Atlantic and Gulf Coast Shells

The tenth in Nature Magazine's series of educational inserts

By E. LAURENCE PALMER

REPRESENTING some of the more interesting specimens, the shells shown on the plates in this insert were collected by the author and his wife along the Atlantic Coast from Maine to Florida.

Suggestions for the collection, cleaning and preservation of shells are given on the School Page of this number of NATURE MAGAZINE.

It is proposed that this insert will be followed later by a similar treatment of the Pacific Coast shells, collections of these having already been made for this purpose. Not a few of the shells shown in this insert may be found on the Pacific Coast, and close relatives of still others may be found there. Thus the present insert should have value to West Coast readers as it is.

As is the case with other inserts of this series, this article is an elaboration and a modification of a similar article dealing with the sea prepared by the author and published by the New York State College of Agriculture at Cornell University as a number of the *Cornell Rural School Leaflet*. Appreciation is expressed to the college for permission to rewrite this material. Other references that helped in studying these shells, and which should be useful to shell students generally, follow. To them the author acknowledges his appreciation. In general, the nomenclature followed is that used by Charles W. Johnson in his *List of Marine Mollusca of the Atlantic Coast from Labrador to Texas,* published in 1934 as volume 40, number 1 of the Proceedings of the Boston Society of Natural History. The photographs are by Dr. Katherine V. W. Palmer.

Marine Shells of the Florida Southwest Coast by Louise M. Perry. Paleontological Research Institution, Ithaca, New York. 1940. The most useful reference on animal behavior.

East-coast Marine Shells by Maxwell Smith. Edwards Brothers, Ann Arbor, Michigan. 1937.

The Sea-beach at Ebb-tide by Augusta Foote Arnold. The Century Company, New York. 1901.

The Shell Book by Julia Ellen Rogers. Doubleday, Page and Company, New York. 1908.

Florida Sea Shells by Bertha Aldrich and Ethel Snyder. Houghton Mifflin Company, New York. 1936.

What Shell is That? by Percy A. Morris. D. Appleton-Century Company, New York. 1939.

Manual of the Common Invertebrate Animals Exclusive of the Insects by Henry Sherring Pratt. P. Blakiston's Son and Company, Philadelphia. 1935.

The Pelecypods or Bivalves

(Plates 1 and 2, pages 342 and 343)

The shells of these animals are to be found in the shallower fresh or salt waters of the world. They are valuable as indicators of ancient shorelines. As fossils, they are found imbedded in the rocks of some of our higher mountains, deposited there when the mountains were at sea level. Their trails in the muds and sands intrigue us. The pearls that may be developed within them dazzle us. The soft parts of the bodies of some of them are delicious. Their shells, made into buttons, are useful in holding our clothing around our bodies. They are important in road building. They were used by primitive peoples as weapons, as skin scrapers, as agricultural implements and as vessels for holding food. Some of them have been used as media of exchange; some, in the making of wampum and as ornaments.

In 1937, oysters as food in the United States and Alaska yielded $8,703,000 and clams $3,112,000, the former exceeding in value any fish, except the salmon and tuna. Returns from the latter just about matched those from cod.

The shells of pelecypods are abundant in the midden heaps of ancient peoples. Musical instruments, ornaments and utensils made of the shells of pelecypods are abundant in the midden heaps of American Indians in the West, middle West and the East. Other midden heaps still are being made by minks, otters and muskrats. Many of the fresh-water pelecypods are eaten, shells and all, by otters, but the minks and muskrats usually open the shells and eat only the soft animal within.

Many modifications are found in animals to help them get the shellfish they use as food. These may be mouths paved with bony plates to crush the animals; ghastly-looking teeth, such as are found on sheepshead; great teeth, like those of the walruses, which tear the animals free from the bottom.

It is only natural that those interested seriously in the study of shells should have named the various parts of shells to assist in making descriptions. Almost any zoology text will provide this information. This applies also to most of the details concerned with the soft parts of the animal. However, the casual student of shells should know something of what makes the animal behave as it does.

If a bivalve such as a clam has one shell broken, a thin tissue, the mantle, will be seen to enclose the soft interior. Near the opening, between the shells, this mantle may, in some pelecypods, be brilliantly-colored, fringed, fluted and attractive. Through this part of the mantle will appear two openings; one for the siphon through which a stream of water enters the animal; the other for the siphon through which the waste water is discharged. The length and shape of these siphons vary greatly in the different species.

Another opening in the mantle enclosing the soft parts of a pelecypod permits the extension of the muscle, or so-called foot. With the single foot most of these animals possess, they are able to push their bodies along the bottom. Often this leaves a conspicuous trail in the mud or sand. In some cases, the animal is able to move the foot quickly so that movement by a series of sudden jerks and leaps is possible.

In a number of bivalves, the edge of the mantle is marked with sensory organs detecting light and serving as eyes. A moving shadow may cause sudden changes in the position of living bivalves thus provided. There may be conspicuous flapping movement, or merely withdrawal of the soft part into the protection of the shells.

The mantle, foot, and the siphons are all soft parts and may be protruded from between the hard shells of the living animals. Some have another external structure with which they attach themselves to the bottom or other permanent support. This "byssus" is particularly evident in the mussels.

The pelecypods figured on pages 342 and 343 are as follows:

FAMILY ARCIDAE. The members of this family have comb-like teeth in rows on the hinge. The foot is large and the mantle-edges bear a row of eyes. The shells are relatively heavy and have a thick velvety or hairy covering or epidermis, which wears off variously in the dead shells. The family is an ancient one. It is represented by many fossils. Its largest species is to be found at Panama, and in India there is a species that lives in the Ganges River hundreds of miles from the sea.

1. Black Ark, Widow or Ponderous Ark. *Noetia ponderosa.* Length, 2 to 2½ inches. Shell, heavy, swollen, with about 32 flattened, radiating ribs; yellowish-white, with a dark shaggy cover. Interior, yellowish-white, but white and glossy at the edge. Massachusetts to Florida and Texas, being exceedingly abundant on beaches in the southern part of its range.

2. Ark Shell. *Arca campechiensis.* This is called the "bloody clam" because of its red blood. It varies greatly with the environment, being largest at Cape Cod. The shell is 2 to 2½ inches long with a height of 2 inches. The ribs of the left valve are commonly flatter and narrower than those of the right. The species occurs from Massachusetts to Texas; common on Long Island and New Jersey coast. The variety *pexata* is found from Massachusetts to North Carolina.

3. Ark Shell. *Arca transversa.* Length, 1½ to 2 inches; width, about the same; height, ⅔ the length. Brown. Ribs, about 35,

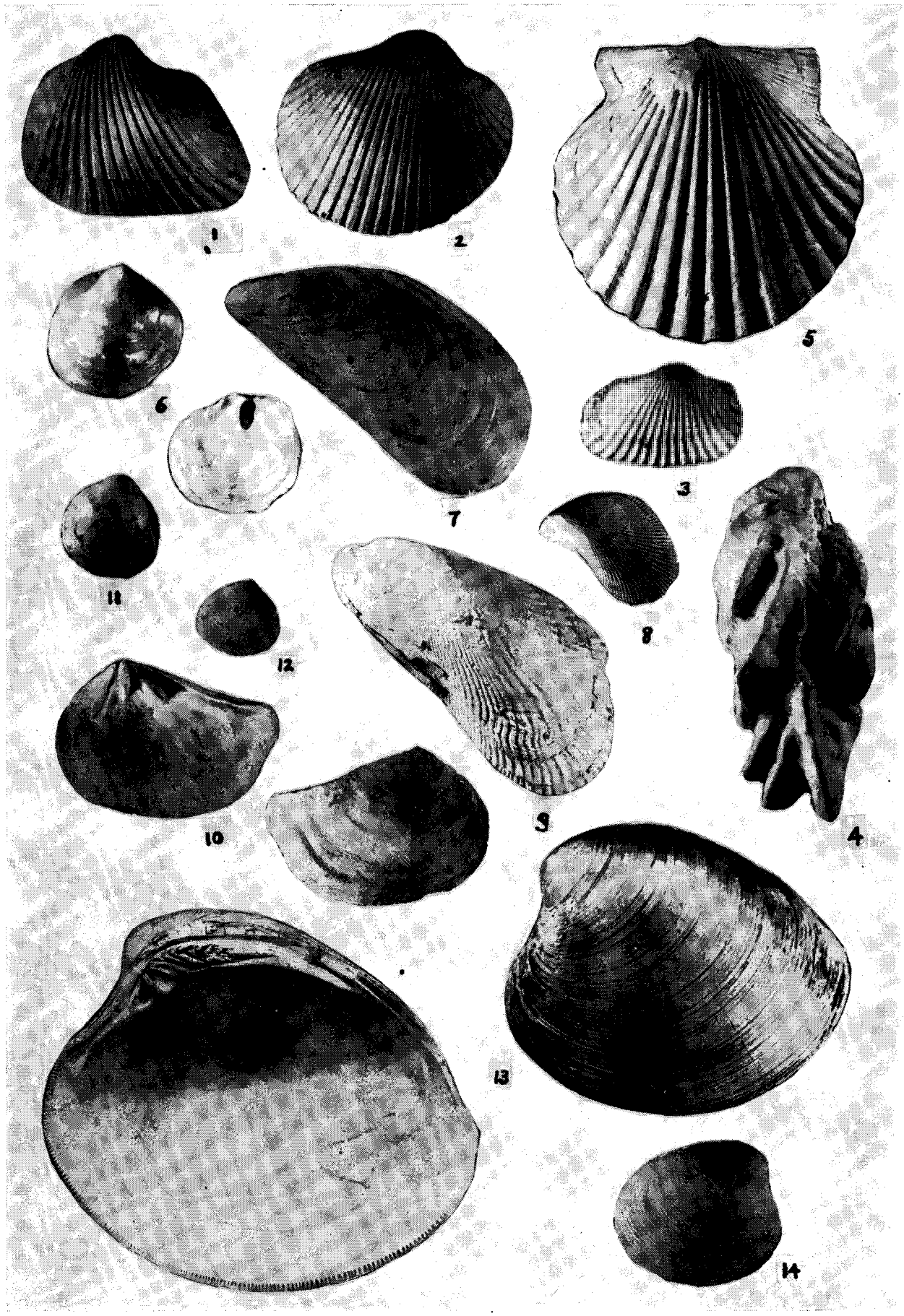
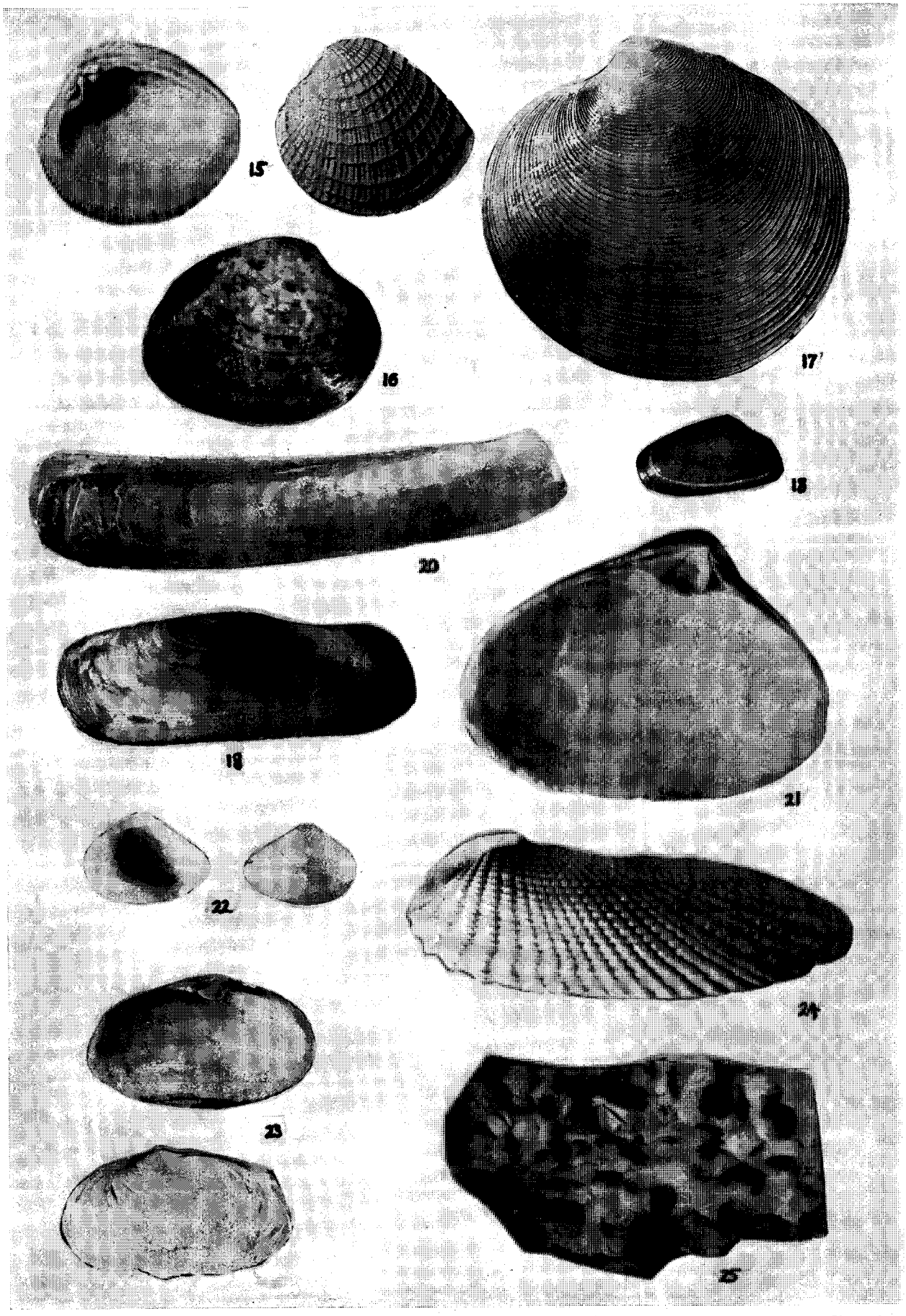


Plate No. 1



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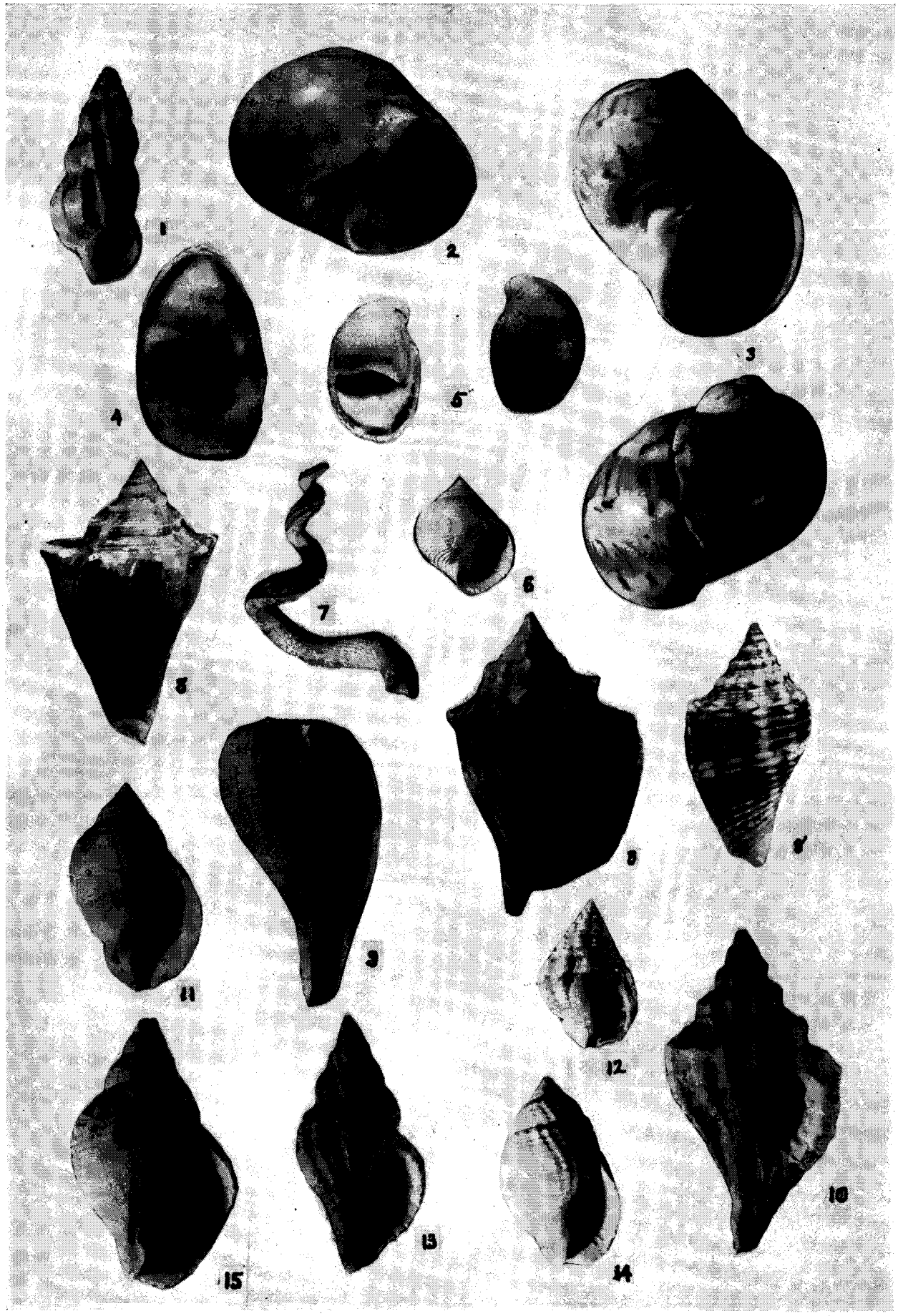

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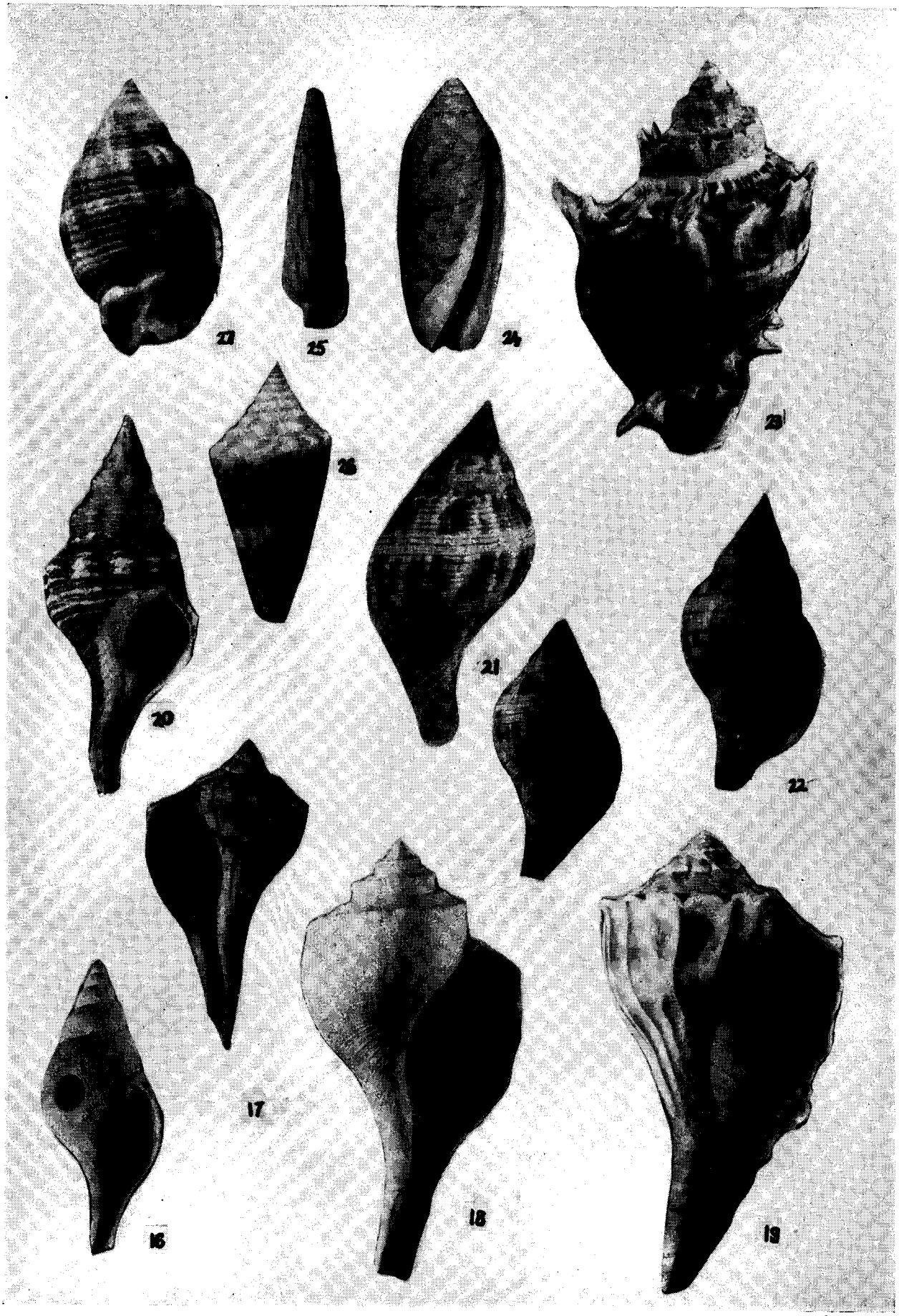

Plate No. 4

deeply-cut. Found in shallow water from Massachusetts to Texas, but particularly on Nantucket and the west coast of Florida.

FAMILY OSTREIDAE. This family of pelecypods includes the oysters, which, according to Pliny, have been cultivated by man since the first century B. C. The animals vary greatly because they modify their shape in accordance with the bottom to which they are attached.

4. Oyster. *Ostrea virginica.* This important and well-known shellfish was described in detail in the insert in *Nature Magazine* for February, 1940.

FAMILY PECTINIDAE. *Pecten* shells are the trade mark of a gasoline, and figure in art. The animals are well worth knowing in part because of their habits but also because of their economic importance. The young animals are usually attached; the adults free-swimming. The family is represented by at least 500 fossil species. The mantle hangs like a finely-fringed curtain inside each shell, with a conspicuous row of black eye dots along its base.

5. Scallop. *Pecten irradians.* This commercial shellfish was also described in detail in the February, 1940, insert.

FAMILY ANOMIIDAE. The left, or lower, shells of the members of this family are pierced. Through this hole the animal attaches itself firmly to some objects. The fixed adults have practically lost their muscle of locomotion. Upper shells are convex. Both shells let light through easily and are thin and pearly.

6. Plain Jingle Shell. *Anomia simplex.* One to two inches across. The largest of this genus on the Atlantic Coast. Oval or circular in outline but variable in shape, fitting itself to the object on which it grows. When fixed, it may bore its foot into cover. Outer surface, dark, fragile; when worn, in dead shells, shows golden or greenish mother-of-pearl. In shallow water, particularly on oyster beds, from Nova Scotia to the West Indies.

FAMILY MYTILIDAE. These mussels are the animals living commonly between the tide lines, either attached separately, grouped in nests, or sunken in burrows in wood or earth. The two shells are equal and are generally long.

7. Mussel. *Mytilus edulis.* This edible and commercial species was described in detail in the insert for February, 1940, and need not be further discussed here.

8. Hooked Mussel. *Mytilus recurvus* (*M. hamatus*). Length, 1 to 2 inches. Shell, thick; dark colored; surface, densely-striped. Rhode Island to Texas and the West Indies, being particularly abundant in Florida.

9. Humble Mussel. *Modiolus demissus plicatus.* Shell, 2 to 4 inches long; narrow, yellowish green, triangular; fat, dingy-looking, brittle, compressed behind; plaited and with finely-radiating lines or ribs; surface appearing to be varnished. Shell lining, silvery white. Attachment, long and strong. These animals make nests of shells, or in burrows. It is probably the most common of all the eastern mussels. It is found in tide waters or mud flats at the mouths of streams, usually near the highwater mark. It is often found among the reeds or where it has burrowed into banks. Because it is common and at its best in polluted waters it should not be eaten. Found from Nova Scotia to Georgia; smaller in northern part of range.

FAMILY PANDORIDAE. The shells of the members of this family are pearly, irregular, thin; usually with the right shell flat and its mate convex. Two spreading teeth in the right shell form a groove for the tooth in the left.

10. *Pandora gouldiana.* Length, 1 to 1½ inches; height, ⅔ inch; width, ⅕ inch. Delicate, clear white, rough, very thin, with iridescent interior. Found on oyster beds, in sand or mud, burrowing freely. Common to depth of 180 feet, from Prince Edward Island to North Carolina.

FAMILY CARDIIDAE. This family includes the cockle shells. The margins of the shells are conspicuously toothed. Most of the cockles are larger than the one here shown.

11. Morton's Cockle. *Laevicardium mortoni.* Length, 1 inch; width, nearly as great; height, about ⅔ the length. Shell, small, smooth and thin. Pale fawn-color sometimes with brown spots on the outside and bright yellow with a purplish blotch within. Often brilliant in muddy water, but color fades in collected shells. In shallow water (1 to 5 fathoms) on sand flats, from Nova Scotia to the Gulf of Mexico; particularly common south of Cape Cod.

FAMILY VENERIDAE. The shells of this family include some of great beauty; and others that are rather unattractive. They are among the most widely-distributed of bivalves and are found at a great variety of depths. They have long had commercial value. The foot of these shells is strong; the valves of the shell, equal and strong. The name Veneridae implies that at least some of the species must have beauty.

12. Gem Shell. *Gemma gemma.* Like small yellow peas ⅛ inch through and about ½ as wide. Pink, white, or violet-tinged, or even colorless. Surface smooth and shining. In sand, or between tide marks, or in shallow water, from Labrador to North Carolina. Abundant in many places. Young are carried a considerable time, and when freed are alive and independent.

13. Clam, Quahog. *Venus mercenaria.* This animal was discussed in detail in the insert for February, 1940, and need be no more than mentioned here.

14. Hard-shelled Clam. *Pitar morrhuana.* Shell, plump, thin but hard, chalky, with concentric scratches. Length, 2 inches. From Prince Edward Island to Cape Hatteras.

15. Cross-barred Venus. *Chione cancellata.* Length, 1 to 1½ inches. Somewhat heart-shaped to triangular but with narrow, raised ridges crossing on the surface. Dirty white to yellow brown outside, with the inside, white, violet, purple or even orange. From Cape Hatteras south to Florida and the West Indies, being the commonest Venus-like shell in Florida.

16. Spotted Callista. *Macrocallista maculata.* Length, 2½ to 3 inches. This beautiful shell has a surface marked with violet-brown patches or waves, and a shining, horny skin. Inside, it is white. The flesh is edible but rather peppery. The shell is not common but has been present from Pliocene times in Florida. It is known from Cape Hatteras to the Gulf of Mexico, the West Indies and on to Brazil.

17. Elegant Dosinia. *Dosinia elegans.* This beautiful flat shell looks like a disc. Its surface is finely but distinctly marked with concentric, raised ridges. Its length is 2½ inches. The living animals prefer the warmer waters, some distance offshore, from Cape Hatteras to Yucatan and in the West Indies. Sometimes in certain places they are abundant.

FAMILY DONACIDAE. The members of this family have wedge-shaped shells and are found in the clean sand of ocean beaches. The foot is long and the gills differ in size. The mantle is open below and fringed.

18. Wedge Shell. Pompano Shell. *Donax variabilis.* These small and beautiful shells are from ½ to 1 inch long. They are blue-white with purple or reddish bands; highly variable in color and pattern. Common on clean, sand beaches; bury themselves in the sand with surprising rapidity when necessary. In spring they are often tossed alive on the beach in great numbers and are collected and sold by the quart. Make excellent soup, and shells are used in making shell "birds", shell "flowers" and so on. Commonest East Coast wedge shell; it is found from Cape Hatteras to Texas and in the West Indies.

FAMILY SANGUINOLARIIDAE. This family includes some of the razor clams, in many of which the shells are more or less transparent.

19. Short Razor Clam. *Tagelus gibbus.* The length of this shell is up to 4 inches; the height, ⅓ the length; and the width, ¼ the length. This shell is thick and almost cylindrical. The foot is too large to be retracted into the shells and the siphons are two tubes, each of which may be longer than the shell, and each of which may have a separate hole through the sand in which the animal is embedded. The burrows have two exits because of this. Found from Cape Cod, in Massachusetts, to Florida and Texas.

FAMILY SOLENIDAE. This family includes the razor shells whose valves gape at either end and are much elongated.

20. Sword Razor Clam. *Ensis directus.* Length, about 6 inches; width, ⅛ the length. Yellowish or greenish. Right shell, with 1 projecting tooth and a long ridge-like tooth back of it; left, with 2 teeth and a double ridge. Burrows rapidly in sand at low water mark by a digging motion of the club-shaped foot. Animal much larger than the shell. Gulf of St. Lawrence to Florida.

FAMILY MACTRIDAE. These include, among others, the Beach Clams, the Channeled Ducks and others. There is a heavy, thick skin over the shell. The siphons are united and fringed at the tip. The foot is flattened and the mantle is open in front.

21. Surf Clam, Giant Clam, Solid Surf Clam. *Spisula solidissima.* Length, 7 inches; height, ⅘ the length; width, ⅖ the length. Large solid shell; brown or white. Largest Atlantic Coast bivalve. Can leap with foot for escape. May be caught by thrusting stick between open shell. Sometimes used for food, considered excellent. In shallow water, from Labrador to North Carolina. The

variety *similis* occurs from Massachusetts to Gulf of Mexico; more abundant south of Cape Hatteras.

22. Triangular Clam. *Mulinia lateralis.* A small, whitish, triangular clam ⅜ inch to an inch across and ½ inch high; width, ⅖ inch. Apparently smooth but really finely-wrinkled. Smoother to the south. Bare, white, with brownish skin. On muddy bottoms, near river mouths; abundant in many places, particularly on Long Island Sound. New Brunswick to Texas and the West Indies.

FAMILY MYACIDAE. This includes the soft-shelled clams in which one shell has a spoon-shaped tooth that fits into a corresponding opening in the other.

23. Sand Clam. Soft-shelled Clam. *Mya arenaria.* Also called "nannynose". Length, about 4 inches; width, a little more than ½ the length; open at each end. Shell, chalky white with brownish cover. Skin, wrinkled, thin and dirty brown. Common between tide lines, in shallow water and mud flats, or in sand. Burrow to depth of about 1 foot, leaving small opening at low tide through which water is spurted when clam is disturbed. From Greenland to Florida.

FAMILY PHOLADIDAE. The shells of the animals in this family gape at both ends, have tooth-like sculptures in front and have no hinge or ligament.

24. Angel's Wing Shell. *Barnea costata* (formerly *Pholas*). Length, 6 to 8 inches; width and height, each about ⅓ the length. Shell, white; animal, yellow. The shells meet only near the tips. In colonies burrowing several feet deep in sandy mud or clay, or even in wood or rocks. Massachusetts to the West Indies. Commonly sold for food in the markets of Cuba.

25. Little Piddock. *Martesia cuneiformis.* Shell small, closed and divided by a serrated canal which runs obliquely. The animals may burrow into timber or soft rock. Found from Connecticut to Trinidad.

Gastropods or Univalves

(Plates 3 and 4, pages 344 and 345)

These animals are possibly best represented by the snails. They have a single shell, commonly coiled, with an opening, the aperture, that may be closed by an operculum. A muscular "foot" may be drawn into the protection of the shell. Eyes may be present either on tentacles or at their base. The animals rasp their food with a long file-like tongue, which may be greatly extended. They may breathe by gills or by lungs, and may hear by means of special organs on the foot. They react variously to light and may locate food by the sense of smell.

FAMILY EPITONIIDAE. These so-called "staircase" shells are usually pure white and have many, rounded whorls, with conspicuous longitudinal ribs that represent periods of rest or slow growth.

1. Angular Wentletrap or Angled Staircase. *Epitonium angulatum.* This is a rather stout shell, ¾ inch long, with 6 to 11 whorls, there being 9 or 10 ribs on each whorl. The opening at the mouth of the shell is almost circular. When disturbed, the animals give off a purple fluid. They prey upon other animals and will eat raw beef hungrily. They are found from Connecticut to Texas.

FAMILY NATICIDAE. The foot in animals of this family is so enlarged by the absorption of sea water that it may cover the shell and it cannot usually be completely withdrawn into the shell. The shell is commonly rather globular, with a half-moon-shaped opening. The eggs are deposited in a collar of sand fastened together with mucus.

2. Moon Shell. Sand Collar. *Polinices duplicata.* Length, about 2 inches and width, the same. Shell, solid, with 5 or more whorls and a prominent spire. Opening, oval and oblique. A horny operculum partly closes the opening in the shell. Lip, thin and sharp. Interior, pearly or chestnut. Outside, ashy-gray to brown. Found in shallow waters from Massachusetts Bay to the Gulf of Mexico.

3. Little Moon Shell. *Natica canrena.* Shell, about 1 inch long. Brown, with longitudinal, zigzag streaks. About 5 whorls, smooth and regular, with a limy operculum. The animal lacks eyes and has a huge foot with which it envelops its food. If the prey is another shellfish, a hole is drilled in the shell and the soft parts eaten out. May eat dead fish and serve as scavenger. Often found burrowing in sand in search of bivalves. It is common from North Carolina to the West Indies.

FAMILY CREPIDULIDAE. These slipper-shaped shells have a shelf on one half on the inside.

4. Flat Slipper Shell. *Crepidula plana.* Length, 1 to 1⅔ inches. Width, just over ½ the length. Frail shell, with white, polished interior and white outside, frequently curved to conform to the shape of the object to which it is attached. The female is reported to be 15 times the size of the male. It is commonly found in all the warmer seas, often attached to shells or sea-weeds, from low-water mark to a depth of 3000 feet from Prince Edward Island to Texas.

5. Arched Slipper Shell. Quarter-decks. Boat Shell. *Crepidula fornicata.* Length, to 1 or 2 inches. Brown or white. Obliquely oval, with a white diaphragm. The animal feeds upon seaweed, or on other mollusks, and is found attached to shells of other animals. It has some commercial value as a base for oyster beds. It is common in shallow water from Prince Edward Island to Texas and the West Indies; also in Europe.

FAMILY LITTORINIDAE. These Periwinkles or Clink Shells are more or less globular or top-shaped. The shell is spiral with a round opening and a horny opening cover or operculum. A widely-distributed family in shallow water, often above tide.

6. Periwinkle. *Littorina littorea.* Length, up to 1 inch; width, ⅔ the length. Shell, solid, roughened, yellowish, black, brown or reddish with dark bands and somewhat glossy. Inside, white or brown. Shell, thick, with 6 or 7 whorls, with an acute apex. Males are smaller than females. The head projects and has conical tentacles with eyes at their bases. The foot is divided longitudinally so that when the animal moves it swings alternately from side to side. The tongue is 2 or 3 times the length of the animal. Live in shallow waters or on the rocks; feed on plant material; lay their eggs in masses on rocks and weeds. Eaten in Europe and to some extent in America; also used as fish bait. Common in European waters and was introduced on our Atlantic Coast, where it is abundant from Labrador to Delaware Bay.

FAMILY VERMETIDAE. These Worm Shells are well described by the common name.

7. Worm Shell. *Vermicularia spirata.* Length, 6 to 10 inches. The shell develops from a regular to an irregular spiral. It is yellow, brown or white and has a thin membrane-like portion with which the opening may be closed; animal retreats deep within its shell. The interior is also partitioned off by cross walls. The foot is not well developed. The head is long, with two cone-like tentacles, with eyes at their bases, and 2 other tentacles at the sides of the mouth. The animals are essentially stationary and often occur in crowded, tangled masses in shallow water, in sponges, on coral, or among weeds, or to the depth of 1000 feet. It ranges from Vineyard Sound, Massachusetts, to the West Indies and Texas.

FAMILY STROMBIDAE. Large, solid-shelled, conical-spired animals; the shells, with expanded lips deeply-notched. The opening in the shell is long and narrow, and may be closed by an operculum. The eyes are large and are at the ends of a pair of long stalks.

8. Fighting Stromb. Conch. *Strombus pugilis.* The shell is orange to brown, or purple, with a thin skin over it and which wears off quickly in old shells. Length, to 4 inches. The animals are active in attacking other animals and move by a series of jumps, moving the shell from side to side. If upset, the animal rights itself by a somersault motion. Found in shallow seas from Cape Hatteras to the Gulf of Mexico, as well as in fossil beds of the Pliocene.

FAMILY TONNIDAE. Animals with small-spired shells with large openings in which the animal is not protected by an operculum, at least in adult stages.

9. Fig Shell. *Ficus papyratia.* Shell light-brown with a darker interior. Length, to 3½ inches. The animal has a large foot and a long, narrow siphon. Found from Cape Hatteras to the Gulf of Mexico.

FAMILY MURICIDAE. This family includes the Borers (*Eupleura*) and the Rock Shells (*Murex*) from which the ancients extracted a purple dye. The foot is long and opening uniform in outline.

10. Borer. *Eupleura. Eupleura caudata.* In *Eupleura* there are 2 growth ridges to a whorl; in *Murex,* there are three. Length, ½ to 1½ inches; width, ⅗ the length. Shell, brown, gray, white or red-brown. Foot, yellow, with the remainder of the animal white. The lip of the shell is thick. There are about 7 angular whorls in mature animals. The shell is relatively common at depths of 6 to 50 feet from Massachusetts to Florida.

13. Oyster Drill. *Urosalpinx cinerea.* Length, rarely an inch.

Growth ridges, 9 to a whorl. Yellow to gray in color, but brown within. Small foot, with yellow border. Eyes, small and black. Bores neat round holes through shells of oysters and other shellfish, and then sucks out soft parts for food. Eggs laid in parchment cases each containing up to a dozen eggs and attached in rows to rocks. Single female may lay 100 such cases in a few weeks and usually places them just below low-water mark. Probably the oyster's worst enemy. Prince Edward Island to Florida; also at San Francisco.

FAMILY THAISIDAE. Short-spurred shells with no growth ridges. Many produce a crimson dye.

11. Little Rock Purple, Dog Winkle, Horse Winkle, Sting Winkle, Whelk. *Thais lapilla* (formerly *Purpura*). Length, 1 to 1¾ inches. Reddish, yellow, white, or banded. Feeds on oysters, mussels, and other mollusks, whose shells it drills until its tongue can be thrust inside to remove the soft parts. Known enemies include starfish, hermit crabs, and fish. Eggs resemble pink rice on tiny stalks attached to rock surfaces, each group containing 29 to 40 young. One individual capable of producing more than 200 such groups. Eggs laid any time of year in capsules shaped like slender eggs attached at one end and open at the other. Injures valuable shellfish. On rocks commonly in shallow water from Newfoundland to Connecticut; also common in northern Europe.

FAMILY NASSARIIDAE. These Dog Whelks have shells more or less egg-shaped, with the enamel which lines the lip smoothly spreading somewhat around the opening.

12. Lash Nassa. Basket Shell. Mud Snail. *Nassarius vibex.* (*Nassa.*) Length, ¼ inch. Chestnut and white, in bands or washes that are brilliant when the shell is fresh. Shell, with 6 whorls. The foot of the animal is forked behind. Found from Vineyard Sound, Massachusetts, to the Gulf of Mexico.

14. Worn-out-basket Shell. *Nassarius obsoletus* (formerly *Nassa*). Length, about 1 inch or less; width, ½ the length. Shell, brown or muddy. Opening, dark-brown with white bands. Body, mottled-gray. Whole animal, commonly sand-covered. Eggs, laid in spring, in sacs, on an empty clam shell or other shell; each sac, spiny, transparent and stalked. Scavengers, or may bore shells of other shellfish including their own kind. Common where water is brackish at stream mouths in shallow water, from the south of the Gulf of St. Lawrence to Florida; probably the commonest shell on north Atlantic Coast.

FAMILY BUCCINIDAE. Whelks. The shell has an unusually large opening that ends below in a wide notch or canal through which the siphon extends.

15. Waved Whelk. *Buccinum undatum.* Length, 3 to 6 inches; width, ⅔ the length. Gray outside; yellow around opening of shell, and usually white within. Several hundred eggs laid in a half-pea-shaped sac, with about 500 sacs fastened together in a mass. The newly-hatched young feed on their kind, some two months being spent in the egg sac usually during the winter months. Steal bait from fish-hooks. Form large part of diet of cod and other fish, and are used as bait by fishermen. In Europe, are fried or made into soups and eaten by man. Low water to deep water, from Labrador to New Jersey; also in Europe.

FAMILY NEPTUNEIDAE. The shells of this family are highly variable, and, except in the genus *Busycon,* generally lack color.

16. Stimpson's Colus. Short Distaff. *Colus stimpsoni.* Length, 3 to 6 inches. Generally covered with a velvety surface. Found in water from 6 to 2700 feet deep from Labrador to North Carolina, favoring the deeper water in the south.

17. Left-handed Whelk. Lightning Shell. *Busycon contrarium* (formerly *Busycon perversum*). Length, 6 to 10 inches. Fawn-colored, with bluish-brown stripes but when young, tan. The spiral turns to the left in this species. In India, such shells are considered sacred, so many are shipped from Florida to India for use in temples and in various ceremonies. The lining of the shell is shining brown. The animal is black. The eggs are in cases attached in a row to a long cord. The animals burrow in the sand for their food, which is largely other mollusks. Found from Cape Hatteras to Cuba and abundant on the west coast of Florida.

18. Channeled Whelk. *Busycon canaliculatum* (formerly *Fulgur*). Length, 6 to 9 inches. Brown, with numerous revolving lines. A channel follows the joint of the whorls. Egg sacs much as in Knobbed Whelk but with a narrow, instead of a double-ridged edge. Indians made wampum of the shells. Shells commonly used as containers, and have been used as cutting tools. In shallow water from south of Cape Cod to St. Augustine, Florida.

19. Knobbed Whelk. *Busycon carica* (formerly *Fulgur*). Length, 6 to 11 inches; width, about ½ the length; usually smaller on Long Island. Gray or brownish. Shell, red within. Lip of shell, thin. Knobs on outer whorl give the shell its name. Sexes, distinct. Food, the soft parts of oysters and other animals procured by drilling a small, round, *bevelled* hole, and sucking out the contents. Eggs laid during the warmer months, in disc-shaped sacs with double ridge around edge, fastened in a long spiral ribbon, one end of which is anchored to a stone. The egg ribbons may be a yard long. From the egg sacs emerge young whelks shaped much like the adults. On sandy beaches, near oyster beds, and elsewhere, from the south shore of Cape Cod to Cape Canaveral, Florida.

23. Crown Melongena. *Melongena corona.* Shell, pear-shaped but with curved, flattened spines, which give it a crown-like appearance, spines being arranged in two or three series. Length of shell, 3 to 5 inches. The surface is polished. The animals prey upon other mollusks, sticking their long snouts into the soft parts and rasping the muscle free. They live in brackish water where it is shallow, and are often in or covered by the mud. Florida and West Indies.

FAMILY FASCIOLARIIDAE. These Band Shells are, by some, grouped with the Spindle Shells, and this helps to describe them.

20. Giant Band Shell. *Fasciolaria gigantea.* This shell is one of the largest of the univalves as it may be 2 feet long. It is solid, has 10 whorls with strong ribs, with less distinct ones between them. There is a reddish or brown epidermis over the shell and the soft part of the animal is conspicuously red. The shell is heavy. The animals are found in shallow waters, either in tidal pools or on open shores, from North Carolina to the Gulf of Mexico.

21. Tulip Band Shell. *Fasciolaria tulipa.* The shell is somewhat like a tulip in shape and is from 4 to 8 inches long. There is a plain orange or a dark mahogany form although the color and pattern may be variable. There are 9, well-rounded whorls. There is a sculptured region near the line between the whorls which is lacking in the next species. The animal feeds upon dead animals such as mollusks and crabs, and is a scavenger. It is found from North Carolina to the Antilles.

22. Pale Tulip Shell. *Fasciolaria distans.* These shells are gray with shadowy designs in white, or may be marked with 14, dark brown bands. Length, 2½ to 3½ inches. North Carolina to Mexico.

FAMILY OLIVIDAE. These Olive Shells are brilliantly-polished and almost cylindrical. There is no operculum to close the long narrow opening.

24. Lettered Olive Shell. Panama Shell. *Oliva sayana* (formerly *Oliva litterata* Lamarck). This shell is from 1½ to 2½ inches long, usually with 2 bands of irregular markings and zigzag ornaments. It tapers at both ends. The animals live in colonies often buried in the sand. None seem to have been taken alive north of the Florida Keys. They move quickly and are covered by the mantle, which may vary in color with the environment. The mantle may completely cover the shell. The live animal may look "like a piece of fat pork".

FAMILY TEREBRIDAE. These Auger Shells are found in warm seas, and because of their shape are not easily confused with others. Some species are provided with poison glands.

25. Dislocated Terebra. *Terebra dislocata.* Length, 1 to 1⅘ inches. The animal has a long proboscis with which it squeezes, suffocates, poisons and sucks its victim to death. Movement is normally sluggish. Egg cases are found on the shells in May. Occurs from Virginia to Texas.

FAMILY CONIDAE. Little but the name "cone" is necessary to identify these shells, which are heavy and china-like. The shell-opening is long and narrow. The animals of some species can remove some of the inner whorls of their shells to make more room for themselves. Some species have poison glands and strike at their enemies or prey. Some have great value to collectors.

26. Florida Cone Shell. *Conus floridanus* Gabb. Length, 1½ to 2 inches. Yellowish white, blotched with brown, with an indistinct white band at the shoulder and at the center. Found from North Carolina to the Gulf of Mexico.

FAMILY CANCELLARIIDAE. These Cross-barred Shells are small and are marked with conspicuous cross-ribs.

27. Cross-barred or Nutmeg Shell. *Cancellaria reticulata.* Length, 1½ to 2½ inches. White, with brown bands and with the surface finely-ribbed and grooved. The animal is slow and shy. It explores with the forepart of its foot and lives on plant materials. It is found from Cape Hatteras to Guadaloupe.