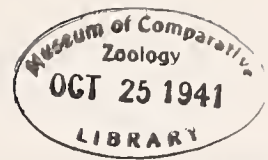


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THE GENUS *STROMBUS* IN THE WESTERN ATLANTIC

BY

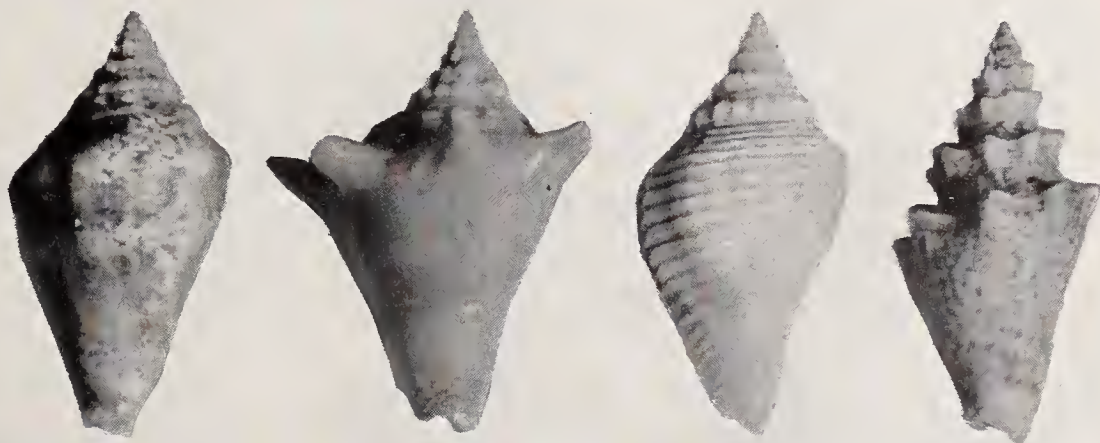
W. J. CLENCH AND R. T. ABBOTT

The genus *Strombus* is widely distributed throughout the tropical portions of the globe, though in certain areas various species extend into subtropical and temperate zones. In the western Atlantic region there are nine species and subspecies, and these collectively range from North Carolina and Bermuda south through the West Indies to southern Brasil.

Only one species appears to be at all of any great economic value, namely *Strombus gigas*. This species is employed extensively for food and fish bait in the West Indies, especially in the Bahamas. Cameos are often made from the shell, and in a pulverized state it is used in the manufacture of finer porcelains. This species is the source of the large pink pearls which a few years ago were highly valued in European markets. As a food, especially in the form of chowder, it ranks with clams and scallops in taste and nutrition.

Strombus may be exceedingly abundant in certain areas. Though obtainable nearly everywhere in the West Indies, *S. gigas* is really only locally abundant in a few places. West End, Grand Bahama is such a locality. During the senior author's short stay of two weeks in 1936 at this settlement, 16,000 specimens were shipped to Florida for the novelty trade. These specimens were collected on the shallow grassy sand-flats within two or three miles of the settlement. Fortunately, the Bahama government has now restricted such wholesale collecting.

We have also seen thousands of *S. pugilis alatus* during certain seasons on the sand-bars at Sanibel Island, Florida. At Santa Barbara de Samana at the eastern end of Santo Domingo *S. pugilis* occurs in considerable numbers. Across the bay at San Lorenzo we found



raminus

pugilis

alatus

gigas

Plate 1. Young specimens, natural size.

this species six to eight feet deep on the floors of the vast caves that were originally the homes of the aborigines. It must have formed a very important food supply. Fluek (Nautilus, **19**, p. 33, 1905) mentions the abundance of *S. pugilis nicaraguensis*, and states that "the natives find it in such quantities that it is regularly sought after as an article of food."

All of the species in this genus live in comparatively shallow water, occurring in the intertidal zone and down to a depth of ten fathoms. We have seen *S. gigas* in six to eight fathoms of water in the Bahamas, though it generally prefers much shallower water.

Young specimens differ considerably from the adults. We have figured four of the common species for comparison. All are natural size. (Plate 1).

Strombus Linné

Strombus Linné 1758, Syst. Nat., ed. 10, **1**, p. 742, no. 289. Genotype, *Strombus pugilis* Linné (Montfort, 1810).

Shell generally subovate to fusiform with a narrow, oblique aperture and a wing-like or expanded lip in adult specimens. The canal is short and recurved to the right. A shallow depression or "stromboid notch" occurs near the canal at the base of the aperture, forming a "wave" in the aperture margin. Young shells are likely to appear quite different from the adults owing to the lack of the widely expanded lip.

The animal is furnished with large eyes at the ends of thick pedicels. The tentacles are slender and arise from the middle of the eye-pedicels. The foot is narrow, arcuate and without ventral sole. It creeps with an interrupted motion and when out of water and turned over it can push itself over onto its ventral surface and certain species can even jump a few inches by means of the very muscular foot.

Subgenus **Strombus** Linné

Strombus raninus Gmelin, Plate 2

Strombus raninus Gmelin 1790, Syst. Nat., **1**, p. 3511 (no locality).

Strombus bituberculata Lamarck 1822, Anim. s. Vert., **9**, p. 690 (Seas of Antilles).

Description. Shell 40 to 110 mm. in length, solid, bluntly spinose, mottled in color and strongly sculptured. Whorls 9.5 to 10, regularly increasing in size. Color a mottled chocolate brown interspersed with a dirty white which renders the whole shell greyish. Occasional specimens have a pinkish tinge. Two or three rather broad and lighter bands occasionally occur around the middle of the body whorl. An aluminum-like glaze is sometimes present on the parietal wall and outer lip. Interior of aperture is usually suffused with light to dark salmon pink. Parietal wall glazed, with a milky white deposit on the lower half, and the color mottlings showing through the upper half. Aperture long, comparatively narrow, slightly oblique, and with the characteristic stromboid notch strongly developed near the base of the outer lip. Basal canal moderately short and recurved toward the right. Outer lip thickened and extended above into a short wing which is generally no higher than the spire. Spire moderately pointed. Suture indistinct and slightly wavy. Nuclear whorls smooth. Spiral sculpture consists of very fine thread-like striae on the early post-nuclear whorls. These later become larger and much coarser, and fan out over the expanded lip in the last whorl. Axial sculpture consists of fine, then rather coarse, costae which on the penultimate and last whorls pinch up to form large blunt spines just below the suture. The last two spines on the body whorl are by far the largest. Sometimes one or two spiral rows of small nodules are formed around the middle of the body whorl. Within the aperture, between the canal and the stromboid notch, there are usually small submarginate costae or wrinkles. On the upper and inside corner of the aperture

two or three heavy folds or lamellae run along the inner parietal wall. Operculum much smaller than the aperture, somewhat sickle-shaped, chitinous brown, and without marginal serrations. A thin, horny periostracum generally covers the outer shell, though in some cases it is absent when the specimen has undergone considerable wave action and wear.

	length	width (including spines)	
(large)	102	82 mm.	Pelican Id., Barbados.
(average)	90	65	Alicetown, Bimini Ids., Bahamas.
(small)	40	25	Lake Worth, Palm Beach Co., Florida.

Types. As the type locality was not given by Gmelin, we here designate it as Puerto Plata, Hispaniola. Gmelin connects his description of *raninus* with Knorr's figure (Vergnugen Schnecken Muscheln, 6, pl. 29, fig. 8, Nurnberg, 1772). We now select this illustration as the type figure.

Remarks. For many years this species has been known as *bituberculata* Lamarck. However, in conformity with the present rules of nomenclature we are obliged to accept the name *raninus* which Gmelin applied to this species some thirty years prior to that of Lamarck.

Strombus raninus Gmelin and *S. gallus* Linné are closely related species. The latter is characterized by the long extension or wing of the outer lip, and by its higher spire. The former, unlike *gallus*, possesses rather heavy folds or lamellae in the upper and parietal corner of the aperture. There are only two large spines on the body whorl of *raninus*, the other spines being much smaller, whereas in *gallus* there are three to five moderately long spines regularly increasing in size.

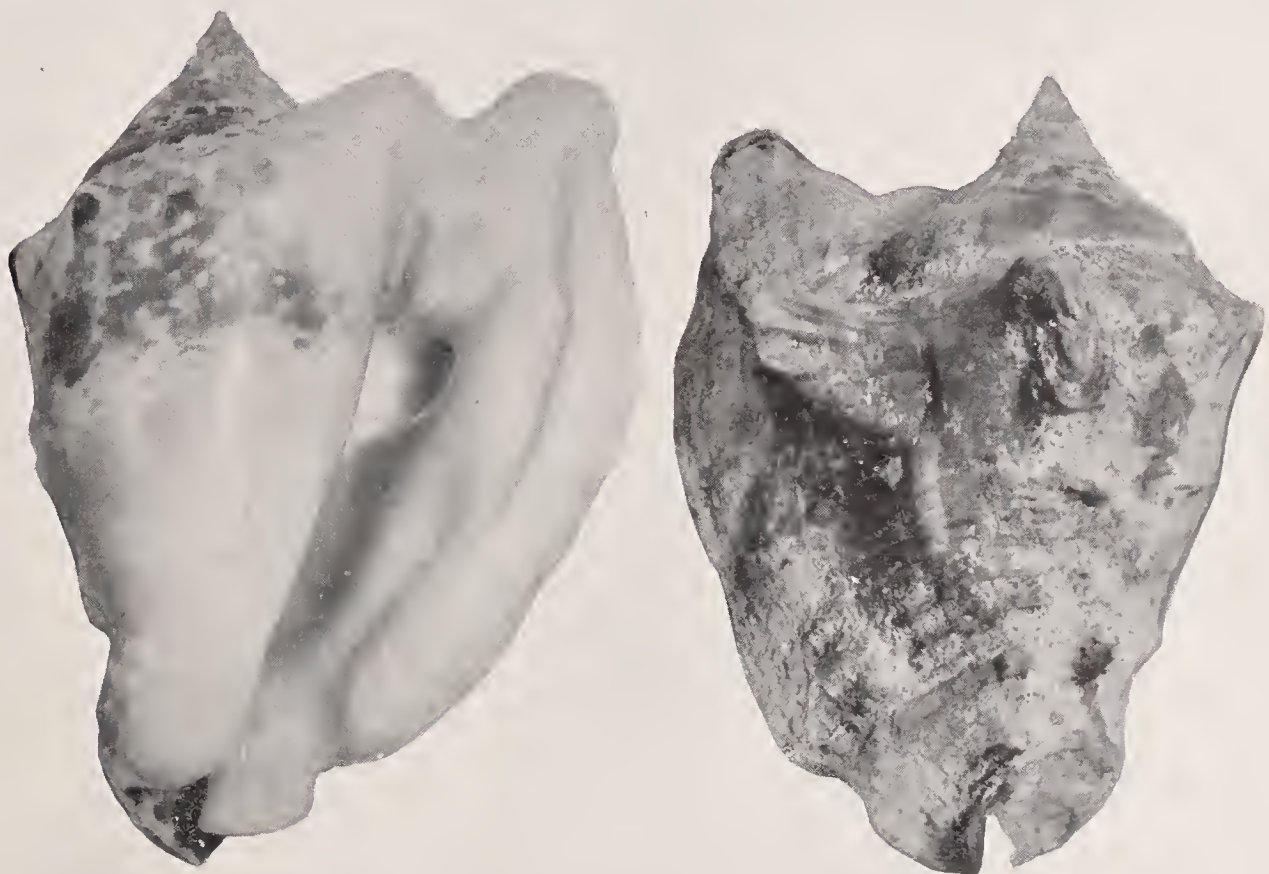


Plate 2. *Strombus raninus* Gmelin. Natural size.

Range. This species is found from southeastern Florida, through the West Indies, south to Colombia, South America.

Records. FLORIDA: Pelican Shoals, off Key West; Lake Worth. BAHAMAS: Bimini Islands; Cat Island; Eleuthera; Grand Bahama; Great Inagua; Long Island. CUBA: Cayo Frances, Caribarien; Cienfuegos. HISPANIOLA: Monte Christi; Santa Barbara de Samana; Puerto Plata; Gonave Island. JAMAICA: Montego Bay; Port Antonio. LESSER ANTILLES: Barbados. CENTRAL AMERICA: Bluefields, Nicaragua; Porto Bello, Panama. SOUTH AMERICA: Cartagena, Colombia.

***Strombus gallus* Linné, Plate 3**

Strombus gallus Linné 1758, Syst. Nat., ed. 10, 1, p. 743, no. 428 (no locality).

Description. Shell 95 to 150 mm. in length, solid, bluntly spinose, mottled in color and strongly sculptured. Whorls 9.5 to 10, regularly increasing in size. Color a light mottled brown over a dirty white, and sometimes with a pinkish background. Lower three fourths of parietal wall and outer lip glazed with a creamy orange. Interior of aperture white. An aluminum-like glaze is rarely found in this species. Aperture long, comparatively narrow, slightly oblique, and with a slightly developed stromboid notch near the base of the outer lip. Basal canal slightly lengthened and recurved toward the right. Outer lip expanded, slightly thickened, and extending above into a long wing which is always much higher than the spire. Spire somewhat high and pointed. Suture distinct and moderately indented. Nuclear whorls smooth. Spiral sculpture consists of thread-like striae on the whorls of the spire. These later develop into thick smooth lines on the body whorl and fan out over the expanded lip. Axial sculpture on the first post-nuclear whorls consists of fine costae which on the succeeding whorls pinch up to form a series of evenly spaced rounded nodules just under the suture. On the body whorl the nodules give place to moderately long spines which regularly increase in size. On the upper and parietal corner

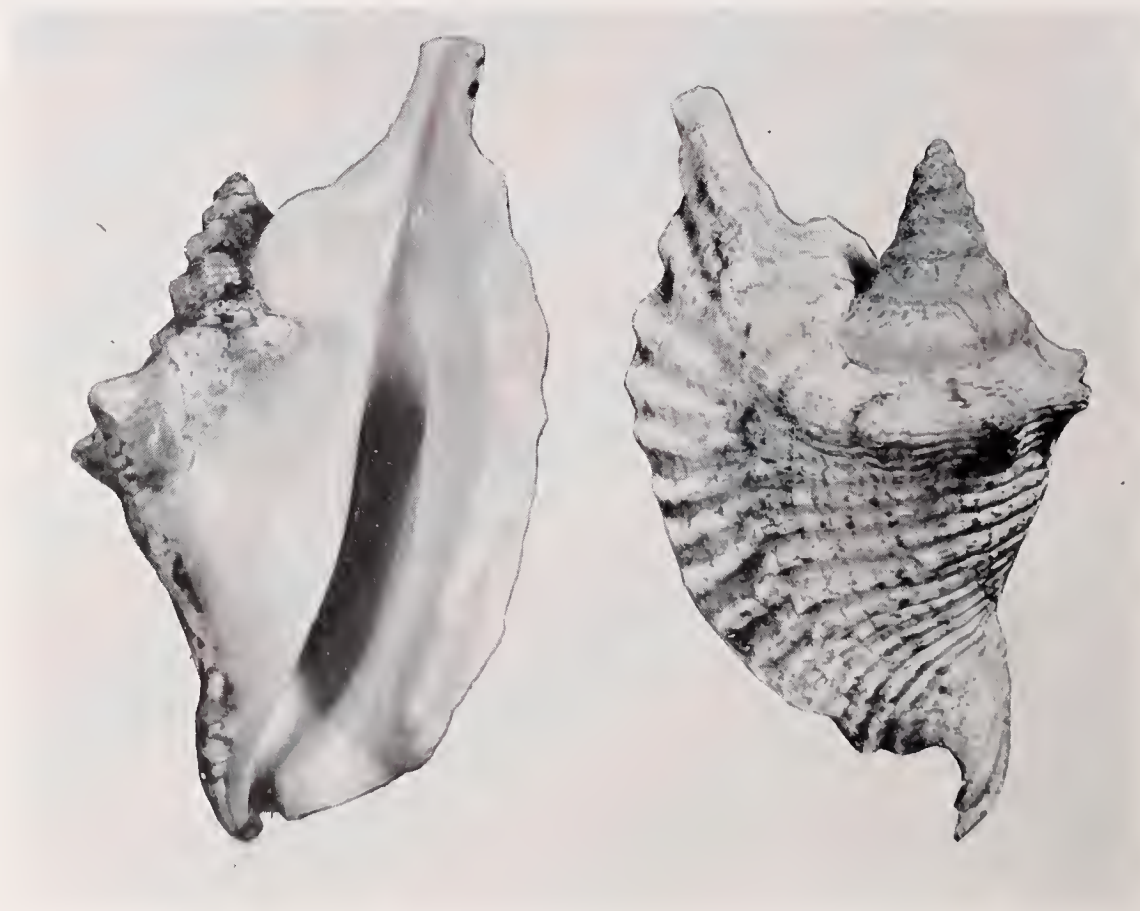


Plate 3. *Strombus gallus* Linné. Four fifths natural size.

ERRATA

Page 2, line 26 read bituberculatus

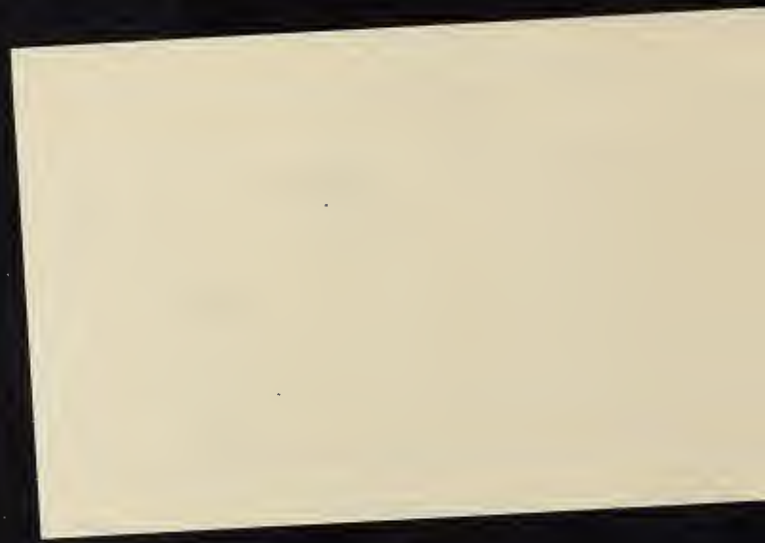
Page 3, line 13 read bituberculatus

Page 5, line 14 read pugilis pugilis

Page 5, line 15 read pugilis

Page 5, line 16 read pugilis

Page 15, line 25 read Charleston



of the aperture there are sometimes three or four very fine lamellae running back out of sight. Operculum similar to that of *S. raninus*. The periostracum is usually wanting.

	length	width (including spines)	
(large)	150	70 mm.	Port Antonio, Jamaica.
(average)	115	70	Barbados.
(small)	95	55	Matthewtown, Great Inagua, Bahamas.

Types. Port Antonio, Jamaica is here selected as the type locality. We also select as type figures those of Bonnani in his *Recreatio Mentis Oculi*, Rome, 1684, **3**, figs. 309, 310.

Remarks. See under *S. raninus*.

Range. West Indies south to Brasil.

Records. BAHAMAS: Great Inagua; Little San Salvador. JAMAICA: Port Antonio. VIRGIN ISLANDS: Guana Id., Tortola. LESSER ANTILLES: Barbados. SOUTH AMERICA: Bahia, Brasil. (Dall, 1897, p. 122).

Strombus pugilus pugilus Linné, Plate 4

Strombus pugilus Linné 1758, *Syst. Nat.*, ed. 10, **1**, p. 744, no. 430 (Jamaica).

Strombus pugilus peculiaris M. Smith 1940, *World Wide Sea Shells*, Lantana, Florida, p. 35, sp. 500 (Florida).

Description. Shell 52 to 100 mm. in length, solid, always spinose, with the longest spines on the penultimate whorl. Whorls 8 to 9, regularly increasing in size. Color a rich uniform salmon pink, with a deep orange glaze on the parietal wall and within the aperture. End of canal tipped with bluish purple. On occasion, an aluminum-like glaze is superimposed on the parietal wall and palatal lip. Aperture long, comparatively narrow, slightly oblique, and with the stromboid notch near the base of the outer lip. Basal canal short. Outer lip expanded or winged, and in fully adult specimens the upper shoulder extends up to form a definite projection or point. Parietal wall smooth and with a high

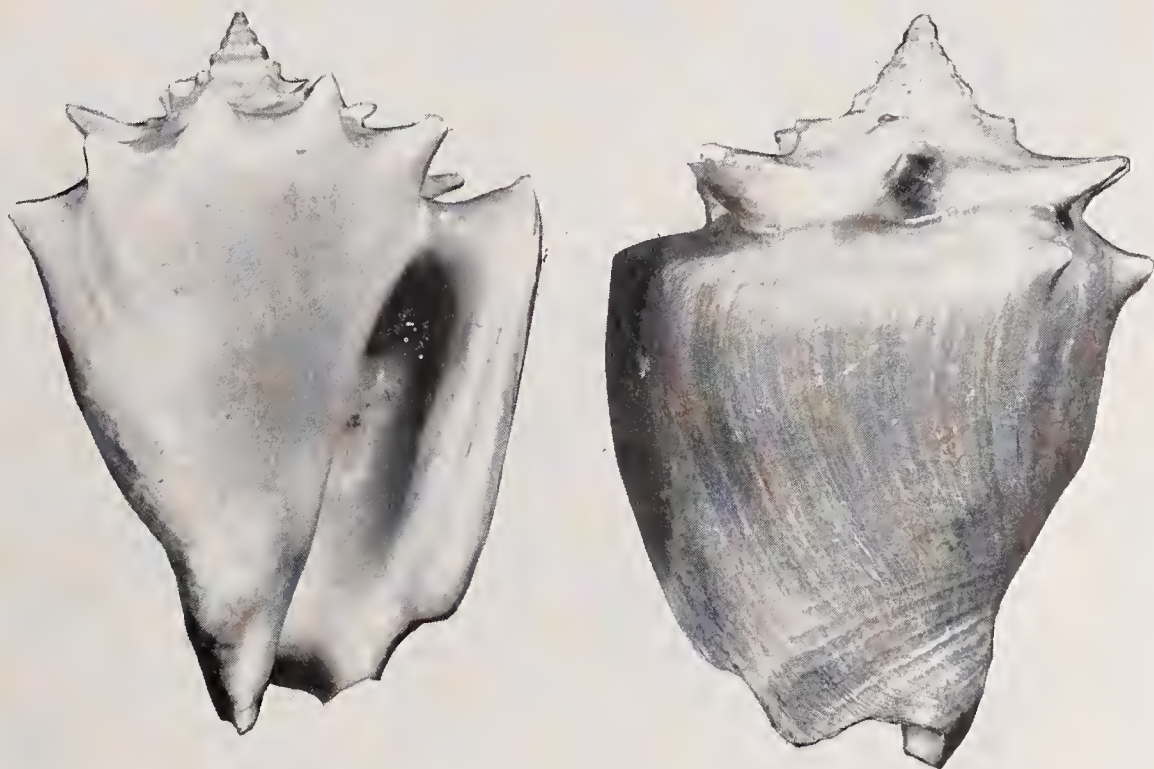


Plate 4. *Strombus pugilis* Linné. Natural size.

glaze. Base of columella moderately recurved to the right. Spire extended slightly. Suture slightly indented and over-lapping the whorl above. Nuclear whorls smooth. Sculpture consists of a series of moderately coarse axial costae on the first few post-nuclear whorls. From the fourth whorl on, these costae pinch up to form a single row of spines just below the suture. In this species the spines are longest in the penultimate or second to last whorl, and usually disappear one half whorl before the aperture. Spiral sculpture consists of numerous thread-like striae. In young specimens, as in the adults, these threads are confined to the very upper shoulder of the whorls, as well as a small portion at the base. Occasionally short submarginate costae or wrinkles are developed on the inside of the lip, and at times on the lower inside of the columella. A thin velvet-like, greyish periostracum covers the outer shell. Operculum much smaller than the aperture, somewhat sickle-shaped, chitinous brown, and with 7 to 10 small saw-like teeth on its outer margin.

	length	width (including spines)	
(large)	103	65 mm.	Puerto Plata, Hispaniola.
(average)	85	56	Montego Bay, Jamaica.
(small)	52	34	Itaparica, Estado da Bahia, Brasil.

Types. In Linné's Systema Naturae "Jamaica" is given as the type locality for *pugilis*, and reference is made to the figures of Lister (Conch. pl. 864, fig. 19) and P. Bonnani (Recreatio Mentis Oculi, Rome, 1864, 3, fig. 299). Lister's figure is valueless, but Bonnani's is a distinguishable illustration of the West Indian form. We therefore designate that of Bonnani as the type figure for *pugilis* Linné. We also select Montego Bay, Jamaica as the type locality.

Remarks. In the past there has been considerable confusion regarding both the nomenclature and the identity of *Strombus pugilis* Linné and *S. alatus* Gmelin. A large series of carefully localized material reveals different and distinct characters as well as separate geographical distribution. In addition, recourse to the earliest publications clarifies the position of these two forms.

There is no doubt that *alatus* Gmelin, illustrated in Martini Conchy-Cab., (1), 3, 1777, pl. 91, fig. 894, is the Florida form, though unfortunately this figured specimen is without spines, a fact which has led people to believe erroneously that this is characteristic of Gmelin's species.

Thus as the nomenclature now stands, the typical form is *Strombus pugilis pugilis* Linné of the West Indies, and the Florida form which we consider a variety will stand as *Strombus pugilis alatus* Gmelin. However, *S. pugilis pugilis* does reach southeastern Florida at Lake Worth, the only locality so far reported. This locality has a few typically West Indian species not recorded elsewhere north of the West Indies.

The three forms of *pugilis* are readily separated. Typical *pugilis* is uniformly colored a rich salmon, and we have never seen West Indian specimens that possess the browns, purples or mottlings found in *alatus*. In addition, the peculiar development of the longest spines on the penultimate whorl is quite different from the general uniformity in size of the spines of *alatus*. On the whole, typical *pugilis* has a shorter spire than *alatus*, and also possesses the upturned and pointed shoulder of the outer lip. *S. pugilis nicaraguensis* Fluck differs in its much smaller size and its youthful spiral sculpture covering the last whorl in the adults. It resembles typical *pugilis* somewhat in coloration, and its spines are like those of *alatus*. It appears to be a well marked subspecies.

An indistinguishable form of *pugilis* in which the spines are distorted and somewhat

flattened has been named *peculiaris* by M. Smith. We have before us similar specimens which are only aberrant individuals and as such do not warrant names.

Range. This species ranges from southeastern Florida, through the West Indies, to Central America and south as far as southern Brasil.

Records. FLORIDA: Lake Worth. BAHAMAS: Great Inagua. CUBA: Cayo Frances, Caribarien; off Havana. HISPANIOLA: Monte Christi; Puerto Plata; Santa Barbara de Samana; Miragoane. PUERTO RICO: Mayaguez; Ponce. VIRGIN ISLANDS: Tortola. JAMAICA: Montego Bay. LESSER ANTILLES: Tobago. CENTRAL AMERICA: San Blas, Panama; Cavech, Guatemala (Hinkley, 1920, p. 41). SOUTH AMERICA: Cartagena, Colombia; Praguary, Sao Paulo; Ilha de Sao Sebastiao, Sao Paulo; Cidade da Bahia; Sao Goncalo, Rio de Janeiro; Brasil. Santa Caterina, south lat. 26°, Brasil (Dall, 1893, p. 111).

***Strombus pugilis alatus* Gmelin, Plate 5**

Strombus alatus Gmelin 1790, Syst. Nat., 1, p. 3513, no. 14 (no locality).

Description. Shell 70 to 100 mm. in length, solid, generally spinose, and color variable. Whorls 9 to 10, regularly increasing in size. Color ranging from mottled salmon or orange brown to dark uniform brownish red. Many specimens, especially young, have a zig-zag pattern, and in others there is a tendency towards banding. Within the aperture the color varies from purplish to very dark purple. End of canal tipped with purple. Often an aluminum-like glaze is superimposed on the parietal wall and outer lip. Aperture long, comparatively narrow, slightly oblique, and with the stromboid notch near the base of the outer lip. Short basal canal. Outer lip expanded or winged, the upper margin or shoulder sloping down. Parietal wall smooth and glazed. Base of columella moderately recurved

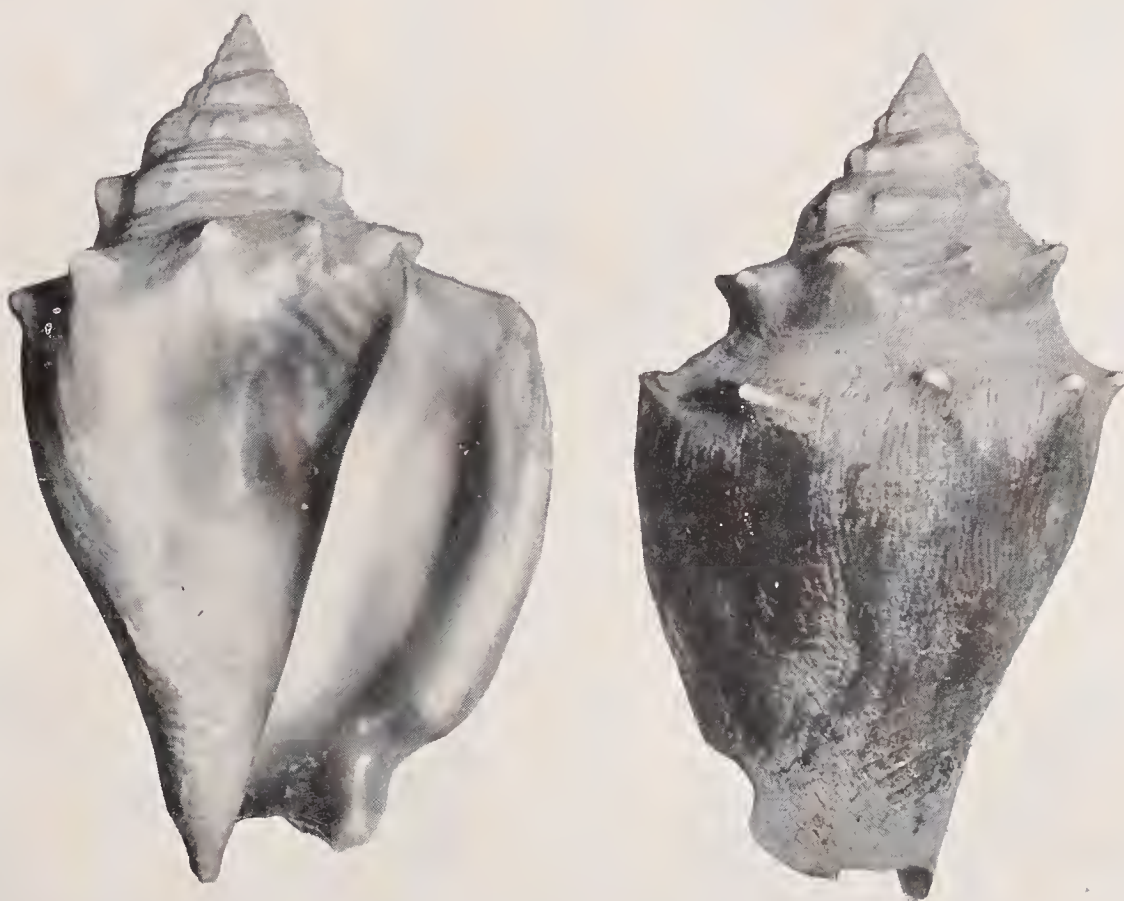


Plate 5. *Strombus pugilis alatus* Gmelin. Natural size.

towards the right. Spire extended. Suture slightly indented and over-lapping the whorl above. Nuclear whorls smooth. Sculpture consists of a series of moderately coarse axial costae on the first few post-nuclear whorls. From the fourth whorl on, however, these costae pinch up to form a single row of subsutural spines which in this species are longest and generally of the same size on the last two whorls. Occasionally completely non-spinose specimens are found. Spiral sculpture consists of numerous thread-like striae. In young specimens the entire shell possesses these fine threads. In adults, however, the last two whorls are lacking in these striae except near the base of the body whorl. Often submarginate short costae or wrinkles are developed on the inside of the lip, and occasionally on the inside of the columella. A thin velvet-like greyish periostracum covers the outer shell. Operculum similar to that found in typical *pugilis*. We have before us several albino specimens from Sanibel Island, Florida. In some the aperture is slightly tinged with pink.

	length	width	
(large)	100	54 mm.	Passagrille, Sarasota, Florida.
(average)	81	52	Sanibel Id., Lee Co., Florida.
(small)	70	47	Naples, Lee Co., Florida.

Types. We here select as type figure Martini, Conchy-Cab. (1), **3**, 1777, p. 191, fig. 894. No locality was mentioned by Gmelin, and we now designate Sanibel Island, Lee Co., Florida as the type locality.

Remarks. See under *pugilis*.

Range. This subspecies is known to occur only on the southeastern coast of North America, from North Carolina south to Florida and west to Texas.

Records. NORTH CAROLINA: Shackleford Island. SOUTH CAROLINA: (Mazyck, 1913 p. 13). FLORIDA: North Inlet, Lake Worth; Pavilion Key, Chokoloskee; Bonita Springs; Naples; Sanibel Id.; Egmont Key, Manatee Co.; Cape Romano; Long Key, Sarasota Co.; Lemon Bay, Hillsboro Co. TEXAS: (record for state only).

***Strombus pugilis nicaraguensis* Fluck, Plate 6**

Strombus pugilis nicaraguensis Fluck 1905, Nautilus **19**, p. 32.

Description. Shell 35 to 62 mm. in length, solid, spinose, with the color slightly vari-

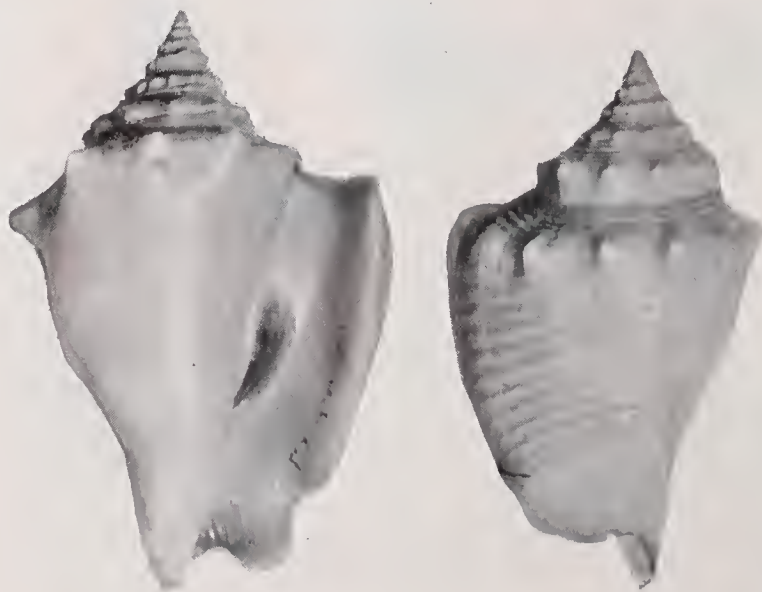


Plate 6. *Strombus pugilis nicaraguensis* Fluck. Natural size.

able. Whorls 8.5 to 9, regularly increasing in size. Color a light salmon to rosy salmon, usually with a lighter band midway across the body whorl. End of canal tipped with bluish purple. Aperture a glazed orange within. Aperture long, comparatively narrow, slightly oblique, and with a moderately indented stromboid notch near the base of the outer lip. Short basal canal. Outer lip expanded or winged, and in fully adult specimens the upper margin or shoulder extending up, but hardly forming a definite point. Parietal wall highly glazed. Base of columella moderately recurved to the right. Spire extended. Suture slightly indented and somewhat overlapping the whorl above. Nuclear whorls smooth. Axial sculpture consists of a series of coarse costae on the first few post-nuclear whorls; from the fourth whorl on, however, these costae pinch up to form a single row of subsutural spines, which in this subspecies continue to increase regularly in size to the last whorl. Spiral sculpture consists of numerous thread-like costae which completely cover the whorls even in adult specimens. At times short submarginate costae or wrinkles are developed on the lower part of the inside of the lip. A thin velvet-like greyish peristracum covers the outer shell. Operculum similar to that found in typical *pugilis*.

	length	width (including spines)
Holotype	61	41 mm. Wawa River, Nicaragua (Plate 6, left figure).
Paratype	55	37 Wawa River, Nicaragua (Plate 6, right figure).

Types. Holotype no. 87959 and paratype no. 141218, Mus. Comp. Zoöl. Beaches between Principolka and Wawa Rivers, Mosquito coast, Nicaragua. William Fluck collector.

Remarks. (For comparison with other species see under remarks of *S. pugilis pugilis*).

Range and Records. Known only from the type locality.

***Strombus costatus* Gmelin, Plate 7**

Strombus costatus Gmelin 1790, Syst. Nat., 1, Part 6, p. 3520 (no locality).

Strombus accipitrinus Lamarek 1822, Anim. s. Vert., 7, p. 200 (no locality).

Strombus inermis Swainson 1822, Appendix of Bligh Catalogue, p. 7 (no locality).

Description. Shell 80 to 185 mm. in length, solid, heavy, bluntly spinose, uniform in color, and strongly sculptured. Whorls 10 to 11, regularly increasing in size. Color a uniform white to a yellowish white. Parietal wall and outer lip glazed white or cream. An aluminum-like glaze is often found on the parietal wall, columella and outer lip of heavy shells. Interior of aperture white or creamy white. Aperture long, comparatively narrow, oblique, with a slightly developed stromboid notch near the base of the outer lip. Basal canal short and slightly recurved. Outer lip expanded, very much thickened in some specimens and not in others. Spire pointed. Suture slightly indented and overlapping the nodules on the whorls above. Nuclear whorls smooth. Spiral sculpture consists of thread-like striae on the whorls of the spire. These later develop into rather thick corrugations on the body whorl. Axial sculpture on the first post-nuclear whorls consists of fine, irregularly placed nodules. On the succeeding whorls the subsutural nodules are larger, evenly spaced, but rather flattened. Four to six moderately long, blunt spines are developed on the body whorl. On the upper and parietal corner of the aperture there are five or six fine lamellae or wrinkles which disappear within the aperture. Operculum much smaller than the aperture, slightly sickle-shaped, brown, and without the saw-like teeth at the margin. Periostracum generally covering the entire shell.

	length	width (including spines)
(large)	185	140 mm. Arthurstown, Cat Id., Bahamas.
(average)	150	115 Clarendetown, Long Id., Bahamas.
(small)	80	65 Santa Barbara de Samana, Hispaniola.

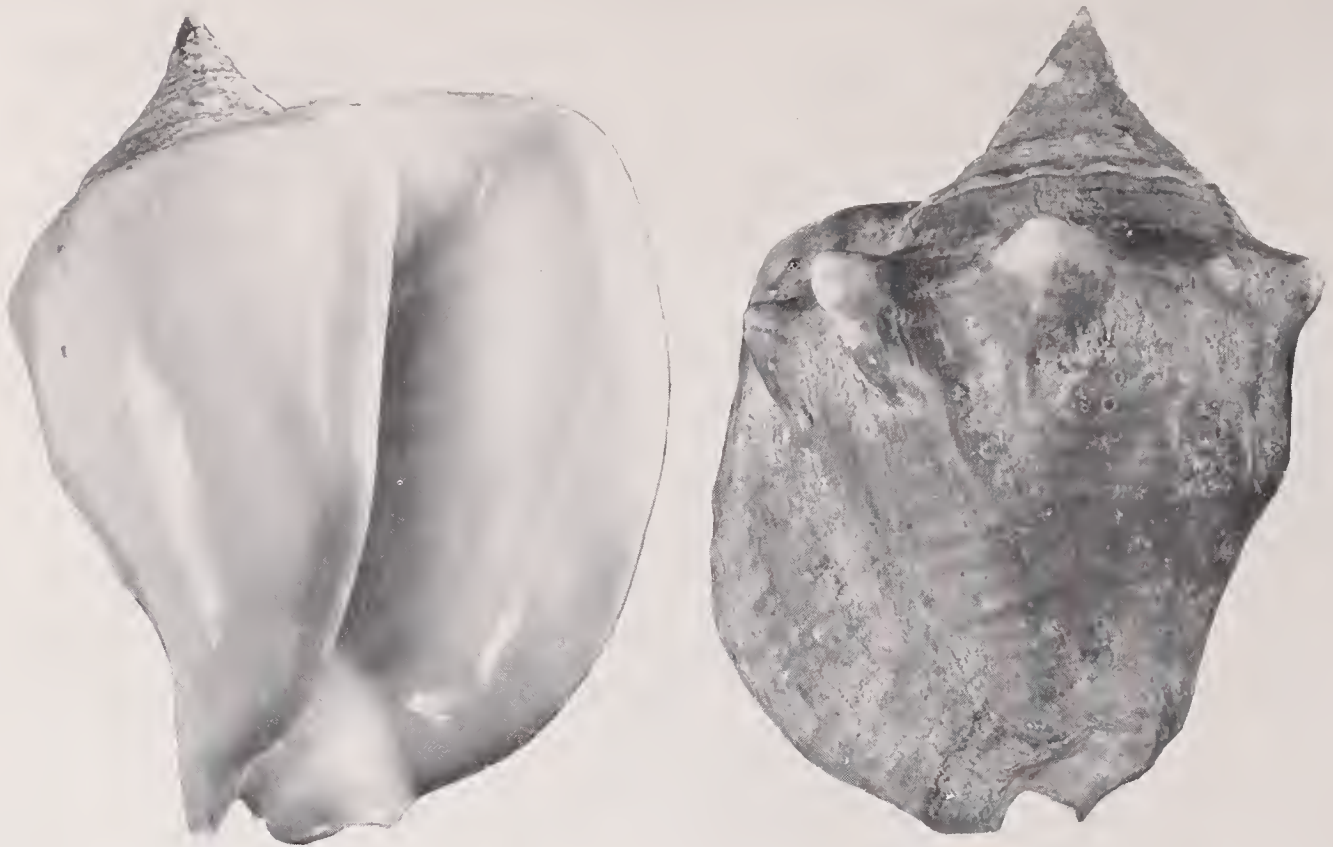


Plate 7. *Strombus costatus* Gmelin. One half natural size.

Types. We here select fig. 829, pl. 81, Martini, Conchy-Cab., (1), 3, 1777, as the type figure. No locality was given by Gmelin, and we now designate Clarencetown, Long Island, Bahamas as the type locality.

Remarks. This species occurs quite commonly in the Bahamas on reefs and sand flats. The development of spines or nodules is quite variable even among specimens from the same locality. This is generally a rather massive shell, becoming much thickened in old specimens, especially at the lip. The aperture is always white, and generally with considerable aluminum-like glaze on the lip areas.

Both Gmelin and Lamarck refer to the same figure in Martini as the type of their species (see above). The earliest name, *costatus*, of Gmelin has preference over Lamarck's name *accipitrinus*. Swainson in his description of *inermis* refers to Lister's figure (Conchyliorum, 1770, fig. 856) which is unquestionably *costatus* with only moderately developed spines.

Range. Florida, through the West Indies, to Central and South America as far south as Brasil.

Records. FLORIDA: Sanibel Island; Tortugas; 40 miles N. W. of Tortugas. BERMUDA: St. Georges (fossil). BAHAMAS: Bimini Islands; Cat Island; Eleuthera; Grand Bahama; Great Abaco; Great Inagua; Long Island. HISPANIOLA: Puerta Plata; Santa Barbara de Samana. JAMAICA: Port Antonio. LESSER ANTILLES: St. Kitts. CENTRAL AMERICA: Bluefields, Nicaragua. SOUTH AMERICA: Bahia, Brasil (Dall, 1897, p. 122).

***Strombus samba* Clench, Plate 8**

Strombus samba Clench 1937, Proc. New England Zoöl. Club, 16, p. 18, pl. 1, fig. 1.

Description. Shell 150 to 180 mm. in length, solid, spinose, roughly sculptured. Whorls 9 to 10, regularly increasing in size. Color of shell pale yellowish. Parietal wall and outer

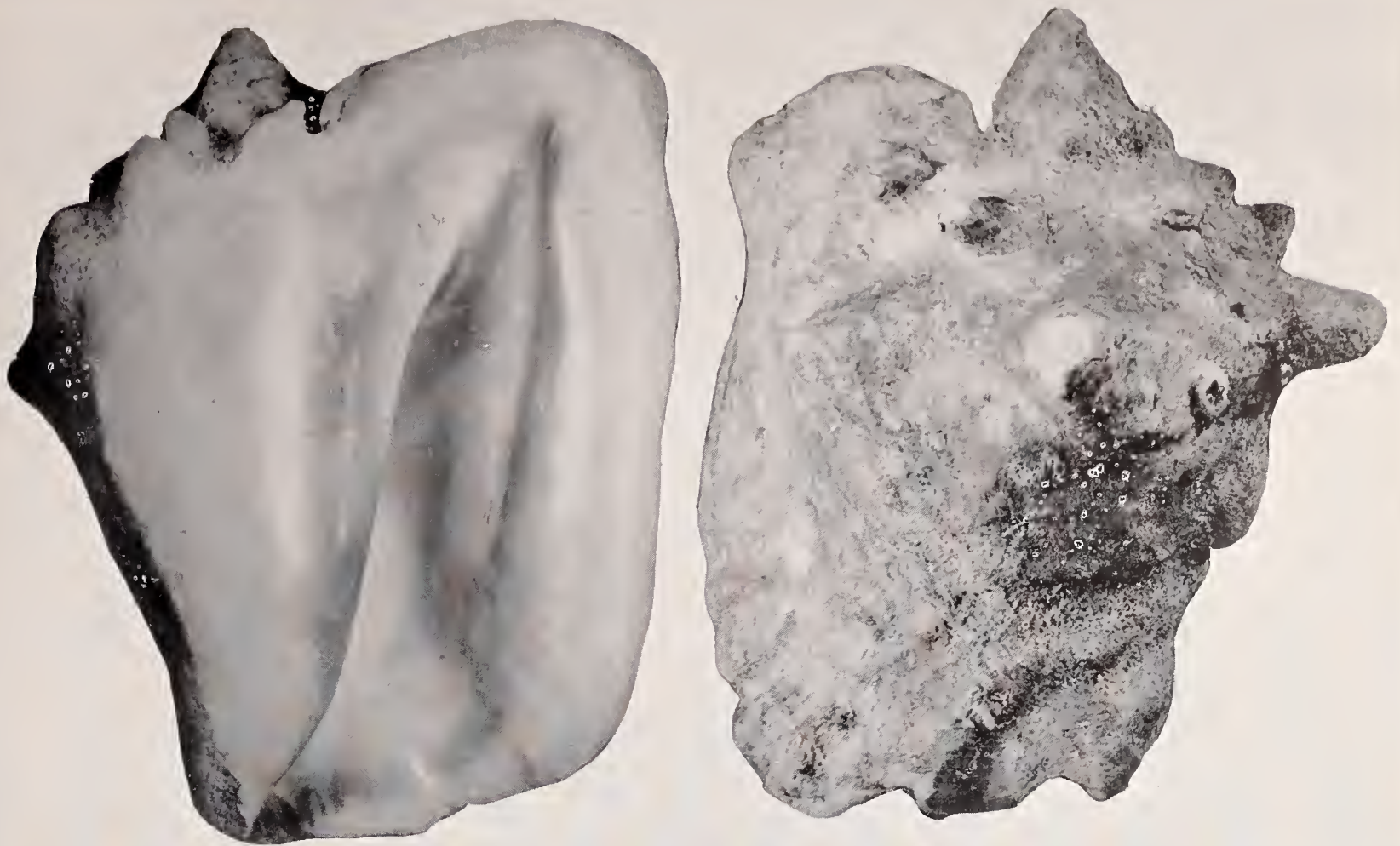


Plate 8. *Strombus samba* Clench. Two thirds natural size.

lip brownish yellow, merging into deep pink within the aperture. A heavy aluminum-like glaze is always present on the parietal wall and outer lip. Aperture long, comparatively narrow, slightly oblique, and with a moderately developed stromboid notch near the base of the outer lip. Basal canal short and slightly recurved. Outer lip slightly flaring and greatly thickened, the upper portion or shoulder extending above to the height of the spire. Columella short. Spire pointed. Suture rather indistinct, slightly indented, and at times overlapping the spines on the whorl above. Nuclear whorls smooth. Spiral sculpture on the first few post-nuclear whorls consists of fine striae. On the body whorl these develop into coarse thread-like lines, and in some specimens become rough corrugations. Axial sculpture on the spire often consists of pointed nodules, while on the last two whorls, moderately long spines are present. Operculum much smaller than the aperture, somewhat sickle-shaped, brown, and without saw-like teeth on its outer margin. Periostracum horny, yellowish brown, and generally covering the entire outer shell.

	length	width (including spines)	
(large)	180	140 mm.	Paratype. West End, Grand Bahama.
(average)	159	130	Holotype. West End, Grand Bahama (Plate 8, left fig.)
(small)	150	135	Paratype. West End, Grand Bahama (Plate 8, right fig.)

Types. Holotype no. 116054, Mus. Comp. Zoöl. Wood Cay, West End, Grand Bahama, Bahamas. William J. Clench collector.

Remarks. This species is closely related to *S. gigas*, though it possesses characters somewhat approximating *S. costatus*. It differs from *S. gigas* by its smaller size, very much

thickened and shorter lip, and by the presence of a great deal of aluminum-like glaze. The soft parts, particularly the portion extruded while crawling, are nearly entirely black, while the color of *S. gigas* is orange red.

S. samba approximates large specimens of *S. costatus* in size, in thickened lip and in the presence of the aluminum-like glaze, but differs in possessing pink within the aperture, and in having at times blunt spines on the spire.

Range and Records. Known only from the type locality.

Strombus gigas Linné, Plate 9

Strombus gigas Linné 1758, Syst. Nat., ed. 10, **1**, p. 745, no. 435 (America).

Strombus gigas horridus M. Smith 1940, World Wide Sea Shells, Lantana, Florida, p. 131, sp. 1629a, (Lake Worth, Florida).

Description. Shell 190 to 300 mm. in length, solid, massive, spinose, color varying, and roughly sculptured. Whorls 9 to 11, regularly increasing in size. Color of outer shell yellowish. Half of parietal wall farthest from aperture yellow, flecked with brown; half nearest aperture glazed, brownish or deep pink. Outer lip glazed, white to pinkish white. Interior of aperture suffused with pink. The aluminum-like glaze is rarely found in this species. Aperture long, comparatively narrow, oblique and with a slightly developed stromboid notch near the base of the outer lip. Basal canal short and slightly recurved. Outer lip large and flaring, moderately thickened, but never to any great degree. Usually the outer edge is irregularly waved. Upper end of the lip is broad and raised, but usually



Plate 9. *Strombus gigas* Linné. One half natural size.

no higher than the spire. Collumella short. Spire pointed. Suture rather indistinct, slightly indented, and sometimes overlapping the above whorl as far as the base of the spines. Nuclear whorls smooth. Spiral sculpture on the first post-nuclear whorls consists of very fine striae which on the succeeding whorls become larger and more indistinct. On the body whorl and expanded lip these striae develop into larger and rough corrugations. Axial sculpture on the early whorls consists of small evenly spaced nodules. There are present on all succeeding whorls pointed nodules, regularly increasing in size, which culminate on the body whorl in rough and moderately long spines. Coarse longitudinal striae often are present on the body whorl. Operculum much smaller than the aperture, somewhat sickle-shaped, and chitinous brown. Periostracum horny, yellowish brown, and generally covering the entire outer shell.

	length	width	
(large)	300	210 mm.	Puerto Plata, Hispaniola.
(average)	250	180	Wood Cay, Grand Bahama, Bahamas.
(small)	190	160	Middle Sambo Id., Key West, Florida.

Types. We here select as type figure that of Bonnani (*Recreatio Mentis Oculi*, 1684, 3, pl. 321. Montego Bay, Jamaica is here designated as the type locality, since Linné only gave "America" in his original description.

Remarks. *S. gigas* occurs from low water to depths of six or eight fathoms. Its favorite haunt is the sandy and grassy bottom, though it may also be found among coral and loose rock. Its widely expanded lip and deep pink coloration differentiates it from all other species of this genus. M. Smith (1940, p. 131) has given the name *horridus* to a malformed specimen from Lake Worth, Florida. It appears to us to have no value, even as a subspecies.

Range. Bermuda and southern Florida, south through the West Indies to northern South America.

Records. FLORIDA: Bahia Honda Key; Middle Sambo Id., off Key West; Lake Worth. BERMUDA: Castle Harbor; Hamilton Sound. PUERTO RICO: San Juan; Tal-laboa Bay; Guanica Harbor. BAHAMAS: Middle Bight, Andros; Bimini Islands; Cat Island; Fortune Island; Grand Bahama; Great Abaco; Great Inagua; Long Island. CUBA: Cienfuegos; Havana; Guantanamo Naval Base; Bahia Honda. HISPANIOLA: Miragoane; Gonave Id.; Monte Cristi; Puerta Plata; Santa Barbara de Samana. JAMAICA: Montego Bay. VIRGIN ISLANDS: St. John; St. Thomas; Tortola; Virgin Gorda. LESSER ANTILLES: Barbados; Trinidad. CARIBBEAN ISLANDS: Swan Island. CENTRAL AMERICA: Progreso, Mexico (Weisbord, 1926, p. 86). SOUTH AMERICA: Cartegena, Colombia (Dall, 1889, p. 136).

***Strombus goliath* Sowerby, Plate 10**

Strombus goliath Sowerby, 1842, *Thesaurus Conchyliorum* 1, p. 35, pl. 10, fig. 118 (no locality).

Description. Shell about 200 to 300 mm. in length, solid, massive and nodulose. Color cream to yellowish brown, and according to Reeve's figure (1851) there are clear spiral bands of dark brown on the body whorl and parietal wall. The specimen we have examined, however, is cream colored throughout, other than a few axial streaks of dark brown on the spire. Interior of aperture a deep cream with a slightly pinkish caste. The upper margin of the outer lip is expanded and forms a flattened shield in front of the spire, and joins the shoulder of the body whorl. The shell is rather coarsely nodulose along the shoulder

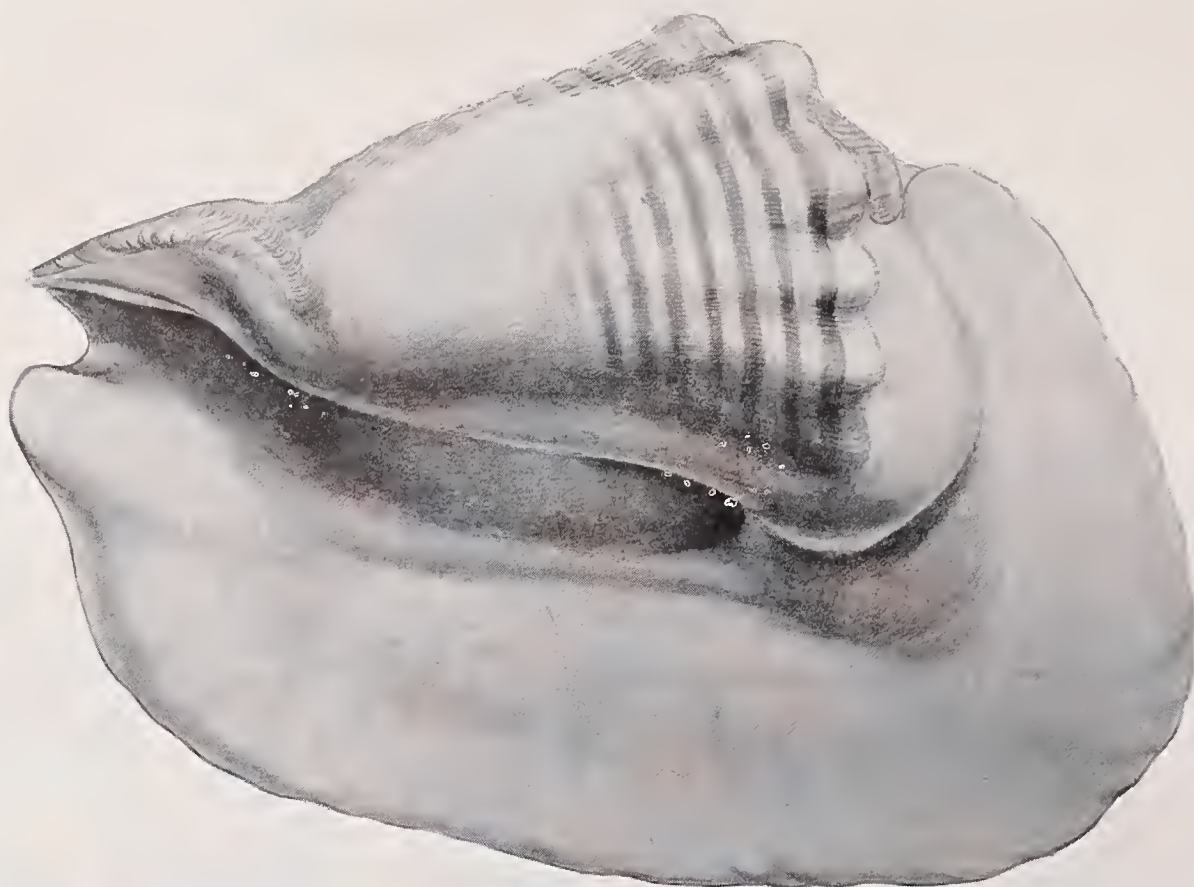


Plate 10. *Strombus goliath* Sowerby. Two thirds natural size.

of the body whorl. In addition there are several coarse and deeply incised spiral grooves running over the body whorl which fan out over the expanded lip.

length	width (including lip)
310	231 mm. American Mus. Nat. Hist. no. 13124

Remarks. The exact locality of this species is unknown. On various occasions it has been reported from the West Indies and the west coast of South America. We suspect that this species may be found eventually along the northeastern coast of South America.

This species is closely allied to *S. latissimus* Linné of the South Pacific, though the latter differs in its much smaller size, its lack of nodules, the deeper stromboid notch, and the fact that its spire is half buried in the upper expansion of the outer lip. We are indebted to the American Museum for the loan of the specimen from which our description was made. Our plate 10 is a copy of Reeve's figure which was originally drawn from a small specimen.

Key to the Western Atlantic Strombus (adults)

1. Shell longer than 190 mm. ($6\frac{3}{4}$ inches)	3
2. Shell shorter than 190 mm. ($6\frac{3}{4}$ inches)	5
3. Aperture colored deep pink	<i>gigas</i>
4. Aperture colored a pale salmon or cream	<i>goliath</i>
5. Shell heavy with a greatly thickened outer lip	7
6. Shell solid with a strong but not thickened outer lip.	9
7. Aperture colored white	<i>costatus</i>
8. Aperture colored pink	<i>samba</i>
9. Outer lip definitely winged above	11
10. Outer lip not definitely winged above	13
11. Wing as high or higher than spire	<i>gallus</i>
12. Wing shorter than height of spire	<i>rauinus</i>
13. Spines on penultimate and last whorl equal	15
14. Spines on penultimate whorl longest	<i>pugilis</i>
15. Shell longer than 65 mm. ($2\frac{1}{2}$ inches)	<i>alatus</i>
16. Shell shorter than 65 mm. ($2\frac{1}{2}$ inches)	<i>nicaraguensis</i>

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JOHNSONIA

During the past several years there has developed an ever increasing interest in the study of shells. This interest is not only in the shells alone, but also in the life histories of the animals, their distribution, and other information concerning them.

“Johnsonia” aims to aid in this study, to present both descriptions and figures of shells, particularly the species that are to be found along the Atlantic shores of the Americas.

Parts will be published, each complete for a genus, giving all of the species known to occur in the Western Atlantic. The term Western Atlantic includes the shore line from Greenland south to Patagonia, with Bermuda and the West Indies considered as part of this province.

All species that are to be found in depths of less than 25 fathoms of water will be considered fully, with descriptions, figures and original references. Deep water species, those known only from depths exceeding 25 fathoms, will be listed and the original citation included.

All parts will be sold at the cost of printing and mailing. Genera will appear not in any systematic order but on the basis of interest and the availability of material for study.

A general introduction will be included for each genus, followed by a short description of the genus. Each species will include the original citation, a list of the recently considered synonyms, and a detailed description with measurements.

Under the remarks, comparisons will be made with all of the closely allied species as well as other data of general interest. Following this, there will be the type designation and type locality. Under distribution the full extent of the range will be given as well as several specific locality records. These records are based upon material that is contained in the Museum of Comparative Zoölogy, unless otherwise noted. We will attempt to give as much information as it is possible for each species. At the end of each genus a few references will be added that lead to additional information.

Our present plan is a “pay as you go” policy. A single work, embracing all of the species of this vast area, would cost far beyond our resources and would take many years of work to complete. This plan makes possible the immediate publication of several genera. Each genus will be sold separately, the cost of each will be based upon the number of pages that are included.

Much of the Western Atlantic region still remains unexplored for shells. Many sections of this coastline, sometimes hundreds of miles in extent, are but partially and even wholly unknown. Material from these areas is much to be desired. The gulf coasts of Alabama, Louisiana, Texas and Mexico are very poorly known, and all sections of the Central American coast have hardly been touched. Very little of the Atlantic of South America is known at all, at least as far south as Rio de Janeiro, and beyond Rio de Janeiro much information is wanting except in the vicinity of Uruguay and northern Argentina.

The name “Johnsonia” that we have selected is a tribute to Charles W. Johnson, a scientist who did so much for the study of our Western Atlantic mollusks.

William J. Clench, *general editor*
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