer upon twigs in shallow water at low-tide in Lake Worth, near Lower Inlet, Florida.

Pl. 40, Fig. 11
Florida; West Indies

Family Cassididae (Metal Helmet Shells)

Shell solid; spire short; whorls often varicose; aperture ending in short recurved canal; columella often plicate; outer edge of lip strengthened, toothed within; operculum corneous.

Animal active and voracious; food consisting mostly of bivalve mollusks, proboscis cylindrical; mantle and foot of generous size.

GENUS CASSIS Lamarck 1799

CASSIS MADAGASCARENSIS Lamarck. (C. cameo Stimp.). Surface spirally ridged but not honeycombed; interstices of teeth and ridges inside deep chocolate brown. Length 8-10 inches.

Observed, by the writer, living in shallow quiet water of Lake Worth, Florida, close to the inlets connecting with the Atlantic. Only a small portion of the shell was visible above the surface of the sand.

Pl. 1, Fig. 1
Beaufort, North Carolina to the West Indies

CASSIS INFLATA ABBREVIATA Lamarck. Spiral grooves placed equal distances apart; surface spotted with square zones of light chestnut upon a yellowish-white ground; columella granulate; outer lip toothed, often greatly thickened. Length 3-4 inches.

Pl. 41, Fig. 1
Cape Hatteras, North Carolina to Brazil

CASSIS TESTICULUS Linné. Longitudinally ridged, cut by spiral grooves, flesh color or darker; columella plicated entire length; strong teeth upon outer lip; margins shaded and cross banded with orange brown. Length 2-3 inches.

Pl. 41, Fig. 3
Cape Hatteras, North Carolina to Trinidad

CASSIS TUBEROSA Linné. Triangularly ovate in shape; three rows of tubercles or knobs; spotted with chestnut and chocolate color. Length 6-8 inches.

Pl. 41, Fig. 5
Beaufort, North Carolina to Barbados

CASSIS FLAMMEA Linné. Shell cream colored, clouded and crescent-marked with brown, these markings also on face which is stained with dark brown between ridges, interstices of teeth on outer lip also dark colored; three to four rows of separated blunt tubercles; spire longitudinally ridged, usually only below. Length 4-6 inches.

Pl. 41, Fig. 2
South Carolina; Lake Worth, Florida, to Florida Keys; West Indies

GENUS MORUM Roeding 1798

Shell solid, surface covered with rows of prominent warty nodules; outer lip thickened, toothed inside; canal short, callus of columella region extending over base and nodulous.

MORUM ONISCUS Linné. Shell with low spire, whorls often sharply shouldered; three rows of nodules on body whorl; color white, spotted with brown or gray; outer lip dotted, interior white, callus white or purple. Length 1 inch.

Pl. 53, Fig. 7
Palm Beach (beach specimens); Florida Keys; West Indies

Family Tonnidæ

Shell ventricose, spirally furrowed; spire small, aperture very large; no operculum in the adult.

Animal large, mantle dilated; foot with horizontal groove.

GENUS TONNA Brunnich 1772
Dolium Lamarck 1801 (TUN SHELLS)

Shell thin, globosely oval.

TONNA GALEA Linné. May be distinguished by the sunken sutures and somewhat twisted columella; whorls seven; spiral ribs close set; chocolate-brown markings within the aperture. Length 9 inches, usually less.

Pl. 41, Fig. 6

Cape Hatteras, North Carolina to Texas; West Indies

TONNA PERDIX Linné. Shell inflated; about twenty low revolving grooves which are rather widely spaced, sometimes crossed by the growth lines; outer lip hardly thickened; umbilicus behind the reflexed, curved columella; color brownish or purple, occasionally marked with white spots. Length 4-9 inches.

Pl. 41, Fig. 7

Florida Keys to Brazil; Pacific; west Africa

GENUS FICUS Roeding 1798, Pyrula Lamarck 1799 (FIG SHELLS)

Shell fig or pear shaped, spirally ribbed or decussated; canal open and long; spire short; lip thin; no operculum.

Animal with very large foot; mantle covering sides of shell; siphon very long and narrow.

FICUS PAPYRATIA Say. Shell brownish white, interior somewhat darker; about thirty spiral ribs with less distinct ones between; growth lines irregular; spire sunken. Length 3.5 inches.

On Sanibel Island, west Florida, thousands of this species are washed upon the ocean beach after winter storms.

Pl. 41, Fig. 8

Cape Hatteras, North Carolina to Gulf of Mexico

Family Cymatiidae

Shell with disconnected varices, representing rest periods, not more than two of these to each whorl against three in Murex; canal prominent; teeth upon lips. These shells are closely related to Murex but also show affinity to Cassis and Tonna.

C. tritonis, the largest species,

is used as a horn by the Australian and Polynesian islanders. In the West Indies and the Mediterranean live forms very similar to it.

GENUS CYMATIUM Roeding 1798,
Triton of authors

CYMATIUM FEMORALE Linné. Epidermis yellow brown, the strongest ribs white where crossed by the varices, interior white, violet or rose color. Length 3-7.5 inches.

Pl. 42, Fig. 3

Southern Florida and West Indies

CYMATIUM AQUITILE Reeve (T. pileare L.). Shell light brown with contrasting white or dark revolving bands; whorls rounded, often with nodules on periphery, fine and coarser ridges crossed by faint ribs; canal often reflexed; interior and outer lip orange or red, teeth whitish, upper portion inner lip often almost black; epidermis hirsute, thin and light green. Length 2-6 inches.

Pl. 42, Fig. 4

Florida Keys; West Indies; Pacific

CYMATIUM CHLOROSTOMA Lamarck. Color dirty white, varying to reddish ash, faint red or brown spots and revolving cut colored lines, interior reddish. Length 1-3 inches.

Sculpture similar to C. aquitile but with stronger ribs, often humped on body whorl, varices strong, outer lip extremely heavy and with a double row of teeth within aperture.

Pl. 42, Fig. 5

Jupiter Inlet, East Florida to West Indies; Pacific

SECTION TRITONOCAUDA Dall 1904

CYMATIUM CYNOCEPHALUM Lamarck. Light yellow with darker indistinct bands; interior pale yellow; columella with brown spot. Length 2-3 inches.

Pl. 42, Fig. 9

Florida Keys; Texas; West Indies

SECTION GUTTURIUM Morch 1852

CYMATIUM TUBEROSUM Lamarck. Shell short; canal recurved; sculptured with irregular ribs which are nodulous; the interstices of the ribs lirate; often a strong hump on the body whorl and one or two smaller ones; outer lip varicose with teeth inside. Color

white, marked with brown, often banded. Interior dark, aperture white, Length 2 inches.

Pl. 42, Fig. 7

Florida Keys and West Indies

SECTION LINATELLA

In form and sculpture the species placed under this section approach the Tonidae.

CYMATIUM CINGULATUM PENINSULUM Maxwell Smith. Surface and interior whitish; numerous revolving ribs, yellowish brown in color, the ribs alternating in size, wide and narrow; sutures well marked; terminations of deepest grooves between ribs marked with orange brown on outer lip; canal short and oblique, whorls 4.5; epidermis rather heavy; operculum small. Length 2.75 inches.

One living example has been collected in Lake Worth and a number of fresh dead specimens. It may eventually be found as far north as Cape Hatteras. The typical shell occurs in the West Indies and Central America. On Pl. 44 a specimen of the variety is shown with the epidermis and operculum.

Pl. 1, Fig 2

Pl. 44, Fig. 5

Lake Worth, Florida

SUBGENUS MONOPLEX Perry 1811

CYMATIUM COSTATUM Born (T. olearium of authors). Shell light brown, varices and lip marked with brown; ribs often in pairs, sometimes broken by granules; epidermis thin and partly hair-like, shown in Fig. 47.

Pl. 42, Figs. 1, 2

Cape Hatteras, North Carolina to West Indies

GENUS CHARONIA Gistel 1848 (Septa Perry 1811)

CHARONIA TRITONIS NOBILIS Conrad. A fine large shell, brilliantly painted with red

and brown. This variety is heavier, shorter and more shouldered than the typical which lives in the Indo-Pacific region. Length 16 inches.

Pl. 1, Fig. 3

Palm Beach County, Florida to West Indies

GENUS DISTORSIO Roeding 1798 (WRITHING SHELLS)

Aperture contracted and toothed, narrow; columella reflected upon last whorl.

DISTORSIO CLATHRATA Lamarck (*D. reticulata* Link). Shell whitish under a velvety yellowish-brown epidermis; canal long; surface divided into squares by the strong ribs; columella plait and lip varying from light to dark salmon color. Length 1.25 inches.

An off-shore shell which has been taken living at certain times of the year in Lake Worth, Florida, also upon the beaches. Depth range 22-124 fathoms.

Pl. 42, Fig. 8

Lake Worth, Florida to West Indies

GENUS GYRINEUM Link 1807; Ranella, Lamarck in Part (FROG SHELLS)

Shell nodulous, two rows of varices opposite each other; outer lip toothed, inner one wrinkled; canal at base short, usually reflexed; operculum horny.

GYRINEUM AFFINE CUBANIANUM Orbigny. Shell yellow or flesh-colored, often rose tinted near apex; surface spotted with brown or red. The angles and tubercles vary in different individuals. Length 1.75-2.5 inches. It has been collected on the Dry Tortugas.

Pl. 43, Fig. 8

North Carolina to West Indies

GYRINEUM CRUENTATUM Reeve (*Ranella thomae* Orbigny?). Shell short, yellowish or brownish white, often spotted with red; revolving ridges with tubercles, those on the periphery the strongest; posterior canal small, anterior canal reflexed; aperture white or purple, often with reddish spots on inside wall. Length 1 inch.

A fresh beach specimen was taken at Boynton, Florida, apparently the first record for the United States.

Pl. 42, Fig. 6

Boynton, Florida to West Indies



Fig. 47

Cymatium costatum, showing hairy epidermis

ORDER STENOGLOSSA

Family Muricidae

Shell provided with a straight posterior canal; aperture entire; animal with a broad foot.

GENUS MUREX Linné 1758 (ROCK SHELLS)

Ornamented with broad longitudinal varices, or rib-like thickenings, which represent rest periods in the development of the shell by the animal.

The purple fluid which exudes from these mollusks was utilized by the ancients for a dye. Heaps of dead shells, largely broken, beside caldron-shaped holes may still be seen, as evidence, upon the Tyrian shore.

The radula of *M. tenuispina* is shown in Fig. 25, page 19.

MUREX BEAUI Fisher and Barnardi. In this fine and remarkable species the adults from rocky stations are frilled or webbed in form. These are invariably from deep water. Specimens from muddy bottoms and all young shells are comparatively smooth, showing no trace of the frills or webs. Range 82-183 fathoms.

Pl. 44, Fig. 3

Cedar Keys, Florida to West Indies

MUREX CABRITII Barnardi. An adult shell may be pinkish white or of a fine uniform pink, without dots or marking whatever. It may be very spinous or the spines may be absent entirely. It may be separated from the other spiny Murices by the short thick spines when present. In 1880, when the Manual was written by Tryon, only a solitary specimen was known and that without habitat. Since then it has been dredged in from 25-164 fathoms.

A specimen taken upon the beach at Sanibel measures 55 mm. in length. It has also been collected on the shore at Marco, Florida.

Pl. 44, Fig. 1

Marco, Florida, north and west to Texas; West Indies

MUREX MESSORIUS Reeve. Almost spineless but varices thick, crossed by elevated lines, partly cut into tubercles, the latter sometimes developed into short spines; no color dots or lines, epidermis heavy; canal much shorter than in the preceding species its nearest relative. Length rarely more than 2 inches.

This is a small species compared with its cousins living in the Pacific.

Fresh dead specimens have been taken by the writer at Palm Beach and living ones dredged on the Featherbed Bank in Lower Biscayne Bay, Florida.

Pl. 48, Fig. 7

Pl. 45, Fig. 10

Palm Beach County, Florida to West Indies

MUREX MESSORIUS RUBIDUM Baker. The deep rose-pink form which apparently is confined to the west coast of Florida. Except for the color it agrees with *M. messorius*. It is not infrequently found at Sanibel.

Cedar Keys to Marco, Florida

SUBGENUS CHICOREUS Montfort 1810

MUREX RUFUS Lamarck. Remarkable for its frond-like spines which are most striking near the outer lip and adjacent to the canal; color brownish, pinkish when worn; aperture more rounded than in other species, notched above; canal almost closed; about ten ribs upon the body whorl. Length 1.5-2 inches.

This very attractive shell may easily be obtained at Sanibel and elsewhere. The young specimens, as well as faded old ones, are of a vivid or pale-pink color.

Pl. 44, Fig. 4

Cape Fear, North Carolina to Cartagena, Columbia

MUREX BREVIFRONS Lamarck. This shell possesses long fronds in addition to spines, also close revolving striae; one to two nodules or knobs between the varices; interior white or chocolate brown. Length 3 inches.

Pl. 44, Fig. 2

Cape Hatteras, North Carolina to Cartagena, Columbia

SUBGENUS PHYLLONOTUS Swainson 1833

MUREX FULVESCENS Sowerby (*M. spinicostatus* Val.). Whorls about eight, many prominent spines which are often orange-brown in contrast to the thin light brown epidermis and white shells; spines connected with raised ribs; canal narrow, almost closed in part, interior white; operculum convex, dull outside, interior varnish-like, except central portion or place of attachment which resembles a large fingerprint. Length of shell about 6 inches.

This magnificent species was brought in from fairly deep water off Wilbur, Florida, by fisherman and through the efforts of F. S. Webber. Depth around 30 fathoms.

Pl. 43, Fig. 2

North Carolina to Florida, west to Texas

MUREX POMUM Gmelin. In this species there are no spines, a short canal, nodulous surface, dark brown bands and a lip sometimes tinted with chocolate color. The normal color of the aperture is pale salmon picked out with deep brown. Usually there are three varices but there may be four. Length 2-3 inches.

Pl. 43, Fig. 3

Cape Hatteras, North Carolina to Venezuela

MUREX CHRYSOSTOMUS Sowerby. This shell is characterized by one or two spur-like spines on a varix near the aperture. These spurs are generally at the left but sometimes on the back varix, rarely on the right hand near the margin; lips and interior more or less tinged with orange color. Length 2.5 inches.

Pl. 43, Fig. 4

Southern Florida and West Indies

SUBGENUS *PTEROPURPURA* Jousseau 1880

MUREX TRISTICHUS Dall. Shell delicate; varices placed at one-quarter of a revolution each around the spire; aperture pear-shaped; canal bent to right; canal belonging to preceding varix behind it, persistent and bent to left; nucleus large, loosely coiled.

This Murex is quite different from any of the shallow water species. Length 10-20 mm. Depth range 152-450 fathoms.

Pl. 57, Fig. 12

Florida Strait and West Indies

GENUS *EUPLEURA* H. and A. Adams 1853
(BORERS)

The radula of Murex, the operculum of Thais and the shell resembling Gyreneum indicate relationship to various groups.

EUPLEURA CAUDATA Say. Color varying from whitish to brown; livid inside; varices and intermediate ribs present. The peculiar shape of the shell is evident in the illustration.

When adult the shell presents a well-cancellated surface. There are five transverse riblets on the back of the last whorl, between two varices; three riblets in front. Length 12-25 mm.

Pl. 45, Fig. 14

Pl. 69, Fig. 11

Cape Cod to Florida Keys

EUPLEURA CAUDATA SULCIDENTATA Dall. Spire more elevated than the preceding; spiral threads, except on varices, often absent or obsolete; generally whiter in color, larger in size; in adult form three flattish ribs on the back and two to three in front.

Length 1-1.5 inches.

Pl. 45, Fig. 2

Gulf coast of Florida; Cuba

GENUS *ASPELLA* Morch 1877

ASPELLA OBELISCUS A. Adams. Shell elevated, whorls about eight, nucleus smooth; later whorls with three major and three minor varices; arranged alternately; narrow, sharp, elevated riblets which overlap the varices and form slight spines at their intersection, chiefly on the major varices; canal long; narrow and plainly recurved. Length 1 inch, breadth 11 mm.

The specimen illustrated was found by Mrs. Frank Lyman at Boynton, Florida, apparently the first record for the state. Tryon confused this species with *Tritonalia intermedia*.

A. obeliscus is descended from the Pliocene *A. engonatus* Dall which occurs in the marl at Clewiston, Florida. Living examples of the recent shell will eventually be dredged off the Florida coast.

Pl. 49, Fig. 11

Palm Beach County, Florida; Texas; St. Thomas, West Indies

GENUS *TRITONALIA* Fleming 1828, *Ocinebra* Leach 1847

Varices numerous; operculum similar to Thais.

TRITONALIA CELLULOSA Conrad. Aperture small, purplish inside, large prominent ribs with wrinkled lines between them.

It lives chiefly in oyster beds; also observed by the writer living on coral rock, close to mangrove roots, on Little Pine Key, Florida. Length 12 mm. Range 0-14 fathoms.

Pl. 45, Figs. 7, 11
North Carolina to Gulf of Mexico;
West Indies

TRITONALIA INTERMEDIA C. B. Adams. Shell elongated, spire elevated; whorls seven to eight, convex, sutures deep; six to eight revolving scaly ribs; aperture small, canal short; color white or yellowish. Length under 1 inch.

Pl. 45, Fig. 20
Florida Keys; West Indies, Bermuda

GENUS MURICIDEA Swainson 1840

Closely related to the preceding genus.

MURICIDEA MULTANGULA Philippi. Shell whitish with pale brown flecks, often with purplish or rosy suffusion about the aperture; when perfect the epidermis slightly hairy. Length 18 mm.

A very variable shell in color but the rich pink mouth is most frequent. Examination of the radula is desired as this may prove to belong to a totally different family. Fresh specimens possess a hispid epidermis with little triangular projection points.

It lives in shallow water, particularly in the south, but has been dredged in 95 fathoms.

Pl. 45, Figs. 3, 12
North Carolina to Gulf of Mexico;
West Indies

MURICIDEA OSTREARUM Conrad. Shell gray; interior livid purple.

This shell is often confused with *Urosalpinx perrugatus* with which it lives in the oyster beds. It may be separated by a longer, more sculptured and less excavated shoulder to the whorl, also a wider and shorter canal. The operculum is also totally different with an apical nucleus (Dall).

Depth range 0-13 fathoms. Length of shell 1 inch.

Pl. 45, Fig. 18 Pl. 43, Fig. 5
Tampa Bay to Cape Romano, West
Florida

MURICIDEA HEXAGONA Lamarck. Shell whitish, epidermis pale brown or yellowish; about five rows of spines on body whorl, becoming less prominent below; canal long and open; outer lip thickened inside and with small

teeth; apex often reddish color. Length 25-40 mm. Depth range 1-25 fathoms.

Pl. 44, Fig. 7
Palm Beach, Florida to West Indies

GENUS UROSALPINX Stimpson 1865
(OYSTER BORERS)

Somewhat coarser and stouter shells, canal deflected.

UROSALPINX CINEREUS Say. Shell light brown or yellow, rarely with red bands; aperture pink, flesh color, brown or purple; about ten rounded ribs on body whorl which are widest and strongest in center of shell, these crossed by about fifteen spiral ridges; outer lip thin and crenulated. Average length 1 inch.

This the well-known oyster drill probably also attacks other mollusks.

Pl. 45, Fig. 1
Pl. 63, Fig. 6

Prince Edward Island to Florida

UROSALPINX PERRUGATUS Conrad. A strongly shouldered shell with a longer canal than the preceding species; radiating lines more pronounced and wavy; some individuals much more slender; interior usually chocolate-brown color. Length 28 mm.

Pl. 45, Fig. 15
Cedar Keys to Key West, Florida

UROSALPINX TAMPAENSIS Conrad. Shell broadly shouldered; surface latticed by whitish vertical and horizontal ribs; outer lip well extended, the terminations of the spiral ribs forming projections; interior of aperture grooved to correspond with exterior surface; ground color often brownish inside and between ribs. Length 1 inch.

This shell very much resembles *Eupleura* with which it might be confused by the novice.

Pl. 45, Fig. 5
Cedar Keys to Cape Sable, Florida

GENUS TROPHON Montfort 1810

Shell fusiform; varices numerous; spire conspicuous; aperture ovate; canal open, often deflected.

TROPHON SCALARIFORMIS Gould. (*T. clathrata* of authors, not Linné). Whorls eight, aperture half length of shell; thirteen to

sixteen varices which are arched like tiles; faint revolving sculpture on adult specimens.

This the largest American Trophon sometimes attains a length of 53 mm. It is chiefly obtained from haddock stomachs.

Pl. 42, Fig. 16

Iceland to Labrador; Newfoundland Banks to Massachusetts Bay

TROPHON TRUNCATUS Strom. Whorls six; numerous low, close-set varices which are often obscurely crenulate; suture well impressed; canal short and obliquely truncate; aperture and canal shorter than spire. Length 12-17 mm. Depth range 10-50 fathoms.

The most common North Atlantic

Trophon.

Pl. 44, Fig. 13

Finmark to Greenland and south to Georges Bank

Family Thaisidae

Shell striated, imbricated or tuberculated; spire short; aperture usually small. Animal similar to Murex.

Many of these mollusks produce a fluid which creates a crimson dye. This may be observed by exerting pressure upon the operculum. They are largely predatory and in Europe are destructive to the mussel beds.

GENUS THAIS Roeding 1798; *Purpura* Bruguiere 1789, not Martyn

SUBGENUS PATELLIPURPURA Dall 1918

THAIS PATULA Linné. This species develops a capacious aperture and numerous nodules upon the back of the shell. These knobs are less distinct in mature specimens. The outer lip has sharp teeth inside the edge, the base being hardly notched. The color is dark brown, interior often bluish. Length 1-3 inches.

A widely distributed species which varies considerably in size.

Pl. 45, Fig. 8

Jupiter Inlet, Florida to Brazil; Pacific

SUBGENUS STRAMONITA Schumacher 1817

THAIS FLORIDANA Conrad. With or without two rows of low tubercles; sculpture strong;

color whitish, blotched and streaked with brown. The interior is often pale brown with a white border inside lip. Length 1-2 inches.

This shell is common upon rocks almost everywhere in Florida and along the gulf coast. The radula is shown on Plate 64.

Pl. 45, Fig. 9

Pl. 48, Fig. 3

Pl. 64, Figs. 3, 4

North Carolina to Texas; West Indies

THAIS FLORIDANA HAYSAE Clench. Shell large, dull gray or brownish gray, whorls six to seven; two rows of large tubercles on each whorl slightly above center, these in turn two to three ridged, becoming two ridged at base; spire acute and produced; inner margin of lip crenulate; pinkish or orange inside; suture deep. Length 3.5 inches.

Pl. 45, Fig. 13

Grand Bayou, Mississippi Delta, Louisiana

THAIS DELTOIDEA Lamarck. Principal rows of nodules placed above periphery, bluntly pointed and indistinct row below; parietal callus broad, pink color and blotched with brown; blotches sometimes upon lip which is slightly crenulate; axis slightly twisted to form a short canal. Length 1 inch.

A chunky form, usually well covered with incrustations and therefore not readily detected upon coral rocks.

Pl. 44, Fig. 10

Jupiter Inlet, East Florida to St. Vincent, West Indies

SUBGENUS NUCELLA Roeding 1789

THAIS LAPILLUS Linné. An excessively variable shell, both in form and color. It is very largely influenced by environment. Very thick heavy specimens are found in exposed situations on the coast of Maine.

The shell is generally pointed at both ends. It is variegated with yellow, brown and white. Upon the surface are coarse revolving ridges. The aperture is thickened and has teeth inside. It lives on ocean rocks everywhere within its range and is also common in northern Europe. Length 1-1.75 inches.

The ovicapsules are shown on Pl. 69, Fig. 3.

Pl. 45, Fig. 19
 Pl. 69, Figs. 1, 2, 3
 Newfoundland to Connecticut

THAIS LAPILLUS IMBRICATUS Lamarck. This beautiful variety lives in quieter and more protected stations. As the name indicates the exterior resembles shingles on the roof of a house.

Pl. 45, Fig. 21
 Maine to Massachusetts

GENUS *SISTRUM* Montfort 1810
 (RATTLE SHELLS)

Shell small, thick, tuberculated or spiny; aperture contracted by projections upon each side. Many of the Pacific Ocean species are brilliantly painted inside with orange or purple color. The following is rather a dusky representative.

SISTRUM NODULOSUM Adams. A greenish lead color or blackish shell; nodules black, interior dark, teeth lighter. Length 12 mm.

A colony has been observed living under stones inside the Palm Beach Inlet and another in Upper Biscayne Bay, Florida. It is often associated with *Planaxis*.

Pl. 45, Fig. 4
 Palm Beach, Florida to West Indies

Family Coralliphilidae

The members of this family are usually distinguished by shells with spines or undulating ribs, usually covered with fine close-set growth lines; interior white or more frequently pink or purple. The individual species are widely distributed, very variable, and mostly found below low-tide marks. They prefer coral, broken stone or shell bottoms.

GENUS *CORALLIOPHILA* H. and A. Adams 1853
 (CORAL SNAILS)

CORALLIOPHILA ABBREVIATA Lamarck. Interior pinkish violet, or whitish, including the rather long open canal which is anterior; nodules crossed by ribs and very fine close-set sculpture, the ribs terminating upon outer lip in delicate crenulations. Length 20-25 mm. Depth range 15-100 fathoms.

At Fort Lauderdale, Florida, this species was brought in on coral from off shore. It has also been collected on

Carysfort Reef, Florida Keys.
 Pl. 45, Fig. 16
 Pl. 59, Fig. 6
 North Carolina to Florida Keys;
 West Indies

CORALLIOPHILA DEBURGHIAE Reeve. This extraordinary species lives in deep water and occurs in both the Atlantic and Pacific. It is remarkable for the range in depth and varying temperature of the water. The most foliaceous and largest examples come from the greatest depths. Length 30 mm. Depth range 56-878 fathoms.

Pl. 58, Fig. 5
 Off Cape Hatteras, North Carolina
 to West Indies

Family Colubrariidae

Shell elongated; aperture small; canal short.

GENUS *COLUBRARIA* Schumacher 1817

COLUBRARIA LANCEOLATA Menke. A flesh-colored or yellowish-white shell, spotted with brown; eight to nine varices. Length 25 mm.

Florida specimens are usually smaller in size than those from the West Indies. It has been collected living under pieces of coral, in shallow water, off Little Pine Key, Florida. During the summer it also occurs in Lake Worth.

Pl. 45, Fig. 6
 North Carolina to Gulf of Mexico;
 West Indies

COLUBRARIA TESTACEA Morch (*T. obscura* Reeve). A light brown shell with one or two revolving zones of brown blotches; spire straight; varices far apart. Length 1-2 inches.

Pl. 42, Fig. 10
 North Carolina to Gulf of Mexico;
 West Indies; Cape Verde Islands;
 Indian Ocean

GENUS *MONOSTIOLUM* Dall 1904

Varices absent; surface usually sculptured.

MONOSTIOLUM SWIFTI Tryon. Whorls seven to eight; aperture more than one-half length of shell; axial ribs most prominent upon spire, crossed by many spiral lines which bridge the ribs; canal broadest at posterior

end; outer lip thickened, toothed inside with one denticle upon opposite side; color white, mottled with brown. Length 22.5 mm.

Florida records of this species are dubious but it probably lives among the Keys.

Pl. 42, Fig. 13

Bermuda; West Indies

Family Pyrenidae (Columbellidae)

Shell small, aperture long and narrow; outer lip thickened, particularly in the middle, toothed; inner lip crenulated; operculum very small.

GENUS PYRENE Roeding 1798

PYRENE OVULATA Lamarck. Whorls about seven; suture fairly distinct; entire surface lightly spirally grooved; interior of margin lightly toothed; shell white, clouded or mottled with red or brown. Length 15 mm.

Pl. 46, Fig. 25

Florida Strait and West Indies

SUBGENUS COLUMBELLA Lamarck 1739

PYRENE MERCATORIA Linné. Trader Pyrene. Shell oval, thick, color variable; spire short; whorls five to six, spirally grooved; aperture two-thirds length of shell; outer lip strongly toothed inside; columella with about six small teeth below, two to three larger teeth above. Length 17 mm.

An abundant form and a variable one.

Pl. 46, Fig. 8

Cape Hatteras, North Carolina to West Indies

PYRENE RUSTICOIDES Heilprin. Rustic Pyrene. Shell smooth, white or orange color with white angular star-like spots near suture; spire short and sharp; whorls seven; outer lip with small white teeth; interstices of teeth dark chocolate color; epidermis hairy. Length 18 mm.

The dark spaces between the teeth separate this from the preceding with which it might readily be confused. An European Pyrene, *P. rustica*, is similar to but not identical with this species.

Pl. 46, Fig. 2

Florida; West Indies

GENUS ANACHIS H. and A. Adams 1853

ANACHIS AVARA Say. Greedy Anachis. Shell ovate in shape, light straw-colored; whorls six, nearly flat; suture distinct and somewhat scalloped near folds upon the shell; aperture one-third length of shell; lengthened teeth within margin; operculum horny. Length variable.

The typical form is abundant in Florida but does not extend southward of that state. It is rather small, dull colored, with only about ten ribs to the whorl and spindle-shaped.

Pl. 46, Fig. 24

Wellfleet, Massachusetts to Florida Keys

ANACHIS AVARA SEMIPLICATA Stearns. Specimens of this form are long, slender and of a greenish color. The size is considerably larger than the other races. It is abundant on the bay side of Sanibel, Florida, particularly in Tarpon Bay. Length 13 mm.

Pl. 46, Fig. 7

Cedar Keys to Sanibel Island, Florida

ANACHIS AVARA SIMILIS Ravenel. A dwarf race, otherwise similar to *translirata*. Length 7 mm.

Pl. 46, Fig. 19

Massachusetts Bay to Florida Keys; Gulf of Mexico

ANACHIS AVARA TRANSLIPATA Ravenel. This the commonest race of all is brightly colored and many ribbed. It is also the most widespread in distribution. Often it is identified as the typical. Length 10-14 mm.

Pl. 46, Fig. 23

North Carolina to Florida Keys; Gulf of Mexico

ANACHIS HOTESSIERI Orbigny. Shell oblong; long ribs well separated; spirally striated; spire short; whorls seven; suture moderately impressed; aperture sinuous; six teeth inside lip; columella subpubescent; color yellowish brown and spotted. Length 7 mm. Depth range 35-85 fathoms.

North Carolina to Gulf of Mexico

ANACHIS OBESA C. B. Adams. Fat Anachis.

Shell ventricose in shape, longitudinally ribbed, chestnut banded near suture and below on body whorl. Length 5-7 mm.

Pl. 46, Fig. 3

North Carolina to Florida; West Indies

GENUS NITIDELLA Swainson 1840
(GLISTENING SHELLS)

NITIDELLA CRIBRARIA Lamarck. Shell oblong, pyramidal, spotted often with whitish color; tip generally broken off; whorls seven to eight; upper teeth, inside outer lip, larger than the others; epidermis usually heavy and almost black or dark brown. Length 10 mm.

This species is often abundant on rocks, between tides, on the Florida Keys and in Biscayne Bay.

Pl. 46, Fig. 5

Palm Beach County to Florida Keys; West Indies

NITIDELLA LAEVIGATA Linné. Shell thin and shining under a light epidermis; base white with zigzag lines and chocolate-colored spots, the latter often upon the periphery; outer lip toothed, aperture large; whorls five to seven. Length 17 mm.

In old specimens the apex is apt to be obtuse.

Pl. 46, Fig. 15

Palm Beach to Florida Keys; West Indies

NITIDELLA NITIDULA Sowerby. Surface smooth, shining, whitish marked with brown; six whorls, the last one equal to three-fourths the length of the shell; aperture narrow, twelve teeth inside outer lip, black between the teeth. Length 15 mm.

A strikingly beautiful little shell, especially if obtained alive. It may be taken among seaweed, at extreme low tide, upon the ocean rocks at the north end of Palm Beach, Florida.

Pl. 46, Fig. 9

Jupiter Inlet, East Florida, southward to West Indies

NITIDELLA MOLECULINA Duclos. Surface whitish with an open network of chestnut which become curved and darker near the suture; sometimes very dark colored but still exhibiting the pattern. Length 10 mm.

Pl. 46, Fig. 6

Florida Keys; West Indies, Pacific

GENUS MITRELLA Risso 1826; Astyris, H. and A. Adams 1858 (LITTLE MITRES)

MITRELLA FUSIFORMIS Orbigny. Shell white or yellowish, spirally sulcate; spire long, apex sharp; whorls nine; aperture oval, canal distinct, outer lip white and toothed. Length 6 mm.

This species lives at moderate depths but is very rarely taken upon the beaches.

Pl. 33, Fig. 19

Southern Florida and West Indies

MITRELLA LUNATA Say. Shell small, surface smooth, red-brown, two series of crescent-shaped whitish spots; aperture oval in shape, outer lip dark brown and toothed inside. Length 5 mm.

Their station is just below low-tide mark, clinging to weeds and bits of shell. It is said to be abundant from the North Shore, above Boston, around to Buzzards Bay, often associated with *Bittium alternatum*. In the spring of the year they venture out on the sands.

Pl. 46, Fig. 18

Prince Edward Island to Gulf of Mexico

SECTION PLECTARIA Dall 1924

MITRELLA ALPELLA IONTHA Ravenel. Whorls about six, flattened, deeply channelled at suture; about fourteen slightly oblique axial ribs upon final whorl and spire but not extending below periphery; spiral grooves below periphery which extend inward upon columella; color white, often clouded with amber or brown color. Length 6 mm.

It is not rare upon the beaches at Sanibel, Florida.

Pl. 46, Fig. 1

Gulf of Mexico and West Indies

MITRELLA PURA Verrill. The writer has not seen this species.

Pl. 39, Fig. 13

Family Nassariidae

Ovate-shaped shells, variously sculptured, inner lip smooth with enamel spreading over wall of shell; outer lip

toothed, internally crenulated.

GENUS NASSARIUS Duméril 1805, Nassa of
Authors (BASKET SHELLS)

Animal with broad foot, with horns in front and two little tails behind; very quick and active in its movements.

NASSARIUS OBSOLETUS Say. Obsolete Basket. Shell dark reddish brown, covered with network of lines, often folded; aperture deep violet; outer lip sharp.

Animal mottled with slate color and very active. It feeds upon dead fish or crabs and may be observed living in countless numbers upon muddy shores away from the surf. Brackish water, well drained at low tide, is preferred. No shell of equal size is so abundant upon the north Atlantic coast.

Old individuals are much eroded, particularly the early whorls, consequently adolescent examples provide better cabinet specimens. A greenish mould-like plant vegetates upon this Nassarius. Length 1 inch.

Pl. 46, Fig. 12

Pl. 69, Fig. 9

Nova Scotia to west Florida

NASSARIUS TRIVITTATA Say. Three-Banded Basket. Shell greenish white, surface covered with network of lines giving a cross-barred effect, often three dark bands on lower whorls; shouldered at suture; raised lines within lip. Length 16 mm.

Animal whitish, spotted with pale lilac; see Pl. 68, Fig. 13.

Worn examples are frequently taken upon the beaches.

Pl. 46, Fig. 10

Pl. 69, Fig. 7

Nova Scotia to St. Augustine, Florida

NASSARIUS VIBEX Say. Shell thick and short; surface with waving folds and revolving lines, zoned with light and dark areas; thick enamel upon inner wall of shell with granulations below. Length 10 mm.

A common shell in Florida waters, rare in the north. Fresh dead specimens exhibit attractive coloring. There are a number of variations.

Pl. 46, Fig. 13

Pl. 69, Fig. 8

Cape Cod to West Indies

NASSARIUS AMBIGUA Montagu. A short, solid form, whorls well rounded or shouldered; suture deep and distinct, sometimes with canal; thirteen to fourteen almost straight well-marked rounded ribs, extending from suture to suture, crossed by many fine ridges which alternate in size; aperture small, almost circular, outer lip thickened; color yellowish or white, spotted or banded with brown. Length 8-15 mm.

Pl. 46, Fig. 16

Cape Hatteras, North Carolina to West Indies

NASSARIUS ACUTUS Say. Pointed Basket. Shell acute, whitish, cancellations resembling granules; transverse grooves deeper than the spiral ones; spire longer than body whorl; suture moderately impressed; outer lip incrassated. Length 12 mm.

Related to *N. ambigua* but a much rarer shell. The peculiar lip separates it from the last species.

Pl. 46, Fig. 17

North Carolina to Gulf of Mexico

NASSARIUS CONSENSA Ravenel. Harmonious Basket. A rather slender shell with fine spiral threads and somewhat scalariform spire. The restricted callus area adjacent to the columella is a feature. Range 5-50 fathoms.

Pl. 46, Fig. 11

North Carolina to Gulf of Mexico

NASSARIUS HOTESSIERI Orbigny. Hotessier's Basket. In this species the spiral sculpture is rather pronounced, the ribs somewhat infrequent, and the columellar callus moderately extended. It is from deeper water than the other species, occurring in 38-85 fathoms.

Pl. 46, Fig. 14

North Carolina to Gulf of Mexico; West Indies

Family Buccinidae

Shell notched in front, or with canal reflected; animal carnivorous.

GENUS BUCCINUM Linné 1767 (WHELKS)

Shell few whorled, aperture large, canal short.

The whelk is dredged in Great Britain for the market and eagerly sought by those with a slender purse. It may be

caught by baiting a basket which should be left down over night.

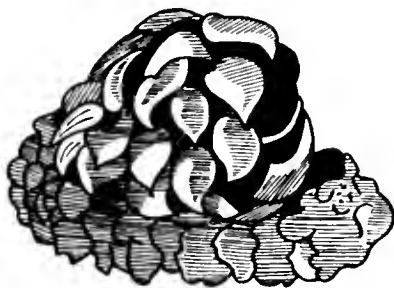


Fig. 48
Egg case of *Buccinum undatum*

shore to a depth of 100 fathoms.

BUCCINUM UNDATUM Linné. Waved Whelk. An opaque, almost lustreless shell, sculptured with many fine thread-like spiral ridges arranged in groups; whorls seven to eight; shell wall glazed near inner lip; operculum pale yellow with layers of growth resembling the epidermis of shell. Length 2.5 inches.

There are many extraordinary varietal manifestations of this species, dwarfs, keeled, elongated, thin, reversed, two to three operculated shells. Some of the most remarkable have been taken off the English coasts. It lives from tide mark to considerable depths. In America the specimens are slightly smaller than the European ones.

Tons of these whelks are carried to the British fish markets. In the year 1504, when Warham was enthroned Archbishop of Canterbury, there were provided for a feast "8,000 whelks at 5 shillings per 1,000."

The curious spawn cells are called "Sea Wash Balls" on account of their being used by sailors to wash their hands.

Pl. 47, Fig. 6

Newfoundland southward to Charleston, South Carolina; Iceland to Mediterranean Coast of France

GENUS *PISANIA* Bivona 1832

Shell oblong; spire prominent; outer lip thickened, canal short; operculum ovate.

PISANIA PUSIO Linné. Whorls ten to eleven; growth lines almost rib-like on upper whorls,

the last becoming smooth; aperture fully half length of shell; outer lip toothed on outer edge; inner lip callus rising into a lip; frequent teeth at base of columella, white plaits on wall above and with canal above them. Color brownish purple with narrow darker bands and white arrowhead-like spots. Length 54 mm.

Pl. 47, Fig. 9

Florida Keys and West Indies

PISANIA VARIEGATA Gray. Whorls eight to nine, suture indistinct; about nine strong nodules to each whorl; longitudinally grooved with raised lines which are darker than the ground color, the color of these often interrupted; last whorl much swollen at termination; outer lip elevated and finely crenulated; canal slightly oblique; small tooth-like plait above and extending inside shell. Length 19 mm.

A specimen collected under a sponge at Lignumvitae Key, Florida affords the above measurement. It is a rather blackish shell.

Pl. 47, Fig. 5

Florida Keys to Trinidad; west Africa

GENUS *CANTHARUS* Roeding 1798;
Tritonidea Swain. (POT SHELLS)

Surface generally cancellated; epidermis thick; spire pointed; outer lip thickened; inner wall with tooth above.

CANTHARUS TINCTUS Conrad. Colored Pot. Spire conical; low longitudinal ribs crossed by riblets; constriction at shoulder leaving nodules; outer lip thickened, strongly ridged inside, inner lip with series of plaits; color purplish brown, sometimes varied with white. Length 1 inch.

Pl. 47, Fig. 4

Cape Hatteras, North Carolina to Mexico

CANTHARUS CANCELLARIA Conrad. Cross-Barred Pot. Aperture half length of shell; indistinct longitudinal plicae; crossed by waving lines which are more elevated than the plicae, finer ones between; sharp distinct lines inside lip; plait at base of columella. Length 1 inch.

Pl. 46, Fig. 22

South Carolina to Florida and Texas

CANTHARUS AURITULA Link. Shell short, solid; about eleven strong ribs upon last whorl, also carried to spire; also intermediate threads which are cut by the growth lines; whorls high, shouldered; strong nodules just below suture; outer lip swollen behind with a prominent tubercle where a sutural series ends; strong deep entering plait on opposite side; color brownish, clouded with white. Length 22 mm.

Allied to *T. tincta* this form is shorter and more solid; the shoulder is also more developed, while the strong tubercle on upper outer lip is a characteristic feature.

Pl. 47, Fig. 11
Florida; West Indies

GENUS PHOS Montfort 1810 (LIGHT SHELLS)

Spire elevated; base notched; columella with folds at base; operculum claw-shaped.

PHOS CANDEI Orbigny. Whorls nine to ten, rounded; numerous slightly curved longitudinal ribs (about sixteen on last whorl) crossed by threads of three sizes; outer lip thick, with varix extending backward, sometimes varices scattered over shell; notch near base of lip well marked as in *Strombus*; plaits on columella; color yellowish white to brownish, with faint broken bands. Length 1 inch.

It lives in 25-180 fathoms. One beach shell was taken at Palm Beach.

Pl. 46, Fig. 20
Cape Hatteras, North Carolina to West Indies

PHOS PARVUS C. B. Adams. Shell small, whorls about eight, separated by deep suture; eleven distinct, elevated, rounded longitudinal ribs, crossed by riblets; fine revolving threads between ribs making surface finely reticulate; varix behind lip very high and strong; notch of lip feeble; color pale brownish, knobs darker; white band below middle of body whorl. Length 16 mm.

Depth range 2-15 fathoms.
Pl. 46, Fig. 21
Charlotte Harbor, west Florida to Barbados, West Indies

PHOS PARVUS INTRICATUS Dall. Length 13.2 mm.

Pl. 68, Fig. 6
Florida; West Indies

GENUS ENGINA Gray 1839

Shell thick, nodulous; lip heavy, toothed inside; operculum claw-shaped.

ENGINA TURBINELLA Kiener. Whorls seven; strongly ridged at periphery and tapering from this to base; row of low knobs just above suture and continuing around periphery of last whorl; surface with delicate revolving threads which cross growth lines and forming fine reticulations; aperture somewhat narrow and extended below; six to eight knobs within outer lip, the upper separated from the others; color black or reddish brown, nodules often white. Length 11 mm.

Pl. 47, Fig. 8
Key West, Florida; West Indies

GENUS NASSARIA Link 1807

SUBGENUS NASSARINA Dall 1889

NASSARINA GLYPTA Bush. Length 4.5 mm. Range 14-63 fathoms.

Pl. 65, Figs. 5, 5a
North Carolina to Florida Keys

Family Neptuneidae

A group which is largely boreal in distribution. The species mostly lack color except in the genus *Busycon*. The forms are highly diverse in shape and sculpture, the individual species themselves being excessively variable.

GENUS NEPTUNEA Roeding 1798, *Chrysodomus* Swain. 1840 (NEPTUNE SHELLS)

Mostly colorless shells with a light brown or yellowish epidermis.

NEPTUNEA DECEMCOSTATUS Say. Many-keeled Neptune. Shell oval, contracted above and below; ashy-white surface; about ten rounded reddish-horn colored keels upon lower portion of body whorl and two upon upper portion of whorls, the keels evenly spaced but one larger than the others; between the ribs and suture a broad excavated shoulder; umbilicus imperfect; interior white, grooved with brown near edge; operculum

horny. Length 3 inches. Range 0-50 fathoms.

It may be sought for on the beaches after severe storms on Massachusetts Bay but particularly northward. From Brooklin, Hancock County, Maine, it has been reported by Mrs. Alice Thayer as living close to the shore.

Pl. 47, Fig. 10

Nova Scotia to Massachusetts

GENUS COLUS Roeding 1798, Siphon of Authors

COLUS STIMPSONI Morch (*Fusus islandicus* Gould, not Gmelin). Stimpson's Distaff. Shell elongated, bluish white; epidermis somewhat velvety and horn colored; eight whorls with evenly spaced encircling lines; aperture same length as spire; polished porcelain white inside, outer lip thin. Length 2.75 inches.

Animal white with specks of black, eyes black.

This off-shore shell is occasionally found upon the beaches, particularly in Maine and northward. Depth range 1-471 fathoms.

Pl. 47, Fig. 3

Labrador to North Carolina

COLUS STIMPSONI BREVIS Verrill. Short Distaff. A short form which is readily recognized. Range 10-17 fathoms.

Maine to Massachusetts

COLUS PYGMAEUS Gould. Pygmy Distaff. Shell small, six whorled, proportions similar to *C. stimpsoni*. It has two more whorls than the young *C. stimpsoni* of similar length, the apex of the present form being sharply pointed in contrast to the "distorted button" usually found in convoluted shells. Range 1-640 fathoms. Length 26 mm. Anatomy Pl. 68, Fig. 9.

Pl. 47, Fig. 1

Pl. 69, Fig. 4

Gulf of St. Lawrence to North Carolina

GENUS BUSYCON Roeding 1798;
Fulgur, Montfort 1810

Shell somewhat pear-shaped; spire abbreviated; body whorl well developed, terminating below in a long and twisted canal.

BUSYCON CANALICULATUS Say. Shell large, pear-shaped; marked with revolving lines; whorls six, gradually diminishing, ending in a long and nearly straight canal; periphery beaded, nodulous and upon most prominent part of each whorl; broad, deep channel at suture so that upper whorls are composed of an upright portion almost horizontal, forming a winding terrace which terminates in the pointed apex; epidermis dense yellow-brown with stiff curved hairs; brightly polished inside; operculum small for size of shell, its inner side strengthened by a varnish-like deposit. Length 6 inches.

The animal's foot is orange color. According to Stimpson, in eating it applies the end of the proboscis to a clam's foot and with a sudden jerk of the radula inward and sidelong extracts a strip of flesh.

The writer has collected this species living upon the beach at Far Rockaway, New York City.

Pl. 49, Fig. 2

Pl. 48, Fig. 2

Cape Cod to Gulf of Mexico

BUSYCON CARICA Gmelin. Shell pear-shaped, spire not turreted, suture not channelled; a series of tubercles immediately above suture; canal long; interior brick red; apex of operculum at one end, strengthened by an entire rim of a dark substance. Length 7 inches.

The largest convoluted shell on this portion of the Atlantic coast and the largest mollusk north of Cape Hatteras. Juvenile specimens and those from southern waters are the most brilliantly colored.

Pl. 49, Fig. 6

Cape Cod to St. Thomas, West Indies

BUSYCON CARICA ELICEANS Montfort. When young like normal *B. carica*, later becoming more thickened, the spines more conspicuous and fewer in number, columella whitish. Sinistral specimens have been taken and Conrad named it *B. gibbosum*.

Pl. 48, Fig. 6

North Carolina to Florida

BUSYCON PERVERSUM Linné. Shell sinistral, aperture brownish white; suture simple, tubercles distinct upon body whorl, less so upon spire. Animal jet black. Old shells attain a length of 12 inches. A freak is illustrated on Pl. 58, Fig. 1 and a dextral

example on Pl. 40.

Easily recognizable on account of the left-handed shell.

Pl. 49, Fig. 7

Pl. 40, Fig. 18 (Dextral)

Pl. 48, Fig. 4

Cape Hatteras, North Carolina to Cuba

BUSYCON PYRUM Dillwyn. Shell with deeply channelled sutures, no tubercles or spinous processes; ornamented with inconspicuous ribs or striae; epidermis hairy; color a yellowish rust inside and out. Length 3-4 inches. It lives in shallow water, usually on sand.

Pl. 42, Fig. 12

Cape Hatteras to Gulf of Mexico

GENUS MELONGENA Schumacher 1817;
Galeodes Roeding

Shell solid, spire short, spiny; canal short; outer lip simple; operculum claw-like, nucleus apical.

MELONGENA CORONA Gmelin. The spines which crown this species are gracefully arranged, often in double or triple series. It is an abundant shallow water shell, often living in and covered with mud. Length of typical shell 3-5 inches.

The range westward is doubtful.

Authentic records from Alabama to Texas are desired.

Pl. 47, Fig. 2

Pl. 48, Fig. 1

Pl. 58, Figs. 2, 8

Indian River region; Florida;

Florida Keys; west coast of Florida

The varieties recently reviewed and described by Pilsbry in "The Nautilus" are ecologic and not true races. For convenience they may be arranged as follows:

MELONGENA CORONA ALTISPIRA Pilsbry. An extremely long, narrow form. The diameter is about one-half the length or less. Length 71 mm., diameter 31 mm.

This form lives near the northern limit of the species on the Florida east coast.

Pl. 58, Fig. 4

Oceanus, Brevard County to Matecumbe Key, Florida; west coast of Florida

MELONGENA CORONA INSPINATA Richards. Spines on edges of square shoulders entirely absent; no traces of knobs in place of the spines; a few (six to eight) sub-basal spines present.

Specimens have been collected at Sarasota and Terra Ceia, Florida.

Pl. 47, Fig. 7

Florida west coast

MELONGENA CORONA MINOR Sowerby. The dwarf form, 2 inches long more or less, which lives in great profusion upon mud flats. Like the typical it may have few spines in a circle at base or spines at shoulder alone. In the Indian River region it has the tendency to become longer, being nearer the form altispira.

Pl. 58, Fig. 9

Florida

MELONGENA CORONA PERSPINOSA Pilsbry. Large, heavy, wider than corona; shoulder spines projecting at right angles and doubled or tripled by accessory spines below the regular series; lower series of spines invariably well developed. The example figured by Pilsbry measured 109 mm. in length.

Pl. 58, Fig. 6

Tampa Bay south to Marco Pass and Lossmans Key

MELONGENA CORONA SUBCORONATA Heilprin. Shell wider and shorter than corona; strong shoulder spines extending at right angles and with basal series always present. Pl. 58, Fig. 7 represents a form near this.

Found fossil in the Caloosahatchie River Pliocene beds.

Pl. 28, Fig. 4

Pl. 58, Fig. 7

Florida (Pliocene)

MELONGENA MELONGENA Linné. Differs from M. corona in the possession of a distinct groove close to the suture. There are from one to three rows of spines on upper portion of body whorl and an additional row below. Length 3-5 inches.

Pl. 48, Fig. 5

Florida Keys; West Indies

- - - - -

Family Fasciolaridae

GENUS FASCIOLARIA Lamarck 1801

Shell rather solid, no umbilicus; spire elevated and sharply pointed; aperture with canal in front; outer lip simple, provided with raised lines internally; columella area concave with a few oblique plaits below. Operculum pointed at top, its nucleus apical.

FASCIOLARIA GIGANTEA Kiener. Shell very large, solid, whorls ten, with strong revolving ribs and less distinct ones between these, large nodules near middle of whorls which become less distinct on the body whorl; outer lip ridged internally; canal long, open; three folds below columella; epidermis reddish or brown over the salmon or chamois-colored surface. Animal red and very conspicuous. Length of shell 2 feet or less, diameter 7-10 inches.

One of the largest of Gastropod mollusks. It is often plentiful in quiet shallow waters and upon the open coast. At Sanibel, Florida, it occurs in tidal pools. Pl. 39, Fig. 3

North Carolina to Gulf of Mexico

FASCIOLARIA GIGANTEA REEVEI Jonas. Shell smaller than the preceding, nodules less prominent or lacking, shell also thinner. Length about 6 inches.

It is not infrequent on the Gulf coast. Specimens have been collected at Marco, west Florida.

Gulf of Mexico

FASCIOLARIA TULIPA Linné. Shell with about nine well-rounded whorls, suture distinct, both growth lines and revolving sculpture present; color pattern variable, often with an ash-colored or almost white base, overlaid with clouds and blotches of light brown, orange or red. Length 6 inches.

In the typical shell the protoconch (that portion which emerged from the egg) and half whorl of the young shell are smooth, followed by whorls with longitudinal ridges which gradually give place to beaded ones on the ultimate whorls.

Some Bahaman examples are shouldered upon the body whorl. There are from twenty-six to thirty-three dark spiral lines on the body whorl. Simpson writes "A mahogany colored form is occasionally found on the Keys."

It is sometimes confused with *F. distans* but is always sculptured near the suture, a feature lacking in *F. distans*.

Pl. 49, Fig. 1

Pl. 1, Fig. 6

North Carolina to the Antilles

FASCIOLARIA TULIPA SCHEEPMAKERI Dunker. In this variety the spiral grooves and ridges cover the entire shell.

North Carolina to the Antilles

FASCIOLARIA DISTANS Lamarck. Both Tryon and Rogers place this species under *F. tulipa* but Dall indicated its validity. It is a smaller and smoother shell with only indistinct spiral sulcations. An internal ridge on the body whorl, in front of the suture, is peculiar.

There are blue, gray or brown masses of color upon the whitish base together with five to six dark brown bands, sometimes with additional feeble bands. The length varies from 2.5-3.5 inches.

Pl. 49, Fig. 4

Pl. 1, Fig. 5

North Carolina to Florida and westward to Mexico

GENUS LATIRUS Montfort 1810

Shell turreted, spire produced, outer lip thin; columella straight, with several plaits in front.

LATIRUS BREVICAUDATUS Reeve. Shell brown, with encircling dark brown cords; aperture light brown. Length 1.5-2 inches.

Pl. 28, Fig. 7

Florida Straits to Brazil

LATIRUS INFUNDIBULUM Gmelin. A spindle-shaped shell with open canal and spiral ridges which are most prominent upon the nodules; small revolving ridges between the larger ones; three to four plaits upon columella; color brown with ridges of a much darker shade. Dead specimens are often orange colored. Length 2-2.5 inches.

Pl. 52, Fig. 16

Florida Keys and West Indies

GENUS LEUCOZONIA Gray 1847

Shell keeled or shouldered; both spire and canal short.

LEUCOZONIA CINGULIFERA Lamarck. Whorls about

eight, form very variable, strong tubercles on middle of whorls forming a strong shoulder on middle of body whorl but not present in all examples; distinct growth lines and faint revolving threads together form a reticulated surface. Outer lip grooved inside or smooth, sometimes a small tooth present; four plaits on columella. Color varying from pale brown to almost black, usually white banded just above base. Length 2 inches.

It lives mostly on coral reefs.

Pl. 45, Fig. 17

Pl. 47, Fig. 12

Florida; Texas; West Indies

LEUCOZONIA OCELLATA Gmelin. Shell solid, rows of nodules on middle of whorls, a second and inferior row above shoulder; small revolving ridges on surface with fine raised threads in the interspaces; canal short, three plaits on columella. Color dark brown or bluish with white knobs, interior bluish white with a dark blotched border. Length 1 inch.

Pl. 44, Fig. 8

Cedar Keys to Florida Keys and West Indies

Family Xancidae

Shell thick, heavy; spire short; several plaits upon columella; operculum claw-shaped.

The "Chank Shell" of the Hindus is carved by the Cingalese and left-handed examples are held sacred.

GENUS XANCUS Roeding 1798; Turbinella Lamarck 1799 (VISHNU SHELLS)

XANCUS ANGULATUS Solander (T. scolymus Gmelin). Shell ponderous, yellowish white under a thin epidermis; interior and columella pinkish. The young shell is much more nodulous. Length 8-10 inches.

Pl. 49, Fig. 3

Florida Keys; Texas; West Indies

GENUS VASUM Roeding 1798 (VASE SHELLS)

VASUM MURICATUM Born. Rough Vase. A ponderous shell, easily recognized by its numerous knobs and heavy raised horizontal lines, also by the plaits extending inside columella; epidermis brown and very persistent; interior white. Length 2-3 inches.

Found living, by the writer, upon a small Key inside Sugar Loaf and at Saddle Bunch, Florida Keys.

Pl. 49, Fig. 5

Florida Keys and West Indies

Family Volutidae

An aristocratic family, well distributed in tropical seas and long a favorite with shell collectors. The majority of the species live in fairly deep water, among rocks, and are difficult to obtain even with a dredge.

Those from warm seas are often brilliantly colored and attractively ornamented with prominent spines.

Often the nuclear whorls, which emerged from the ovum, are quite different in sculpture from those which follow. Dall in his extremely valuable summary of the Floridian species, including *Junonia*, states that the true *Volutes*, typified by *V. musica* and including *V. virescens*, look as if their regularly coiled nucleus was shelly from the outset while in *Maculopeplum junonia* the earliest shell substance may be soft and this protoconch is lost, perhaps while still in the ovicapsule. A bulbous or mamillar nucleus is shown on page 13.

In this family the columella is plaited, the lowest plaits generally being most oblique.

A West Indian species (*V. musica*) suggests in its color pattern bars and notes of written music upon the back of the shell. The nucleus of *V. musica* is shown in Fig. 49, the shell



Fig. 49

Nucleus of *Voluta musica*

Pl. 54, Fig. 5. *Voluta radula* Fig. 24, page 19.

GENUS VOLUTA Linné 1758 (VOLUTES)

VOLUTA VIRESCENS Solander. Greenish *Volute*. Compared with *V. musica* the shell is lighter, the columella lip straighter, the plaits smaller and more numerous. There are six brown spots on the outer lip, interior yellowish-cream color. Over the entire surface there are sharp grooves and threads in the interspaces near the canal. The ground color is dark brown with three to four paler bands; eleven ribs on last and twelve on preceding whorl. The chief difference,

however, is in the nucleus of two turns, the first white and swollen. In the adult form there are 4.5 whorls plus those of the nucleus, about six in all, against 7.5 in *V. musica*; further there are sometimes fifteen plaits on the columella against twelve at the outside in *V. musica*. The early whorls and nucleus of both species are shown in Figs. 49, and 50.



Fig. 50
Nucleus of *Voluta virescens*

Pl. 51, Fig. 10
Texas and West Indies

GENUS MACULOPEPLUM Dall 1906

MACULOPEPLUM JUNONIA Chemnitz. Juno's Volute. Shell ovate-fusiform, smooth, very finely decussated; round and square chestnut spots arranged in double transverse rows; apex acute; outer lip somewhat thickened within; four folds on columella. Length 2-4 inches.

Dall has called attention to certain details which follow: "The beginning of the nucleus is livid purple, second whorl pale waxen white with dark purple-brown spots, two additional series of these upon the last half whorl; epidermis very thin, smooth, very pale brown. With respect to the sculpture, the embryonic shell is finely granulose, the next half turn polished and finely striate, then narrow ribs (about twenty-four) appear which develop on the third whorl and begin to disappear at end of that whorl.

The direct progenitor of the recent genus *Maculopeplum* is found in the Eocene (Vicksburg and Red Bluff deposits) and described under the name of *Caricella demissa* Conrad."

At Sanibel, Florida, specimens of *M. Junonia* are thrown upon the ocean beach by winter storms. It is not infrequently brought in by the Greek sponge-divers of west Florida. Depth range 10-30 fathoms.

Pl. 50, Fig. 1
Pl. 1, Fig. 4

Two beach specimens in the National Museum were collected in the year 1847 on the coast of Texas near Mesquital. A third example, also in Washington, came from Cartagena, Columbia and measures 32x53 mm. This species is also known as *V. polygonalis*, Lamarck.

Pl. 64, Fig. 5

Off Cape Lookout, North Carolina to Florida Keys and Gulf of Mexico

Family Mitridae

Shell thick, fusiform in shape; spire acute, usually well developed; aperture small, notched in front; columella plaited; operculum horny, almost transparent, very small or absent; epidermis, when present, very thin.

Animal provided with long proboscis; some species with a purple fluid with nauseous odor and emitted when animal is disturbed; eyes on ends of tentacles or at their base.

The Mitras range from low water to considerable depths, living chiefly in warmer seas. They lurk in holes of rocks, on seaweed in crevices, under stones and dead corals; others burrow in sand or mud.

Some of the larger species, living in the Pacific, have been associated with the church and bear ecclesiastical names such as the Cardinal's, Pope's and Episcopalian Mitres.

GENUS MITRA Lamarck 1799 (MITRE SHELLS)

MITRA BARBADENSIS Gmelin. Shell yellowish brown, shining, whorls six, suture distinct; surface covered with numerous raised horizontal lines with less distinct ones between; vertical sculpture readily discernible under a pocket lens; lip and columella whitish, the latter with three prominent plaits above and three minor ones below, from which the wall descends almost straight to canal. Length 1 inch or more.

It lives upon the coral reefs of the Tortugas.

Pl. 50, Fig. 2
Lower Florida; West Indies

MITRA NODULOSA Gmelin. Knobbed Mitre. Whorls about ten, scarcely rounded but slightly shouldered above; suture distinct, impressed; longitudinal ribs cut by furrows into nodules; basal notch deep; four plaits on columella; color light or dark brown; teeth whitish. Length 35 mm.

Pl. 51, Fig. 14
Cape Hatteras, North Carolina to West Indies

MITRA FLORIDANA Dall. Florida Mitre. Shell

small, black or gray, surface cancellated by horizontal and vertical ribs, forming nodules where they cross and giving a latticed appearance; nucleus and interior brownish; outer lip crenulated by terminations of the spiral sculpture. Length 7 mm.

It was taken living under a stone, in shallow water, off Pumpkin Key. The author also dredged it in shallow water of lower Card Sound and obtained beach specimens at No Name Key, Florida.

Pl. 50, Fig. 5

Pl. 68, Fig. 5

Card Sound to Key West and to Marco, Florida

MITRA PUELLA Reeve. A dark brown or black chunky little shell with flames or spots of white; polished externally and with faint decussating sculpture. Length 9 mm.

This attractive little shell was collected at extreme low tide upon the rocks at Palm Beach, Florida.

Pl. 50, Fig. 4

Cape Hatteras, North Carolina to West Indies

MITRA HANLEYI Dohrn. A delicately marbled species, ranging from gray or yellow, with dark columella area, to nearly white. There are about eleven strong, smooth, swollen nodules on body whorl and fewer on earlier whorls; color darker between the knobs and below columella; fine incised horizontal lines. Length 7 mm.

One of the finest little shells in Florida. It was taken under sponges at Lignumvitae Key and dredged in Card Sound, Florida.

Pl. 51, Fig. 15

Card Sound, Florida to the West Indies

MITRA HANLEYI GEMMATA Sowerby. A variety of the preceding which is nearly black with white or yellowish ribs. Length 7 mm.

Charlotte Harbor, Card Sound, Florida

MITRA SULCATA Gmelin. Shell small, brown with rather wide white bands; aperture half length of shell; strong whitish plications on columella. Length 10 mm.

The specimen illustrated was obtained near the ferry landing on No Name Key.

Pl. 51, Fig. 13

Pl. 50, Fig. 3

Florida Keys and West Indies

GENUS VOLUTOMITRA Gray

VOLUTOMITRA GROENLANDICA Gray. A whitish shell under a brown epidermis. Length 12-20 mm. The character of the peculiar radula is shown on Pl. 64.

Pl. 64, Figs. 6, 7

Greenland

Family Marginellidae (RIM SHELLS)

Shell smooth, shining, porcellanous, imperforate, some with longitudinal ridges; spire short, sometimes sunken; aperture long, outer lip thickened, sometimes provided with teeth; columella with three to four plaits.

GENUS MARGINELLA Lamarck 1801

MARGINELLA APICINA Menke. Usually pale yellow, sometimes white, pinkish or dark, often with several spots on edge of outer lip. Length usually under 12 mm.

The most plentiful Marginella in Florida waters. A left-handed example, in the author's collection, was collected in Tampa Bay, Florida.

Pl. 50, Fig. 22

North Carolina to Gulf of Mexico; West Indies

MARGINELLA APICINA BOREALIS Verrill. A heavier, whiter shell than the preceding one. Range 64-100 fathoms.

Off Martha's Vineyard, Massachusetts to Virginia

MARGINELLA APICINA VIRGINEA Jousseaume. A pale flesh-colored form, pinkish inside.

Florida Keys and West Indies

MARGINELLA CARNEA Storer. An orange or reddish shell with a narrow white band, lip and callus white. Length 18 mm.

Pl. 49, Fig. 8

Cape Hatteras, North Carolina to West Indies

MARGINELLA DENTICULATA Conrad. This shell varies considerably in size, especially in stoutness; pure white or banded spirally

with yellow. It is further characterized by strong, even, plaits on the columella, the lower ones the stronger; outer lip toothed only in the central part. Sometimes, among the fossil specimens, there is a tendency toward angulation at the periphery. Length 3-4 mm.

Pl. 50, Fig. 21

North Carolina to Gulf of Mexico;
West Indies

MARGINELLA DENTICULATA OPALINA Stearns. Shell a uniform amber color, sometimes with suggestions of bands. It has been dredged in shallow water on the west coast of Florida including Tarpon Bay. Length 3-4 mm.

Pl. 50, Fig. 19

West Florida

MARGINELLA GUTTATA Dillwyn. Shell flesh color, broadly banded with a darker tint and surface covered with white flecks; two to five broad bands or stripes upon outer lip and base. Length 16-25 mm.

Pl. 50, Fig. 18

Cape Hatteras, North Carolina to
West Indies

MARGINELLA MINUTA Pfeiffer. Shell white, four plaits on columella; lip finely toothed inside. Length 2.5 mm.

A rather common species but easily overlooked on account of its extremely small size.

Pl. 50, Fig. 15

Florida; West Indies; Mediterranean

MARGINELLA AUREOCINCTA Stearns. Whorls five, sutures slightly impressed, spire elevated, outer lip well thickened; color whitish with two amber colored bands; four plaits upon columella. Length 4 mm.

This very attractive minute shell was dredged by the writer from mud bottom and shallow water in Tarpon Bay, Sanibel, Florida. Also it was taken in Barnes Sound, Teatable Key and at Palm Beach. Though more slender it is like a miniature *M. denticulata*. It has been reported in from 3-44 fathoms.

Pl. 50, Fig. 24

North Carolina to Gulf of Mexico

MARGINELLA LACHRIMULA Gould. A minute white species with indistinct spire; lip slightly toothed inside. Length 1.5 mm.

Originally reported from off Georgia

in 400 fathoms it may be secured upon the shore at Sanibel during low tides. The animal of translucent beauty is exceedingly active and when extended much larger than its diminutive shell.

Pl. 48, Fig. 8

Georgia and Florida

MARGINELLA AVENA Valenciennes. Surface with three pale yellowish bands upon a milky white ground; spire somewhat glazed; outer lip slightly incurved at the middle; four strong plaits on columella, the lower ones slightly stronger. Length 12 mm.

In Florida waters this little shell lives under sponges in shallow water on the Keys.

Pl. 50, Fig. 20

Florida Keys; Texas; West Indies

MARGINELLA CATENATA Montagu. Spire concealed, covered by last whorl; aperture narrow, curved, wider below, fine plications inside outer lip; heavy callus upon columella, four strong plaits below and indistinct ones above; color whitish with revolving chain-like bands of brown or milk-white markings. Length 3.5 mm.

A Gulf of Mexico species, chiefly Central American, taken by the author among drift at Yamato, East Florida.

Pl. 50, Fig. 14

Yamato, Florida to West Indies

MARGINELLA LACTEA Kiener. Shell minute, white, pale yellow banded, shining, translucent, spire short, apex obtuse; four plaits on columella; lip simple. Length 9 mm., diameter 3.4 mm. Depth range 1-10 fathoms.

Pl. 49, Fig. 9

Florida Keys and West Indies

MARGINELLA PALLIDA Linné. Shell cylindrical, yellowish white or yellow, translucent; spire inconspicuous, four minute whorls, apex brownish and shining, swollen; suture distinct, base of aperture rounded, four plaits on columella. Length 15 mm., major diameter 7 mm., aperture 15 mm. Depth range 10-170 fathoms.

Pl. 50, Figs. 13, 16

Florida Keys and West Indies

MARGINELLA OBLONGA Swainson. Shell flesh color, faintly and broadly banded with a darker shade; two chestnut spots on outer lip; sometimes flecked with white. Length

18 to 25 mm.

Florida Keys to Mexico

MARGINELLA SUCCINEA Conrad (M. nitida Hinds). A thin pellucid form, white or amber color, spire lengthened.

It has been found living in dead horseshoe crabs at Gulfport, Florida, Length 17 mm.

Pl. 50, Fig. 11

Fernandina, Florida to West Indies

MARGINELLA FAUNA Sowerby. Shell oval, pale red, spire short; columella with four oblique plaits; outer lip incurved in middle. Length 8-12 mm.

Pl. 50, Fig. 12

Florida Keys and West Indies

MARGINELLA VELIE Pilsbry. Spire high; aperture wide; four plaits upon columella; outer lip well thickened; color white or yellowish. Length 15 mm., breadth 7 mm.

It has been reported from Captiva and Sanibel, Florida.

Pl. 49, Fig. 10

West Coast of Florida

Family Olividae

Brilliantly polished shells, oblong, subcylindrical in shape; final whorl covering most of the previous ones, spire short; aperture long, a little dilated in front; columella vertical, more or less folded; lip simple, thick, no reflection or teeth; notch above becoming a canal at suture; canal at base of shell abbreviated but distinct; operculum absent.

GENUS OLIVA Bruguiere 1789

OLIVA RETICULARIS Lamarck. A slender shell which is swollen a little in the middle; spire somewhat raised; ridges on columella many and strong. Upon the whitish-ground color there are faint purplish-brown reticulations, often as white triangular spots. A variety has two darker bands near the middle of the final whorl and groups of brownish lines near the suture. Length 35-50 mm.

Zigzag longitudinal markings of pink and brown are characteristic; fasciculations (pointed markings) of the same color around the suture. Some specimens are almost uniformly covered with chestnut

brown. The aperture is white. Length 35-58 mm.

No specimens have been taken alive north of the Florida Keys.

Pl. 51, Fig. 18

Pl. 50, Fig. 23

Florida Keys and West Indies

OLIVA RETICULARIS OLORINELLA Duclos. A color variety which is uniformly light yellow.

Florida Keys and Bahamas

OLIVA RETICULARIS BOLLINGI Clench. A larger and heavier shell than the typical form, color markings stronger, ground color not as white or creamy. Length 61 mm.

The holotype was taken in crab-traps off Miami in about 200 feet of water.

Pl. 51, Fig. 9

Off Miami, Florida

OLIVA SAYANA Ravenel (O. litterata Lamarck). Spire produced; usual zigzag markings and sutural ornamentations, also two bands of hieroglyphic-like markings. Length 50-62 mm.

A wider shell than O. reticularis. It lives in large numbers at low-tide mark upon the west Florida beaches but colonies are often difficult to locate. Freak shells are shown on Pl. 44.

Pl. 50, Fig. 9

Pl. 44, Figs. 6, 12

Pl. 64, Figs. 8, 8g

North Carolina to Texas

OLIVA SAYANA CITRINA Johnson. The uniformly yellow form.

Gulf coast of Florida

GENUS OLIVELLA Swainson 1840

Distinguished from Oliva by the small size and more developed spire; more readily separated by the presence of a large thin, horny operculum which is absent in Oliva proper.

These little shells live in sandy stations, often burying below the surface. Their presence is usually indicated by a track on the surface of a tidal flat.

OLIVELLA FLORALIA Duclos. Shell highly polished, much narrower than O. jaspidea and O. nivea; spire tipped with dark brown or yellow, also with a distant brown zigzag

pattern. Length 8-10 mm.

The most abundant *Olivella* upon the Florida beaches and readily detected on account of its glistening surface.

Pl. 50, Fig. 7

Cape Hatteras, North Carolina to West Indies

OLIVELLA JASPIDEA Gmelin. Shell yellowish white, fasciculated with dark brown color at sutures; surface with cross-cut sculpture and tiny holes. Length 12-18 mm.

Pl. 51, Fig. 19

Cape Hatteras, North Carolina to West Indies

OLIVELLA MUTICA Say. Intermediate in size, sometimes broader than the other *Olivella* of our southern coasts; white, yellow or brown, frequently banded; very dark specimens caused by merging of the bands; middle band commonly the broadest; spire produced. Length 10-16 mm.

When the bands are very wide they give the appearance of very narrow white bands between them.

Pl. 50, Fig. 6

Pl. 64, Figs. 1, 2 (Anatomy)

Cape Hatteras, North Carolina to West Indies

OLIVELLA NIVEA Gmelin. Body whorl fasciculated, pinkish at suture; much larger than *O. mutica* and narrower than *jaspidea*. Length 12-25 mm.

Pl. 51, Fig. 11

Pl. 50, Fig. 8

West Florida to the West Indies

Family Terebridae

Shell long and narrow with indistinct suture; whorls flattened and columella without plaits; operculum horny.

Some of the species are provided with a poison gland. There are approximately two hundred known species distributed throughout warm seas.

GENUS *TEREBRA* Bruguiere 1789

TEREBRA DISLOCATA Say. Longitudinally plicate, grooved upon the spire; small knobs upon the sutural band; usually a light zone at the periphery. Length of shell 25-35 mm.

The animal's proboscis of giant size is extruded base first. It is very

muscular and funnel-shaped, according to Dall, the victim being squeezed, smothered and sucked to death simultaneously. The movements of the animal, when kept in captivity, are very sluggish. In May small round ovicapsules, 1 mm. in diameter, are found upon the shells, probably of the same species.

There is no jaw or radula but a constriction of the proboscis appears to contain the poison fangs in the form of grooved prickles.

At Sanibel, Florida, this species lives in great numbers upon the ocean beach near the lighthouse. At low tide its tracks may be seen near those of the little *Olivella mutica*. The movements of the milky white animal are slow but graceful.

Pl. 51, Fig. 3

Virginia to Florida and westward to Texas

TEREBRA DISLOCATA RUDIS Gray. A large form with coarse sculpture.

Pl. 51, Fig. 16

Southern Florida and West Indies

TEREBRA CONCAVA Say. Whorls concave, both sides of the suture nodulous; no costae, spirally grooved; color white; whorls thirteen. Length 19 mm.

Dead specimens have been taken at Sea Island City, New Jersey.

Pl. 33, Fig. 7

North Carolina to Georgia

TEREBRA CONCAVA VINOSA Dall. Grooves replaced by channels separating raised threads; wine color or variegated. Length 18 mm. Depth range 2-30 fathoms.

Pl. 33, Fig. 18

North Carolina to Florida

SECTION ACUS H. and A. Adams 1857

TEREBRA PROTEXTA Conrad. Whorls convex and with numerous small plications; chocolate color inside and out; sutural band sometimes present upon a grayish ground. Length 18-25 mm. Depth range 1-50 fathoms.

Not a difficult shell to find upon the west coast of Florida.

Pl. 51, Fig. 12

North Carolina to Florida and Texas

TEREBRA PROTEXTA LUTESCENS E. A. Smith. A yellow variety. Depth range 1-20 fathoms. Off North Carolina and Gulf of Mexico

SECTION PERIRHOE Dall 1908

SUBGENUS HASTULA H. and A. Adams 1853

TEREBRA CINEREA Born. A comparatively smooth shell, polished, minutely plicated below the suture; pattern of light chestnut spots in series with a white band often present at the periphery. Length 36-65 mm.

Large numbers are sometimes seen at Jensen, Florida, upon the sandy beaches at low tide.

Pl. 51, Fig. 2

Florida to Texas; West Indies

TEREBRA HASTATA Gmelin. A whitish shell with two to three bands of fawn or orange brown color, sometimes in the form of blotches instead of bands, occasionally uniform in color; closely plicated, forming crenulations upon the suture. Length 27 mm.

Fresh beach shells have been taken at Yamato rocks, Florida.

Pl. 51, Fig. 1

Florida Keys and West Indies

Family Conidae

Shell conical, tapering regularly; whorls numerous, spire short; outer lip notched at suture; operculum pointed.

The Cones inhabit fissures and holes in rocks, also shallow pools of coral reefs from low water to moderate depths. They are all predatory, boring into other mollusks and extracting the juices. Apparently dreaded by other shellfish a Pacific Ocean *Strombus* mimics a *Conus* in design of the shell and in consequence is free from molestation. Equipped with a poison *Conus* sometimes bites when handled, the larger species inflicting painful and even dangerous wounds.

In Equatorial seas live the largest and handsomest species. There are roughly five hundred known forms, some of them very rare. Only a few penetrate into temperate regions.

GENUS *CONUS* Linné 1758

CONUS FLORIDANUS Gabb. Florida Cone. Spire elevated, last whorl with straight sides, grooved below; yellowish white blotched with brown; indistinct central white band and a narrower one at shoulder; brown spots frequent between bands. Length 1.5-2 inches.

Pl. 51, Fig. 4

North Carolina to Gulf of Mexico

CONUS MUS Hwass. Mouse Cone. Ash white, streaked and spotted with chestnut brown; white tubercles upon the spire and usually white banded below the periphery; interior chestnut brown with a white center line. Length 1-1.75 inches.

Pl. 51, Fig. 6

Jupiter Inlet, Florida to West Indies

CONUS PROTEUS Hwass. Variable Cone. Shell white with encircling series of spots and cloud-like marks of brown or yellow with a tendency toward broken bands; base grooved. Length 1.5-2.5 inches.

Pl. 51, Fig. 5

Both coasts of Florida and West Indies

CONUS PYGMAEUS Reeve. Dwarf Cone. Shell broad shouldered and inflated above, slightly pinched and grooved below; almost white with many small brown spots and clouds of violet or brown forming three faint bands; interior white or violet. Length 1-1.25 inches.

Pl. 51, Fig. 8

Florida Keys; Gulf of Mexico; West Indies

CONUS PEALII Green. Peals Cone. Breadth at sharply keeled shoulder less than half the length; smooth behind, grooved on anterior half; spire slightly excavated or channelled; color livid gray with chestnut blotches and sides with narrow fillets of brown and white, brown spots always the smaller and sometimes lacking, the white sometimes translucent and brightest on the keel; interior of aperture white and dark brown; middle of outer lip arched forward (Dall). Length 18 mm.

This shell is often confused with *C. floridanus*. It is not uncommon on the Florida west coast and the Keys, preferring a grassy bottom in shallow water.

Pl. 51, Fig. 7

North Carolina to Gulf of Mexico and West Indies

CONUS VERRUCOSUS Hwass. Rough Cone. Shell grooved all over, white and yellow, variegated with orange-red; spire short. Length slightly more than 1 inch.

This species and *C. mus* are the

two commonest Cones in the Antilles.

Pl. 51, Fig. 17

Florida Keys and West Indies

CONUS DAUCUS Bruguiere. Shell orange or carrot color, indistinctly banded, turbinated in form with a low spire; spiral sculpture present.

Fossil specimens have been collected in the Caloosahatchee beds of Florida and it possibly may still be living near the Florida Keys. Length 1.5-2 inches.

Pl. 52, Fig. 8

West Indies

CONUS NEBULOSUS Solander. Cloudy Cone. Shell solid, turbinated; zones of brownish color crossed by fine spiral lines of slightly darker shade, these lines becoming dots or dashes of white and dark below, toward the base becoming granular; spotted with white irregularly upon surface; bluntly crowned with short tubercles at the shoulder; interior mostly whitish.

This very beautiful shell is apparently unrecorded from the United States. Several specimens collected upon the Florida beaches during the winter of 1935-1936 have been called to the writer's attention. The fine shell illustrated was secured at Fort Lauderdale by W. A. Royce. Another worn specimen has been reported by Dr. B. R. Bales from Pelican Shoals, about eighteen miles northeast of Key West. Tryon reports the species as occurring in the West Indies and adjacent coasts of North and South America.

Pl. 51, Fig. 21

Palm Beach County, Florida to the West Indies

Family Turridae (Turritidae)

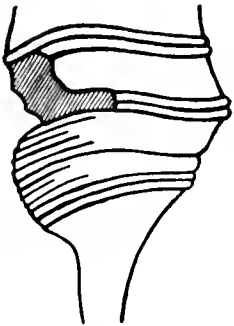


Fig. 51

Slit of *Turris*

Shell fusiform, spire elevated, canal long and straight; slit on outer lip, near suture, an opening for excretions and shown in Fig. 51.

Animal with sinus upon right margin and corresponding with slit in shell. A poison gland is often present and used in connection with the radula. The

presence of this gland, together with the notch in the shell, indicate affinity with the Conidae.

The species are extremely numerous, also difficult to define and classify. Individuals are usually few in numbers. Many have been described from solitary examples and a considerable number inadequately illustrated, if at all.

GENUS *TURRIS* Roeding 1798, *Pleurotoma* Lamarck 1799 (TOWER SHELLS)

TURRIS VIRGO Wood (*T. albida* Perry). Color whitish; about five prominent raised spiral ridges which are most conspicuous near the periphery; additional, similar, closer ones below; pairs of finer ridges between some of the larger ones; suture well impressed; canal long, narrow. Length 2.5-3.5 inches. Depth range 26-150 fathoms.

A single example, occupied by a hermit-crab, was taken in Lake Worth, Florida. In the West Indies it lives in comparatively shallow water.

Pl. 52, Fig. 15

Palm Beach County, Florida; Gulf of Mexico; Antilles

SUBGENUS *ANCISTROSYRINX*

A very elegant group of deep-water shells which also occur in the Eocene fossil beds at Jackson, Mississippi and also probably in Europe.

ANCISTROSYRINX ELEGANS Dall. In this shell the anterior portion of the whorls is covered with granulose spirals, one more prominent than the rest in front of which the suture coils; sinus comparatively short, banded outside by an elevated keel. The spines are very small and curved toward the apex; nucleus brownish, glassy and with one keel. Length 27 mm.

Pl. 38, Fig. 28

Florida Reefs; off Havana, 805 fathoms

GENUS *CYMATOSYRINX* Dall 1889, *Drillia* of Authors in Part

CYMATOSYRINX FURCATA Reeve. Shell faintly channelled above periphery; ribs usually six in number, rounded, not strong, not interrupted at periphery but extending to suture; peculiar hump or varix back of body

whorl; color yellowish white, banded with yellow or orange-brown. Length 21 mm. Depth range 14-50 fathoms.

Pl. 52, Fig. 11

Cape Hatteras, North Carolina to West Indies

CYMATOSYRINX PAGODULA Dall. Length 18 mm. Depth range 50-175 fathoms.

Pl. 50, Fig. 10

Florida and West Indies

CYMATOSYRINX THEA Dall. Whorls eight; often pale brown with a shiny, thin epidermis, interior aperture brown; eleven short, oblique ribs, most prominent at periphery and fading away above; some strong raised threads at base. Length 15 mm. Depth range 3-15 fathoms.

Pl. 52, Fig. 1

Pl. 68, Fig. 1

Cape Hatteras, North Carolina to Florida Keys

GENUS CLATHRODRILLIA Dall 1918, Drillia of Authors in Part

CLATHRODRILLIA OSTREARUM Stearns. Whorls nine, rounded, clearly shouldered; suture well impressed and bordered below by a rather broad flattish excavated area in the center of which runs an elevated somewhat interrupted keel together with finer lines; parallel with the latter on body whorl about fourteen spiral ridges and fewer upon the spire; the ridges crossed by stronger axial ribs which number about twenty-one upon the final whorl; notch moderately deep; color usually brownish. Length 22 mm.

A very variable shell which is rather common and well distributed. Depth range 1-15 fathoms.

Pl. 50, Fig. 17

North Carolina to Gulf of Mexico

CLATHRODRILLIA EBUR Reeve. Shell solid, whitish with a pale yellow epidermis; suture distinct and somewhat puckered from the axial rib terminations; seven rounded axial ribs upon final whorl which are crossed by numerous close-set spiral lines which almost completely and uniformly cover the surface; notch U-shaped. Length 13 mm. Depth range 14-95 fathoms.

Pl. 51, Fig. 3

North Carolina to Gulf of Mexico

CLATHRODRILLIA ALBINODATA Reeve (C. zebra Lam.). Shell orange or brown in color with a double row of knobs on the periphery; one to two lesser white bands upon knobs or below in addition to more prominent ones. Length 9 mm.

A very striking little shell taken only once by the writer inside the North Inlet at Palm Beach, Florida, apparently the first record for the east coast. Four examples were found living under a single stone in about eight feet of water. Later it was found in a similar station in Upper Biscayne Bay, near Arch Creek.

Pl. 52, Fig. 10

Charlotte Harbor, west Florida; Palm Beach to West Indies

CLATHRODRILLIA LEUCOCYMA Dall. Angle at periphery bearing a pair of close revolving ribs, more prominent than remainder of spiral sculpture and tipped with white where crossing the longitudinal ribs. Length 15 mm.

There are about eight prominent double whitish knobs upon each of the latter whorls. The shell is grayish black in color. It is common at Sanibel, Florida.

Pl. 52, Fig. 13

Pl. 68, Fig. 7

Florida; Yucatan

CLATHRODRILLIA EBENINA Dall. A dead-black shell when taken alive, fading to brown; eleven whorls, two of these belonging to smooth, dark brown, nucleus; final whorl more than half length of shell; about fifteen transverse ribs on final whorl and excluding the varix in addition to the sharp elevated ribs; spaces between ribs much wider; varix large; fine, uniform, spiral threads with wider interspaces, not cutting the ribs on periphery; suture distinct; canal wide, short; notch circular, almost closed in front. Length 16.5 mm.

This shell is sometimes found in the Pliocene of the Caloosahatchie beds, Florida. It lives in shallow water on the Florida Keys.

Pl. 52, Fig. 7

Florida Keys

CLATHRODRILLIA HARFORDIANA Reeve. Strongly and widely indented below suture; brownish red. Length 18 mm.

It has been reported from Sanibel, Florida.

Pl. 52, Fig. 3
Florida; West Indies?

GENUS LORA

Shell small, fusiform in shape; spire elevated; canal short; outer lip lightly notched. These little mollusks are inhabitants of cool water and occur mostly off the coast of New England and Canada.

LORA BICARINATA Couthouy. Shell small, brownish or purple with usually a darker interior; whorls six, the last keeled above; whorls of spire keeled in centers; last whorl shouldered by continuation of same keel; fine axial and spiral striae forming a decussated surface. Length 5-10 mm. Depth range 6-100 fathoms.

It has been taken at extreme low tide in Casco Bay, Maine but is more often obtained in fish stomachs.

Pl. 52, Fig. 18

Pl. 69, Fig. 15

Labrador, to New York

LORA CANCELLATA Mighels and Adams. Whorls seven, convex; suture well marked; apex acute; aperture narrow, lip thin and crenulated by the spiral sculpture terminations. Length 11 mm.

A very graceful little shell which has been taken from haddock and other fish stomachs. Depth range 7-312 fathoms.

Pl. 47, Fig. 14

Labrador to Massachusetts

LORA HARPULARIA Couthouy. Whorls seven to eight, flattened above and forming a shoulder; about sixteen oblique rounded axial ribs and many spiral lines; flesh color, which is constant. Length 10-15 mm.

Pl. 69, Fig. 17

Labrador to off Block Island,
Rhode Island

LORA INCISULA Verrill. A chunky little shell in which the axial ribs are more prominent at the posterior end and forming a crown at the shoulder; special sculpture consists of rather broad light incised lines which upon the body whorl are more numerous and closely placed in the region of the columella; the latter broadly spread out with a yellowish callus. Length 6.5 mm. Depth range 5-110 fathoms.

Pl. 53, Fig. 20

Labrador to off Newport, Rhode
Island

LORA NOBILIS Moller. Whorls seven; about fifteen prominent rather sharp axial ribs; spiral sculpture between ribs also strong; shoulder well marked; canal wide and short. Length 12-17 mm. Depth range 7-15 fathoms.

Pl. 47, Fig. 13

Greenland to Maine

LORA PLEUROTOMARIA Couthouy. Whorls eight; shell narrow and tapering; eighteen to twenty oblique rounded axial ribs and very indistinct spiral sculpture; body whorl more than half length of shell. Length 11 mm. Depth range 5-235 fathoms.

Pl. 47, Fig. 15

Labrador to Martha's Vineyard,
Massachusetts

GENUS MANGILIA Risso 1826

Slit at suture of shell; no operculum; aperture oval-elongate, usually narrow and ending in short truncate canal.

Animal sluggish in its actions but capable of sustaining itself upon surface of water, shell downward.

MANGILIA ATROSTYLA Dall. Shell small, solid, usually yellowish; lip thick, broad, often indented; about eleven rounded axial ribs upon body whorl; notch not deep; suture deeply cut. Length 7 mm.

Pl. 47, Fig. 16

Pl. 65, Figs. 4, 4a

North Carolina to Gulf of Mexico;
West Indies

MANGILIA CERINA Kurtz and Stimpson. Whorls seven, well shouldered; about ten strong axial rounded ribs which taper off toward the sutures, parallel sculpture fine and indistinct, the latter crossed by more prominent spiral lines which are less apparent upon the axial ribs. Length 9-11.5 mm.

Pl. 33, Fig. 23

Massachusetts to Florida

MANGILIA CERINELLA Dall. Whorls eight, suture deeply impressed, horizontal sculpture distinct; strongly ribbed vertically, about seven ribs on body whorl; aperture narrow. Length 11 mm. Specimens have been taken at Sanibel.

Pl. 52, Fig. 5
Cape Hatteras, North Carolina to
Florida and Texas

MANGILIA GUARANI Orbigny. Color brown,
often with narrow and lighter bands; ribs
rounded, conspicuous and crenulating the
suture; revolving lines elevated. Length
5 mm.

Pl. 52, Fig. 12
Palm Beach, Florida

MANGILIA LANCEOLATA PSILA Bush
Pl. 65, Fig. 2

MANGILIA LIMONITELLA Dall. Shell small,
thin, translucent, lemon yellow; whorls
eight to nine, turreted, angulated by ribs
on the periphery, nucleus nearly smooth,
sharply sculptured subsequent surface; spi-
ral sculpture of numerous sharp threads,
quite fine, and extending over entire shell;
two stronger threads at the indistinct suture;
transverse sculpture of strongly
marked lines and about a dozen narrow,
sharply elevated riblets, extending from suture
to suture; notch distinct, canal short
and straight. Length 6.75 mm. It lives
upon mud flats between tides.

Pl. 52, Fig. 6
Pl. 68, Fig. 3
Cedar Keys, Florida to the Tortugas

MANGILIA OXIA Bush. More sparsely trans-
versely sculptured, surface smoother and
more polished than the variety *melanitica*.
The ribs are also sharper, the shell red-
dish brown all over and pillar not so dark.
Depth range 10-25 fathoms. Length 5 mm.
Off Cape Hatteras, North Carolina

MANGILIA OXIA MELANITICA Dall. Spire slender,
base short; whorls nine, first two
rounded and smooth, the rest with revolving
lirae; last four whorls with faint ribs;
aperture wider below than above; notch deep
and rounded, surrounded by inflated raised
rim. Length 4.5 mm.

Pl. 65, Fig. 3a
Cape Hatteras, North Carolina to
Haiti

MANGILIA OXYTATA Bush. Range 14-51 fathoms.
Pl. 65, Fig. 1
Off Cape Hatteras, North Carolina

MANGILIA PLICOSA C. B. Adams. Ribs eleven

to twelve, crossed by about same number of
strong ridges and sometimes producing nod-
ules; color gray or reddish brown, interior
dark, dead shells whitish. Length 6-8 mm.

This species may easily be secured
in Tarpon Bay, Sanibel, with a small dredge
operating on mud bottom in shallow water.
It is a widely distributed and not uncom-
mon form.

Pl. 52, Fig. 2
Pl. 69, Fig. 14
Cape Cod, Massachusetts to west
Florida

MANGILIA QUADRATA Reeve. Two strong angles
on the body whorl characterize this shell;
ribs distinct and far apart; color white or
yellow, spaces between ribs chestnut brown.
Length 9 mm.

Cape Hatteras, North Carolina to
Mexico

MANGILIA QUADRATA RUGIRIMA Dall. Ribs
about eight to each whorl; revolving sculp-
ture close-set, fine, easily felt by touch;
color white or yellow, spaces between ribs
sometimes dark; whorls eight. Length 9 mm.

Pl. 52, Fig. 4
Sanibel, Florida

MANGILIA STELLATA FILOSA Dall. Shell tur-
reted, yellow, touched with red brown;
whorls seven, shouldered above, twelve to
thirteen ribs; lip much thickened outside,
notched deeply near suture. Length 6 mm.

It has been reported by Dr. Perry
as occurring at Sanibel.
Pl. 44, Fig. 11
Pl. 52, Fig. 14
Tampa to Key West, Florida

MANGILIA EXSCULPTA Watson. A deep-water
species.

Pl. 52, Fig. 9
Gulf of Mexico

GENUS *DAPHNELLA* Hinds 1844

DAPHNELLA LYMNABIFORMIS Kiener. (*D. decora-
ta* C. B. A.). Whorls seven, shouldered
next to suture; surface covered with rather
closely placed light spiral lines which are
crossed upon the early whorls by equal sized
axial sculpture which upon that portion
form a reticulated surface.

The spiral lines are not uniform in
size, large and small ones alternating upon

the body whorl. The shell is whitish and tinted with yellow. Length 16 mm.

A beautiful little shell and the only representative of the genus living in shallow water upon our coast.

Pl. 52, Fig. 17

Florida Keys and West Indies

GENUS CYTHARA Schumacher 1817

CYTHARA BALTEATA Reeve. Whorls bluntly and slightly angulated in center; few ribs, these narrow and with wide smooth spaces between; shell white with middle brown zone. Length 12 mm.

Cape Hatteras, North Carolina to Barbados

Family Cancellariidae

GENUS CANCELLARIA Lamarck 1789
(CROSS-BARRED SHELLS)

Shell strongly cancellated; strong oblique folds upon columella; canal short.

"The animal is very shy, rarely showing more than the tips of the tentacles beyond the front edge of the shell. It has the power of considerably extending the fore part of the foot, using it as an exploring organ."

CANCELLARIA RETICULATA Linné. Netted Cross-Bar. Whorls ribbed and grooved, the ribs low and flat, crossed by weaker longitudinal ribs; two prominent raised plaits on columella; color yellowish white, with brownish bands or variegations. Length 1.5-2.5 inches. An albinistic form of this has been discovered at Marco, Florida.

Pl. 53, Fig. 11

Cape Hatteras, North Carolina to Guadaloupe

CANCELLARIA CONRADIANA Dall. Conrad's Cross-Bar. A narrower shell than *C. reticulata*. It is abundant in the Pliocene of Florida but lives only at considerable depths.

Pl. 43, Fig. 1

Gulf of Mexico

SUBGENUS TRIGONOSTOMA Blainville 1826

CANCELLARIA TENERA Philippi (*C. stimpsoni* Calkins). Delicate Cross-Bar. Whorls strongly shouldered, about thirteen nodules

upon angle of last whorl and two less distinct rows of nodules below, between these ribs of varying size; two plaits on columella. Color yellowish or white. Length 20mm, usually less.

A single fresh dead example was taken on the beach at Boca Raton, Florida. It occurs more frequently on the Florida Keys and in the Pliocene beds near Clewiston, Florida.

Pl. 51, Fig. 20

Palm Beach County, Florida to West Indies

GENUS ADMETE Kroyer 1842

Canal absent or very short; shell turreted; columella plaited.

ADMETE VIRIDULA Jay. Greenish Admete. Whorls five to six; three folds upon columella; apex acute; spiral lines coarse; axial ribs most prominent near shoulder; epidermis thin but persistent. Length 12.5 mm. Depth range 10-60 fathoms.

Rather abundant at times in stomachs of fish. It is frequently inhabited by hermit-crabs.

Pl. 51, Fig. 22

Labrador to Massachusetts Bay

SUBCLASS OPISTHOBRANCHIA

ORDER PLEUROCOELA

Family Acteonidae

Shell small or minute, spirally grooved on suture, whorls few, outer lip thin and simple, inner lip or columella twisted to form a fold; no folds or teeth upon adjacent wall.

GENUS ACTEON Montfort 1810

ACTEON PUNCTOSTRIATUS C. B. Adams. Broken-Line Acteon. Shell minute, white, whorls four to five, last one large, lower half of same with revolving punctured lines; suture deep and bordered with revolving grooves; color variable. Length 3-6 mm.

Fresh dead specimens are frequent upon the inner sandbars near the North Inlet at Palm Beach, Florida.

Pl. 53, Fig. 3

Pl. 71, Fig. 22

Pl. 65, Fig. 17

Cape Cod southward to Haiti

Family Acteocinidae (Tornatinidae)

Shell cylindrical or fusiform; spire conic or flattened; apex projecting, mamillar and left handed; suture channelled; one fold upon columella at junction with the whorl.

GENUS ACTEOCINA Gray 1847; Tornatina, A. Adams 1850

ACTEOCINA CANALICULATA Say. Channelled Little Acteon. Shell almost cylindrical, spire elevated slightly; top of whorls grooved; white, shining, faint growth lines; whorls five. Length 3-5 mm.

Pl. 71, Fig. 27

Cape Cod southward to Haiti

ACTEOCINA CANDEI Orbigny. Shell small, widest on shoulder; surface smooth except for faint growth lines, shining, milk white; outer lip advanced in center; fold on columella moderate. Length 2.5 mm.

A rather frequent shell in Florida but not so often taken alive.

Pl. 53, Fig. 14

Pl. 65, Fig. 13

Cape Hatteras, North Carolina to West Indies

ACTEOCINA RECTA Orbigny. Straight Little Acteon. Shell oblong, cylindrical, shining, thin, white, spirally and lightly sub-striate; spire short, suture channelled; indistinct fold on columella. Length 2 mm., diameter 1 mm.

Separated from *A. candei* by the spiral sculpture and indistinctness of the columella fold, from *A. bullata* by its smaller size.

Pl. 57, Fig. 10

Florida Keys and West Indies

ACTEOCINA BULLATA Kiener. Shell ivory white, solid, a little contracted in center; spiral striae fine and covering surface but becoming fainter at shoulder; apex mamillar, minute, projecting and turned over; suture well channelled, whorls not concave above; one strong fold on columella, outer lip somewhat inflexed. Length 11 mm., diameter, 5 mm.

The largest West Indian Acteocina.

Pl. 53, Fig. 21

Florida Keys and West Indies

GENUS RETUSA Brown 1827 (BLUNT SHELL)

RETUSA PERTENUIS Mighels. Thin Blunt Shell. Shell very small, white; aperture narrow above, wide below; no spiral sculpture. Length 2.5 mm. Depth range 10-294 fathoms.

Pl. 57, Fig. 14

Pl. 71, Figs. 25, 26

Greenland to Fernandina, Florida

RETUSA CAELATA Bush. Range 15-294 fathoms. Pl. 65, Fig. 15
North Carolina to Fernandina, Florida

GENUS VOLVULA A. Adams 1850 not Sistel 1848 (WRAPPER SHELLS)

VOLVULA ACUTA Orbigny. Range 15-124 fathoms.

Pl. 65, Fig. 11

Cape Hatteras, North Carolina to West Indies

VOLVULA OXYTATA Bush. Shell minute, dull milk white; much produced and pointed above; upper half of aperture very narrow, gradually increasing in width below; inside wall with distinct callus; columella oblique, outer lip acute and curving inward at center; interior lustrous. Length 3.5 mm. Range 5-63 fathoms.

A single example was taken by the writer on the North Inlet bar at Palm Beach, Florida.

Pl. 53, Fig. 1

Pl. 65, Fig. 12

Cape Hatteras, North Carolina to Cuba

GENUS ATYS Montfort 1810

ATYS SHARPI Vanatta. "Shell small, sub-cylindrical, solid, porcellanous, glossy, translucent bluish white, very finely spirally striate, striae strongest above and below. Apex with an external small perforation; base umbilicate; aperture narrow above, broader below. The lip rises from the right side of the apical perforation and describes a more or less even arc above without the twist so common to this genus. The outer lip describes a gentle curve and the basal lip is arcuate. The columella is concave with a slight twist." Length 7.8 mm., diameter 3.8 mm.

The original specimen came from St. Martin, West Indies.

Pl. 53, Fig. 6

Palm Beach County, Florida to West Indies

ATYS CARIBAEA Orbigny (*A riiseana* Orb.?). An oblong, thin, smooth, shell which is distinctly striated at both ends; spire invisible and with an umbilical depression above; aperture not wide; color white. Length 5-8 mm.

Not uncommon after storms upon the beaches at Boynton and Yamato, Florida.

Pl. 53, Fig. 23

North Carolina to West Indies

GENUS DIAPHANA Brown 1827

DIAPHANA DEBILIS Gould. Shell small, transparent, inflated, smooth; whorls four. Length 4 mm. Range 6-16 fathoms.

Pl. 71, Fig. 24

Greenland to Connecticut

GENUS CYLICHNA (CUP SHELLS)

CYLICHNA ALBA Brown. White Cup. Shell smooth, whitish, size of a grain of rice, a pit in place of the spire; covered with a rusty epidermis; many minute revolving lines; aperture narrow, becoming suddenly double the width; lip sometimes waved inward at the center. Length 5 mm. Circumboreal in distribution. Range 10-1091 fathoms. Dead shells are not rare on the beaches.

Pl. 53, Fig. 12

Greenland to Block Island, Rhode Island

GENUS CYLICHNELLA Gabb 1872
(LITTLE CUP SHELLS)

CYLICHNELLA BIDENTATA Orbigny. This tiny shell has two distinct folds upon the columella. Length 4 mm. Range 7-168 fathoms.

It is not infrequently taken upon the beach at Sanibel, Florida.

Pl. 53, Fig. 19

Pl. 65, Fig. 14

Cape Hatteras, North Carolina to Florida; Texas; West Indies

CYLICHNELLA ORYZA Totten. Rice Cup. Shell minute, white, shining; last whorl covering all the others and with only a few revolv-

ing lines; summit depressed into a shallow pit; columella twisted to form an oblique pit, at its base ending abruptly to form a blunt tooth; no umbilicus. Length 4 mm. Range 2-4 fathoms.

It has been found in the mud of New Bedford and Newport harbors.

Pl. 71, Fig. 23

Maine to Connecticut

Family Bullidae

Shell oval, external or partially covered by the animal; aperture longer than shell; rounded at ends, lip sharp; columella short and concave.

GENUS BULLA Linné 1758 (BUBBLE SHELLS)

BULLA OCCIDENTALIS Adams. Western Bubble. Ovately oblong, opaque, solid; color usually pale red, variegated with wavy lines and brownish spots. Length 25 mm.

The most plentiful *Bulla* in Florida waters.

Pl. 53, Fig. 10

Florida to Texas; West Indies

BULLA SOLIDA Gmelin. Solid Bubble. Shell oblong, white, solid, epidermis light brown; strongly grooved at each end, smooth in center; last whorl keeled in middle, lip twisted and expanded; slight fold in columella. Length 35 mm.

Pl. 53, Fig. 9

Florida Keys and West Indies

BULLA STRIATA Bruguiere. Threaded Bubble. Shell ovate, solid, variegated with red-brown and red; apex umbilicated; aperture partly dilated below, narrowed above, outer lip depressed in middle; both ends spirally striated. Length 1 inch, often less.

Pl. 53, Fig. 17

Palm Beach County; Clearwater, Florida

Family Hydatinidae

Shell oval, highly colored; spire wide, depressed, outer lip sharp. Animal with large foot extending beyond shell; eyes small and black.

GENUS HYDATINA Schumacher 1817
(WATER-BLISTER SHELLS)

HYDATINA PHYSIS Linné. Shell thin, semi-pellucid, whitish, with wavy lines. Length 1 inch.

This remarkably handsome and striking shell is said to live upon clean sand but Frank Lyman reports its occurrence on weeds in Lake Worth, Florida.

Pl. 53, Fig. 13
Southern Florida; Gulf of Mexico;
West Indies

GENUS MICROMELO Pilsbry 1894 (Bullina Fer.)

MICROMELO UNDATA Bruguiere. Shell oval, umbilicated; yellowish white with transverse red lines, grooved surface, spaces between grooves punctured; apex sharp, whorls four; single fold on columella. Length 14 mm. It was first collected on the mainland by Mrs. Frank Lyman.

Pl. 53, Fig. 2
Deerfield, Florida to Florida Keys;
West Indies

Family Akeridae

GENUS HAMINOEA Turton and Kingston 1830
(Haminea "Leach" Gray 1847)

Small, very delicate shells; not strictly vegetarian. They inhabit muddy places near mouths of rivers. Animal much larger than shell which is more or less internal.

HAMINOEA ANTILLARUM Orbigny. Shell narrower above, swollen below, subtranslucent, often slightly greenish, normally horn colored; thickened outer lip starting from right side of center, produced high above vertex; upper portion of aperture twice width of lower. Length 10 mm.

The typical shells from the Florida west coast, almost white in color, are abundant.

Pl. 53, Fig. 22
Tampa, Florida southward; West
Indies

HAMINOEA ANTILLARUM GUADALUPENSIS Sowerby. Shell thin, distinctly compressed above, greenish yellow; surface with unevenly placed growth wrinkles; columella extremely concave and with white callus, making a

slight fold above. Length 18 mm.

It has been observed living upon tidal flats near the mouth of New River at Fort Lauderdale, Florida. A few also were taken in Upper Biscayne Bay. It is usually a larger shell than *H. antillarum* and more deeply colored.

Pl. 53, Fig. 4
White Water Bay and west Florida,
northward on east coast to Fort
Lauderdale, Florida

HAMINOEA ELEGANS Gray. Shell thin, pellucid, white or yellowish; sculptured with clear-cut incised straight spirals as if machine engraved; entire surface scored with minute, mingled with much coarser unequally spaced, grooves. Length 12 mm.

Rather frequently taken in drift, when conditions are favorable, near the Yamato rocks, east Florida. It probably lives somewhere nearby.

Pl. 53, Fig. 8
Florida to Brazil; Texas

HAMINOEA PETITII Orbigny. Shell truncated above, rounded below; color light yellowish green; imperforate; columella rather straight, not folded above. Length 9 mm.

Similar to *H. antillarum* but more cylindrical and columella straighter than in other West Indian Haminoea.

Pl. 57, Fig. 11
Tampa, Florida to West Indies

HAMINOEA SOLITARIA Say. Shell bluish white, fragile, last whorl enveloping all others; surface shining; fine, deeply impressed spiral grooves; vertex white, impressed in middle. Length 10 mm.

The imperfect opening in the region of the spire is characteristic. It is not rare upon the New England coast and New Jersey.

Pl. 71, Fig. 20
Massachusetts to Georgia

HAMINOEA SUCCINEA Conrad. Shell cylindrical, very thin, diaphanous, amber color; sculptured with minute wrinkled lines; columella concave or channelled below; animal dark brown. Length of shell 10 mm.

It is said to be common in Tampa Bay.

Pl. 56, Fig. 10
Florida; Texas; West Indies

Family Ringiculidae

GENUS RINGICULA Deshayes 1839

Shell solid, nearly white, aperture channelled and notched at base; outer lip thickened and often toothed or crenulated inside; columella edge strongly caloused with two to four folds.

RINGICULA NITIDA Verrill. Columella edge with two folds; whorls five, suture well impressed; aperture crescent shaped. Length 4.2 mm.

Pl. 53, Fig. 16
Bed of Gulf Stream off Florida;
West Indies; Europe

Family Philinidae

GENUS PHILINE Ascanius 1772

Shell internal, translucent, oval, spire rudimentary. Animal pale, eyeless.

The egg capsules are arranged in a single series on a long spiral thread.

PHILINE SAGRA Orbigny. Shell minute, pale yellow, finely spirally striate, exterior slightly lustrous; outer lip thin, deflected above, crenulate below; callus upon interior wall only discernible in center. Length 4 mm.

A single fresh example was dredged by the writer in the shallow water of Lake Worth, Florida, near the South Inlet. It was probably washed in from the ocean.

Pl. 53, Fig. 5
Pl. 65, Figs. 16, 16a
Off Cape Hatteras, North Carolina;
Palm Beach County, Florida; West
Indies

Family Tethyidae (SEA PIGEONS)

Neck and head narrower than the body; mouth an upright fissure; two folded lobes above head; two raised rhinophores behind these, in front of which are the eyes.

Shell nearly or quite covered by the mantle, a mere concave plate.

GENUS TETHYS Linné 1758, Aplysia of
Authors

Swimming lobes and foot well de-

veloped; shell thin with small pointed apex and concave posterior sinus.

TETHYS PROTEA Rang. Variable Tethys. Back much swollen, neck slender, tails pointed, foot of generous size, ring-shaped dark marks scattered upon surface. Shell 3 inches in length.

The variations in the color markings of the animal are considerable. It may be sought for in protected bays and tide pools. The very light shells become brittle when dry and are quickly scattered by the wind.

Pl. 50, Fig. 25
Florida; Bermuda; West Indies

TETHYS WILLCOXI Heilprin. Color of animal sea-green, tinged with purple, blotched and speckled with spots of lighter color. Shell about 2 inches in length, internal, horny-calcareous, deeply emarginate, both longitudinally and transversely striated. Length of animal 7-8 inches.

It emits a brilliant crimson fluid. It should be sought for at a depth of 2-3 feet and also upon the surface of the water. A variety has more recently been discovered in southern Massachusetts, Rhode Island and at Cape May, New Jersey.

Pl. 53, Fig. 15
Little Gasparilla Bay to Marco,
Florida

ORDER PTEROPODA

This group of animals is entirely pelagic, living upon floating gulf weed and essentially adapted to that environment. In the tropics they may be seen in countless numbers, swimming by a vigorous flapping of a pair of fins, upon the surface of the sea. Certain of the larger forms have lingual teeth and therefore may be gregarious in spite of their small size. In the north they form food for countless birds and also whales. Weeds from the Gulf Stream, containing the shells, are frequently thrown upon the Florida beaches but the specimens are often somewhat damaged, the delicate spines being lost.

These organisms are allied to the Gastropoda but are much lower in structure. They are said to be sensitive to light, heat, and perhaps odors. The true foot, strictly speaking, is only rudimentary

but the more useful fins largely replace it. These fins are placed near the mouth and neck.

When the shell is present it is usually glassy, often translucent, with dorsal and ventral plate united. Old, worn, or dead specimens often appear opaque.

The sexes are united, each individual possessing male and female organs which are located on the right side of the neck.

These mollusks show no affinity with the bivalves. There are certain characters which suggest the Cephalopoda but the Pteropoda are unique and deserve complete isolation in a separate order. They are possibly closest to the Gastropoda.

Family Limacinidae

Shell minute, spiral, sometimes operculate. The true fry are left-handed and on this account may easily be separated from Atlanta, Carinaria, and other Gastropods.

GENUS LIMACINA Cuvier 1817

Shell umbilicated, umbilicus marginal; no operculum.

LIMACINA TROCHIFORMIS Soul. The smallest of the American Pteropods. Diameter 1 mm.
N. 42° to S. 28°

LIMACINA BULIMOIDES Orbigny. Another very small form. Length 2 mm.
N. 35° to S. 48°

LIMACINA HELICINA Phipps. The illustration is of the radula enlarged.

Pl. 68, Fig. 14

Arctic Seas to Gulf of Maine

Family Cavoliniidae

GENUS CAVOLINA Gioeni 1785, Hyalaea Lamarck 1801

CAVOLINA TRISPINOSA Le Sueur. Shell compressed; three straight spines, one longer behind; longitudinally ribbed on ventral face; color whitish, almost transparent, smoky tinted. Length 10 mm.

Pl. 59, Fig. 12 (Shell)

Pl. 74, Fig. 115

N. 60° to S. 40°

CAVOLINA LONGIROSTRIS Le Sueur. Shell marked with five concentric ridges, upper face almost hemispherical, dorsal face ribbed, forming in front a long, folded, depressed beak; lateral spines compressed, middle spine truncated and short. Length 4 mm.

Pl. 49, Fig. 12

N. 47° to S. 40°

CAVOLINA GIBBOSA Rang. Shell somewhat inflated, ventral face with high sharp ridge, this portion striated, the rest finely reticulated; dorsal face convex, almost smooth or with seven faint ridges; upper lip turned sharply downward; lateral spines short, close together, middle spine stout, short and a little curved upward. Length 9 mm.

Pl. 59, Fig. 8

N. 43° to S. 41°

CAVOLINA TELEMUS Linné (*C. tridentata*). One of the largest forms in this group and often represented in collections. Length 18 mm.

Pl. 74, Fig. 113

Pl. 59, Fig. 9

N. 40° to S. 40°

CAVOLINA UNCINATA Rang. Much swollen ventrally, surface finely and evenly reticulated, fine ridges in front; dorsal surface with three low radiating ribs, evenly rounded at aperture, turned downward; lateral spines compressed and curved a little backward; middle spine short, stout and turned upward. Color pale amber. Length 9 mm.

Pl. 74, Fig. 116

N. 40° to S. 40°

CAVOLINA INFLEXA Le Sueur. Shell long, compressed, ventral face a little inflated; dorsal face indistinctly three ribbed; lateral spines small, turned backward slightly; central spine long, stout and curved upward. Length 5 mm.

N. 40° to S. 42°

GENUS CRESEIS Rang 1828

CRESEIS ACICULA Rang (*S. recta* of authors). Pelagic.

Pl. 74, Fig. 118

N. 48° to S. 40°; Gulf of Mexico

CRESEIS CONICA Eschscholtz (S. vitrea Ver.)
Pelagic.

Pl. 74, Fig. 112
N. 40° to the tropics; Gulf of
Mexico

GENUS HYALOCYLIS Fol 1875

HYALOCYLIS STRIATA Rang. Pelagic.
Pl. 74, Fig. 119
N. 40° 6', W. 68° 6', alive to
S. 40°; Gulf of Mexico

GENUS STYLIOLA Le Sueur 1826

STYLIOLA SUBULA Quoy and Guimard. Length
10 mm.

Pl. 59, Fig. 11
N. 41° to S. 40°

GENUS CLIO Linné 1767; Cleodora Peron
and Le Sueur 1810

Shell pyramic-shaped; three sided,
ventral side flat, dorsal side keeled;
aperture triangular; apex acute.

The internal organs, including the
heart and gills, may be seen functioning
in living examples through the glassy shell.

CLIO PYRAMIDATA Linné. The specimen il-
lustrated is from off Georges Bank in 1290
fathoms, temperature 40°. Length 15 mm.

Pl. 57, Fig. 15
Spitzbergen to S. 40°

SECTION BALANTIUM Benson 1837

CLIO RECURVA Children.
Pl. 59, Fig. 10
Pelagic N. 40° to S. 33°

GENUS CUVIERINA Boas 1886
Cuvieria Rang 1827

CUVIERINA COLUMNELLA Rang. Length 12 mm.
Pl. 74, Fig. 117
N. 43° to S. 40°

Family Cymbuliidae

GENUS COROLLA Dall 1871

COROLLA CALCEOLA Verrill.
Pl. 74, Fig. 120
1 mile off Gay Head, Massachusetts
and in N. 40° 6', W. 68° 6'

Family Clionidae

GENUS CLIONE Pallas 1774, Clion of
Authors

CLIONE LIMACINA Phipps.
Pl. 74, Fig. 122
Davis Strait to N. 37°

ORDER ACOELA

Family Umbraculidae

GENUS UMBRACULUM

Shell limpet-shaped, much depressed,
concentric growth lines well marked; apex
oblique and very little raised; edge sharp;
muscle impression well marked inside shell.
A curious feature is the very minute left-
handed nucleus. The animal is extremely
large, the mantle not extending beyond the
shell.

UMBRACULUM PLICATULUM Martens. Coiled Um-
brella. This apparently is the first rec-
ord for the species within the United States.
The specimen obtained upon the beach at
Deerfield was perfectly fresh but did not
contain the animal. Length 28 mm.

Pl. 28, Fig. 1
Deerfield, east Florida to West
Indies

Family Pleurobranchidae

GENUS KOONSIA Verrill 1882

KOONSIA OBESA Verrill. Range 192-312 fath-
oms.

Pl. 66, Fig. 7
Off Delaware Bay

Family Heterodoridae

GENUS HETERODORIS Verrill and Emerton 1882

HETERODORIS ROBUSTA Verrill and Emerton.
458 fathoms.

Pl. 66, Fig. 5
Off Martha's Vineyard, Massachusetts

- - - - -

Family Dorigitidae

GENUS GEITODORIS Bergh 1891

GEITODORIS COMPLANATA Verrill. Range 85-146 fathoms.

Pl. 66, Fig. 6

South of Martha's Vineyard

SUBCLASS PULMONATA

(Air Breathers)

ORDER BASOMMATOPHORA

Family Ellobiidae (Auriculidae)

Amphibious mollusks, breathing air but apparently dependent upon plenty of moisture, living close to the sea. Members of certain genera are covered by the tide four hours out of twelve.

Shell spiral with a horny epidermis; aperture long, with strong folds on inner lip, outer lip often toothed or grooved inside.

Animal with respiratory orifice on the right side.

GENUS AURICULASTRUM Fischer 1883
(EAR SHELLS)

Mantle margin of animal thickened; foot simple.

AURICULASTRUM PELLUCENS Menke. Transparent Ear Shell. This was collected by Rhoades near Miami, Florida, only in and under the soft rotten mangrove branches which lay on the mud in the mangrove swamps along the bay side. They deeply imbed themselves in the rotten wood. It also has been reported from Sanibel and Highland Point, west Florida. Length 18 mm.

Pl. 55, Fig. 2

Cedar Keys, west Florida to Demerara

GENUS PHYTIA Alexia Gray 1847

Shell thin, spire pointed; inner wall with one to five teeth, outer lip with teeth or thickening inside.

PHYTIA MYOSOTIS Drap. Shell semitransparent, smooth, shining; whorls seven to eight; outer lip expanded and thickened, some-

times with tooth-like folds on inside; sharp white teeth below inner wall and a smaller one above it. Length 8 mm.

This shell probably was introduced to America from Europe through commerce.

Pl. 55, Fig. 3

Nova Scotia to West Indies

GENUS TRALIA Gray 1840

TRALIA PUSILLA Gmelin. Shell a rich deep chestnut-brown color, often almost black; varying in shape from oval to elongate; one fold upon columella, two upon parietal wall; outer lip thickened, inflected in center with single revolving ridge on its inside. Length 13 mm.

Collected by Earl Moore at Miami, Florida.

Pl. 55, Fig. 6

Pl. 67, Fig. 5

Miami, Florida southward to Guadeloupe, West Indies

GENUS PEDIPES Scopoli 1777
(STEPPING SHELL)

Foot of animal divided inferiorly by a transverse groove. Shell subrounded, transversely ridged, spire short; inner lip with three plaits, outer lip with two internal teeth, lip margin sharp.

The generic name was applied on account of the peculiar mode of progression. The animal moves by a series of little steps and the strange movements are executed with such rapidity that Pedipes is one of the most agile of mollusks.

PEDIPES ELONGATUS Dall. Shell longer and more pointed than the following species; comparatively smooth; suture lightly impressed. Length 4 mm.

Pl. 67, Fig. 4

Marco, west Florida

PEDIPES MIRABILIS Muhlfield. Shell small, whorls about four, sometimes shouldered; whorls lirate spirally; outer lip sometimes callous and with low teeth inside, both sometimes absent. Length 3 mm.

This Pedipes enters shallow water near the inside of the North Inlet at Palm Beach, apparently to deposit its eggs in the late spring, later returning to deeper water. It may be observed under stones between tide marks. A variety is shown on Pl. 67.

Pl. 55, Fig. 8
 Pl. 67, Fig. 17
 Tampa, Florida to West Indies; Palm
 Beach, Florida

Family Siphonariidae

Shell limpet-shaped; apex near center; muscular impression horseshoe-shaped; on right side a deep siphonal groove, making a slight projection on the margin.

The animals are remarkable in possessing both lungs and gills, being amphibious. They live between tide marks and usually individuals are numerous. South Africa appears to be their metropolis so far as number of species is concerned. The largest one lives at Panama.

This interesting family, in a way, connects the marine mollusks with their gills, and the pulmonates which are equipped with lungs.

GENUS SIPHONARIA Sowerby 1824
 (SIPHON SHELLS)

SIPHONARIA ALTERNATA Say. Alternated Siphon. Shell conical; thirty or more obsolete ribs, hardly elevated, unequal in size; apex curved and its tip pointed nearly in a parallel direction with surface of shell; color brown, rayed with white; breadth 8mm.

It is abundant on No Name Key, Florida, near the ferry dock.

Pl. 55, Fig. 10
 Bermuda; east Florida; Cuba, Yucatan

SIPHONARIA NAUFRAGUM Stearns (*S. lineolata* Orbigny). Ship-Wrecked Siphon. Shell white or brown with radiating blackish lines which are plainly visible; groove distinct; sculpture fine and close. Length 1 inch.

A very plentiful shell upon the rock jetties in Palm Beach County, Florida.

Pl. 55, Fig. 9
 Florida east coast; Cuba

GENUS MELAMPUS Montfort 1810
 (BLACK FOOT)

Aperture of shell long, narrow; inner lip with several tooth-like projections; outer lip sharp and with ridges extending inside.

Melampus lives mostly out of the water upon land which is subject to over-

flow. It clings to grass-like plants in shaded spots, close to the ground, and also crawls about in wet places. When a colony is discovered there are usually countless numbers of individuals.

MELAMPUS BIDENTATUS Say (*M. lineatus* Say). Shell horn-colored or reddish; whorls four to five; spire short, body whorl $\frac{5}{6}$ the length of shell; grooves sometimes present inside outer lip; single tooth upon inside wall, also tooth-like fold below and extending inside. Length 10 mm.

Very common upon salt marshes near high-water mark. The young shells, shining and banded are prettier than the adults.

Pl. 55, Fig. 11
 Pl. 67, Fig. 12
 New England to the West Indies

MELAMPUS COFFEUS Linné. Cone-shaped, solid, and heavy; surface fawn colored under epidermis; narrow white band at shoulder, two narrow light bands below upon a lead or lurid brownish ground; umbilicus rimate or closed; numerous ridges inside outer lip; two white folds on inside wall, the upper one most prominent. Length 18 mm.

The remarkable fact about this form is that the interior partitions and axis are often entirely absorbed by the animal to afford more space. The light-colored bands are sometimes absent.

At Cape Sable, Florida and on some of the Florida Keys very large races of this species occur.

Pl. 55, Fig. 7
 Pl. 67, Fig. 3
 Southern Florida; West Indies

MELAMPUS FLAVUS Gmelin. Shell varying from brown to chestnut; usually with two but sometimes three bands, the upper on the strong shoulder; base sometimes white; single fold upon columella; white teeth inside outer lip rather irregular. Length 14 mm.

The single columellar fold is the most constant character but this shell is often difficult to separate from *M. coffeus*. There are usually two columella folds in the latter.

Pl. 55, Fig. 12
 Pl. 67, Fig. 1
 West Florida to Florida Keys; West Indies

MELAMPUS FLORIDANUS Shutt. Shell thin,

smooth; grayish with brown bands; whorls ten; aperture narrow, angular, lip acute. Length 7.5 mm.

Pl. 55, Fig. 5

Pl. 67, Fig. 2

Tampa Bay, Florida to Florida Keys

GENUS DETRACIA Gray 1840

DETRACIA BULLOIDES Montagu. Shell heavy, thick, shining, brownish with white revolving bands; whorls ten, tapering toward base; six to eight elongated ridges inside but not quite reaching outer lip. Length 11 mm.

On Big Pine, one of the lower Florida keys, Detracia lives under stones and bits of wood not far from the ocean beach.

Pl. 55, Fig. 1

Pl. 67, Fig. 7

Cedar Keys, West Florida to Florida Keys

GENUS SAYELLA Dall 1885

SAYELLA CROSSEANA Dall. Length 2.5 mm.

Pl. 67, Fig. 10

Egmont Key, Florida; West Indies

SAYELLA HEMPHILLII Dall. Length 3.75 mm.

Pl. 67, Fig. 11

Cedar Keys, Florida

GENUS BLAUNERIA Shuttleworth 1854

BLAUNERIA HETEROCLITA Montagu.

Pl. 67, Fig. 14

Tampa, Florida to West Indies; Europe

Family Piliidae

The "apple snails" are fluviatile. The breathing cavity being partly closed they are able to remain out of water for long periods, even years in times of drought.

The animal's tentacles are long, the lips so modified that they resemble an additional pair of tentacles. On the left side of the mantle is a long siphon; large pulmonary sac on each side of mantle cavity; operculum usually completely closing aperture.

In the mightiest of rivers such as the Amazon and its tributaries, the Ganges, and the Nile, live the largest and finest species. A South American bird has a beak especially designed for entrance under the operculum of a Pomacea.

GENUS POMACEA Perry

All of the species which inhabit the Western Hemisphere are provided with a horny operculum and are placed under this genus.

POMACEA PALUDOSA Say. Spire of shell much depressed, whorls four, pale olive or brown with greenish or brownish lines. Length 1.5 inches.

This fresh-water snail apparently lives in every Florida county. It prefers a muddy station and a sluggish stream or pond. At night it is most active and should be sought for with a flashlight. The writer observed a large number of adolescent individuals living under water hyacinths in the St. John's River near Orange, Florida. In Volusia County it also occurs plentifully as a fossil in the shell-gravel pits, the material from which is used as a top dressing for minor roads. Large numbers of dead and bleached specimens may be seen upon the banks of canals throughout the state and elsewhere in the south. The eggs are shown in Fig. 52.

Pl. 57, Fig. 13

South Carolina to Louisiana

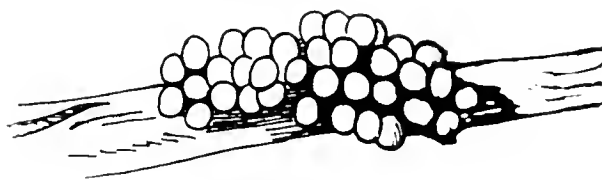


Fig. 52

Eggs of Pomacea

POMACEA PALUDOSA FLAVA Pilsbry. A striking yellow shell, without bands. This variety has been collected in canals near Pinecrest on the Tamiami Trail.

Central Everglades and near Miami, Florida

CLASS CEPHALOPODA

Here are placed the octopods, nautili, cuttlefish, Spirula, and other highly organized forms. Structurally these are similar to other mollusks but their mode of living is entirely different. Many of them are active swimmers, swift in motion, contrasting with the relatively slow clam and snail.

The common squid (*Loligo pealii*) remains in deep water during the winter but about May 1st enters shallow water in order to lay its eggs.

The orders under the Cephalopoda are arranged with respect to the number of gills together with other internal organs and also the character of the shell.

SUBCLASS DIBRANCHIATA

ORDER DECAPODA

Family Spirulidae

Animal with elongate tentacular arms; cups numerous, evenly spaced, in six series and very small; body sometimes provided with a thickened belt and a small fleshy fin on each side; eyes covered with skin, lower eyelid present.

Shell internal, of shelly nature, spiral, chambered, the chambers provided with a siphon, the last of sufficient size to contain a very small portion of the animal. See Fig. 53.

GENUS SPIRULA Lamarck 1799
(SPIRAL SHELLS)

Whorls of shell separated from each other; septa or plug outwardly concave, provided with a funnel-shaped siphon on inner or curved side and reaching into each cell without these directly communicating with each other.

SPIRULA SPIRULA Linné. The only known species of the genus. It lives in the open sea. The shell is white and pearly;



Fig. 53
Spirula spirula.
Showing position
of internal
shell

the two to three revolutions not making contact. Breadth 1 inch.

This interesting shell, much resembling a ram's horn, is common upon southern beaches.

Pl. 28, Fig. 6
Nantucket and Cape
Cod, Massachusetts
southward to the
tropics

SPIRULA SPIRULA LINNÉ

Charles W. Johnson, late editor of "The Nautilus" after hearing a paper read by J. Henry Blake at a meeting of the Boston Malacological Club composed the following lines which admirably describe the history and habits of *Spirula*.

"The chambered shells of the *Spirula*
As they float upon the sea,
Are cast on a thousand beaches
For any one to see;
But the animal that made this shell
Was long a mystery.

Linné called it *Nautilus spirula*
Which was not a very bad guess.
Lamarck called it *Spirula peroni*
(Though he'd first named it *fragilis*);
And thus quite early was started
A nomenclatorial mess.

Some said with that disk-like sucker
Attached it must surely grow,
While the rudimentary fins would prove
As a swimmer it must have been slow;
Then the chromatophores would indicate
That it lived in the mud, you know.

- - - - -

'Twas the Dana Expedition
That discovered Spirula's home
Far above the oozy bottom
And below the great waves' comb;
For bathypelagic is the Spirula
And there's where it loves to roam.

It only lives in the warmer seas,
At more than a thousand feet,
Suspended head down in the water
A position hard to beat—
Though doubtless it is its chambered
shell
That aids it in this feat.

And now they say that the "sucking disk"
Is really a lamp instead,
And perhaps its lighter color is due
To its standing on its head:
But, alas! poor little Spirula
Can't rest in the ocean's bed."

ORDER OCTOPODA

Family Argonautidae

Male very small, without arms or shell; female provided with a symmetrical shell which is secreted by thin terminal expansions of the two dorsal arms. All other molluscan shells are secreted by the mantle but Argonauta uses its arms to perform this function.

Prior to the year 1839 two eminent naturalists of their day, Gray and de Blainville, advanced a fantastic theory with respect to the animal of Argonauta. Their strange hypothesis maintained that the inhabitant of the "Paper Nautilus" was a parasite incapable of producing a protection of its own while the original builder was a Heteropod.

In 1839 Madame Jeannette Power working in her vivarium at Messina, Sicily, made a series of observations upon Argonauta. She demonstrated that the young when first excluded from the egg is naked, and that after ten to twelve days the shell begins to appear being deposited by the two web-like arms and that when broken it is repaired through the same agent.

The ^{shell} body is thin and translucent, not shaped to conform to the body of the animal nor attached by shell muscles. The hollow of the spire, not occupied by the

animal, provides a repository for the eggs, also a protection and serves in their incubation. It is nearly equivalent to the float in Janthina. The Argonauta literally sits in its boat with the sail-shaped arms close to its sides and used as oars. Propulsion is accomplished by ejection of water from the funnel but when crawling it assumes a reversed position with the shell upon its back like a snail (Power and Rang).

The male Argonauta is said to be only an inch in length and provided with a sac in the form of a separate arm which is used in mating time.

GENUS ARGONAUTA Linné 1758 (ARGONAUTS)

ARGONAUTA ARGO AMERICANA Dall. The well-known "Paper Nautilus." The specimen figured is abnormal in that a break in the shell necessitated a resumption of construction on the outer edge which resulted in a break of the continuity. Average length 5 inches.

This fine shell is often taken on the beaches of Florida after winter storms, sometimes containing the animal. Depth range 0-1917 fathoms.

Pl. 28, Fig. 2

Pl. 66, Fig. 1, 1a, 1b

Massachusetts to West Indies; warm oceans generally.

ARGONAUTA HIANS Solander (A. gondola Dillwyn.) Shell with few, well-separated, ribs; surface smooth, polished. The specimen illustrated measures 28 mm. and was taken at Boynton, East Florida.

Pl. 28, Fig. 3

South Atlantic; Pacific

Family Octopodidae

Among the Cephalopoda the Octopus stands at the head being the most highly developed, possibly, of all mollusks. It presents a decided contrast to the other sedentary and harmless mollusks which belong to the other great classes, Fig. 54.

The Octopus is indeed the pirate or outlaw of the sea. It usually lives in some rocky hole, the approaches to which are often strewn with the bones or remains of its victims. The suckers are used for attachment to its prey and also to prevent

dislodgement from some solid object to which it has become fastened. The color changes of the body are significant and denote the emotional changes which take



Fig. 54
Octopus, a At rest, b Swimming, f Funnel

place when the animal is disturbed or attracted by food. It is possible for the Octopus to escape detection by assuming a color which harmonizes with its environment. The pigment cells connect with the optic nerves so that what the animal sees results in a reflex action suited to the battle for existence.

The head is large, arms long and more or less webbed. There is considerable variation in the size and length of the arms in the different species. They are very voracious and exceedingly active animals. The eggs are deposited on seaweed or in cavities of dead shells. The chestnut-brown ink which is discharged for a smoke-screen is characteristic and well known. Viewed in the dark the animals are slightly phosphorescent. In the male Octopus the right arm is more developed than that upon the opposite side and is used for breeding purposes.

GENUS OCTOPUS Lamarck 1798

OCTOPUS VULGARIS Lamarck. In this species the body is small, the arms very large and unequal in length. The over-all length is often around 2 feet.

Widespread in Atlantic; Mediterranean; Red Sea; Pacific

OCTOPUS RUGOSUS Bosc. Body purse-shape, back granular, rough, with a deep ventral groove; color violet-brown, white underneath, brown lines forming network on sides of arms. Length about 8 inches.

Confirmation of the presence of these two species in east coast waters is desired.

North Carolina to Florida; warm seas elsewhere

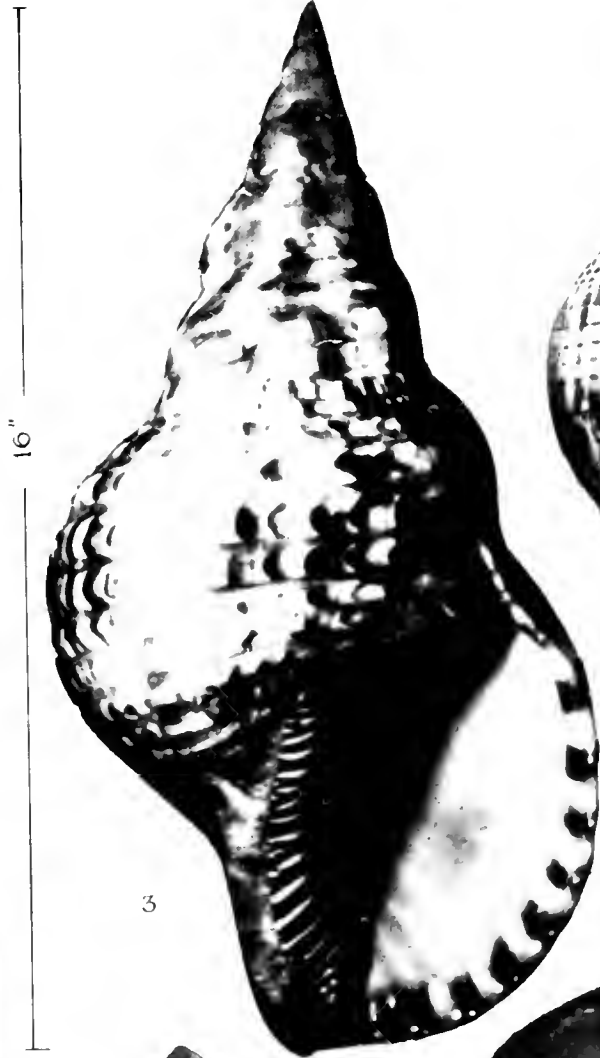
P L A T E S

P L A T E 1

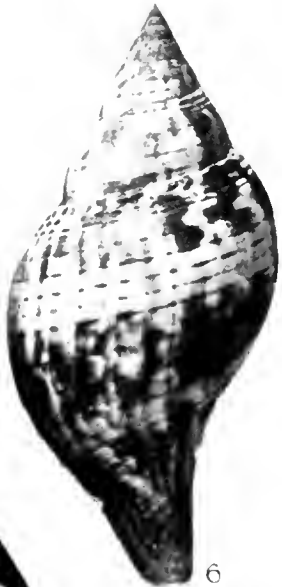
1. *Cassis madagascarensis* Lamarck. Lake Worth, Florida. 10 inches. p. 111.
2. *Cymatium cingulatum peninsulum* Smith. Lake Worth, Florida. 2.75 inches.
p. 113.
3. *Charonia tritonis nobilis* Conrad. Key West, Florida. 16 inches. p. 113.
4. *Maculopeplum junonia* Chemnitz. West Florida. 3 inches. p. 128.
5. *Fasciolaria distans* Lamarck. West Florida. 2.5 inches. p. 126.
6. *Fasciolaria tulipa* Linné. West Florida. 3 inches. p. 126.



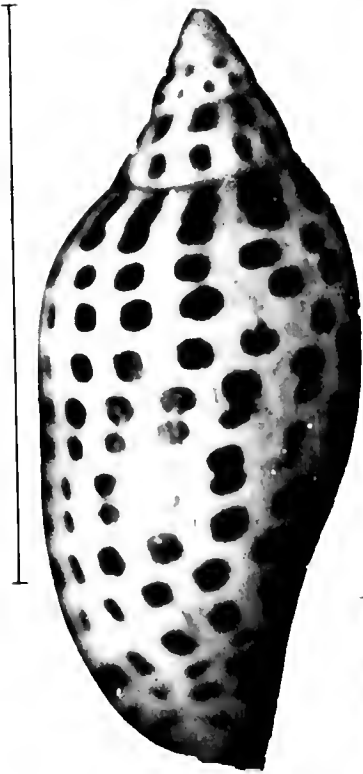
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1

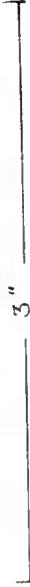
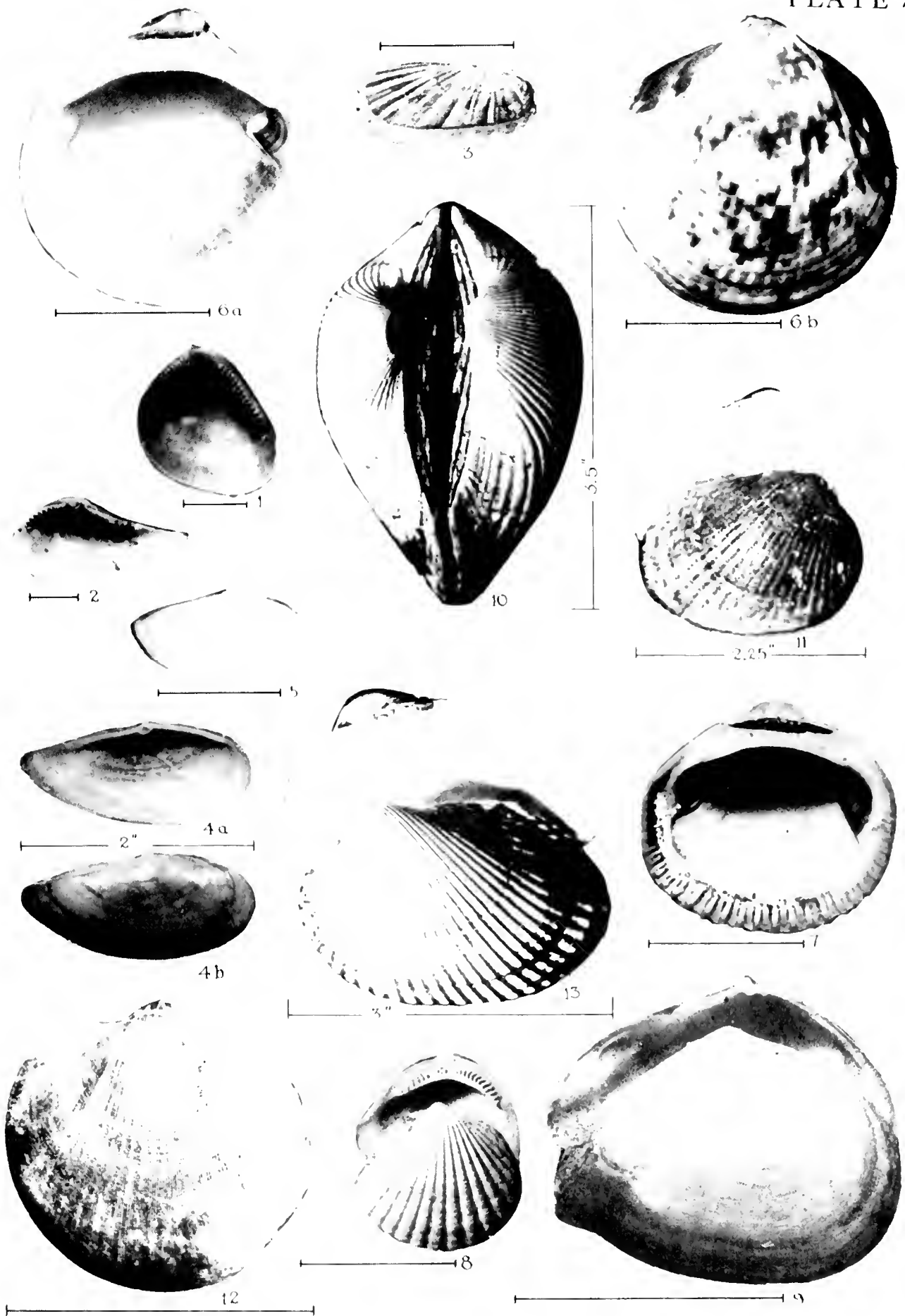


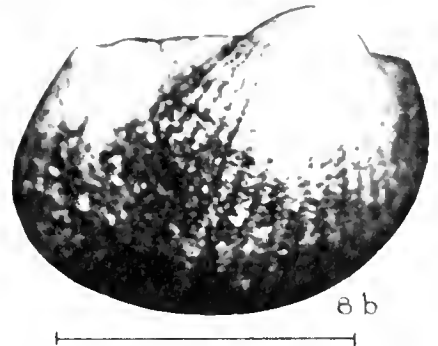
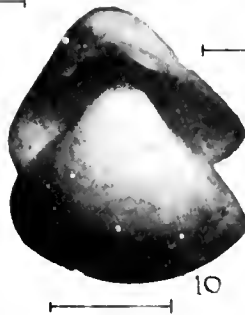
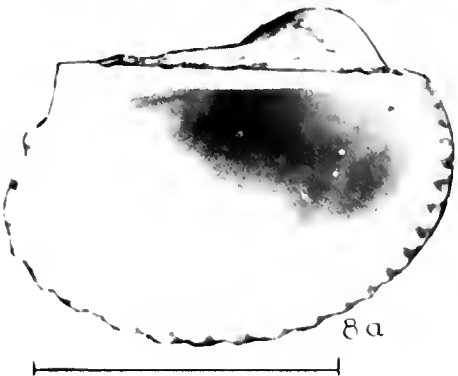
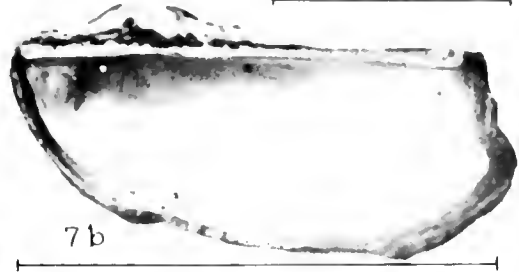
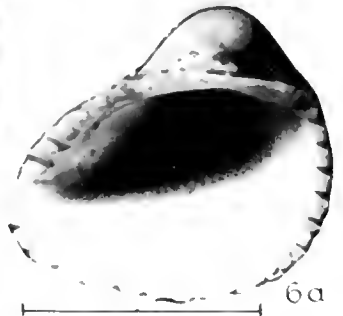
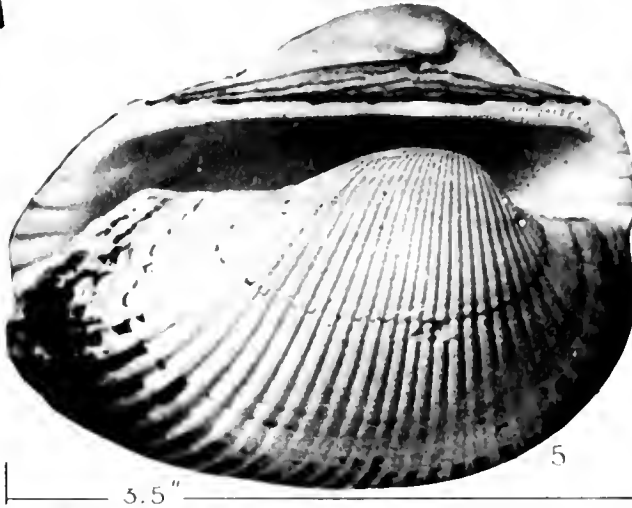
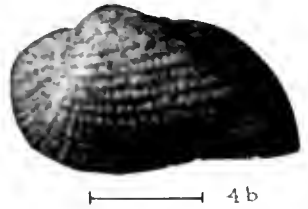
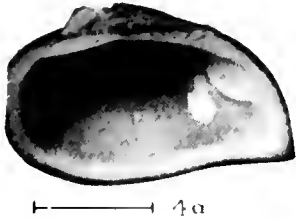
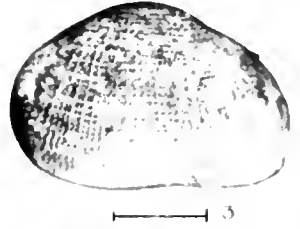
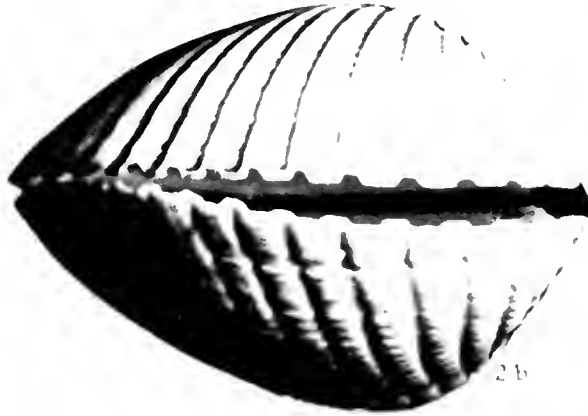
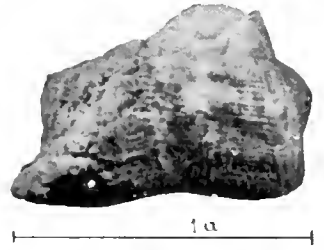
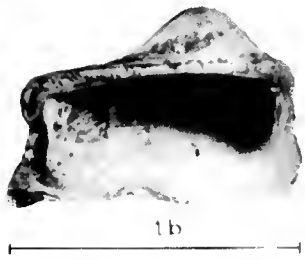
PLATE 2

1. *Nucula proxima* Say. West Florida. 12 mm. p. 25
2. *Nuculana acuta* Conrad. Sanibel, Florida. 9 mm. p. 26.
3. *Solemya velum* Say. New England. 1 inch. p. 25.
- 4a, 4b. *Yoldia limatula* Say. Raritan Bay, New Jersey. 2 inches. p. 26.
5. *Yoldia sapotilla* Gould. Maine. 23 mm. p. 26.
- 6a, 6b. *Glycymeris americanus lineatus* Reeve. Yamato, Florida. 29 mm. p. 29.
7. *Glycymeris pennaceus* Lamarck. Yamato, Florida. 29 mm. p. 29.
8. *Glycymeris pectinatus* Gmelin. Florida Keys. 29 mm. p. 29.
9. *Macoma constricta* Bruguiere. Sanibel, Florida. 2 inches. p. 59.
10. *Arca secticostata* Reeve. Sanibel, Florida. 3.5 inches. p. 27.
11. *Arca campechiensis pexata* Say. Long Island, New York. 2.25 inches. p. 26.
12. *Glycymeris americanus* DeFrance. Vieques, Porto Rico. 60 mm. p. 29.
13. *Arca campechiensis americana* Wood. North Carolina. 3 inches. p. 27.



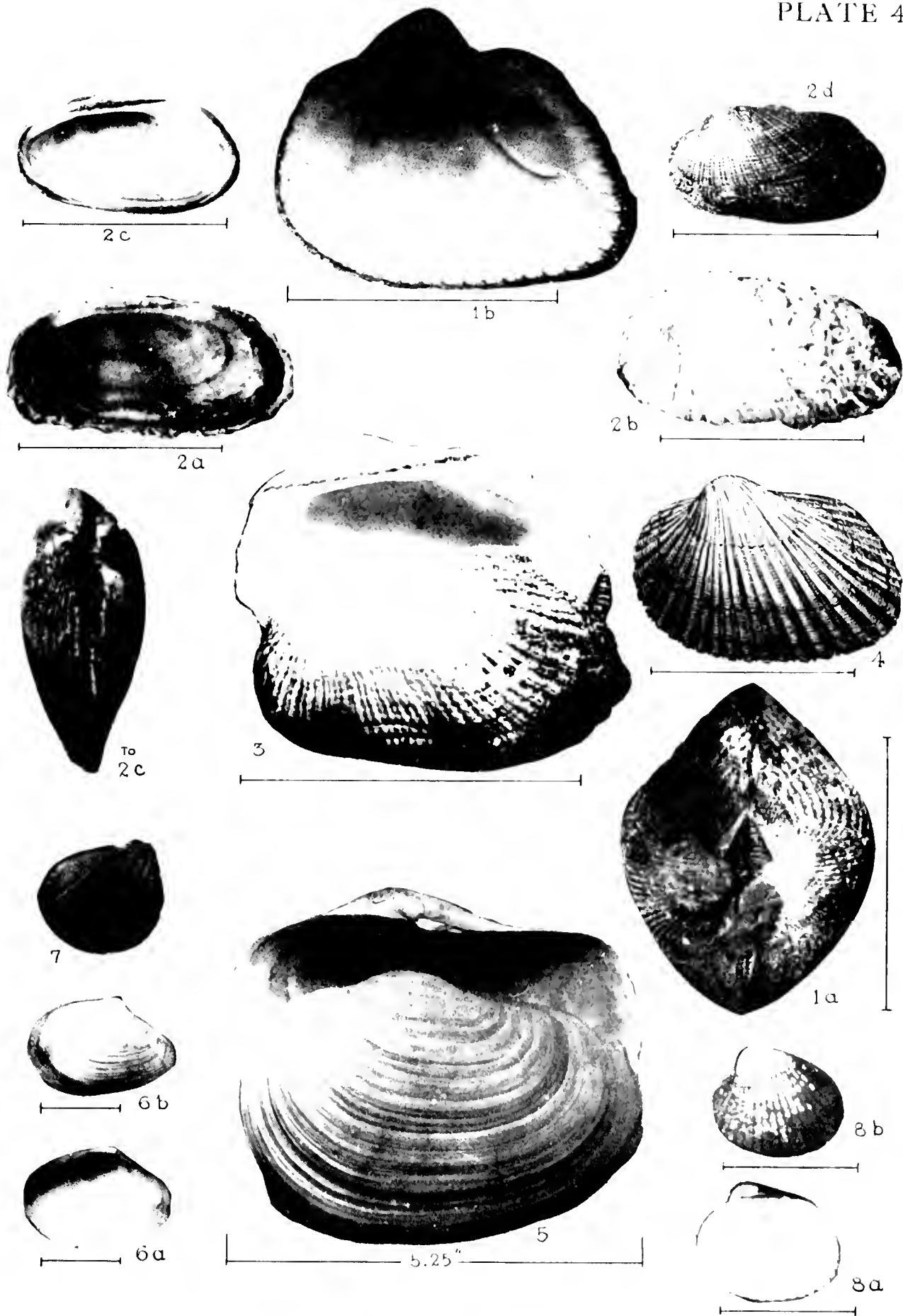
P L A T E 3

- 1a, 1b. *Arca umbonata* Lamarck. Florida Keys. 1.5 inches. p. 27.
- 2a, 2b. *Arca incongrua* Say. Wilbur, Florida. 2 inches. p. 27.
- 3. *Arca adamsi* E. A. Smith. Florida Keys. 12 mm. p. 28.
- 4a, 4b. *Arca reticulata* Gmelin. Florida Keys. 15 mm. p. 28.
- 5. *Arca secticostata* Reeve. Sanibel, Florida. 3.5 inches. p. 27.
- 6a, 6b. *Arca chemnitzii* Philippi. St. Thomas, W. I. 1.25 inches. p. 27.
- 7a, 7b. *Arca occidentalis* Philippi. Sanibel, Florida. 2.5 inches. p. 27.
- 8a, 8b. *Arca auriculata* Lamarck. Bahamas. 40 mm. p. 26.
- 9. *Mulinia lateralis* nucleus Conrad. Connecticut. 12 mm. p. 65.
- 10. *Mulinia lateralis* corbuloides Desh. Mayport, Florida. 16 mm. p. 65.



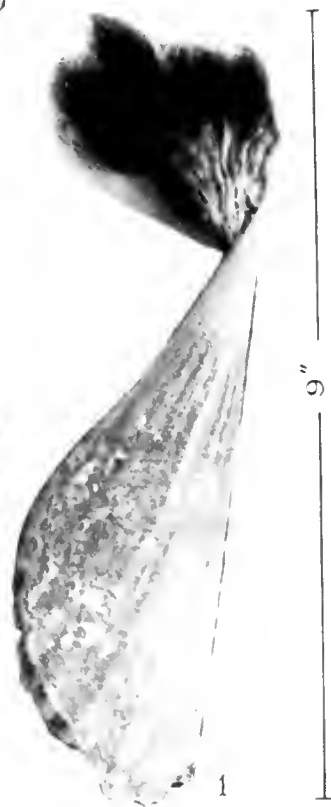
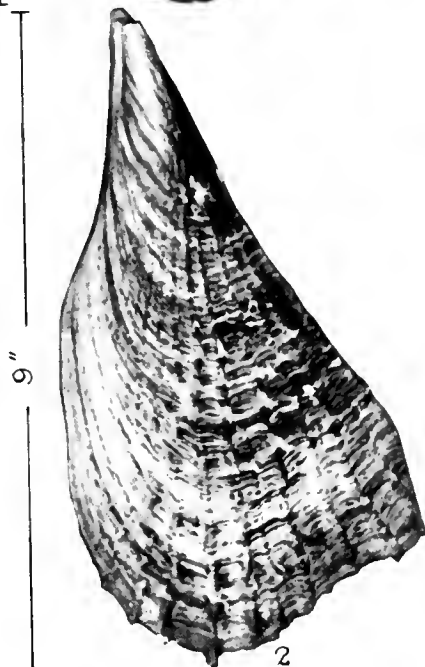
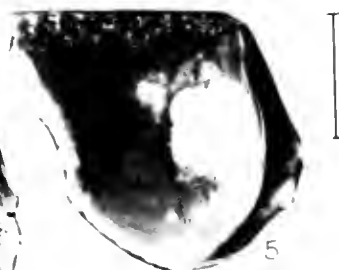
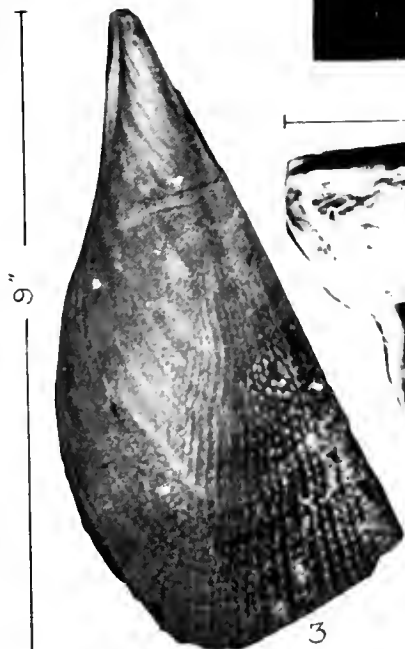
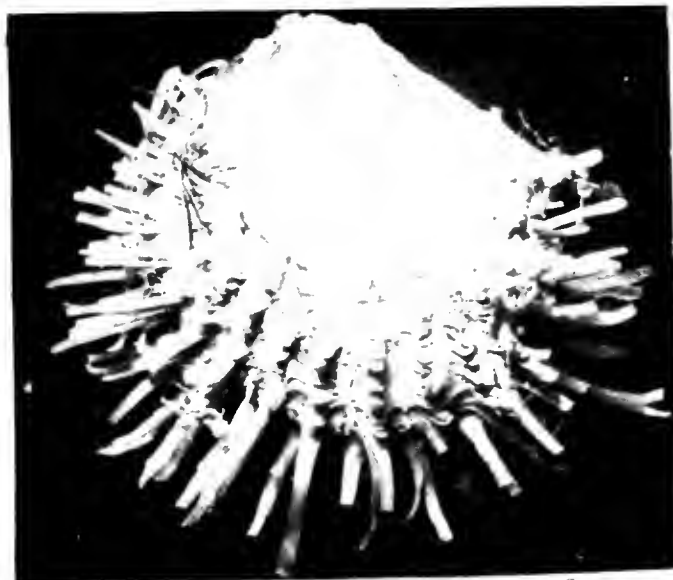
P L A T E 4

- 1a, 1b. *Noetia ponderosa* Say. Sanibel, Florida. 2 inches. p. 28.
- 2a, 2b. *Arca barbata* Linné. Lower Matecumbe Key, Florida. 1.5 inches. p. 28.
- 3. *Arca candida* Guilding. Yamato, Florida. 2-2.5 inches. p. 28.
- 4. *Arca transversa* Say. New England. 1.5 inches. p. 27.
- 5. *Panope bitruncata* Conrad. Florida tertiary. 5.25 inches. p. 68.
- 6a, 6b. *Periploma undulata* Verrill. Off Long Island, New York. 15 mm. p. 40.
- 7. *Montacuta floridana* Dall. West Florida. p. 48.
- 8a, 8b. *Arca campechiensis* Gmelin. Cameron, Louisiana. 1 inch. p. 26.



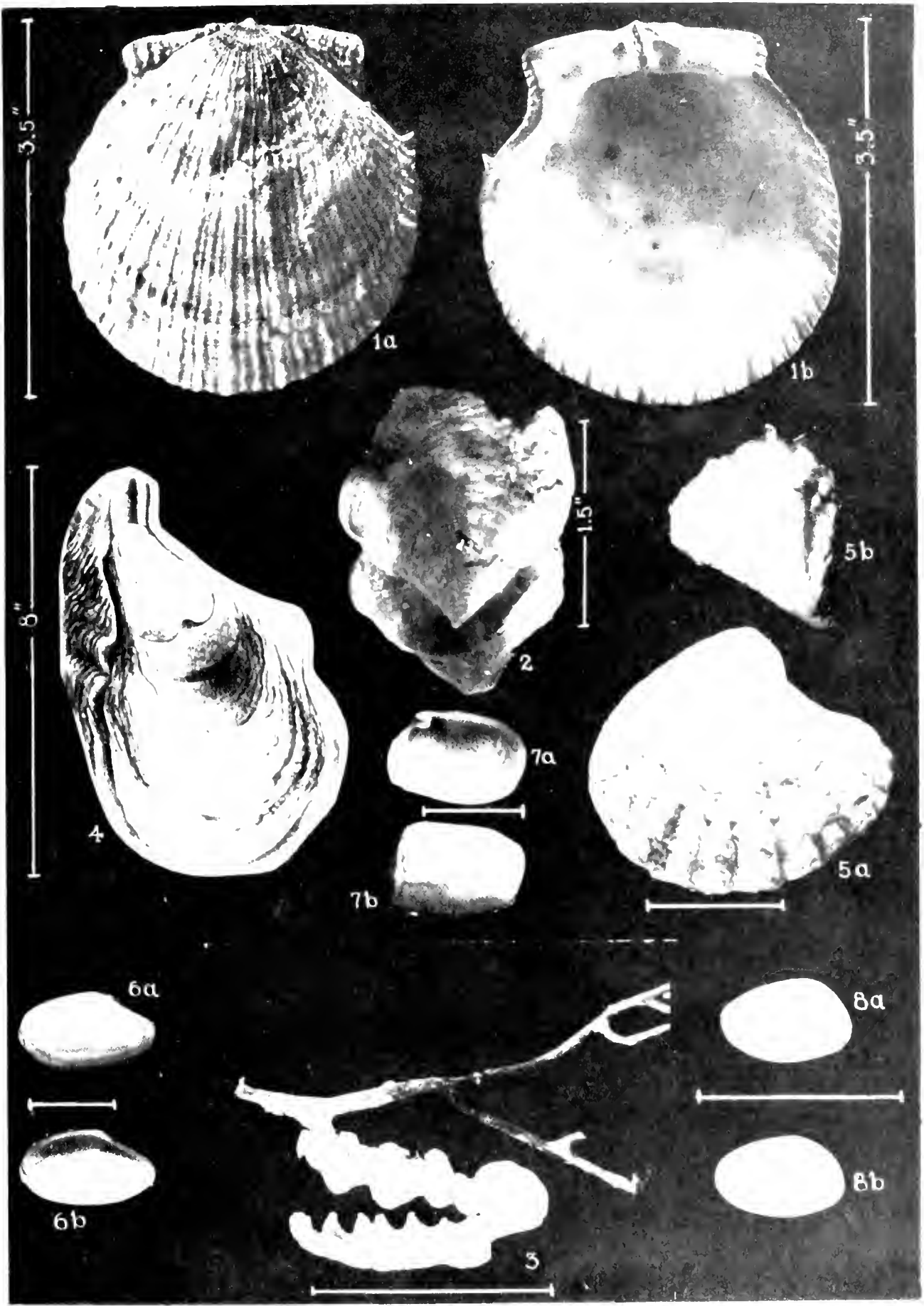
P L A T E 5

1. *Pinna carnea* Gmelin. Tortugas. 9 inches. p. 29.
2. *Atrina rigida* Dillwyn. Sanibel, Florida. 9 inches. p. 30.
3. *Atrina serrata* Sowerby. Sanibel, Florida. 9 inches. p. 30.
4. *Pedalion alata* Gmelin. Angel Fish Creek, Florida. 3 inches. p. 31.
5. *Pedalion semiaurita* Linné. Near Jupiter, Florida. 16 mm. p. 31.
6. *Pinctada radiata* Lamarck. West Florida. 2 inches. p. 30.
7. *Pteria colymbus* Roeding. Sanibel, Florida. 3.5 inches. p. 30.
- 8a, 8b. *Pedalion listeri* Hanley. Florida Keys. 35 mm. p. 31.



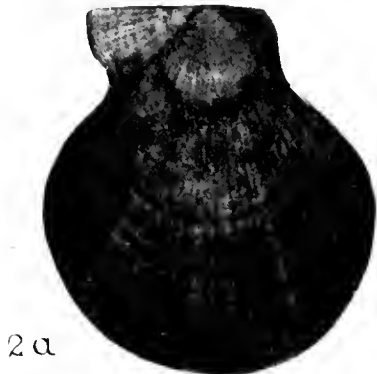
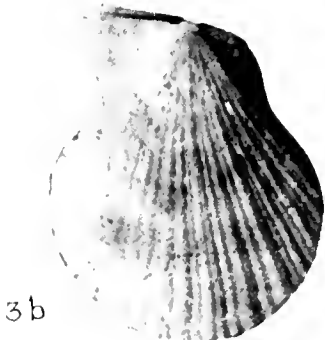
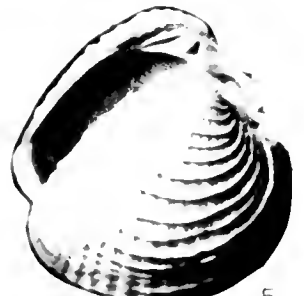
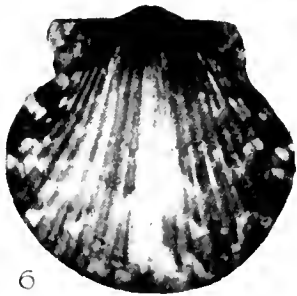
P L A T E 6

- 1a, 1b. *Spondylus americanus* Hermann. Florida Keys. 3.5 inches. Beach valves, lacking spines. p. 32.
2. *Ostrea permollis* Sowerby. Sanibel, Florida. 1.5 inches. p. 31.
3. *Ostrea frons* Linné. Sanibel, Florida. 45 mm. p. 31.
4. *Ostrea virginica* Gmelin. Virginia. 8 inches. p. 32.
5. *Plicatula gibbosa* Lamarck. Sanibel, Florida. 1 inch. p. 32.
6. *Macoma tenta* Say. Bermuda. 15 mm. p. 59.
7. *Periploma angulifera* Philippi. Charleston, South Carolina. 18 mm. p. 40.
8. *Mesodesma arctata* Conrad. New England. 1.5 inches. p. 66.



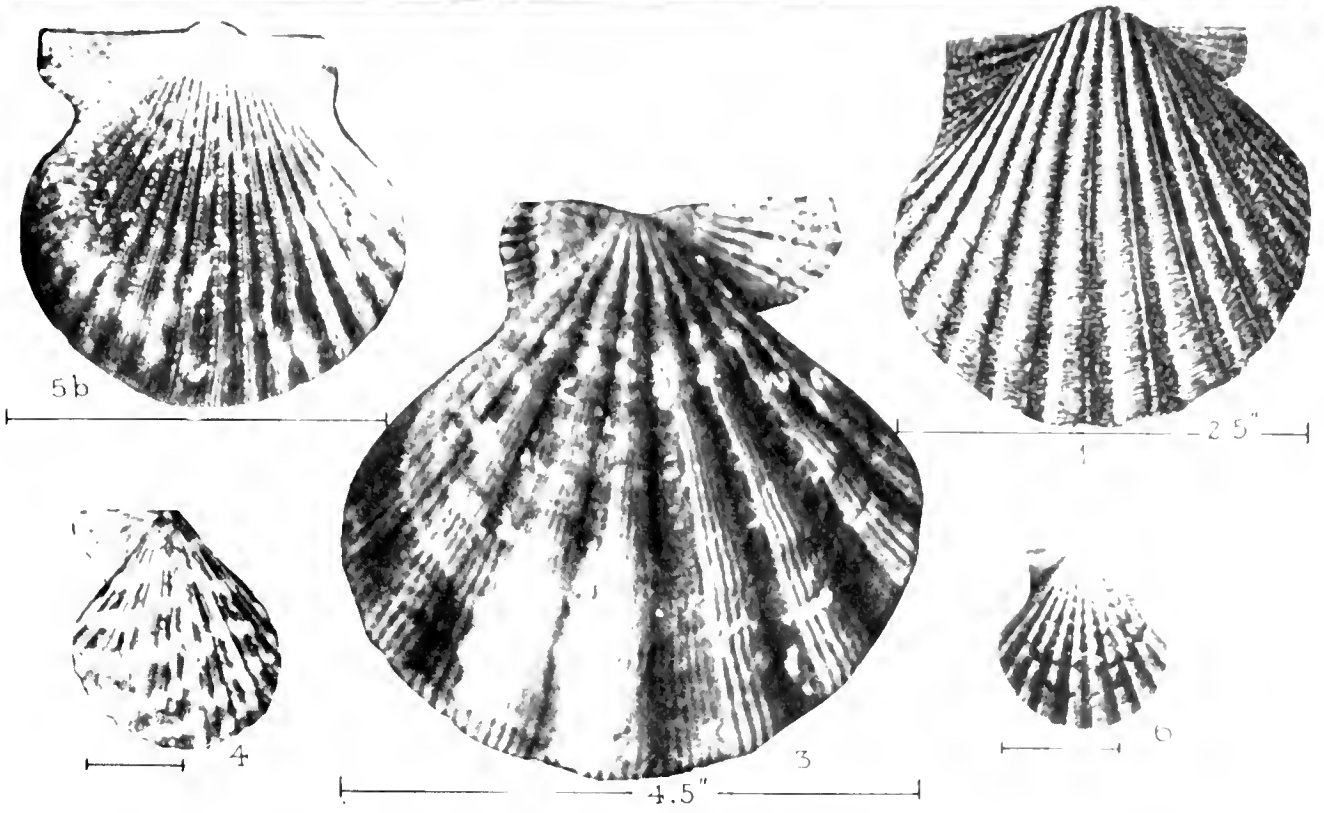
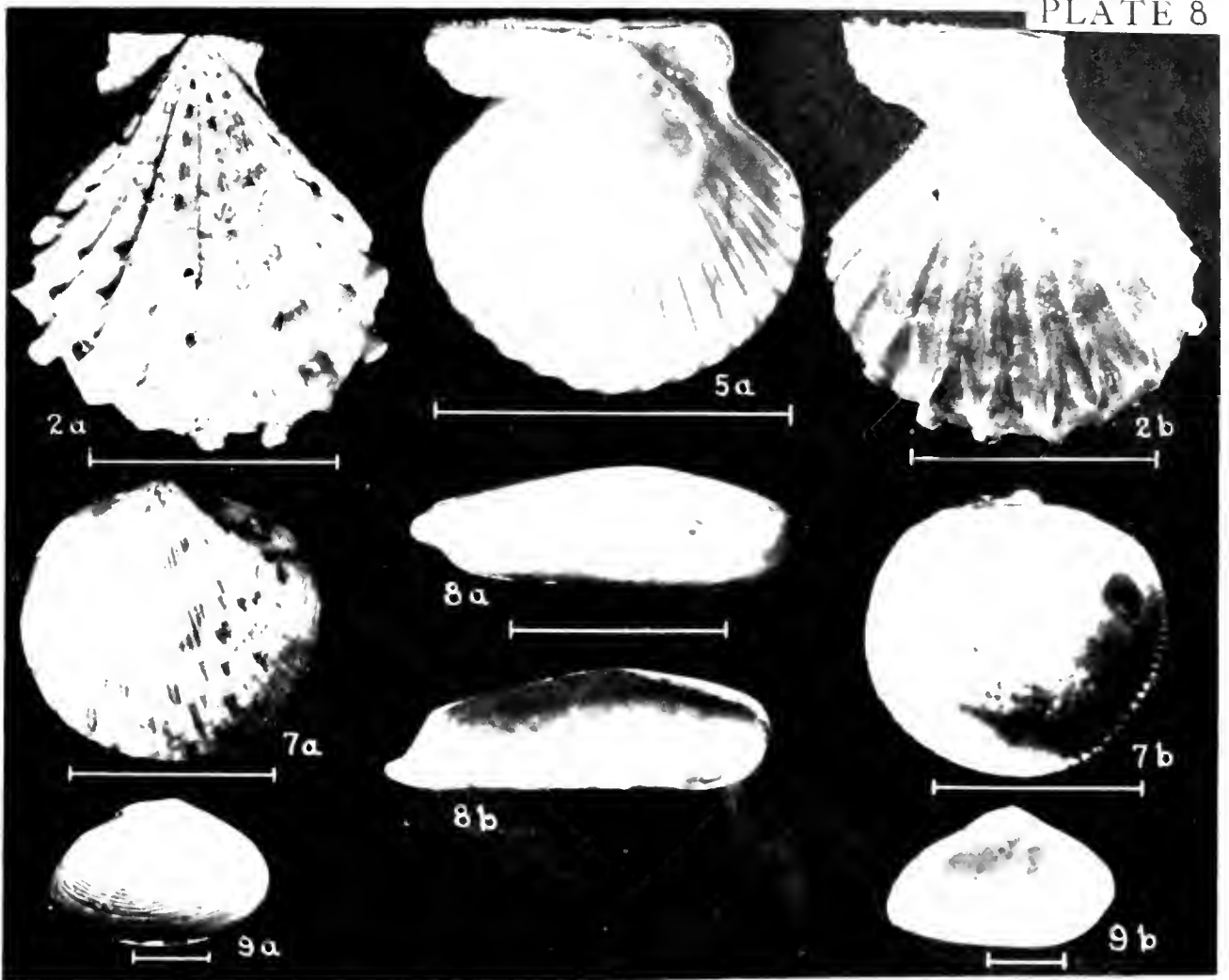
P L A T E 7

1. Pecten ziczac Linné. Bermuda. 3 inches. p. 33.
- 2a. Pecten islandicus Muller. 3.5 inches. p. 33.
- 2b. Same, interior of right valve. p. 33.
- 3a, 3b. Pecten sentis Reeve. West Florida. 33 mm. p. 33.
4. Pecten grandis Solander. Bay of Fundy. 6 inches. p. 35.
5. Chione cancellata Linné. Lake Worth, Florida. 1 inch. p. 53.
6. Pecten gibbus Linné. Pawley's Id., South Carolina. 1.5 inches. p. 34.
- 7a, 7b. Pecten irradians Lamarck. Long Island, New York. 2.5 inches. p. 34.



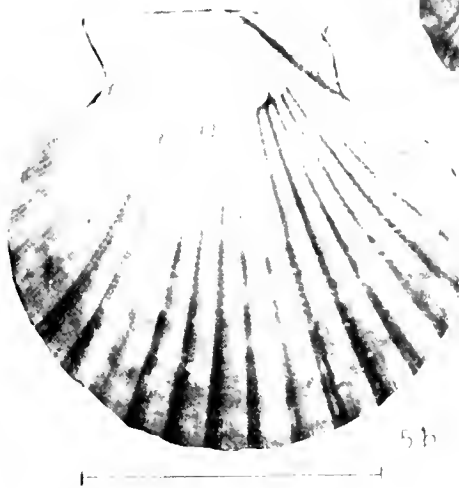
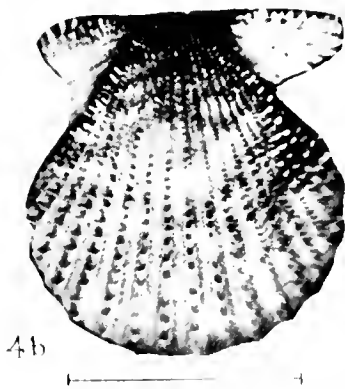
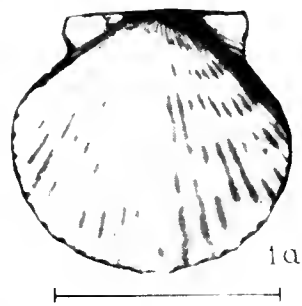
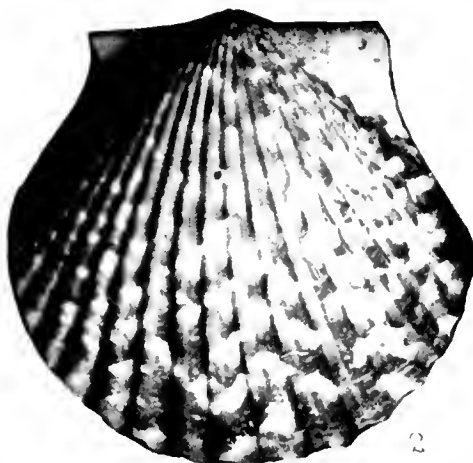
P L A T E 8

1. *Pecten gibbus amplicostatus* Dall. Texas. 2.5 inches. p. 34.
- 2a, 2b. *Pecten imbricatus* Gmelin. Yamato, Florida. 35 mm. p. 34.
3. *Pecten nodosus* Linné. West Florida. 4.5 inches. p. 34.
4. *Pecten ornatus* Lamarck. Jupiter, Florida. 12 mm. p. 33.
5. *Pecten exasperatus* Sowerby. Sanibel, Florida. 2 inches. p. 33.
6. *Pecten antillarum* Recluz. Florida Keys. 15 mm. p. 35.
- 7a, 7b. *Glycymeris pennaceus* Lamarck. Barbados. 29 mm. p. 29.
- 8a, 8b. *Lithophaga aristata* Dillwyn. Jamaica, W. I. 30 mm. p. 39.
- 9a, 9b. *Corbula contracta* Say. Vineyard Sound, Massachusetts. 11.5 mm. p. 67.



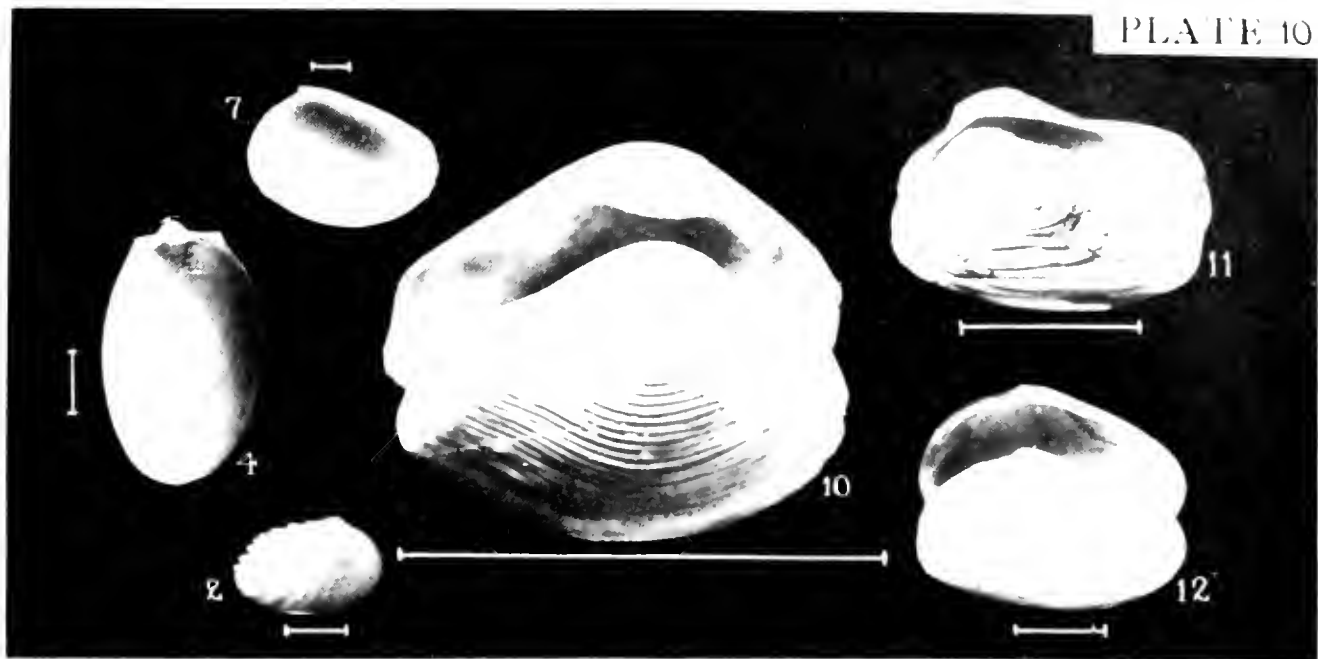
P L A T E 9

- 1a, 1b. *Pecten nucleus* Born. Miami, Florida. 30 mm. p. 34.
- 2. *Pecten gibbus* Linné. Boca Ceiga Bay, Florida. 2 inches. p. 34.
- 3. *Pecten acanthodes* Dall. Holotype, in National Museum. 32 mm. p. 34.
- 4a, 4b. *Pecten exasperatus* Sowerby. Lake Worth, Florida. 31 mm. p. 33.
- 5a, 5b. *Pecten heliacus* Dall. Holotype, in National Museum. 40 mm. p. 34.
- 6. *Pecten nodosus* Linné. Young specimen. Yamato, Florida. p. 34.
- 7. *Pecten antillarum* Recluz. Florida Keys. 15 mm. p. 35.
- 8. *Tellina lineata* Turton. Florida. 30 mm. p. 57.



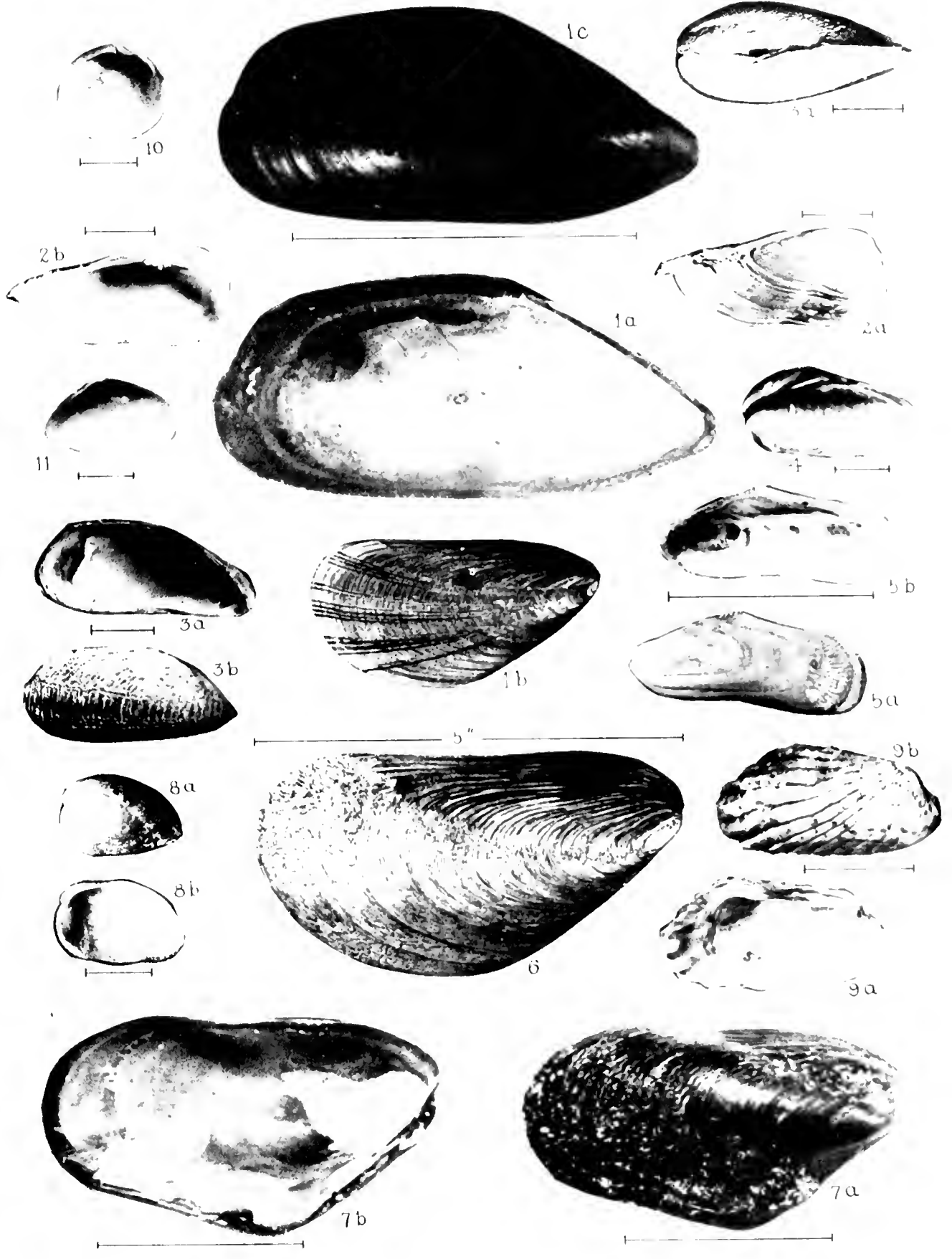
P L A T E 1 0

- 1a, 1b. *Lima scabra* Born. West Florida. 2.75 inches. p. 36.
2. *Papyridea semisulcata* Gray. Yamato, Florida. 8 mm. p. 49.
- 3a, 3b. *Lima hians* Gmelin. 44 mm. p. 36.
4. *Lima subauriculata* Montagu. Oban, Scotland. p. 36.
5. *Lima lima* Linné. West Indies. 1.5 inches. p. 36.
6. *Anomia simplex* Orbigny. Off Gulfport, Florida. 1.5 inches. p. 37.
7. *Semele nuculoides* Conrad. Off Key West, Florida. 4.5 mm. p. 61.
8. *Mytilus recurvus* Rafinesque. Mexico. 2 inches. p. 37.
9. *Donax tumida* Philippi. St. Augustine, Florida. 16 mm. p. 62.
10. *Crassatella gibbsi* T. and H. Tertiary, Florida. 65 mm. p. 43.
11. *Saxicava arctica* Linné. Brooklin, Maine. 1 inch. p. 68.
12. *Donax fossor* Say. Florida. 12 mm. p. 62.
13. *Pododesmus decipiens* Philippi. Argentina. 3 inches. p. 37.
14. *Lima tenera* Sowerby. Gulf of Mexico. 1.5 inches. p. 36.



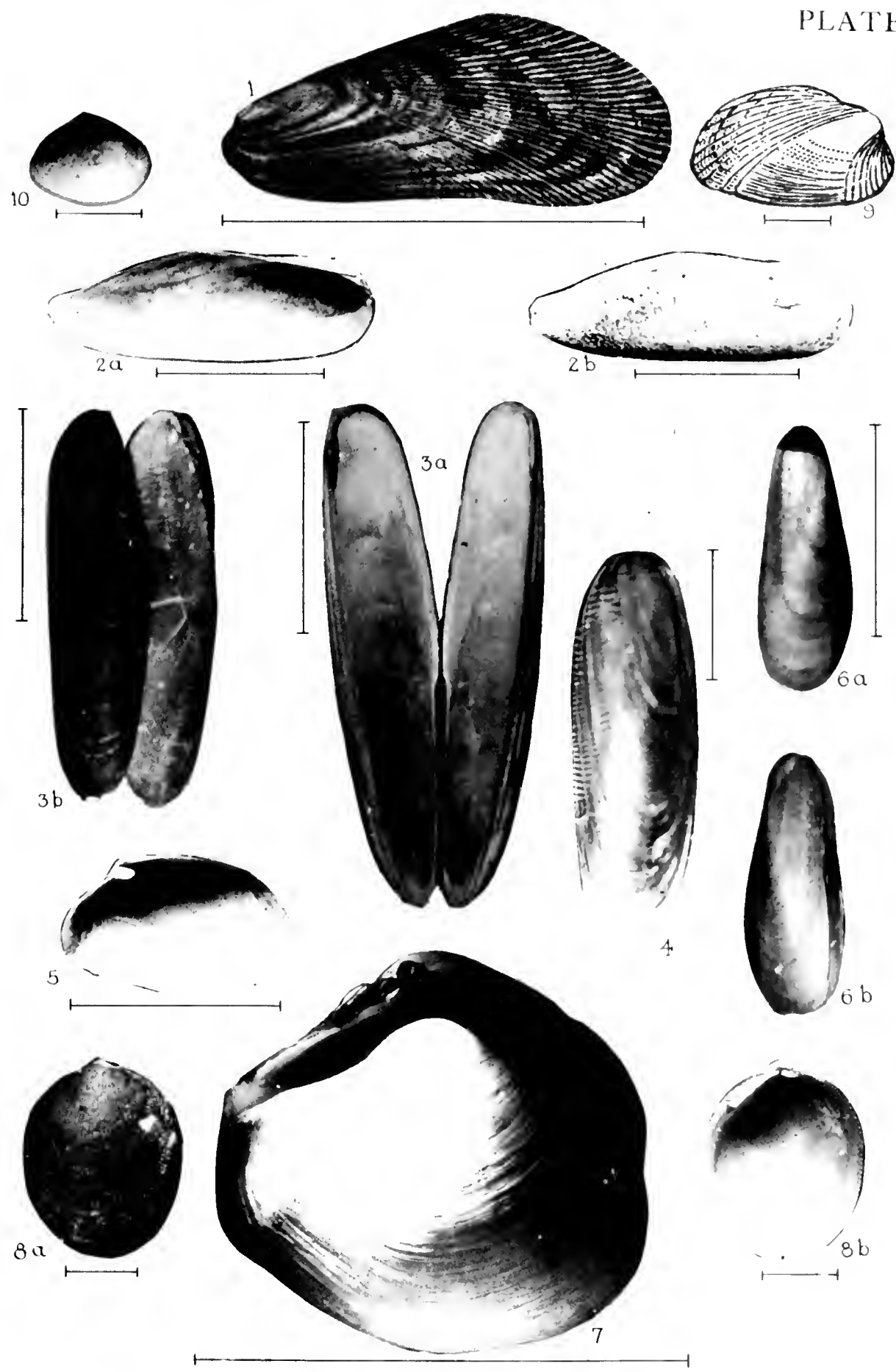
P L A T E 1 1

- 1a, 1c. *Mytilus edulis* Linné. 2.5 inches. p. 37.
- 1b. Same, rayed form. p. 37.
- 2a, 2b. *Modiolus opifex* Say. 13 mm. p. 38.
- 3a, 3b. *Mytilopsis leucopheata* Conrad. Maryland. 12 mm. p. 39.
- 4. *Botula fusca* Gmelin. 10 mm. p. 38.
- 5a, 5b. *Mytilus exustus* Linné. Pine Key, Florida. 1.5 inches. p. 37.
- 6. *Modiolus modiolus* Linné. New England. 5 inches. p. 38.
- 7a, 7b. *Modiolus tulipus* Linné. Biscayne Bay, Florida. 1.5 inches. p. 38.
- 8a, 8b. *Modiolaria lateralis* Say. 12 mm. p. 39.
- 9a, 9b. *Cardita gracilis* Shuttleworth. Tampa Bay, Florida. 20 mm. p. 44.
- 10. *Myrtaea lens* Verrill and Smith. 10.5 mm. p. 48.
- 11. *Tellina candeana* Orbigny. Bermuda. 10 mm. p. 59.



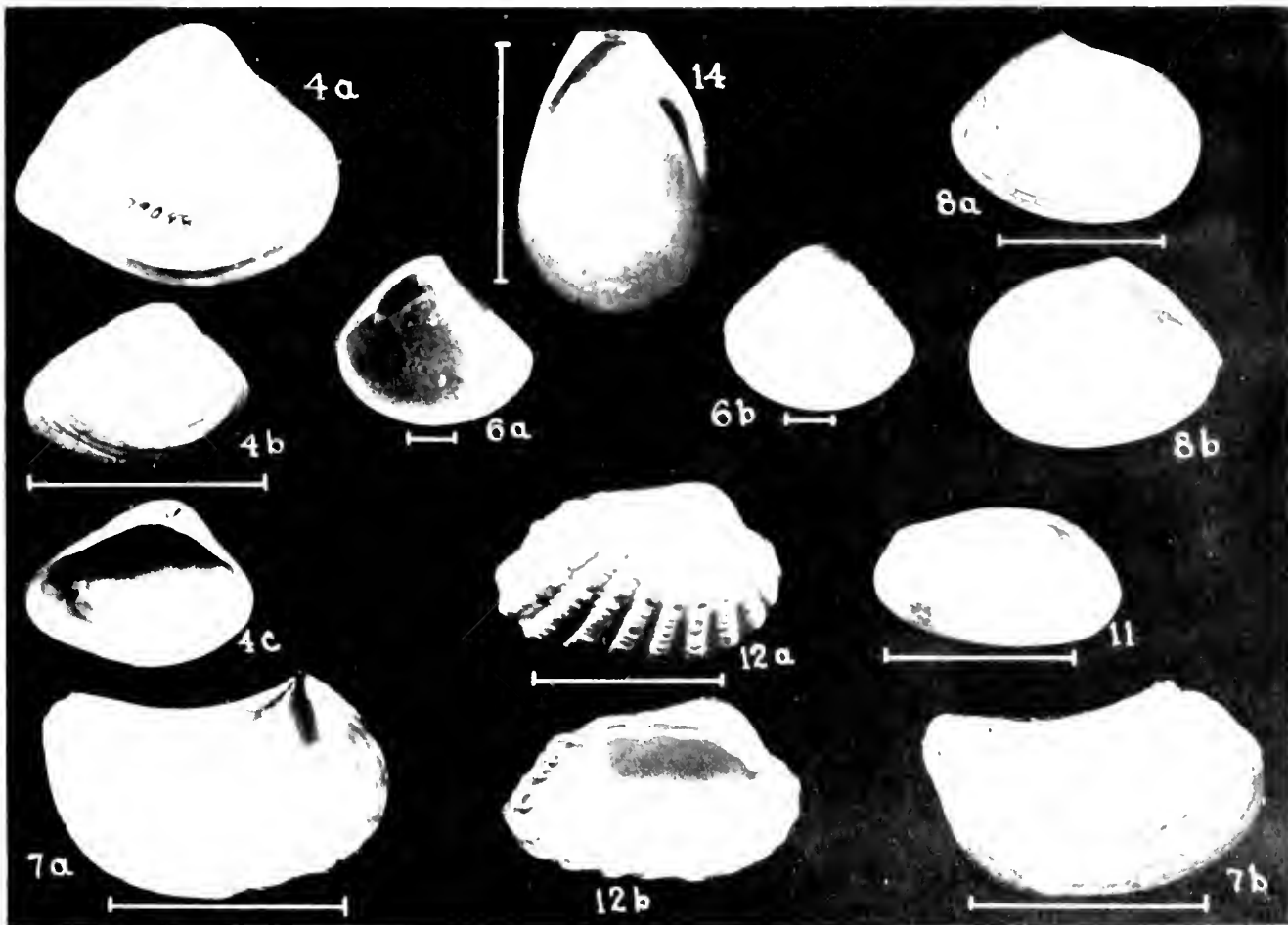
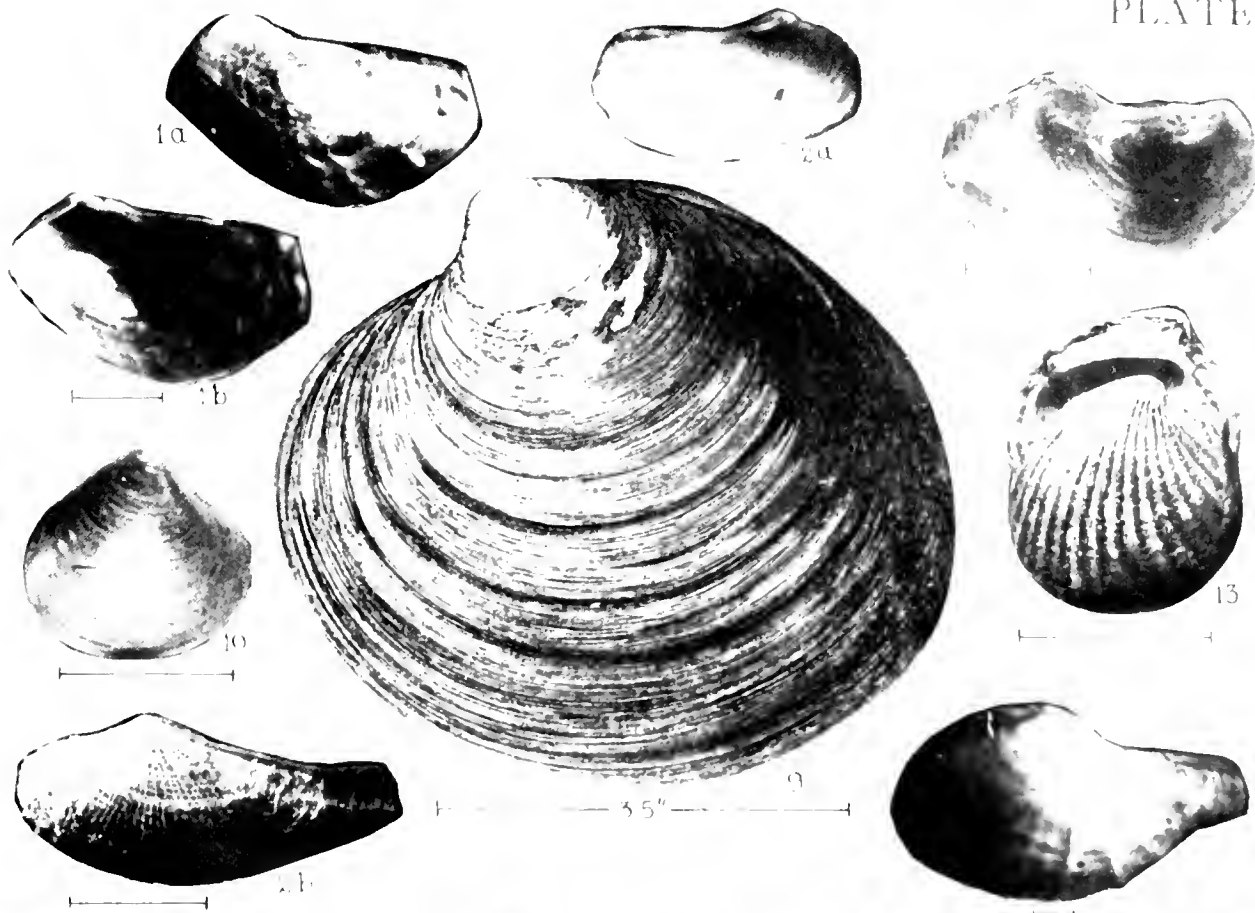
P L A T E 1 2

1. *Modiolus demissus plicatulus* Lamarck. New York. 3 inches. p. 38.
- 2a, 2b. *Lithophaga bisulcata* Orbigny. Sanibel, Florida. 30 mm. p. 38.
- 3a, 3b. *Lithophaga antillarum* Orbigny. West Indies. 1.5 inches. p. 38.
4. *Lithophaga nigra* Orbigny. Bermuda. 23 mm. p. 38.
5. *Periploma inaequalis* Schumacher. Florida. 1.5 inches. p. 40.
6. *Modiolus aborescens* Dillwyn. Sanibel, Florida. 1.5 inches. p. 38.
7. *Thracia conradi* Couthouy. Duxbury, Massachusetts. 3.5 inches. p. 40.
- 8a, 8b. *Crenella glandula* Totten. Off Massachusetts. 13 mm. p. 39.
9. *Modiolaria corrugata* Stimpson. New England. 12 mm. p. 39.
10. *Tellina mera* Say. Florida. 15 mm. p. 58.



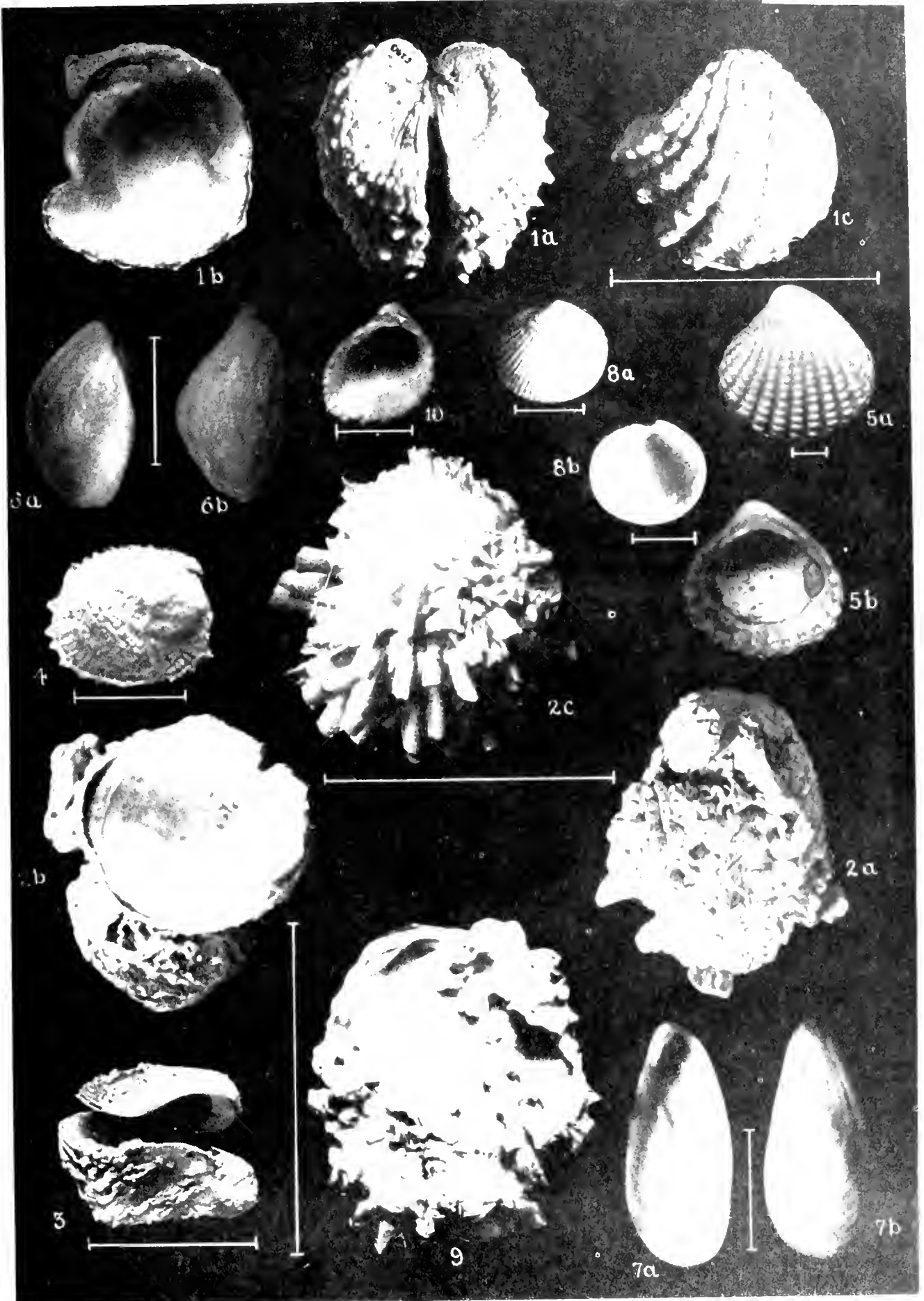
P L A T E 1 3

- 1a, 1b. *Lyonsia floridana* Conrad. Florida. 12 mm. p. 41.
- 2a, 2b. *Lyonsia hyalina* Conrad. Connecticut. 18 mm. p. 41.
- 3. *Lyonsia beana* Orbigny. Sanibel, Florida. 17 mm. p. 41.
- 4a-4c. *Polymesoda floridana* Conrad. Big Pine Key, Florida. 21 mm. p. 43.
- 5. *Cuspidaria gemma* Verrill and Bush. Jupiter, Florida. 5 mm. p. 41.
- 6a, 6b. *Crassinella mactracea* Linsey. 6 mm. p. 43.
- 7a, 7b. *Pandora gouldiana* Dall. Duxbury, Massachusetts. 32 mm. p. 41.
- 8a, 8b. *Tellina aequistriata* Say. Florida. 22 mm. p. 57.
- 9. *Cyprina islandica* Linné. New England, 3.5 inches. p. 42.
- 10. *Astarte castanea* Say. Sandy Hook, New Jersey. 23 mm. p. 43.
- 11. *Modiolaria nigra* Gray. Maine. 1 inch. p. 39.
- 12a, 12b. *Cardita floridana* Conrad. Sanibel, Florida. 1 inch. p. 44.
- 13. *Venericardia borealis* Conrad. Maine. 1 inch. p. 44.
- 14. *Lima inflata* Lamarck. Florida. 32 mm. p. 36.



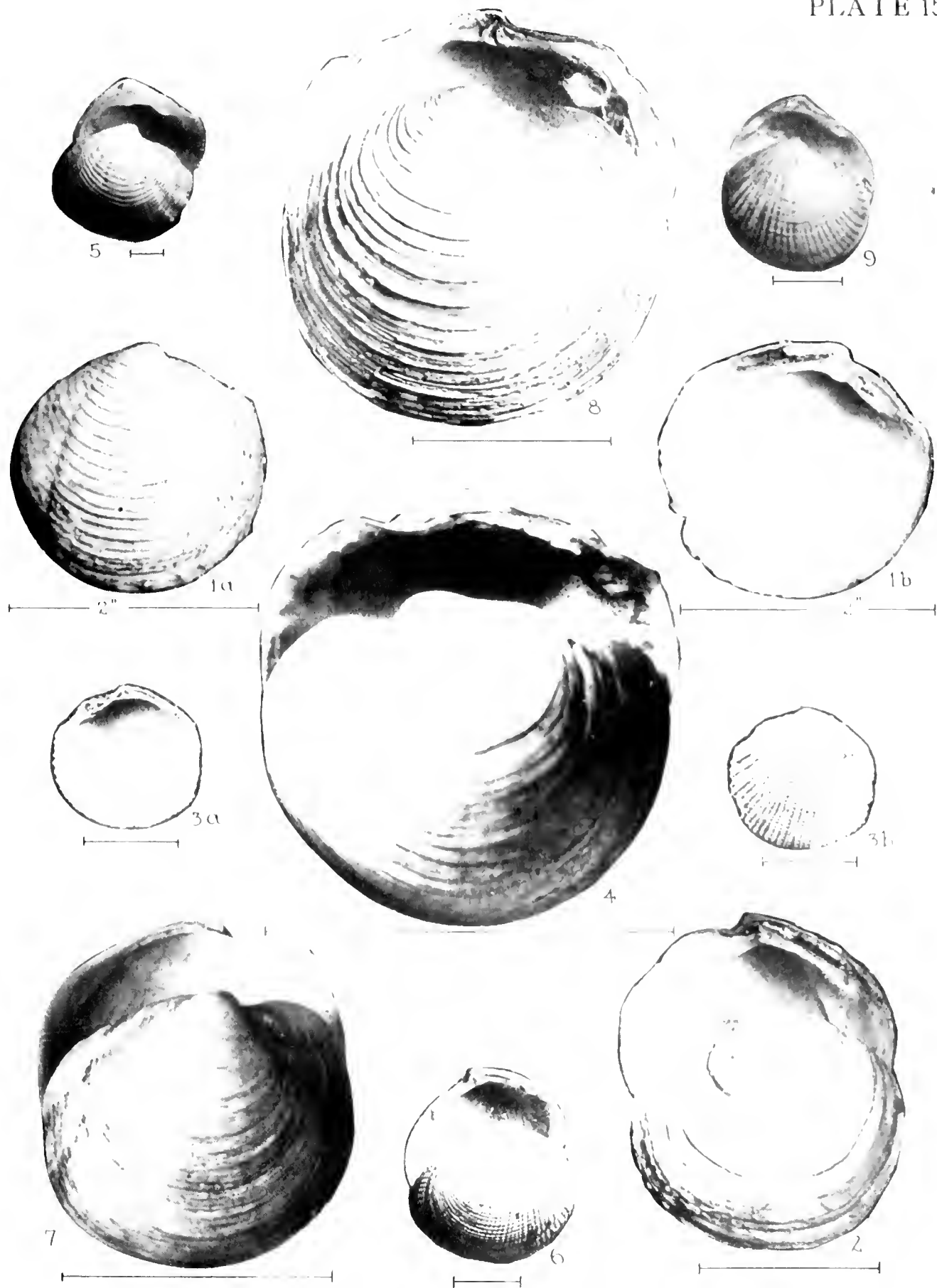
P L A T E 1 4

- 1a,1b,1c. *Echinochama arcinella* Linné. Sanibel, Florida. 2 inches. p. 45.
2a. *Chama macerophylla* Gmelin. West Indies. 55 mm. p. 44.
2b, 2c. Same, Florida. p. 44.
3. *Chama sarda* Reeve. West Indies. 32 mm. p. 44.
4. *Chama congregata* Conrad. 21 mm. p. 44.
5a, 5b. *Venericardia tridentata* Say. Beaufort, North Carolina. 6.5 mm. p. 44.
6a, 6b. *Gastrochaena ovata* Sowerby. Bermuda. 24 mm. p. 68.
7a, 7b. *Gastrochaena cuneiformis* Spengler. Off North Carolina. 23 mm. p. 68.
8. *Codakia orbiculata* Montagu. Biscayne Bay, Florida. 13 mm. p. 47.
9. *Ostrea cristata* Born. Gulf of Mexico. 2.5 inches. p. 31.
10. *Montacuta floridana* Dall. West Florida. 14 mm. p. 48.



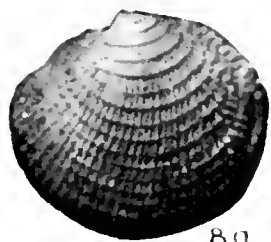
P L A T E 1 5

- 1a, 1b. *Lucina pennsylvanica* Linné. Lantana, Florida. 2 inches. p. 46.
- 2. *Lucina floridana* Conrad. Sanibel, Florida. 34 mm. p. 46.
- 3a, 3b. *Lucina muricata* Spengler. Jamaica. 18 mm. p. 46.
- 4. *Loripinus schrammi* Crosse. Sanibel, Florida. 3 inches. p. 48.
- 5. *Lucina amiantus* Dall. Sanibel, Florida. 6 mm. p. 47.
- 6. *Codakia orbiculata* Montagu. Barnes Sound, Florida. 13 mm. p. 47.
- 7. *Loripinus chrysostoma* Philippi. Lake Worth, Florida. 2 inches. p. 47.
- 8. *Lucina filosa* Stimpson. Off Portland, Maine. 1.5 inches. p. 46.
- 9. *Codakia costata* Orbigny. Bermuda. 13 mm. p. 47.

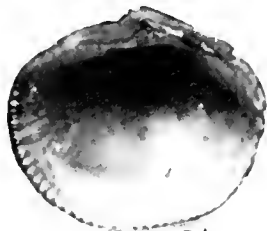


P L A T E 1 6

1. *Lucina jamaicensis* Lamarck. Lake Worth, Florida. 2 inches. p. 46.
2. *Polymesoda carolinensis* Bosc. Redault R., Florida. 1.75 inches. p. 42.
- 3a, 3b. *Loripinus schrammi* Crosse. Florida. 2 inches. p. 48.
- 4a, 4b. *Divaricella dentata* Wood. Florida. 1.5 inches. p. 47.
- 5a, 5b. *Divaricella quadrisulcata* Orbigny. Florida. 1 inch. p. 47.
6. *Myrtaea lens* Verrill and Smith. Florida. 10.5 mm. p. 48.
7. *Seripes gronlandicus* Bruguiere. Banks of Newfoundland. 2.5 inches. p. 50.
- 8a, 8b. *Lucina nassula* Conrad. Sanibel, Florida. p. 46.
9. *Siliqua squama* Blainville. 2.5 inches. p. 64.
10. *Macoma calcarea* Gmelin. Greenland. 1.25 inches. p. 60.
11. *Cyrenoida floridana* Dall. 12 mm. p. 45.



8a



8b



1



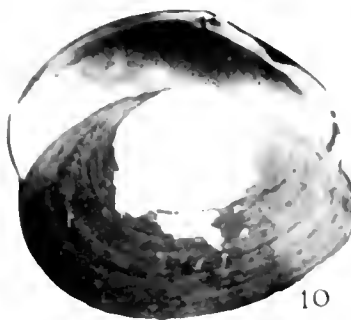
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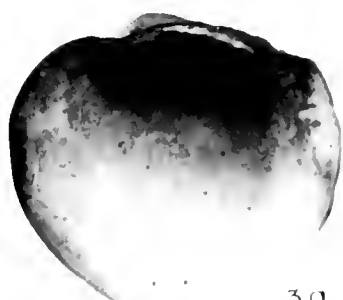
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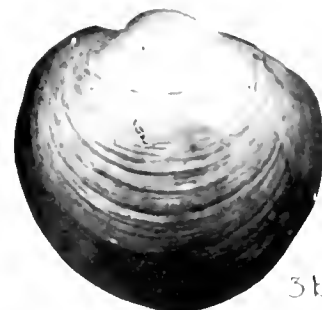
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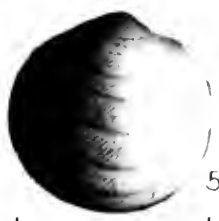
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3a



3b



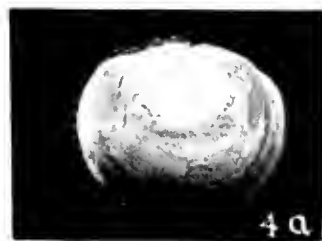
5a



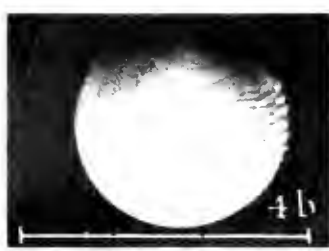
5b



7



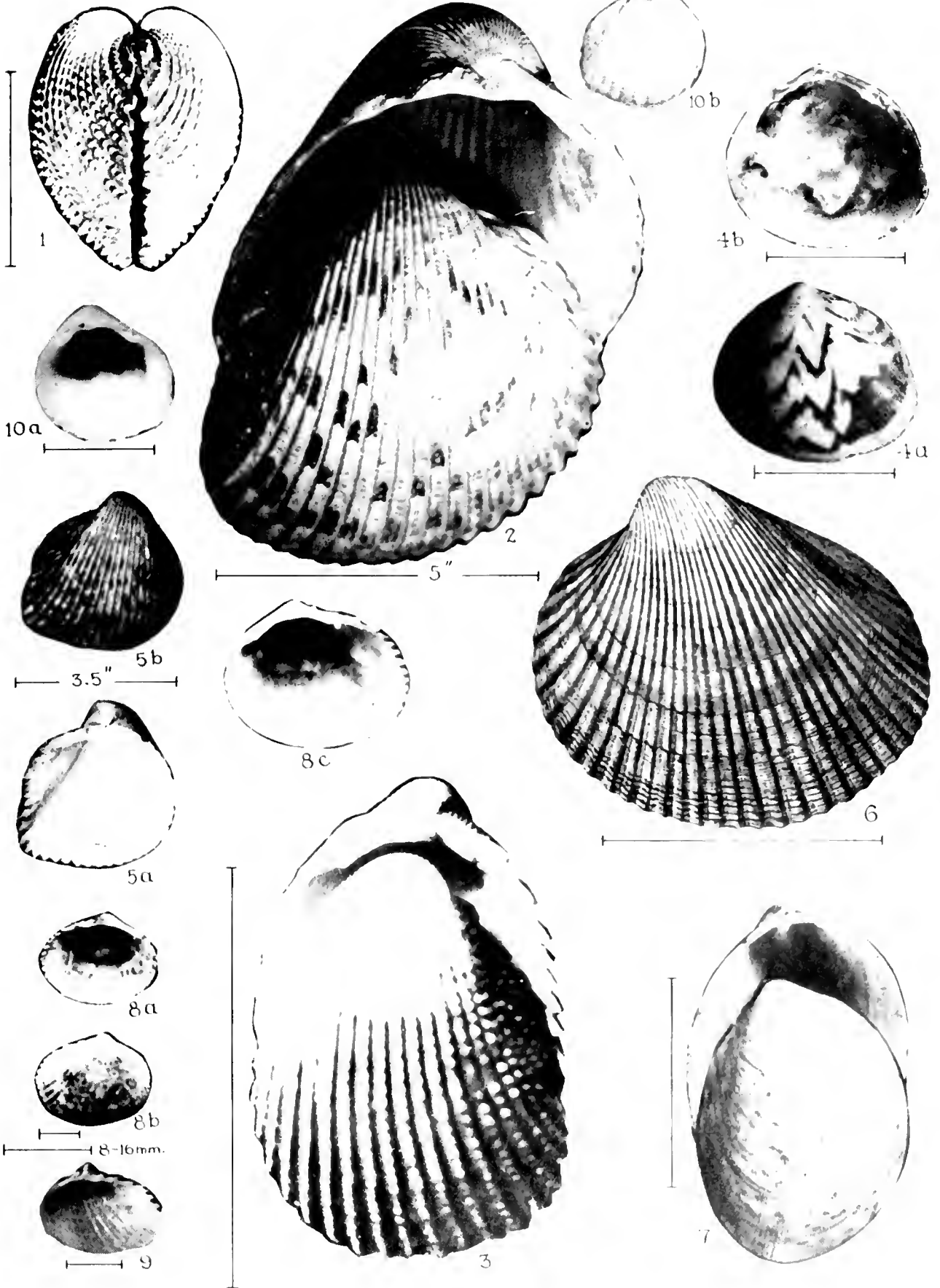
4a



4b

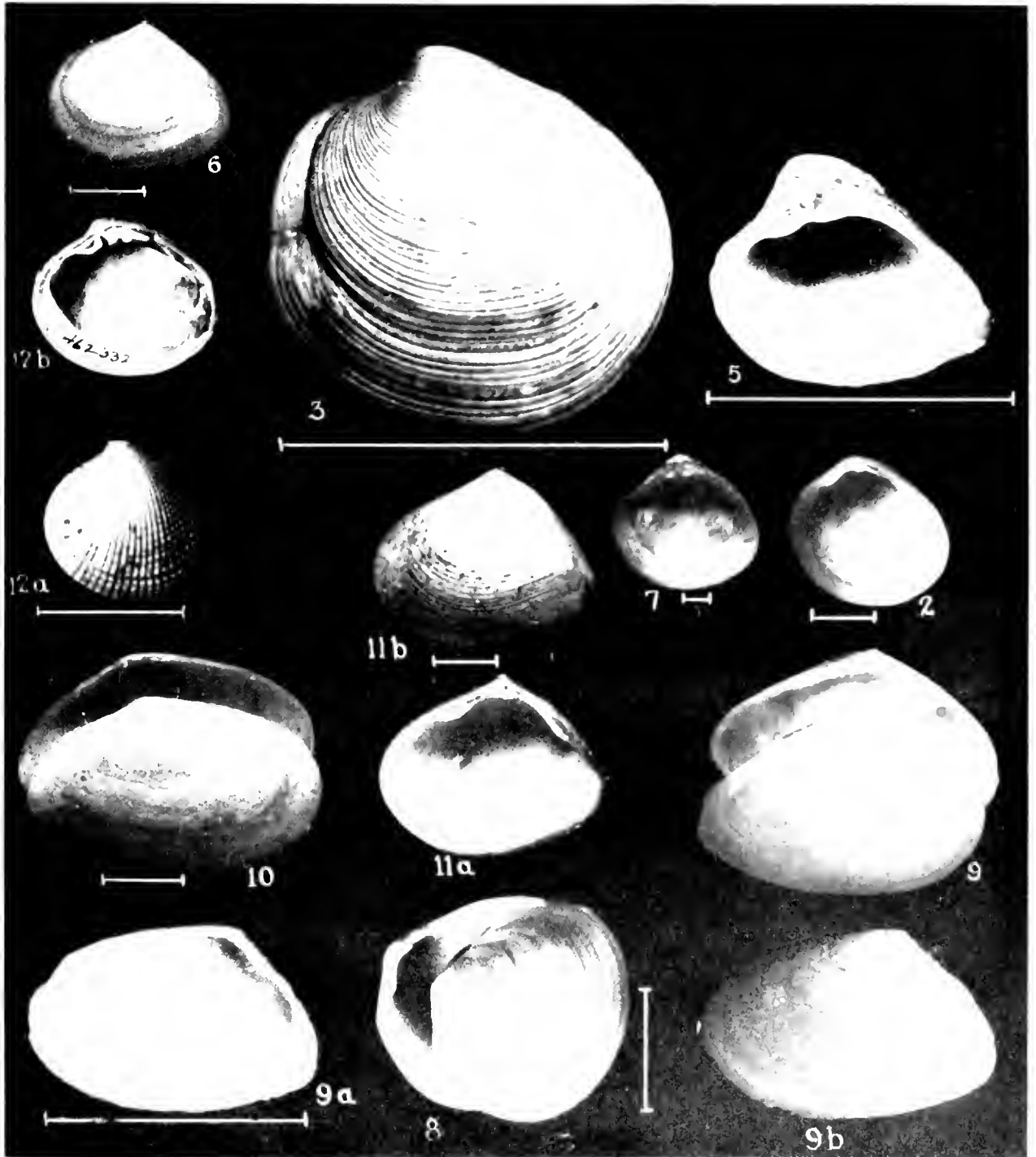
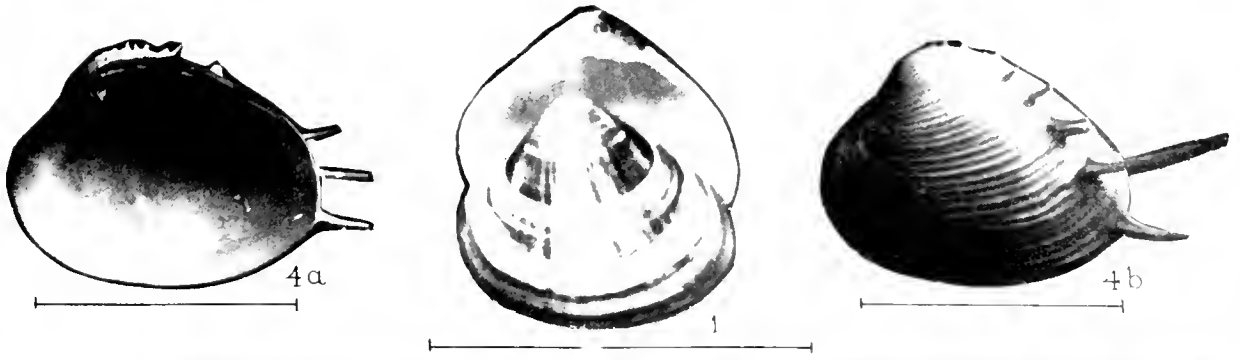
P L A T E 1 7

1. *Cardium muricatum* Linné. Sanibel, Florida. 35 mm. p. 49
2. *Cardium robustum* Solander. Sanibel, Florida. 5 inches. p. 49.
3. *Cardium isocardium* Linné. Florida. 3 inches. p. 48.
- 4a, 4b. *Laevicardium mortoni* Linné. Tarpon Bay, Florida. 1 inch. p. 50.
- 5a, 5b. *Trigonicardia medium* Linné. Florida Keys. 3.5 inches. p. 50.
6. *Cardium ciliatum* Fabricius. New England. 2 inches. p. 49.
7. *Laevicardium serratum* Linné. Biscayne Bay, Florida. 1.5 inches. p. 50.
- 8a, 8b, 8c. *Papyridea spinosum* Meuschen. Florida. 8-16 mm. p. 49.
9. *Papyridea semisulcata* Gray. Yamato, Florida. 10 mm. p. 49.
- 10a, 10b. *Trigonicardia antillarum* Orbigny. bahamas. 20 mm. p. 49.



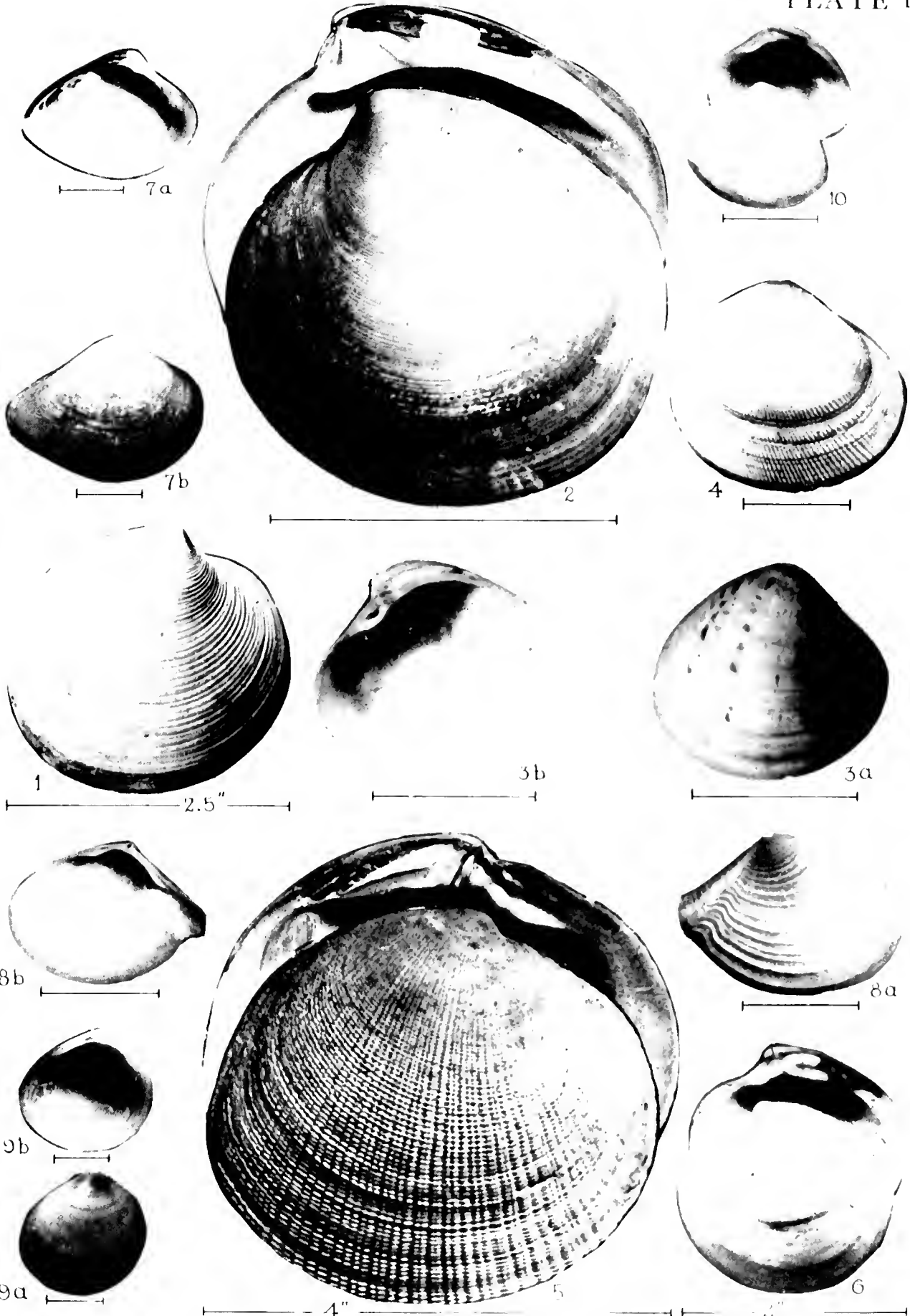
P L A T E 1 8

1. *Tivela mactroides* Born. Nicaragua. 2 inches. p. 52
2. *Strigilla flexuosa* Say. Key West, Florida. 10 mm. p. 60.
3. *Dosinia elegans* Conrad. Sanibel, Florida. 2.5 inches. p. 51.
- 4a, 4b. *Hysteroconcha dione* Linné. West Indies. 35 mm. p. 53.
5. *Rangia cuneata rostrata* Petit. 2 inches. p. 65.
6. *Gafrarium cerina* C. B. Adams. Charlotte Harbor, Florida. 12 mm. p. 52.
7. *Gemma gemma* Totten. 4 mm. p. 55.
8. *Strigilla rombergi* Morch. 20 mm. p. 60.
- 9a, 9b. *Tellina angulosa* Gmelin. Wounta Haulover, Nicaragua. 42 mm. p. 58.
10. *Tellina tenera* Say. Cape May, New Jersey. 13 mm. p. 58.
- 11a, 11b. *Tellina martinicensis* Orbigny. Dominican Republic. 10 mm. p. 53.
- 12a, 12b. *Chione granulata* Gmelin. Jamaica. 24 mm. p. 54.



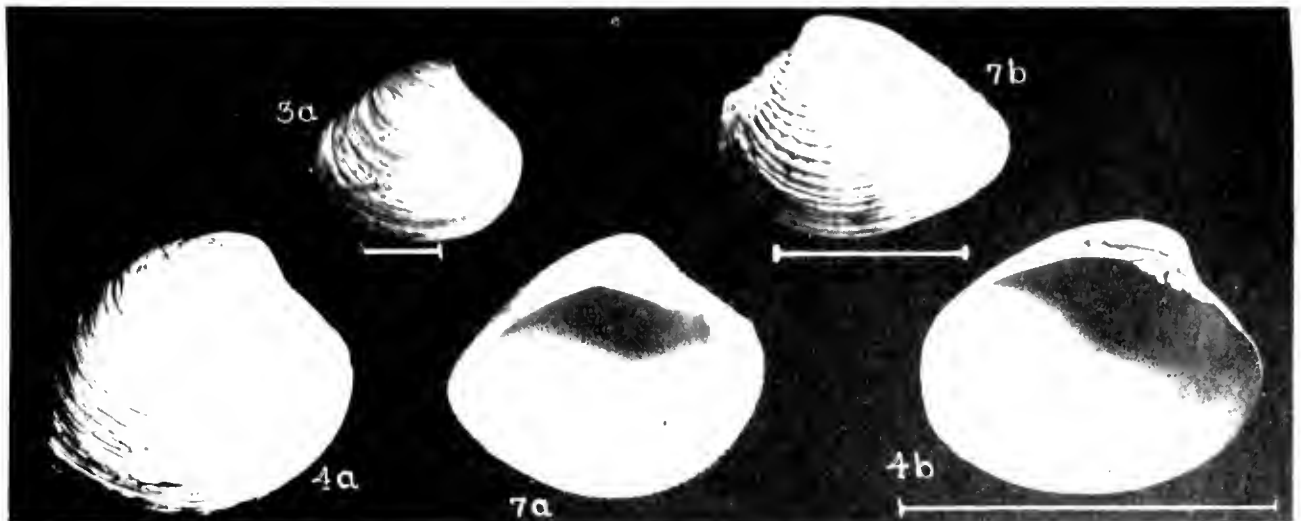
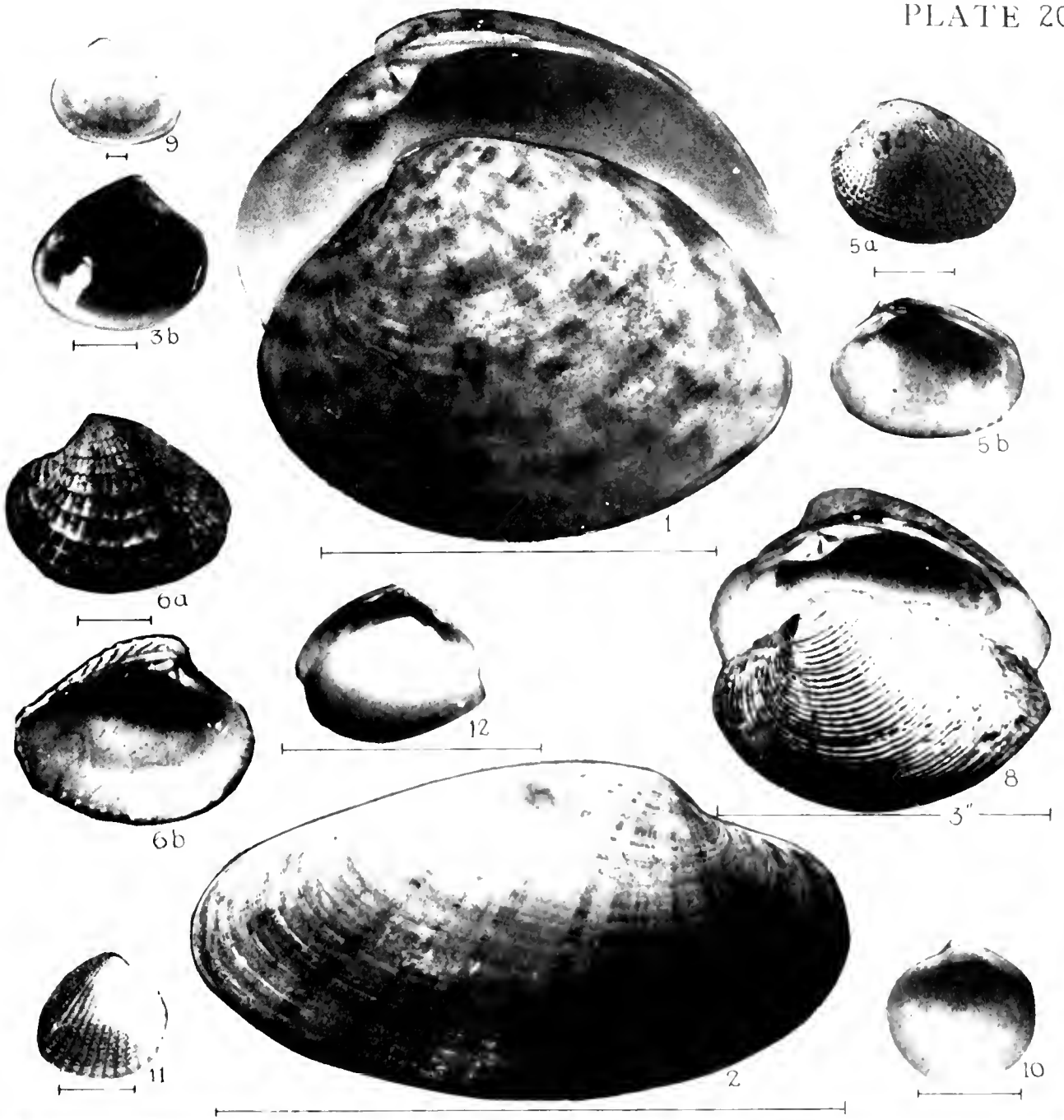
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1. *Dosinia elegans* Conrad. Florida. 2.5 inches. p. 51.
2. *Dosinia discus* Reeve. Beaufort, North Carolina. 2.5 inches. p. 51.
3. *Pitar fulminata* Menke. West Florida. 30 mm. p. 52.
4. *Strigilla carnaria* Linné. West Indies. 20 mm. p. 60.
5. *Codakia orbicularis* Linné. S. E. Florida. 4 inches. p. 47.
6. *Dosinia concentrica* Born. Brazil. 2 inches. p. 51.
- 7a, 7b. *Transennella conradina* Dall. Sanibel, Florida. 12 mm. p. 51.
- 8a, 8b. *Tellina crystallina* Wood. Barcelona, Venezuela. 21.5 mm. p. 57.
- 9a, 9b. *Strigilla pisiformis* Linné. San Domingo. 10 mm. p. 60.
10. *Pitar simpsoni* Dall. Tampa Bay, Florida. 18 mm. p. 52.



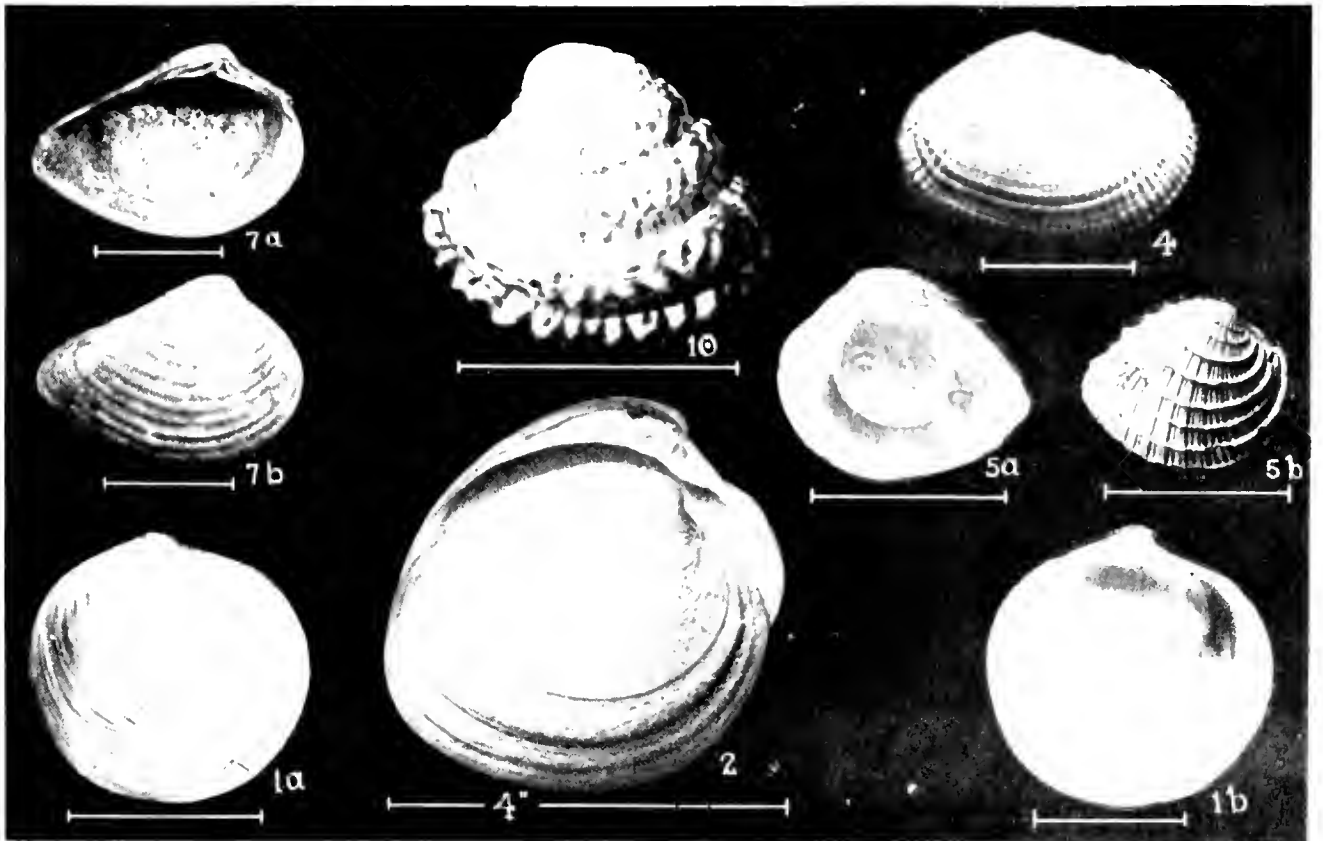
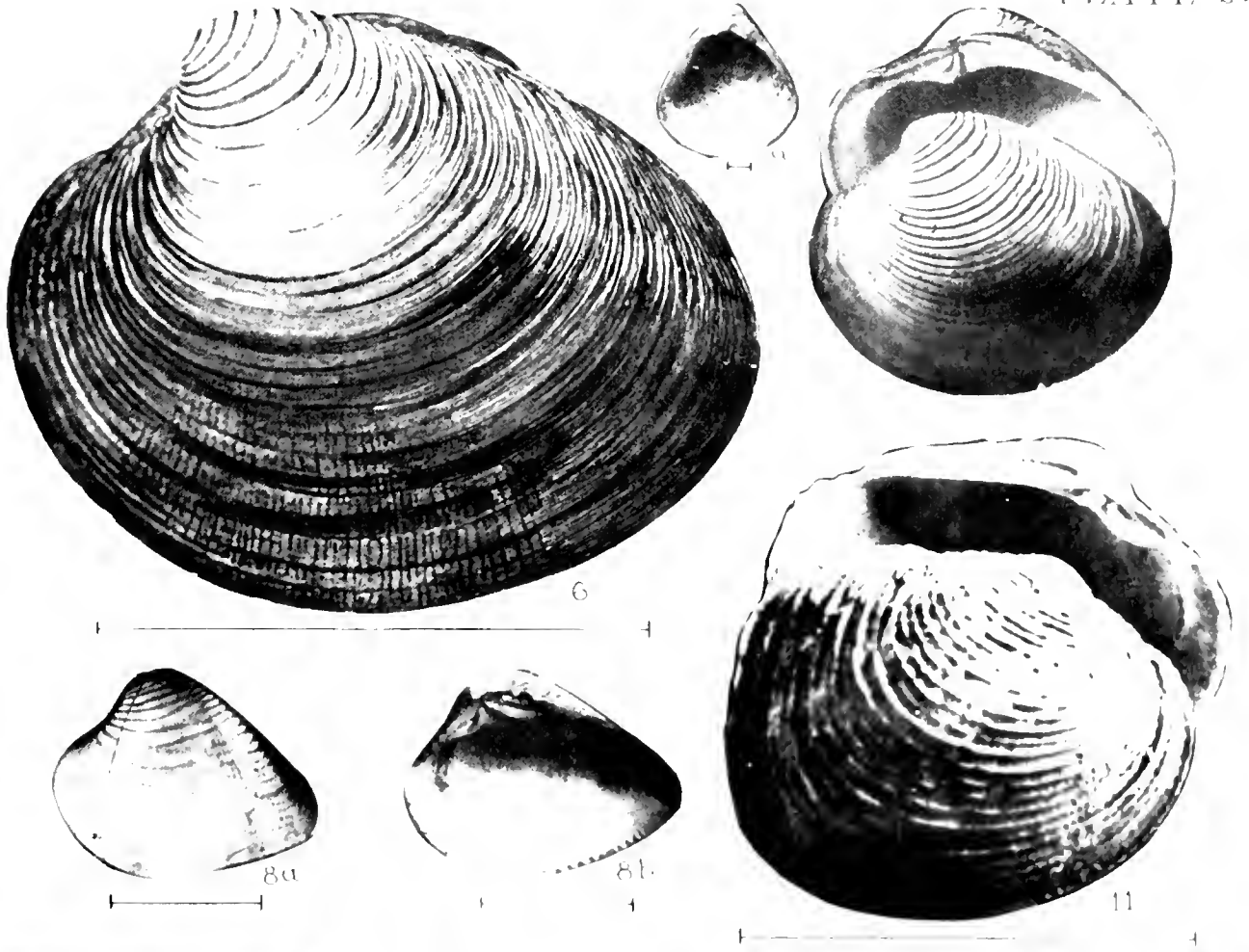
P L A T E 2 0

1. *Macrocallista maculata* Linné. Boynton, Florida. 2.5 inches. p. 52.
2. *Macrocallista nimbose* Solander. Marco, Florida. 4 inches. p. 52.
- 3a, 3b. *Pitar fulminata* Menke. Sanibel, Florida. Young. 10 mm. p. 52.
- 4a, 4b. *Pitar morrhua* Gould. Duxbury, Massachusetts. 2 inches. p. 52.
- 5a, 5b. *Chione pygmaea* Lamarck. West Indies. 13 mm. p. 54.
- 6a, 6b. *Chione mazyckii* Dall. Off Charleston, South Carolina. 12 mm. p. 53.
- 7a, 7b. *Chione subrostrata* Lamarck. 1 inch. p. 54.
8. *Chione pubera* Val. West Indies. 3 inches. p. 53.
9. *Kellia rubra* Montagu. 3 mm. p. 48.
10. *Lucina radians* Conrad. Florida. 17 mm. p. 46.
11. *Cardium pinnulatum* Conrad. Maine. 12 mm. p. 49.
12. *Tellina angulosa* Gmelin. West Indies. 42 mm. p. 58.



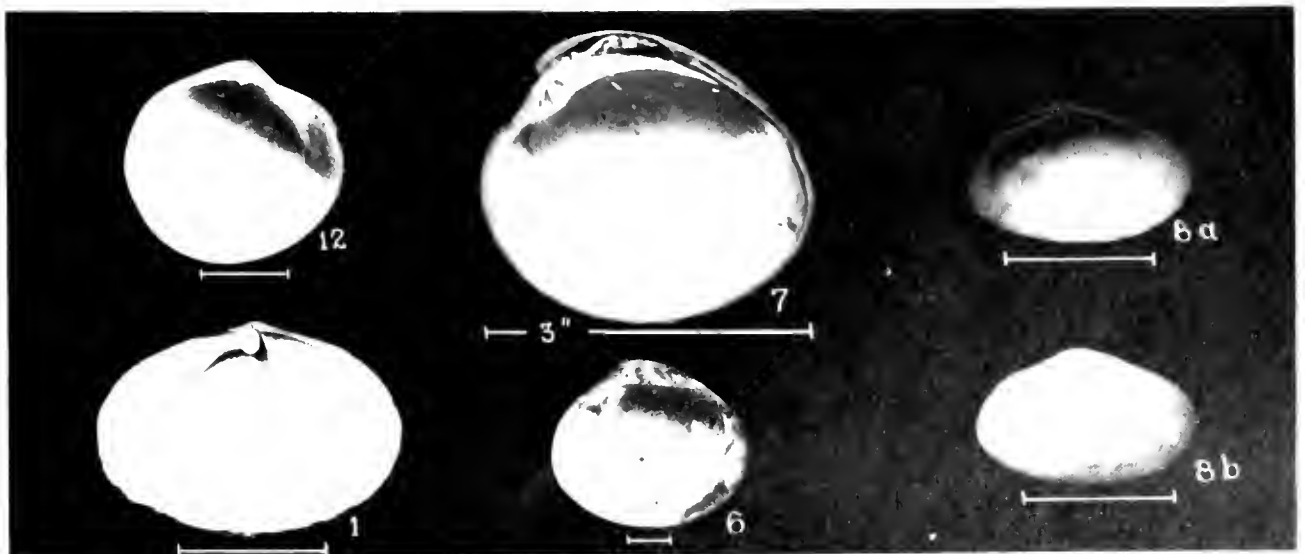
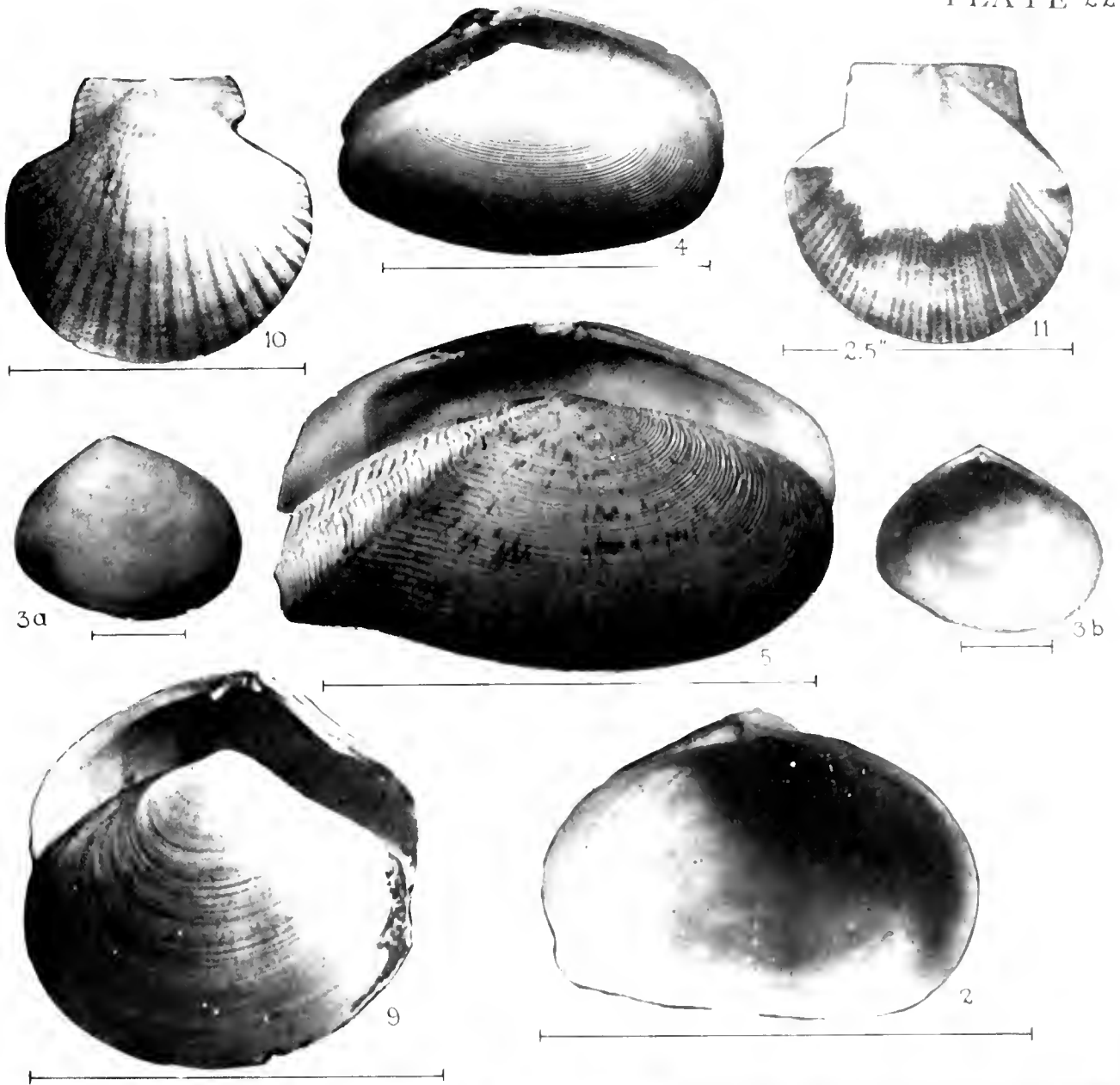
P L A T E 2 1

- 1a, 1b. *Cyclinella tenuis* Recluz. Sanibel, Florida. 1 inch. p. 53.
2. *Venus campechiensis* Gmelin. Sanibel, Florida. 4 inches. p. 55.
3. *Venus mercenaria notata* Say. p. 54.
4. *Semele bellastrata* Conrad. Key West, Florida. 20 mm. p. 61.
- 5a, 5b. *Chione cancellata* Linné. Lake Worth, Florida. 1 inch. p. 53.
6. *Venus mercenaria* Linné. New England. 3 inches. p. 54.
- 7a, 7b. *Anomalocardia cuneimeris* Conrad. Lake Worth, Florida. 17 mm. p. 55.
- 8a, 8b. *Anomalocardia brasiliana* Gmelin. 21 mm. p. 55.
9. *Parastarte triquetra* Conrad. Palm Beach, Florida. 3 mm. p. 56.
10. *Chione latirata* Conrad. Yamato, Florida. 1.5 inches. p. 54.
11. *Antigona listeri* Gray. Biscayne Bay, Florida. 2.5 inches. p. 53.



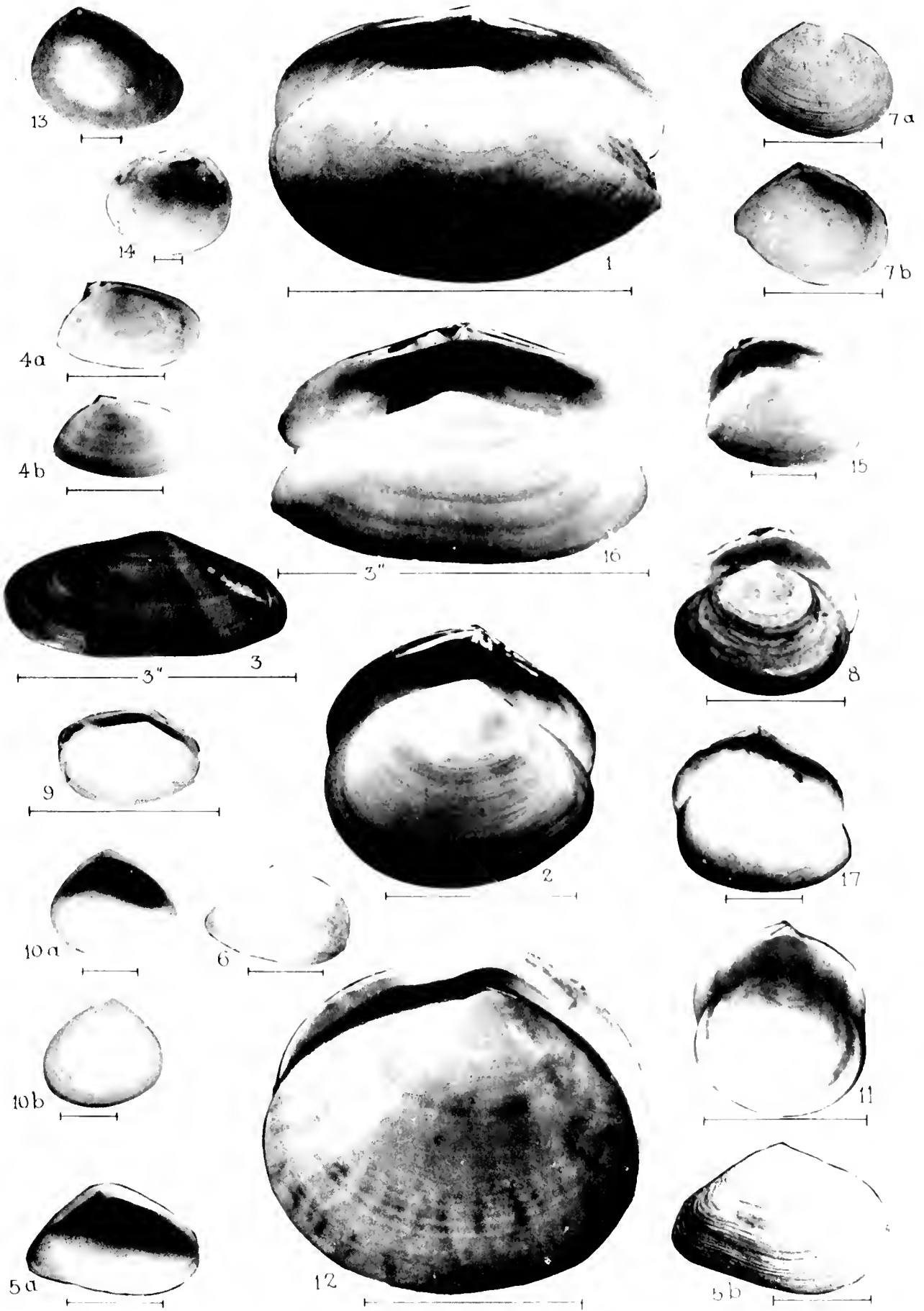
P L A T E 22

1. *Cochlodesma leanum* Conrad. Casco Bay, Maine. 20 mm. p. 40.
2. *Apolymetis intastriata* Say. Palm Beach, Florida. 3 inches. p. 60.
- 3a, 3b. *Tellina promera* Dall. Bermuda. 14 mm. p. 58.
4. *Tellina alternata* Say. Lake Worth, Florida. 2 inches. p. 57.
5. *Tellina interrupta* Wood. West Indies. 3 inches. p. 56.
6. *Astarte quadrans* Gould. Maine. 6 mm. p. 43.
7. *Venus campechiensis* Gmelin. Sanibel, Florida. 3 inches. p. 55.
- 8a, 8b. *Tellina similis* Sowerby. Barnes Sound, Florida. 20 mm. p. 59.
9. *Tellina fausta* Donovan. Biscayne Bay, Florida. 2.5 inches. p. 57.
10. *Pecten raveneli* Dall. St. Martin's Reef, Florida. 45 mm. p. 33.
11. *Pecten ziczac* Linné. Lake Worth, Florida. 2.5 inches. p. 33.
12. *Taras venezuelensis* Dunker. 11.5 mm. p. 45.



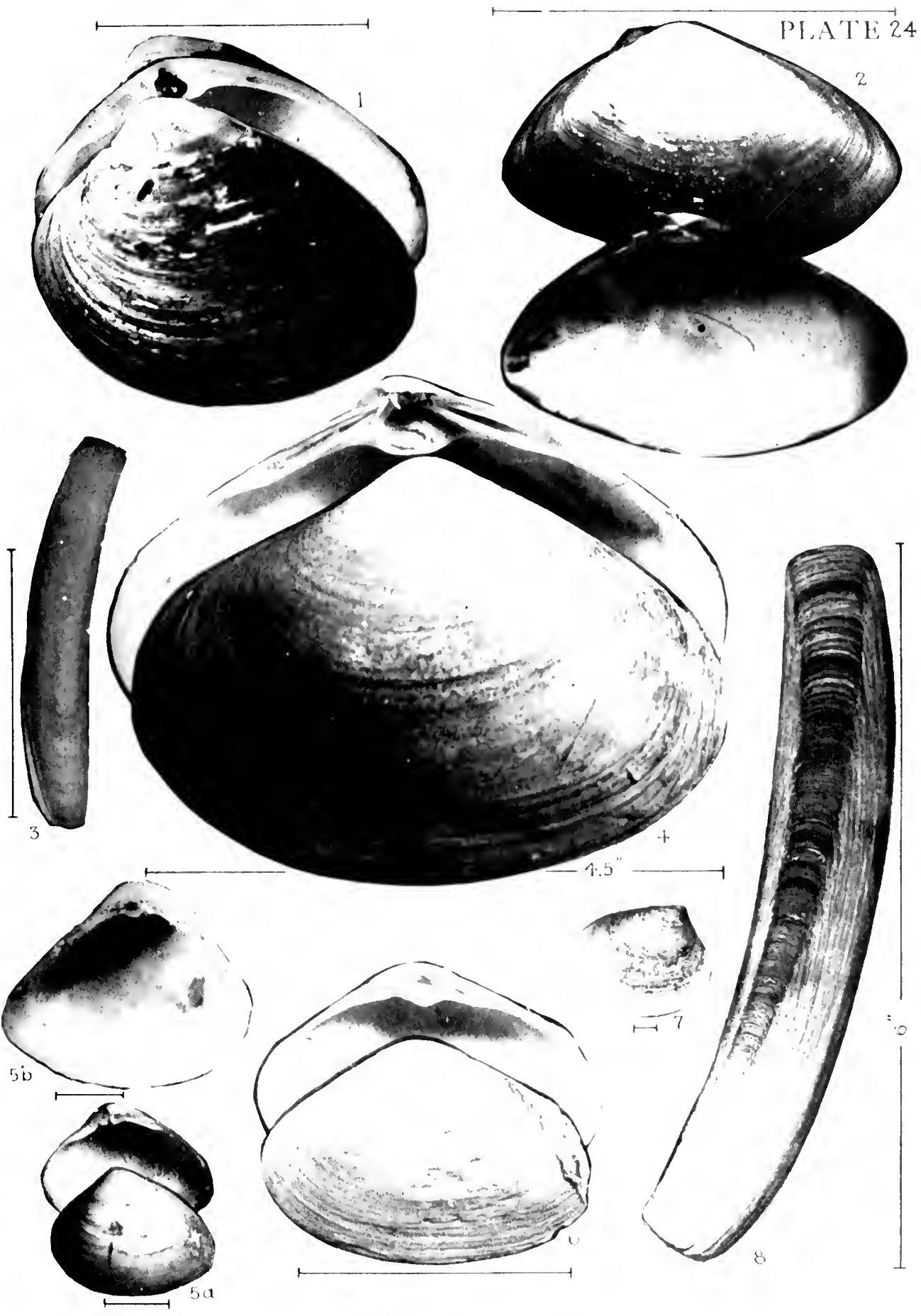
P L A T E 2 3

1. *Tellina magna* Spengler. Bermuda. 2.5 inches. p. 58.
2. *Tellina laevigata* Linné. Bermuda. 35 mm. p. 57.
3. *Tellina radiata* Linné. Boynton, Florida. 3 inches. p. 57.
- 4a, 4b. *Tellina sayi* Dall. Angelsea, New Jersey. 18 mm. p. 58
- 5a, 5b. *Cumingia coarctata* Sowerby. Punta Gorda, Florida. 18 mm. p. 62.
6. *Cumingia tellinoides* Conrad. 14 mm. p. 62.
- 7a, 7b. *Tellina linteae* Conrad. Off Cape Lookout, North Carolina. 22 mm. p. 57.
8. *Macoma balthica* Linné. 1 inch. p. 59.
9. *Macoma brevifrons* Say. St. Petersburg, Florida. 35 mm. p. 60.
- 10a, 10b. *Abra aequalis* Say. Sanibel, Florida. 10 mm. p. 61.
11. *Semele proficua* Pult. Sanibel, Florida. 30 mm. p. 61.
12. *Semele purpurascens* Sowerby. Palm Beach, Florida. 40 mm. p. 61.
13. *Abra lioica* Dall. Captiva, Florida. 7 mm. p. 61.
14. *Lucina crenella* Dall. Florida. 5 mm. p. 46.
15. *Tellina iris* Say. 12 mm. p. 59.
16. *Tellina radiata unimaculata* Lamarck. West Indies. 3 inches. p. 57.
17. *Tellina tampaensis* Conrad. Sanibel, Florida. 14 mm. p. 58.



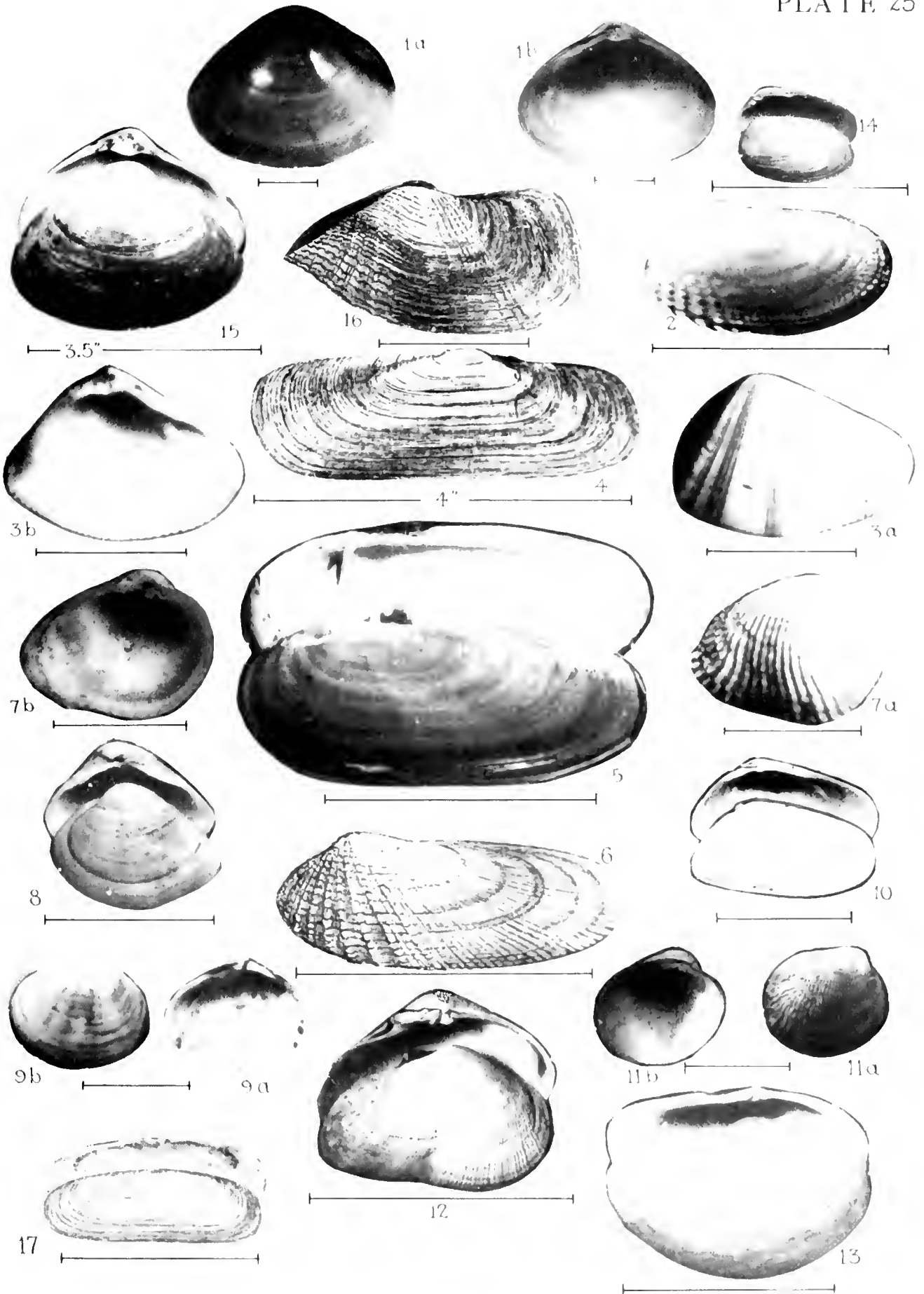
P L A T E 2 4

1. *Rangia cuneata* Gray. Jacksonville, Florida. 2 inches. p. 65.
2. *Iphigenia brasiliensis* Lamarck. Lake Worth, Florida. 3 inches. p. 63.
3. *Solen viridis* Say. Sanibel, Florida. 2 inches. p. 64.
4. *Spisula solidissima similis* Say. West Florida. 4.5 inches. p. 65.
- 5a, 5b. *Mulinia lateralis* Say. 12 mm. p. 65.
6. *Macra fragilis* Gmelin. 2 inches. p. 64.
7. *Rochfortia planulata* Stimpson. 4 mm. p. 48.
8. *Ensis directus* Conrad. Long Island, New York. 6 inches. p. 64.



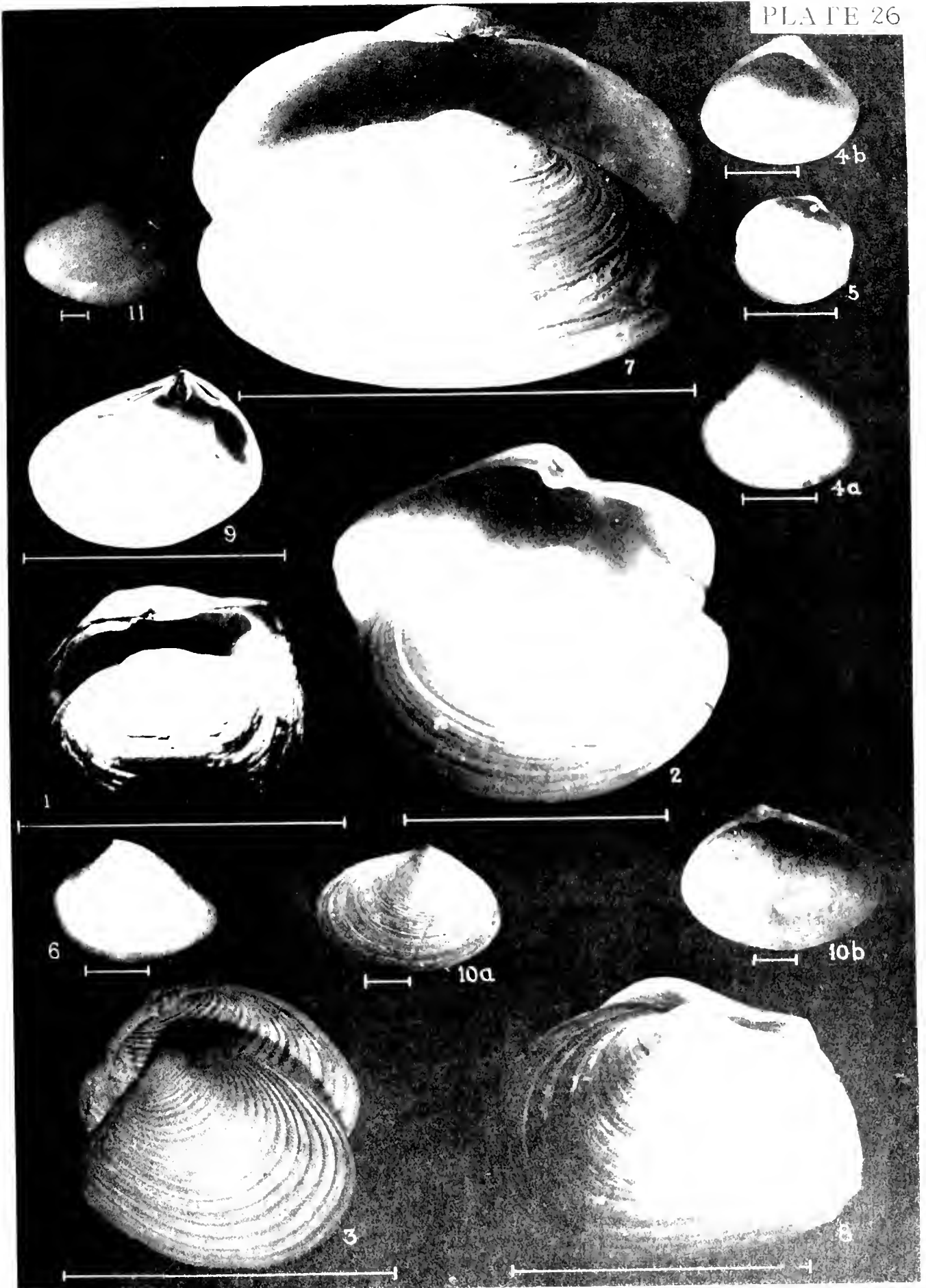
P L A T E 2 5

1. *Tivela abaconis* Dall. Yamato, Florida. 11 mm. p. 52.
2. *Petricola pholadiformis lata* Dall. Beaufort, North Carolina. 1.75 inches, p. 56.
- 3a, 3b. *Donax denticulatus* Linné. Nicaragua. 28 mm. p. 62.
4. *Tagelus gibbus* Spengler. 4 inches. p. 64.
5. *Siliqua costata* Say. Swampscott, Massachusetts. 2 inches. p. 64
6. *Petricola pholadiformis* Lamarck. Far Rockaway, New York. 2.35 inches. p. 56.
- 7a, 7b. *Rupellaria typica* Jonas. Palm Beach, Florida. 1 inch. p. 56.
8. *Polymesoda floridana sarasotaensis* Henderson. Tampa Bay, Florida. 1.25 inches. p. 43.
- 9a, 9b. *Heterodonax bimaculatum* Linné. 20 mm. p. 63.
10. *Donax variabilis* Say. West Florida. 1 inch. p. 62.
- 11a, 11b. *Petricola lapicida* Gmelin. Gordon Pass, Florida. 20 mm. p. 56.
12. *Asaphis deflorata* Linné. Miami, Florida. 2 inches. p. 63.
13. *Sanguinolaria sanguinolenta* Gmelin. Jamaica. 40 mm. p. 63.
14. *Coralliophaga coralliophaga* Gmelin. Bermuda. 1.5 inches. p. 56.
15. *Spisula polynyma* Stimpson. Grand Manan, N. B. 3.5 inches. p. 65.
16. *Barnea truncata* Say. 28 mm. p. 69.
17. *Tagelus divisus* Spengler. New England. 1.5 inches. p. 63.



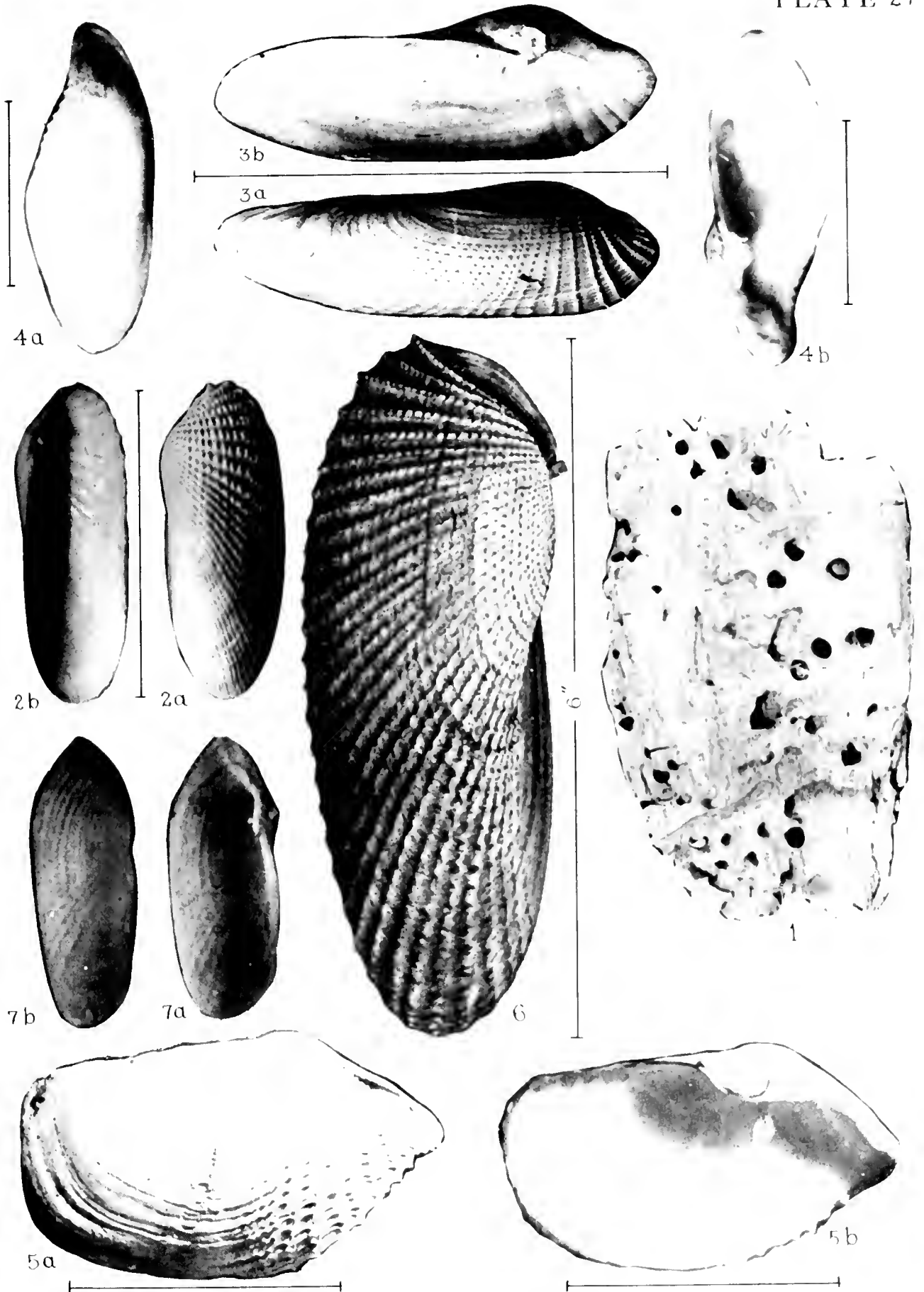
P L A T E 2 6

1. *Panomya arctica* Lamarck. Off Owl's Head, Maine, 2.5 inches. p. 68.
2. *Anatina lineata* Say. Sanibel, Florida. 2 inches. p. 65.
3. *Anatina canaliculata* Say. 2.5 inches. p. 65.
- 4a, 4b. *Transennella stimpsoni* Dall. Egmont Key, Florida. 14 mm. p. 51.
5. *Periploma papyratia* Say. 17 mm. p. 40.
6. *Transennella conradina* Dall. West Florida. 12 mm. p. 51.
7. *Mya arenaria* Linné. Stonington, Connecticut. 3.5 inches. p. 66.
8. *Mya truncata* Linné. New England. 58 mm. p. 66.
9. *Mesodesma arctata* Conrad. North Truro, Massachusetts. 2 inches. p. 66.
- 10a, 10b. *Ervilia nitens* Montagu. Antilles. 8 mm. p. 66.
11. *Ervilia concentrica* Gould. 5 mm. p. 66.



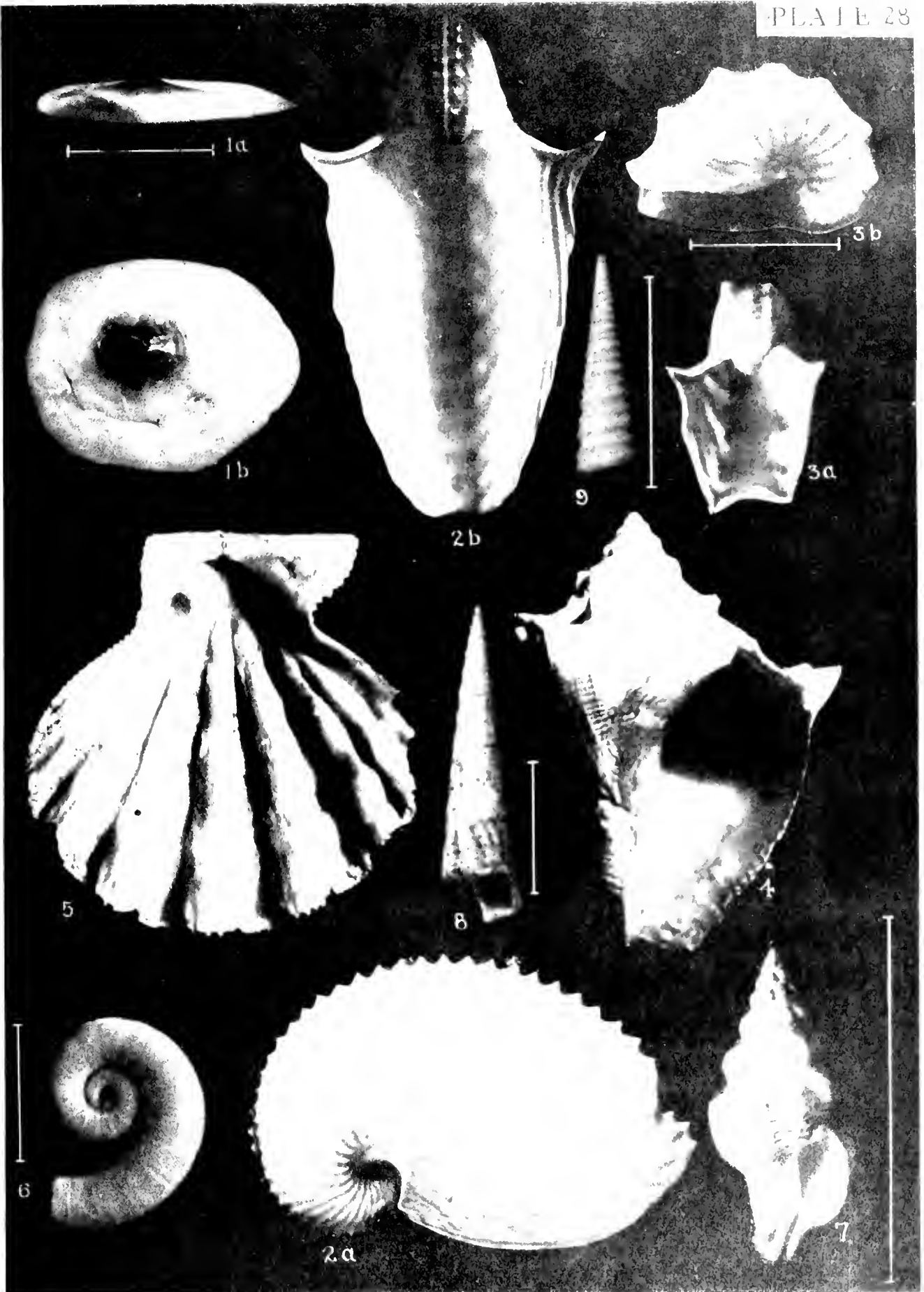
P L A T E 2 7

1. *Teredo navalis* Linné. Borings in timber. p. 70.
- 2a, 2b. *Petricola pholadiformis* Lamarck. Long Island, New York. 2.25 inches. p. 56.
- 3a, 3b. *Pholas campechiensis* Gmelin. 3.5 inches. p. 68.
- 4a, 4b. *Barnea maritima* Orbigny. Gulf of Mexico. 35 mm. p. 69.
- 5a, 5b. *Zirfaea crispata* Linné. Scituate, Massachusetts. 2 inches. p. 69.
6. *Barnea costata* Linné. Cape Sable, Florida. 6 inches. p. 69.
- 7a, 7b. *Zirfaea crispata* Linné. Sanibel, Florida. p. 69.



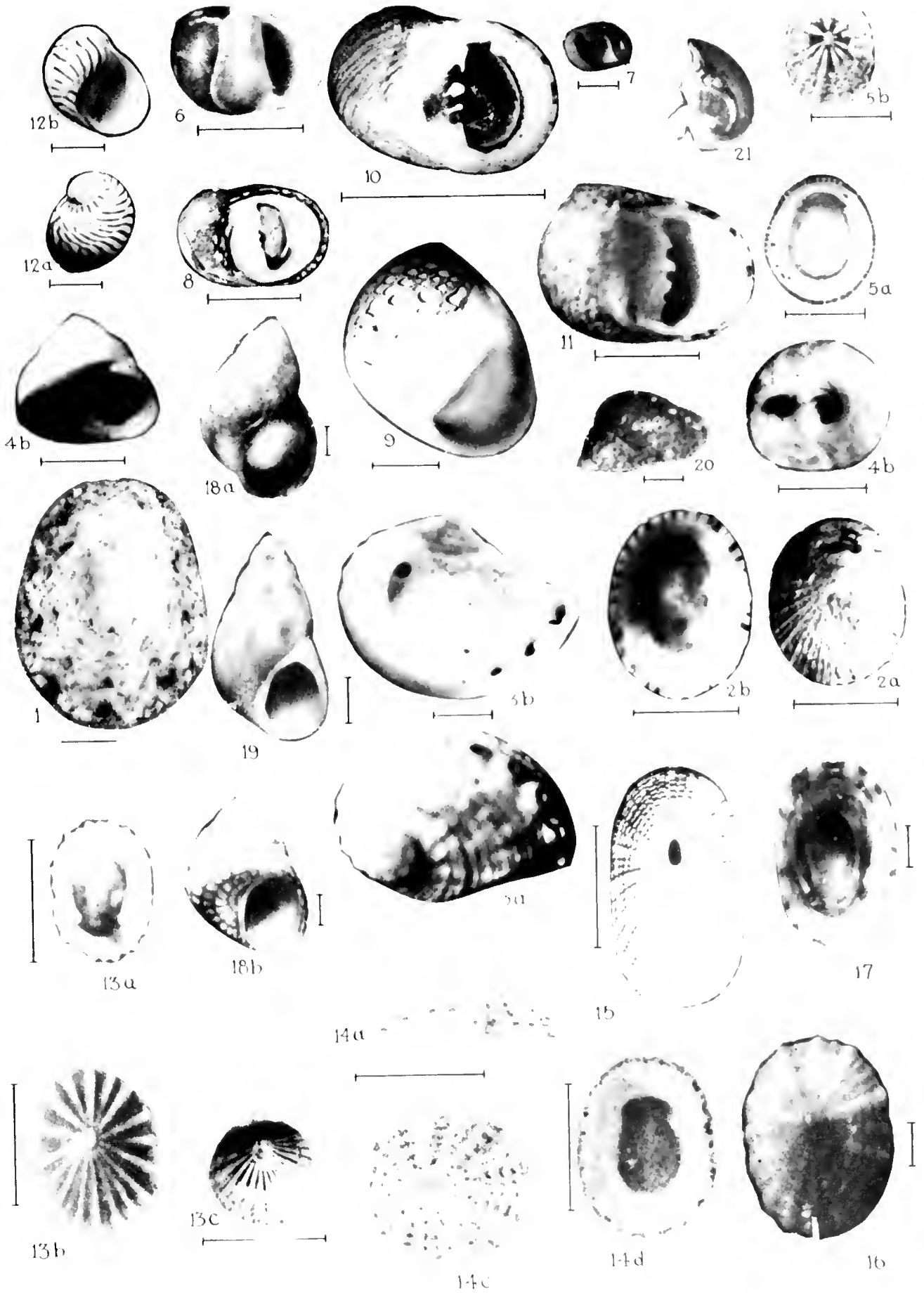
P L A T E 2 8

- 1a, 1b. *Umbraculum plicatulum* Martens. Deerfield, Florida. 28 mm. p. 144.
2. *Argonauta argo americana* Dall. Florida. p. 149.
- 3a, 3b. *Argonauta hians* Solander. Lantana, Florida. 28 mm. p. 149.
4. *Melongena corona subcoronata* Heilprin. Pliocene, Florida. p. 125.
5. *Pecten nodosus* Linné. Interior of valve. p. 34.
6. *Spirula spirula* Linné. 1 inch. p. 148.
7. *Latirus brevicaudatus* Reeve. St. Thomas, W. I. 2.75 inches. p. 126.
8. *Torcula subannulata acropora* Dall. West Florida. 1 inch. p. 101.
9. *Turritella exoleta* Linné. Havana, Cuba. 40 mm. p. 101.



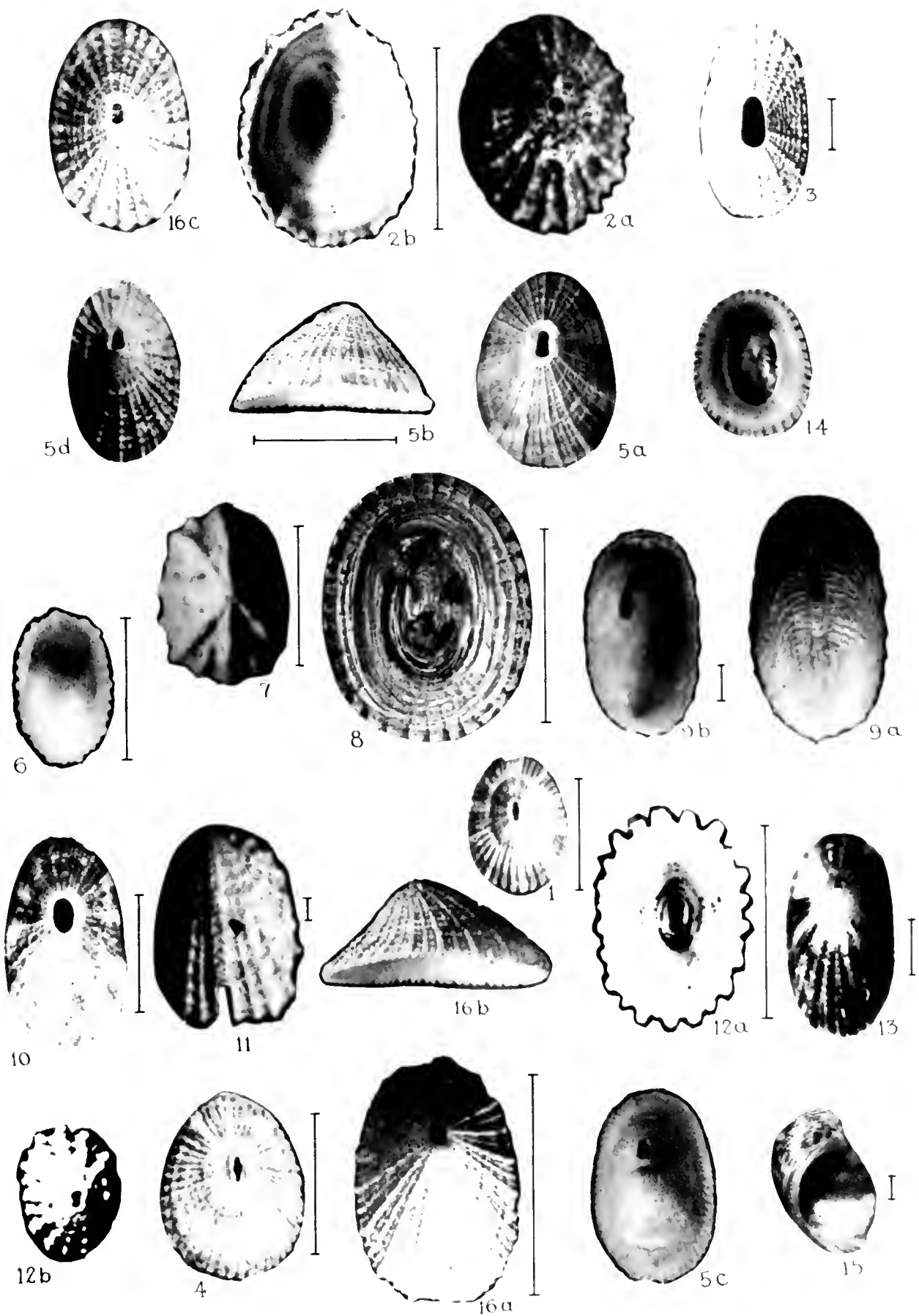
P L A T E 2 9

1. *Acmaea candeana* Orbigny var. Young. Key West, Florida. 10 mm. p. 74.
- 2a, 2b. *Acmaea candeana antillarum* Sowerby. Guantanamo, Cuba. 20 mm. p. 74.
- 3a, 3b. *Haliotis pourtalesii* Dall. Off Key West, Florida. 11 mm. p. 78.
- 4a, 4b. *Tegula semigranosa* A. Adams. Yamato, Florida. 16 mm. p. 78.
- 5a, 5b. *Acmaea cubensis* Reeve. Nassau, Bahamas. 15 mm. p. 74.
6. *Neritina reclivata* Say. Lake Worth, Florida. 20 mm. p. 83.
7. *Neritina viridis* Linné. Palm Beach, Florida. 7.5 mm. p. 83.
8. *Nerita tessellata* Gmelin. Boynton, Florida. 18 mm. p. 83.
9. *Neritina virginea* Linné. Palm Beach, Florida. 12 mm. p. 83.
10. *Nerita peloronta* Linné. Jupiter, Florida. 1.5 inches. p. 82.
11. *Nerita versicolor* Lamarck. Florida. 20 mm. p. 82.
- 12a, 12b. *Neritina pupa* Linné. 10 mm. p. 83.
- 13a, 13b, 13c. *Acmaea leucopleura* Gmelin. 23 mm. p. 74.
- 14a-14d. *Acmaea punctulata* Gmelin. 24 mm. p. 74.
15. *Lucapina cancellata* Sowerby. Boynton, Florida. 23 mm. p. 76.
16. *Submarginula pumila* A. Adams. Dominican Republic, 8 mm. p. 77.
17. *Acmaea testudinalis alveus* Conrad. Interior, Maine. 8 mm. p. 75.
- 18a, 18b. *Phasianella tessellata* Potiez and Michaud. Boynton, Florida. 5.5 mm. p. 81.
19. *Phasianella affinis* C. B. Adams. St. Martins, W. I. 8.5 mm. p. 81.
20. *Phasianella umbilicata* Orbigny. Bonair Id., W. I. 7 mm. p. 81.
21. *Nerita peloronta* Linné. Operculum. p. 82.



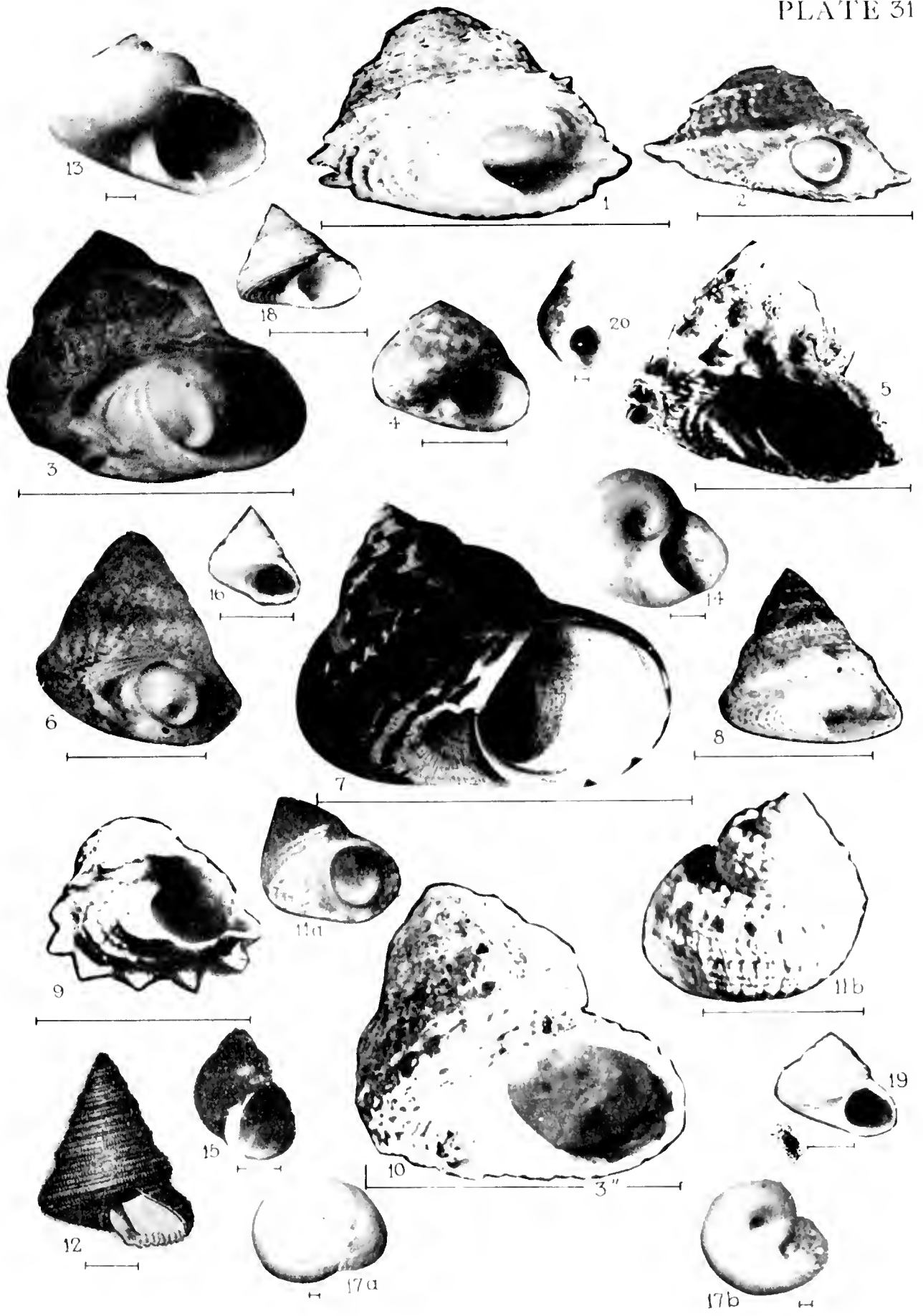
P L A T E 3 0

1. *Fissurella fascicularis* Lamarck. Rum Key, Florida. 20 mm. p. 75.
- 2a, 2b. *Fissurella barbadensis* Gmelin. Bahamas. 33 mm. p. 75.
3. *Lucapinella limatula* Reeve. Off Cape Fear, North Carolina. 9 mm. p. 76.
4. *Fissurella pustula* Lamarck. West Indies. 1 inch. p. 75.
- 5a-5d. *Diadora alternata* Say. 1 inch. p. 76.
6. *Submarginula emarginata* Blainville. 1 inch. p. 77.
7. *Submarginula octoradiata* Adams. 1 inch. p. 77.
8. *Acmaea testudinalis amaena* Say. Maine. 35 mm. p. 75.
- 9a, 9b. *Rimula frenulata* Dall. Off Cape Lookout, North Carolina. 6.25 mm. p. 77.
10. *Lucapina adspersa* Philippi. Lignumvitae Key, Florida. 21 mm. p. 76.
11. *Emarginula cancellata* Philippi. Off Cape Hatteras, North Carolina. 4 mm.
p. 76.
- 12a, 12b. *Fissurella nodosa* Born. 35 mm. p. 75.
13. *Diadora minuta* Lamarck. Boynton, Florida. 10 mm. p. 76.
14. *Acmaea candeana* Orbigny. p. 74.
15. *Stomatella picta* Orbigny. Florida Keys. 4 mm. p. 77.
- 16a, 16b, 16c. *Diadora listeri* Orbigny. Biscayne Bay, Florida. 40 mm. p. 76.



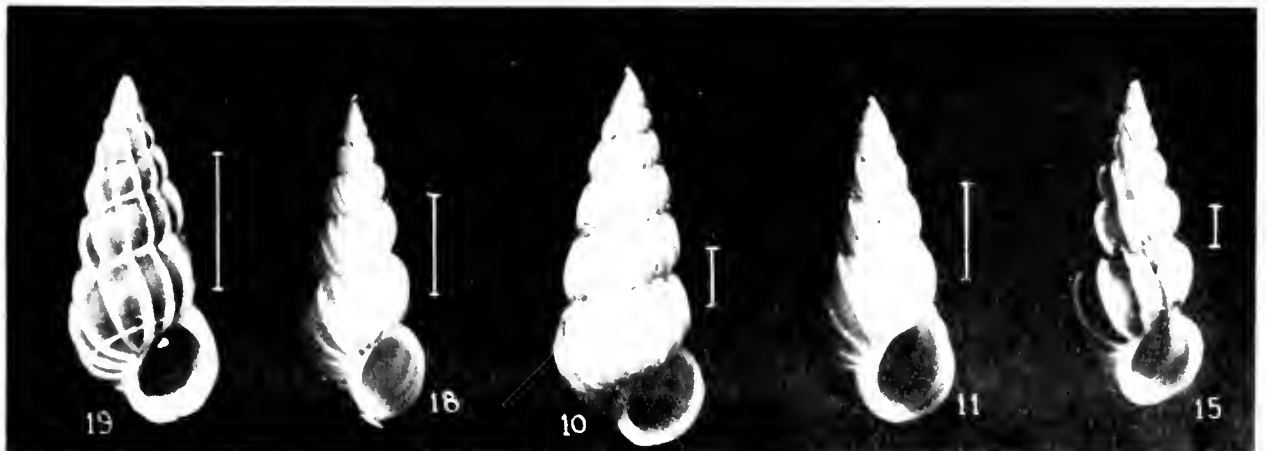
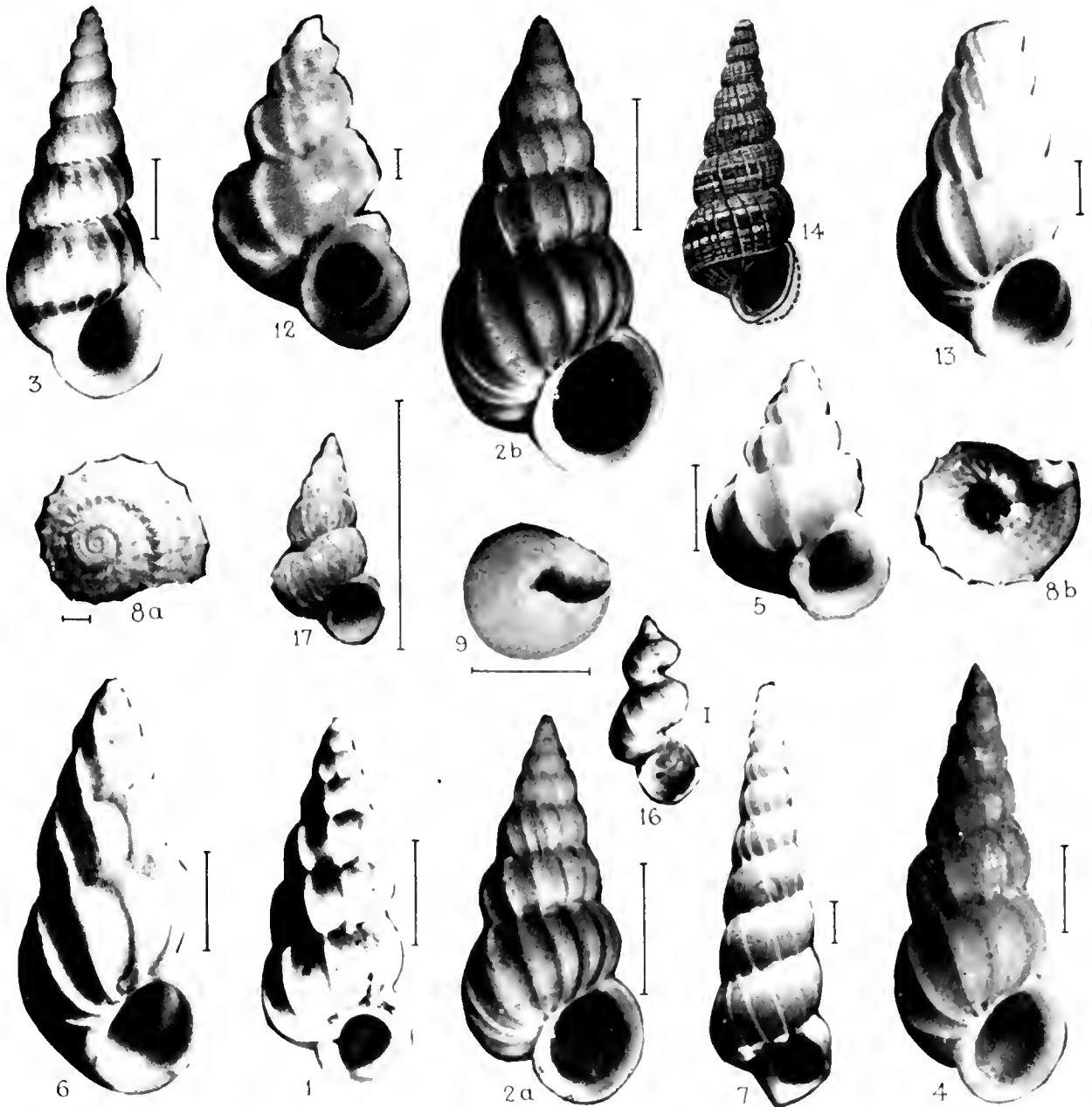
P L A T E 3 1

1. *Astraea longispina spinulosa* Lamarck. 65 mm. p. 82.
2. *Astraea longispina* Lamarck. 40 mm. p. 82.
3. *Astraea tuber* Linné. Boca Raton, Florida. 2 inches. p. 82.
4. *Tegula fasciata* Born. Biscayne Bay, Florida. 16 mm. p. 78.
5. *Astraea imbricata* Gmelin. 40 mm. p. 82.
6. *Astraea americana* Gmelin. Florida Keys. 1 inch. p. 82.
7. *Livona pica* Linné. West Indies. 2.75 inches. p. 79.
8. *Calliostoma jujubinum* Gmelin. West Florida. 33 mm. p. 79.
9. *Astraea brevispina* Lamarck. West Indies. 40 mm. p. 82.
10. *Astraea caelata* Gmelin. Lantana, Florida. 3 inches. p. 82.
- 11a, 11b. *Turbo castaneus* Gmelin. Florida Keys. 30 mm. p. 81.
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- 17a, 17b. *Cochliolepis parasitica* Stimpson. 2 mm. p. 80.
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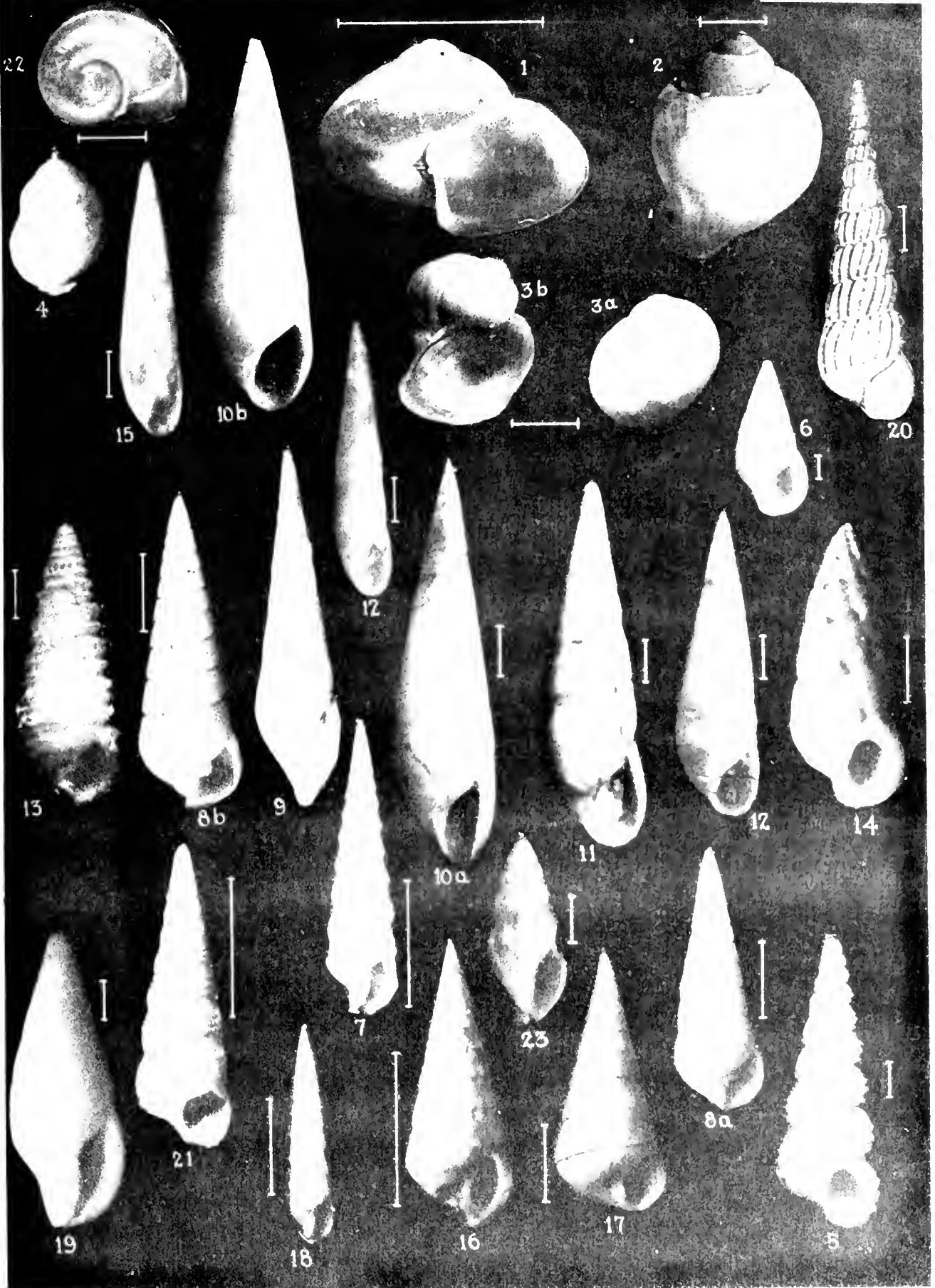
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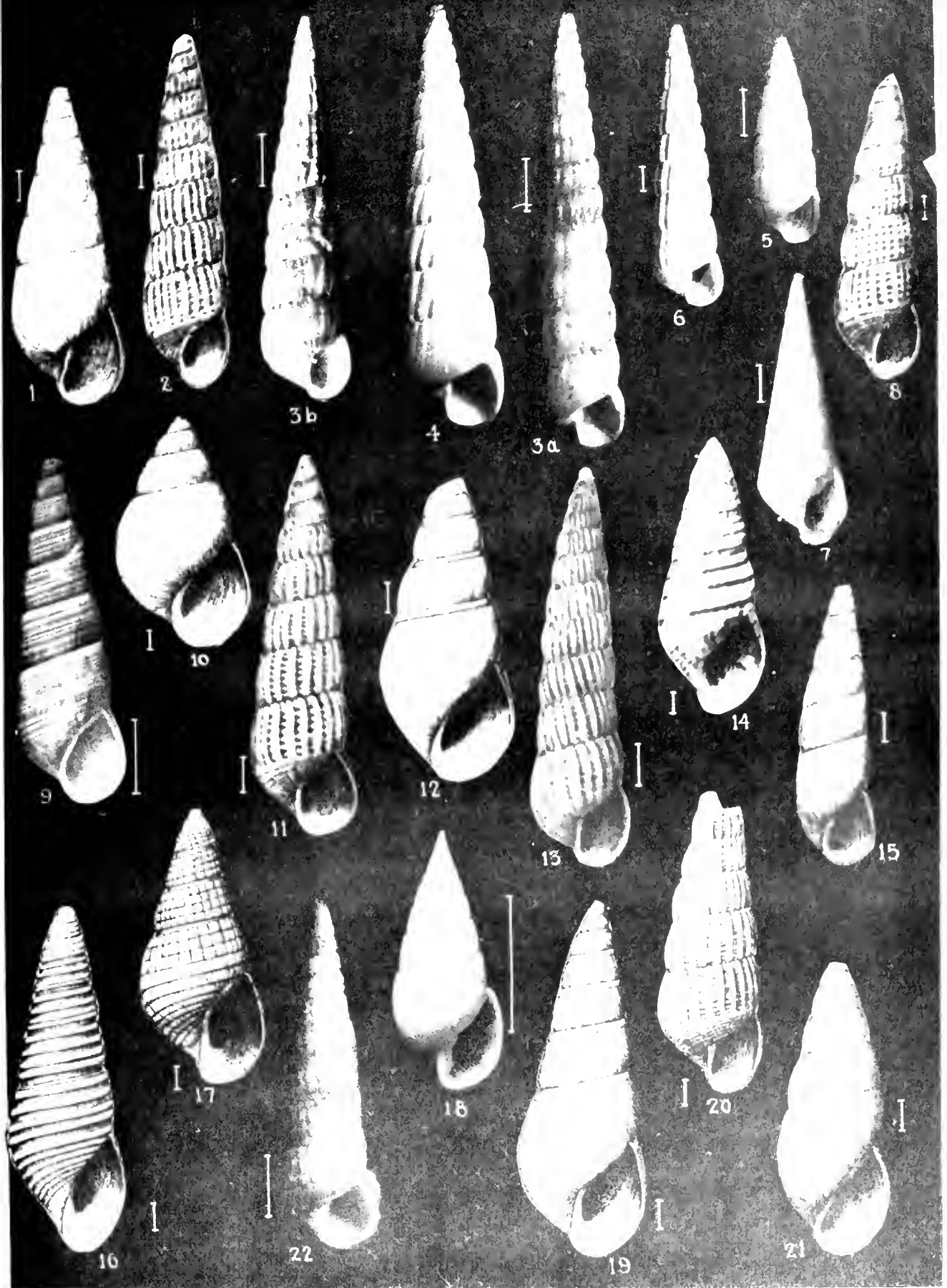
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- 8a, 8b. *Pyramidella crenulata* Holmes. Palm Beach, Florida. 14 mm. p. 87.
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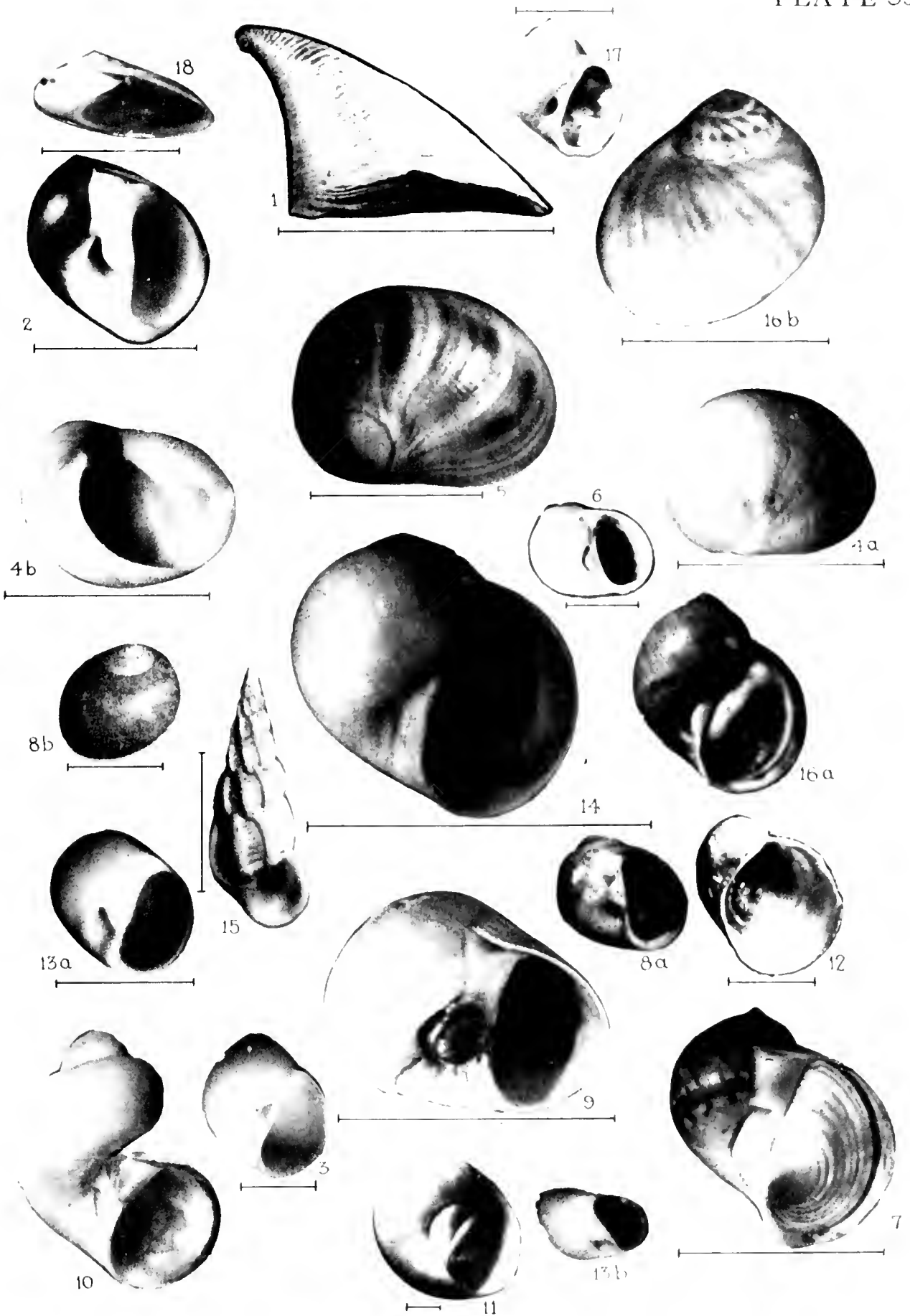
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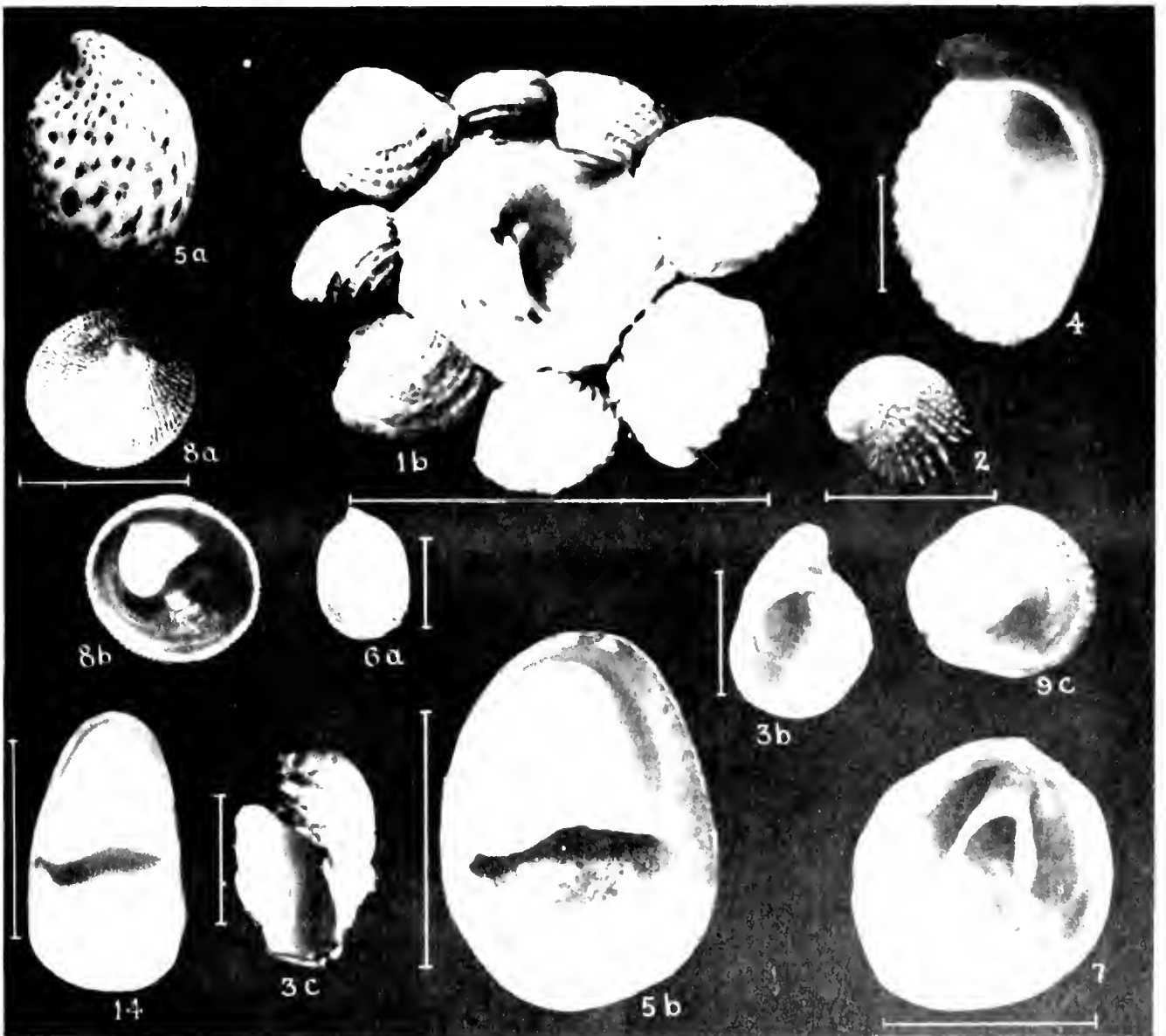
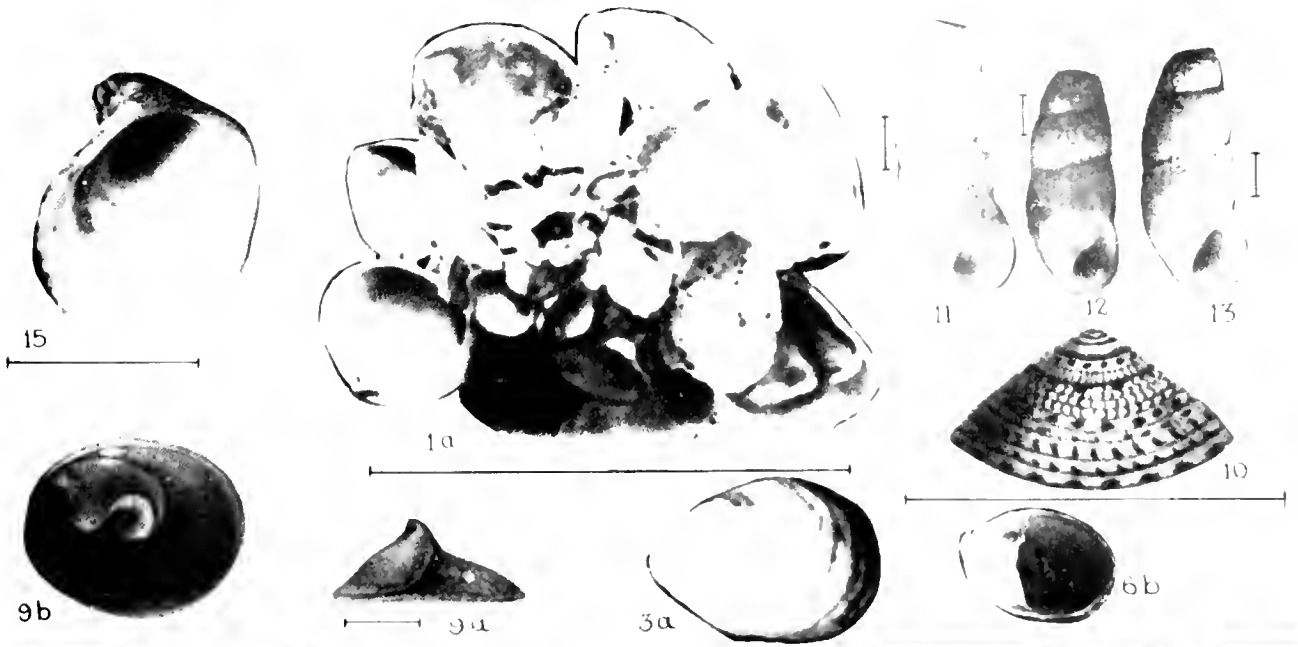
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3. *Eunaticina semisulcata* Gray. Boynton, Florida. 14 mm. p. 93.
- 4a, 4b. *Sinum perspectivum* Say. Delray Beach, Florida. 1.5 inches. p. 93.
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6. *Natica livida* Pfeiffer. Palm Beach, Florida. 13 mm. p. 91.
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- 8a, 8b. *Polinices triseriata* Say. Maine. 17 mm. p. 92.
9. *Polinices duplicata* Say. Far Rockaway, New York. 2 inches. p. 92.
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- 13a, 13b. *Polinices lactea* Guilding. Palm Beach, Florida. 1 inch. p. 92.
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17. *Polinices groenlandica* Moller. New England. 18 mm. p. 92.
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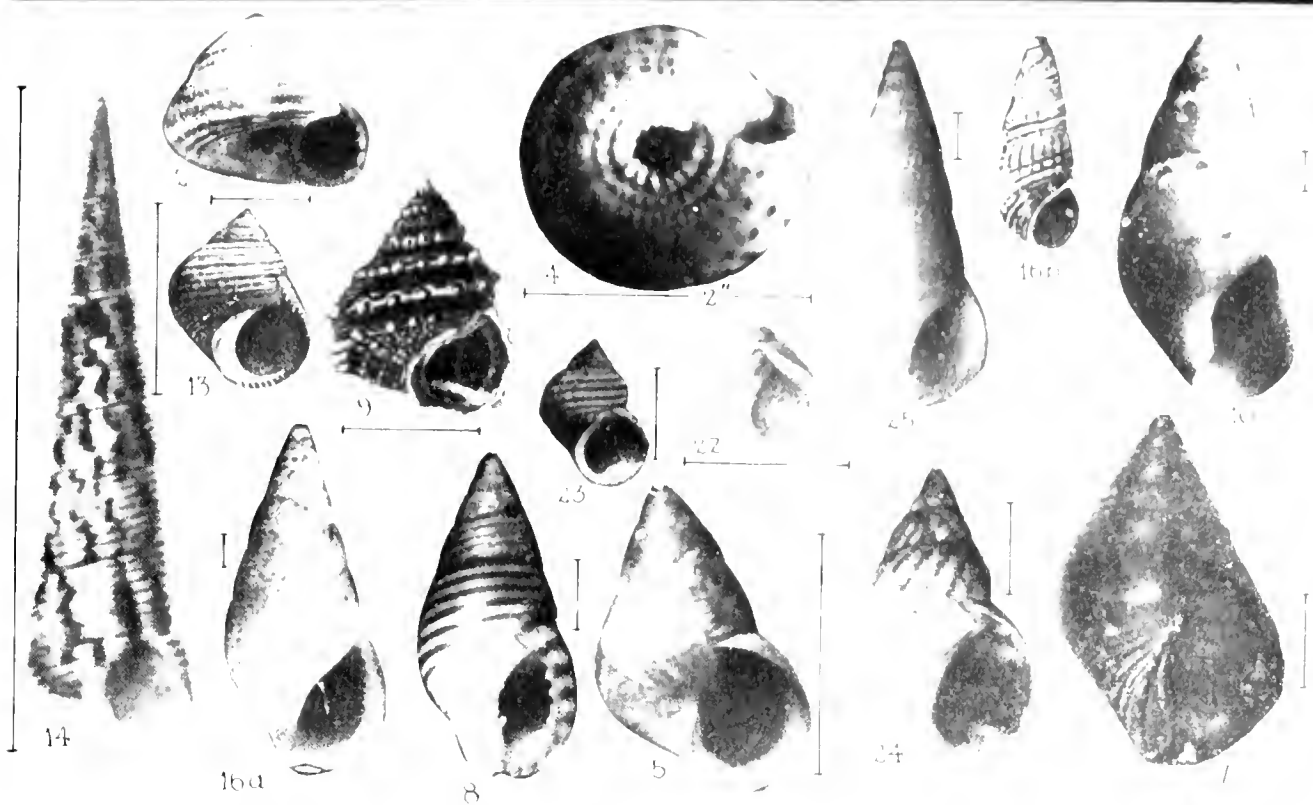
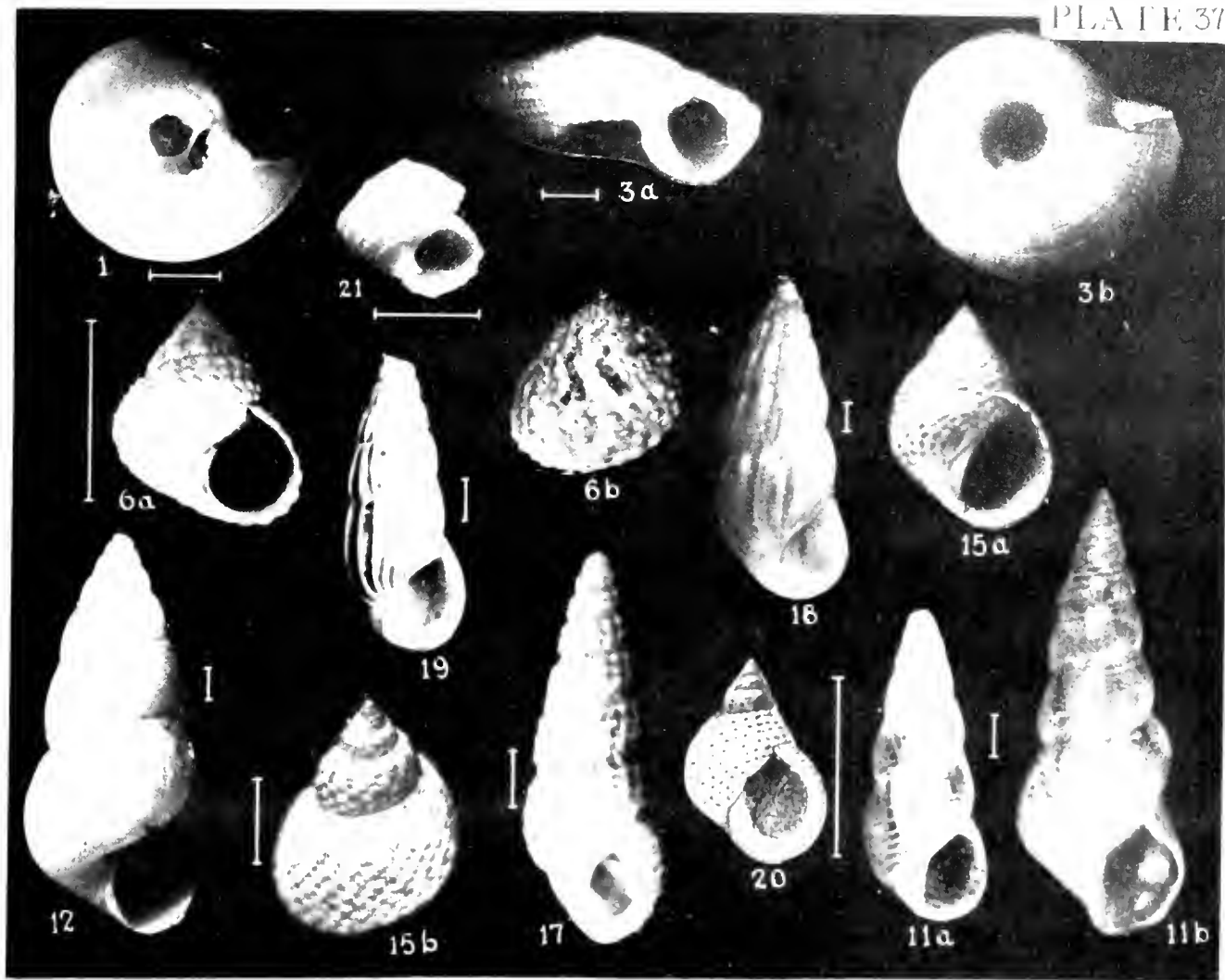
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- 1a, 1b. *Xenophora conchyliophora* Born. Palm Beach, Florida. 2.5 inches. p. 94.
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11. *Truncatella caribaeensis* Sowerby. Florida Keys. 7 mm. p. 96.
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13. *Truncatella bilabiata* Pfeiffer. Palm Beach, Florida. 5.5 mm. p. 96.
14. *Crepidula plana* Say. Lake Worth, Florida. 30 mm. p. 96.
15. *Capulus ungaricus* Linné. 1 inch. p. 94.



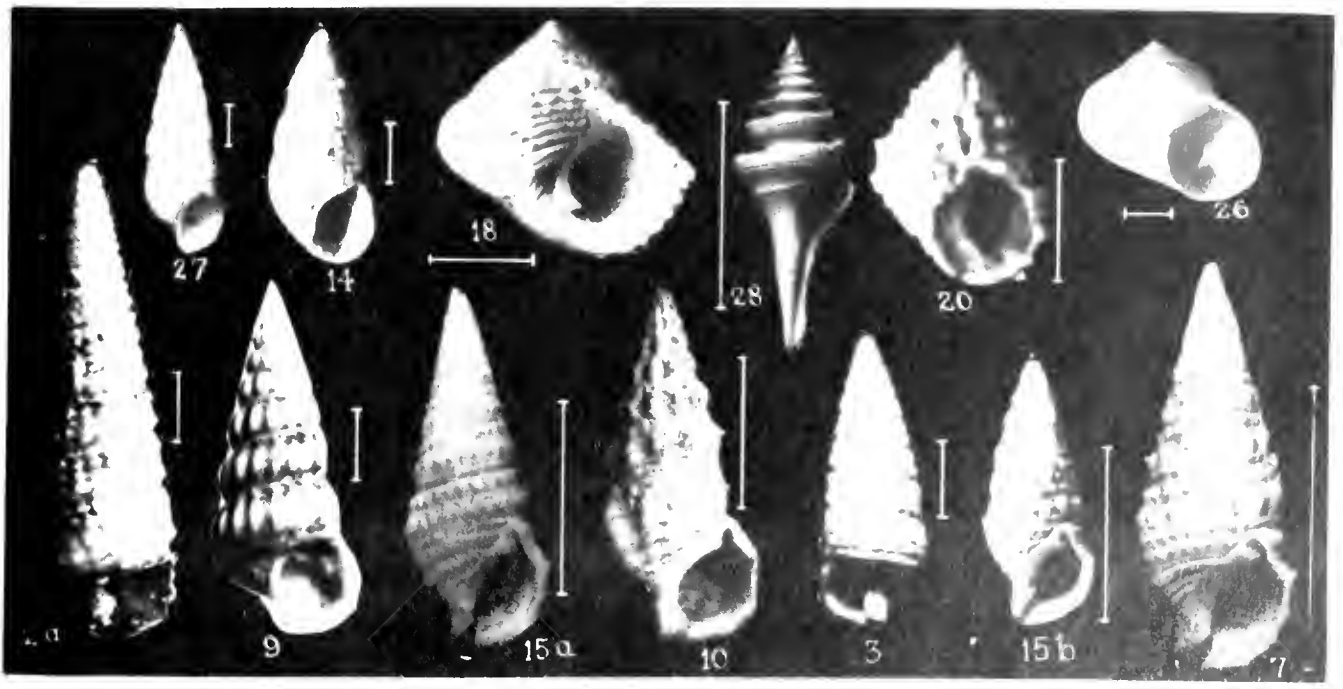
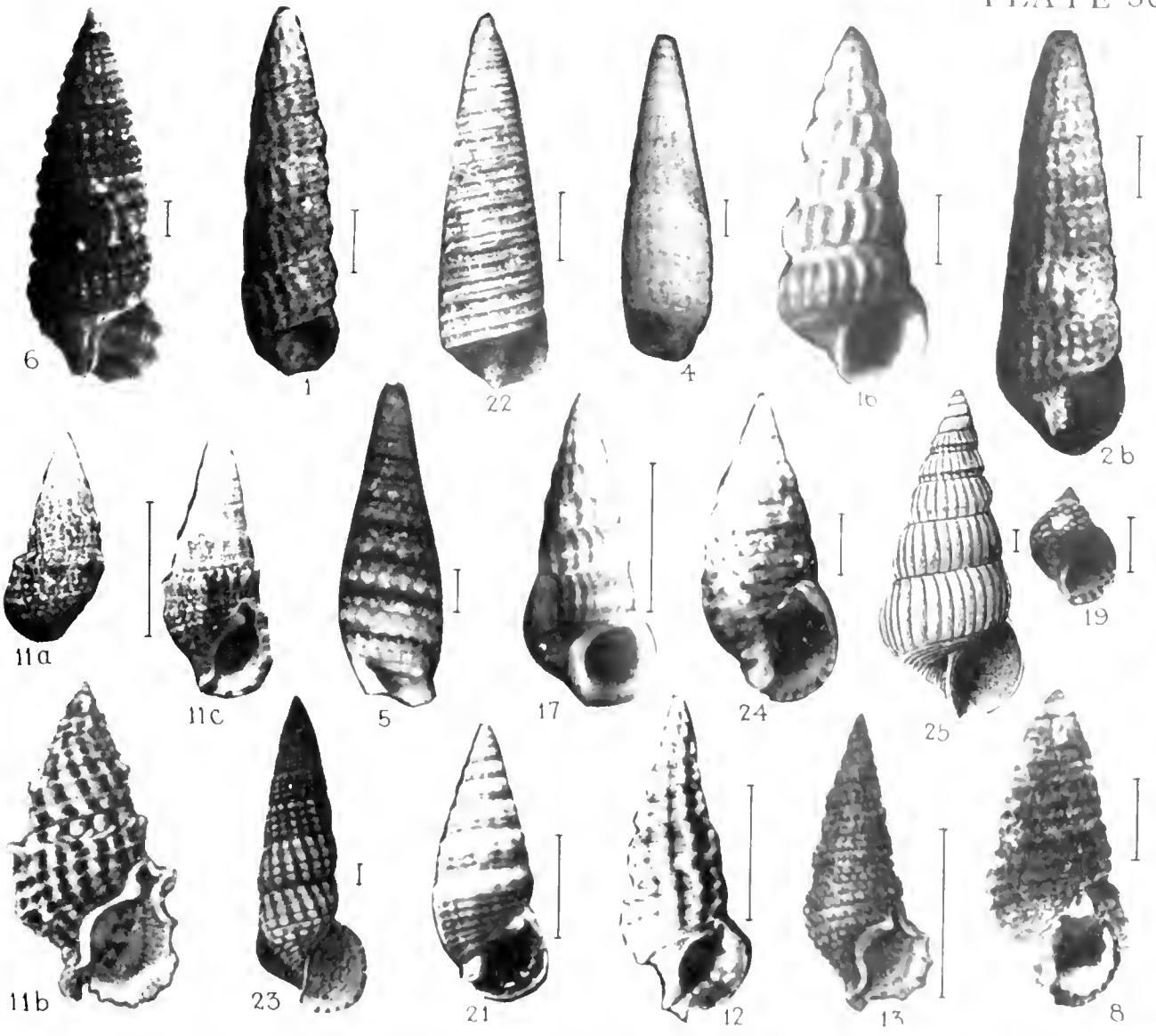
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5. *Littorina angulifera* Lamarck. Lake Worth, Florida. 1.25 inches. p. 100.
- 6a, 6b. *Tectarius muricatus* Linné. Boca Raton, Florida. 1 inch. p. 100.
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- 11a, 11b. *Alaba tervaricosa* C. B. Adams. Boynton, Florida. 6 mm. p. 98.
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15. *Littorina ziczac lineata* Lamarck. Jupiter, Florida. 12 mm. p. 100.
- 16a, 16b. *Rissoina laevigata* C. B. Adams. Palm Beach, Florida. 4 mm. p. 97.
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18. *Rissoina chesnelli* Michaud. West Florida. 4 mm. p. 97.
19. *Rissoina bryerea* Montagu. Palm Beach, Florida. 5 mm. p. 97.
20. *Littorina irrorata* Say. Coronado Beach, Florida. 1 inch. p. 99.
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25. *Rissoina decussata* Montagu. 6 mm. p. 97.



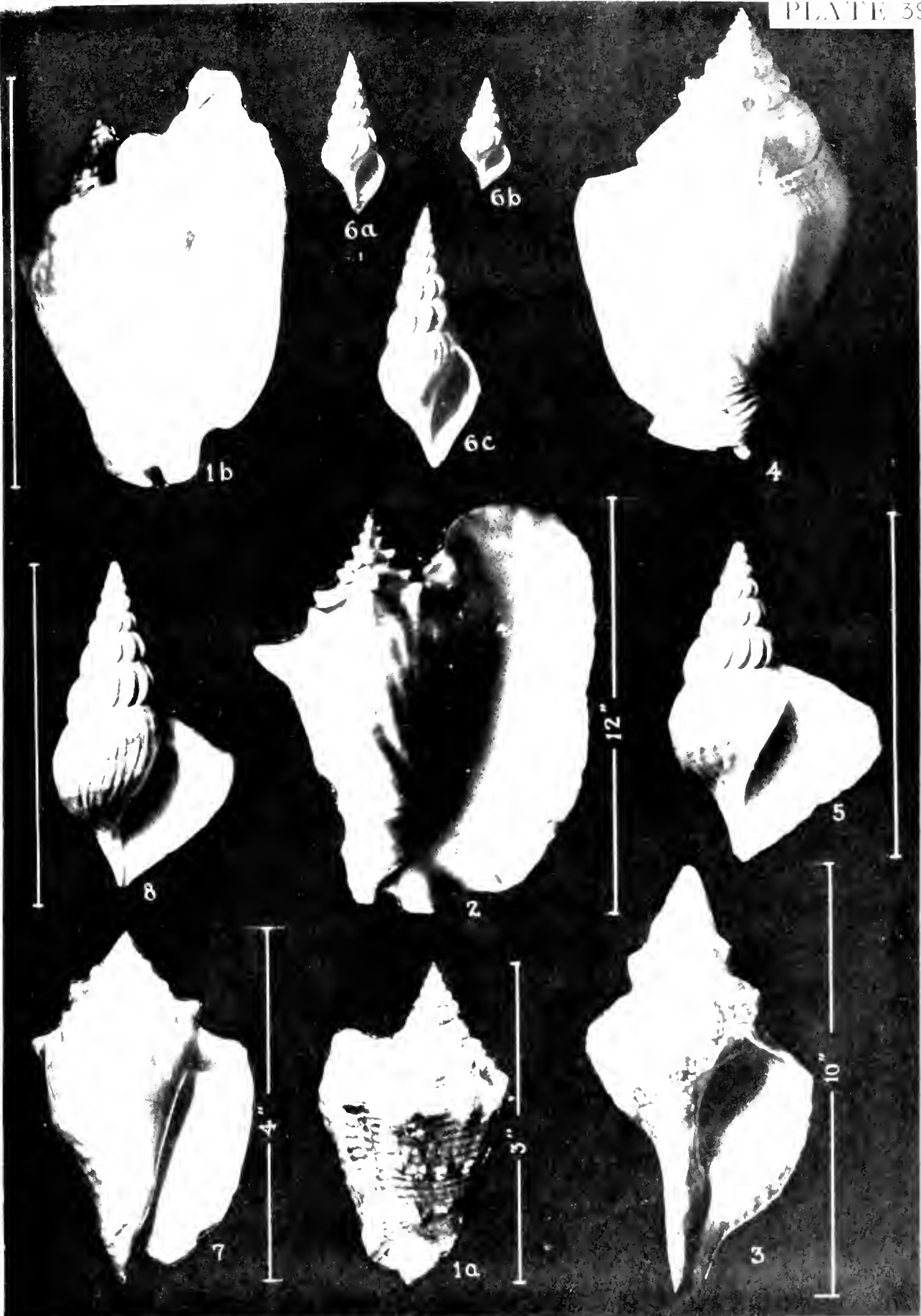
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- 2a, 2b. *Cerithiopsis subulata* Montagu. 9 mm. p. 105.
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5. *Triphora turris-thomae* Dillwyn. 6 mm. p. 104.
6. *Cerithiopsis greeni* C. B. Adams. Sanibel, Florida. 5 mm. p. 105.
7. *Cerithium floridanum* Morch. 1.5 inches. p. 106.
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9. *Cerithidea costata* Da Costa. 9 mm. p. 107.
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- 11a, 11b, 11c. *Cerithium literatum* Born. 20 mm. p. 106.
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18. *Modulus angulatus* C. B. Adams. Fox Bay, Colon. 13 mm. p. 104.
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26. *Margarites olivacea* Brown. New England. 6 mm. p. 80.
27. *Bittium varium* Pfeiffer. Florida. 5 mm. p. 107.
28. *Ancistrosyrinx elegans* Dall. Florida reefs. 27 mm. p. 134.



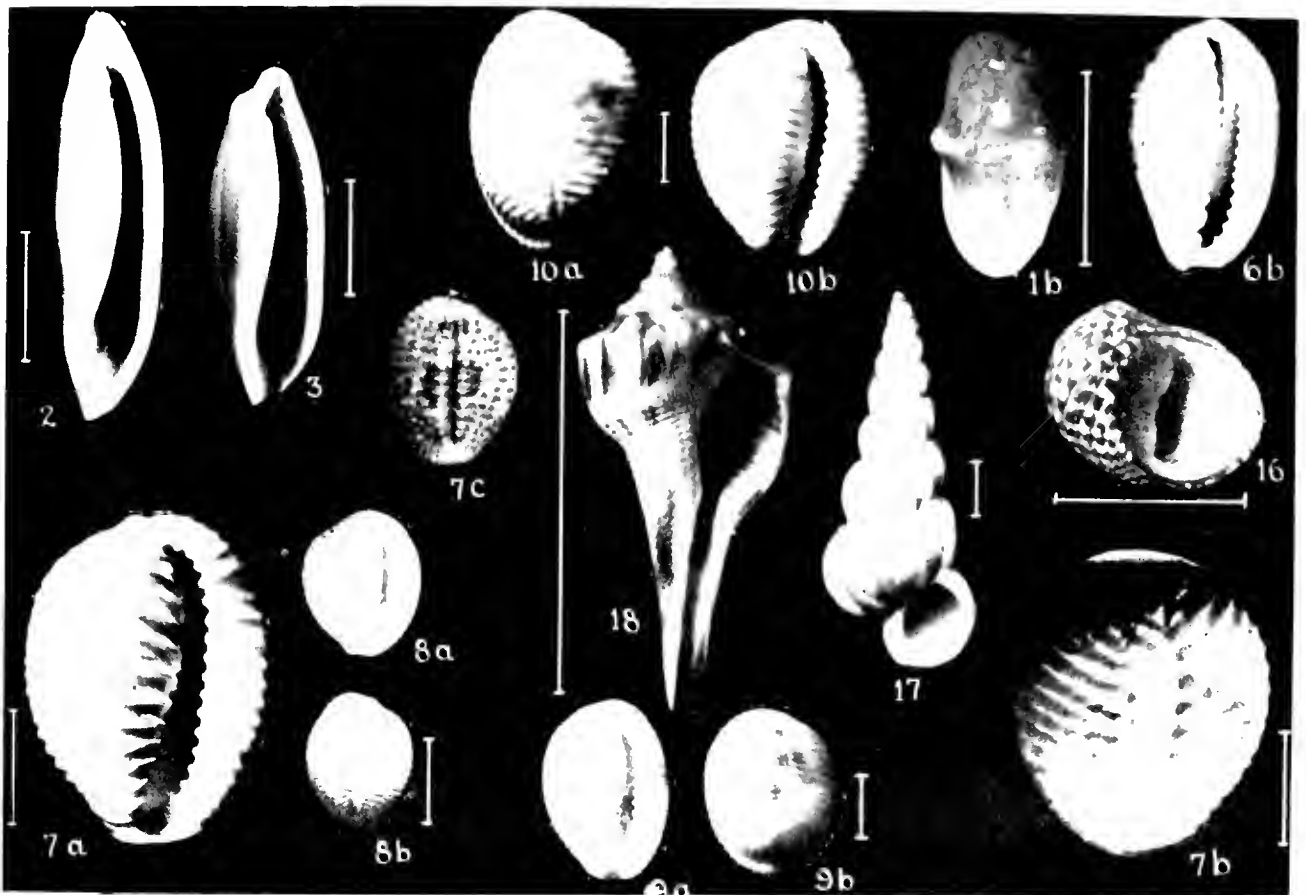
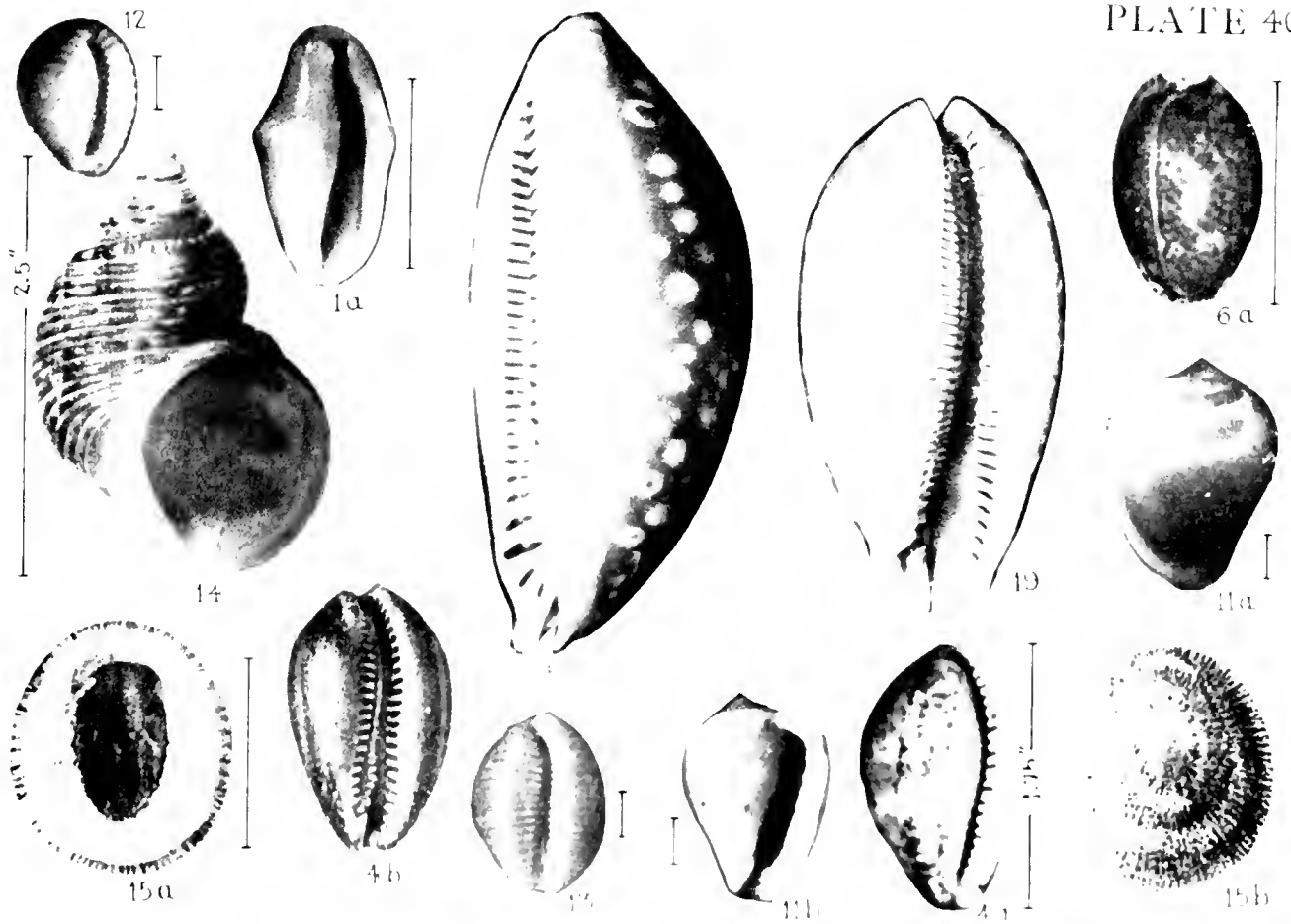
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- 1a, 1b. *Strombus bituberculatus* Lamarck. Lake Worth, Florida. 3 inches. p. 108.
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7. *Strombus pugilis* Linné. Lake Worth, Florida. 4 inches. p. 108.
8. *Aporrhais occidentalis* Beck. Off Maine. 2.5 inches. p. 107.



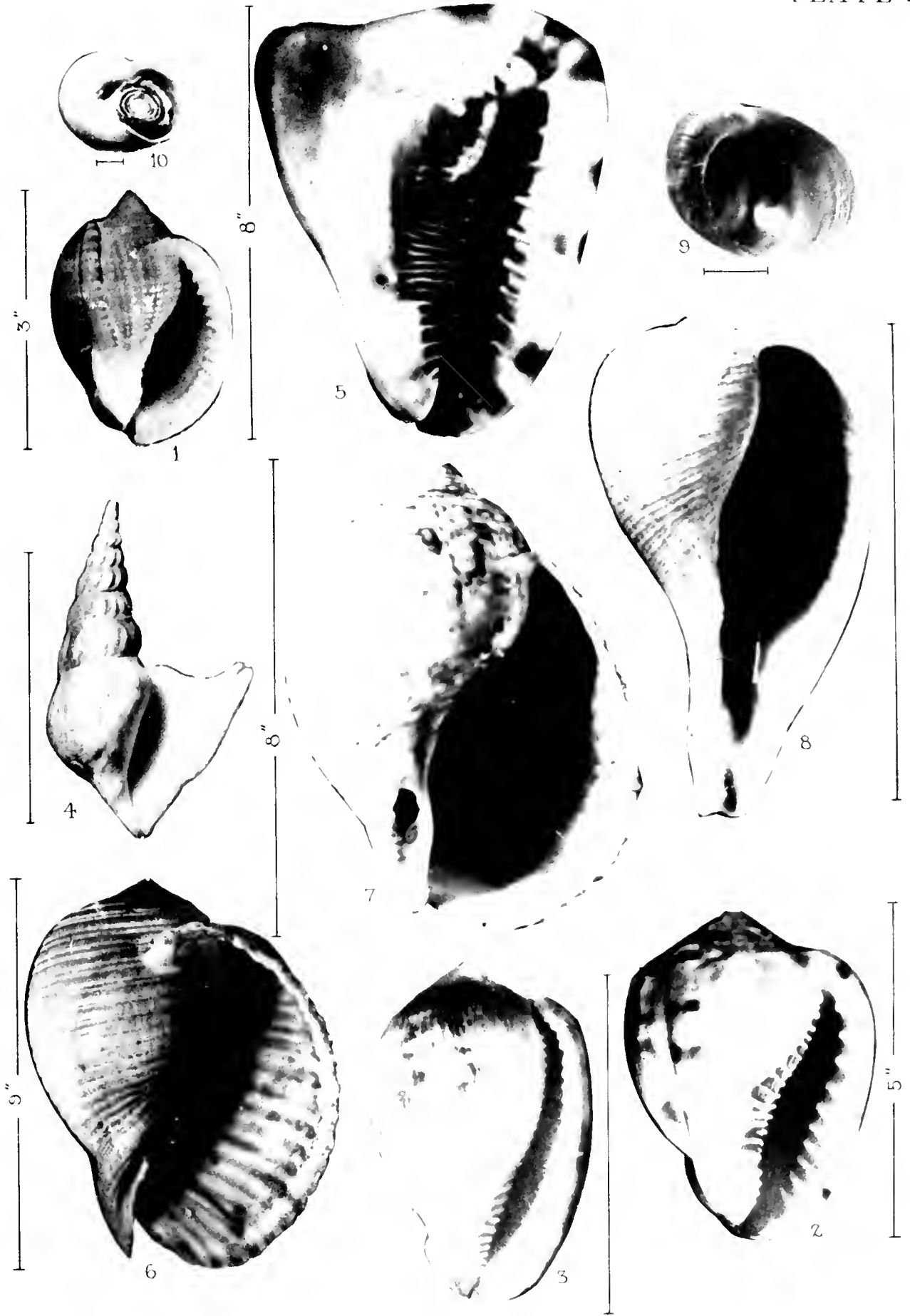
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1. *Cyphoma gibbosa* Linné. Tortugas. 1 inch. p. 109.
2. *Simnia acicularis* Lamarck. Sanibel, Florida. 17 mm. p. 109.
3. *Simnia uniplicata* Sowerby. 15 mm. p. 109.
- 4a, 4b. *Cypraea cinerea* Gmelin. Tortugas. 1.75 inches. p. 110.
5. *Cypraea exanthema* Linné. Florida Keys. 4 inches. p. 110.
- 6a, 6b. *Cypraea spurca* Linné. Boynton, Florida. 30 mm. p. 110.
- 7a,7b,7c. *Trivia pediculus* Linné. Lantana, Florida. 15 mm. p. 110.
- 8a, 8b. *Trivia globosa* Gray. 11 mm. p. 110.
- 9a, 9b. *Trivia quadripunctata* Gray. 8 mm. p. 110.
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19. *Cypraea exanthema cervus* Linné. Florida. 2.75 inches. p. 110.



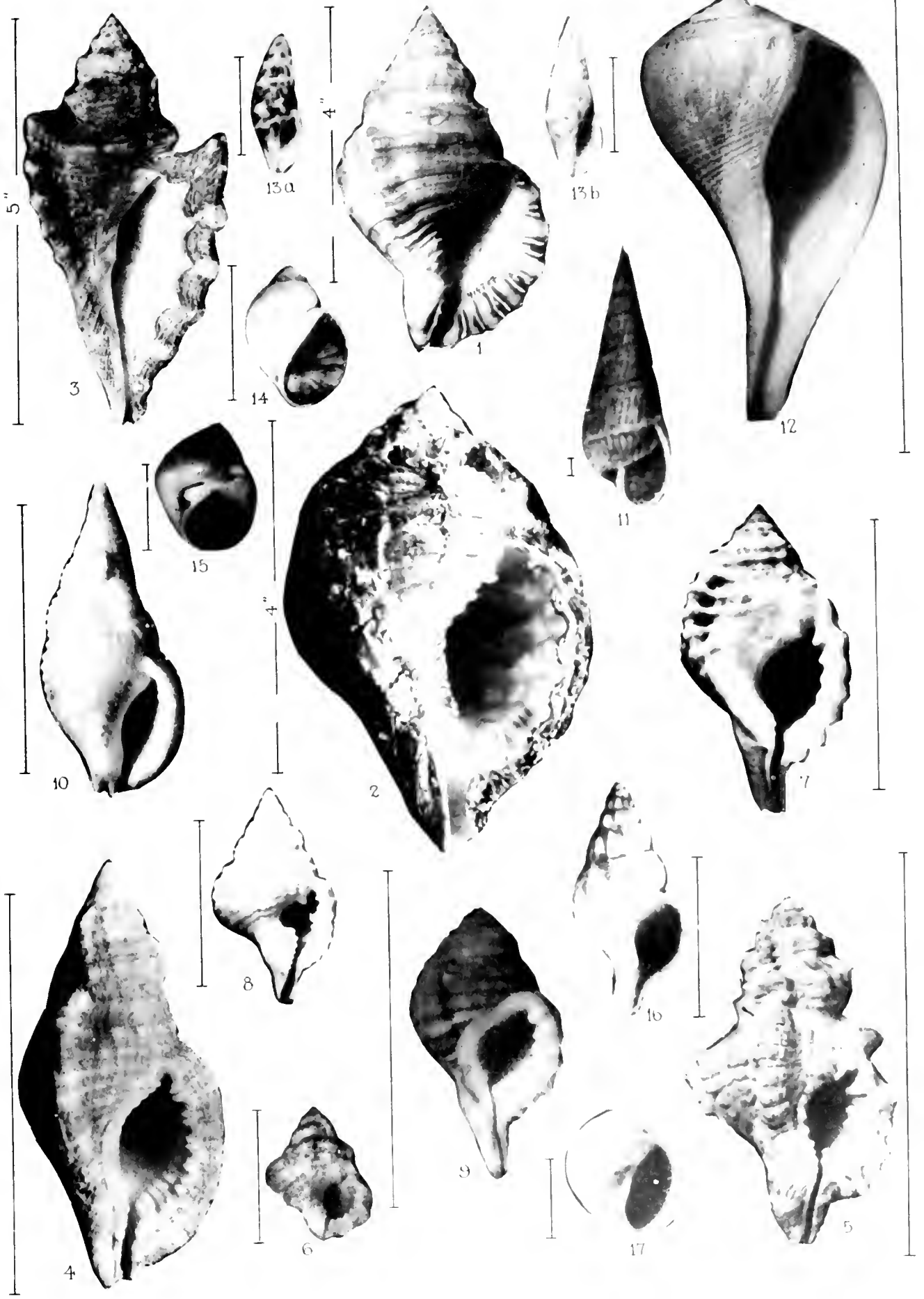
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1. *Cassis inflata abbreviata* Lamarck. Lantana, Florida. 3 inches. p. 111.
2. *Cassis flammea* Linné. Florida. 5 inches. p. 111.
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4. *Aporrhais occidentalis labradorensis* Johnson. Labrador. 2 inches. p. 108.
5. *Cassis tuberosa* Linné. Lake Worth, Florida. 3 inches. p. 111.
6. *Tonna galea* Linné. 9 inches. p. 112.
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8. *Ficus papyratia* Say. Sanibel, Florida. 3.5 inches. p. 112.
9. *Lamellaria pellucida* Verrill. Deerfield, Florida. 12 mm. p. 93.
10. *Margarites helycinus* Phipps. New England. 5 mm. p. 80.



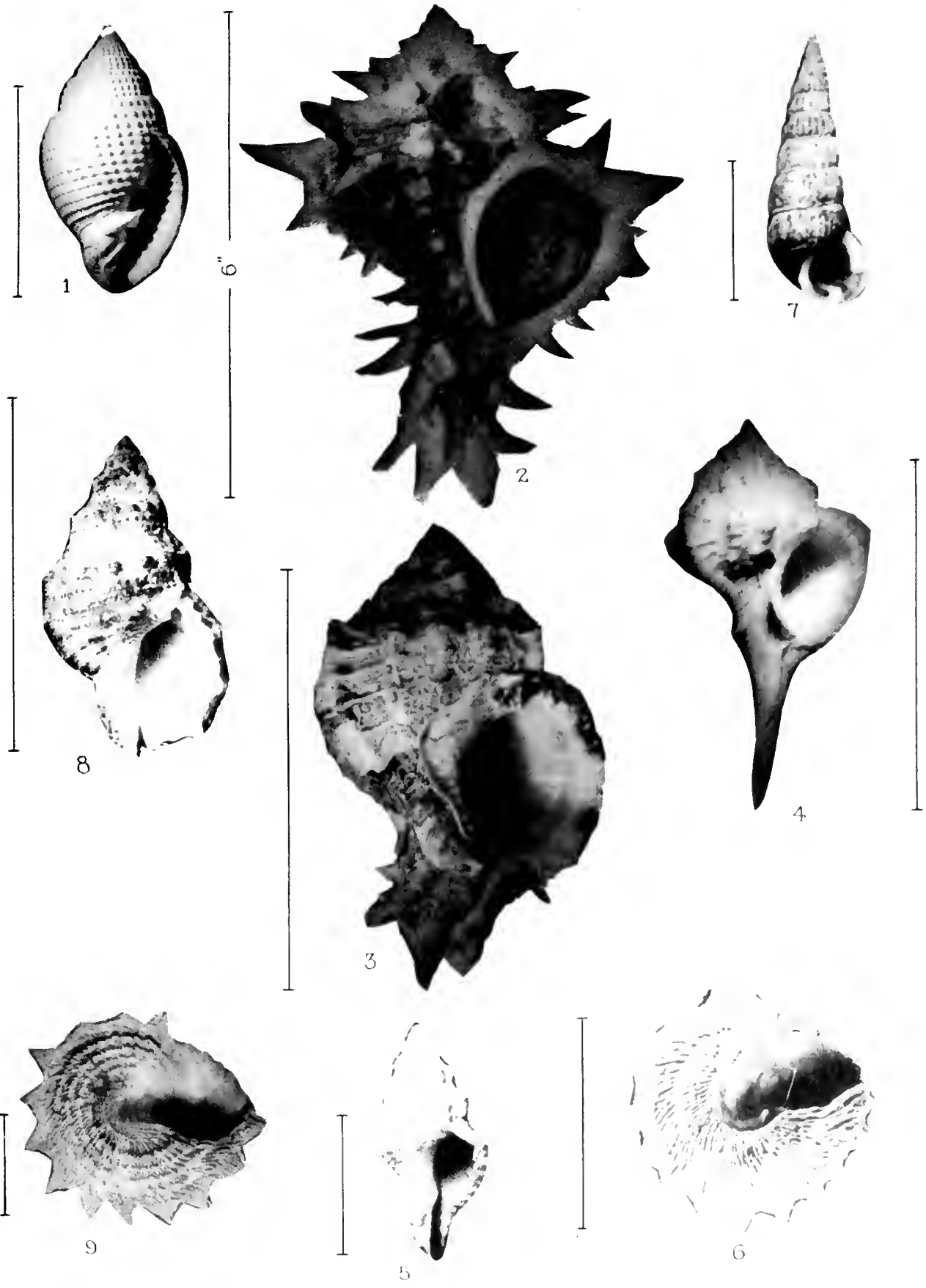
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1. *Cymatium costatum* Born. 4 inches. p. 113.
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3. *Cymatium femorale* Linné. Florida Keys. 5 inches. p. 112.
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6. *Gyrineum cruentatum* Reeve. Boynton, Florida. 1 inch. p. 113.
7. *Cymatium tuberosum* Lamarck. West Indies. 2 inches. p. 112.
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- 13a, 13b. *Monostiolum swifti* Tryon. Bermuda. 18-22 mm. p. 118.
14. *Amauropsis islandica* Gmelin. New England. 1 inch. p. 93.
15. *Natica clausa* Brod. and Sowerby. Off New England. 16 mm. p. 92.
16. *Trophon scalariformis* Gould. Georges Bank. 30 mm. p. 116.
17. *Eunaticina semisulcata* Gray. Palm Beach, Florida. 14 mm. p. 93.



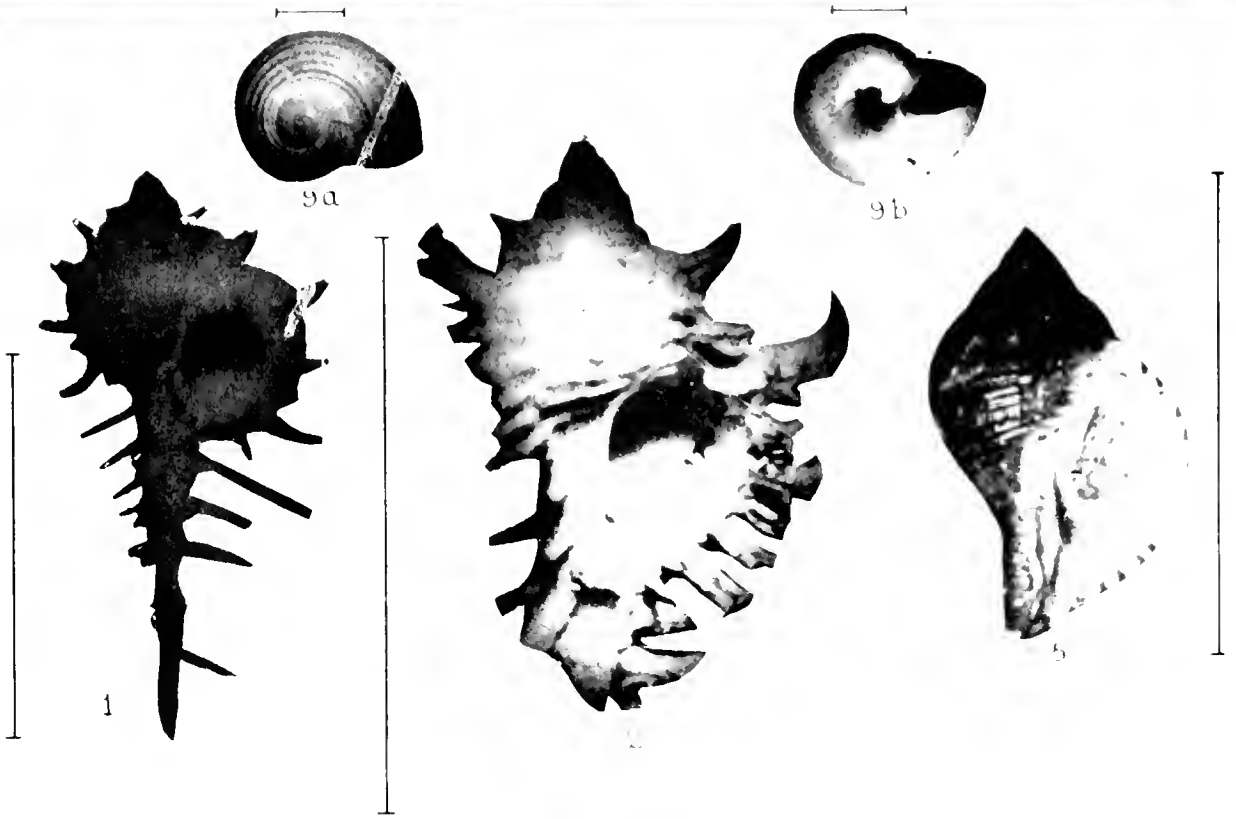
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1. *Cancellaria conradiana* Dall. Gulf of Mexico. 1.5 inches. p. 138.
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3. *Murex pomum* Gmelin. West Florida. 3 inches. p. 115.
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5. *Muricidea ostrearum* Conrad. West Florida. 1 inch. p. 116.
6. *Astraea brevispina* Lamarck. West Indies. 1.5 inches. p. 82,
7. *Cerithidea scalariformis* Say. 1 inch. p. 107.
8. *Gyrineum affine cubaninum* Orbigny. Tortugas. 2.5 inches. p. 115.
9. *Astraea longispina* Lamarck. Florida Keys. 18 mm. p. 81.



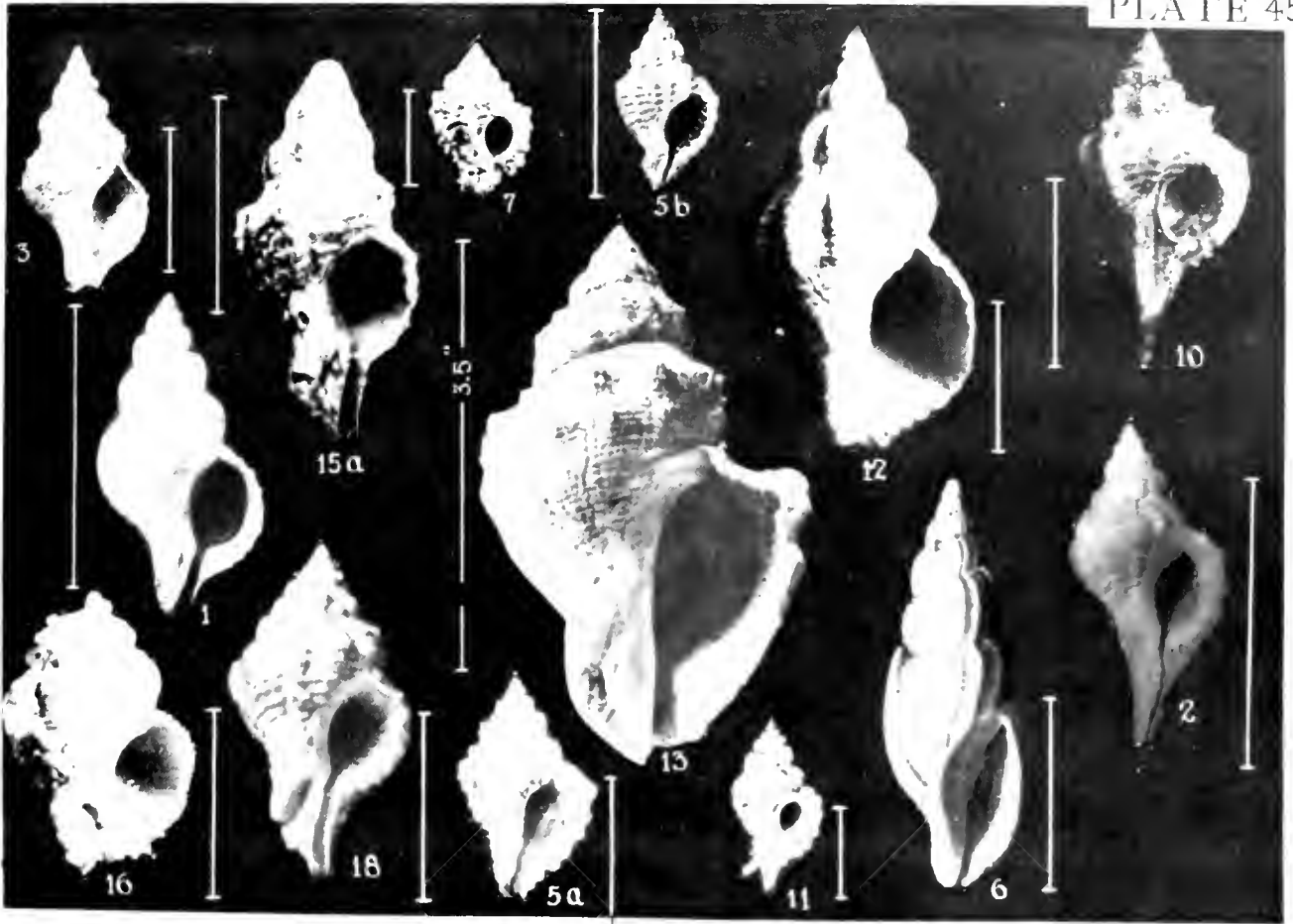
P L A T E 4 4

1. *Murex cabritii* Barnardi. Gulf of Mexico. 2 inches. p. 114.
2. *Murex brevifrons* Lamarck. West Indies. 3 inches. p. 114.
3. *Murex beaui* Fisher and Barnardi. South of Cuba. p. 114.
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5. *Cymatium cingulatum peninsulum* Smith. Lake Worth, Florida. 2.5 inches.
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6. *Oliva sayana* Ravenel. Spire much produced, a freak. West Florida. p. 131.
7. *Muricidea hexagona* Lamarck. Palm Beach, Florida. 1 inch. p. 116.
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- 9a, 9b. *Adeorbis beaui* Fischer. Florida. 9 mm. p. 98.
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12. *Oliva sayana* Ravenel. Freak, shouldered form. West Florida. p. 127.
13. *Trophon truncatus* Strom. New England. 12 mm. p. 117.



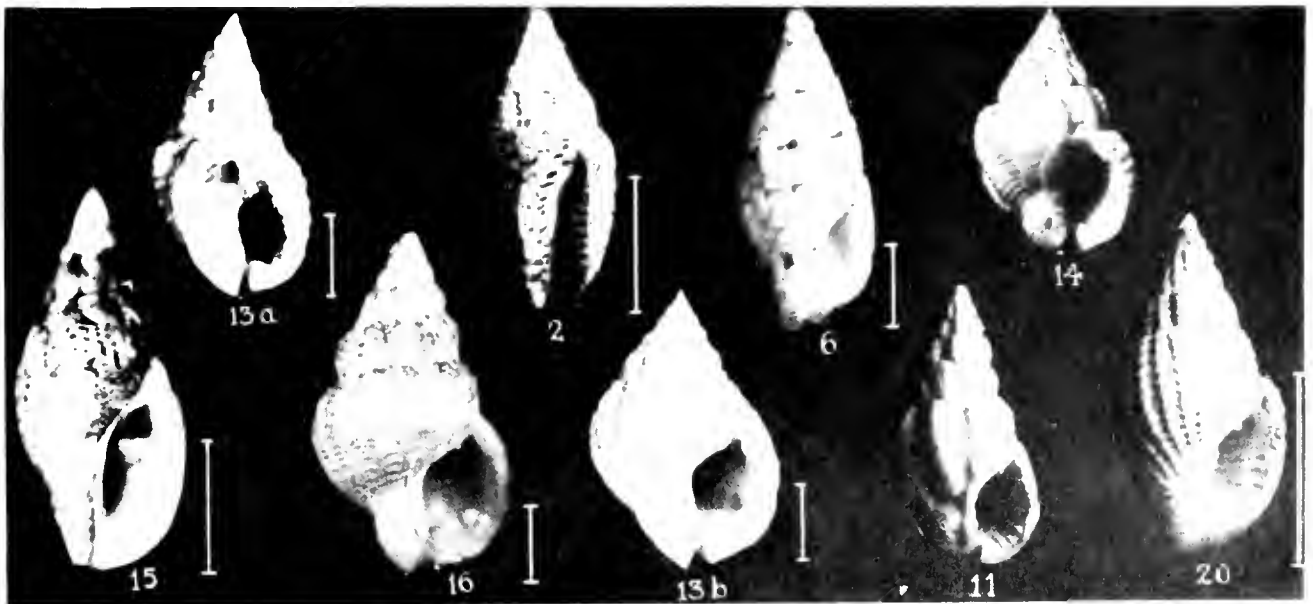
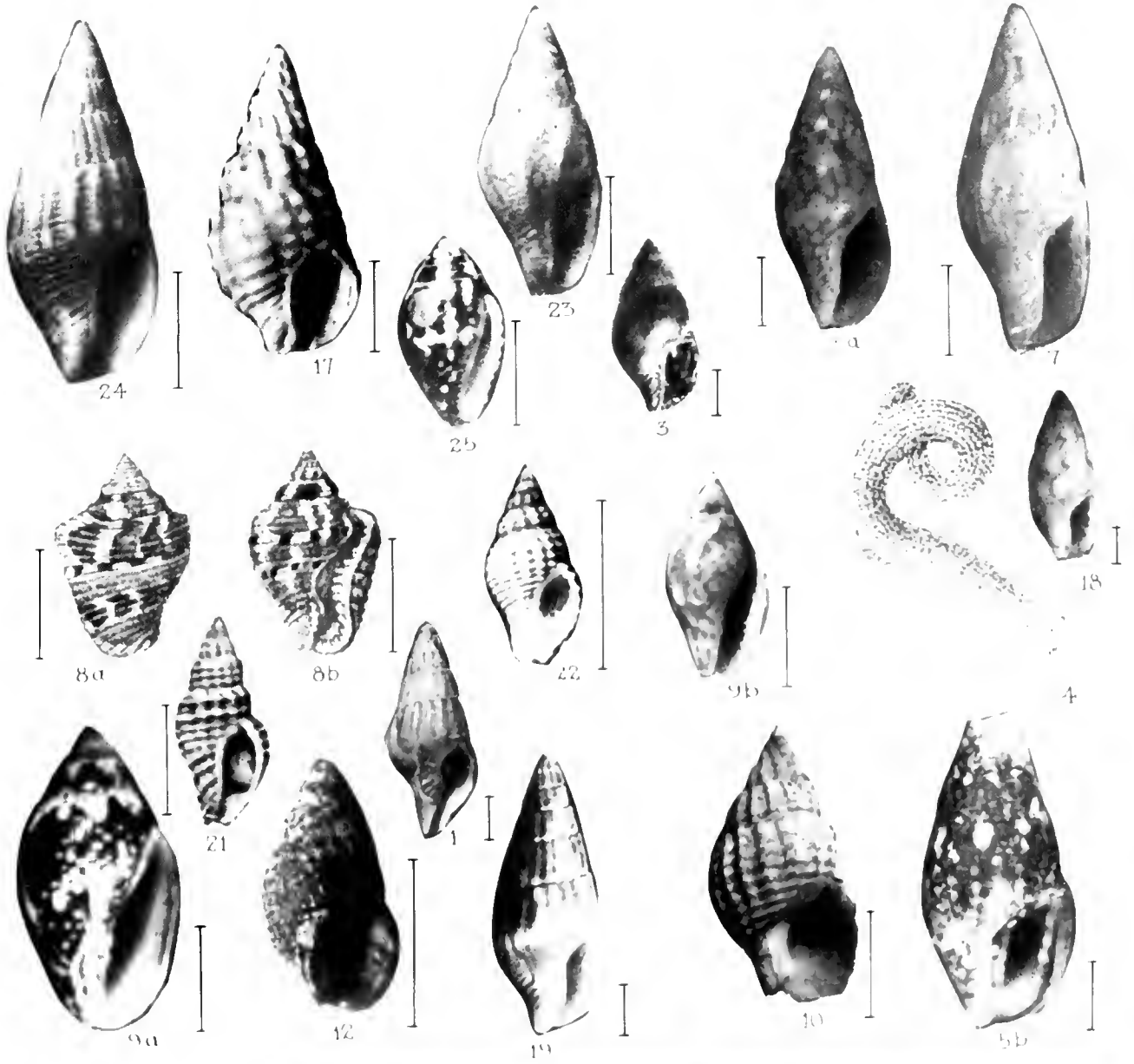
P L A T E 4 5

1. *Urosalpinx cinereus* Say. Long Island, New York. 37 mm. p. 116.
2. *Eupleura caudata sulcidentata* Dall. West Florida. 1.5 inches. p. 115.
3. *Muricidea multangula* Philippi. 19 mm. p. 116.
4. *Sistrum nodulosum* C. B. Adams. Biscayne Bay, Florida. 12 mm. p. 118.
5. *Urosalpinx tampaensis* Conrad. West Florida. 1 inch. p. 116.
6. *Colubraria lanceolata* Menke. Florida. 1 inch. p. 118.
7. *Tritonalia cellulosa* Conrad. Florida Keys. 12 mm. p. 115.
- 8a, 8b. *Thais patula* Linné. Boynton, Florida. p. 117.
9. *Thais floridana* Conrad. Yamato, Florida. 1.5 inches. p. 117.
10. *Murex messorius* Reeve. Palm Beach, Florida. 1 inch. p. 114.
11. *Tritonalia cellulosa* Conrad. 12 mm. p. 115.
12. *Muricidea multangula* Philippi. 20 mm. p. 116.
13. *Thais floridana haysae* Clench. Louisiana. 3.5 inches. p. 117.
14. *Eupleura caudata* Say. 1 inch. p. 115.
15. *Urosalpinx perrugatus* Conrad. 28 mm. p. 116.
16. *Coralliophila abbreviata* Lamarck. Florida. 1 inch. p. 118.
17. *Leucozonia cingulifera* Lamarck. Florida Keys. 2 inches. p. 126.
18. *Muricidea ostrearum* Conrad. Off Tiger Key, Florida. 1 inch. p. 116.
- 19a-19d. *Thais lapillus* Linné. Maine. 1.25 inches. p. 117.
20. *Tritonalia intermedia* C. B. Adams. Bermuda. 22 mm. p. 116.
21. *Thais lapillus imbricatus* Lamarck. Nova Scotia. 1 inch. p. 118.



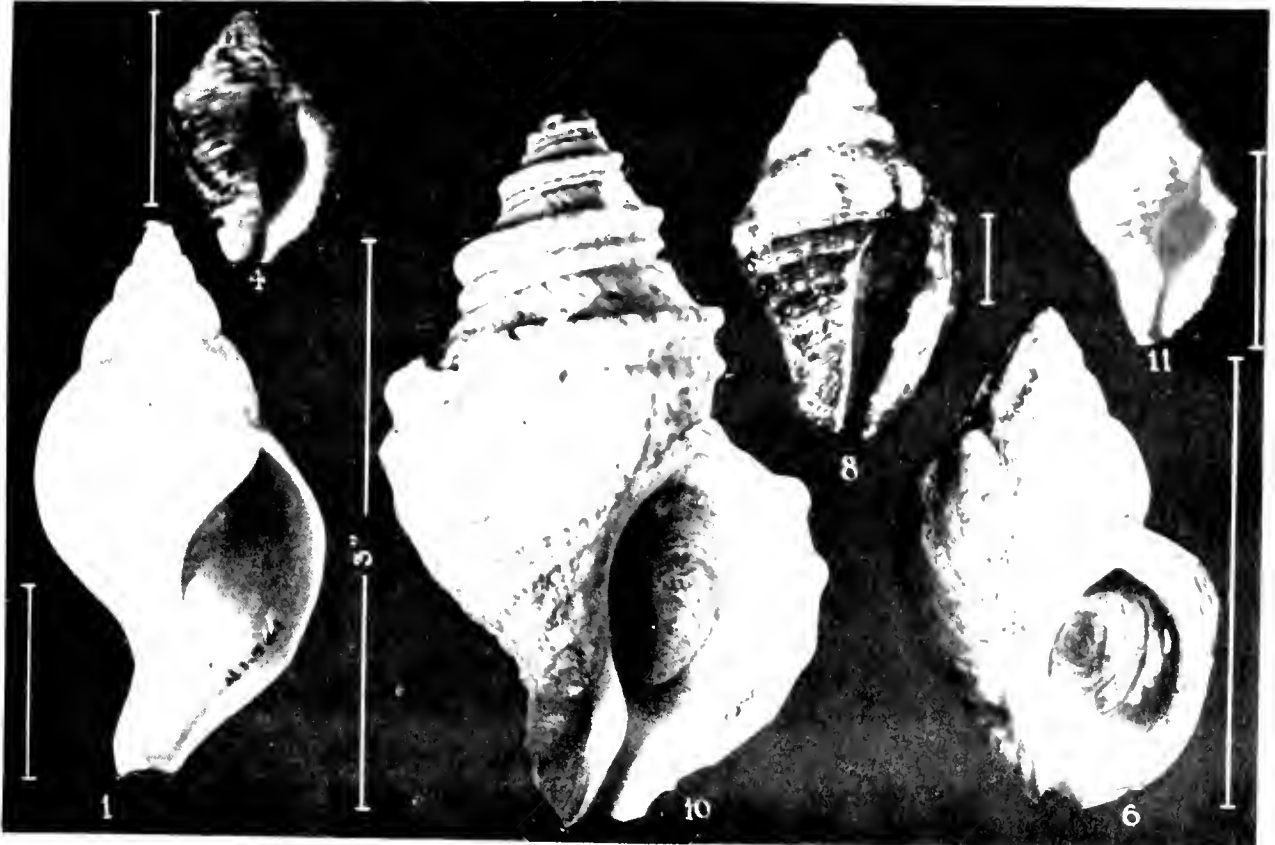
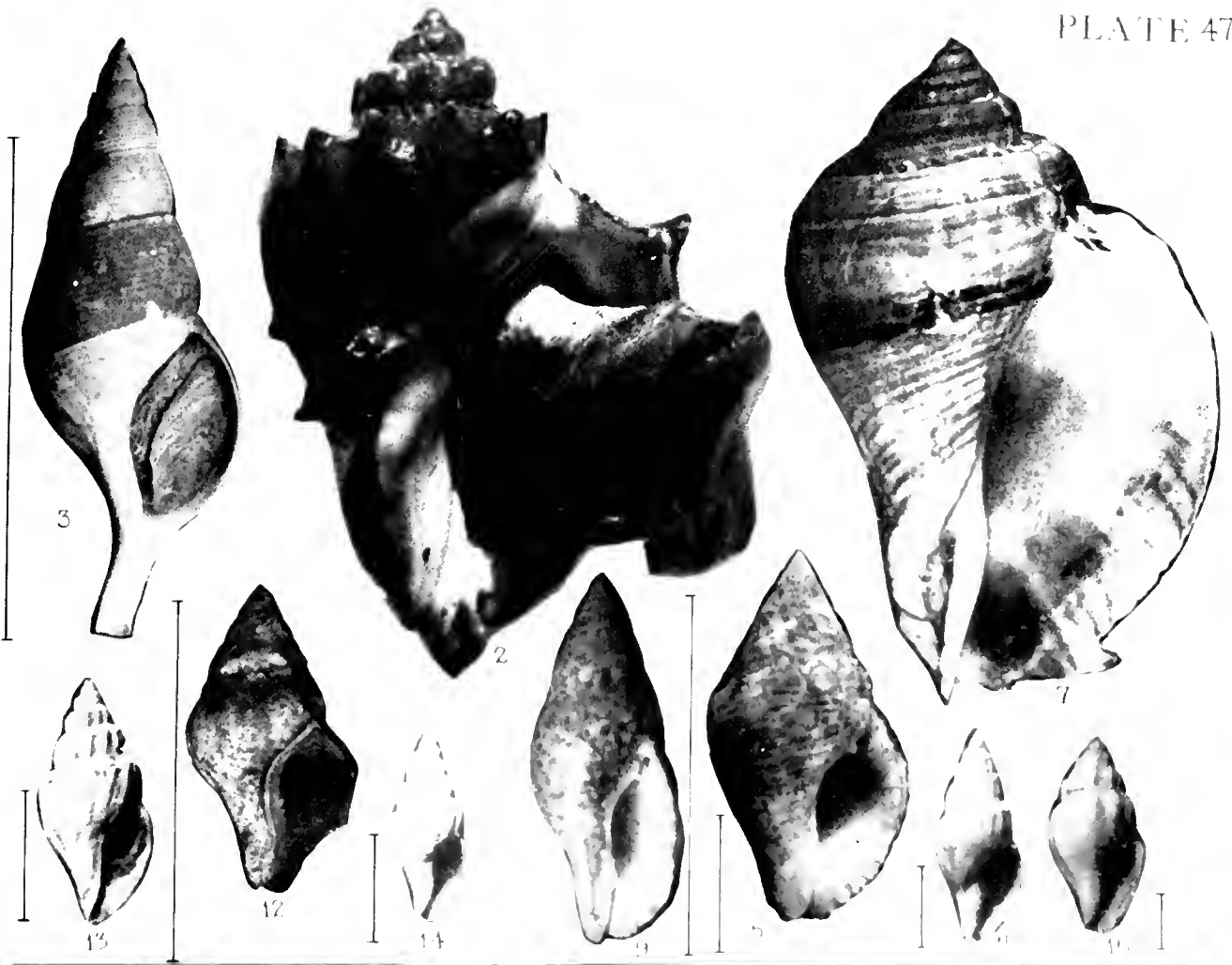
P L A T E 4 6

1. *Mitrella albella iontha* Ravenel. Sanibel, Florida. 6 mm. p. 120.
2. *Pyrene rusticoides* Heilprin. Florida. 18 mm. p. 119.
3. *Anachis obesa* C. B. Adams. 6 mm. p. 119.
4. *Serpulorbis decussatus* Gmelin. p. 102.
- 5a, 5b. *Nitidella cribraria* Lamarck. Boynton, Florida. 10 mm. p. 120.
6. *Nitidella moleculina* Duclos. Japan. 10 mm. p. 120.
7. *Anachis avara simplicata* Stearns. Tarpon Bay, Florida. 13 mm. p. 119.
- 8a, 8b. *Pyrene mercatoria* Linné. West Indies. 17 mm. p. 119.
- 9a, 9b. *Nitidella nitidula* Sowerby. Palm Beach, Florida. 15 mm. p. 120.
10. *Nassarius trivittata* Say. New England. 16 mm. p. 121.
11. *Nassarius consensa* Ravenel. Charlotte Harbor, Florida. p. 121.
12. *Nassarius obsoleta* Say. Long Island, New York. 1 inch. p. 121.
- 13a, 13b. *Nassarius vibex* Say. Florida. 10 mm. p. 121.
14. *Nassarius hotessieri* Orbigny. Off Sand Key, Florida. p. 121.
15. *Nitidella laevigata* Linné. Palm Beach, Florida. 17 mm. p. 120.
16. *Nassarius ambigua* Montagu. Yamato, Florida. 10 mm. p. 121.
17. *Nassarius acutus* Say. Florida. 13 mm. p. 121.
18. *Mitrella lunata* Say. New England. 5 mm. p. 120.
19. *Anachis avara similis* Ravenel. 7 mm. p. 119.
20. *Phos candei* Orbigny. Florida. 1 inch. p. 123.
21. *Phos parvus* C. B. Adams. var. Florida Keys. 16 mm. p. 123.
22. *Cantharus cancellaria* Conrad. West Indies. 1 inch. p. 122.
23. *Anachis avara translirata* Ravenel. North Carolina. 14 mm. p. 119.
24. *Anachis avara* Say. Woods Holl, Massachusetts. 17 mm. p. 119.
25. *Pyrene ovulata* Lamarck. Florida Keys. 15 mm. p. 119.



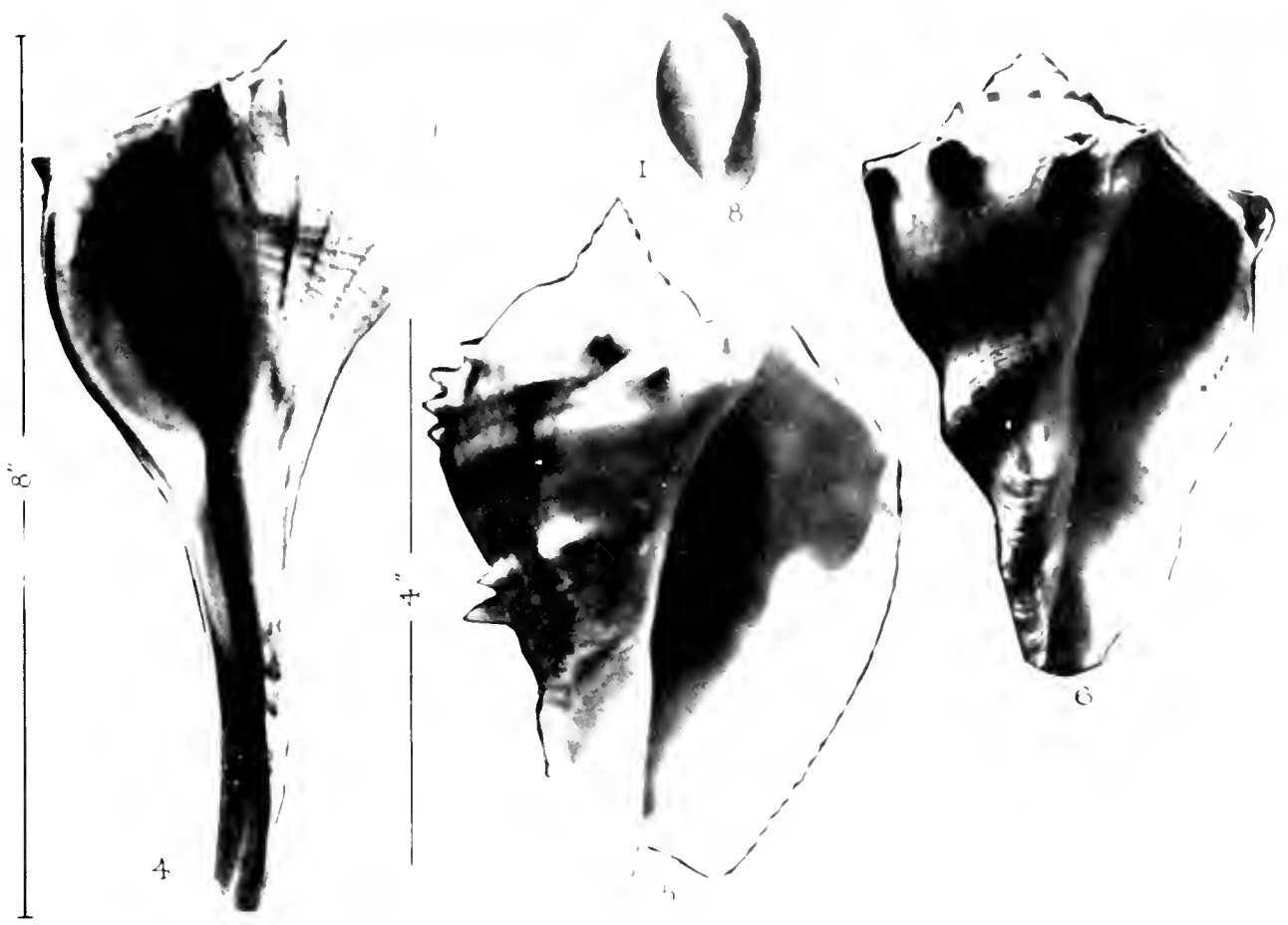
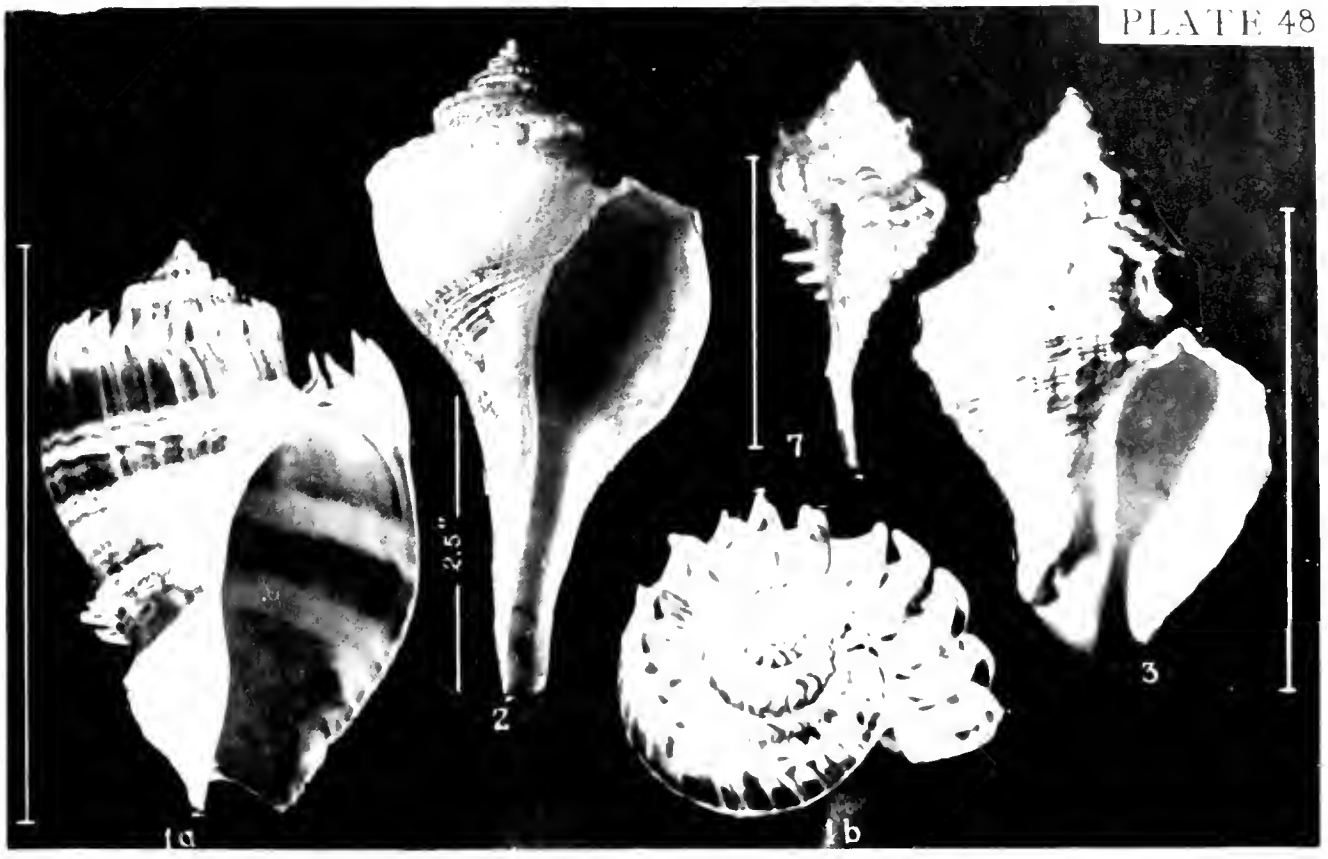
P L A T E 4 7

1. *Colus pygmaeus* Gould. New England. 1 inch. p. 124.
2. *Melongena corona* Gmelin. Animal extended. Sanibel, Florida. p. 125.
3. *Colus stimpsoni* Morch. Maine. 2.75 inches. p. 124.
4. *Cantharus tinctus* Conrad. Yamato, Florida. 1 inch. p. 122.
5. *Pisania variegata* Gray. Florida Keys. 19 mm. p. 122.
6. *Buccinum undatum* Linné. Maine. 2.5 inches. p. 122.
7. *Melongena corona inspinata* Richards. West Florida. p. 125.
8. *Engina turbinella* Kiener. Key West, Florida. 11 mm. p. 123.
9. *Pisania pusio* Linné. Florida Keys. 2 inches. p. 122.
10. *Neptunea decemcostata* Say. Maine. 3 inches. p. 123.
11. *Cantharus auritula* Link. Jupiter, Florida. 1 inch. p. 123.
12. *Leucozonia cingulifera* Lamarck. Florida Keys. 2 inches. p. 126.
13. *Lora nobilis* Moller. Frenchman's Bay, Maine. 18 mm. p. 136.
14. *Lora cancellata* Mighels and Adams. Eastport, Maine. 15 mm. p. 136.
15. *Lora pleurotomaria* Couthouy. Casco Bay, Maine. 11 mm. p. 136.
16. *Mangilia atrostyla* Dall. Sanibel, Florida. 7 mm. p. 136.



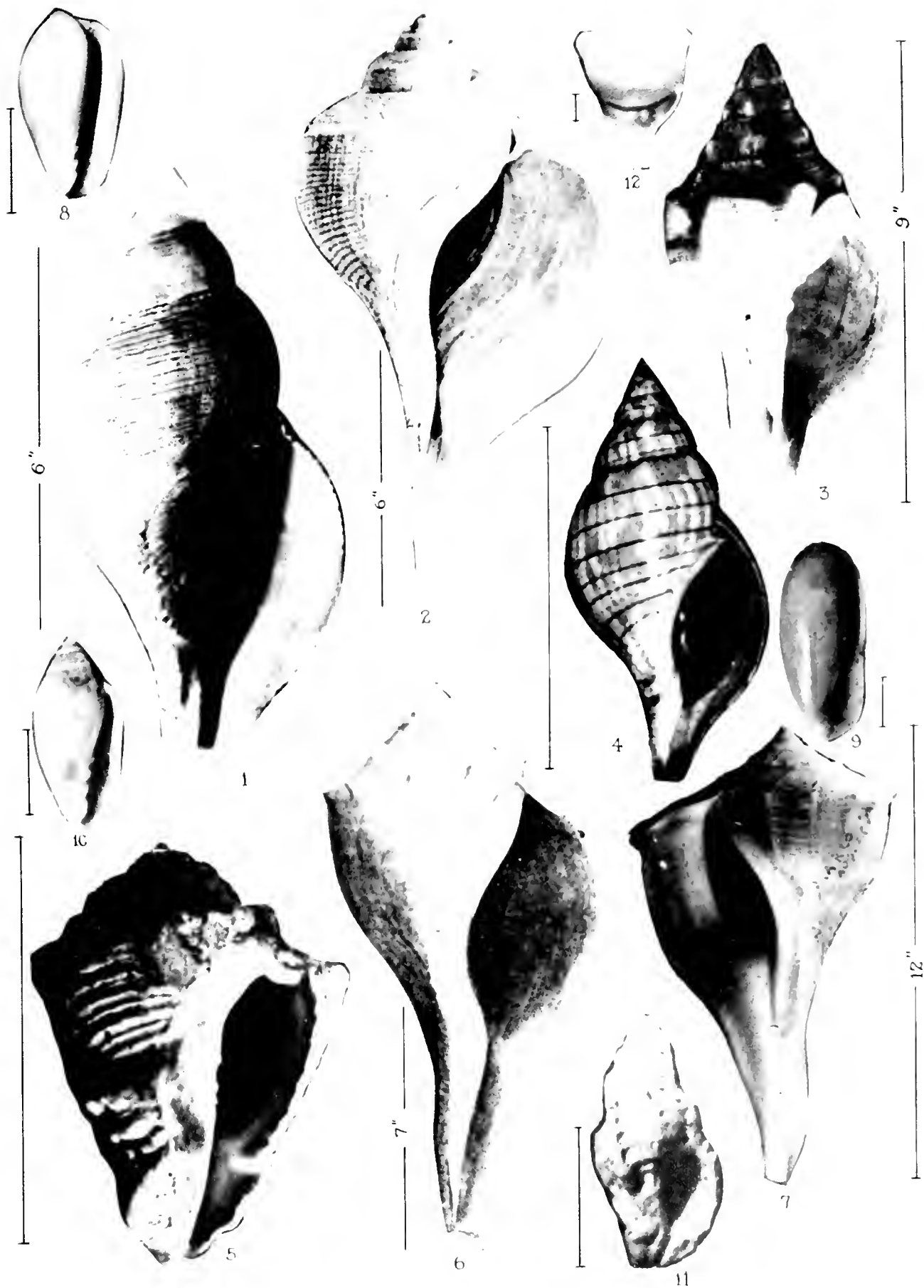
P L A T E 4 8

1. *Melongena corona* Gmelin. Sanibel, Florida. 3 inches. p. 125.
2. *Busycon canaliculatus* Say. Daytona Beach, Florida. 2.5 inches. p. 124.
3. *Thais floridana* Conrad. Florida. 2.5 inches. p. 117.
4. *Busycon perversum* Linné. Sanibel, Florida. 3 inches. p. 124.
5. *Melongena melongena* Linné. West Indies. 4 inches. p. 125.
6. *Busycon carica eliceans* Montfort. North Carolina. p. 124.
7. *Murex messorius* Reeve. Marco, Florida. 1.5 inches. p. 114.
8. *Marginella lachrimula* Gould. Florida. 1.5 mm. p. 130.



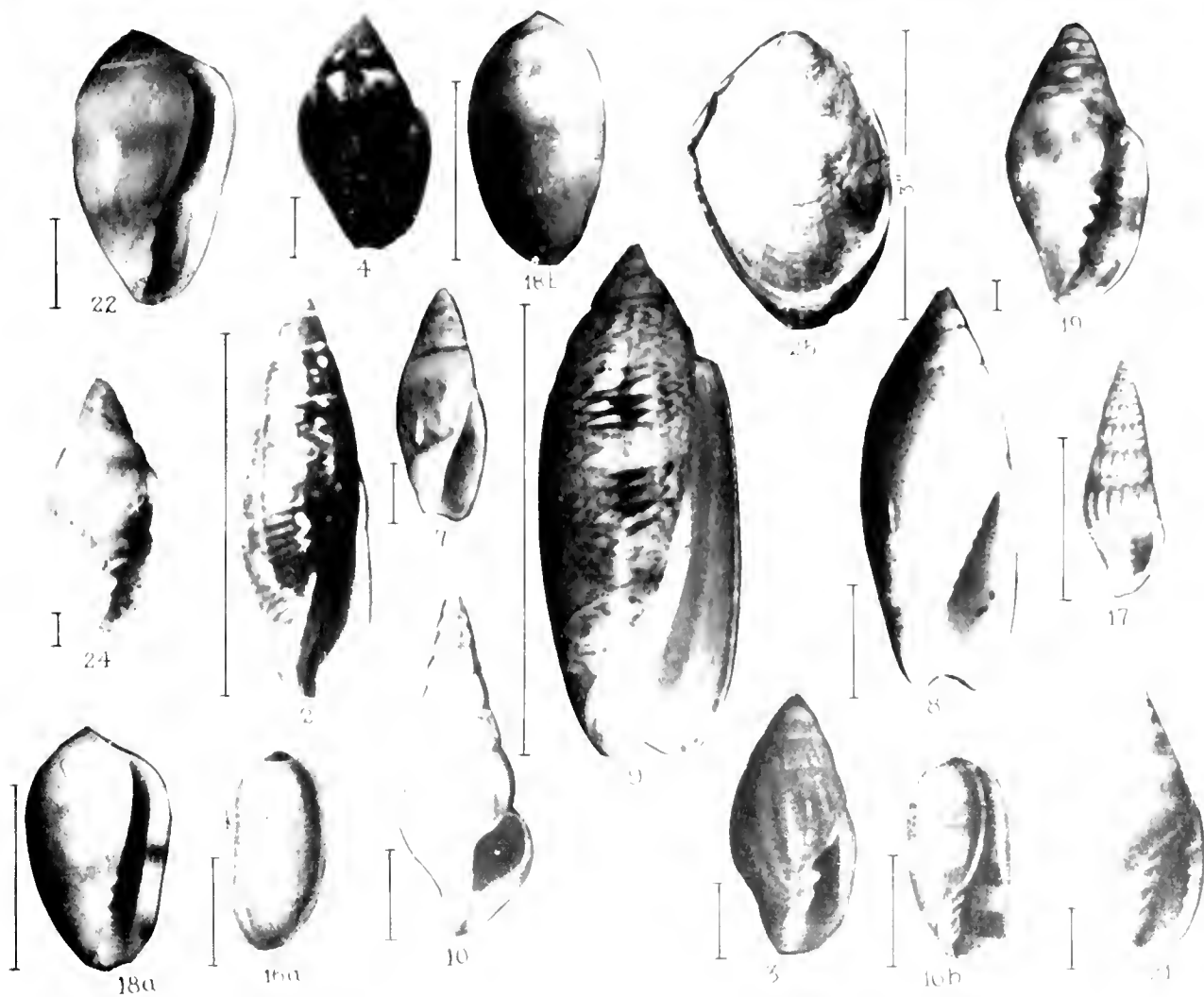
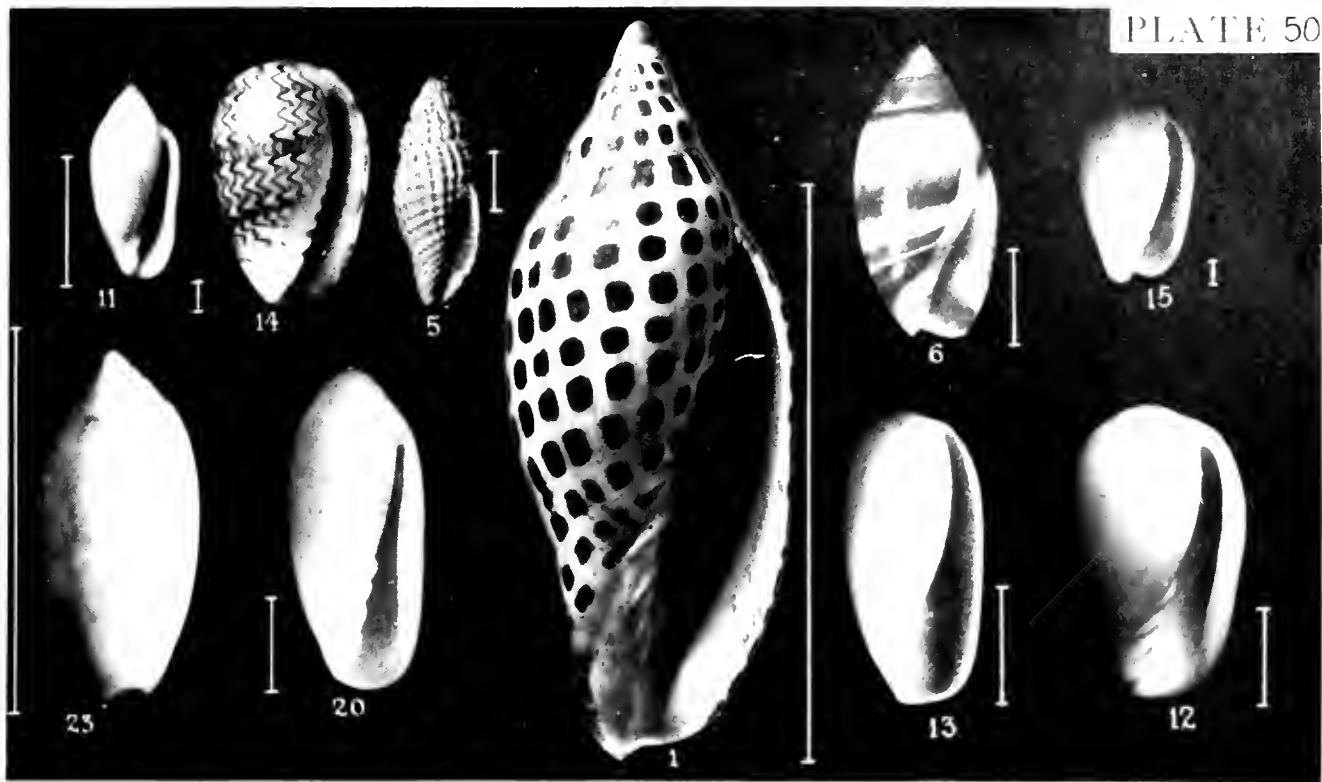
P L A T E 4 9

1. *Fasciolaria tulipa* Linné. Biscayne Bay, Florida. 6 inches. p. 126.
2. *Busycon canaliculatum* Say. Far Rockaway, New York. 6 inches. p. 124.
3. *Xarxus angulatus* Solander. Florida Keys. 9 inches. p. 127.
4. *Fasciolaria distans* Lamarck. Sanibel, Florida. 2.5 inches. p. 126.
5. *Vasum muricatum* Born. Lower Keys, Florida. 5 inches. p. 127.
6. *Busycon carica* Gmelin. 7 inches. p. 124.
7. *Busycon perversum* Linné. Marco, Florida. 12 inches. p. 124.
8. *Marginella carnea* Storer. 19 mm. p. 129.
9. *Marginella lactea* Kiener. 9 mm. p. 130.
10. *Marginella velie* Pilsbry. Captiva, Florida. 15 mm. p. 131.
11. *Aspella obeliscus* A. Adams. Palm Beach, Florida. 1 inch. p. 115.
12. *Cavolina longirostris* Le Sueur. 4 mm. p. 143.



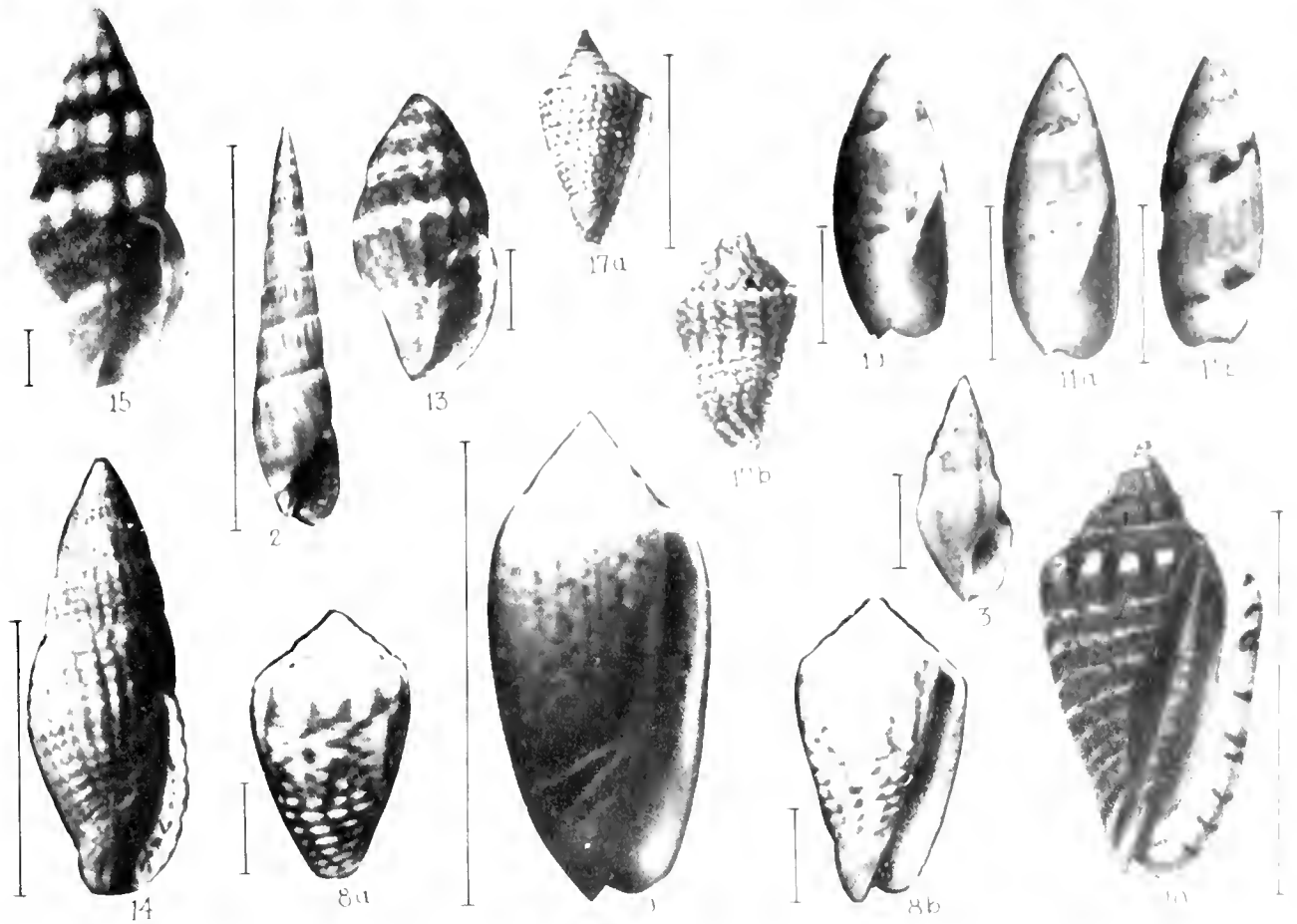
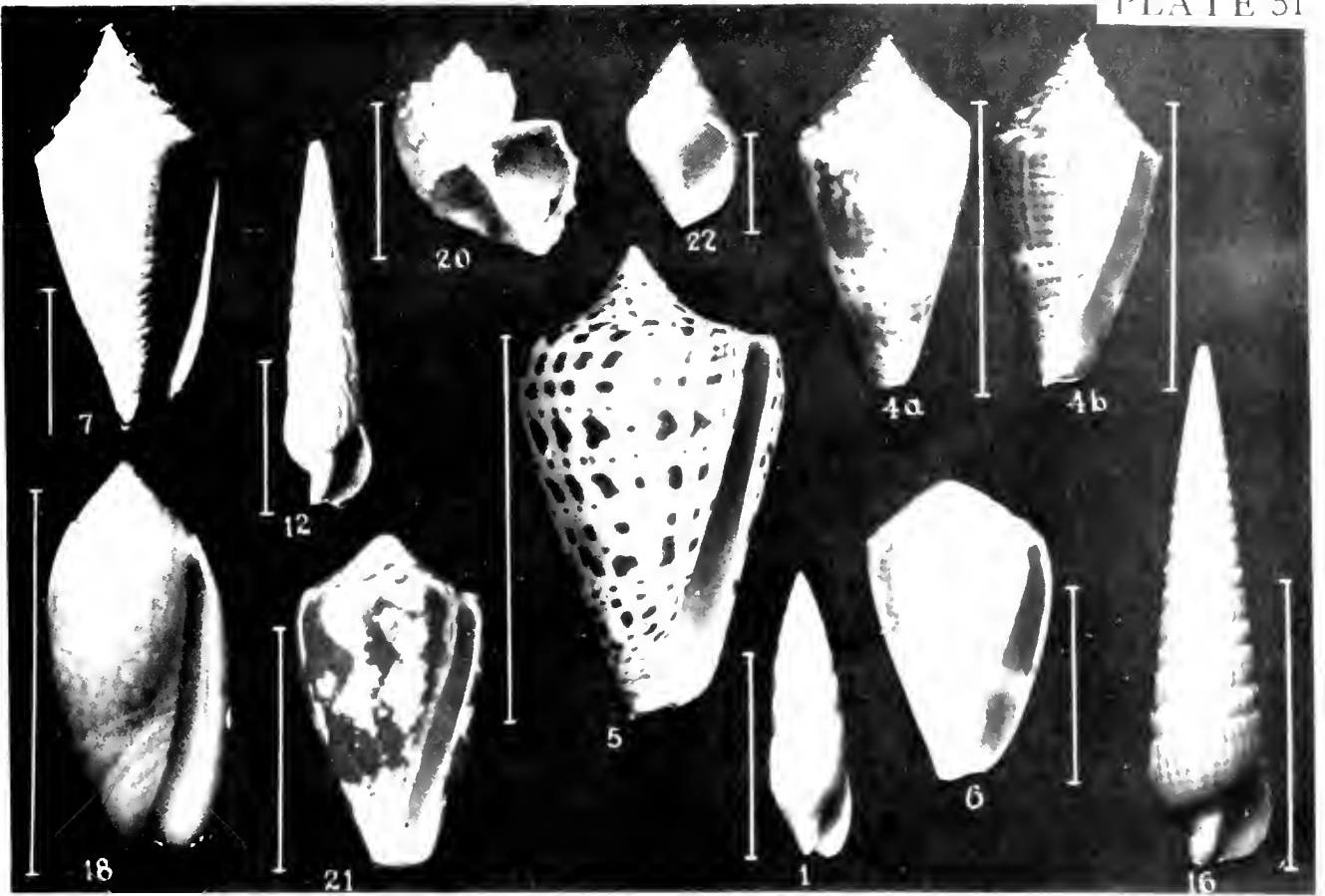
P L A T E 5 0

1. *Maculopeplum junonia* Chemnitz. Gulf of Mexico. 3 inches. p. 128.
2. *Mitra barbadensis* Gmelin. Tortugas. 2 inches. p. 128.
3. *Mitra sulcata* Gmelin. Florida Keys. 10 mm. p. 129.
4. *Mitra puella* keeve. Palm Beach, Florida. 8 mm. p. 129.
5. *Mitra floridana* Dall. West Florida. 7 mm. p. 128.
6. *Olivella mutica* Say. Beaufort, North Carolina. 12 mm. p. 132.
7. *Olivella floralia* Duclos. Palm Beach, Florida. 8 mm. p. 131.
8. *Olivella nivea* Gmelin. Lake Worth, Florida. 15 mm. p. 132.
9. *Oliva sayana* Ravenel. West Florida. 2.5 inches. p. 131.
10. *Cymatosyrinx pagodula* Dall. Off Barbados. 12 mm. p. 135.
11. *Marginella succinea* Conrad. Gulfport, Florida. 17 mm. p. 131.
12. *Marginella fauna* Sowerby. 12 mm. p. 131.
13. *Marginella pallida* Linné. Cuba. 15 mm. p. 130.
14. *Marginella catenata* Montagu. Yamato, Florida. 3.5 mm. p. 130.
15. *Marginella minuta* Pfeiffer. Palm Beach, Florida. 2.5 mm. p. 130.
- 16a, 16b. *Marginella pallida* Linné. West Indies. 15 mm. p. 130.
17. *Clathrodrillia ostrearum* Stearns. Sanibel, Florida. 22 mm. p. 135.
- 18a, 18b. *Marginella guttata* Dillwyn. Florida Keys. 1 inch. p. 130.
19. *Marginella denticulata opalina* Stearns. Tarpon Bay, Florida. 8 mm. p. 130.
20. *Marginella avena* Valenciennes. 12 mm. p. 130.
21. *Marginella denticulata* Conrad. Florida. 8 mm. p. 129.
22. *Marginella apicina* Menke. Lake Worth, Florida. 12 mm. p. 129.
23. *Oliva reticularis* Lamarck. 2 inches. p. 131.
24. *Marginella aureocincta* Stearns. West Florida. 4 mm. p. 130.
25. *Tethys protea* Rang. Florida. 3 inches. p. 142.



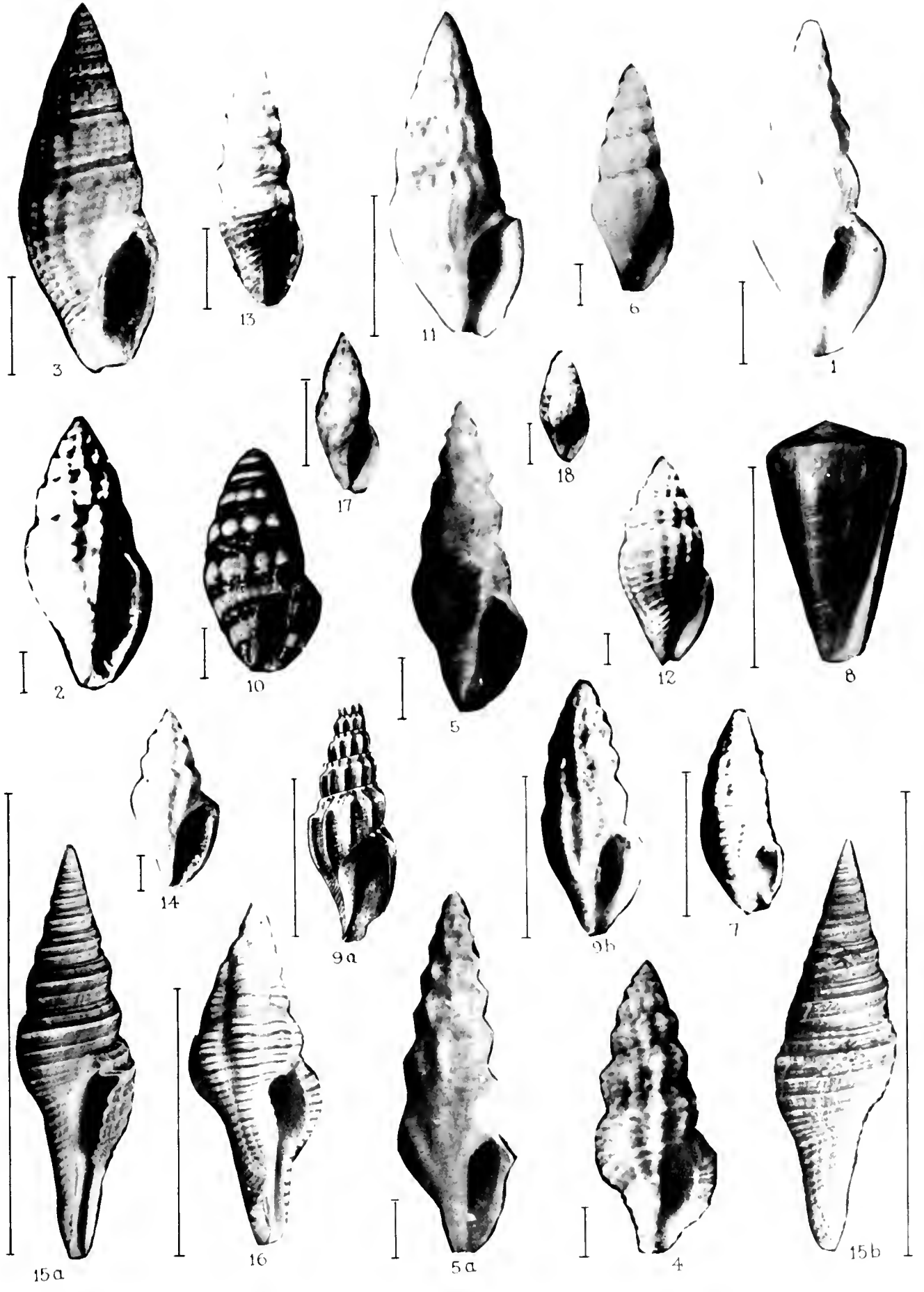
P L A T E 5 1

1. *Terebra hastata* Gmelin. Yamato, Florida. 27 mm. p. 133.
2. *Terebra cinerea* Born. Jensen, Florida. 2 inches. p. 133.
3. *Clathrodrillia ebur* Reeve. Gulf of Mexico. 12 mm. p. 135.
- 4a,4b. *Conus floridanus* Gabb. Lemon Bay, Florida. 1.5 inches. p. 133.
5. *Conus proteus* Hwass. West Florida. 2 inches. p. 133.
6. *Conus mus* Hwass. Palm Beach, Florida. 1 inch. p. 133.
7. *Conus pealii* Green. Florida. 19 mm. p. 133.
- 8a,8b. *Conus pygmaeus* Reeve. Florida Keys. 12 mm. p. 133.
9. *Oliva reticularis bollingi* Clench. Off Miami, Florida. 61 mm. p. 131.
10. *Voluta virescens* Solander. 2 inches. p. 127.
- 11a,11b. *Olivella nivea* Gmelin. Florida. 20 mm. p. 132.
12. *Terebra protexta* Conrad. West Florida. 20 mm. p. 132
13. *Mitra sulcata* Gmelin. No Name Key, Florida. 10 mm. p. 129.
14. *Mitra nodulosa* Gmelin. 36 mm. p. 128.
15. *Mitra hanleyi* Dohrn. Card Sound, Florida. 7 mm. p. 129.
16. *Terebra dislocata rudis* Gray. 1.5 inches. p. 132.
17. *Conus verrucosus* Hwass. West Indies. 1 inch. p. 133.
18. *Oliva reticularis* Lamarck. West Indies. 2 inches. p. 131.
19. *Olivella jaspidea* Gmelin. Florida Keys. 15 mm. p. 132.
20. *Cancellaria tenera* Philippi. Florida. 20 mm. p. 138.
21. *Conus nebulosus* Solander. Ft. Lauderdale, Florida. 32 mm. p. 134.
22. *Admete viridula* Jay. New England. 12.5 mm. p. 138.



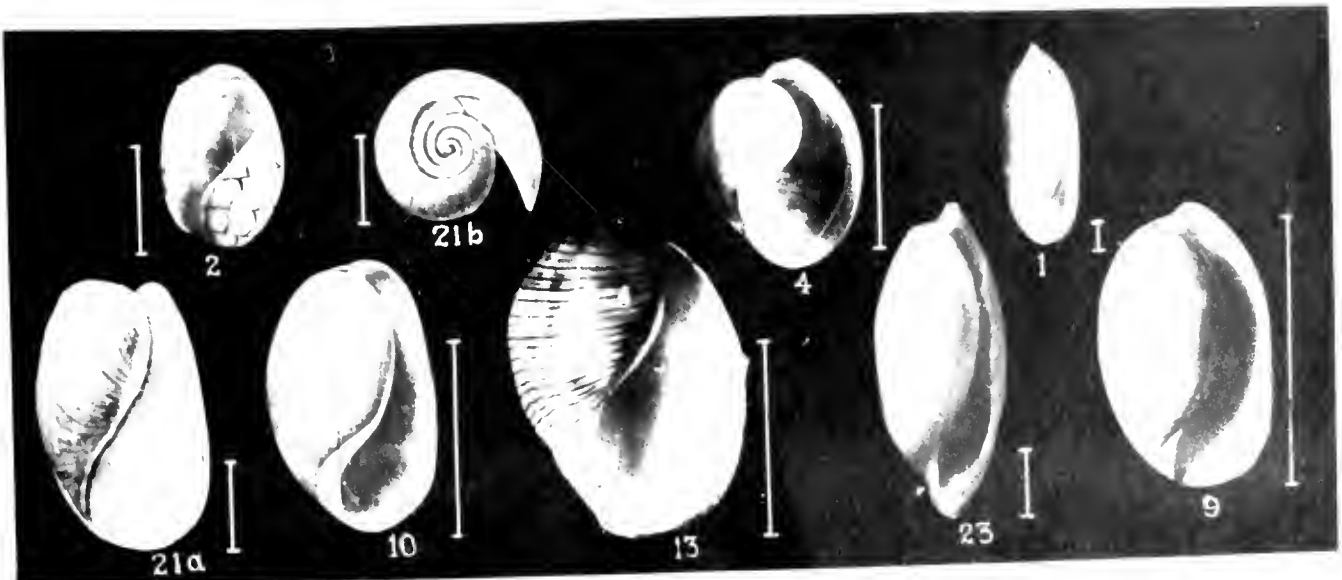
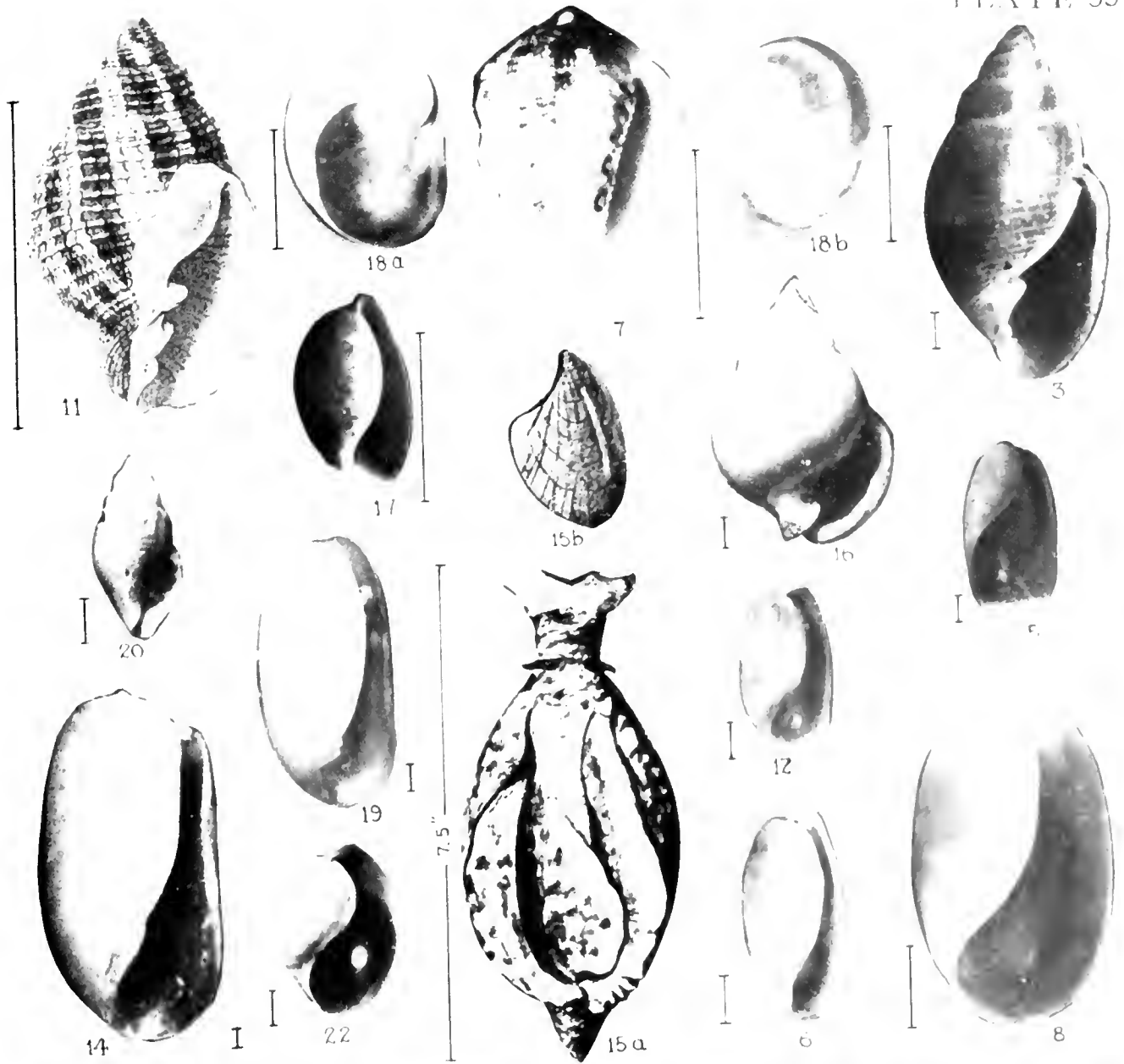
P L A T E 5 2

1. *Cymatosyrinx thea* Dall. Palm Beach, Florida. 15 mm. p. 135.
2. *Mangilia plicosa* C. B. Adams. Gulfport, Florida. 7 mm. p. 137.
3. *Clathrodrillia harfordiana* Reeve. Palm Beach, Florida. 18 mm. p. 135.
4. *Mangilia quadrata rugirima* Dall. Sanibel, Florida. 9 mm. p. 137.
5. *Mangilia cerinella* Dall. West Florida. 11 mm. p. 136.
6. *Mangilia limonitella* Dall. Sanibel, Florida. 7 mm. p. 137.
7. *Clathrodrillia ebenina* Dall. Key West, Florida. 27 mm. p. 135.
8. *Conus daucus* Bruguiere. Jamaica. 1.5 inches. p. 134.
9. *Mangilia exculpta* Watson. Gulf of Mexico. 30 mm. p. 137.
10. *Clathrodrillia albinodata* Reeve. Palm Beach, Florida. 9 mm. p. 135.
11. *Cymatosyrinx furcata* Reeve. Nassau, Bahamas. 26 mm. p. 134.
12. *Mangilia guarani* Orbigny. Palm Beach, Florida. 5 mm. p. 137.
13. *Clathrodrillia leucocyma* Dall. Sanibel, Florida. 15 mm. p. 135.
14. *Mangilia stellata filosa* Dall. Sanibel, Florida. 6 mm. p. 137.
- 15a,15b. *Turris virgo* Wood. Jamaica. 3.5 inches. p. 134.
16. *Latirus infundibulum* Gmelin. Jamaica. 2 inches. p. 126.
17. *Daphnella lymnaeiformis* Kiener. West Indies. 16 mm. p. 137.
18. *Lora bicarinata* Couthouy. Casco Bay, Maine, 7 mm. p. 136.



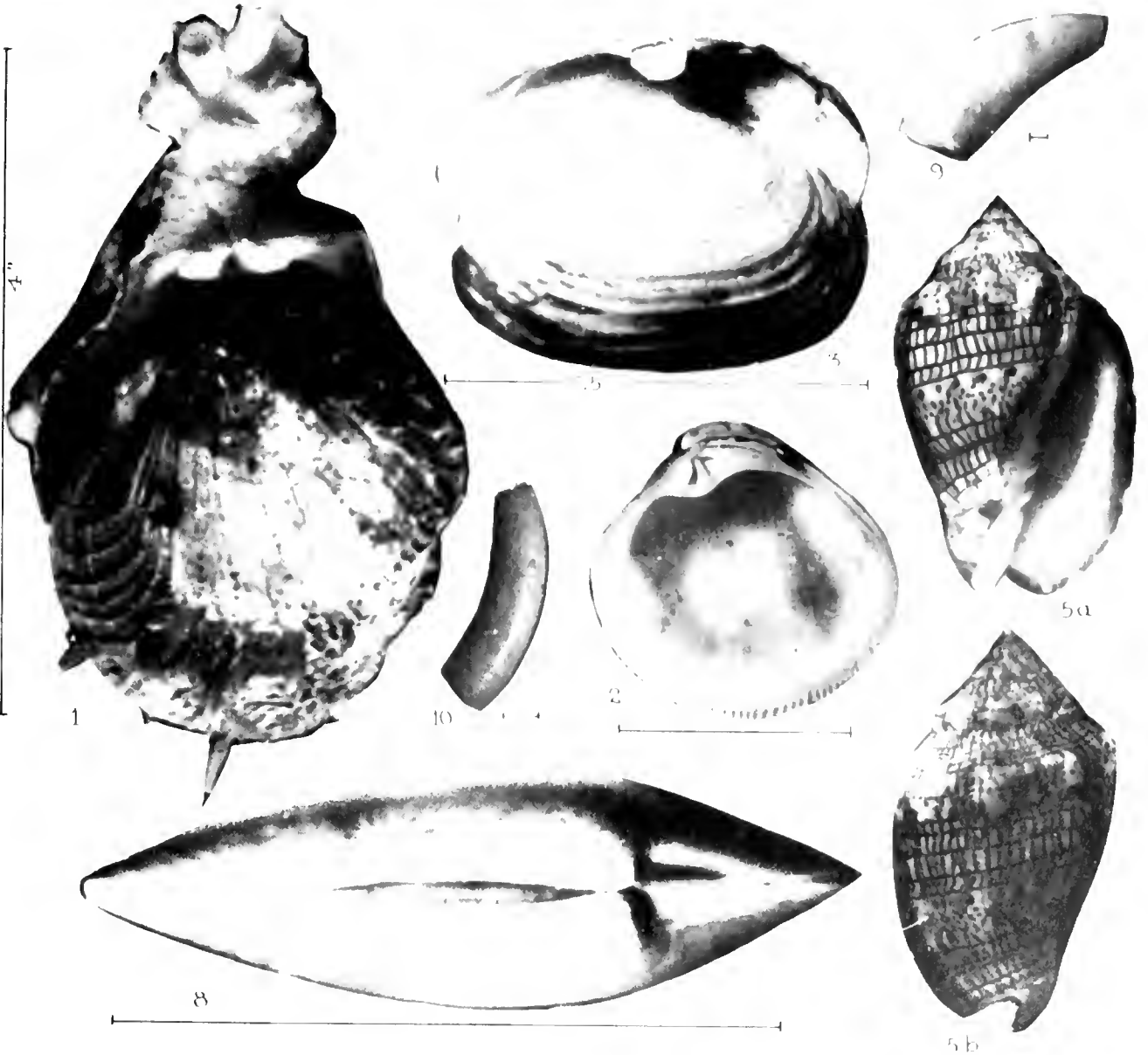
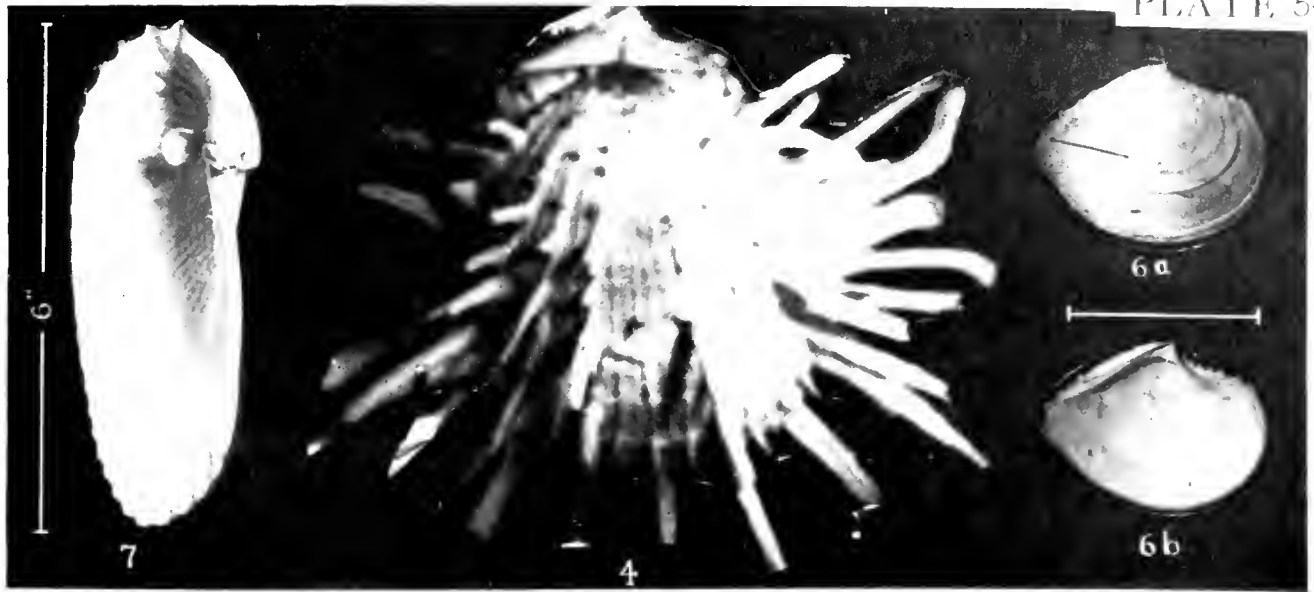
P L A T E 5 3

1. *Volvula oxytata* Bush. Lake Worth, Florida. 3.5 mm. p. 139.
2. *Micromelo undata* Bruguiere. Deerfield, Florida. 14 mm. p. 141.
3. *Acteon punctostriatus* C. B. Adams. Sanibel, Florida. 5 mm. p. 138.
4. *Haminoea antillarum guadalupensis* Sowerby. Sanibel, Florida. 18 mm. p. 141.
5. *Philine sagra* Orbigny. Lake Worth, Florida. 4 mm. p. 142.
6. *Atys sharpi* Vanatta. Boynton, Florida. 7.5 mm. p. 139.
7. *Morum oniscus* Linné. Florida. 1 inch. p. 111.
8. *Haminoea elegans* Gray. 12 mm. p. 141.
9. *Bulla solida* Gmelin. West Florida. 35 mm. p. 140.
10. *Bulla occidentalis* C. B. Adams. Lake Worth, Florida. 1 inch. p. 140.
11. *Cancellaria reticulata* Linné. Florida. 2 inches. p. 138.
12. *Cylichna alba* Brown. 5 mm. p. 140.
13. *Hydatina physis* Linné. Delray, Florida. 1 inch. p. 141.
14. *Acteocina candei* Orbigny. 2.5 mm. p. 139.
- 15a,15b. *Tethys wilcoxi* Heilprin. Sanibel, Florida. 7.5 inches. p. 142.
16. *Ringicula nitida* Verrill. 4.2 mm. p. 142.
17. *Bulla striata* Bruguiere. Yamato, Florida. 1 inch. p. 140.
- 18a,18b. *Sinum martiniana* Philippi. Lake Worth, Florida. 18 mm. p. 93.
19. *Cylichnella bidentata* Orbigny. Sanibel, Florida. 4 mm. p. 140.
20. *Lora incisula* Verrill. Maine. 6.5 mm. p. 136.
- 21a,21b. *Acteocina bullata* Kiener. West Indies. 11 mm. p. 139.
22. *Haminoea antillarum* Orbigny. 5 mm. p. 141.
23. *Atys caribaea* Orbigny. Boynton, Florida. 8 mm. p. 140.



P L A T E 5 4

1. *Spondylus americanus* Hermann. West Florida. 4 inches. p. 32.
2. *Chione intapurpurea* Conrad. Yamato, Florida. 35 mm. p. 53.
3. *Mya arenaria* Linné. New England. 3.5 inches. p. 66.
4. *Spondylus americanus* Hermann. West Florida. p. 32.
- 5a,5b. *Voluta musica* Linné. West Indies. p. 127.
6. *Tellidora cristata* Recluz. Sanibel, Florida. 1 inch. p. 60.
7. *Barnea costata* Linné. Marco, Florida. 6 inches. p. 69.
8. *Macrocallista nimbosa* Solander. Marco, Florida. 4 inches. p. 52.
9. *Meioceras nitidum* Stimpson. 2.5 mm. p. 103.
10. *Caecum carolinianum* Dall. 4.75 mm. p. 103.



P L A T E 5 5

1. *Detracia bulloides* Montagu. Florida Keys. 11 mm. p. 147.
2. *Auriculastrum pellucens* Menke. Sanibel, Florida. 18 mm. p. 145.
3. *Phytia myosotis* Drap. 8 mm. p. 145.
4. *Crucibulum auricula spinosum* Sowerby. Plio., Florida. 1.2 inches. p. 95.
5. *Melampus floridanus* Shuttleworth. 7.5 mm. p. 146.
6. *Tralia pusilla* Gmelin. 13 mm. p. 145.
7. *Melampus coffeus* Linné. Florida. 18 mm. p. 146.
8. *Pedipes mirabilis* Muhlfield. Palm Beach, Florida. 3 mm. p. 145.
- 9a,9b. *Siphonaria naufragum* Stearns. Boynton, Florida. 1 inch. p. 146.
- 10a,10b. *Siphonaria alternata* Say. Florida Keys. 8 mm. p. 146.
11. *Melampus bidentatus* Say. 10 mm. p. 146.
12. *Melampus flavus* Gmelin. 14 mm. p. 146.
13. *Dentalium semistriolatum* Guilding. 29.5 mm. p. 72.
- 14a,14b. *Dentalium entale stimpsoni* Henderson. 40 mm. p. 72.
15. *Trichotropis borealis costellarus* Couthouy. 19 mm. p. 103.
- 16a. *Dentalium occidentale* Stimpson. Apical portion magnified. p. 72.
- 16b-16d. *Dentalium occidentale* Stimpson. 26-31 mm. p. 72.
17. *Dentalium semistriolatum* Guilding. 29.5 mm. p. 72.
- 18a. *Dentalium antillarum* Orbigny. 20.5 mm. p. 71.
- 18b. Same, showing sculptural detail. p. 71.
19. *Dentalium texasiana* Philippi. 24 mm. p. 72.
20. *Pecten raveneli* Dall. Florida. 30 mm. p. 33.
- 21a. *Dentalium callithrix* Dall. Juvenile 23.5 mm. p. 71.
- 21b. Same, enlarged sculptural detail. p. 71.
22. *Cadulus carolinensis* Bush. 8 mm. p. 73.

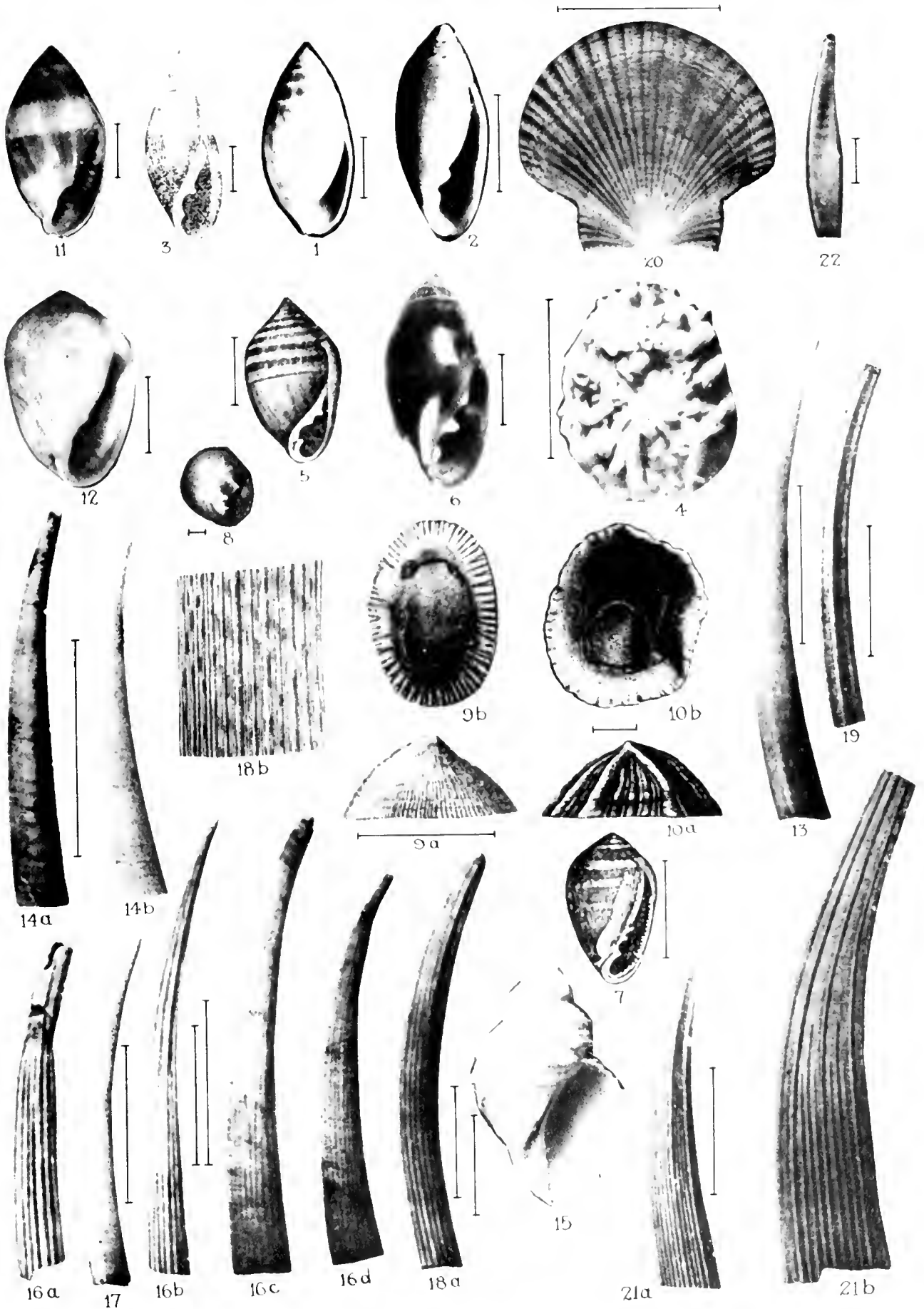
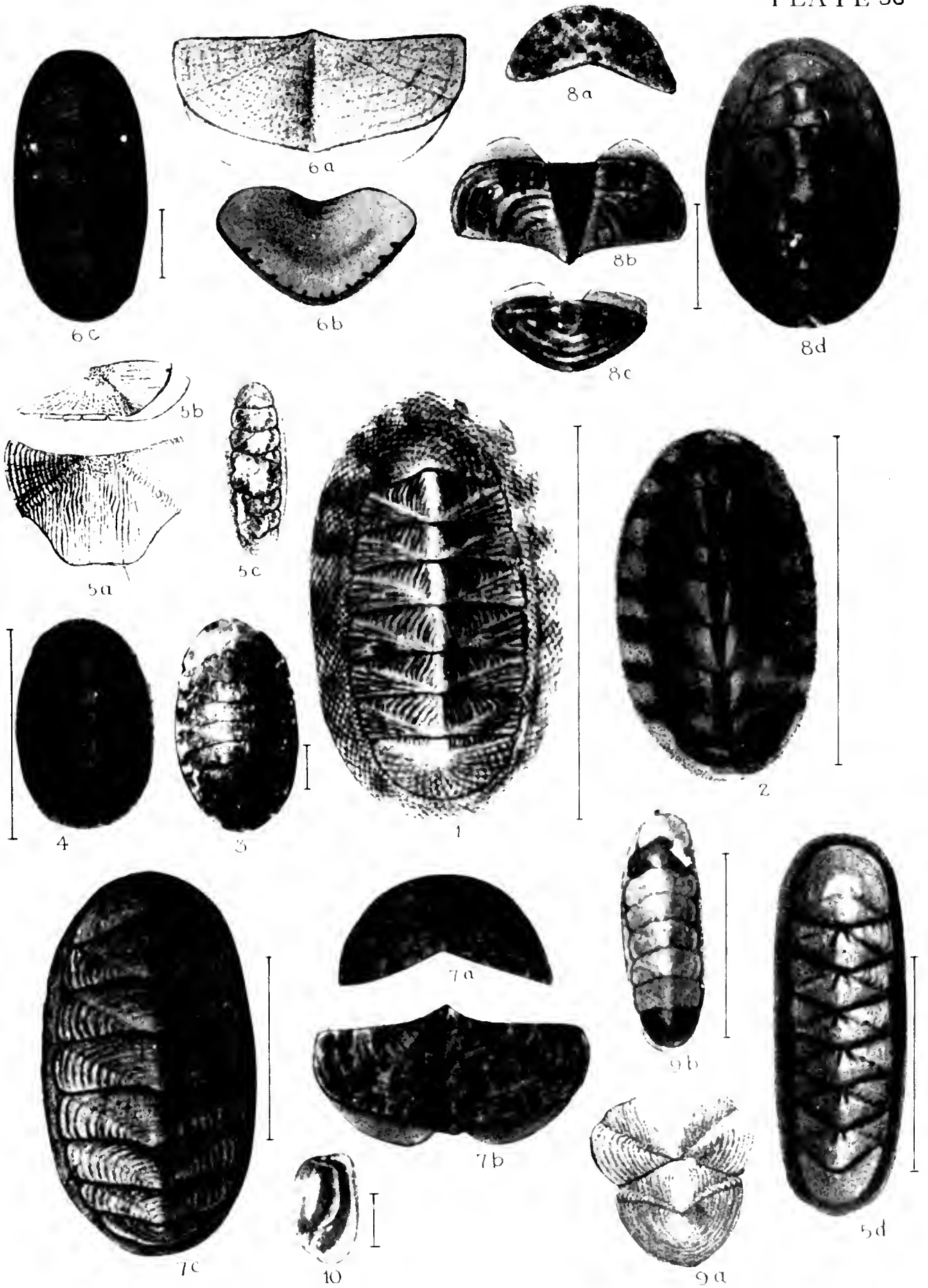


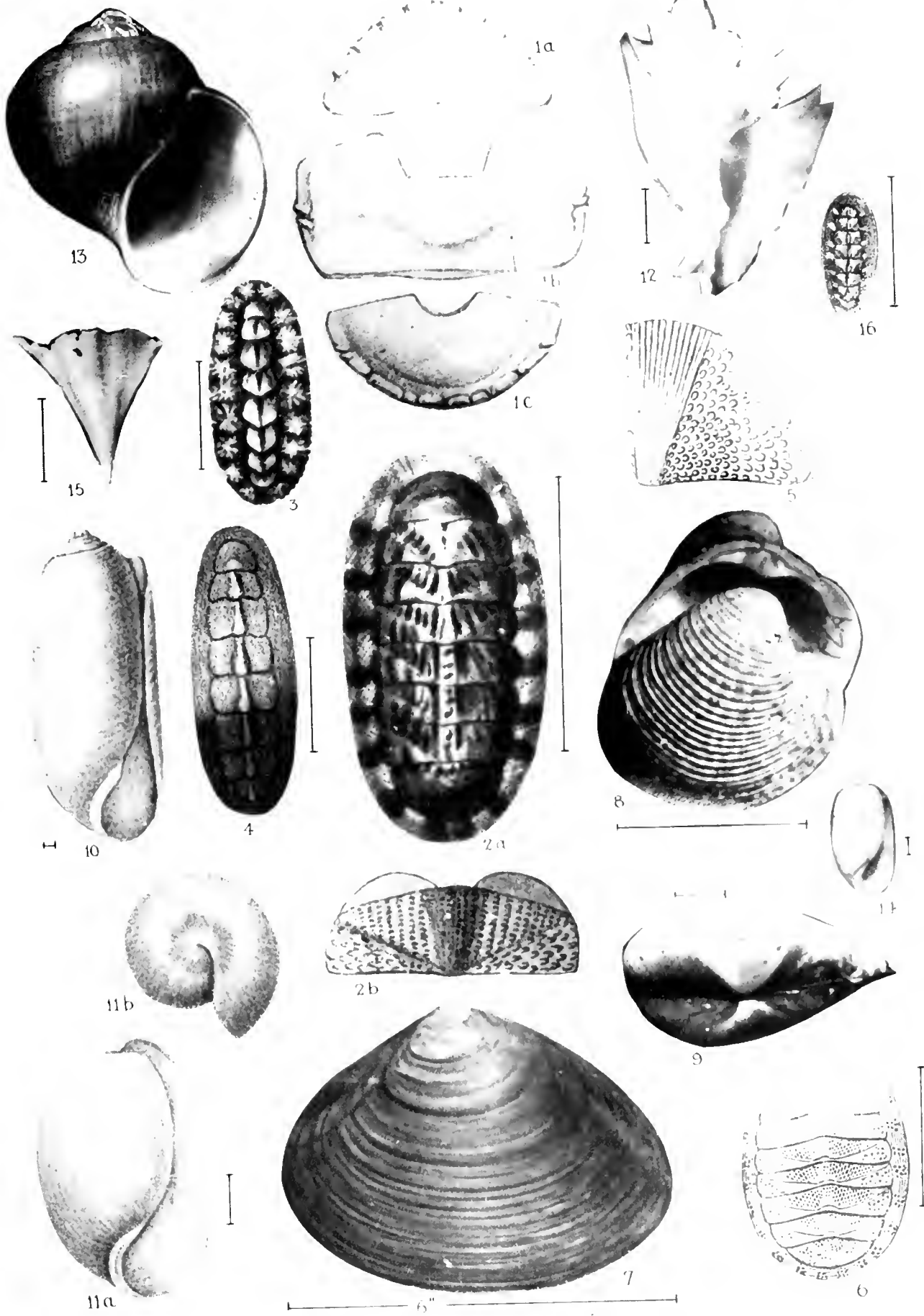
PLATE 56

1. *Chiton tuberculatus* Linné. 3 inches. p. 23.
2. *Acanthopleura granulata* Gmelin. Florida Keys. 2.5 inches. p. 24.
3. *Ischnochiton papillosus* C. B. Adams. Florida Keys. 8.5 mm. p. 23.
4. *Ceratozona rugosa* Sowerby. 40 mm. p. 23.
- 5a-5d. *Ischnochiton floridanus* Pilsbry. 41 mm. p. 23.
- 6a,6b,6c. *Lepidochiton alba* Linné. New England. 13 mm p. 22.
- 7a,7b,7c. *Lepidochiton marmorea* Fabricius. New England. 35 mm. p. 22.
- 8a-8d. *Lepidochiton ruber* Lowe. New England. 20 mm. p. 22.
- 9a,9b. *Ischnochiton limaciformis* Sowerby. 35 mm. p. 23.
10. *Haminoea succinea* Conrad. 10 mm. p. 141.



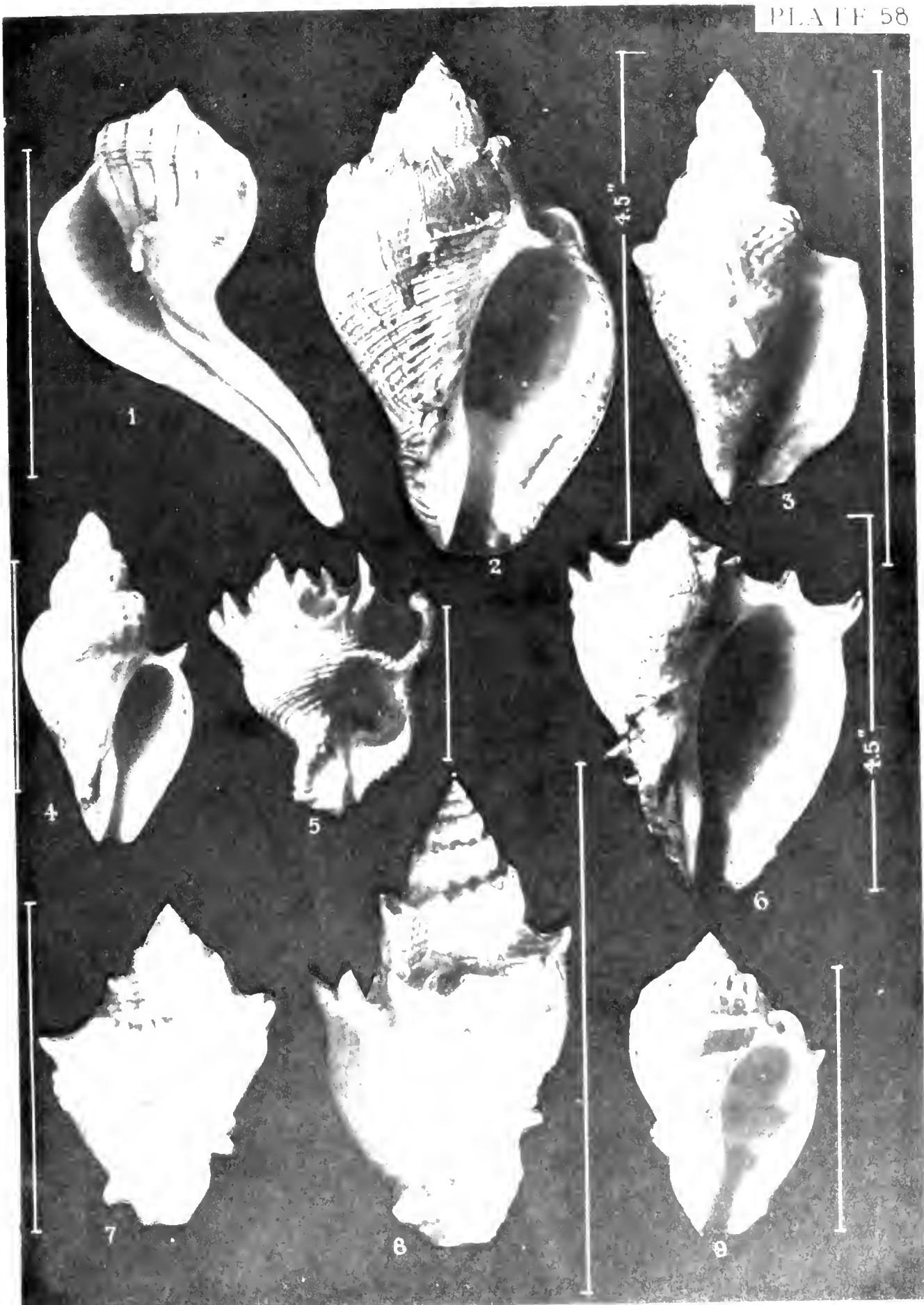
P L A T E 5 7

- 1a,1b,1c. *Ceratozona rugosa* Sowerby. 40 mm. p. 23.
- 2a,2b. *Chiton marmoratus* Gmelin. 2 inches. p. 23.
3. *Acanthochites spiculosus astriger* Reeve. 20 mm. p. 24.
4. *Acanthochites floridanus* Dall. 21 mm. p. 24.
5. *Acanthochites pygmaeus* Pilsbry. 8 mm. p. 24.
6. *Chaetopleura apiculata* Say. 1 inch. p. 23.
7. *Spisula solidissima* Dillwyn. 6 inches. p. 64.
8. *Chione intapurpurea* Conrad. Yamato, Florida. 35 mm. p. 53.
9. *Corbula swiftiana* C. E. Adams. Palm Beach, Florida. 9 mm. p. 67.
10. *Acteocina recta* Orbigny. 2 mm. p. 139.
11. *Haminoea petitii* Orbigny. 9 mm. p. 141.
12. *Murex tristichus* Dall. Florida Strait. 10 mm. p. 115.
13. *Pomacea paludosa* Say. Lantana, Florida. p. 147.
14. *Retusa pertenuis* Mighels. Eastport, Maine. 2.5 mm. p. 139.
15. *Clio pyramidata* Linné. 15 mm. p. 144.
16. *Acanthochites hemphilli* Pilsbry. Key West, Florida. Length 24 mm. p. 24.



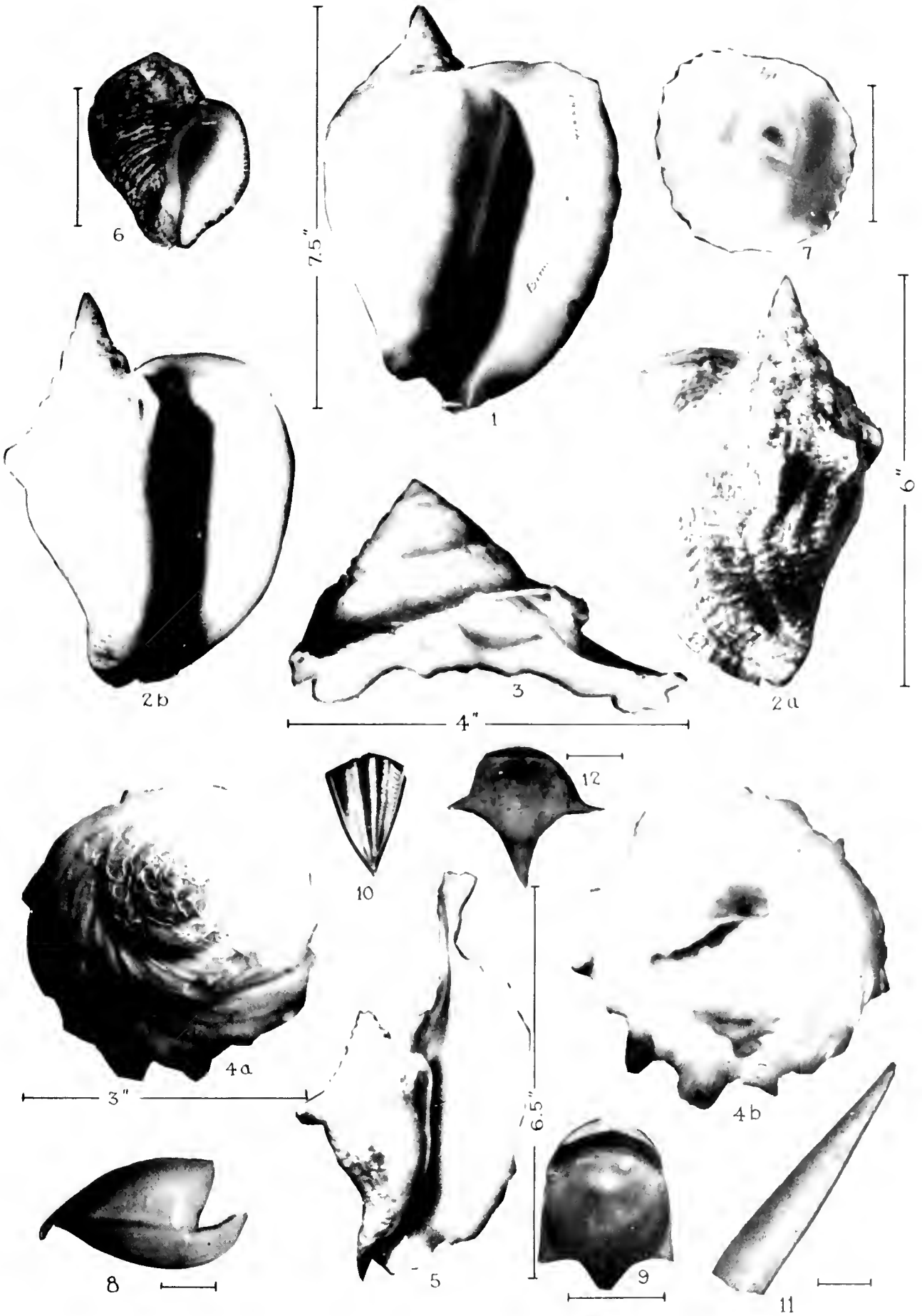
P L A T E 5 8

1. *Busycon perversum* Linné. Sanibel, Florida. A freak. 2.5 inches. p. 124.
2. *Melongena corona* Gmelin. Old Tampa Bay, Florida. 4.5 inches. p. 125.
3. *Strombus pugilis* Linné. Sanibel, Florida. A freak. 3.75 inches. p. 109.
4. *Melongena corona altispira* Pilsbry. Lower Matecumbe Key, Florida. 1.75 inches. p. 125.
5. *Coralliophila deburghiae* Reeve. Japan. 29 mm. p. 118.
6. *Melongena corona perspinosa* Pilsbry. Little Bayou, Tampa Bay, Florida. 4.5 inches. p. 125.
7. *Melongena corona subcoronata* Heilprin. ? Pinellas Point, West Florida. 2.5 inches. p. 125.
8. *Melongena corona* Gmelin. Tampa Bay, Florida. 4 inches. p. 125.
9. *Melongena corona minor* Sowerby. John's Pass, West Florida. 2 inches. p. 125.



P L A T E 5 9

1. *Strombus costatus* Gmelin. Bimini, Bahamas. 7.5 inches. p. 108.
2. *Strombus costatus* Gmelin. Tortugas, Florida. 6 inches. p. 108.
3. *Xenophora longleyi* Bartsch. Off Tortugas, Florida. 4 inches. p. 94.
4. *Xenophora caribaea* Petit. Gulf of Mexico. 3 inches. p. 94.
5. *Strombus gallus* Linné. Antilles. 6.5 inches. p. 109.
6. *Coralliophila abbreviata* Lamarck. Off Ft. Lauderdale, Florida. 1 inch.
p. 118.
7. *Crucibulum auricula* Gmelin. West Indies. 1 inch. p. 95.
8. *Cavolina gibbosa* Rang. 10 mm. p. 143.
9. *Cavolina telemus* Linné. 18 mm. p. 143.
10. *Clio recurva* Children. p. 144.
11. *Styliola subula* Quoy and Guimard. 10 mm. p. 144.
12. *Cavolina trispinosa* Le Sueur. 10 mm. p. 143.



P L A T E 6 0

- 1,1a,1b. *Corbula krebsiana* C. B. Adams. 6.1 mm. p. 67.
2,2a,2b. *Basterotia quadrata granatina* Dall. 10 mm. left valve. p. 67.
3,3a-3c. *Corbula cubaniana* Orbigny. 12.7 mm. p. 67.
4,4a,4b. *Corbula disparilis* Orbigny. 9 mm. p. 67.
5,5a,5b. *Corbula dietziana* C. B. Adams. 10.7 mm. p. 67.
6,6a,6b. *Corbula kjoeriana* C. B. Adams. 12 mm. p. 67.
7,7a. *Corbula cymella* Dall. 13.5 mm. p. 67.

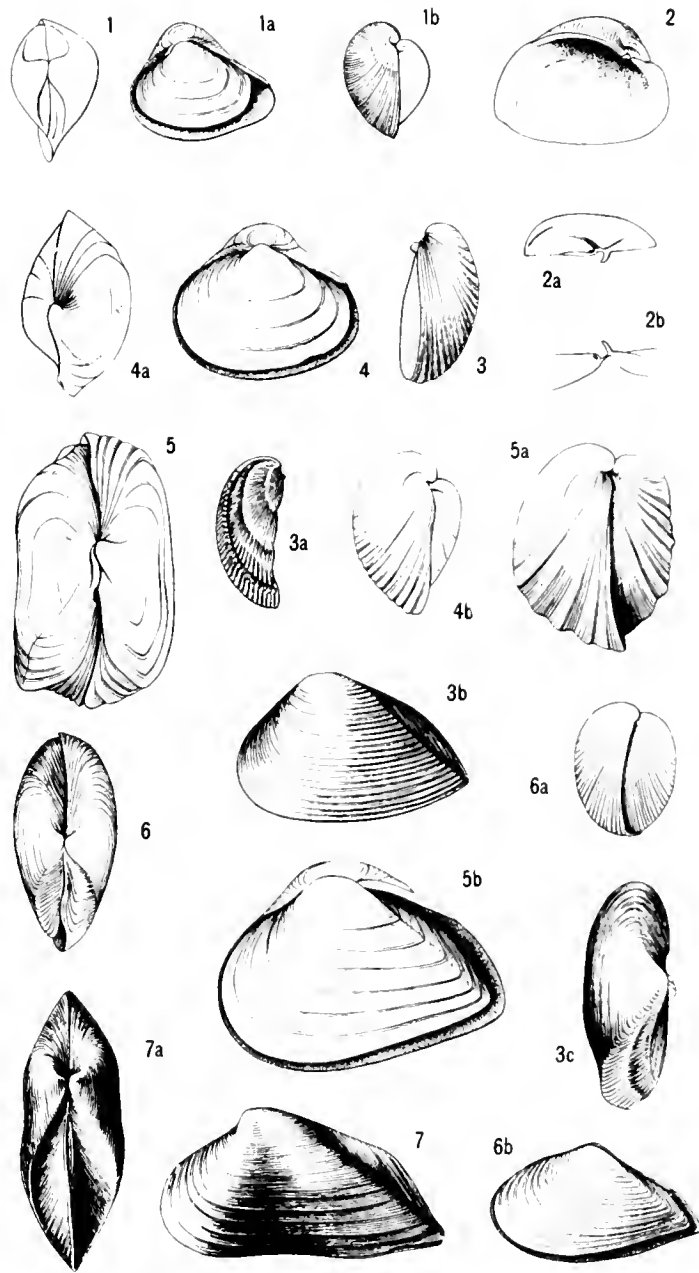


PLATE 60

P L A T E 6 1

- 1a,1b. *Verticordia elegantissima* Dall; 13.25 mm. p. 42.
2,2a. *Leiomya claviculata* Dall. 12 mm. p. 42.
3a,3b. *Cuspidaria perrostrata* Dall. 8 mm. p. 42.
4a,4b. *Verticordia fischeriana* Dall. 10 mm. p. 42.
5a-5c. *Corbula swiftiana* C. B. Adams. 10.4 mm. p. 67.
6a-6d. *Corbula chittyana* C. B. Adams. 8.5 mm. p. 67.
7,7a-7c. *Corbula barratiana* Orbigny. 8.9 mm. p. 66.

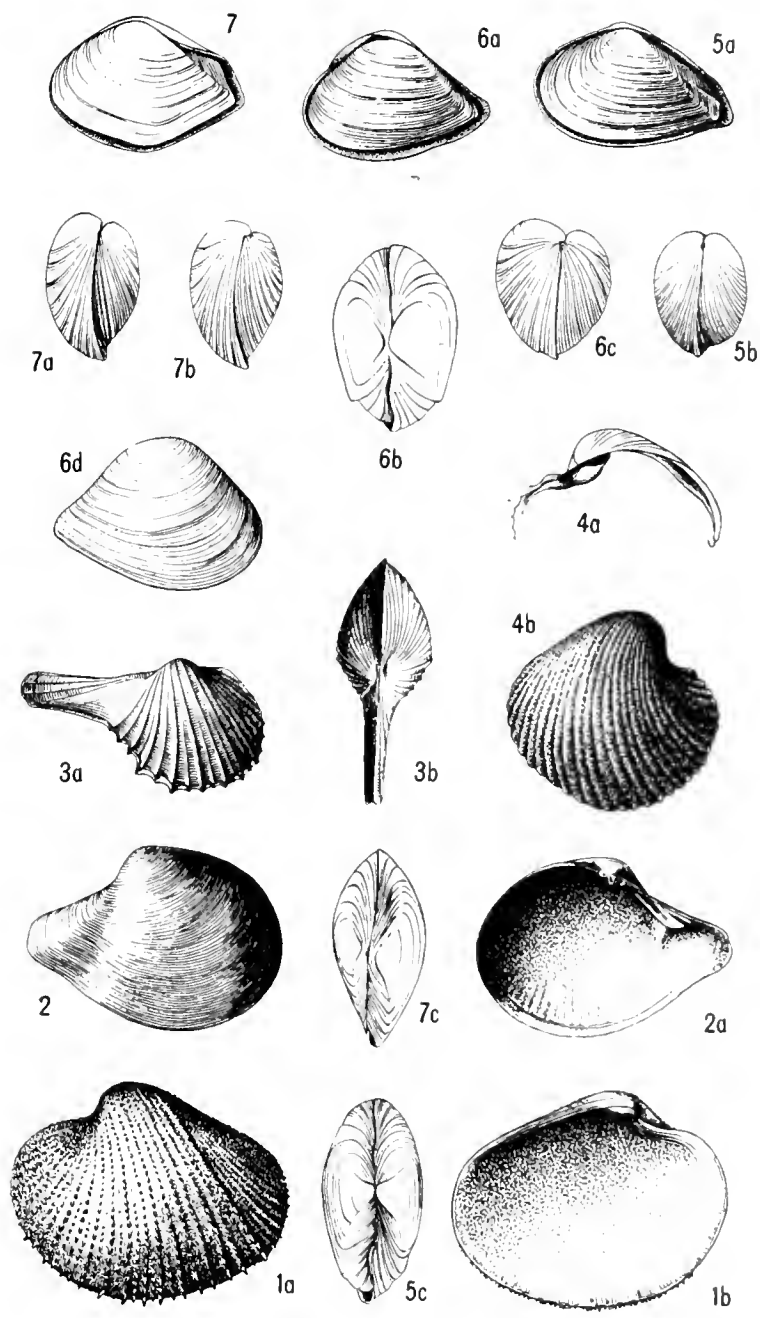


PLATE 61

P L A T E 6 2

- 1a. *Amusium dalli* E. A. Smith. 62 mm. p. 35.
- 1b. The same, inside of upper valve. p. 35.
- 2. *Pecten sigsbeeii* Dall. 11.5 mm. p. 35.
- 3. *Amusium pourtalesianum marmoratum* Dall. 13.5 mm. p. 35.
- 4a,4b. *Pecten imbrifer* Loven. 12.5 mm. p. 35.
- 5a,5b. *Dimya argentea* Dall. 12 mm. p. 32.
- 6. *Trigoniocardia ceramidum* Dall. 8.2 mm. p. 50.
- 7. *Protocardia peramabilis* Dall. 12.5 mm. p. 50.
- 8. *Abra lioica* Dall. 8.1 mm. p. 61.
- 9a,9b. *Saxicava azarea* Dall. 25 mm. p. 68.

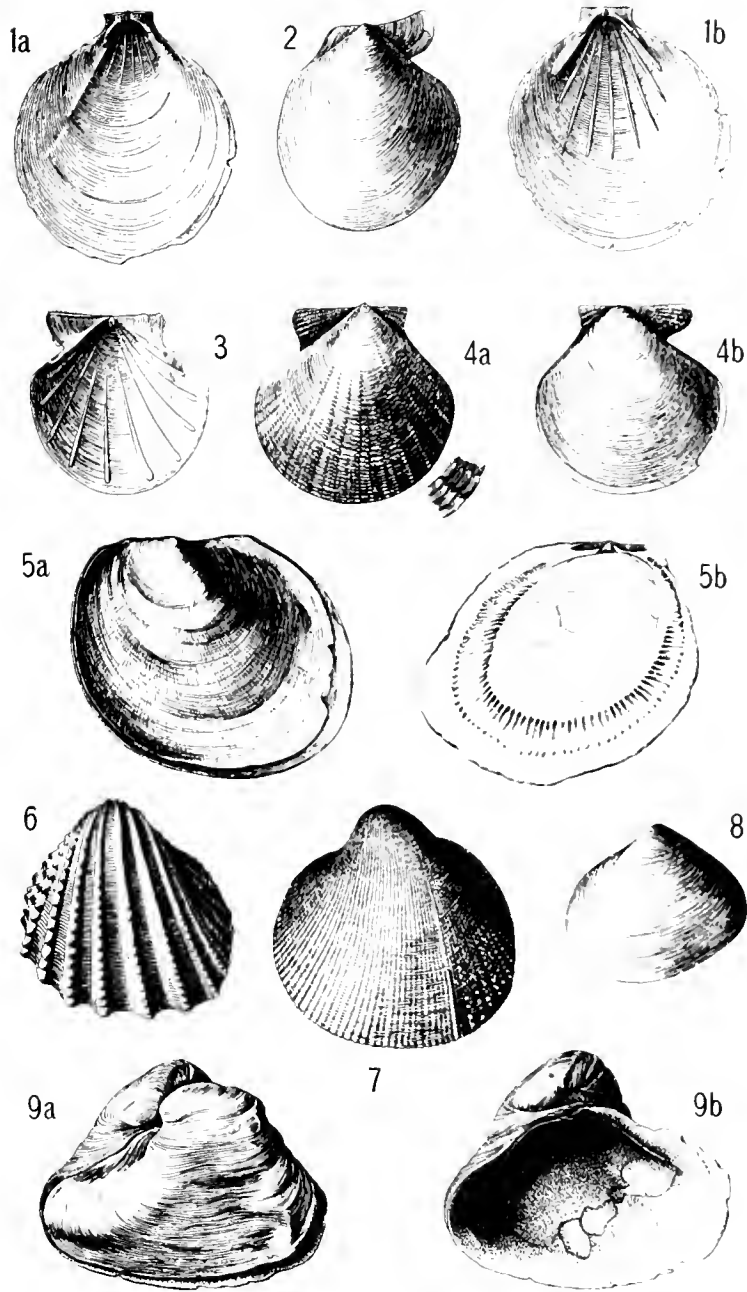


PLATE 62

P L A T E 6 3

1. *Dentalium laqueatum* Verrill. 29 mm. p. 72.
2. *Dentalium ceratum* Dall. Very young. 7 mm.
3. *Dentalium carduus* Dall. 16 mm. p. 71.
4. *Dentalium gouldii obscurum*. 28 mm. p. 72.
5. *Cadulus quadridentatus* Dall, and outline of aperture. 10 mm. p. 73.
6. *Dentalium perlongum* Dall, and outline of aperture. 80 mm. p. 72.
7. *Cadulus amiantus* Dall. 5.75 mm. p. 73.
8. *Cadulus lunula* Dall, and outline of aperture. 6 mm. p. 73.
9. *Cadulus aequalis* Dall, and outline of aperture. 15 mm. p. 73.
10. *Dentalium callithrix* Dall. 25 mm. p. 71.
11. *Cadulus acus* Dall. 8 mm. p. 73.
- 12a. *Cadulus watsoni* Dall, and outline of aperture. 20 mm. p. 73.
- 12b. *Dentalium callipeplum* Dall. 36 mm. p. 71.
- 12c. *Cadulus agassizii* Dall, and outline of aperture. 9 mm. p. 73.
- 12d. *Cadulus cucurbita* Dall, and outline of aperture. 4 mm. p. 73.

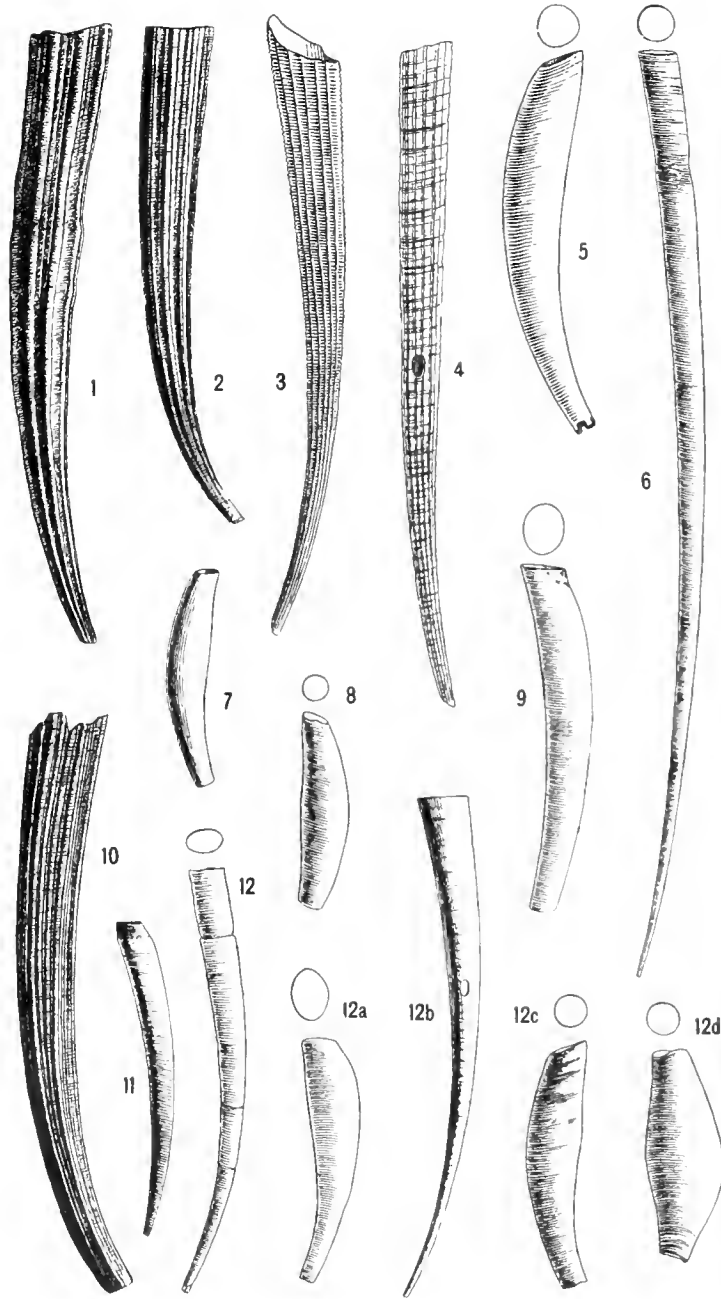


PLATE 63

P L A T E 6 4

1. *Olivella mutica* Say. a-g, varieties of form and color; h, operculum; i, l, operculum outside and inside, magnified; m, animal crawling; n, head, showing absence of eyes and tentacles; section of oral aperture magnified; p, sexual organ; r, section of shell showing absorption of walls. p. 132.
2. *Olivella mutica* Say. Portion of radula. p. 132.
3. *Thais floridana* Conrad. c, animal from below; d, head from above. p. 117.
4. *Thais floridana* Conrad; radula. p. 117.
5. *Maculopeplum junonia* Chemnitz. b, shell; c, sculpture of early whorls; d, nucleus; e, section. p. 128.
6. *Volutomitra groenlandica* Beck. Young shell and magnified nucleus. p. 129.
7. *Volutomitra groenlandica* Beck. Rhachidian tooth; a, from above; b, in profile. p. 129.
8. *Oliva sayana* Ravenel. a, animal crawling; b, tentacles and eyes; c, soft parts removed from shell, showing (f) foot, (g) propodium, (h) breathing siphon, (i) vent, (l) posterior ligament of mantle, (m) mantle raised up, (n) verge, (o) gill; d, section of muzzle; e. gill and sensory organ. p. 131.
- 8g. *Oliva sayana* Ravenel. Dentition from female specimen. These drawings were made in 1889 by Dr. William Stimpson. p. 131.

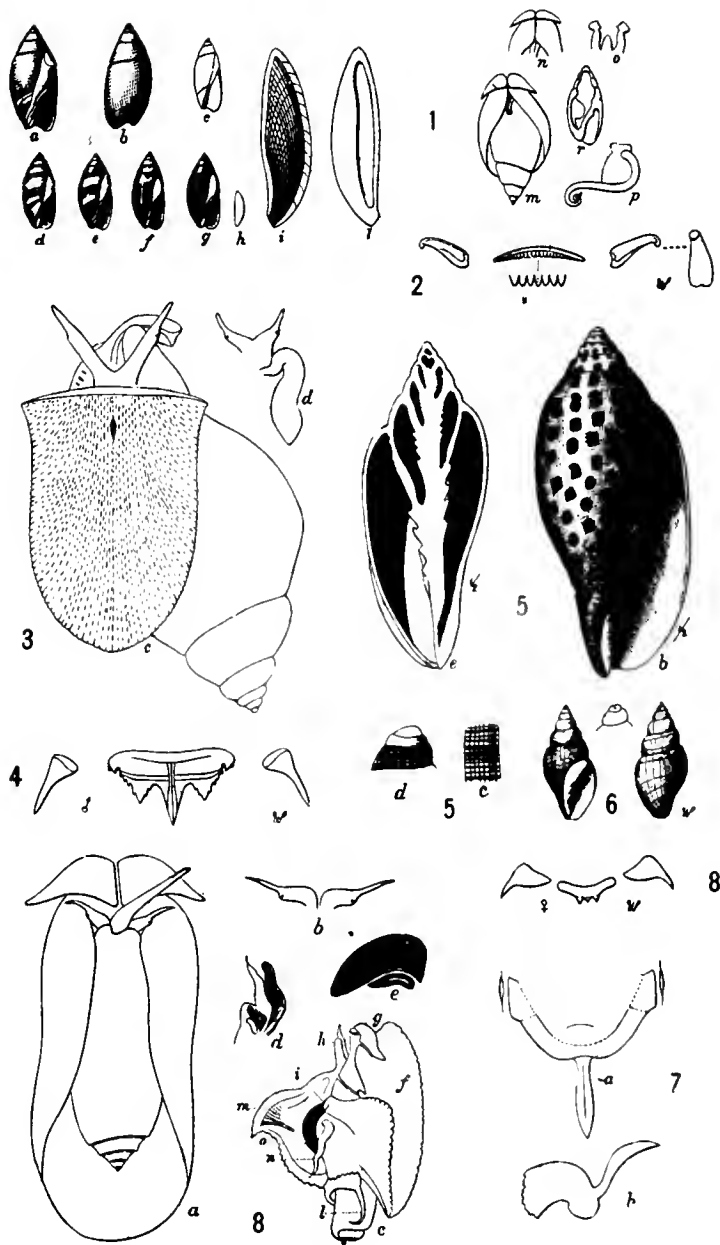


PLATE 64

P L A T E 6 5

1. *Mangilia oxytata* Bush. p. 137.
2. *Mangilia lanceolata psila* Bush. p. 137.
3. *Mangilia oxia* Bush. 4.5 mm. p. 137.
- 3a. *Mangilia oxia melanitica* Dall. p. 137.
4. *Mangilia atrostyla* Dall. 7 mm. p. 136.
- 5,5a. *Nassarina glypta* Bush. 4.5 mm. p. 123.
6. *Triphora turris-thomae* Dillwyn. 6 mm. p. 104.
- 7,7a. *Adeorbis supranitidus* Wood. 2.5 mm. p. 98.
8. *Epitonium teres* Bush. p. 85.
9. *Pyramidella engonia teres* Bush. p. 88.
10. *Niso interrupta aeglees* Sowerby. p. 87.
11. *Volvula acuta* Orbigny. p. 139.
12. *Volvula oxytata* Bush. 3.5 mm. p. 139.
13. *Acteocina candei* Orbigny. 2.5 mm. p. 139.
14. *Cylichnella bidentata* Orbigny. 4 mm. p. 140.
15. *Retusa caelata* Bush. p. 139.
- 16,16a. *Philine sagra* Orbigny. 4 mm. p. 142.
17. *Acteon punctostriatus* Adams. var. 5 mm. p. 138.
- 18,18a. *Dentalium eboreum* Conrad. 30 mm. p. 71.
19. *Cadulus carolinensis* Bush. 9.5 mm. p. 73.
20. *Cadulus quadridentatus incisus* Bush. 8.5 mm. p. 73.
21. *Cuspidaria ornatissima* Orbigny. 9.5 mm. p. 42.

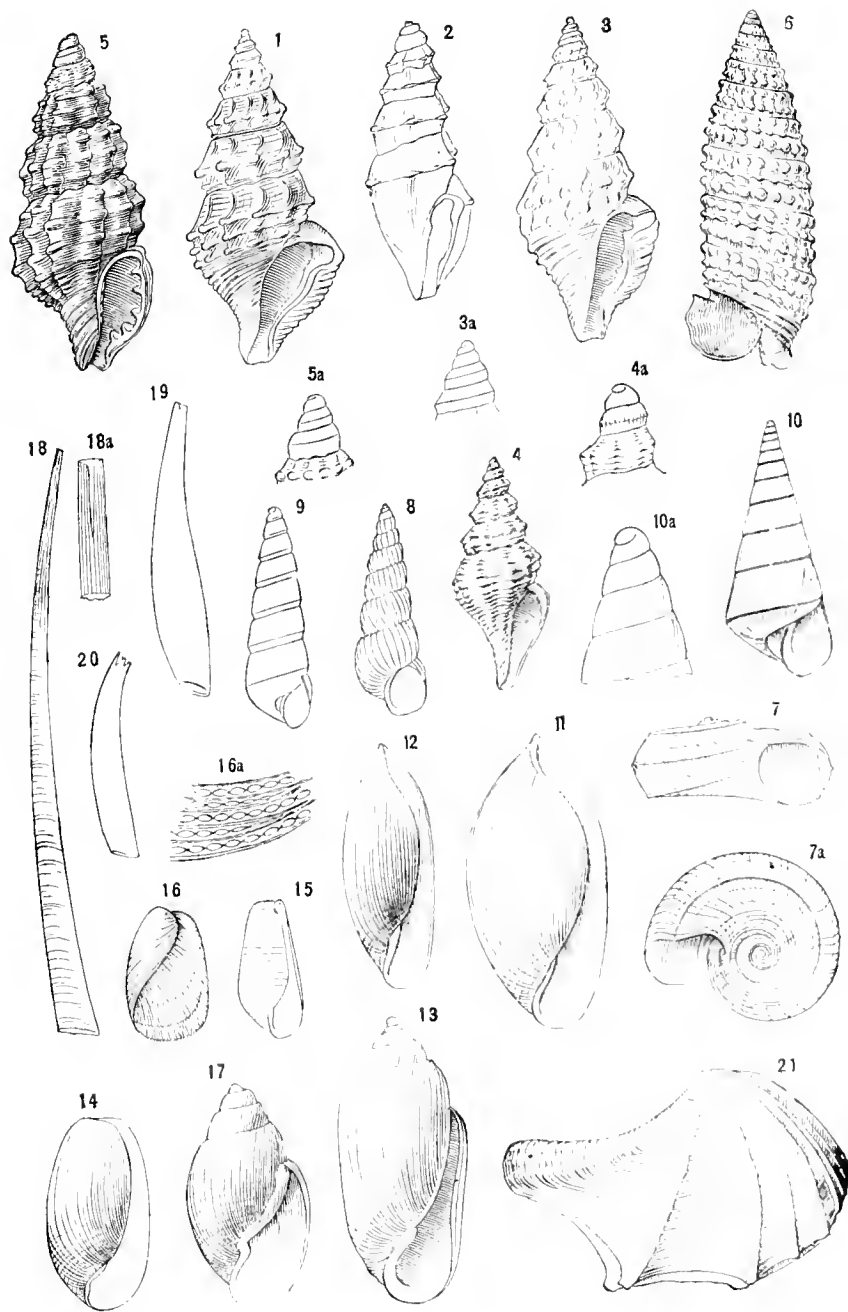


PLATE 65

P L A T E 6 6

1. *Argonauta argo americana* Dall. Slightly contracted. p. 149.
- 1a. The same, shell from in front. p. 149.
- 1b. The same, from the side. p. 149.
2. *Abralia megaptera* Verrill, one of the sessile arms.
3. *Cavolina hargerii* Verrill. Dubious.
- 4,4a. *Atlanta peronii* Le Sueur. p. 91.
- 5,5a. *Heterodoris robusta* Verrill and Emerton. p. 144.
6. *Geitodoris complanata* Verrill and Emerton. p. 145.
7. *Koonsia obesa* Verrill; distorted by alcohol. p. 144.
8. *Caecum cooperi* Smith. Enlarged view of anterior end of shell with animal extended. p. 103.

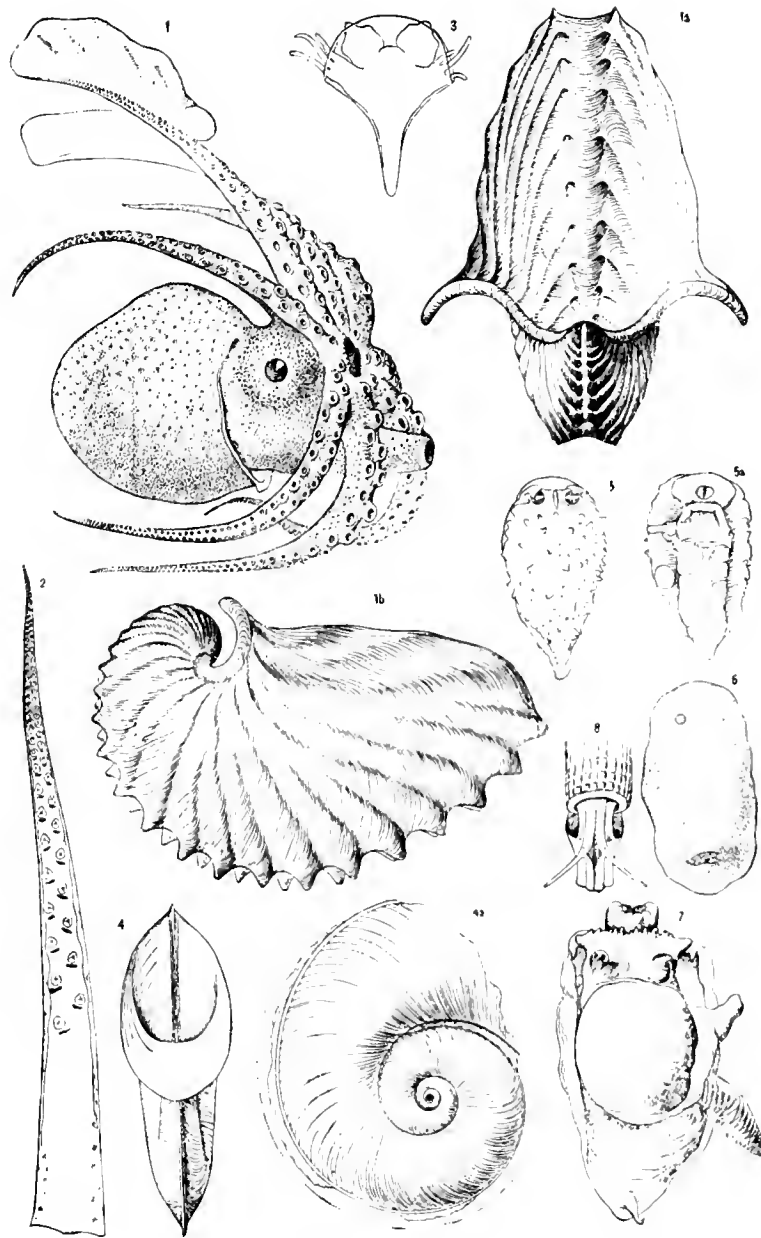


PLATE 66

P L A T E 6 7

1. *Melampus flavus* Gmelin. 12 mm. p. 146.
2. *Melampus floridanus* Shuttleworth. 7.5 mm. p. 146.
3. *Melampus coffeus* Linné. p. 146.
4. *Pedipes elongatus* Dall. 4 mm. p. 145.
5. *Tralia pusilla* Gmelin. 11 mm. p. 145.
6. *Pedipes unisulcatus* Cooper. W. Am., for comparison.
7. *Detracia bulloides* Montagu. 11 mm. p. 147.
8. *Auriculastrum pellucens* Menke. 16 mm. p. 145.
9. *Melampus bidentatus* Say. p. 146.
10. *Sayella crosseana* Dall. 2.5 mm. p. 147.
11. *Sayella hemphillii* Dall. 3.75 mm. p. 147.
12. *Melampus bidentatus* Say. Banded. p. 146.
13. *Leuconia bidentata* Montagu. American records dubious.
14. *Blauneria heteroclita* Montagu. p. 147.
15. *Pedipes liratus* Binney; for comparison.
16. *Melampus olivaceus* Carpenter; W. Am., for comparison.
17. *Pedipes mirabilis* Muhlfield. 3.6 mm. p. 145.

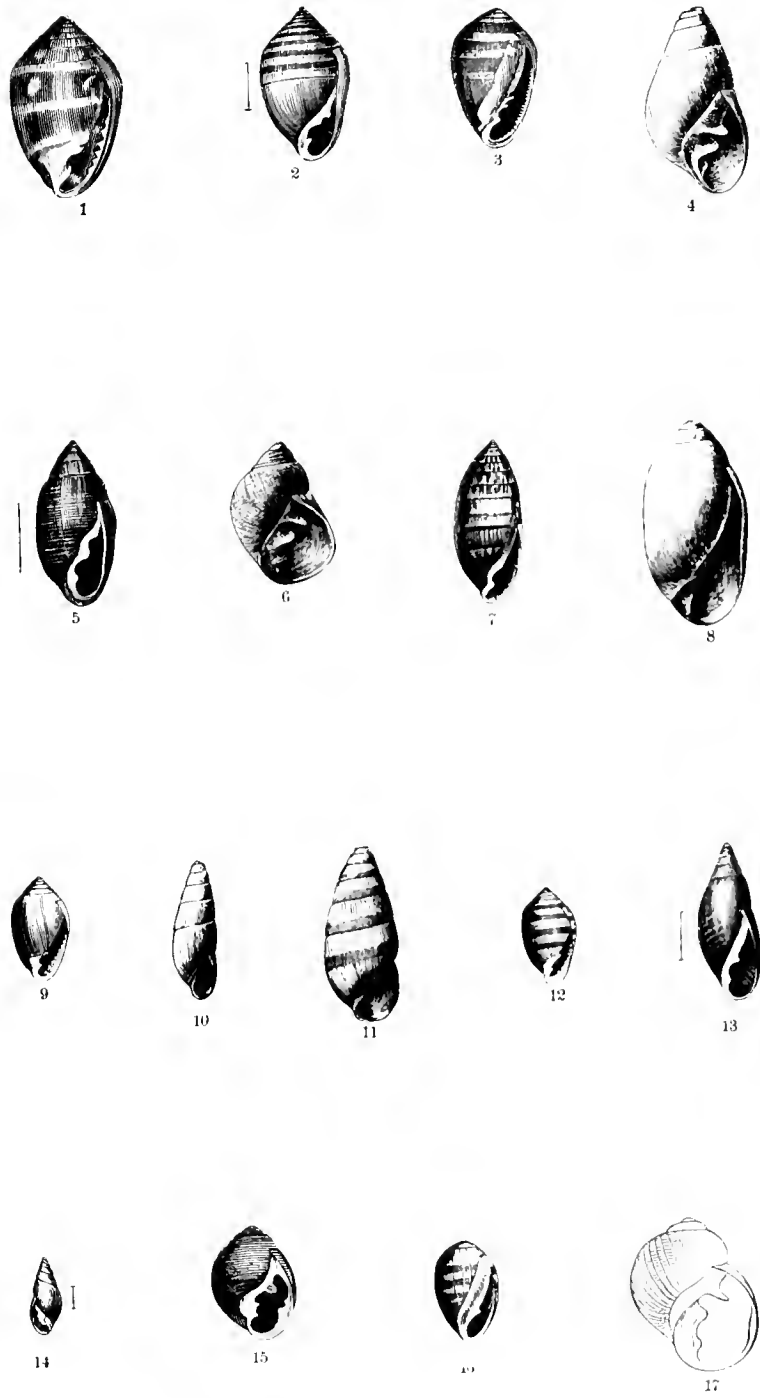
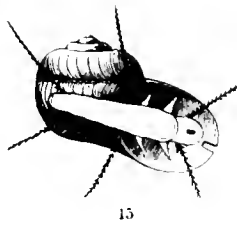
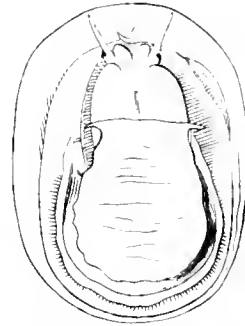
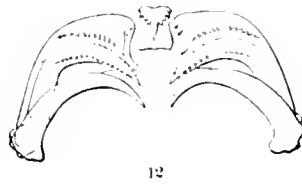
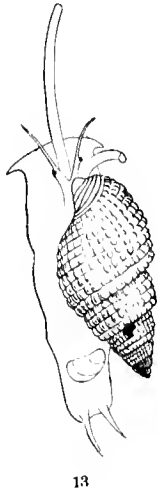
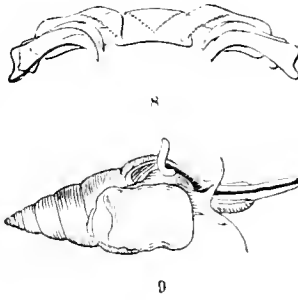
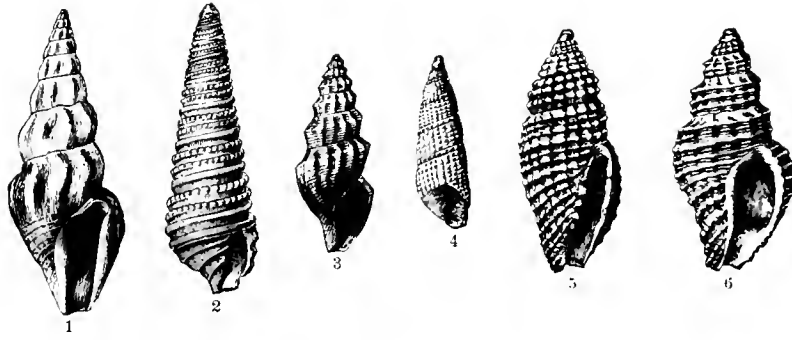


PLATE 67

P L A T E 6 8

1. *Cymatosyrinx thea* Dall. 15 mm. p. 135.
2. *Oscilla biseriata* Gabb. 8.5 mm. p. 90.
3. *Mangilia limonitella* Dall. 6.75 mm. p. 137.
4. *Turbonilla cedrosa* Dall. 5.5 mm. p. 89.
5. *Mitra floridana* Dall. 6 mm. p. 128.
6. *Phos parvus intricatus* Dall. 13.2 mm. p. 123.
7. *Clathrodrillia leucocyma* Dall. 7.5 mm. p. 135.
8. *Capulus ungaricus* Linné. Radula teeth, enlarged. p. 94.
9. *Colus pygmaeus* Gould. Soft parts. p. 124.
10. *Tachyrhynchus erosa* Couthouy; portion shell and animal, enlarged. p. 101.
11. *Liostraca hemphilli* Dall. 3 mm. p. 86.
12. *Crepidula plana* Say. Radula. p. 96.
13. *Nassarius trivittata* Say; showing animal. p. 121.
14. *Limacina helicina* Phipps; radula, enlarged. p. 143.
15. *Scissurella crispata* Fleming, showing animal. 4 mm. p. 78.
16. *Crepidula fornicata* Linné, from below, showing soft parts; 20 mm. p. 95.



16

P L A T E 6 9

- 1,2. *Thais lapillus* Linné. p. 117.
3. The same; ovicapsules enlarged. p. 117.
4. *Colus pygmaeus* Gould. p. 124.
5. *Epitonium multistriata* Say. p. 84.
6. *Urosalpinx cinereus* Say. p. 116.
7. *Nassarius trivittata* Say. p. 121.
8. *Nassarius vibex* Say. p. 121.
9. *Nassarius obsoletus* Say. p. 121.
10. *Epitonium humphreysii* Kiener. 17 mm. p. 84.
11. *Eupleura caudata* Say, small northern form. p. 115.
12. *Anachis avara* Say, variety. p. 119.
13. *Mitrella pura* Verrill. p. 120.
14. *Mangilia plicosa* C. B. Adams. 7 mm. p. 137.
15. *Lora bicarinata* Couthouy. 7 mm. p. 136.
16. *Mitrella lunata* Say. 5 mm. p. 120.
17. *Lora harpularia* Couthouy. 12 mm. p. 136.
- 18,19. *Polinices triseriata* Say, young. p. 92.
20. *Polinices immaculata* Totten. p. 93.
21. *Natica pusilla* Say; 6 mm. p. 92.
22. *Caecum pulchellum* Stimpson. 2.5 mm. p. 102.
23. *Crepidula fornicata* Linné. 32 mm. p. 95.
24. The same, young. p. 95.
25. *Crepidula glauca convexa* Say. 14 mm. p. 96.
26. *Crepidula plana* Say. p. 96.
27. *Crucibulum striatum* Say; profile. p. 95.
28. The same, from below. p. 95.

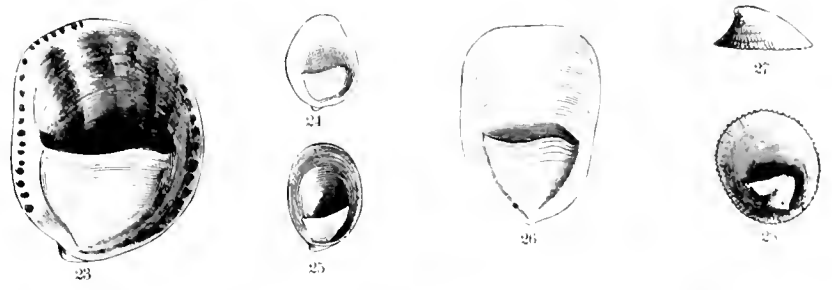
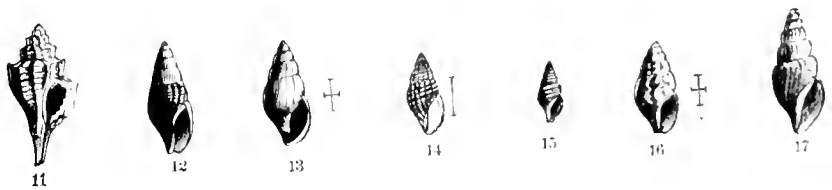
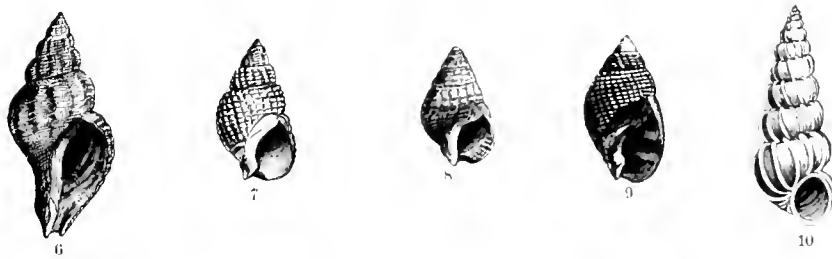
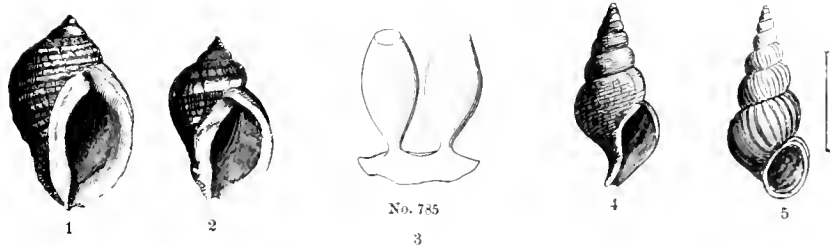


PLATE 69

P L A T E 7 0

1. Polinices heros Say, showing animal. p. 92.
- 2, 3. Acmaea testudinalis amaena Say. p. 75.
4. Vermicularia spirata Philippi. p. 102.
5. Littorina obtusata Linné. 20 mm. p. 99.
6. Littorina saxitile Olivi. 12 mm. p. 99.
7. Acmaea testudinalis alveus Conrad, profile. 8 mm. p. 75.
8. The same, from below. p. 75.
9. Lepidochiton ruber Lowe. 20 mm. p. 22.
10. Chaetopleura apiculata Say. 1 inch. p. 23.
11. Polinices heros Say. p. 92.
12. Polinices duplicata Say. p. 92.

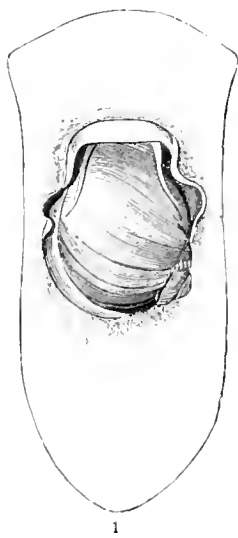
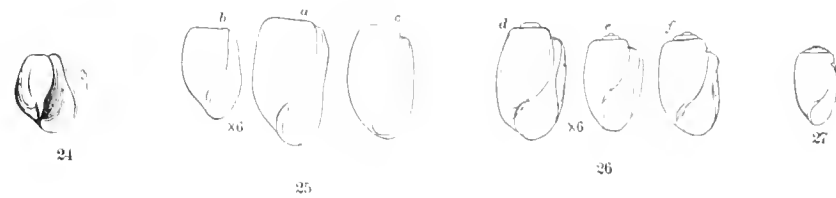
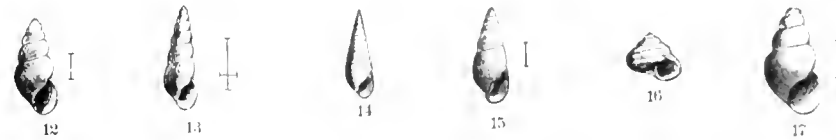


PLATE 70

P L A T E 7 1

1. *Cerithiopsis subulata* Montagu. 12 mm. p. 105.
2. *Cerithiopsis greenii* C. B. Adams. 5 mm. p. 105.
3. *Triphora perversa nigrocincta* Adams. 10 mm. p. 104.
4. *Bittium alternatum* Say. 7 mm. p. 107.
5. *Seila adamsi* H. C. Lea. 10 mm. p. 105.
6. *Turbonilla elegantula* Verrill. p. 89.
7. *Odostomia bisuturalis* Say. 4.7 mm. p. 90.
8. *Odostomia trifida* Totten. 4 mm. p. 90.
9. *Phytia myosotis* Drap. young. p. 145.
10. *Odostomia seminuda* C. B. Adams. 3.8 mm. p. 90.
11. *Odostomia impressa* Say. 4.8 mm. p. 90.
12. *Onoba aculeus* Gould. p. 97.
13. *Pyramidella producta* Adams. 5 mm. p. 87.
14. *Melanella intermedia* Cantraine. 7.5 mm. p. 86.
15. *Pyramidella fusca* Adams. 5.5 mm. p. 87.
16. *Solariella obscura* Couthouy. 7 mm. p. 79.
17. *Hydrobia minuta* Totten. 3.5 mm. p. 97.
18. *Skenea planorbis* Fabricius. 1.4 mm. p. 98.
19. *Lacuna vincta* Montagu. 8 mm. p. 101.
20. *Haminoea solitaria* Say. 10 mm. p. 141.
21. *Cylichna alba* Brown. 5 mm. p. 140.
22. *Acteon punctostriatus* Adams. 4 mm. p. 138.
23. *Cylichnella oryza* Totten. 4 mm. p. 140.
24. *Liaphana debilis* Gould. 4 mm. p. 140.
- 25,26. *Retusa pertenuis* Mighels, showing variations. 2.5 mm. p. 139.
27. *Acteocina canaliculata* Say. 5 mm. p. 139.



P L A T E 7 2

1. *Anomia simplex* Orbigny, side view. p. 37.
2. The same, from below. p. 37.
3. *Siliqua costata* Say. p. 64.
4. *Ensis directus* Conrad. p. 64.
5. *Anomia aculeata* Linné, from above. 12 mm. p. 37.
6. The same, from below. p. 37.
7. The same, sculpture enlarged. p. 37.
8. The same, smooth variety. p. 37.
9. *Modiolaria corrugata* Stimpson. 12 mm. p. 39.
10. *Crenella glandula* Totten. 12 mm. p. 39.
11. *Pecten irradians* Lamarck, typical form. p. 34.

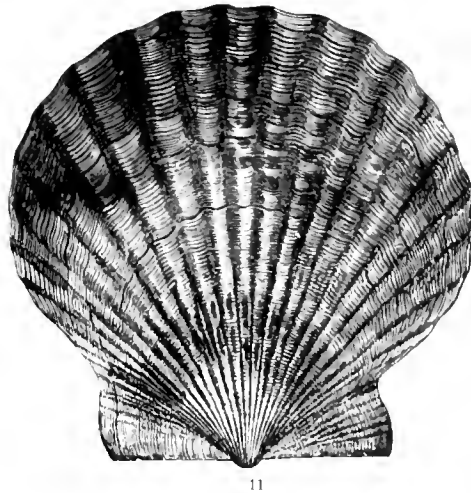
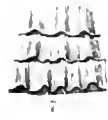
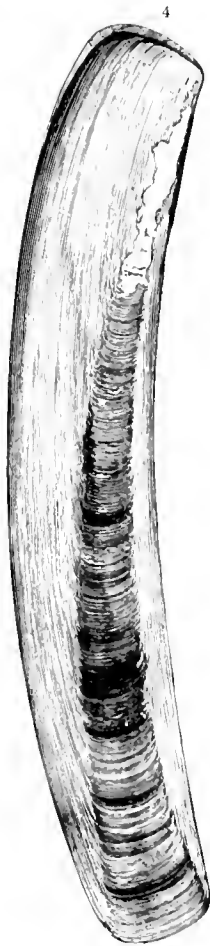
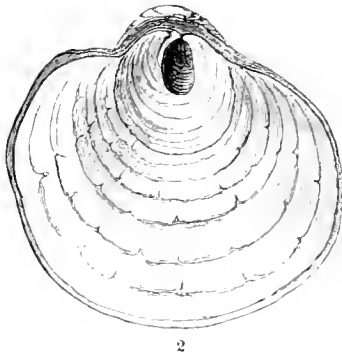


PLATE 72

P L A T E 7 3

1. *Astarte undata* Gould. p. 43.
2. *Thyasira gouldii* Philippi. p. 45.
3. *Solemya velum* Say. p. 25.
4. *Astarte quadrans* Gould. 6 mm. p. 43.
5. *Cardium pinnulatum* Conrad. 12 mm. p. 49.
6. *Divaricella dentata* Wood. p. 47.
7. *Astarte castanea* Say. 23 mm. p. 43.
8. *Laevicardium mortoni* Conrad, animal extended. p. 50.
9. *Venericardia borealis* Conrad, typical form. p. 44.
10. *Venericardia borealis novangliae* Morse. p. 44.
11. *Crassinella mactracea* Linsey; much enlarged. p. 43.
12. *Thyasira obesus* Verrill; much enlarged. p. 45.
13. *Crassinella mactracea* Linsey. 6 mm. p. 43.
14. *Lucina filosa* Stimpson. p. 46.

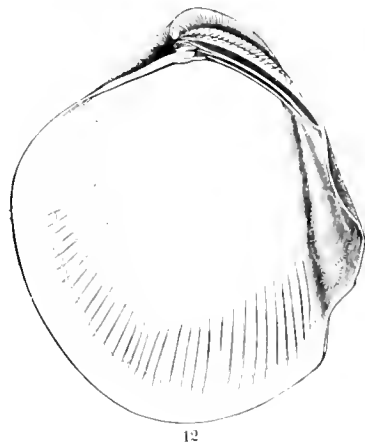
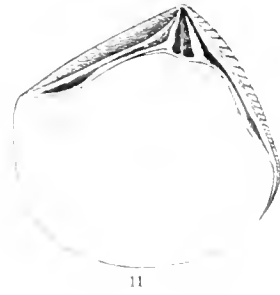
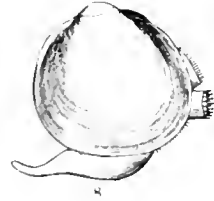
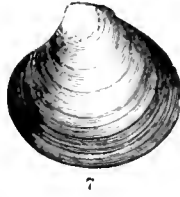
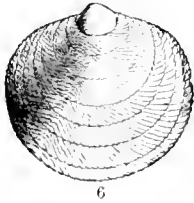


PLATE 73

P L A T E 7 4

- 110. *Atlanta peronii* Le Sueur, side view of shell. p. 91.
- 110a. The same, both much enlarged. p. 91.
- 111. *Atlanta gaudichaudi* Eudoux and Souleyet, for comparison. p. 91.
- 112. *Creseis conica* Eschscholtz, showing animal. p. 144.
- 113. *Cavolina telemus* Linné. 18 mm. p. 143.
- 115. *Cavolina trispinosa* Le Sueur, animal extended; shell 10 mm. p. 143.
- 116. *Cavolina uncinata* Rang, animal extended, shell 10 mm. p. 143.
- 117. *Cuvierina columnella* Rang, animal extended, remnant of the larval cone at base; shell 12 mm. p. 144.
- 118. *Creseis acicula* Rang, side view, greatly enlarged. p. 144.
- 119. *Hyalocylix striata* Rang, animal extended, enlarged. p. 144.
- 120. *Corolla calceola* Verrill, animal extended. p. 144.
- 121. *Spongiobranchia australis* Orbigny, for comparison.
- 122. *Cione limacina* Phipps. p. 144.

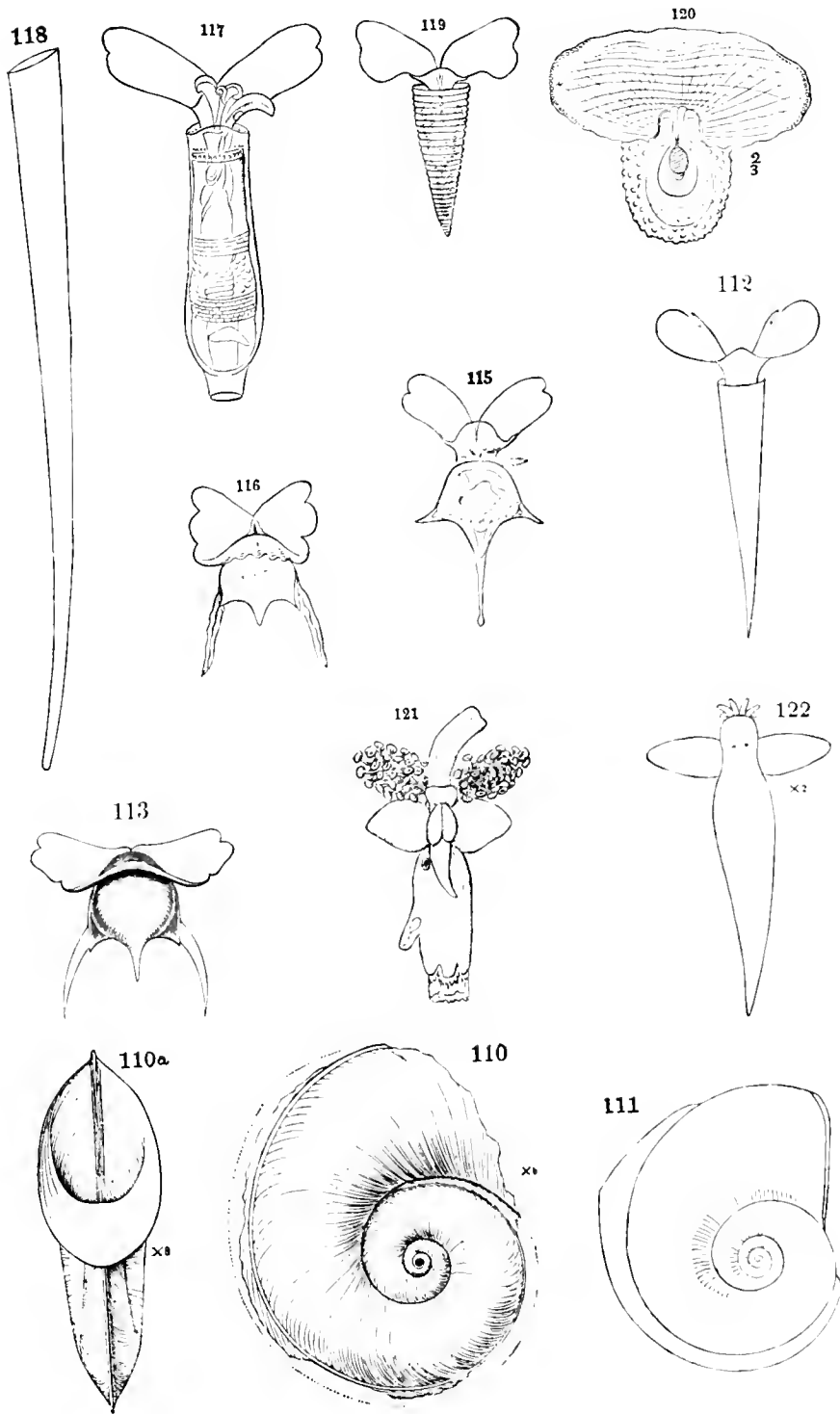


PLATE 74







GLOSSARY OF DESCRIPTIVE TERMS AND GENERAL INDEX

(Sections, Genera, etc., in Separate Index)

- Abyssal region....p. 5
Acoela....p. 144
Acuminate....Sharp pointed
Acute....Sharp edged or pointed
Admedian teeth....Portion of radula, p. 18
Adnate....Growing together, connected
Alated....With wing-like projections, Fig. 20, p. 16
Amphineura....A class, pp. 1, 22
Analogous....Parallel, similar, related
Anatomy....The study of the structure of organisms as shown by dissection
Anterior end....In bivalve shells the opposite end to which the ligament is attached; the front of the shell in life
Aperture....The opening, p. 14
Apex....Summit or place of beginning of univalve shells
Archaeogastropoda....p. 74
Archibenthal region....p. 5
Articulated....See operculum, p. 14
Attached....Fixed to some solid object
Auriculate....Eared or with processes like those in Pecten
Auriform....Shaped like the human ear
Axis....An imaginary center around which the whorls coil
- Basal margin....Margin opposite the umbones, corresponding with foot of animal in bivalves
Base (in univalves)....Extremity opposite to the apex
Beak....Sharp pointed anterior end of a bivalve shell; formerly used to describe the extremity of the umbo
Biangulate....Doubly keeled as in *Tectarius nodulosus*, Pl. 37, Fig. 67
Bifid....Divided at the tip into two parts
Bivalve....Composed of two pieces, rarely enclosed in a tube as in *Teredo*
Byssus....Beard-like filaments proceeding from the animal and used for attachment to some solid object, p. 17
- Cabinet....p. 7
Calcareous....Of shell substance
Callus....A calcareous deposit such as enamel
Camera....p. 10
Canal....Descending groove in aperture of an univalve
Cancelled....When horizontal and vertical lines, of similar strength, cross; cross-barred
Carinate....When whorls are strongly keeled as in *Astraea*
Cephalopoda....A class, pp. 1, 148
- Ciliate....Edged with parallel hairs
Cingulate....Spirally ribbed or ridged as in *Sella adamsi*, Pl. 38, Fig. 22
Cleaning shells....p. 7
Close....Bivalve shells which do not gape
Columella....The pillar of univalves, portion near imaginary axis around which shell revolves
Compressed....Flattened laterally; a reduced or contracted aperture as in *Distorsio*, Pl. 42, Fig. 8
Concave....Hollow, opposed to convex
Concentric lines or ribs....Lines which follow, more or less, the margin of bivalve shells, p. 17
Conchyolin....p. 12
Conic....Shape of a cone
Conical aperture....Sloping from center as in *Diadora*, Pl. 30, Fig. 5
Cordate....Heart-shaped
Coronated....Crowned; spines encircling the whorls as in *Melongena*, Pl. 48, Fig. 1a
Costated....Ribbed
Crenulated....Scalloped at margin; saw-toothed, often the result of line terminations; see *Pisania*, Pl. 47, Fig. 5
Cretaceous....Shell with a large proportion of calcareous matter
Cuspidate....Prickly pointed
Cyclodont....Hinge teeth arched, see Fig. 22, p. 16
Cylindrical....Transverse diameters somewhat equal as in *Oliva*
- Dead shell....More or less worn, lacking original finish; without the living animal
Decapoda....p. 148
Decollated....Apex broken off, p. 13
Decussated....Striae (or sculpture) which cross each other at acute angles; sometimes forming hollows as in *Nassarius trivittatus*, Pl. 46, Fig. 10
Deflected....Bent backward or to one side
Denticles....Hinge teeth, p. 16
Denticulate....Toothed
Dental formula....Reference to radula, p. 18
Dentated....Toothed
Denuded....Destitute of covering
Depressed....Spire only slightly elevated above body whorl
Dextral....Right-handed
Diaphanous....Transparent, clear, pellucid
Dibranchiata....p. 148
Discoidal....Revolving nearly in the same plane, resembling a disk
Disconnected....Tube separated as in *Spirula*, Pl. 28, Fig. 6

- Divisions of the sea....p. 4
 Dorsal....Situating at the back
 Dorsal margin....Upper edge of bivalve shell
 Drawings....p. 10
 Dredge....p. 6
- Ears....Small projecting processes of shell as in Pecten
 Ecology....The study of environment as related to organisms
 Edentate....Toothless
 Elongate....Spire much produced as in Terebra, Pl. 51, Fig. 16
 Embryology....The study of early developmental periods of animals
 Entire....Margin simple, not indented
 Epidermis....Outer skin or covering, p. 12
 Equilateral....p. 16
 Equivalve....p. 16
 Escutcheon....In bivalves an elongated depression anterior to the umbones. See lunule
- Fascicle....A cluster: numerous filaments placed together in a bundle
 Fasciculated....Ornamented with pointed markings near suture as in Oliva, Pl. 50, Fig. 9
 Fasset....In bivalves a cavity of hinge to receive a tooth of opposite valve
 Ferruginous....Oxide of iron color
 Fibrous....With layers of prismatic cells, p. 12
 Flexuose....Zigzag without acute angles
 Fluvial....Inhabiting rivers
 Foliaceous....Like foliage on a plant, p. 17
 Foot....Portion of animal used for locomotion and opposite to surface upon which animal moves
 Fossette....Receptacle for ligament, p. 17
 Fulcrum....Portion of bivalve shell to which cartilage proper is attached
 Fulvous....Orange color
 Fusiform....Bulging in middle and tapering at each end as in Tralia, Pl. 55, Fig. 6
- Gaping....Those bivalves which do not fully close
 Gastropoda....A class, pp. 1, 74
 Genus....Assemblage of species more or less related to each other
 Gibbous....Hump-backed
 Glabrous....Surface smooth, opposed to hairy
 Globular....Sphere-shaped as in Tonna, Pl. 41, Fig. 6
 Granulated....Covered with grain-like elevations
 Gregarious....Living in company with others of its kind
- Herbivorous....Feeding on plants
 Hians....Gaping
 Hinge....Point of union between two valves
 Hinge margin....Area on which the hinge is situated
 Hinge teeth....p. 16
 Hirsute....Rough with prominent hairs
 Hispid....Densely covered with a hairy epidermis
- Holotype....The original shell described by an author
 Hyaline....Transparent
- Imbricated....Placed over one another like shingles on a house roof
 Imbricated operculum....Nucleus at edge, development one sided, p. 14
 Immaculate....Without spots
 Imperforate....Without umbilicus, p. 13
 Incremental lines....Showing an increase
 Incurved....Bowed inward
 Inequilateral....In bivalves, anterior and posterior ends unequal in size and form so that umbones are not in center, p. 16
 Inequivalved....Valves not equal to each other as in Ostrea
 Inflected....Margin turned inward
 Internal....Enclosed within the skin or mantle of animal
 Involute....Rolled inward from each side as in Cypraea
 Iridescent....Reflecting the prismatic colors
 Irrorate....Marked with minute points
- Labiate....Thickened inside or out, near margin, as in Truncatella, Pl. 36, Fig. 13
 Labrum....Exterior side of the aperture in univalves
 Lamella....Thin plate or foliation
 Lamellated....Divided into thin plates as in Ostrea
 Lateral....Placed on one side
 Lateral teeth....In bivalves the hinge teeth on each side of the cardinal or central teeth, p. 16
 Lateral tooth....Of radula, p. 18
 Left valve....p. 16⁵
 Length....Measurement of shell from anterior to posterior end in bivalves described in these pages; sometimes designates the distance from cartilage or umbones to base; in univalves, the point of spire to base
 Lenticular....Depressed but keeled as in Modulus, Pl. 37, Fig. 21
 Lenticular operculum, p. 14
 Ligament....Cartilage substance which connects the valves and functions in opening them, p. 17
 Lineated....Marked with lines
 Lip....Edge of aperture in univalve shell
 Lirate....Grooved, see Pl. 64, Fig. 6; also as upon exterior of Pedipes mirabilis, Pl. 55, Fig. 8
 Litterate....Lettered with irregular lines like the Arabic
 Littoral region....p. 4
 Livid....Pale purplish brown
 Localities....p. 20
 Locotype....A shell from the locality where the holotype was obtained
 Longitudinal....Direction of the longest diameter
 Lunate....Crescent-shaped, or semi-lunar

- Lunule....Depressed or defined area in front of the umbones of bivalves. Absent in many species, p. 16
- Lurid....Dirty yellowish
- Lutose....Covered with dirt or mud
- Maculated....Spotted
- Mantle....Fleshy covering of the body which secretes the matter of which the shell is formed
- Mamillar....Rounded or dome-shaped nucleus; see *Voluta mamilla*, Fig. 10, p. 13
- Margin....Usually used to indicate circumference
- Marginal teeth....Of radula, p. 18
- Marmorate....Resembling marble
- Median tooth....Portion of radula, p. 18
- Mesogastropoda....p. 83
- Microscope....p. 10
- Miniatus....Red, like red-lead
- Mouth....Aperture of univalve shell; of the animal, portion where nourishment is taken
- Mucous pores....Organs which supply lubrication to surface of animal
- Mucronate....Terminating in a sharp rigid point
- Multispiral operculum....Many whorled, p. 15
- Multivalve....Composed of many valves or pieces as in *Chiton*, the coat-of-mail shell
- Muricated....Armed with sharp elevated rigid points as in many *Murex*
- Muscle....A fleshy organ by which animal is attached to the shell
- Muscular impressions....Cicatrices on inside of bivalve shells where the adductor muscles, which act as antagonists to the ligament, are fastened, p. 16
- Nacre....Iridescence, p. 12
- Naked....Without a shell
- Navicular....Boat-shaped
- Net....p. 7
- Nitidus....A little less brilliant than lucid
- Nomenclature....p. 11
- Nuclear whorls....Those which emerged from the egg
- Nucleus....First formed portion of the cone which emerged from egg, p. 13
- Nodule....Knob-like projection
- Nodose....With knobbed ribs, p. 32
- Oblique....Direction intermediate to longitude and transverse
- Olivaceous....Olive color
- Opaline....Bluish white, like the opal
- Operculum....A shelly or horny door, p. 14
- Opisthobranchia....p. 138
- Orbicular....Round and flat
- Order....Subdivision of a class
- Ovate....Shaped like an egg
- Oviparous....Propagating by means of eggs
- Ovoviviparous....Producing young alive
- Packing shells....p. 8
- Pallial line....In bivalves, a more or less impressed line inside and formed by attached mantle
- Pallial sinus....A notch in the pallial line, No. 15, p. 17, Fig. 19o
- Papillary....Apex semi-globular, like a nipple
- Papillous....Surface with dots or pimples
- Parasitical....Inhabiting another animal
- Paratype....Any one of several specimens on which a species is based in addition to, but subservient to, the holotype
- Parietal callus....Enamel on inside wall of aperture
- Parietal wall....Inside wall of shell within aperture
- Patelliform....Conical or limpet-shaped as in *Acmaea*
- Patulous....Openly expanded or dilated as in *Thais*, Pl. 45, Fig. 8
- Paucispiral operculum....Few whorled, p. 14
- Pelagic....Inhabiting the ocean or large body of water far from shore, often upon the surface
- Pelecypoda....A class, pp. 1, 25
- Pennaceous....Feathered, like webs of a quill
- Pennultimate whorl....Previous to the last whorl
- Perforated....Univalves, when umbilicus is small, p. 13
- Periphery....The keel or that portion of a whorl which extends outward the greatest distance, p. 13
- Periostracum....Epidermis, p. 12
- Peristome....Cord-like, thickened edge of the lip in univalves
- Pillar....The columella
- Plaits....Folds
- Plane....Level, without elevations or depressions
- Pleurocoela....p. 138
- Plicae....Folds
- Plicate....Ribbed or ridged transversely
- Plicate aperture....Rib-like internal teeth or folds present
- Porcellanous....A texture, p. 12
- Posterior end....Rear end of bivalve, p. 15
- Primary teeth or cardinals....Central teeth, beneath the umbones, in bivalves
- Proboscis....Fleshy part containing the mouth of animal
- Prosobranchia....p. 74
- Pteropoda....A pelagic order, p. 142
- Pubescent....Coated with a fine wool-like substance or down
- Pulmonata....Order of air breathers, p. 145
- Punctured....When spots, in the color pattern, are so small as to resemble points or dots
- Pustulate....Provided with wart-like projections upon surface
- Pyriform....Pear-shaped as in *Erato*
- Quadrangular....Having four angles
- Quadrate....Square
- Quadrilateral....Having four sides
- Radiate markings....see radiated
- Radiated....With small lines of color or sculpture extending from summit to base or outward from a center

- Radiating lines....In bivalves, lines extending from umbones outward; opposed to concentric lines
- Radula....Lingual ribbon, p. 18
- Recurved....Bowed downward
- Reference books....p. 8
- Reflexed....Bent backward
- Reniform....Kidney-shaped
- Reproduction....p. 17
- Resilium....An internal ligament in bivalves, p. 17
- Reticulate....Resembling a network
- Retuse....Ending in an obtuse summit
- Right valve....p. 15
- Rimate....Form of umbilicus, p. 13
- Rostrate....Pointed or beaked at end, usually the anterior end of bivalves
- Rufous....Red or pale red
- Rugose....Wrinkled or creased
- Scalariform....Whorls separated from one another as in Epitonium
- Scalloped....Indented on edge
- Scaphopoda....A class, pp. 1, 71
- Sculpture....pp. 12, 17
- Septate....Interior of aperture contracted by projecting shelly masses
- Septum....Diaphragm
- Serrate....Like teeth of a saw
- Sinistral....Left-handed, p. 11
- Sinuuous....Twisted
- Sinus....Excavation, as if scooped out; indentation
- Siphons....Tubes of bivalve animal used for imbibing clean water or discharging wastes
- Spinose....Armed with sharp spines; see muricate
- Spiral....Wound around an imaginary axis
- Spiral operculum....p. 14
- Spirally striated....Sculpture following direction of growth
- Spire....That portion of a univalve shell exclusive of the last whorl, p. 13
- Stenoglossa....p. 114
- Striated....With parallel impressions or raised lines; with thread-like lines
- Strigose....Covered with short bristles; lean, thin
- Sulcate....Heaviest at the base; furrowed with wide grooves or channels as in Trivia, Pl. 40, Fig. 7
- Subulate....Awl-shaped
- Suture....Line of separation between whorls, p. 14
- Symmetrical....Univalves with two equal sides and the nucleus central
- Taxonomy....The study of the laws of classification
- Teeth....In bivalves an arrangement of eminences and depressions on edges, used for locking the valves. In the center are the cardinal, at the sides the lateral teeth
In univalves found adjacent to and partially closing the aperture
- Translucent....Transmitting light
- Transverse aperture....At right angles with axis of shell
- Trapezoidal....Shell quadrilateral in outline and opposite sides, although more or less straight, not parallel
- Trinomialism....p. 11
- Trochiform....Of conical shape but flattened below as in *Astraea*, Pl. 31, Fig. 2
- Trochophore....Development of egg stage, p. 1
- Truncate....Cut off at tip
- Tubercles....Small projections
- Tumid....Swollen, applied to bivalves
- Turbinate....Top-shaped or conical and rounded below as in *Turbo*; Pl. 31, Fig. 11
- Turreted....Elongate, with upper whorls angulated or shouldered as in *Turritella*, Pl. 37, Fig. 15
- Umbilicus....A chink or pit at axis of the spiral revolution, varying greatly in different species; often absent or indistinct, p. 13
- Umbo....The beginning of a bivalve shell, which usually emerged from the egg, often elevated and nearly always pointing forward, p. 16
- Uncinal teeth....Portion of radula, p. 18
- Undulated....Waved
- Unguiculate operculum....p. 14
- Univalve....Single valve or part
- Varices....Prominent raised ribs on surface of univalve shells, corresponding to rest periods and periodic thickenings of the lip
- Varicose....See varices
- Varix....A single one of the varices, Fig. 11c, p. 14
- Veliger larva....Development of the egg stage, p. 1
- Ventricose....Swollen
- Viscid....Covered with resinous or greasy matter
- Viviparous....Producing living young
- Whorl....One complete revolution of the spiral shell

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