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SEASHELLS OF THE WORLD



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SEASHELLS OF THE WORLD

A GUIDE TO THE BETTER-KNOWN SPECIES

by
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Illustrated by
GEORGE AND MARITA SANDSTRÖM



Imperial Harp 3"
Indian Ocean
Harpa costata L.



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FOREWORD

Shells occupy a unique place in the natural world. No other animals are as widely collected, traded, or bought and sold because of their beauty, attractiveness and rarity. Each year an increasing number of people want to identify, classify and understand the beautiful shells they see or collect. This guide is necessarily a brief sampling of the many thousands of marine shells. Because it is a guide for collecting we have emphasized attractive and better-known species, occasionally slighting some common species and familiar genera. We hope that the pastime of shell collecting will lead to increasing interest in the fascinating animals which make the shells.

The author, editor and artists wish to express their appreciation to the Academy of Natural Sciences of Philadelphia for the use of its extensive research collections in the preparation of this book. We also owe a debt to the artists, George and Marita Sandström, for their excellent work on the illustrations.

R. T. A.
H. S. Z.



Carrier Shell (*Xenophora*) is the original shell collector. It gathers small empty shells and attaches them to itself. This is the common Japanese Carrier Shell.

Revised Edition 1985

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THE CLASSES OF MOLLUSKS

All seashells have soft bodies. The thin, fleshy mantle usually secretes a limy shell, either as a single cone or a pair of valves, or rarely in 8 parts. About half the mollusks are marine; the others land or fresh-water.



Marine



Fresh-water



Land

SNAILS, or gastropods, have a single shell, usually coiled. They have a distinct head with tentacles and a rasping tongue (the radula). Most of the 40,000 species have shells. (pp. 22-128)



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BIVALVES, or pelecypods, are mollusks with two valves joined by a hinge, a horny ligament, and one or two muscles. Most of the 10,000 species are marine; others are fresh-water.



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CEPHALOPODS include squid, octopus and the Nautilus. Very active animals with large eyes, powerful jaws and with 8-90 tentacles. About 600 species.

TUSK SHELLS (about 300 marine species) live in curved, toothlike shells open at both ends.



pp. 156-157



p. 7

CHITONS are primitive, marine mollusks with 8-plated shells imbedded in tough tissue. There are about 600 shallow-water species.

MONOPLACOPHORA, until recently known only from fossils. A rare deep-sea, primitive group. The soft parts are segmented. 1"





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Frog Shells
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Order
TECTIBRANCHIA



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MESOGASTROPODA



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True
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Order
ARCHAEGASTROPODA

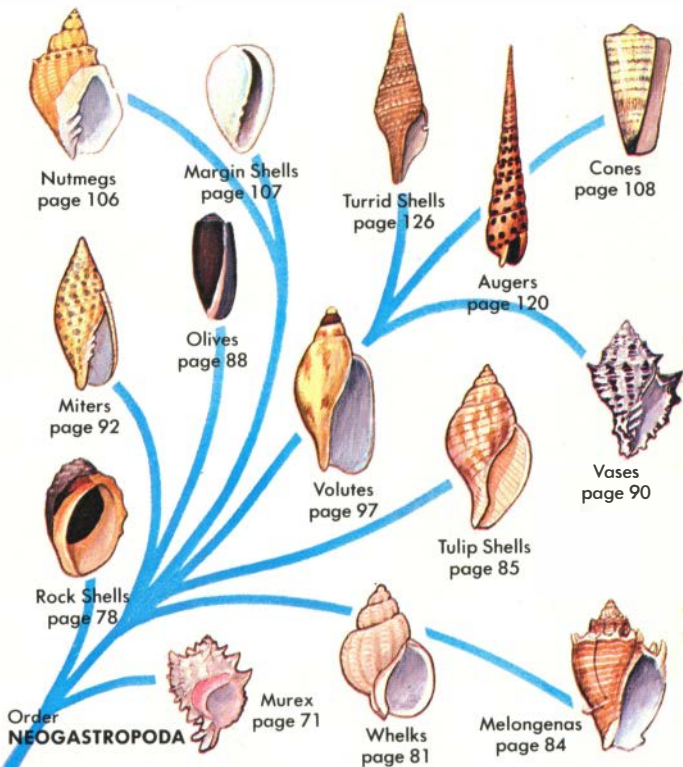
Keyhole Limpets
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Abalones
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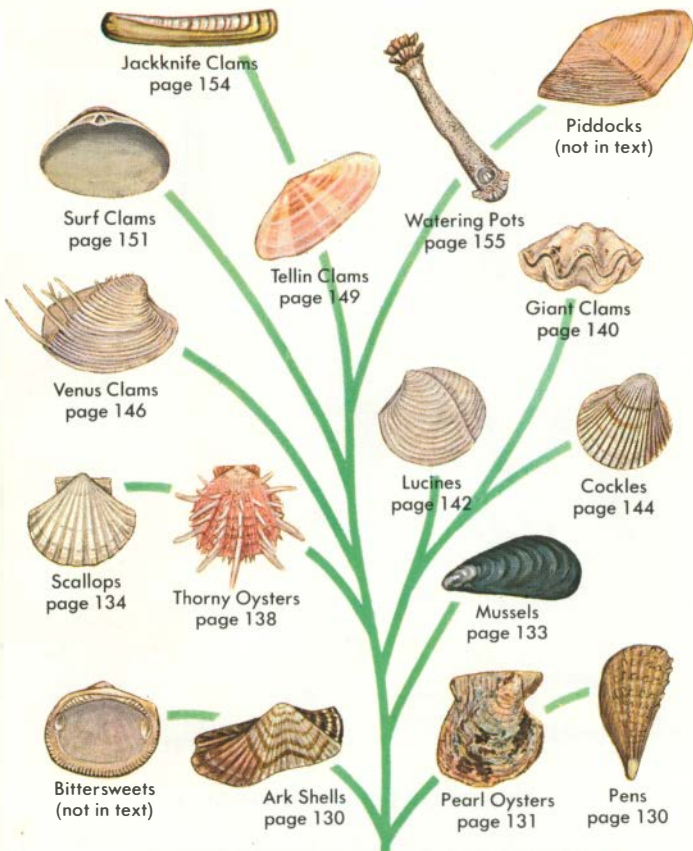


Slit Shells
page 23



MAJOR GROUPS OF MARINE SNAILS

From the primitive slit shells and their limpet allies to the highly evolved bubble shells and cones, the marine snails show great diversity in shape and sculpture. Of the thousand or more families of gastropods, 34 are pictured in this family key (with page numbers). They include the vast majority of the better-known sea snails that are apt to be found in amateur collections.



MAJOR GROUPS OF MARINE BIVALVES

BIVALVES are less numerous than marine gastropods but are of greater economic value. Clams, oysters, mussels and scallops are eaten. One group produces nearly all natural and cultured pearls. The families shown on the tree are most commonly seen in collections.

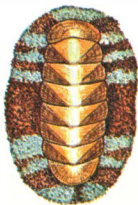
OTHER GROUPS OF SEASHELLS

CEPHALOPODS include the octopus, which has no shell, and the squids, with a thin internal shell. The Nautilus of the Indo-Pacific has a smooth, chambered shell. The Argonaut's paper-thin shell is an eggcase. Pages 156-157.



Chambered Nautilus 6"
Nautilus pompilius Linné
Southwest Pacific

CHITONS are a group of flattened mollusks, some worm-like, most covered with eight shingle-like, overlapping plates held in place by a muscular ring called the girdle. They live on rocks near shore and feed on algae.



Hairy Mopalia 2"
Mopalia ciliata Sowerby
Alaska to California

West Indian Chiton 2-3"
Chiton tuberculata Linné
West Indies



TUSK SHELLS, or scaphopods, are tooth-shaped shells found in shallow and deep water. These odd mollusks are without gills (the mantle assumes this function), head, eyes or true tentacles. Some species were once highly valued by American Indians.

Money Tusk 1-2"
Dentalium pretiosum
Sowerby
Alaska to California



Elephant's Tusk 3"
*Dentalium
elephantinum* Linné
Philippines



YOUR SHELL COLLECTION

A well-arranged, orderly collection of shells has many surprising rewards: a sense of scientific accomplishment, pride in building an educational and beautiful assortment, a stimulus to investigate an intriguing group of animals. Record locality data and best possible identification; follow a natural biological sequence, and your collection will serve as a useful guide and a constant source of satisfaction. Begin early to use a simple cabinet, multiple-sized paper trays, plastic boxes or match boxes, good labels, and a catalog with numbers corresponding to those written in India ink on the labels and specimens. Small shells, with numbered slips, may be put into glass vials, and the vials plugged with cotton.

A wooden cabinet (4 ft. high, 3 ft. deep and 2½ ft. wide) with wooden drawers on simple runners protects your shells from dust and careless hands.



JEANNE SCHWENDEL COLLECTION
NO. 22023
Volutoconus bednalli Brazier
Dredged in 30 ft. sand bottom,
40 miles N.E. of Darwin,
A.R. Cahn, coll. 1962 AUSTRALIA

Boxes made of cardboard of uniform height and of multiple sizes permit an orderly arrangement and best use of space.

Labels should bear the genus and species name. Most important are the locality data and other pertinent information.

COLLECTING MARINE SHELLS

BEACHCOMBING

Few mollusks live on the beach, but after storms fresh specimens may be cast upon the shore. Some appear only at certain seasons. Avoid damaged and water-worn shells.

NIGHT COLLECTING

Mollusks avoid bright sunlight. At low tide turn over rocks; dig in sand. Shore collecting at night in quiet bays is very profitable. Two people working together are most effective.

DIVING

Going down where many shells live brings rich rewards in perfect specimens. Watch for trails in the sand. Put shells in a fine mesh bag. Follow safety rules.

DREDGING

A simple wire-mesh dredge, 24" wide, 36" long and 8" high, can be pulled by rope at depths down to 100 feet. Wash sand away and pick out shells.

EXCHANGING

Trade with collectors in foreign lands. Send perfect specimens with locality data. Wrap securely. A good way to increase your collection and to make friends. Be as generous as possible.

BUYING SHELLS

Many reliable dealers sell specimen shells. Compare prices from several mail listings and then use good judgment. Insist on locality data. Avoid acid-treated shells.

PREPARING SHELLS FOR STUDY

When collecting, observe the live animals and note their habits. So little is known about many species that every accurate observation is of value. Note color and other details, relative abundance, type of bottom, food, egg-laying or mating habits, methods of concealment, water temperature, associated plants and animals. Record your facts in a field notebook. When cataloging, enter the notebook page on the collection label.

The soft parts and shells of mollusks may be permanently preserved in 70% alcohol. If not to be used for anatomical study, clams and snails may be boiled in water for five minutes and the "meat" removed with a bent pin or ice pick. Save the operculum, or trapdoor, to each snail. It is unwise to use acid on shells. Clean exterior with fine wire brush or buffing wheel.

CONSERVATION

Be considerate of nature and other collectors when looking for live shells. Disturb the habitat as little as possible, and turn back rocks as you found them. Otherwise, the eggs, young and food of snails will be killed by direct sunlight. Pollution and upsetting the ecology of the ocean shores are the main reasons for the reduction of live shells, but collectors can help by taking only a few of each kind. Leave young or poor specimens, since they will grow to lay more eggs and produce additional generations. In some states shellfishery laws prohibit the collecting of various kinds at special seasons or under certain sizes. Find out about the pertinent laws and regulations in your area, and follow them.

MORE INFORMATION

Basic information about malacology, or conchology, the study of mollusks, is found in thousands of technical articles. Of greater use to collectors are the books listed below, some of which list the addresses of local shell clubs and national shell organizations. Visit the famous shell collections in natural history museums of large cities. Curators of these collections can give professional advice.

GENERAL BOOKS

- Abbott, R. Tucker. *KINGDOM OF THE SEASHELL*. New York: Bonanza Books, 1982. Introduction to biology, collecting, uses, and evolution of seashells.
- Johnstone, Kathleen Y. *SEA TREASURE—A GUIDE TO SHELL COLLECTING*. Boston: Houghton Mifflin Co., 1956. For beginners.
- Wagner, R. J. L., and R. Tucker Abbott. *STANDARD CATALOG OF SHELLS*. Melbourne, Fla.: American Malacologists, Inc., 1978. Lists thousands of species with current values. Has blank personal catalog, world size records. For intermediate collectors.
- Yonge, C. M., and T. E. Thompson. *LIVING MARINE MOLLUSKS*. London: William Collins Sons, 1976. Readable biology textbook.

NORTH AMERICA

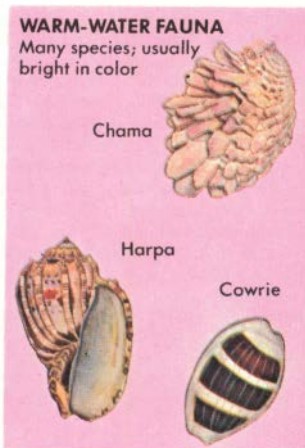
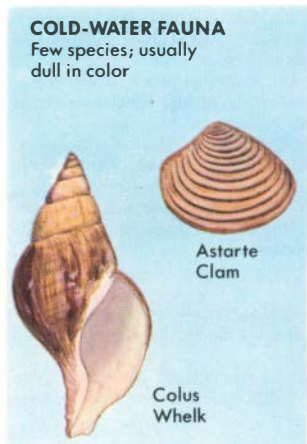
- Abbott, R. Tucker. *AMERICAN SEASHELLS*. 2nd ed. New York: Van Nostrand/Reinhold, 1974. Describes and illustrates 1,500 of the 7,500 species listed from both coasts. For advanced collectors.
- Abbott, R. Tucker. *SEASHELLS OF NORTH AMERICA*. New York: Golden Press, 1969. A colorful guide to field identification of 900 species. Includes biology. For intermediate collectors.
- Abbott, R. Tucker. *COLLECTIBLE SHELLS OF SOUTHEASTERN U.S. AND BAHAMAS*. Melbourne, Fla.: American Malacologists, Inc., 1984. Waterproof, tear-resistant guide to 300 species. For beginning collectors.
- Keen, Myra. *SEA SHELLS OF TROPICAL WEST AMERICA*. 2nd ed. Stanford, Calif.: Stanford Univ. Press, 1971. About 3,300 species illustrated. Large bibliography. For advanced collectors.

FOREIGN

- Abbott, R. Tucker, and S. Peter Dance. *COMPENDIUM OF SEASHELLS*. New York: E. P. Dutton, 1983. 4,200 species illustrated. For advanced collectors.
- Linder, Gert. *FIELD GUIDE TO SEASHELLS OF THE WORLD*. New York: Van Nostrand/Reinhold, 1978. About 1,000 species. For intermediate collectors.

THE WORLD OF MARINE SHELLS

Although the seas, which cover 72 percent of the earth's surface, are interconnected, parts of the oceans are isolated by land masses. Ocean currents, water temperatures and differences in salinity also act as barriers and create smaller sub-areas within faunistic provinces. Present faunistic boundaries were largely determined during the Pliocene, 10 million years ago. These are not clearly defined; some species invade the waters of neighboring provinces. Temperature is an important isolating factor. Within a province there may be special habitats suitable only to certain species—coral reefs, muddy or sandy bottoms, mangrove swamps or rocky shores. Some groups flourish in certain provinces, as the limpets in South Africa and the cowries in the Indo-Pacific. Some mollusks are associated only with certain other animals, such as the wentletraps with sea anemones, and rapa snails with soft corals.



DISTRIBUTION OF MOLLUSKS WITH DEPTH

THE PELAGIC WORLD

Adults of about 100 species of mollusks live near the surface of the ocean. Some float, some are attached to sargassum weed, others hover in mid-water.



THE LITTORAL WORLD

A million miles of the world's intertidal shoreline support a rich fauna of periwinkles, limpets, burrowing clams, mussels and other species living between high- and low-tide level.



THE SHALLOW-WATER WORLD

Most of the marine mollusks live on the continental shelves and in coral reefs from the low-tide line to depths of about 400 feet. The relatively quiet waters and growth of algae permit a rich fauna to exist.



THE ABYSSAL WORLD

Small, mainly colorless shells live in the lightless depths of the ocean where temperatures are near freezing. Abyssal species are somewhat similar in all parts of the world. Squids have phosphorescent lights of blue, red and white.



Deep-sea mollusks living near the equator are found in much shallower waters in the polar seas where the water is cold. Some food comes from pelagic plants and animals which die and sink to the bottom. Both clams and snails have been found 3 miles down.



CALIFORNIAN PROVINCE

Stretching from Washington to parts of Baja California is a cool-water fauna of about 2,100 species. To the north is the cold-water Aleutian Province, some of whose species find their way as far south as northern California. In southern California, elements of the Panamic Province, a much warmer area, begin to appear. The Californian Province is rich in abalones, murex rock shells, limpets and chitons. Among some of the characteristic species are the Kelp-weed Scallop and the Purple Dwarf Olive.



Frilled Dogwinkle
Nucella lamellosa
Gmelin



Chitons
Over 50 species



Haliotis Abalones
Several large species



Purple Dwarf Olive
Olivella biplicata Sowerby



Kelp-weed Scallop
Leptopecten latiauratus
Conrad



Cooper's Nutmeg
Cancellaria cooperi Conrad

CAROLINIAN PROVINCE

From the shores of the Carolinas, to the northern half of Florida and westward into Texas, the temperate-water Carolinian Province is characterized by Quahog Clams (*Mercenaria*) and by such species as the Shark-eye Moon Snail and the Marsh Periwinkle. The southern tip of Florida belongs to the tropical Caribbean Province. To the north, from Maine to Labrador, is the colder Boreal Province with a different and less rich shell fauna. The New England Neptune lives to the north.

Shark-eye Moon Snail
Polinices duplicatus Say



Marsh Periwinkle
Littorina irrorata Say



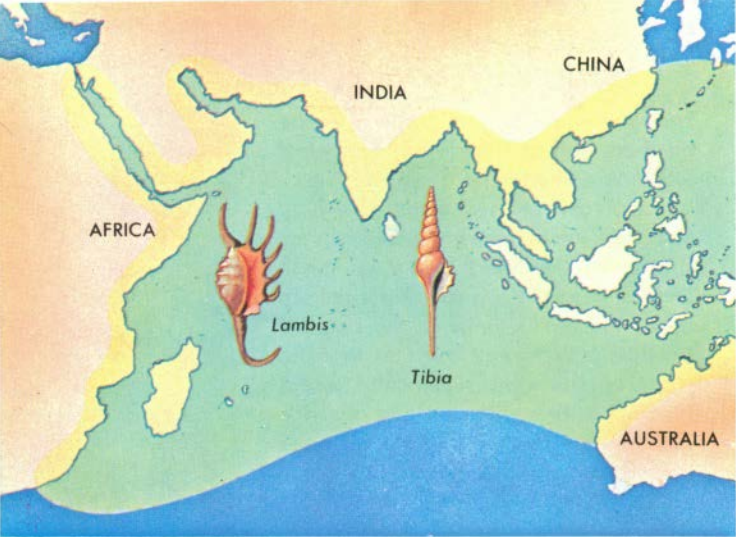
Quahog Clam
Mercenaria mercenaria L.



New England Neptune
Neptunea decemcostata Say
New England and north



Oyster Drill
Eupleura caudata Say



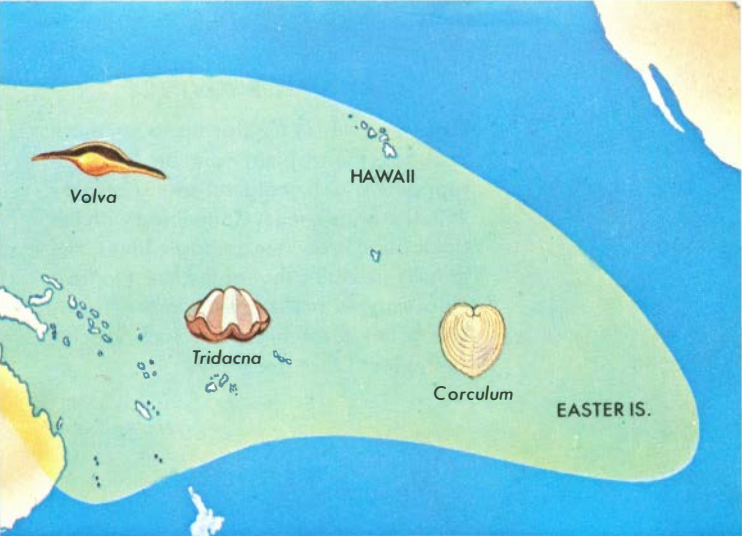
INDO-PACIFIC PROVINCE

The largest and richest shell region in the world extends from the shores of East Africa eastward through the East Indies to Polynesia. Notable for its abundance of colorful shells, it supports many strange and unique mollusks, such as the Giant Clams (*Tridacna*), the Scorpion Conchs (*Lambis*), and the Heart Cockles (*Corculum*). Most of the Indo-Pacific is characterized by tropical waters and coral reefs. The province is further divided into more or less isolated sub-regions.



Lineated Conch
Strombus fasciatus Born

THE RED SEA is an isolated, warm-water pocket of the Indian Ocean noted for its many peculiar subspecies and such unique species as the Lineated Conch (*Strombus fasciatus* Born), and Red-spotted Cowrie (*Cypraea erythraeensis* Sowerby).



AUSTRALIA is, along its tropical northern half, a land of rare and colorful volutes and strange Spiny Vase Shells (*Tudicula*). The seas are shallow with strong tides. The seas of southern Australia are much colder and have many different shells, such as the giant phasianellas.

THE HAWAIIAN CHAIN of volcanic islands in the central Pacific lacks many common Indo-Pacific species. It has some unique cowries and cone shells. The Tiger Cowrie, common elsewhere, is rare here and very large.

THE PHILIPPINES, consisting of thousands of islands, are very rich in mollusks. Several unique kinds are found in these waters, including the Imperial Volute and the Zambo Murex. Some normally uncommon species are abundant on the reefs of Philippine islands.



Bednall's Volute
Volutoconus bednalli
Brazier



Tessellate Cowrie
Cypraea tessellata
Swainson



Imperial Volute
Aulica imperialis
Lightfoot

PANAMIC PROVINCE

From the Gulf of California to northern Ecuador, the tropical Panamic Province supports a rich, colorful fauna of over 2,000 marine shells. Connected with the Caribbean in former geologic times, the fauna resembles that of the West Indies. Tidal ranges are extreme in this area. The genus *Strombina* and such species as the Tent Olive are native.



Tent Olive
Oliva porphyria
Linné



Radix Murex
Murex radix Gmelin



Grinning Tun
Malea ringens Swainson



Strombina Whelks
Several species

SOUTH
AMERICA

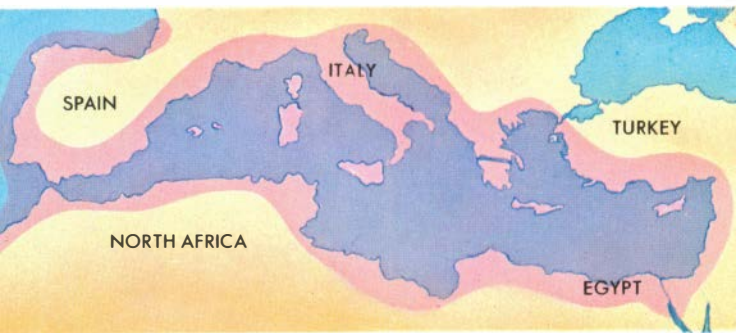
CARIBBEAN PROVINCE

Centered in the West Indies, this tropical province extends north to southern Florida and Bermuda. Many Caribbean elements spread out to the south as far as Brazil. Among the characteristic species are the Pink Conch, the Wide-mouthed Purpura and the Sunrise Tellin. The fauna is rich in *Cassis*, *Murex* and *Tellina*. The larger West Indian islands have over 1,200 species of shelled marine mollusks. Isolated coral islands, poor in food, have only about 350 kinds of mollusks.



MEDITERRANEAN PROVINCE

The most isolated of the world's major seas, the Mediterranean is relatively shallow and less dense than the Atlantic. Its fauna of 1,400 species of mollusks spreads around Portugal to southern France and along the northwest coast of Africa. Also known as the Lusitanian Province, it contains such unique shells as the Pelican's Foot, Jacob's Scallop, and the Murex Dye Shells.



Lurid Cowrie
Cypraea lurida
Linné



Spiny Helmet
Galeodea echinophora L.



Jacob's Scallop
Pecten jacobaeus
Linné

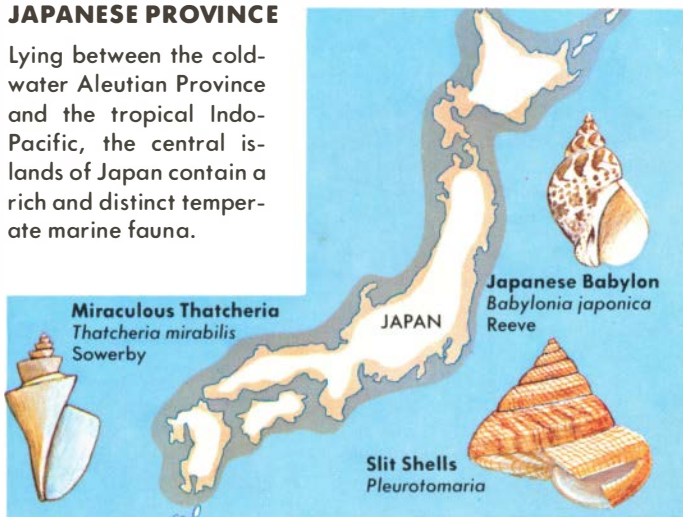
Purple Dye Murex
Murex brandaris
Linné



Pelican's Foot
Aporrhais pespelicani
Linné

JAPANESE PROVINCE

Lying between the cold-water Aleutian Province and the tropical Indo-Pacific, the central islands of Japan contain a rich and distinct temperate marine fauna.

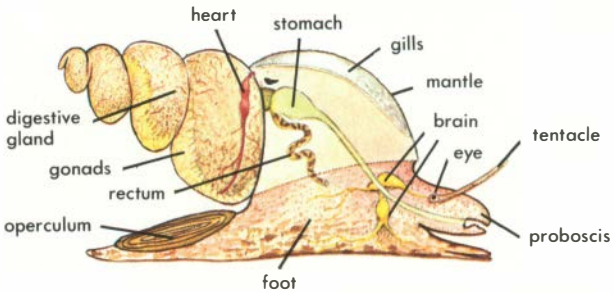


SOUTH AFRICAN PROVINCE

Cool, rough seas pound the rocky shoreline of South Africa. Its isolated fauna of about 900 species is rich in giant limpets, turban shells, and *Thais* rocky shells, plus strange, cool-water cowries and cone shells.



GASTROPODS



cross section of proboscis



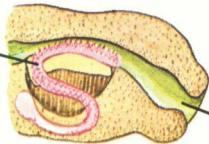
free-swimming veliger

egg capsule



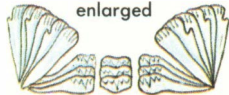
eggs

radular ribbon



mouth

radular teeth enlarged



GASTROPODS, or univalves, single-shelled mollusks, include snails, conchs, periwinkles and whelks. About half of the 40,000 species are marine; the remainder are terrestrial and fresh-water. The fleshy, cape-like mantle produces a hard shell, while the foot may produce a horny operculum. Feeding is aided by a special set of teeth known as the radula. The sexes are separate in many marine species. Eggs are laid into the water or in capsules. A free-swimming larva, or "veliger," emerges which grows into a shelled adult. Most gastropods live 5 to 6 years; some may survive 20 or 30. Univalves may be carnivorous, herbivorous or even parasitic.

SLIT SHELLS (Pleurotomariidae) are primitive snails characterized by two gill plumes. The slit in the shell is a natural opening for the passage of water and waste materials. The family, found in very early fossil deposits, was once considered to be extinct. Today 18 living deep-water species are known.

The operculum of the slit shells is thin, corneous, and brown and has many whorls.



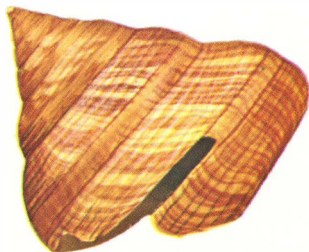
This relatively small operculum is attached to the foot.



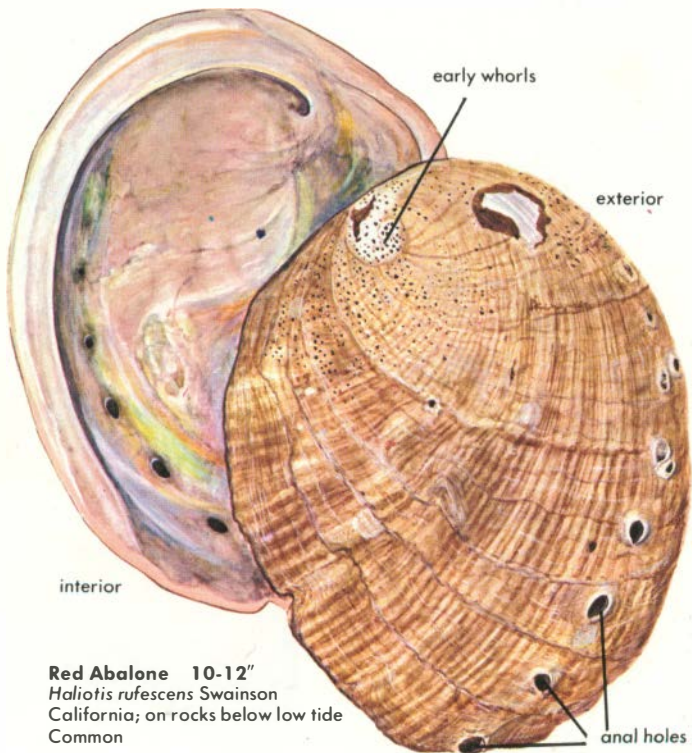
Emperor's Slit Shell 3-5"
Pleurotomaria hirasei Pilsbry
Honshu Is., Japan
This is the commonest slit shell known. It lives at a depth of 300 feet.

Adanson's Slit Shell 5-6"
P. adansonianus Crosse & Fischer
W. Indies; deep water; rare

Beyrich's Slit Shell 4"
P. beyrichi Hilgendorff
E. Asia; deep water; rare



ABALONE shells (Haliotidae) resemble a valve of a large clam, except for the spiral whorl. The animal has a large, flat and muscular foot by which it holds fast to rocks. Sea water is drawn in under the edges of the shell; it passes over the gills, and leaves through the natural holes. The foot is edible and highly esteemed. The iridescent shell is used in costume jewelry. Over a hundred species are known. They are vegetarians.



Red Abalone 10-12"
Haliotis rufescens Swainson
California; on rocks below low tide
Common



Black Abalone 5"
Haliotis cracherodi Leach
California to Mexico
Abundant



Pink Abalone 5-7"
Haliotis corrugata Gray
California; common



Beautiful Abalone 1-1½"
H. pulcherrima Gmelin
Central Pacific; uncommon



Donkey's Ear Abalone 3-4"
Haliotis asinina Linné
S.W. Pacific; abundant

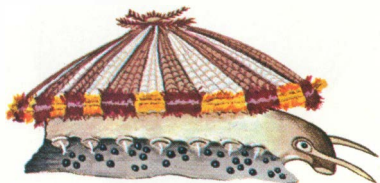


Midas Abalone 4"
Haliotis midae Linné
South Africa; uncommon

KEYHOLE LIMPETS (Fissurellidae) are named for a small hole at the top of the cap-shaped shell, which serves for excretion. Several hundred species are all vegetarians living in shallow, warm water. The single eggs are coated with a gelatinous sheath. The largest comes from California.



Giant Keyhole Limpet 4-5"
Megathura crenulata Sowerby
California (intertidal); common



Maximum Keyhole Limpet 3"
Fissurella maxima Sowerby
Chile (intertidal); common



Barbados Keyhole Limpet 1"
Fissurella barbadensis Gmelin
Florida and W. Indies
Abundant on shore rocks

Roman Shield Limpet (*Scutus*) from Australia has no hole but is related to the keyhole limpets. The shell is 2 inches long. Common on intertidal rocks.

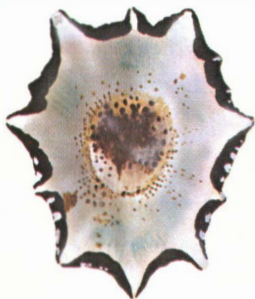


side view of living animal

shell



TRUE LIMPETS (Acmaeidae) live on the rocky shores of all temperate seas. They have a remarkably strong foot. A few species attach to seaweeds. All 400 species are vegetarian.



Sweet Limpet 1"
A. saccharina Linné
Indo-Pacific; common



Atlantic Plate Limpet 1"
Acmaea testudinalis Müller
New England rocks; common



Unstable Limpet 1"
A. instabilis Gould
California; on seaweed



Spiked Limpet 3"
Patella longicosta Lamarck
South Africa

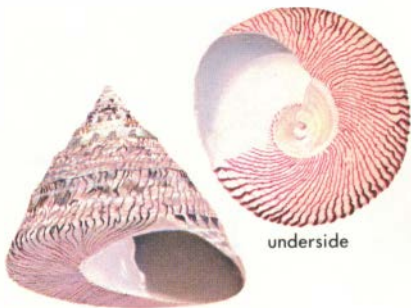
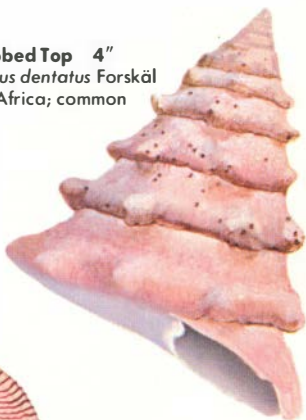


TOP SHELLS (Trochidae) are conical. They have a pearly interior and a thin, horny operculum with many whorls. Over a thousand species are found mainly in temperate and tropical waters. Largest and most useful is the Commercial Trochus, from which shirt buttons are made. Some larger species are eaten. A *Trochus* takes six years to reach adult size—5 inches. Most top shells are vegetarians.



Giant Button Top 1"
Umbonium giganteum Lesson
 Japan; muddy bays; abundant

Knobbed Top 4"
Trochus dentatus Forskäl
 East Africa; common



underside

Lined Top 2"
Trochus lineatus Lamarck
 Australia; common in shallow water

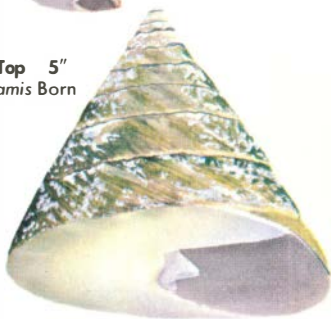


Strawberry Top 1"
Clanculus puniceus Philippi
 Indian Ocean; common

INDO-PACIFIC TOP SHELLS vary greatly in form and color. The button tops (*Umbonium*), mud-dwellers from Japan and Southeast Asia, are unusually flattened.

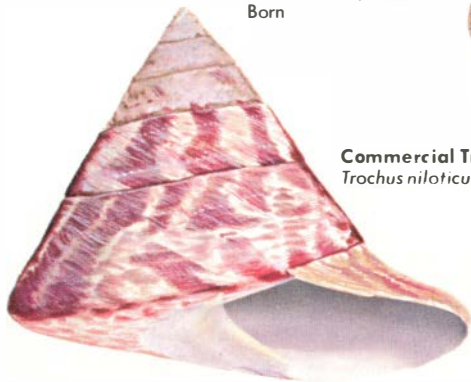
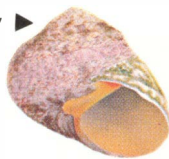


Pyramid Top 5"
Tectus pyramis Born



Maculated Top 2"
Trochus maculatus Linné
A very common species
found under rocks near shore.

Born's Orange Top 3/4" ▶
Chlorostoma paradoxum
Born

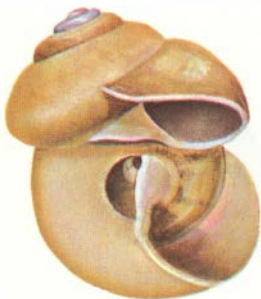


Commercial Trochus 5"
Trochus niloticus Linné



operculum

AMERICAN TOP SHELLS total several dozen species, rarest being the iridescent Gaza. The West Indian Top is used in chowder. Queen Tegula is a collector's item in California. Norris' Top Shell is relatively common in shallow water. Its operculum bears tiny bristles.



Superb Gaza 2"
Gaza superba Dall
 Gulf of Mexico; deep water



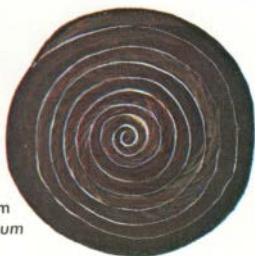
Queen Tegula 2"
Tegula regina Stearns
 S. California; deep water



Norris' Top Shell 2"
Norrisia norrisi Sowerby
 California; near shore



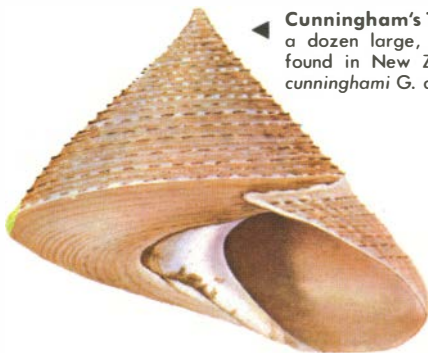
West Indian Top 3"
Cittarium pica Linné
 W. Indies; seashore



operculum
 of *Cittarium*

CALLIOSTOMA TOP SHELLS are the queens of the family. All are lightweight shells with delicate beading and bright colors. Most are cold-water inhabitants found among deep-water beds of algae. Many are considered collector's items. Eggs are in gelatinous ribbons.

◀ **Cunningham's Top.** This is one of a dozen large, stunning species found in New Zealand. *Maurea cunninghami* G. and P., 3"



Monile Top 1"
Calliostoma monile Reeve
N.W. Australia; common near shore on sponge



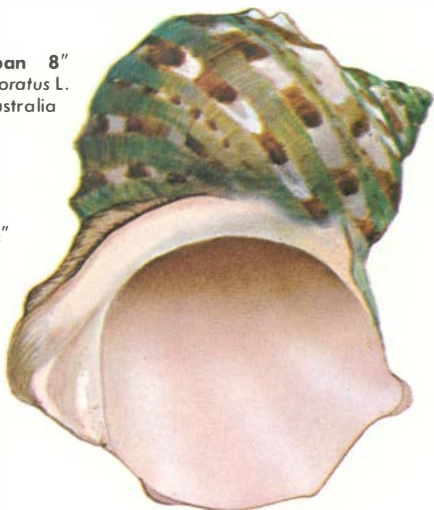
Haliarchus Top 2"
Calliostoma haliarchus Melvill
Japan; deep water



Chocolate-Lined Top 1"
Calliostoma javanicum Lamarck
S. Fla. and Caribbean

TURBAN SHELLS (Turbinidae), about 500 species, possess a hard, limy operculum. The largest member of the family is the Green Turban. Its white operculum may weigh up to one pound. Buttons are made from the shells.

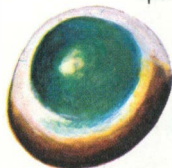
Green Turban 8"
Turbo marmoratus L.
E. Indies-Australia



Chestnut Turban 1 1/2"
Turbo castanea Gmelin
Florida-W. Indies



operculum



outer side



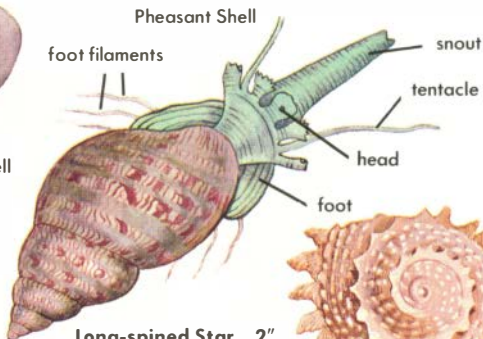
inner side

Tapestry Turban is a herbivorous species of South Pacific coral reefs. The shell has a variable and colorful pattern. Its operculum is the famous blue-green "cat's eye." *Turbo petholatus* Linné, 3"

PHEASANT AND STAR SHELLS are turbans. There are about 40 species. The Pheasant Shells have several "foot feelers." Below is the largest, the Pheasant Shell, *Phasianella australis* Gmelin (3 in.) from southern Australia.



operculum of Pheasant Shell is white and shelly



Long-spined Star 2"
Astraea phoebia Röding
Florida-Caribbean ▶



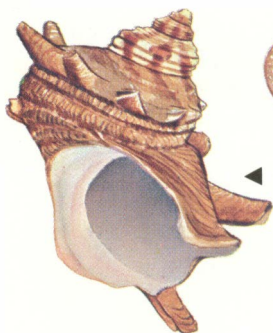
Rotary Star 2"
Astraea rotularia
Lamarck
Australia

Triumphant Star 3-4"
Guildfordia triumphans Phil.
East Asia; especially common in Japan in deep water



COMMON INDO-PACIFIC TURBANS

Of the several dozen turbans from the tropical Western Pacific, these are the commonest. Note the characteristic shape of the operculum in each species.



outer side



operculum



inner side



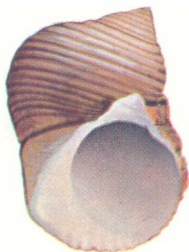
Horned Turban 3"
Turbo cornutus Lightfoot
Southern Japan; common near shore

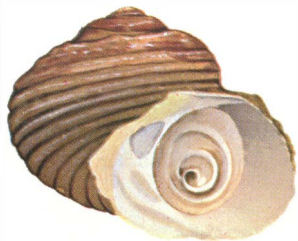
Gold-mouthed Turban 3"
Turbo chryostomus Linné
Common on coral reefs

Dwarf Turban 1½"
T. bruneus Röding

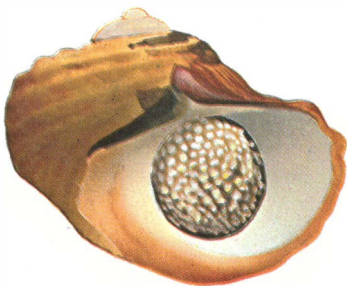
Silver-mouthed Turban 3"
Turbo argyrostomus Linné

Setose Turban 3"
T. setosus Gmelin





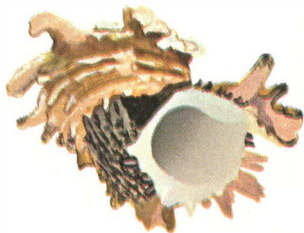
Sydney Turban 3½" *Turbo torquatus* Gmelin. South Australia; common in shallow water; note the peculiar, white operculum.



South African Turban 3" *Turbo sarmaticus* Linné. South Africa. This shell is pearly white and red when polished.

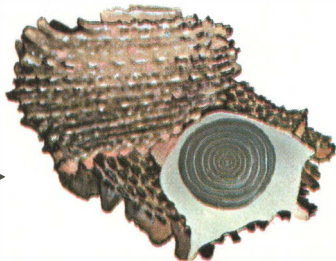


Channelled Turban from the West Indies is rarest in the Americas. *Turbo canaliculatus* Herm., 3"



Two forms of the Delphinula Snail

Delphinula Snail from the Indo-Pacific reefs is very variable and has a brown, horny operculum. *Angaria delphinus* Linné, 2"



NERITE SNAILS (Neritidae) are of a family with varied habitats: shallow water, rocky shores, springs, rivers, swamps and even in trees. The Emerald Nerite lives on eelgrass near coral reefs. The shelly operculum bears a small projecting arm for muscular attachment. Nerites are vegetarians living in large colonies. Several hundred species are known.



Polita Nerite 1"
Nerita polita Linné
Indo-Pacific; common

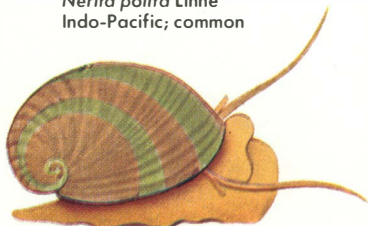


inner side

operculum



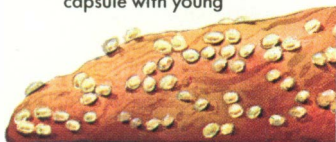
outer side



Living Nerite



capsule with young



egg capsules on rocks



Bleeding Tooth 2"
Nerita peloronta L.
S. Florida-Caribbean

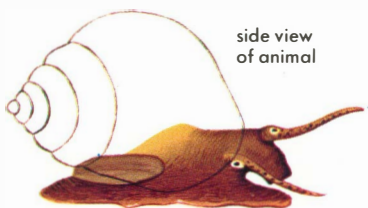


Ornate Nerite 2"
Nerita ornata Sby.
Panama (Pacific)



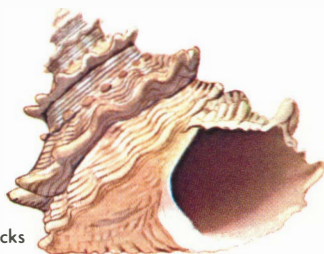
Emerald Nerite 1/3"
Smaragdia viridis L.
Florida-Caribbean

PERIWINKLES (Littorinidae) are found on rocky shores of most parts of the world. Their small size and drab colors protect them from predators. The microscopic eggs laid in the water resemble miniature "flying saucers." Eggs of some species hatch inside oviduct.

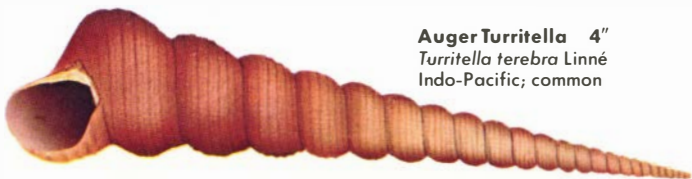


side view
of animal

Common European Periwinkle. Once limited to Europe and Canada, this rock-dweller has spread south to Delaware in the last 200 years. Shells have been found in prehistoric Indian sites. *Littorina littorea* Linné, 1"



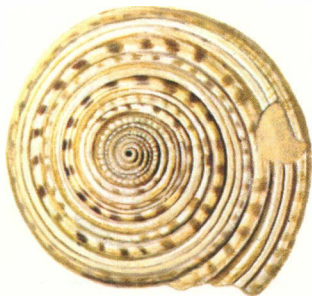
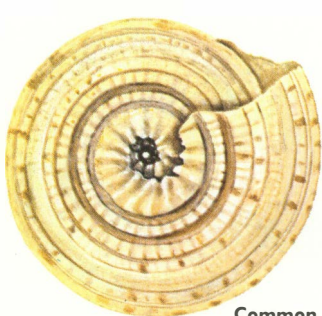
Pagoda Periwinkle 2"
Tectarius pagodus Linné
Indo-Pacific; common on rocks
well above high-tide line



Auger Turritella 4"
Turritella terebra Linné
Indo-Pacific; common

TURRITELLA SNAILS (Turritellidae), about 50 species, are tropical relatives of the periwinkles. The shells, found in shallow, muddy bottoms, are long and pointed. The corneous operculum has few whorls.

SUNDIALS (Architectonicidae) resemble a winding staircase. All 40 species are tropical. A few deep-sea species are collector's items. Operculum like horny pill.



Common Atlantic Sundial 2"
Architectonica nobilis Röding
 Carolinas to West Indies; common in sand



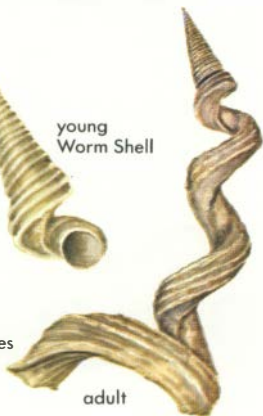
Variegated Sundial 3/4"
Helicac variegatus Gmelin
 Indo-Pacific



Florida Worm Shell 4"
Vermicularia knorri Deshayes
 Carolinas to Mexico



young
 Worm Shell



adult

WORMSHELLS (Turritellidae) resemble marine worms, but are true snails. The early whorls resemble turritella shells, but later ones detach and grow haphazardly.

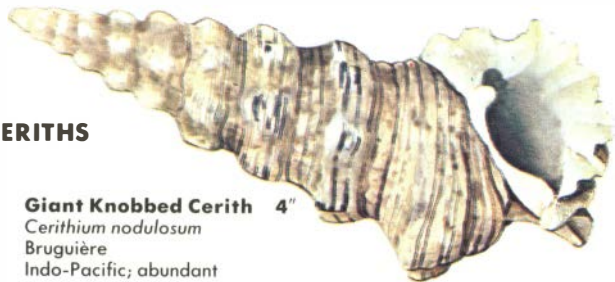
CERITHS

Giant Knobbed Cerith 4"

Cerithium nodulosum

Bruguère

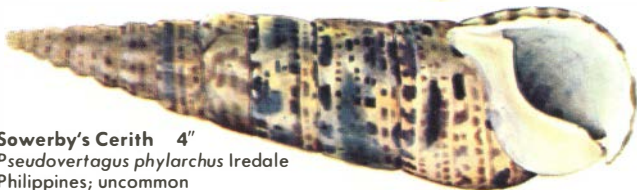
Indo-Pacific; abundant



Sowerby's Cerith 4"

Pseudovertagus phylarchus Iredale

Philippines; uncommon



Common Vertagus 2"

Rhinochlamys vertagus Linné

Indo-Pacific; abundant



Sulcate Cerith 2"

Terebralia sulcata Born

Indo-Pacific; swamps



Radula Cerith 2"

Tympanotonus radula L.

W. African swamps



CERITHS (Cerithiidae), about 300 species, are abundant in the intertidal zone of tropic shores. Some live in mangrove swamps, others at sea. The eggs are in jelly masses.

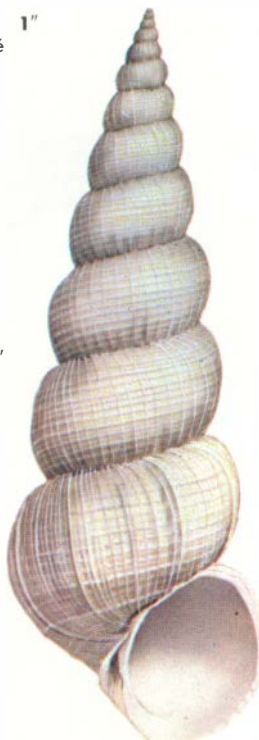
WENTLETRAPS (Epitoniidae), a curious family mainly alabaster-white, are capable of excreting a purple dye. Most are found with sea anemones and *Fungia* corals. Rice-paste counterfeits of the Precious Wentletrap were once sold. About 200 known species, some rare.



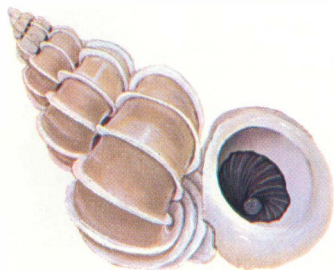
◀ **Common Wentletrap** 1"
Epitonium clathrus Linné
Europe; common



▲ **Noble Wentletrap** 2"
Sthenorytis pernobilis
Fischer & Bernardi
Florida-Caribbean; rare



Magnificent Wentletrap 4"
Amæa magnifica Sowerby
Japan; rare



Precious Wentletrap 2"
Epitonium scalare Linné
Eastern Asia; uncommon

CUP AND SLIPPER SHELLS (Crepidulidae) possess a peculiar plate located inside the main shell. These limpetlike snails live in shallow water. The males are much smaller, but may change their sex and grow to a larger size. The slipper shells may grow on top of each other or on rocks.



Common Atlantic Slipper Shell 2"
Crepidula fornicata Linné
Canada to Texas; Europe; very common
This, like other slipper shells, has no operculum.

Imbricate Cup-and-Saucer 2"
Crucibulum scutellatum Wood
West Mexico

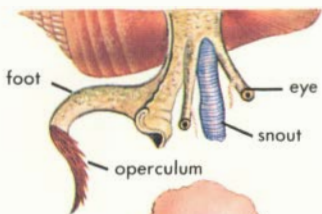


Rayed Peruvian Hat 2"
Trochita trochiformis Born
Peru and Chile



THE TRUE CONCHS

Eighty world species of Strombidae live in warm waters. Note the "notch" on the lower outer lip. The foot is narrow and muscular with a sharp, sickle-shaped operculum.

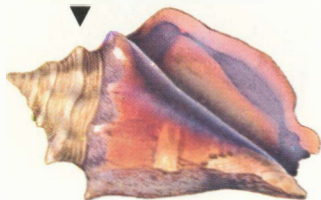


Colorful eyes on special stalks are characteristic for each species. Above are four examples.

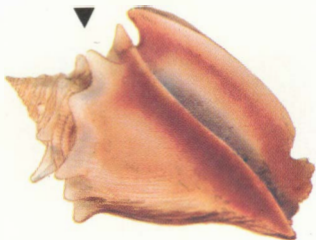


◀ **Pink Conch 8-12"** *Strombus gigas* Linné. Southern Florida-West Indies. This large Caribbean conch shell has long been a favorite ornament. Conch chowder and steak come from this species, and its shell is used as a trumpet. The young "rollers" do not have the flaring, thick lip of the 12-in. adults. Semi-precious pink pearls have been found inside the shells. The animal feeds on delicate algae. Also called the **Queen Conch**.

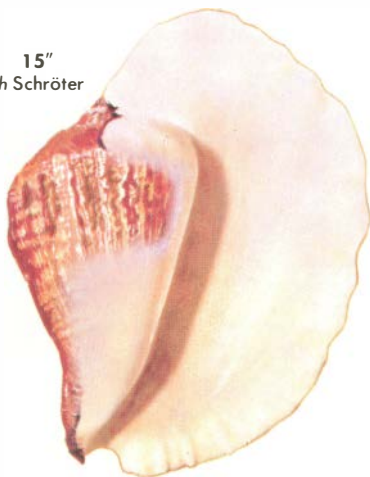
Florida Fighting Conch 2-3"
Strombus alatus Gmelin
Florida; common near shore



West Indian Fighting Conch 2-3"
Strombus pugilis Linné
Caribbean; common near shore



Goliath Conch 15"
Strombus goliath Schröter
Brazil; rare



Rooster Conch 5"
Strombus gallus
Linné
Caribbean ▼

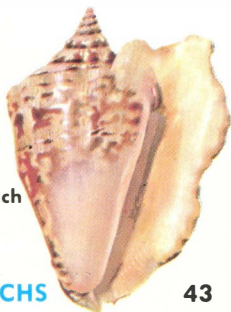


Two of these Atlantic conchs are collector's items. Rarest is the Goliath Conch from Brazil, largest *Strombus* in the world. The Rooster Conch of the Caribbean region is fairly rare. Adults vary in size; the male is smaller. In the Milk Conch, the size and number of knobs is variable, and some shells may be orange, yellow, or whitish. 1½" dwarfs of the Hawk-Wing occur in Lake Worth, Florida.

Milk Conch 4-7"
S. costatus Gmelin
Caribbean



Hawk-Wing Conch
2-4"
S. raninus Gmelin
Caribbean



COMMON INDO-PACIFIC CONCHS (1-3")



Bubble Conch
Strombus bulla Röding



Diana Conch
S. aurisdianae L.



Dog Conch
S. canarium L.

Humped Conch
S. gibberulus L.

Mutable Conch
S. mutabilis Swainson

Little Bear Conch
Strombus urceus L.



black mouth

white mouth



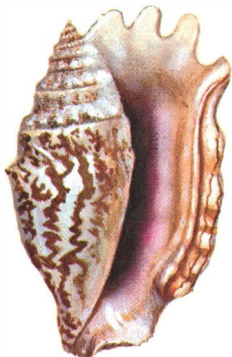
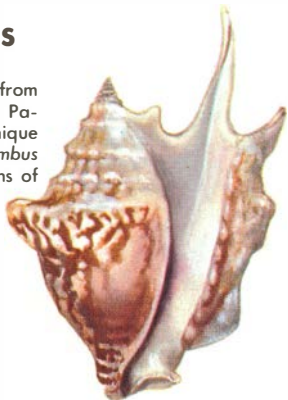
Silver Conch
S. lentiginosus Linné

Blood-Mouth Conch
S. luhuanus Linné



UNUSUAL CONCHS

Bull Conch is a rare species from the coral reefs in the Central Pacific. Shell heavy with two unique spines on outer lip. 4". *Strombus taurus* Reeve. Found at depths of 20 to 50 feet.



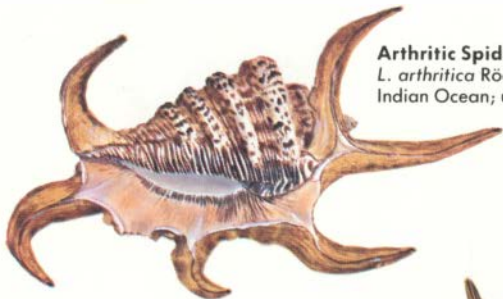
Lacinated Conch is an uncommon and attractive W. Pacific shell noted for the beautiful purple interior of its mouth. 4". *Strombus sinuatus* Lightfoot

Little Frog Conch 4"
Strombus latus Gmelin
West African and Cape Verde Is.



Peruvian Conch 6" ▶
Strombus peruvianus Swainson
Pacific side of
Central America

SPIDER CONCHS (Strombidae) are closely related to the true conchs. The ten known species of spider conchs are limited to the tropical waters of the Indo-Pacific region. A fossil species is found in Hawaii. All are vegetarians and lay spaghetti-like egg masses.



Arthritic Spider Conch 6"

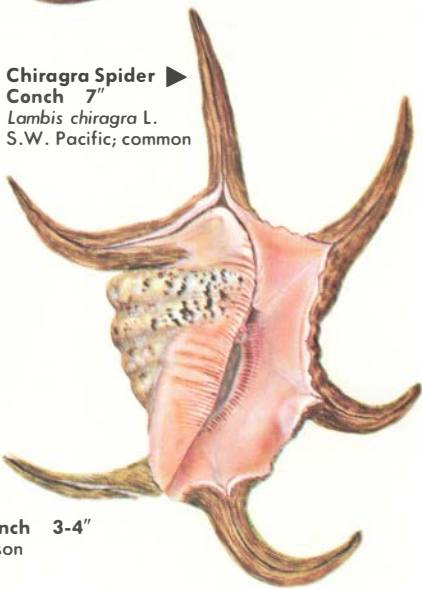
L. arthritica Röding

Indian Ocean; uncommon

Chiragra Spider Conch 7"

Lambis chiragra L.

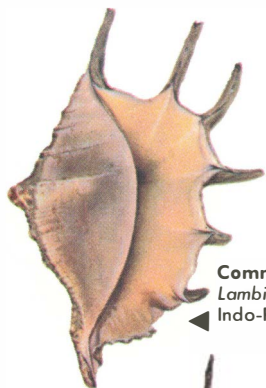
S.W. Pacific; common



Violet Spider Conch 3-4"

L. violacea Swainson

Mauritius; rare



Scorpion Conch 4-5"
L. scorpius Linné
Uncommon



Common Spider Conch 4"
Lambis lambis Linné
◀ Indo-Pacific; abundant

Orange Spider Conch 3-4"
L. crocata Link
Uncommon



Giant Spider Conch 12"
Lambis truncata Lightfoot
Indian Ocean; common
▼



◀ **Milliped Spider Conch** 5"
L. millepeda Linné
S.W. Pacific; common

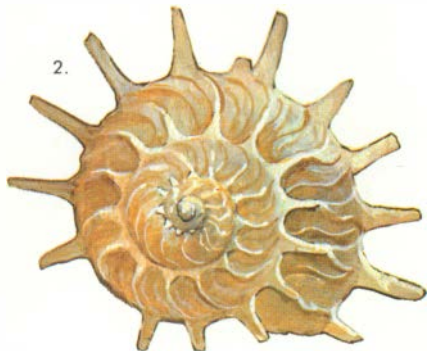


CARRIER AND TIBIA SHELLS



CARRIER SHELLS include the Japanese Carrier Shell (1) *Xenophora pallidula* Reeve, 4", which attaches dead shells to itself. (2) The Sunburst Carrier, *Stellaria solaris* Linné, 3", from the Western Pacific, develops its own limy projections. The animals are very active. Both species are in the family Xenophoridae.

TIBIA SHELLS, long and slender, are from the Philippines. (3) Spindle Tibia, *Tibia fusus* L., reaches 12 in. (4) Dwarf Tibia, *Varicospira cancellata* L., is 1 in. All are collector's items, and belong to the family Strombidae.



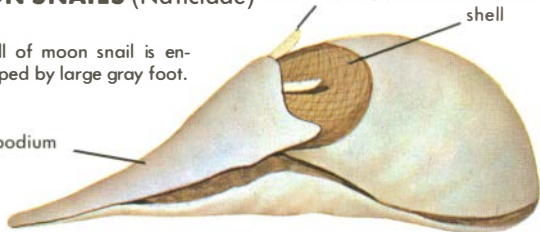
MOON SNAILS (Naticidae)

Shell of moon snail is enveloped by large gray foot.

propodium

tentacle

shell



MOON SNAILS are found on sandy flats in nearly all parts of the world. They spend most of their time digging through the sand in search of clams and smaller snails. They drill a neat hole through the shell of their prey and rasp out the

meat. Their foot is large and covers much of the shell when it is extended. Egg-masses are laid in collar-shaped cases made with fine sand. These are often found at low tide. The young hatch out in 2 or 3 weeks.

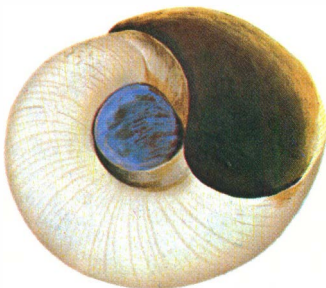
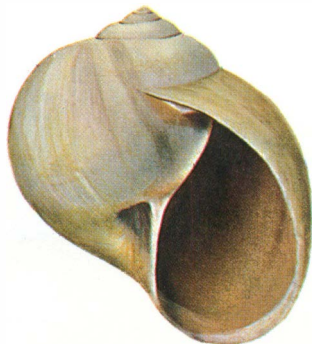
Operculum, or trapdoor, which seals the mouth of *Polinices* and *Lunatia* moon snails is thin and horny. Some are brown; others are red.

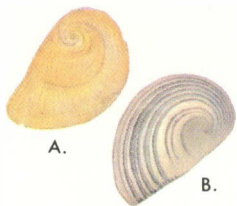


Albumen Moon Snail 2"
Polinices albumen L. Indo-Pacific

Northern Moon Snail 4"
Lunatia heros Say
Canada to Virginia

Atlantic Shark Eye 2"
P. duplicatus Say
Mass. to Texas





Operculum of moon snails in the genus *Natica* is hard and shell-like. Most members of this genus (over 100 species) live in sandy tropical bays; some live in the Arctic. A. Attachment side. B. Outer side.



China Moon 1"
Natica onca Röding
Indo-Pacific; a moderately common species found in sand below low tide



Zebra Moon 1"
N. undulata
Röding
Indo-Pacific



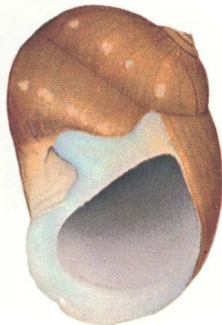
Butterfly Moon 1½"
N. alapapilionis Röding
Indo-Pacific; also found in sand but uncommon

Maculated Moon 1"
N. tigrina Röding
Indo-Pacific

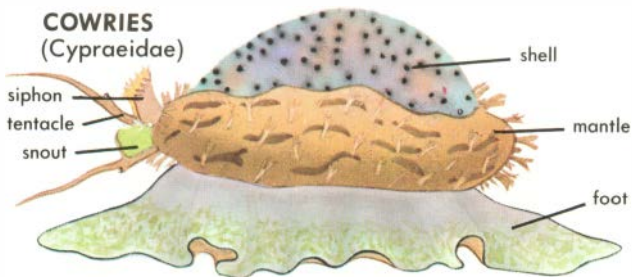


Colorful Atlantic Moon
N. canrena Linné
Florida-Caribbean 1-2"

Stellate Moon 2-3"
N. stellata Chenu
Japan



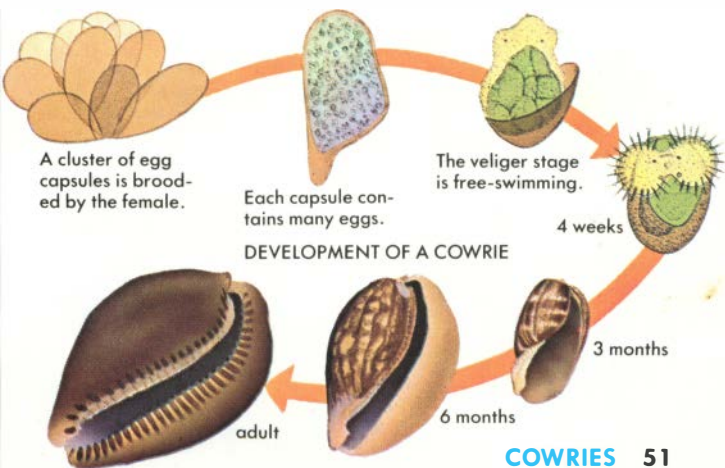
COWRIES (Cypraeidae)



Tiger Cowrie with its fleshy mantle partly covering its shell

When disturbed, its mantle contracts, revealing the glossy shell.

COWRIES, with glossy, china-like shells, attracted primitive peoples who used them as ornaments, money and as religious symbols. Today, cowries rank high with shell collectors. Most of the 190 or so species are relatively common in tropical seas. A few are very rare. The hard shell and attractive colors are produced by the enveloping fleshy mantle. Cowries are active at night, feeding on hydroids and similar small marine creatures.



AMERICAN COWRIES

American tropical waters have less than a dozen species of cowries. Four common Atlantic species are found in Florida, and the uncommon Mouse Cowrie is limited to the lower Caribbean.



Atlantic Gray Cowrie 1"

Cypraea cinerea
Gmelin
Florida-Caribbean



Atlantic Yellow Cowrie 1"

C. spurca acicularis Gmelin
Florida-Caribbean

Measled Cowrie 3"

Cypraea zebra Linné
Florida-Caribbean



Chestnut Cowrie 2"

Cypraea spadicea
Swainson
Southern California



Mouse Cowrie 2"

Cypraea mus Linné
Venezuela



Panama Cowrie 2"

Cypraea cervinetta Kiener
Gulf of Panama



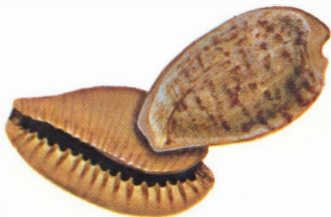
Atlantic Deer Cowrie 4"

Cypraea cervus Linné
Florida-Cuba-Yucatan



AFRICAN COWRIES

South African waters are the home of seven cowries; six of them are relatively common. Fulton's Cowrie is one of the world's rarest, found in the stomachs of the Mussel Cracker fish which feeds on it.



Brown-Toothed Cowrie 1½"
Cypraea angustata Gmelin

Cape Cowrie 1"
Cypraea capensis Gray



Toothless Cowrie 1"
Cypraea edentula Gray



Rat Cowrie 3"
Cypraea stercoraria Linné
West Africa



Fulton's Cowrie 2"
Cypraea fultoni Sowerby



PANAMA (PACIFIC) COWRIES



Little Arabian Cowrie 3/4"
Cypraea arabicula
Lamarck



Black-spotted Cowrie 1-1 1/2"
C. nigropunctata Gray
Galapagos Is.



Roberts' Cowrie 1"
C. robertsi Hidalgo

MEDITERRANEAN COWRIES



Agate Cowrie 1"
C. achatidea
Sowerby



Lurid Cowrie 1 1/2"
C. lurida Linné



Pear Cowrie 1"
C. pyrum Gmelin

Zoned Cowrie 1 1/2"
C. zonaria Gmelin
West Africa



Spurca Cowrie 3/4"
C. spurca spurca Linné



AUSTRALIAN COWRIES



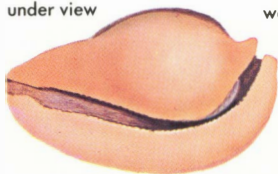
Thersite Cowrie 3"
C. thersites Gaskoin



Friend's Cowrie 3"
Cypraea friendii Gray

Armenian Cowrie 4"
Cypraea armeniaca Verco
Western Australia; deep
water; rare

under view



side view



Umbilicate Cowrie 4"
C. hesitata Iredale
Deep water; New South Wales



Albino form of the
Umbilicate Cowrie 4"
C. hesitata form alba Cox

Decipiens Cowrie 2"
Cypraea decipiens E. A. Smith



COMMON INDO-PACIFIC COWRIES (2" or less)



Pacific Deer Cowrie 2"
C. vitellus Linné



Coloba Cowrie 1"
C. coloba Melvill
Indian Ocean



Tahitian Gold-ringer 1/2"
C. obvelata Lamarck
Society Islands



Chinese Cowrie 1 1/2"
C. chinensis Gmelin



Caurica Cowrie 1 1/2"
C. caurica Linné



Gold-ringer 1/2-1"
C. annulus Linné
Very common



Lynx Cowrie 1-2"
C. lynx Linné



Camel Cowrie 2"
C. camelopardalis Perry
Red Sea; uncommon

COMMON INDO-PACIFIC COWRIES (2-4")



Tiger Cowrie 3"
Cypraea tigris Linné



Panther Cowrie (Red Sea) 3"
C. pantherina Lightfoot



Arabian Cowrie 2"
C. arabica Linné



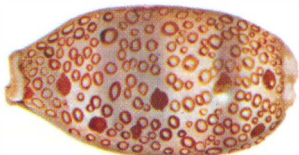
Histrio Cowrie 2½"
C. histrio Gmelin



Eglantine Cowrie 2"
C. eglantina Duclos



Reticulated Cowrie 3"
C. maculifera Schilder

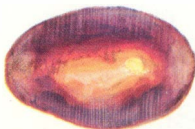


Eyed Cowrie 4"
Cypraea argus Linné
Uncommon



Mole Cowrie 3"
Cypraea talpa Linné

COMMON INDO-PACIFIC COWRIES



Ventriculate Cowrie 2"
C. ventriculus Lamarck



Isabelle Cowrie 1"
C. isabella Linné



Carnelian Cowrie 2"
C. carneola Linné



Tortoise Cowrie 4"
C. testudinaria Linné



Grooved-toothed Cowrie 1½"
C. sulcidentata Gray
Hawaii



Ocellate Cowrie 1"
C. ocellata Linné
Indian Ocean only



Schilder's Cowrie 1½"
C. schilderorum
Iredale



Hump-back Cowrie 3"
C. mauritiana Linné
Commonest on this page

COMMON INDO-PACIFIC COWRIES (1-2")



Snake-head Cowrie
C. caputserpentis L.
Very common



Lamarck's Cowrie
C. lamarcki Gray



Dragon-head Cowrie
C. caputdraconis Melvill
Easter Island; uncommon



Thrush Cowrie
C. turdus Lamarck
Indian Ocean



Boivin's Cowrie
C. boivini Kiener



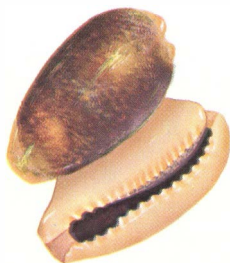
Miliaris Cowrie
C. miliaris Gmelin



Eroded Cowrie
Cypraea erosa
Linné



Onyx Cowrie
C. onyx Linné



Wandering Cowrie
Cypraea errones L.

UNCOMMON INDO-PACIFIC COWRIES

The cowries on these two pages occur in various parts of the Indo-Pacific. Most are uncommon. Most sought after are the Map, Cox's and Stolid Cowries.

Dawn Cowrie $\frac{3}{4}$ "
Cypraea diluculum
 Reeve
 East Africa



Porous Cowrie $\frac{3}{4}$ "
C. poraria Linné
 South Pacific



Tapering Cowrie 1"
Cypraea teres Linné

Cox's Cowrie $\frac{3}{4}$ "
C. coxeni Cox



Cylindrical Cowrie 1"
C. cylindrica Born



Walker's Cowrie 1"
C. walkeri Sowerby



Sieve Cowrie 1"
C. cribraria Linné



Zig-Zag Cowrie $\frac{1}{2}$ "
C. ziczac L.
 Uncommon



Honey Cowrie 1"
C. helvola Linné

Map Cowrie 4"
Cypraea mappa L.
A popular collector's item



Stolid Cowrie 1"
C. stolidus Linné
Moderately common

Punctate Cowrie
C. punctata L. 1/3"



Asellus Cowrie 1/2"
C. asellus Linné



Jester Cowrie 1-1 1/2"
C. scurra Gmelin
Uncommon; two views



Nucleus Cowrie 3/4"
C. nucleus Linné

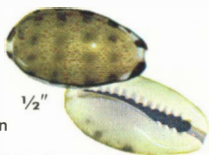


Chick-Pea Cowrie 1/2"
C. cicercula Linné



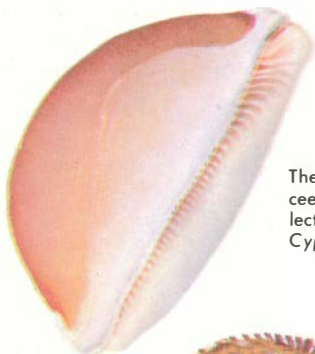
Money Cowrie 1"
C. moneta Linné
Very common

Kitten Cowrie 1/2"
C. felina Gmelin



SOME RARE COWRIES

Seldom seen in amateur collections, but greatly sought after, are several rare cowries, some worth several hundreds of dollars.



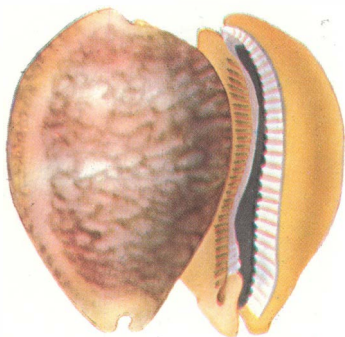
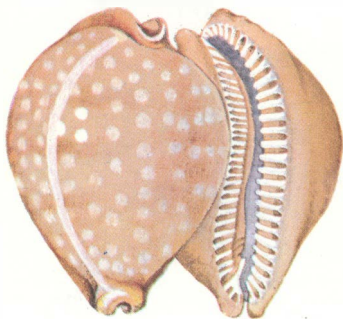
The **Golden Cowrie** is not exceedingly rare, but is a choice collector's item from Melanesia.
Cypraea aurantium Gmelin, 4"

Rare Spotted Cowrie 2"
Cypraea guttata Gmelin
Central Pacific; rare



Leucodon Cowrie 3"
Cypraea leucodon Broderip
Philippines; very rare

Broderip's Cowrie 3"
Cypraea broderipii Sowerby
Indian Ocean; very rare



THE HELMET SHELLS

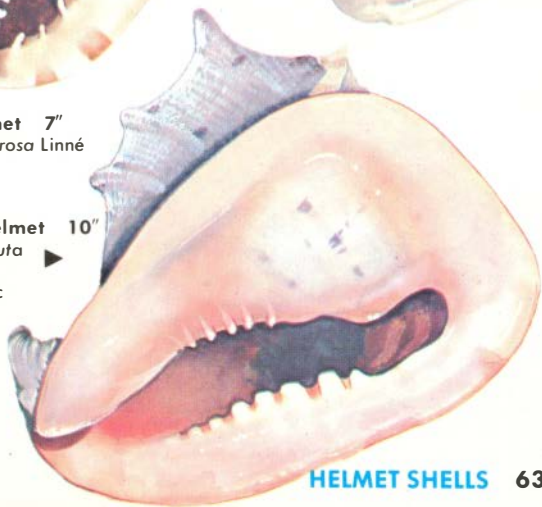
The large, massive helmet shells (Cassidae) are found in tropical waters around the world. They live in shallow water on sandy bottoms and feed mainly on sea urchins. The larger ones are used in making shell cameos.

Tessellate Helmet 6-9"
Cassis tessellata Gmelin
West Africa ▶
Uncommon

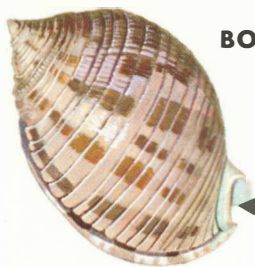


▲ **King Helmet 7"**
Cassis tuberosa Linné
Caribbean

Horned Helmet 10"
Cassis cornuta Linné ▶
Indo-Pacific



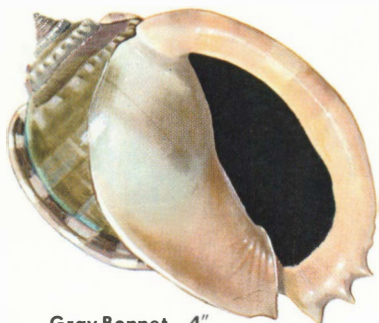
BONNET SHELLS



Scotch Bonnet 3"
Phalium granulatum Born
S.E. U.S.-Caribbean



Smooth Scotch Bonnet 3"
Phalium granulatum
form *cicatricosum* Gmelin
Florida-Caribbean



Gray Bonnet 4"
Phalium glaucum Linné
Indo-Pacific; uncommon



Striped Bonnet 3"
Phalium strigatum Gmelin
Indo-Pacific



note channel

Channelled Bonnet 2"
P. canaliculatum Bruguière
Indo-Pacific



Areola Bonnet 2"
Phalium areola L.
Indo-Pacific



Japanese Bonnet 3"
P. bisulcatum Schubert
and Wagner
Japan



Vibex Bonnet of the Indo-Pacific is very variable in shape, some specimens are quite smooth (right fig.), others with knobs on the shoulder (left fig.). *Casmaria erinaceus* Linné, 1-2"



Iredale's Bonnet 3"
Phalium labiatum Perry
South Africa

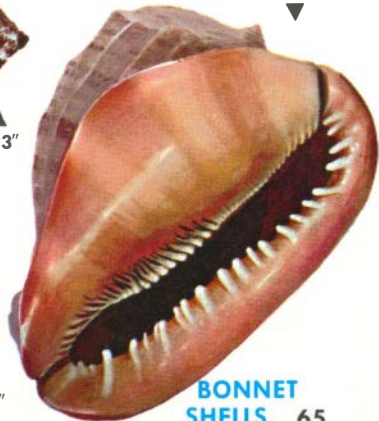


Adult Red Helmets have no operculum. The animal is orange-red. Cameos are made from the large Bull Mouth Helmet of the Indian Ocean which lives in shallow water.



Contracted Cowrie-helmet 3"
C. coarctata Sowerby; Panama

Bull Mouth Helmet 6"
Cypræacassis rufa L.; Indian Ocean



Reticulated Cowrie-helmet 3"
C. testiculus Linné; Caribbean

HELMET SHELLS



▲
Prickly Helmet 3"
Galeodea echinophora L.
Mediterranean



Tuscan Helmet 3"
G. rugosa Linné
Mediterranean

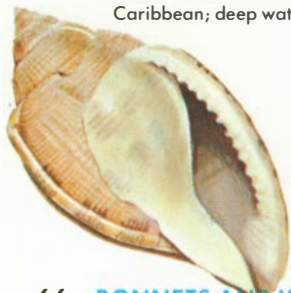


Atlantic Woodlouse 1"
Morum oniscus Linné
Caribbean; common



Cancellate Morum 1½"
Morum cancellatum Sowerby
Southeast Asia

Royal Bonnet 2"
Sconsia striata Lamarck
Caribbean; deep water



Exquisite Morum 1½"
Morum exquisitum
Adams & Reeve
Philippines; rare



THE FROG SHELLS

The tropical frog shells (Bursidae) are represented by several genera and about 60 species, ranging in size from ½" to 10". Large ones were once used for oil lamps.



Gyrate Frog Shell 1"
Gyrineum gyrinum L.
Indo-Pacific ▲



Winged Frog Shell 3"
Biplex perca Perry
Southeast Asia

Granulated Frog Shell 2"
Bursa granularis Röding
Caribbean and Indo-Pacific
A common snail found on reefs under rocks

Giant Frog Shell 5-10"
Bursa bubo L.; Indo-Pacific
Moderately common near coral reefs ►

Spiny Frog Shell 2-3"
Bursa echinata Link
Indo-Pacific ▼



THE TRITON TRUMPETS

There are less than a dozen species of these large triton trumpets. Most occur in tropical waters near coral reefs. By cutting off the end of the spire or making a round hole in the side, natives use the large species as trumpets. All members of the family Cymatiidae have horny opercula.

The Caribbean and the Indo-Pacific triton trumpets are very closely related. The former has thin, raised teeth on the inner lip; the latter has wider, flattened teeth, as shown below.



Pacific Triton 8-15"
Charonia tritonis Linné



Atlantic Triton 8-11"
Charonia variegata Lamarck



Pustuled Triton 5" ▶
Charonia pustulata Lam.
South Africa



Knobbed Triton 10-16"
Charonia nodifera Lam.
Mediterranean

THE HAIRY TRITONS

Most of the hundred species of hairy tritons (family Cymatiidae) are characterized by a periostracum of "hairs" covering the outside of the shell. The family is mainly tropical. Hairy tritons are carnivorous. They lay numerous horny egg capsules on rocks.

Common Hairy Triton 3-4"
Cymatium pileare Linné
Caribbean and Indo-Pacific
Common on coral reefs



Lotorium Triton 5"
Cymatium lotorium Linné
Indo-Pacific; moderately
common on reefs



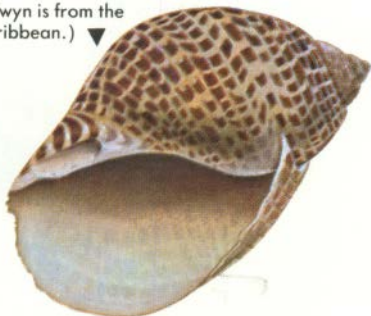
Angular Triton 6"
Cymatium femorale
Linné
Fla.-Caribbean
Common on grass flats



THE TUN AND FIG SHELLS

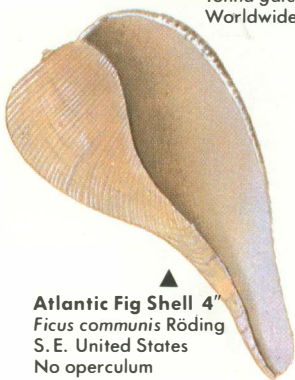
These are large, thin-shelled, rounded shells (family Tonidae), mostly tropical. The animal is usually larger than the shell itself. Adults do not have an operculum but may have a thin, flaky periostracum. The snout contains acid.

Partridge Tun 4"
Tonna perdux L.; Indo-Pacific
(The similar *Tonna maculosa*
Dillwyn is from the
Caribbean.) ▼



▼ **Giant Tun 5-7"**
Tonna galea Linné
Worldwide; tropical

Grinning Tun 4-7"
Malea ringens Swainson
Panama (Pacific side) ▼



▲ **Atlantic Fig Shell 4"**
Ficus communis Röding
S. E. United States
No operculum

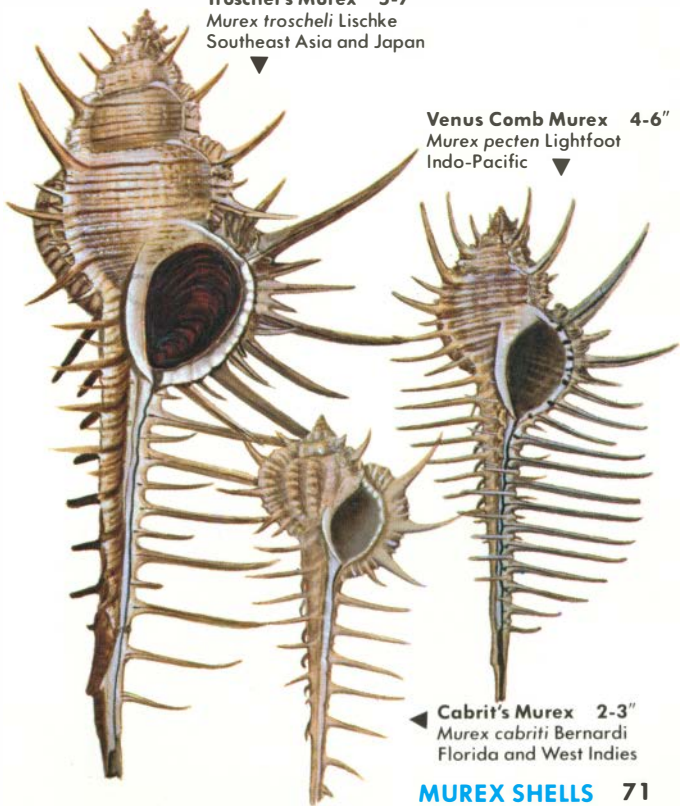
THE MUREX SHELLS

This is a major marine family (Muricidae) which contains a large number of genera and a vast array of species. They are worldwide in distribution, but are found mainly in tropical waters. Long spines and frills characterize this attractive group. The typical *Murex* genus shown on this page contains about 20 species. The operculum is horny.

Troschel's Murex 5-7"
Murex troscheli Lischke
Southeast Asia and Japan

Venus Comb Murex 4-6"
Murex pecten Lightfoot
Indo-Pacific

Cabrit's Murex 2-3"
Murex cabriti Bernardi
Florida and West Indies



MUREX SNAILS (below) are large, showy species living colonially on sandy mud flats on the Pacific side of Central America. Many other smaller, attractive species are known in this area. All murex snails feed on other mollusks, especially bivalves. Eggs are laid in clusters of capsules.

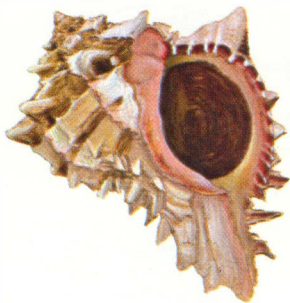


Radix Murex 4"
Murex radix Gmelin



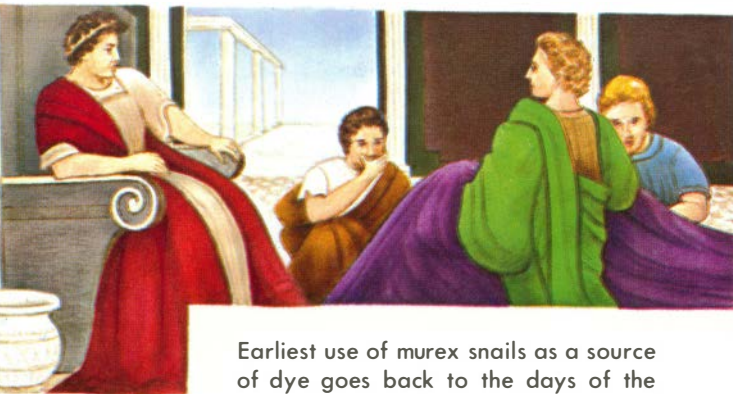
Pink-mouthed Murex 4"
Murex erythrostomus Swainson

Cabbage Murex 5"
Murex brassica Lamarck



Regal Murex 4"
Murex regius Wood





Earliest use of murex snails as a source of dye goes back to the days of the Phoenicians. Later, Greeks and Romans

made use of the valuable coloring material. The murex snails secrete a yellowish fluid which, when boiled and treated, makes a permanent purple dye. Wool and cotton dyed with this so-called Royal Tyrian Purple brought very high prices. During Roman times only Senators and Emperors were allowed to wear purple cloth. After the fall of the Roman Empire the dye was used by the Christian Church and gave rise to the official colors of Cardinals. Many new towns were settled in the western Mediterranean by Phoenicians seeking fresh beds of the dye-producing murex shells.



Boiling
purple dye

Dye Murex 3"
Murex brandaris
Linné
Mediterranean

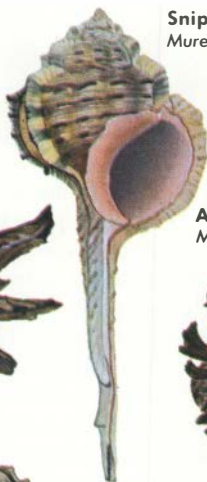


INDO-PACIFIC MUREX SHELLS of shallow water include the common species illustrated below. The Endive and Adustus are from coral reefs; Snipe's Bill Murex is from deeper water and occurs in pairs.

Endive Murex 3"
Murex cichoreus Gmelin



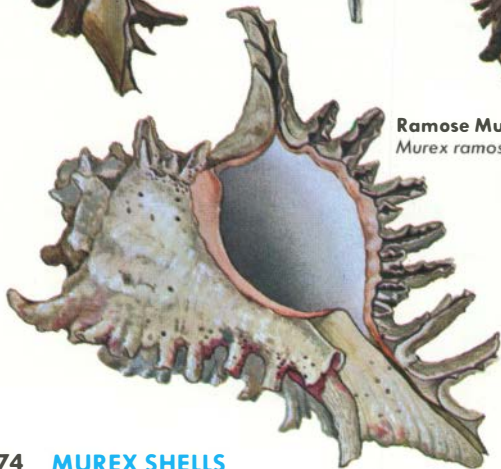
Snipe's Bill 4"
Murex haustellum Linné



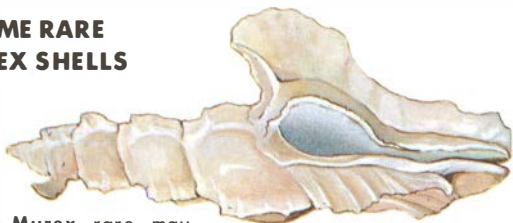
Adustus Murex 2"
Murex brunneus Link



Ramose Murex 8-12"
Murex ramosus Linné

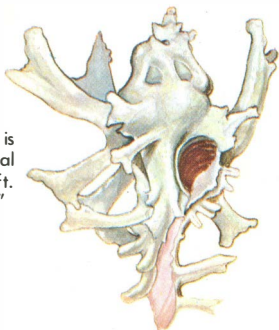


SOME RARE MUREX SHELLS



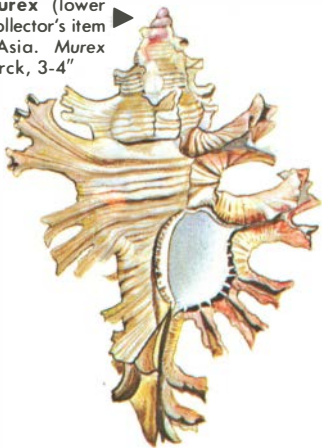
Clavus Murex, rare, may sometimes have a purple mouth. It is more often found in Japan, the Philippines and East Africa. *Murex elongatus* Lightfoot, 2-3½"

The **Zambo Murex** (right) is found on rocks in the central Philippines at depths of 10 ft. *M. zamboi* Burch & Burch, 2"



The **Scorpion Murex** (lower left) may be black, brown or whitish. As it grows, old spines are dissolved by mantle. *Murex scorpio* Linné, 1-2"

▼ **Rose-branch Murex** (lower right) is popular collector's item from southeast Asia. *Murex palmarosae* Lamarck, 3-4" ▶



EASTERN AMERICAN MUREX SHELLS include the common species illustrated below. All live in shallow water, usually on muddy bottoms. All feed on small clams. The Giant Eastern Murex also lives in the Gulf of Mexico. The Apple Murex and Lace Murex are abundant on the west coast of Florida, and are commercially collected.



Rose Murex 2"
M. rubidus F. C. Baker



Apple Murex 2-4"
Murex pomum Gmelin



Lace Murex 2½"
Murex dilectus A. Ada



Giant Eastern Murex 5"
Murex fulvescens Sowerby
Carolinas to Texas

LATIAXIS SHELLS (Coralliophilidae) are abundant and varied in the waters around Japan, which are famous for these species. All are noted for their alabaster white shells and delicate sculpturing. Mawe's Latiaxis, discovered in the early 19th century, was once a great rarity. Now it is more common, and Pilsbry's Latiaxis is considered the top species for collectors. Less attractive species occur in the Caribbean and Eastern Pacific.

Eugenia's Latiaxis 2"
Latiaxis eugeniae Bern.
 Japan; deep water

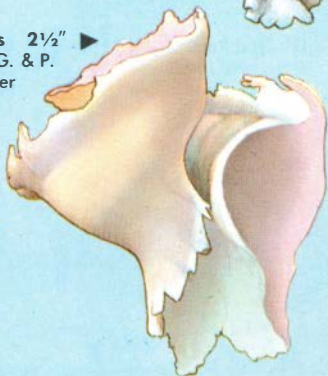
Armored Latiaxis 1"
Latiaxis armatus Sby.
 Japan; deep water.

Japan Latiaxis 2"
Latiaxis japonicus Dunker
 Japan; deep water



Mawe's Latiaxis 2½" ▶
Latiaxis mawae G. & P.
 Japan; deep water

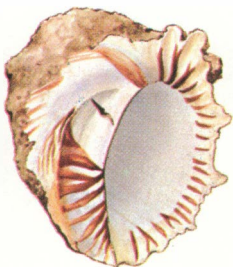
Pilsbry's Latiaxis 1½"
Latiaxis pilsbryi Hirase
 Japan; deep water



ROCK SHELLS of many species (family Thaididae) live in large colonies along rocky shores, where they feed on mussels, oysters and barnacles. Many secrete a purple dye, used by Central American Indians to color cotton. The Barnacle Rock Shell resembles an abalone but has no holes; it is fished commercially for food.



W. Indian Purpura 3"
Purpura patula Linné
 Florida-Caribbean

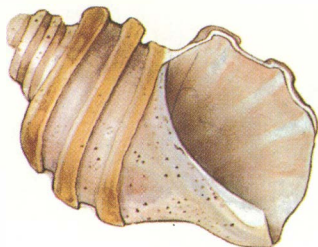


Eye of Judas 3"
Purpura planospira
 Lamarck
 Galapagos Islands;
 Central America



E. Indian Purpura 3"
Purpura persica Linné
 East Indies

Girdled Rock Shell 1½"
Thais cingulata Linné
 Cape of Good Hope



Barnacle Rock Shell 4"
Concholepas concholepas Bruguière
 Peru and Chile



DRUPE SNAILS are small, colorful thaidis found only on the coral-rock shores of the Indo-Pacific area. The Filled Dogwinkle, common along the northwest shores of North America, has relatives in other cool-water areas such as New England and northern Europe. All members of this family lay urn-like egg capsules.



Prickly Drupe 1"
Drupa ricinus
Linné



Purple Drupe 1"
Drupa morum
Röding



Finger Drupe 1"
D. grossularia
Röding

Filled Dogwinkle 1-5" *Nucella lamellosa* Gmelin
N. W. United States; variable in shape and color

Pacific Horse Chestnut 2"
Thais hippocastanea L.
Indo-Pacific



Sertum Rock Shell 2"
Nassa sarta
Bruguère
Indo-Pacific



RAPA AND CORAL SNAILS of the family Magilidae are usually closely associated with soft and hard corals or sea fans. Most species do not have radular teeth. The Magilus Snail of the tropical Pacific lives in brain coral. As the coral grows, the snail also lengthens its shell and fills up its early whorls with solid, shelly material. The Papery Rapa lives in soft, yellow corals of the Philippines, maintaining contact with the ocean's water through a small hole in its host. The Caribbean Coral Snail lives in the base of sea fans.



Caribbean
Coral Snails

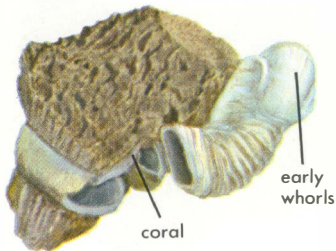


sea fan

snails in base

Caribbean Coral Snail 1"
Coralliophila caribaea Abbott
West Indies

Magilus Snail 1-3"
Magilus antiquus Montfort
Indo-Pacific

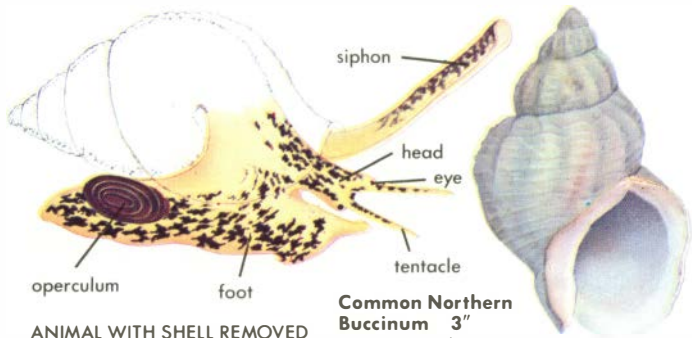


coral

early
whorls

Papery Rapa 3"
Rapa rapa Linné
Indo-Pacific; lives in soft coral





ANIMAL WITH SHELL REMOVED

**Common Northern
Buccinum 3"**

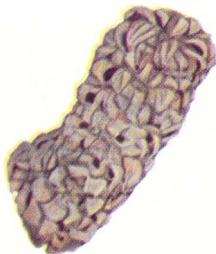
Buccinum undatum Linné
N. Atlantic; common offshore

WHELKS of the family Buccinidae form a large group of many genera and over 400 species. All have corneous opercula and a radula with three rows of strong teeth. Eggs are laid in large clumps of egg capsules. Whelks feed upon marine worms and clams. It is one of the few families to have representatives in both arctic and tropical waters. Arctic species of the genus *Buccinum* are generally drab-colored. The tropical genera are colorful and live in shallow water.

New England Neptune 4"

Neptunea decemcostata Say
Canada to Mass.; common offshore

Neptune
egg capsules



COLD-WATER WHELKS

The buccinids are ravenous carnivores, and the larger species do great damage to clam beds. In Japan, they are commercially fished for food and are used as bait. Species like the Japelion are common in fossil beds and indicate cold-water conditions in former geological times. A few species of buccinids may lack an operculum. The cold-water buccinids are few in species but numerous as individuals, but in the tropics are colorful and varied.

Hirase's Whelk 4"
Japelion hirasei Pilsbry
Northern Japan; a cold-water species

Dilated Whelk 6-7" ▶
Penion dilatatus Q. & G.
New Zealand;
a cold-water species



TROPICAL WHELKS



Signum Whelk 2"

Siphonalia signum Reeve
A common species in Japan;
a pest of oysters



Spiral Babylon 3"
Babylonia spirata Linné
S.E. Asia



False Triton 3"

Colubraria maculosa Gmelin
Indian Ocean; an uncommon
species found around coral reefs

Zelandic Babylon 3"

B. zelandica Bruguière
Indian Ocean; uncommon
Note the purple ridge at
the base of the shell

Phos Whelk 2"

Phos senticosus Linné
Indo-Pacific; commonly dredged

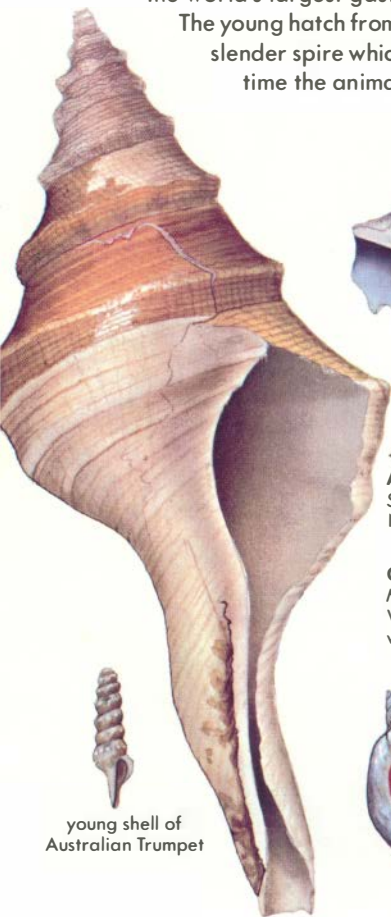


Channeled Babylon 2"

B. canaliculata Schumacher
Indian Ocean



THE MELONGENAS (Melongenidae) are carnivores, feeding on clams and snails. The Australian Trumpet is the world's largest gastropod—over two feet long. The young hatch from the egg capsule with a long, slender spire which is usually broken off by the time the animals mature.



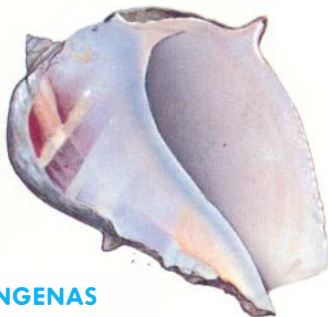
young shell of
Australian Trumpet



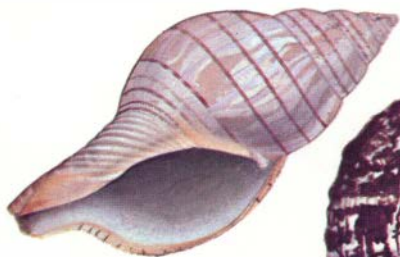
American Crown Conch 2-4"
Melongena corona Gmelin
S.E. United States; common

Australian Trumpet or Baler 2 ft.
Syrinx aruanus Linné
N. Australia

Caribbean Crown Conch 4-5"
Melongena melongena Linné
West Indies; found in shallow
water; feeds on clams



TULIP SHELLS (Fasciariidae) are typical of S.E. United States. Three species in Florida include the 20-inch Horse Conch. Tulips lay their eggs in large clumps of parchment-like capsules. Adults feed on clams.



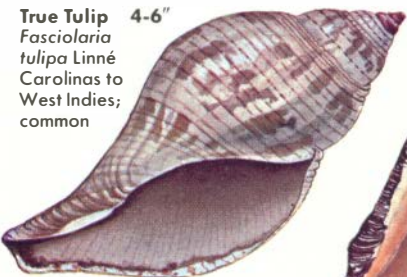
Banded Tulip 3"
Fasciolaria hunteria Perry
Carolinas to Texas; feeds on clams
Common in shallow water

Florida Horse Conch 20" ▶
Pleuroploca gigantea Kiener
Carolinas to Mexico; common offshore

True Tulip 4-6"
Fasciolaria tulipa Linné
Carolinas to West Indies;
common



young shell
of Horse Conch



operculum of Tulip





operculum

Closter Spindle 7"
Fusinus closter Philippi
 Lower Caribbean; uncommon

Distaff Spindle 4"
Fusinus colus Linné
 Indo-Pacific

Nicobar Spindle 4"
F. nicobaricus Röding
 Indo-Pacific

SPINDLE SHELLS (family Fasciolariidae) of some 50 species are well known to collectors because of their long, graceful shape. These snails live on sandy bottoms and travel in pairs. The largest Atlantic species, the Closter Spindle, is a collector's item.

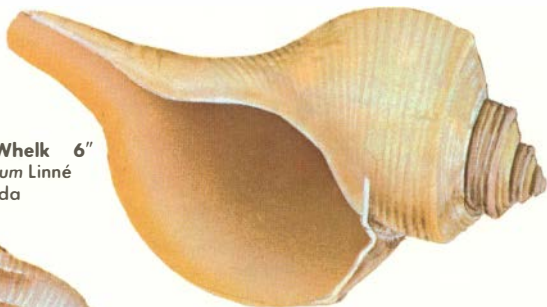
FULGUR WHELKS (Melongenidae) of eastern American waters have been abundant since Miocene times, some 30 million years ago. Today there are six common species. Long chains of egg capsules are often washed ashore. The Lightning Whelk is normally "left-handed."

a string of
egg cases



Knobbed Whelk 7"
Busycon carica Gmelin
Mass. to Georgia

Channeled Whelk 6"
B. canaliculatum Linné
Mass. to Florida



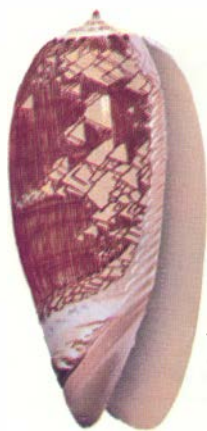
Lightning Whelk 4-16"
◀ *Busycon contrarium* Conrad
Carolinas to Texas





Living olive shell showing extended parts

OLIVE SHELLS (family Olividae) with their agate-like sheen and attractive shape have long been favorites. The family is characterized by great variation in color and markings. The genus *Oliva* has no operculum. The mantle and foot of the animal partly cover the outer shell. Over 300 species of olive shells live on sandy bottoms where they feed on smaller mollusks. The best time to collect olives is at night, at low tide. Philippine collectors use bait on a tiny hook and line.



Ear Olive 2" ▲
Olivancillaria vesica
 Gmelin
 Eastern South America
 Common in sand

Tent Olive 3-5"
Oliva porphyria Linné
 W. Central America
 Uncommon offshore



Tankerville's Olive 3"
Ancilla tankervillei Swainson
 Venezuela; uncommon in sand



Orange-mouthed Olive 3"

Oliva sericea Röding. Indo-Pacific. Note color variation on backs. This is a very common sand-dwelling species.



Purple-mouthed Olive 2-3"

Oliva caerulea Röding
Indo-Pacific; common



Gibbose Olive 2"

Oliva gibbosa Röding
Indian Ocean; abundant



Lettered Olive 2½"

Oliva sayana Ravenel
S. E. United States; common in sand

VASE SHELLS

About two dozen species (family Vasidae), all tropical, have heavy shells with 4 to 5 spiral ridges on the inner lip. Most are common and found near shore, but some, like the Latirus-shaped Vase, are deep-water species.

Common Atlantic Vase 4"

Vasum muricatum Born
Florida and West Indies
A common inshore species



Latirus-shaped Vase 2"

V. latiriforme Reh. & Abb.
Gulf of Mexico; rare



Ceram Vase 4-5"

V. ceramicum Linné
Indo-Pacific
A common reef species



Pacific Top Vase 3"

V. turbinellus Linné
Indo-Pacific; common



Globe Vase 1"

V. globulus Lam.
Lesser Antilles
Uncommon



CHANK SHELLS

The very massive chank shells (Turbinellidae) are found in only a few areas. In India and Sri Lanka they are collected by the thousands and cut into ornamental rings and bangles. Rare "left-handed" specimens are mounted in gold and placed on Hindu altars. Chanks are characterized by a nipple-like apex and folds on the inner lip.

West Indian Chank 10"
Turbinella angulata Lightfoot
Bahamas, Cuba and Mexico
A common shallow-water
species in the Bahamas.
Outer skin flakes off.

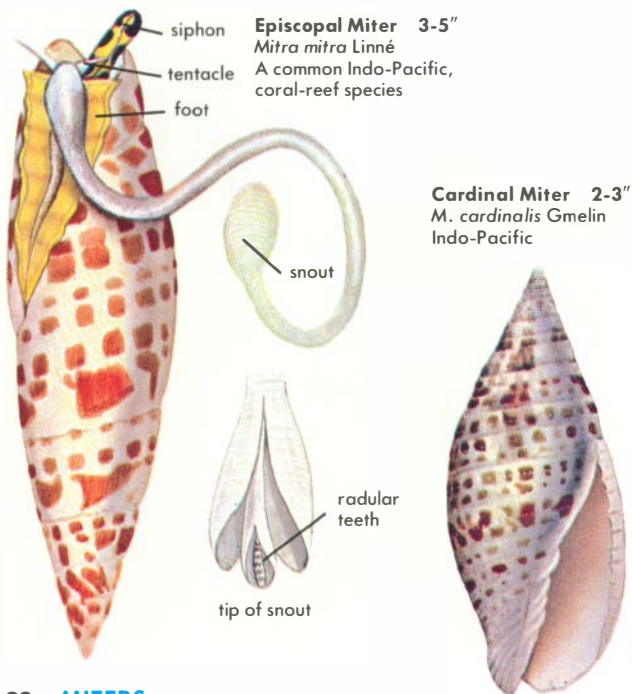


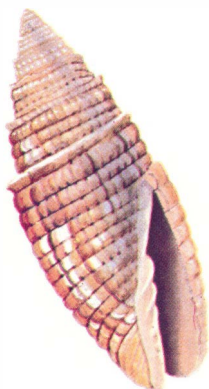
Indian Chank 6"
Turbinella pyrum Linné
Bay of Bengal, India



MITER SHELLS

The renowned Mitridae family of warm, shallow seas includes nearly 600 species, from 0.3 to 6 in. long. The inner lip usually has 3 to 5 strong, curved teeth. Mitters use their long retractable snout to feed on worms and clams. They burrow in sand but keep their siphon extended. Eggs, in small horny capsules, are attached to stones. The Indo-Pacific region has about 400 species of miters. Some of the larger and more common ones are illustrated on these two pages. Mitters are usually found under rocks.





Pin-pointed Miter 2"
M. puncticulata Lamarck



Adusta Miter
Mitra eremitarum Röding



Pontifical Miter 2"
Mitra stictica Link

Papal Miter 3-4" *M. papalis* Linné
One of the handsomest of the common miters from the Indo-Pacific area ▶

**COMMON
INDO-PACIFIC
MITERS**

Melon-like Miter 1"
M. cucumerina Lamarck
Under rocks; shallow water



Imperial Miter 2"
M. imperialis Röding





Plicate Miter 2"
Vexillum plicarium
Linné
Indo-Pacific; common



Rugose Miter 2"
V. rugosum
Linné
Indo-Pacific; common



Little Fox Miter 2"
V. vulpeculum
Linné
Indo-Pacific; common



Belcher's Miter 3"
Mitra belcheri Hinds
West Panama; uncommon

Zaca Miter 3"
M. zaca Strong & Hanna
West Panama; uncommon



Barbados Miter 2"
M. barbadosis Gmelin
Caribbean; common

Nodulose Miter 2"
M. nodulosa Gmelin
Caribbean; common



COMMON INDO-PACIFIC MITERS

Letter Miter $\frac{3}{4}$ "
Mitra litterata Lamarck



Papilio Miter 2"
M. papilio Link

Isabel Miter 3"
M. isabella Swainson

Auger-like Miter 4"
M. terebralis Lamarck



Poor Miter 1"
M. paupercula Linné

Blood-sucker Miter 2"
M. sanguisuga Linné



Sino Miter 1½"
Pterygia sinensis Reeve
East Asia



Nucea Miter 2"
Pterygia nucea Gmelin
Indo-Pacific



Dactylus Miter 2"
Pterygia dactylus L.
Indo-Pacific



Casta Miter 2"
Swainsonia casta Gmelin
Indo-Pacific



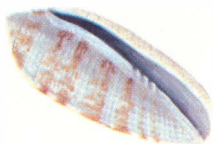
Olive-shaped Miter ½-¾"
Swainsonia olivaeformis Swainson
Indo-Pacific



Cone Miter 1"
Pterygia conus Gmel.
Southwest Pacific

Common Imbricaria ¾"
Imbricaria conica Schum.
South Pacific

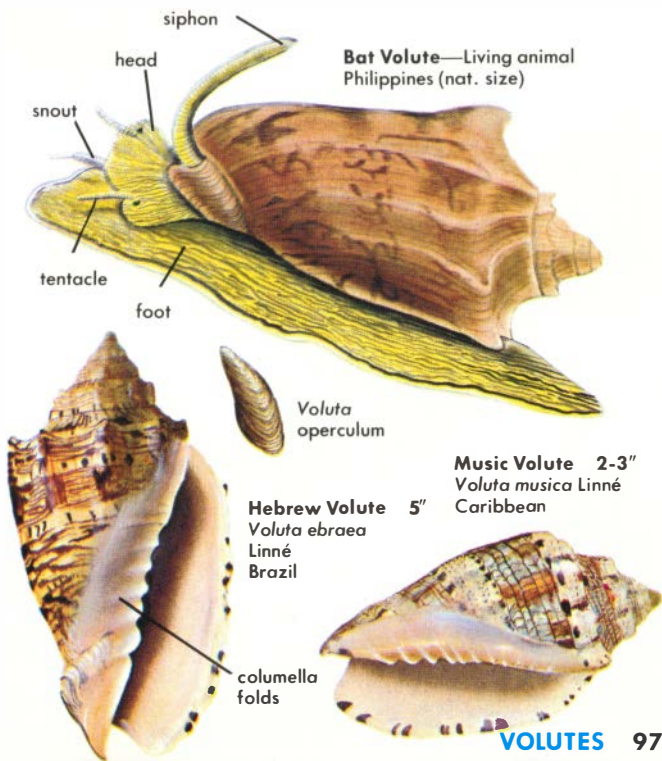
Fenestrate Miter ¾"
Pterygia fenestrata Lam.
Indo-Pacific



Some of the smaller species of miter shells (above) show great diversity in shape, especially Indo-Pacific genera such as *Swainsonia*, *Imbricaria* and *Pterygia*. Some of these strange miters resemble cones, olives and *Strombus* conchs. These genera contain only a few dozen species, which are all sand-dwellers.

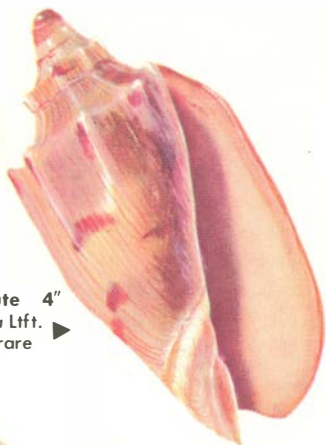
VOLUTES

Volute shells (Volutidae) are large, colorful gastropods. Popular with collectors, some command high prices. Of about 200 kinds, most live in shallow, tropical seas, but some come from deep waters and a few from polar waters. Volutes are carnivorous, rapid crawlers. Females lay eggs in leathery capsules. The operculum is absent in most, but not in the true *Voluta*. Volute shells have strong folds, fairly constant in number, on the columella.

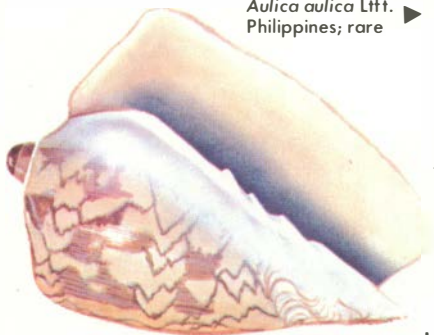




▲ **Bat Volute 3"**
Aulica vesperilio Linné
Indo-Pacific; common



Aulica Volute 4"
Aulica aulica Lft. ▶
Philippines; rare



◀ **Noble Volute 5"**
Aulica nobilis Lightfoot
S.E. Asia; uncommon

Imperial Volute 10"
Aulica imperialis Lightfoot
Philippines; uncommon



FLORIDA VOLUTES belong to the subfamily Scaphellinae, and all live in fairly deep water except for the Junonia, which is occasionally washed ashore in west Florida. The animals are spotted like their shells and they all lack an operculum. Some are very rare.

Kiener's Volute 4-7"
Scaphella kieneri Clench
Deep water; rare ▶



▲
Dohrn's Volute 3"
Scaphella dohrni Sowerby
Deep water; rare



Junonia Volute 4-5"
Scaphella junonia Lamarck
S. E. United States ▶



JAPANESE VOLUTES



▲ **Shin-bone Volute** 2½"

Teramachia tibiaeformis

Kuroda

Japan; rare



▶ **Asian Flame Volute** 4"

Fulgoraria rupestris Gmelin

China and Formosa

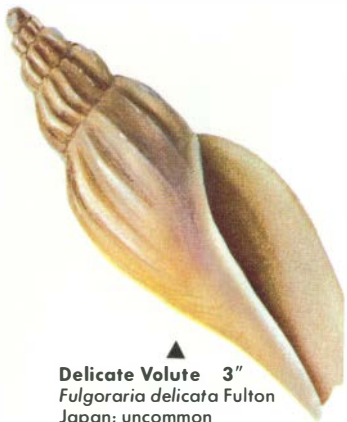
Common offshore



◀ **Notable Japanese Volute** 5"

Fulgoraria concinna Broderip

Japan; uncommon

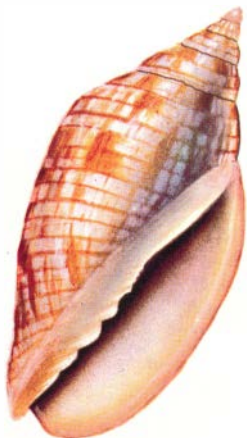


▲ **Delicate Volute** 3"

Fulgoraria delicata Fulton

Japan; uncommon

VOLUTES



Vexillate Volute 3"
Harpulina arausiaca Lightfoot
Ceylon; uncommon

Lightning Volute 5" ▶
Ericusa fulgetrum Sby.
South Australia
Uncommon



Arab Volute 4" ▶
Alcithoe arabica Gmelin
New Zealand
Common

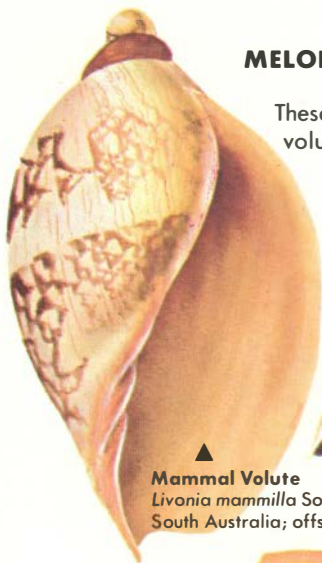


▶ **Ponsonby's Volute 2"**
Alcithoe ponsonbyi E. A. Smith
South Africa; rare

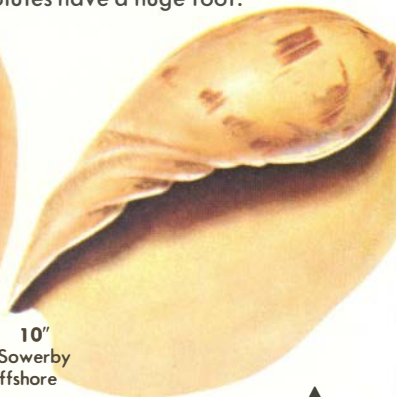


MELON OR BALER SHELLS

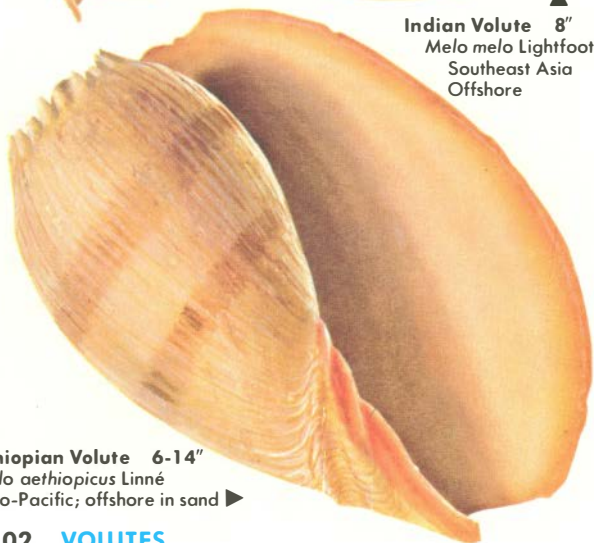
These moderately common volutes have a huge foot.



▲
Mammal Volute 10"
Livonia mammilla Sowerby
South Australia; offshore

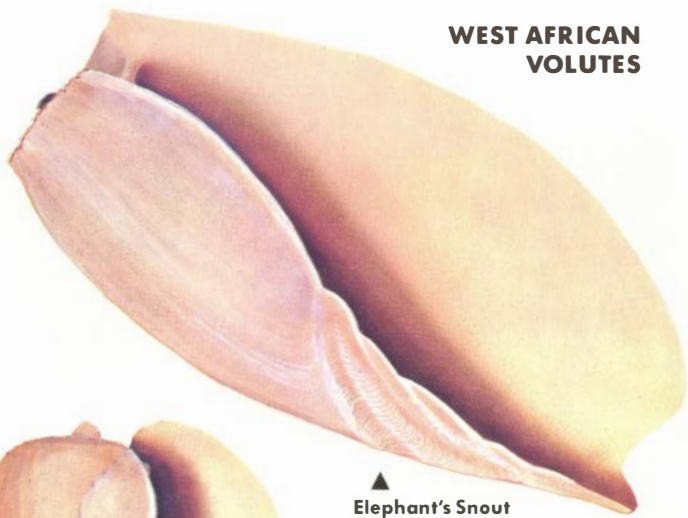


▲
Indian Volute 8"
Melo melo Lightfoot
Southeast Asia
Offshore

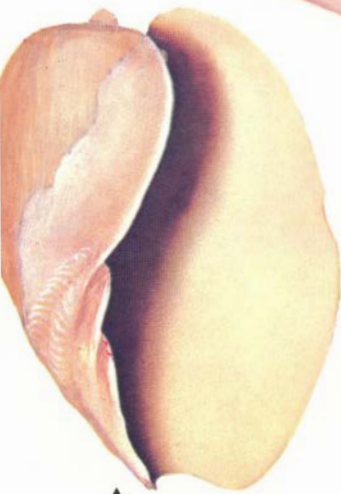


Ethiopian Volute 6-14"
Melo aethiopicus Linné
Indo-Pacific; offshore in sand ▶

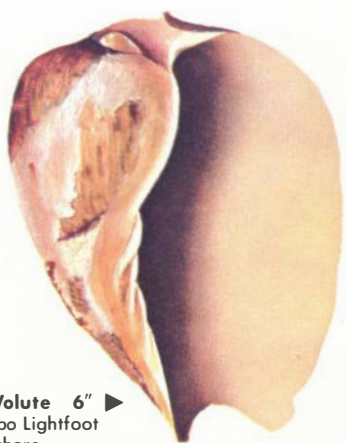
WEST AFRICAN VOLUTES



▲
**Elephant's Snout
Volute 10-14"**
Cymbium glans Gmelin
Abundant offshore



▲
Olla Volute 8"
Cymbium olla Linné
Common offshore



▶
Neptune's Volute 6"
Cymbium pepo Lightfoot
Common offshore

AUSTRALIAN VOLUTES



Elliot's Volute 3"
Amoria ellioti Sowerby
South Australia
Common in sand



Turner's Volute 2"
Amoria turneri Gray
Northern Australia



Damon's Volute 4"
Amoria damoni Gray
Western Australia
Uncommon

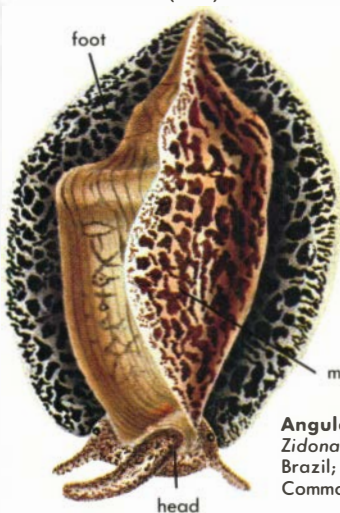


Bednall's Volute 4"
Volutoconus bednalli Brazier
Northern Australia; rare

Gross' Volute 4½" ▶
Volutoconus grossi Iredale
Queensland; rare



Some volutes not only have a very broad foot, but also extend the fleshy, shell-making mantle over the outer shell, such as seen in the top view of a crawling Angular Volute from Brazil (left).



Angular Volute 4-5"
Zidona dufresnei Donovan
 Brazil; animal left, shell right
 Common offshore



Abyssal Volute 3"
Volutocorbis abyssicola Ads. & Rve.
 South Africa; deep water; rare



Delessert's Volute 2" ▶
Lyria delessertiana Petit
 Madagascar; uncommon



▲ **Miter-shaped Volute 2"**
Lyria mitraeformis Lamarck
 South Australia
 Common



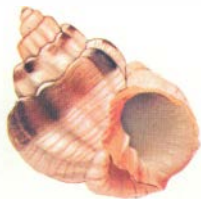
NUTMEGS (Cancellariidae) are oddly sculptured with strong spiral teeth on the inner lip. The largest number of species are in the western American tropics.



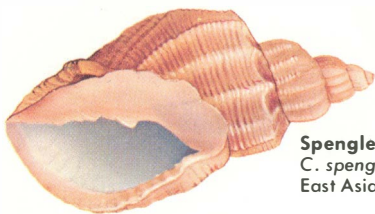
Cancellate Nutmeg 1"
Cancellaria cancellata
 Linné
 West Africa
 Moderately common



Oblique Nutmeg 1"
C. obliquata
 Lamarck
 Indo-Pacific
 Commonly dredged

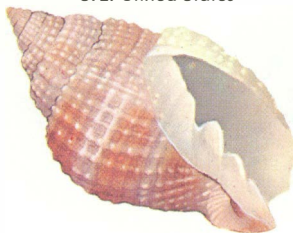


Yellow-mouthed Nutmeg 1"
C. chrysostoma
 Sowerby
 West Central America
 Uncommon offshore;
 mouth sometimes
 orange, but fades
 when shell is dead

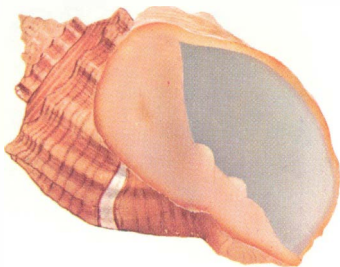


Spengler's Nutmeg 2"
C. spengleriana Deshayes
 East Asia; common

Common Nutmeg 2"
C. reticulata Linné
 S. E. United States



Helmet-shaped Nutmeg 1½"
C. cassidiformis Sowerby
 Panama to Ecuador



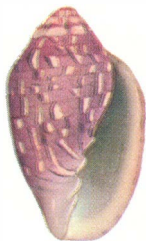
MARGIN SHELLS (Marginellidae) are small and colorful, especially those from the shores of West Africa. Bubble Margin is the largest from the Americas.



Common Atlantic Margin Shell 1/3"
Prunum apicinum Menke
 U.S. to Caribbean
 Common in bays



Orange Margin Shell 1"
Prunum carneum Storer
 Florida-Caribbean
 Uncommon offshore



Rose Margin Shell 1"
Marginella rosea Lam.
 South Africa
 Uncommon offshore

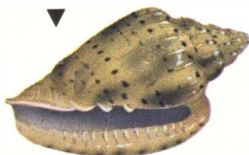
Bubble Margin Shell 2-3"
Prunum bullatum Born
 Brazil; uncommon



Belted Margin Shell 1"
Prunum cingulatum Dillwyn
 West Africa



Bean Margin Shell 1"
Marginella faba Linné
 West Africa



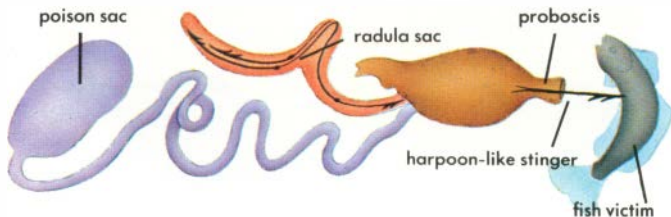
CONE SHELLS

Cone shells (Conidae) total about 400 species from most warm, tropical waters. The majority of the species are Indo-Pacific. Some 50 species are found in the Americas. Cones are heavy, with broad spires and tapering whorls, although some are as small as a grain of rice. Cones are carnivorous, feeding on worms and small fish. A few from the Indian and Pacific oceans can inflict serious and perhaps fatal stings. The largest of the Textile Cones and the Indo-Pacific Geography Cones are venomous. Poison from the venom sac in the head and a tiny "harpoon" in the radula sac are ejected from the proboscis and stabbed into the victim. American cones have a mild sting. Cones prefer shallow water in coral reefs and under rocks. Their eggs, in flat, leaflike capsules, are attached to rocks.

Living Textile Cone



DETAILS OF POISON APPARATUS



GLORY-OF-THE-SEAS



Glory-of-the-Seas 4-5"
Conus gloriamaris Chemnitz
Southwest Pacific

Once considered a great rarity, the Glory-of-the-Seas was a much sought-after cone and thought to be the most valuable shell in the world. In recent years scuba divers in the southwest Pacific and bottom-net fishermen in the Philippines have discovered hundreds of new specimens. Perfect ones still sell for several hundred dollars. Other rare species of cones and cowries bring several thousands of dollars. The Glory-of-the-Seas has almost straight, graceful outlines of the whorls and a very fine network of coloration. Do not confuse this with the common Textile Cones shown on page 113. Their sides are much more rounded and their spires less elevated. The Glory-of-the-Seas has not been known to be fatal, but is probably capable of inflicting a serious sting.

COMMON INDO-PACIFIC CONES

dark phase



light phase

Eburneus Cone 2"
Conus eburneus Hwass
Two color forms

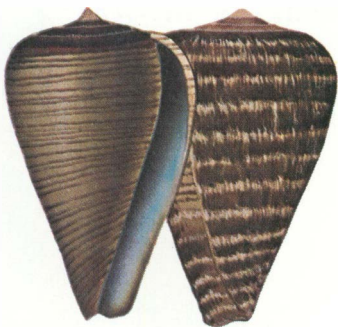


Fig Cone 3"
Conus figulinus Linné
Right: with periostracum
Left: cleaned shell

Tessellate Cone 1-2"
Conus tessulatus Born
Spots vary in size

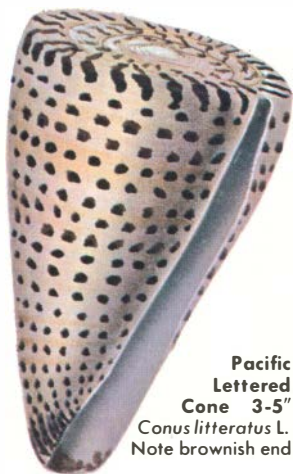


Marble Cone 4"
Conus marmoreus Linné
Rarely albinistic





Leopard Cone 5-9"
Conus leopardus Röding
Note white lower end



**Pacific
Lettered
Cone** 3-5"
Conus litteratus L.
Note brownish end

The common Indo-Pacific cones on these two pages live in sand, usually near coral reefs. By day they hide in the sand; at night they emerge and feed—mainly on marine worms. Living shell has a “skin” or periostracum.

Betulinus Cone *Conus betulinus* L.
Southwest Pacific 4-6"

Hebrew Cone $\frac{1}{2}$ -1 $\frac{1}{2}$ "
Conus ebraeus Linné
Indian and Pacific oceans

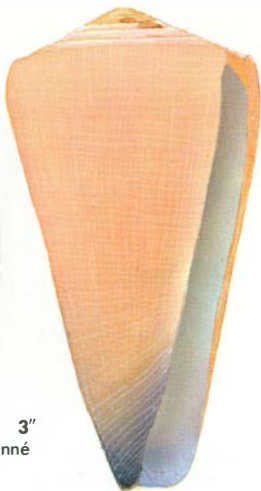




Distant Cone 4"
Conus distans Hwass
Indo-Pacific reefs



Nussatella Cone 3"
Conus nussatella Linné
Indo-Pacific reefs



Virgin Cone 4"
Conus virgo Linné
Indo-Pacific bays

Magus Cone 3"
Conus magus Linné
Indo-Pacific
A variable species

Soldier Cone 3"
Conus miles Linné
Indo-Pacific



two color forms

TEXTILE CONES

This group of cone shells, found mainly in the Indo-Pacific region, is marked with small tent-like triangles. All are closely related to the common Textile Cone (right). Large ones are venomous. See *Glory-of-the-Seas*, page 109.



Netted Cone 2"
Conus retifer Menke
Indo-Pacific; uncommon



Textile Cone 3-4"
Conus textile Linné
Indo-Pacific; common

Aulicus Cone 4-6"
Conus aulicus Linné
Indo-Pacific; uncommon



Queen Victoria Cone 3"
Conus victoriae Reeve
N. W. Australia



Abbas Cone 3"
Conus abbas Hwass
Indo-Pacific
Uncommon

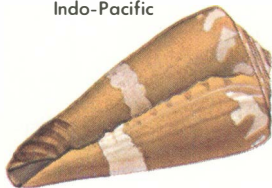


The cones on this page are unusual and the pride of collectors. The Geography Cone is venomous, the General is the most common, and the Pertusa is hardest to find.

Pertusa Cone 1½"
Conus pertusus Hwass
Indo-Pacific



Lithograph Cone 2"
Conus litoglyphus Hwass
Indo-Pacific



Pontifical Cone 1"
Conus dorreensis
Péron and Lesueur
Australia



Bough Cone 4"
Conus thalassiarachus Sowerby
Philippines; uncommon



Geography Cone 5"
Conus geographus Linné
Indo-Pacific



General Cone 3"
Conus generalis L.
Indo-Pacific
Variable colors



Some of these cones are so rare that few collectors have them. Their rarity may indicate that their true habitat, where they may be more common, hasn't been discovered.

Rhododendron Cone 2 1/4"

Conus adamsoni Broderip
Central Pacific; very rare



Bubble Cone 2-3"

Conus bullatus Linné
Western Pacific
Uncommon

Nobility Cone 1-2"

Conus nobilis Linné
Southwest Pacific; rare
in most areas, but less so
in the Sulu Sea, Philippines



Zoned Cone 3"

Conus zonatus Hwass
Andaman Islands
Uncommon





Deep Sea Cone 3"
Conus smirna
Bartsch & Rehder



Cancellate Cone 1½"
Conus cancellatus Hwass
Common offshore



Teramachi's Cone 3"
Conus teramachi Kuroda
Rare; deep water

JAPANESE CONES

Austral Cone 3"
Conus australis Holten
Common offshore



Fulmen Cone 2"
Conus fulmen Reeve
Shallow water; common



Siebold's Cone 3"
Conus sieboldi Reeve
Uncommon offshore



**WEST AFRICAN
CONES**



Prometheus Cone 8-12"
Conus pulcher Lightfoot
Largest living cone
Moderately common



Genuanus Cone 2"
Conus genuanus Linné
Rare



Trader Cone 1½"
Conus mercator Linné
Uncommon



Butterfly Cone 3"
Actually the young of the
Prometheus Cone

FLORIDA-CARIBBEAN CONES



Crown Cone 3"
Conus regius Gmelin
Common on reefs
S. Fla.-W. Indies



Alphabet Cone 3"
Conus spurius Gmelin
Common in sand
Fla.-Gulf of Mexico



◀ **Jeweled Cone ½"**
Conus hieroglyphus Duclos
Caribbean; rare

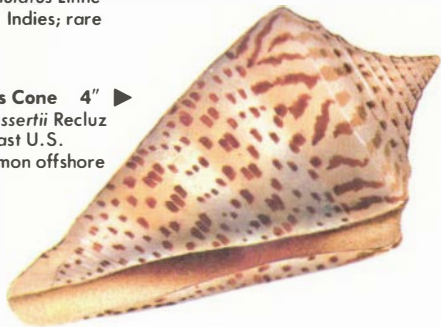


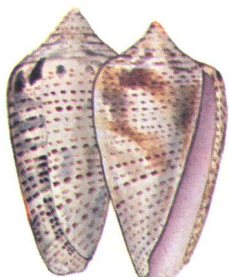
Florida Cone 2"
Conus floridanus Gabb
Common in sand
N. Car.-Florida; variable

Glory-of-the-Atlantic 2"
Conus granulatus Linné
Florida-W. Indies; rare



Sozon's Cone 4" ▶
C. delessertii Recluz
Southeast U.S.
Uncommon offshore





Interrupted Cone 2"
Conus ximenes Gray
Mexico to Peru
Common



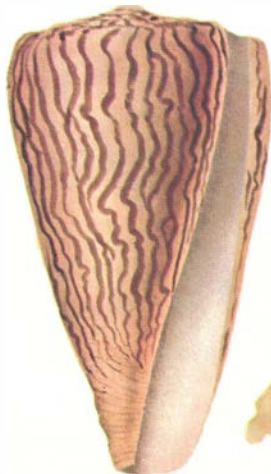
Ladder Cone 2"
Conus gradatus Wood
High-spined *scalaris* form
West Central America; uncommon



Lucid Cone 2"
Conus lucidus Wood
Mexico to Ecuador
Uncommon

PACIFIC PANAMA CONES

Prince Cone 2½"
Conus princeps Linné
Mexico to Ecuador
Uncommon



Pear-shaped Cone 3"
Conus patricius Hinds
Nicaragua to Ecuador
Common



AUGER SHELLS (Terebridae) are long and brightly colored. The radula and poison gland are similar to those of cone shells. No venomous sting has been recorded. Most are tropical sand-dwellers. The largest of some 300 species is the Indo-Pacific Marlin-spike, 6-8 inches long.



Marlin-spike 6-8"
Terebra maculata Linné
Indo-Pacific; abundant

Strigate Auger 1½"
Terebra strigillata Linné
Indo-Pacific; uncommon



Duplicate Auger 3"
Terebra duplicata Lamarck
Australia; common in
sand in shallow water



Tiger Auger 2"
Terebra felina Dillwyn
Indo-Pacific; common



COMMON INDO-PACIFIC AUGERS

Subulate Auger 6"
Terebra subulata Linné
Indo-Pacific; sandy areas



operculum of
Subulate Auger



Muscaria Auger 6"
Terebra areolata Link
Indo-Pacific; near reefs



Dimidiate Auger 6"
Terebra dimidiata Linné
Indo-Pacific; muddy sand

Triseriate Auger 5"
Terebra triseriata Gray
Indo-Pacific; collector's item



enlarged section

Eyed Auger 6"
Terebra guttata Röding
Indo-Pacific; uncommon



Crenulate Auger 6"
Terebra crenulata Linné
Indo-Pacific; common
Left: typical form
Right: *fimbriata* form



INDO-PACIFIC AUGERS



1. Cerithina Auger 1"
Terebra cerithina Lamarck
Common



2. Chlorate Auger 2"
Terebra chlorata Lamarck
Common



3. Affinis Auger 1"
Terebra affinis Gray
Abundant; lives in sand, under rocks



4. Babylon Auger 1"
Terebra babylonica Lamarck
Abundant; lives in sand, under rocks

These small augers live in sand at depths of 3 to 60 feet. They take shelter under small coral rocks. Collectors "fan" the water briskly to stir away the sand and reveal the brightly colored augers. Some people use wire-mesh sieves.



Nebulose Auger 3"
Terebra nebulosa Sowerby
Uncommon; in sand

Lance Auger 2"
Terebra lanceata Linné
Uncommon; in sand



FLORIDA-CARIBBEAN AUGERS



1. Gray Auger $\frac{3}{4}$ "
Terebra cinerea Gmelin
West Indies; common

2. Atlantic Auger 2"
Terebra dislocata Say
S.E. United States; common

3. Florida Auger 3"
Terebra floridana Dall
Off Florida; uncommon

4. Flame Auger 4-6"
Terebra taurinus Lightfoot
A rare West Indian species

5. Shiny Auger 2"
Terebra hastata Gmelin
Florida-West Indies; common

CENTRAL AMERICAN AUGERS



1.

1. Variegate Auger 2"
Terebra variegata Gray
Panama; moderately common



2.

2. Robust Auger 4"
Terebra robusta Hinds
Mexico to Ecuador; uncommon



3.

3. Zebra Auger 4"
Terebra strigata Sowerby
Mexico to Panama; uncommon

In sandy areas between Baja California and Ecuador about 40 species of *Terebra* are found. A few are outstanding in color and size; most are small; some very common. These three burrow in muddy sand.

TURRID SHELLS (Turridae) are a highly evolved group of marine gastropods. The radular teeth have been reduced to a single row in most forms. Most have a "turrid" notch or indentation on the upper part of the outer lip. Several hundred species of variable shapes are found both in very deep and in shallow water. Turrid shells vary in length from



▲ **Babylon Turrid 3"**
Turris babylonica Linné
Indo-Pacific; common



▲ **Fusiform Turrid 3"**
Spergo fusiforme Kur. & Habe
Japan; rare



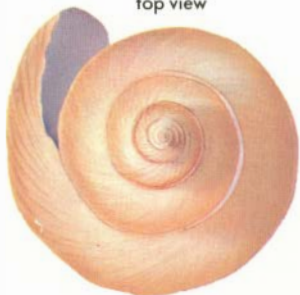
▲ **Humped Turrid 2"**
Crassispira gibbosa Born
West Indies; rare



▲ **Ear Turrid 1"**
Clavus canalicularis Röding
Indo-Pacific; common

$\frac{1}{16}$ to 5". The Miraculous Thatcheria, below, is the world's largest turrid shell. A few cold-water species are sinistrally coiled, or "left-handed." Japan alone has over 400 species of turrids.

top view



JAPANESE TURRIDS

face view



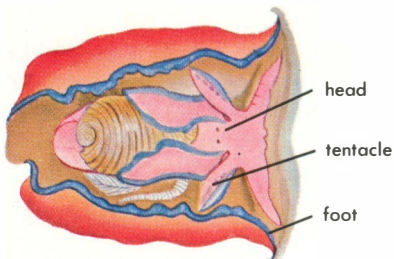
Miraculous Thatcheria 4-5"
Thatcheria mirabilis Sowerby
 Japan; deep water
 Moderately common



Left-handed Turrid 2"
Antiplanes contraria Yokoyama
 Bering Sea; uncommon



Dall's Aforia 3"
Aforia circinata Dall
 Japan; common offshore



Living Paper Bubble

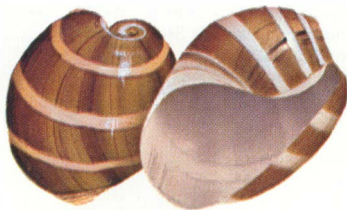


Paper Bubble 2"; *Hydatina physis* L. Indo-Pacific

BUBBLE SHELLS (order Tectibranchia) have external, plume-like gills and both sexes present in the same individual. Some have internal shells, but those of the bubble shell family (Bullidae) are external, large, and spacious. Bubble shells, mostly tropical, are carnivorous. They lay eggs in long, gelatinous strands.



Atlantic Bulla 1½"
Bulla striata Bruguière
West Indies; abundant



White-banded Bubble 1"
Hydatina albocincta Hoeven
Japan; uncommon

Amplustre Bubble 1½"
Aplustrum amplustre Linné
Indo-Pacific; uncommon



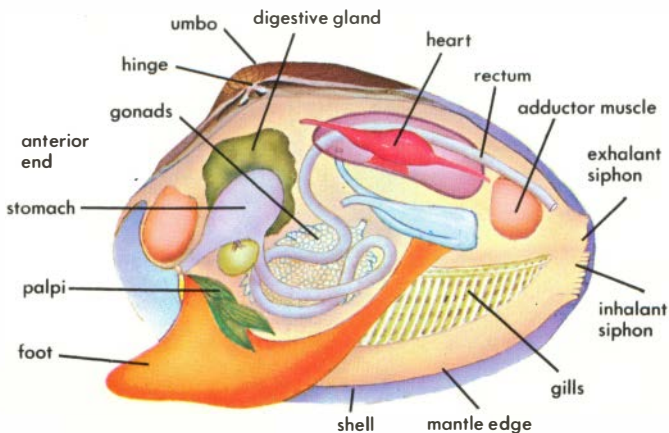
Pacific Bubble 2"
Bulla ampulla Linné
Indo-Pacific; abundant



THE BIVALVES

The pelecypods, or lamellibranchs, the second largest class of mollusks, contain about 10,000 species of bivalves, including the clams, mussels, oysters and scallops. About one third live in fresh water; the others are marine. They lack a head and radular teeth. Feeding is aided by the gills, and most species live on microscopic plant life. The mantle is modified at the posterior end into two tubular siphons which draw and expel water from the mantle cavity. The two shells (valves) are kept closed by strong adductor muscles, and kept slightly open by the action of an elastic, horny pad or ridge—the ligament. Most bivalves shed their eggs directly into the water, but a few brood the young in gill pouches. The sexes may be combined in one individual or may be separate.

Oysters, clams and scallops are a major source of food. From oysters come valuable pearls. The Teredo Shipworm, a bivalve, is destructive to wharf pilings.



ARK SHELLS (Arcidae) have a long series of small, similar teeth on the hinge. They have no siphons and most are anchored by a byssus of hairlike threads. Of 200 species (24 American) most are tropical; many are gathered commercially for food.



West Indian Turkey Wing 3"

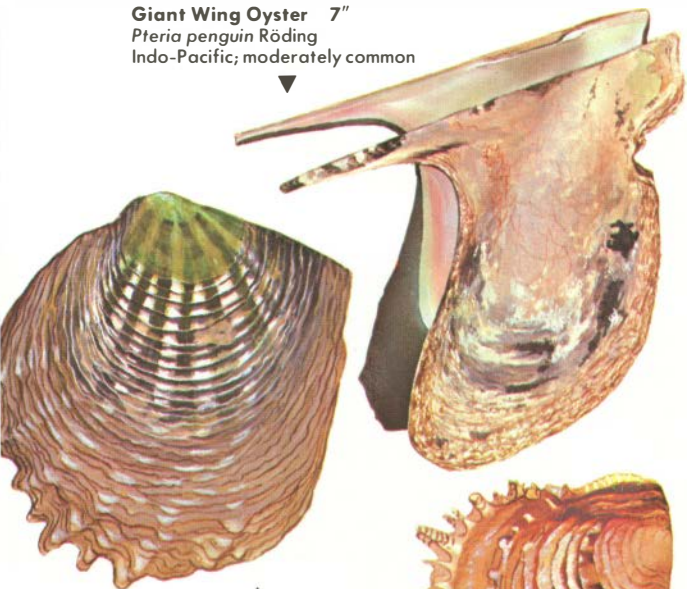
Arca zebra Swainson
Carolina to W. Indies
and Bermuda



PEN SHELLS (Pinnidae), large and fragile, live buried in soft sand anchored by a silky byssus. Ancients made a "golden fleece" from the byssal threads of Giant Mediterranean Pen, *Pinna nobilis* Linné, 14" (front). The black shell (back) is the American Stiff Pen Shell, *Atrina rigida* Lightfoot, 7"

WING OYSTERS (Pteriidae), edible but unpalatable, seldom produce precious pearls. Tropical species, with pearly interiors and long, winglike projections of the hinge, have fragile shells. Wing oysters attach themselves to the ocean bottom and to wharf pilings.

Giant Wing Oyster 7"
Pteria penguin Röding
Indo-Pacific; moderately common



PEARL OYSTERS, six tropical species, live on rocky ocean bottoms. Layers of calcium carbonate around a foreign body in the mantle make pearls. Most productive are the Black-lipped, above (*Pinctada margaritifera* Linné, S. E. Asia, 6") and Japanese, right (*P. martensii* Dunker, 3").

HAMMER OYSTERS (*Isognomonidae*)



side view



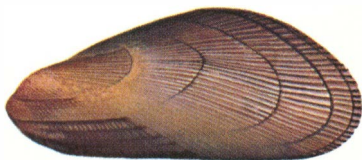
◀ **Flat Tree Oyster 3"**
Isognomon alatus Gmelin
Florida and W. Indies; common
Lives in lower mangrove branches



Common Hammer Oyster 4-6"
Malleus malleus Linné
Indo-Pacific; common

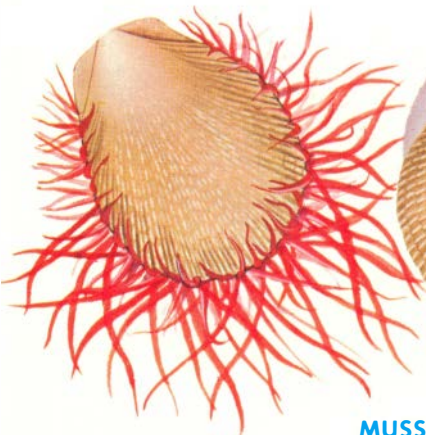
◀ **White Hammer Oyster 4-7"**
Malleus albus Lamarck
Indo-Pacific. Shallow water;
anchors to bottom; common

MUSSELS (Mytilidae) are the most abundant of all mollusks. They occur in dense colonies on rocky shores and wharf pilings. Mussels protect and feed many kinds of snails, worms, and crabs. **FILE CLAMS** (Limidae) swim away from predators by flapping their shells and tentacles. Some file clams build nests for protection.



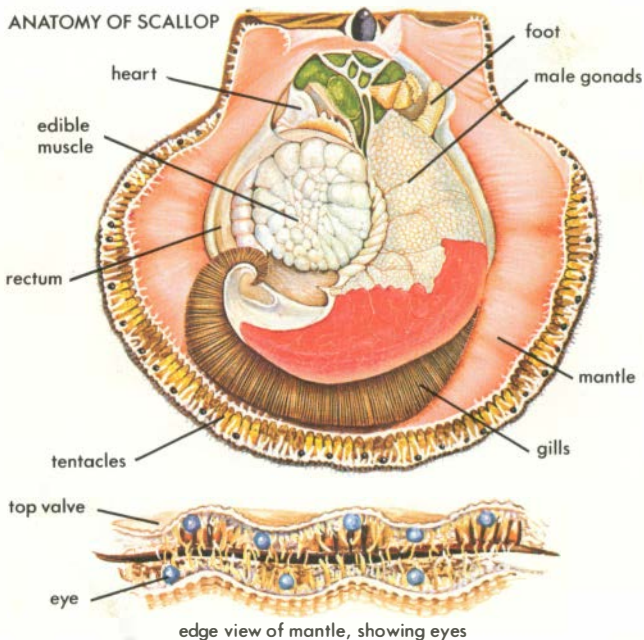
Atlantic Ribbed Mussel 3-4"
Geukensia demissa Dillwyn
Lives in marsh peat
Canada to Texas

Blue Edible Mussel 2-3"
Mytilus edulis Linné
Lives on rocky coasts
Europe and N.E. America



Rough File Clam 2-4"
Lima scabra Born
Florida and W. Indies
Living clam at left

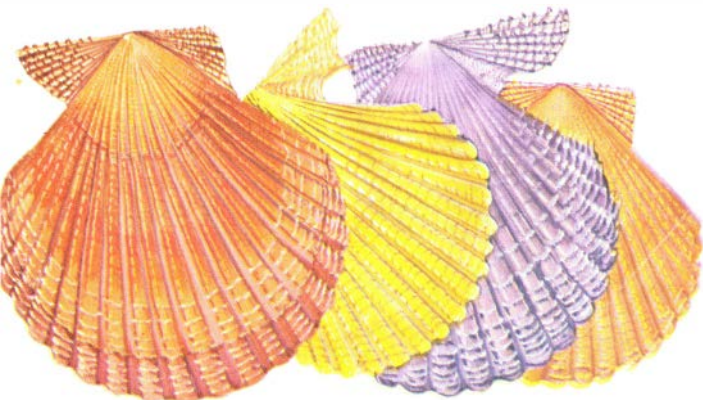
SCALLOPS (Pectinidae) are a worldwide group of several hundred species, including several large northern kinds fished commercially for the large single muscle, which is excellent eating. By snapping their shells together, scallops propel themselves rapidly in a zigzag direction. Most kinds have a series of brightly colored eyes along the edge of the mantle. These are sensitive to minor changes in light intensity, as might be caused by a passing fish. What appear to be the top and bottom valves of the scallop are actually left and right valves. The left (lower) valve is usually more convex.



JAPANESE SCALLOPS. These two deep-water species show an unusual range of pastel color variations.

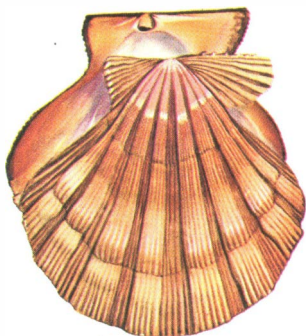
Top Row: **Swift's Scallop 3-5"** *Chlamys swifti* Bernardi

Bottom Row: **Noble Scallop 3-5"** *Chlamys nobilis* Reeve

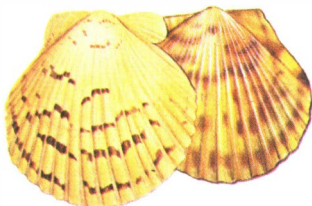


EASTERN AMERICAN SCALLOPS are found from Labrador to the West Indies. The Calico Scallop, used in shell jewelry, is abundant offshore in south Florida. Lion's Paw, a strong heavy shell, is a collector's favorite. Atlantic Deep Sea and Atlantic Bay Scallops, both common on the East Coast, are popular seafood.

Lion's Paw 3-5"
Lyropecten nodosus Linné
Florida-W. Indies



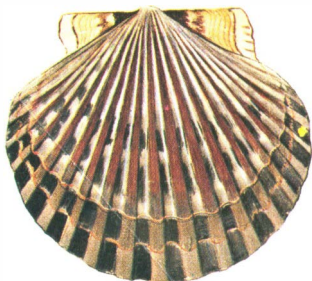
Calico Scallop 1-2"
Argopecten gibbus Linné
S. E. U.S.-Caribbean



Atlantic Deep Sea Scallop 8"
Placopecten magellanicus Gmelin
Labrador-Carolinas
Commonly dredged for food purposes



Atlantic Bay Scallop 4"
Argopecten irradians Lamarck
Eastern United States; abundant



INDO-PACIFIC SCALLOPS do not compare with other famous shells of this region. Most unusual is large Asian Moon Scallop with bottom valve white, top valve colored.

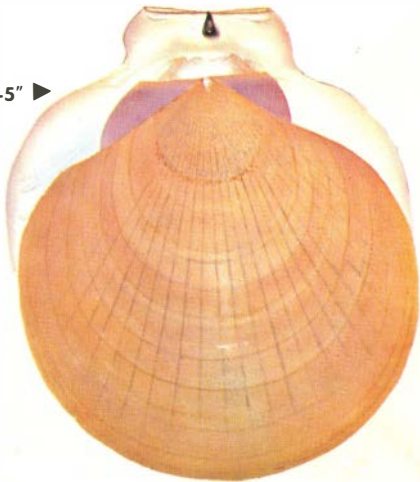


Leopard Scallop 3"
Annachlamys leopardus Reeve
Northern Australia; uncommon

Mantle Scallop 3"
Gloripallium pallium Linné
Indo-Pacific; common

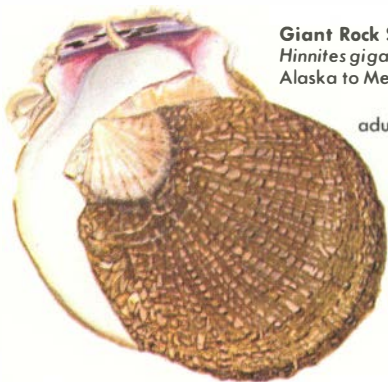
Asian Moon Scallop 4-5" ▶
Amusium pleuronectes L.
S.E. Asia
Deep water; common

Folded Scallop 2"
Decatopecten plica Linné
S.E. Asia



THORNY OYSTERS are not related to true oysters. The huge *Hinnites* of western American waters is in the scallop family and may weigh up to 20 lbs. The thorny oysters of the family Spondylidae have a typical ball-and-socket

Giant Rock Scallop 4-8"
Hinnites gigantea Gray
Alaska to Mexico



adult form



young form

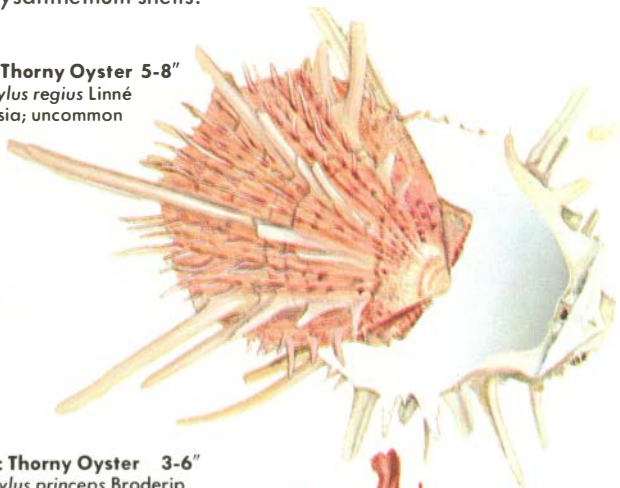
Atlantic Thorny Oyster 6" *Spondylus americanus* Hermann
Florida and Caribbean; two color forms shown below



hinge joint and develop long spines. They occur in deep water, usually in the tropics, and have a rich, varied color pattern. These fairly common bivalves are sometimes called chrysanthemum shells.

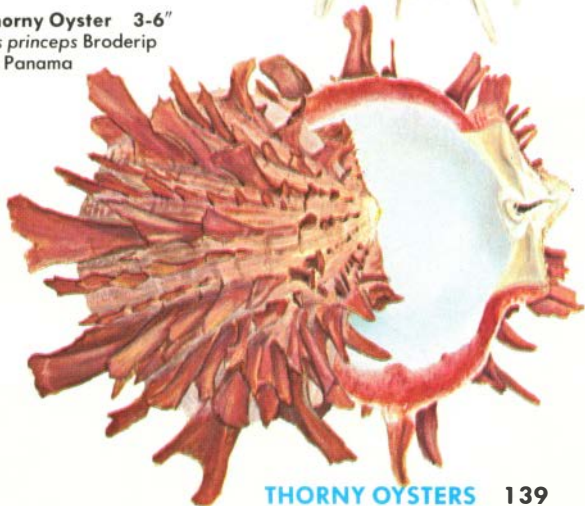
Regal Thorny Oyster 5-8"

Spondylus regius Linné
S.E. Asia; uncommon



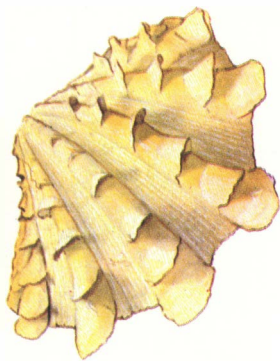
Pacific Thorny Oyster 3-6"

Spondylus princeps Broderip
Mexico to Panama
Common





Giant Clam 2-4 ft.
Tridacna gigas Linné
Indo-Pacific



Fluted Giant Clam 3-12"
Tridacna squamosa Lamarck
Indo-Pacific

GIANT CLAM (Tridacnidae) is the largest shelled mollusk, exceeded only by the 55-ft. Giant Squid of the North Atlantic. It is not a man-eating clam. The Giant Clam of Indo-Pacific coral reefs feeds on colonies of marine algae which grow in its fleshy mantle. A non-precious pearl the size of a golf ball may be produced.



Giant Clam in coral reef.
Color of mantle varies.

JEWEL BOXES (Chamidae), about 20 species of them, live attached to rocks and wrecks. These tropical shells are variable in form and brilliantly colored.

Lazarus Jewel Box 4"
Chama lazarus Linné
Indo-Pacific

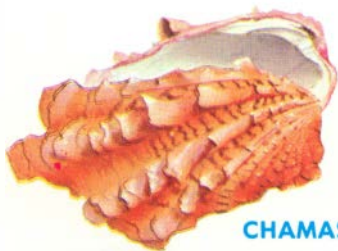
Leafy Jewel Box 3"
Chama macerophylla Gmelin
Florida and Caribbean



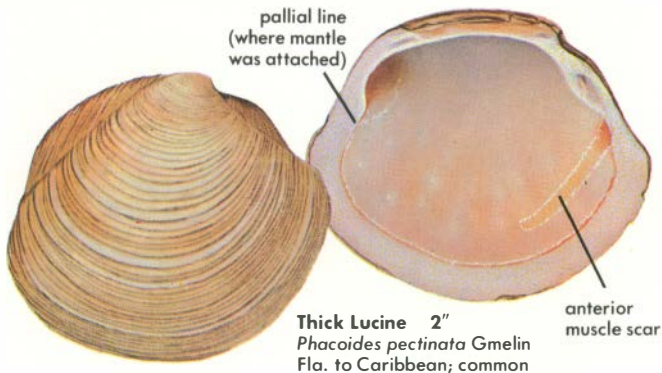
CARDITAS (Carditidae), also from tropical waters, are long and radially ribbed. They are common clams of shallow, muddy bays. About 30 species have been recorded.

Rosy Cardita 2"
Cardita crassicosta Lamarck
Australia; uncommon

Broad-ribbed Cardita 1-1½"
Cardita floridana Conrad
Florida; abundant



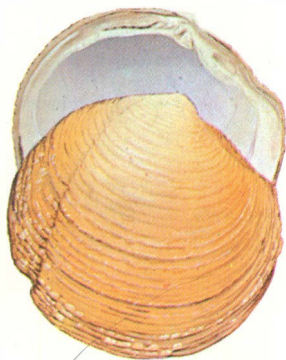
LUCINES (Lucinidae) are worldwide tropical clams with strong, thin shells and long anterior muscle scars. The two siphons are very short; the hinge may be well toothed or toothless. Most of the 200 species are eaten by fishes but a few are used as food by man. The Elegant Fimbria is a delicately formed and tinted relative.

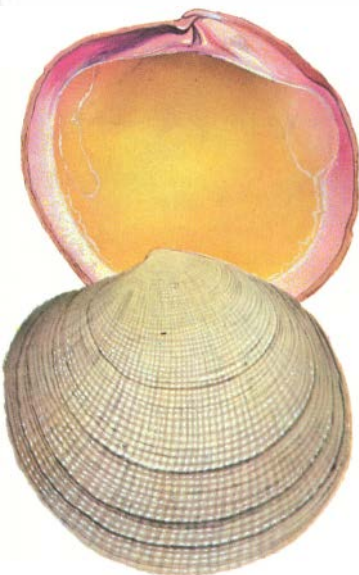


Buttercup Lucine 2"
Anodontia alba Link
S.E. U.S.-Caribbean; abundant



Pennsylvania Lucine 2"
Lucina pennsylvanica Linné
S.E. U.S.-Caribbean; common





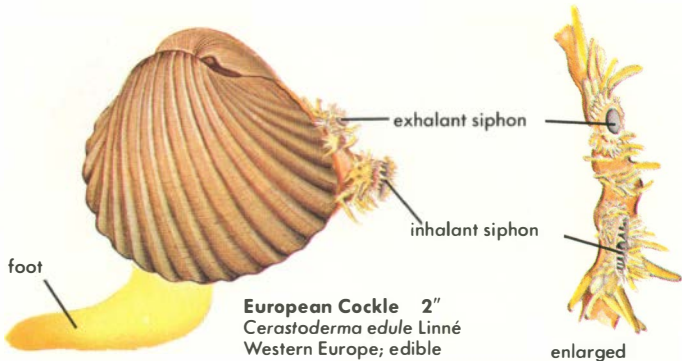
Pacific Tiger Lucine 5"
Codakia tigerina Linné
Indo-Pacific; abundant



Punctate Lucine 3"
Codakia punctata Linné
Indo-Pacific; common

Elegant Fimbria 3"
Fimbria soverbii Reeve
S.W. Pacific; rare





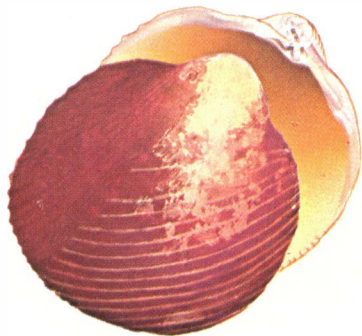
COCKLES (Cardiidae) are a large group of colorful species which demonstrate an evolutionary explosion, the result of which is an array of bizarre shapes showing all degrees of sculpturing. Some species are copious and ribbed; others are compressed. Cockles are active animals. They can jump several inches by means of a long, powerful foot. A current of water entering through the inhalant siphon brings food and a supply of oxygen. Cockles are a food for fishes as well as for man.



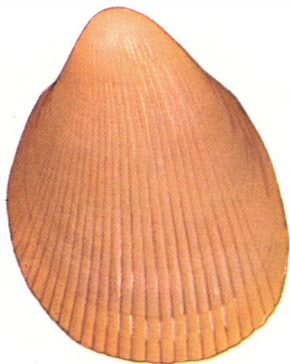
Costate Cockle 4"
Cardium costatum Linné
 West Africa; common



Prickly Cockle 2"
Trachycardium egmontianum Shutt.
S.E. U.S.; common in sand
Sometimes pure white (albinistic)



Lyrate Cockle 2"
Discors lyrata Sowerby
S.E. Asia; uncommon



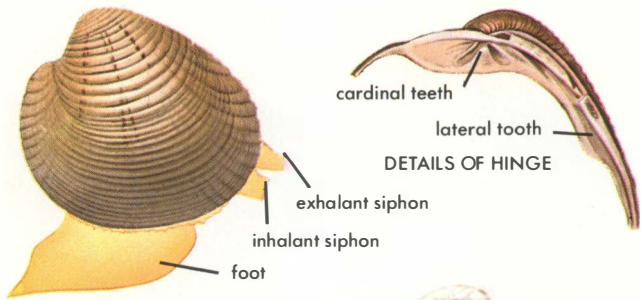
Oblong Cockle 2"
Laevicardium oblongum
Gmelin
Europe; uncommon



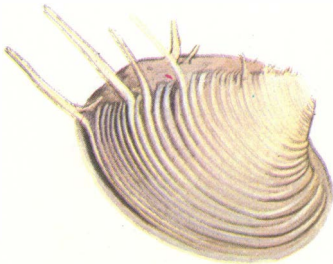
Heart Cockle 3"
Corculum cardissa Linné
Indo-Pacific; common

Half-heart Cockle 1½"
Hemicardium hemicardium Linné
Indo-Pacific; uncommon





European Venus 3"
Venus verrucosus Linné
 Europe

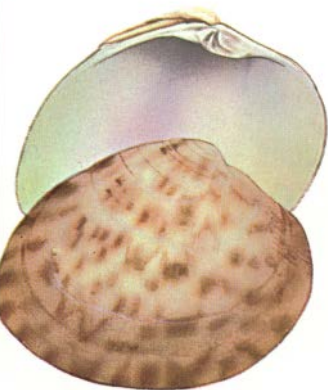


Royal Comb Venus 2"
Pitar dione Linné
 Tex. to Carib.; uncommon

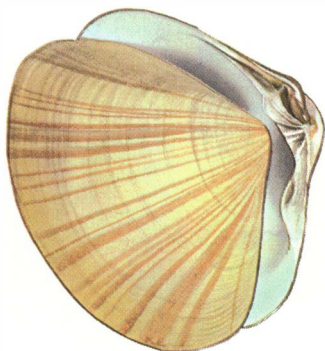


Hard Shell or Quahog 3"
Mercenaria mercenaria Linné
 Eastern U.S.; edible

VENUS CLAMS (Veneridae) are probably the most successful of all the clams. Over 400 abundant species occur the world over. All have hinges which bear interlocking lateral and cardinal teeth. The well-developed foot is compressed and hatchet-shaped. American Indians once manufactured their wampum from the Quahog, the chief commercial clam of east coastal U.S. Young Quahogs are known as cherrystones and littlenecks. The Philippines have over one hundred varieties of venus clams.

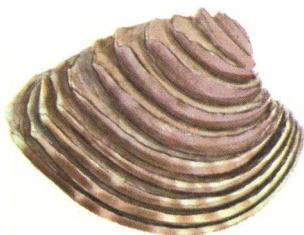


Calico Clam 2"
Macrocallista maculata Linné
Carolinas to Caribbean
Introduced to Bermuda
Abundant

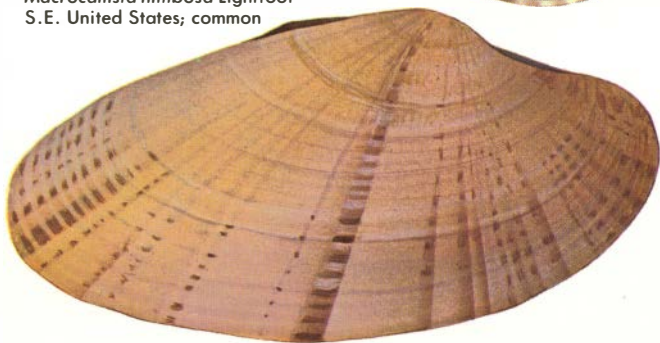


Pismo Clam 5"
Tivela stultorum Mawe
Calif. to Mexico
Abundant

King Venus 1½" ▶
Chione paphia Linné
West Indies; uncommon



Sunray Venus 5"
Macrocallista nimbosa Lightfoot
S.E. United States; common



INDO-PACIFIC VENUS CLAMS



Wedding Cake Venus 2½"
Callanaitis disjecta Perry
Australia; uncommon



Lamellate Venus 2"
Antigona lamellaris Schumacher
Indo-Pacific; common

Golden Venus 3"
Paphia euglypta Philippi
East Asia; uncommon

Squamose Venus 1"
Anomalodiscus squamosus L.
S.E. Asia; common



exterior

interior



◀ **Lettered Venus** 3"
Tapes literata Linné
Indo-Pacific; common

TELLINS (Tellinidae) are a large, mainly tropical family of sand-dwelling clams with elongate fragile shells and two long, separate siphons. Over 200 species; most are shiny and delicately tinted. The Sunrise Tellin is used in shell-jewelry manufacture.

Candy Stick Tellin 1"
Tellina similis Sowerby
Fla.-Caribbean; abundant



Hatchet Tellin 1"
Tellina donacina Linné
Mediterranean



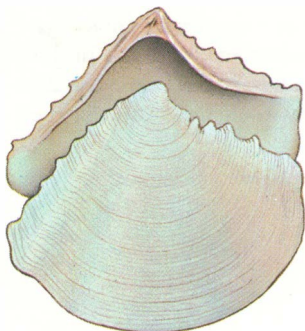
◀ **Sunrise Tellin 3"**
Tellina radiata Linné
Fla. and West Indies
Abundant in sand

Virgate Tellin 2½"
Tellina virgata Linné
Indo-Pacific; common

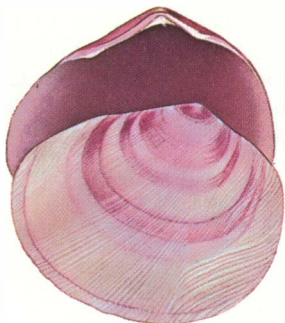


Rostrate Tellin 3"
Tellina rostrata Linné
S. E. Asia; rare





Burnett's Tellidora 1½"
Tellidora burnetti Broderip
West Mexico; uncommon

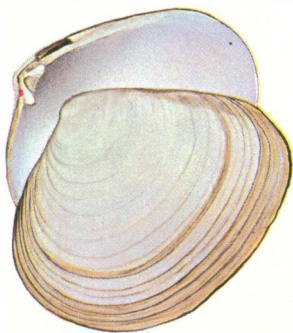


Large Strigilla 1"
Strigilla carnaria Linné
S.E. U.S.-Caribbean

Atlantic Grooved Macoma 3"
Psammotreta intastriata Say
Florida-Caribbean

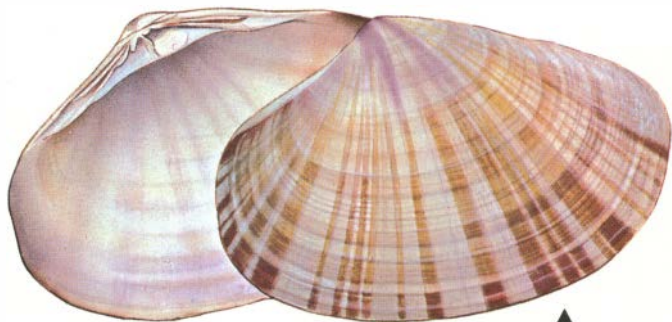


Bruguère's Macoma 2"
Macoma bruguèrei Hanley
Philippines; uncommon



Close relatives of the true tellins (*Tellina*) are the strigillas of shallow, sandy bottoms. The shells are finely sculptured. The macomas are twisted toward the back and the hinge lacks the lateral teeth.

SURF CLAMS (Mactridae) include many large edible clams with a spoon-shaped depression on the hinge. The Atlantic Surf Clam, common on sandy beaches, is the source of commercial clam chowder. The duck clams, *Raeta*, of warm waters, have thin, fragile shells.

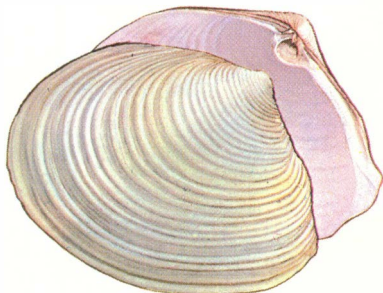


Oblong Surf Clam 5"
Lutraria oblonga Gmelin
Western Europe ▼

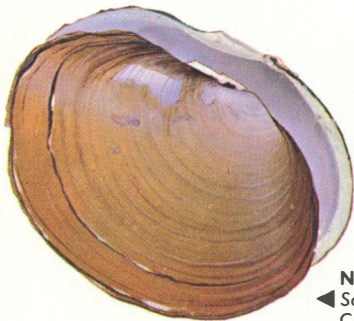
Hians Surf Clam 3"
Mactra hians Philippi
S.E. Asia; common ▲



Channeled Duck Clam 3"
Raeta plicatella Lamarck
Carolinas to Carib.; common

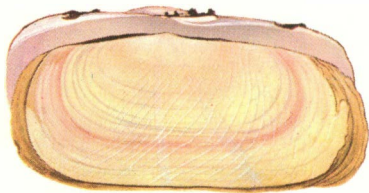


SANGUIN CLAMS (Psammobiidae), of tropical, shallow, muddy waters, are closely related to the tellin shells. The thin, nearly transparent shells are drab in color with purple and browns predominating. About 100 species are known, many edible.



Violet Sanguin 2"
Soletellina violacea Lamarck
East Indies; common

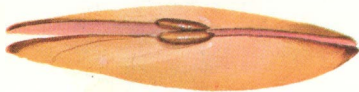
Nuttall's Mahogany Clam 3"
◀ *Sanguinolaria nuttalli* Conrad
California to Mexico; common



Mediterranean Solecortus 3"
Solecortus strigilatus Linné
Mediterranean; uncommon



Operculate Sanguin 2"
Sanguinolaria cruenta Lightfoot
Caribbean-Brazil
Note that one valve is flatter than the other.
Color often rose.





The **Gaudy Asaphis**, *Asaphis deflorata* Linné, shown above, is a colorful 3-in. sanguin clam from the Caribbean. It is common in the intertidal zone in gravel. Colors may be rose, white or purple.

WEDGE CLAMS (Donacidae) are small, wedge-shaped clams found in the sand of nearly every temperate and tropical beach. Most of the 50 species are edible. The Atlantic Coquina is also known as the Butterfly Shell.

Atlantic Coquina 1/2"
Donax variabilis Say
 S. E. U.S.; makes good soup



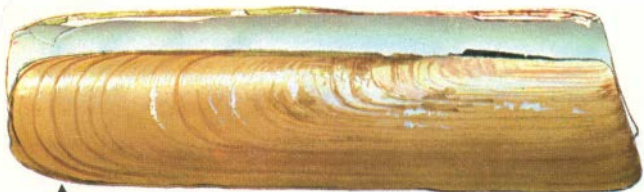
Giant South African Wedge 3"
Donax serra Gmelin
 South Africa; common



Californian Wedge 1"
Donax californicus Conrad
 California to Panama



JACKKNIFE CLAMS (Solenidae) are the true razor shells which dig a foot or more into sandy beaches with their curved, powerful foot. The Atlantic Jackknife is the largest and most common on the eastern Atlantic coast. It and Pacific species are harvested commercially. About 40 species are known. In the genus *Solen* the hinge teeth are at the very end of the shell; in *Ensis* they are a bit forward.



▲ **Giant Japanese Solen** 5"
Solen grandis Dunker
Eastern Asia

Gould's Solen 5"
Solen gouldi Conrad
Eastern Asia ▼



Atlantic Jackknife Clam 6-7"
Ensis directus Conrad
Labrador-Carolinas ▼

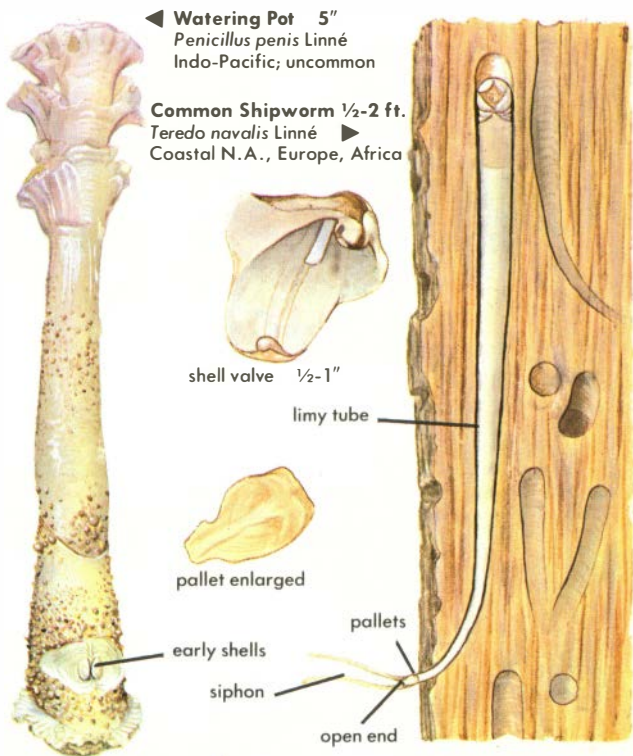


Rose-spotted Solen 2"
Solen roseomaculatus Pilsbry
Japan ▼

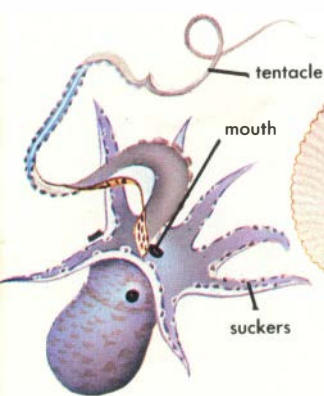
Philippi's Razor 2"
Ensiculus philippianus Dunker
S.E. Asia; uncommon ▼



SHIPWORMS (Teredinidae) are highly specialized mollusks. The adult is a destructive wood borer, honeycombing wooden ships and pilings with burrows cut by the small sharp-edged shells. The mantle secretes lime to line the tube, and two paddle-shaped pallets regulate the siphon openings. The Watering Pot (Clavagellidae) buries its shelly tube in the mud or sand. Lower end is perforated.



ARGONAUTS AND NAUTILUS, Class Cephalopoda, the most highly developed mollusks, also include the octopus and squid. Cephalopoda have heads with eight or more tentacles and highly developed eyes. The sexes are separate. All are carnivorous and most lack shells. The female Paper Nautilus secretes a shell with a specialized arm to



a male Argonaut

"shell" of female

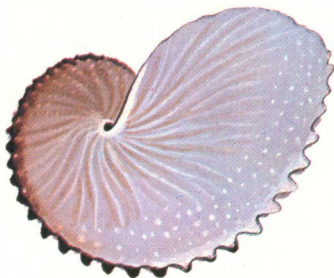


Common Paper Nautilus 6-12"
Argonauta argo Linné
Worldwide, warm seas

Brown Paper Nautilus 3"
Argonauta hians Lightfoot
Worldwide, warm seas



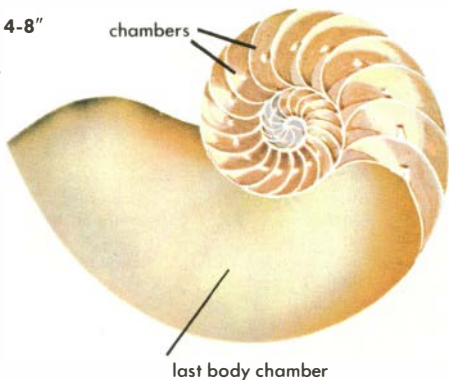
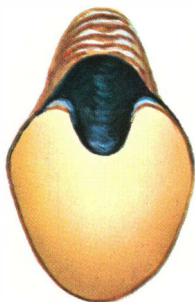
Nodose Paper Nautilus 5"
Argonauta nodosa Lightfoot
Worldwide, warm seas



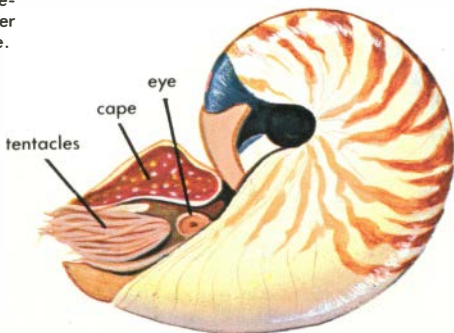
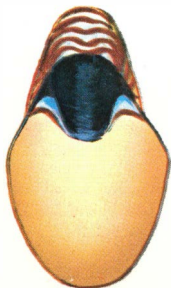
protect her eggs. The smaller male makes no shell. The Chambered, or Pearly, Nautilus lives in tropical deep water, swimming in search of crabs and shellfish. Surrounding the mouth are 60-90 small tentacles. The sealed-off, gas-filled chambers serve as a balancing apparatus. It is most abundant in the central Philippines.

Chambered Nautilus 4-8"
Nautilus pompilius Linné
 W. Pacific ocean bottoms

cross section



End views of the Chambered Nautilus. The female below is narrower than the male seen above.





INDEX

Because this book deals with 200 genera involving over 1,100 scientific and popular species names, this index has been condensed to aid the reader in locating the families and genera in which the illustrated species occur.

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