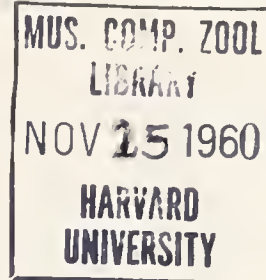


JOHNSONIA

Published by
THE DEPARTMENT OF MOLLUSKS
Museum of Comparative Zoölogy, Harvard University
Cambridge, Massachusetts



NOVEMBER 25, 1960

TROCHIDAE

VOL. 4, NO. 40*

THE GENUS *CALLIOSTOMA* IN THE WESTERN ATLANTIC

BY

WILLIAM J. CLENCH AND RUTH D. TURNER

The genus *Calliostoma* in the broad sense is nearly world wide in distribution, extending from the boreal to the austral seas and probably into the Arctic and Antarctic Oceans. Various species occur from the intertidal area to depths of several hundred fathoms.

The Western Atlantic is exceedingly rich in species as this present study indicates. It is, however, unfortunate that several are known only from single or at best, only a few specimens. Very little is known about their life history. All are presumed to feed on plant material such as various kinds of algae and diatoms; the deep water forms on plant detritus. Several genera and subgenera have been proposed to group certain of the many species in this large genus. Most subgenera have been based on rather trivial differences in the shell morphology such as separating the umbilicate forms from those which have an umbilical pad. In this way, closely related species are separated and in many cases

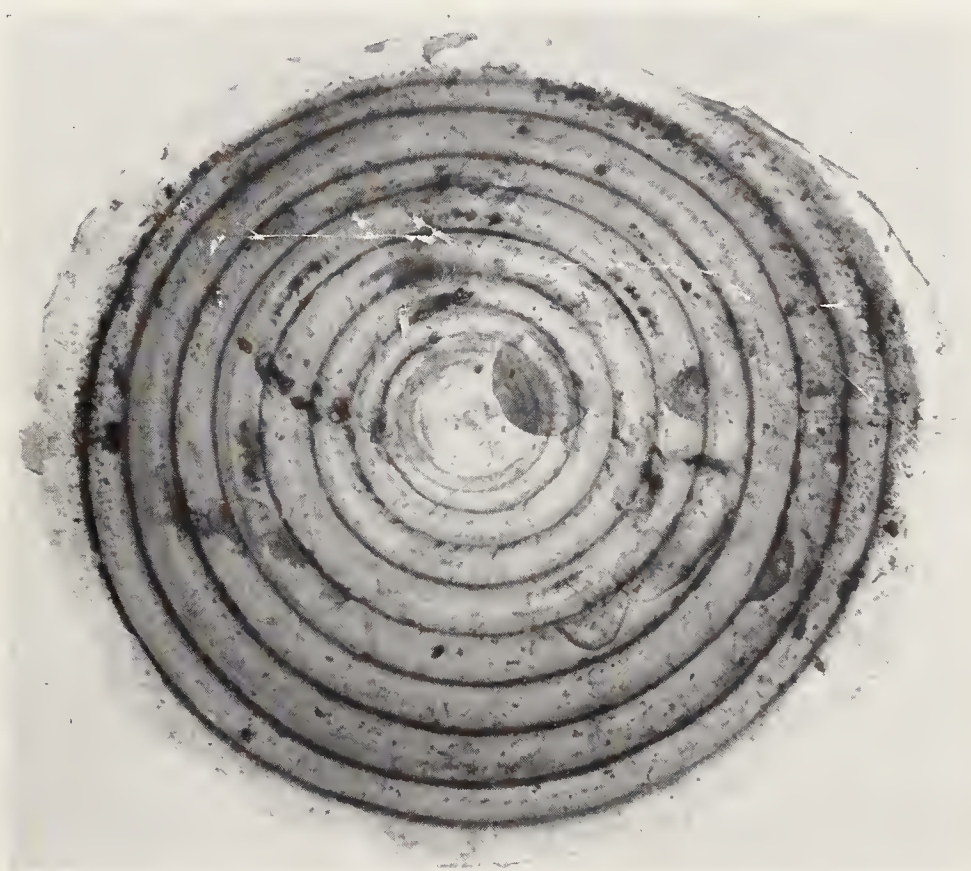


Plate 1. Operculum of *Calliostoma zizyphinum* Linné (13.6x). From Millport Harbour, Scotland.

* *Johnsonia*, Volume 4, starts with Number 40.

distantly related forms are brought together. In a few instances, the young may be umbilicate while the adults of the same species are imperforate.

Our studies of the jaws and radulae have shown that there are at least three rather distinct categories in which many of the Western Atlantic *Calliostoma* may be placed. Unfortunately, the soft parts of several species were not available so that the subgeneric placement of these species must be left until material is available. We feel, that at this time, a conservative attitude should be taken regarding the Western Atlantic *Calliostoma*, particularly on the generic level. To make several genera out of the many species groups based on the characters of the shell morphology would be meaningless and would confuse rather than expedite their classification. Certainly, characters of the shell are very important on a specific level but these same characters fail to meet the differences expected between genera.

In a few reports which include *Calliostoma*, a family name has been indicated, Calliostomidae. At this time this would appear to be unjustified as we still lack anatomical data on most genera in the Trochidae. In general, families are based upon characters which are rather sharply differentiated from one another and these characters may be based on such things as shell morphology or on significant differences in the soft anatomy. In the present case, *Calliostoma* is not at all sharply differentiated from many other genera in the Trochidae. In fact, there are several species described as *Calliostoma* which are now allocated to other genera. As far as we can trace, no one has set the limits of the

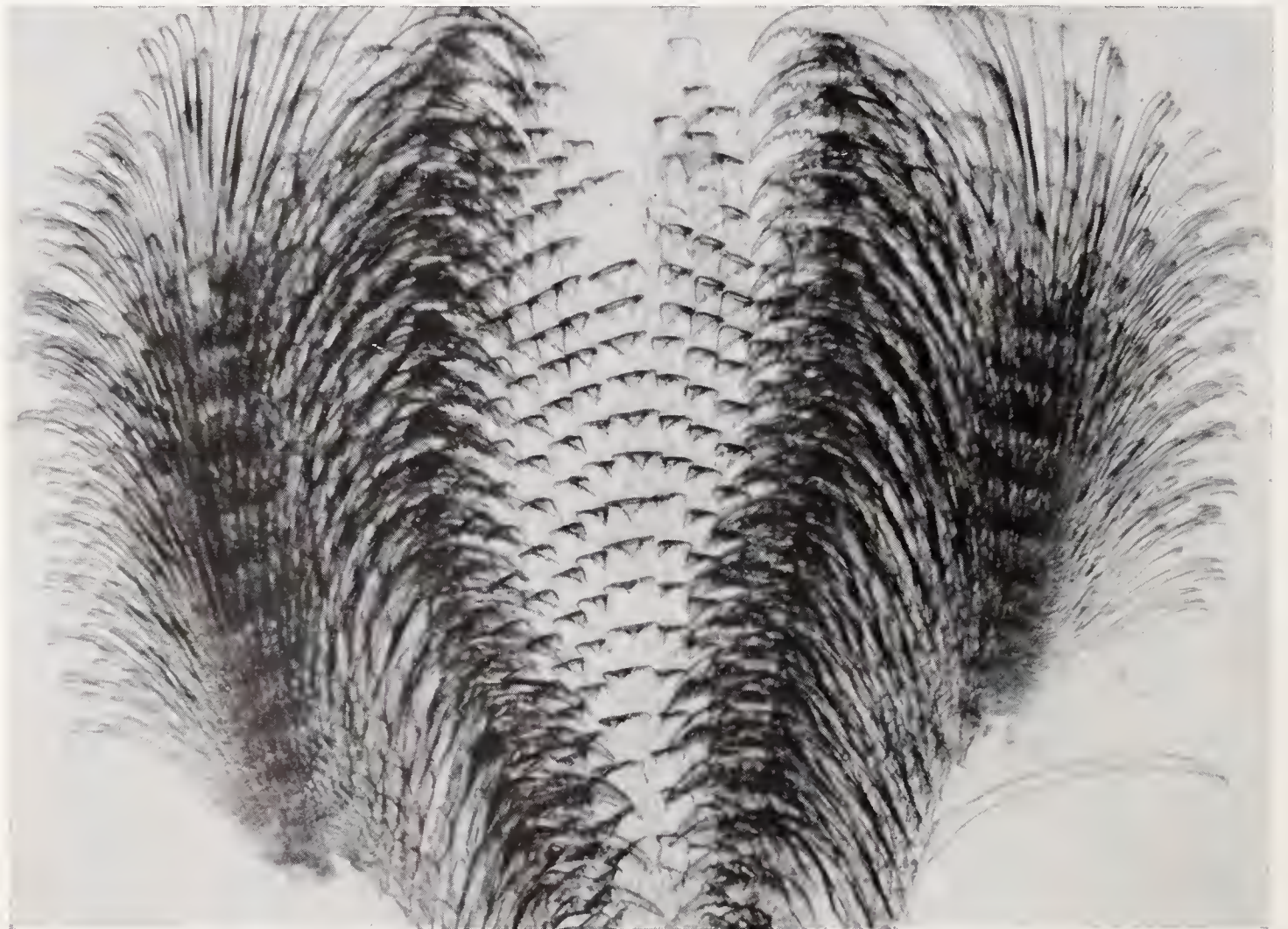


Plate 2. A whole mount of a section taken from the middle of the radular ribbon of *Calliostoma oregon* Clench and Turner, to show the complexity of the teeth and their arrangement. The first row of marginal teeth are completely covered other than a single tooth at the top and near the right center (52.5x). From the *Oregon*, station 550, about 70 miles SE of Corpus Christi, Texas.

family Calliostomidae. It is probably equal to what Wenz has considered on the family level.

Little is known of the anatomy of *Calliostoma* and unfortunately the material we had for study was not sufficiently well preserved for detailed anatomical work, though we were able to obtain the radulae and jaws from 20 species, 16 of which are illustrated. The jaws are most interesting and seem to be composed largely of organic material. They can only be obtained satisfactorily by dissection. If the entire head region is placed in potassium hydroxide for the extraction of the radular ribbon the jaws are reduced to a thin film which lacks all scales and other important characters. The jaws as illustrated have been removed from the membranes in which they are normally held and are spread out flat for photographing. The anterior end is uppermost. Normally the two small central plates are dorsal; the large plates extend down on either side of the odontophore and are connected by a membrane ventrally to form a tube. This chitin-like membrane extends anteriorly beyond the jaws in a ruffled tube. A portion of this tube remains and can be seen on Plate 10, fig. 1. Exactly how the jaws function we do not know but possibly they only hold the mouth open, though there might be some slight lateral scraping or gathering of food particles. Certainly they are not strong enough for actually biting off particles of food.

The jaws in the material studied may be grouped into three distinct types.

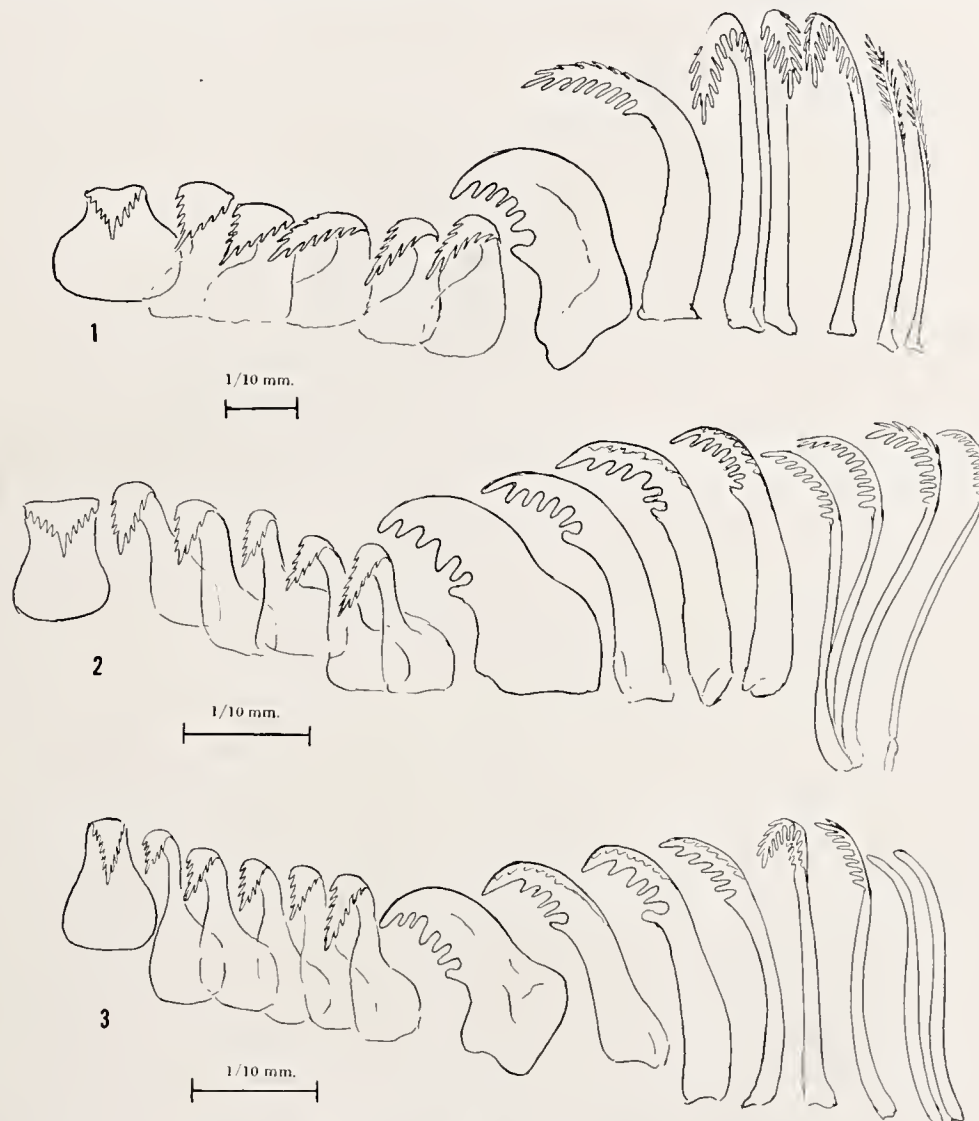


Plate 3. Radulae. Fig. 1. *Calliostoma zizyphinum* Linné, Millport Harbour, Scotland. Fig. 2. *C. jucundum* Gould, off Río de la Plata, Argentina. Fig. 3. *C. pulchrum* Adams, Bahía de Cárdenas, Matanzas, Cuba.

The first (*Calliostoma* ss.) has rather thin, straw-colored, rounded jaws with distinct and relatively large scales and, on the anterior edge, the scales are elongate, extending anteriorly as a fringe. This fringe can best be seen by using transmitted light and does not show well in all of the photographs (Plate 8).

In the second group (subgenus *Elmerlinia*) the jaws are somewhat pointed at the anterior end, the scales on the surface of the jaws are large and at the anterior end the scales are very long and project in tufts (Plate 9).

The third group (subgenus *Kombologion*) has rounded jaws that are rather thick, heavy, and dark brown in color, with very minute scales and a nearly smooth anterior edge without a true fringe (see Plates 10 and 11).

The radula of *Calliostoma*, as in all Archaeogastropoda, is very complicated, adapted for feeding on minute particles scraped from the surface of algae or, in the deep water forms, probably for gathering detritus. We have found minute particles of shells, sand grains and what appeared to be worm tubes filling the posterior end of the intestine in several deep water species. The radula probably acts mainly as a conveyor belt to carry the food into the mouth. Certainly the teeth are not strong enough, except possibly the first two marginal teeth, to be efficient rasps. Plate 2 shows a transverse section taken from the middle portion of the radular ribbon of *Calliostoma oregon* Clench and Turner. It is typi-

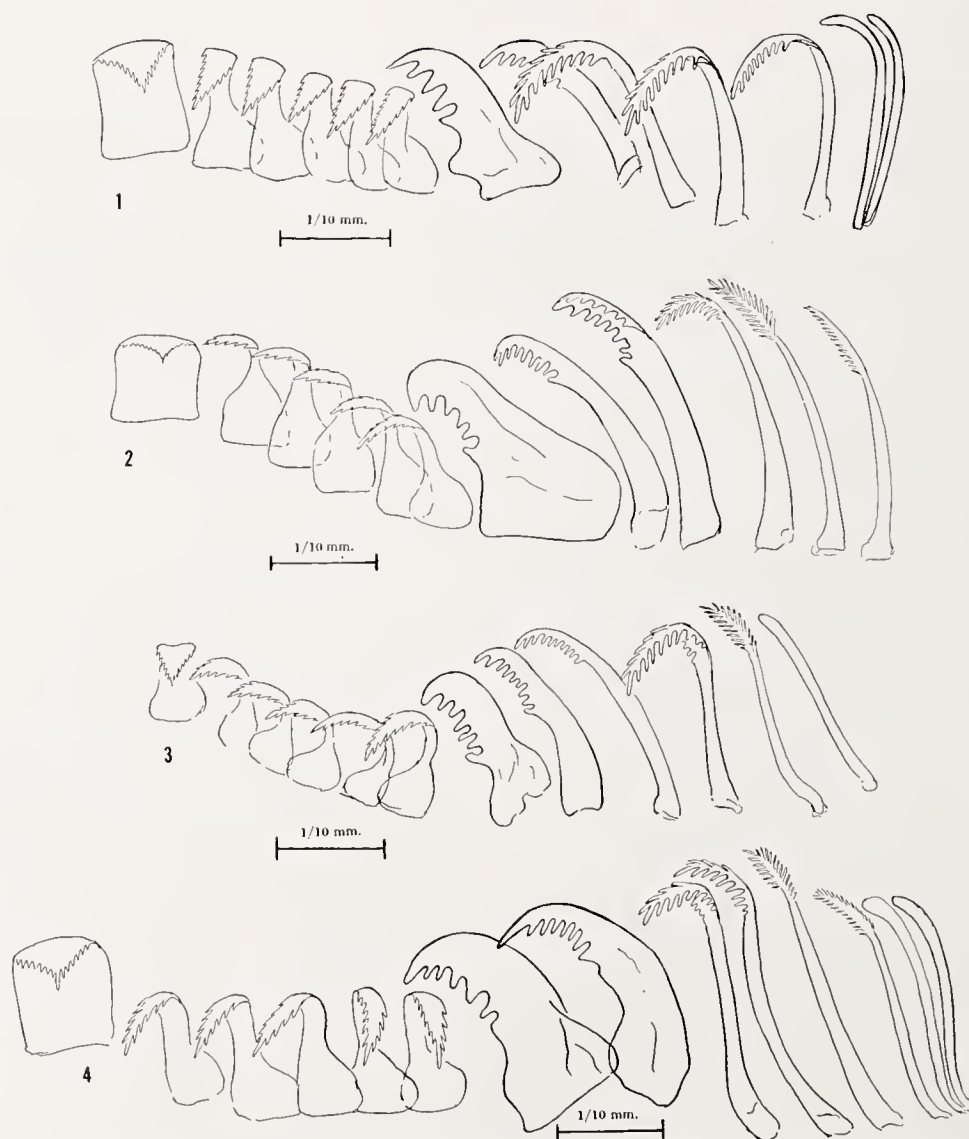


Plate 4. Radulae. Fig. 1. *Calliostoma coppigeri* Smith, from the *Hassler*, station 27, about 60 miles E of Peninsula Jabalí, Argentina. Fig. 2. *C. occidentale* Mighels and Adams, Eastport, Maine. Fig. 3. *C. roseolum* Dall, SW of Tortugas, Florida. Fig. 4. *C. yucatecanum* Dall, off Port Isabel, Texas.

cal of the genus and may be used as the basis for the discussion of various types of radulae found in the Western Atlantic *Calliostoma*. It will be noted that the central tooth is fairly broad, though weak, with a single large cusp which is finely serrated. The lateral teeth are quite similar to the central tooth and this produces a broad "low" central portion extending the length of the ribbon. The first marginal tooth, however, is large, strong and heavy. In the photograph (Plate 2) only a single first marginal can be seen at the top right hand side of the center, the others being covered by the overlapping marginals. The second marginal (in all Western Atlantic forms studied) is somewhat similar to the first though less powerful and never with as heavy a basal area. Beginning with the third marginal tooth, the remainder are very long, with numerous large serrations. The marginal teeth gradually diminish in size and often the outermost marginals are nearly or quite smooth. After studying the radulae of several species and several specimens of a single species from a single locality, as well as various portions of a single radular ribbon, it became apparent that the number of serrations on a given tooth varied considerably and could not be used as a taxonomic character. The number of marginal teeth varied in different specimens from the same locality and even in different portions of the same ribbon, and so could not be used. The number of lateral teeth, however, was constant for a given species, though not for the genus. The number of laterals varied from 4 to 7 with most species having 5. The proportional size and shape of the first marginal tooth varied considerably from one species to another. Though the first marginal tooth is always large, in *Calliostoma* ss. it is very heavy and has a large thick base (see Plates

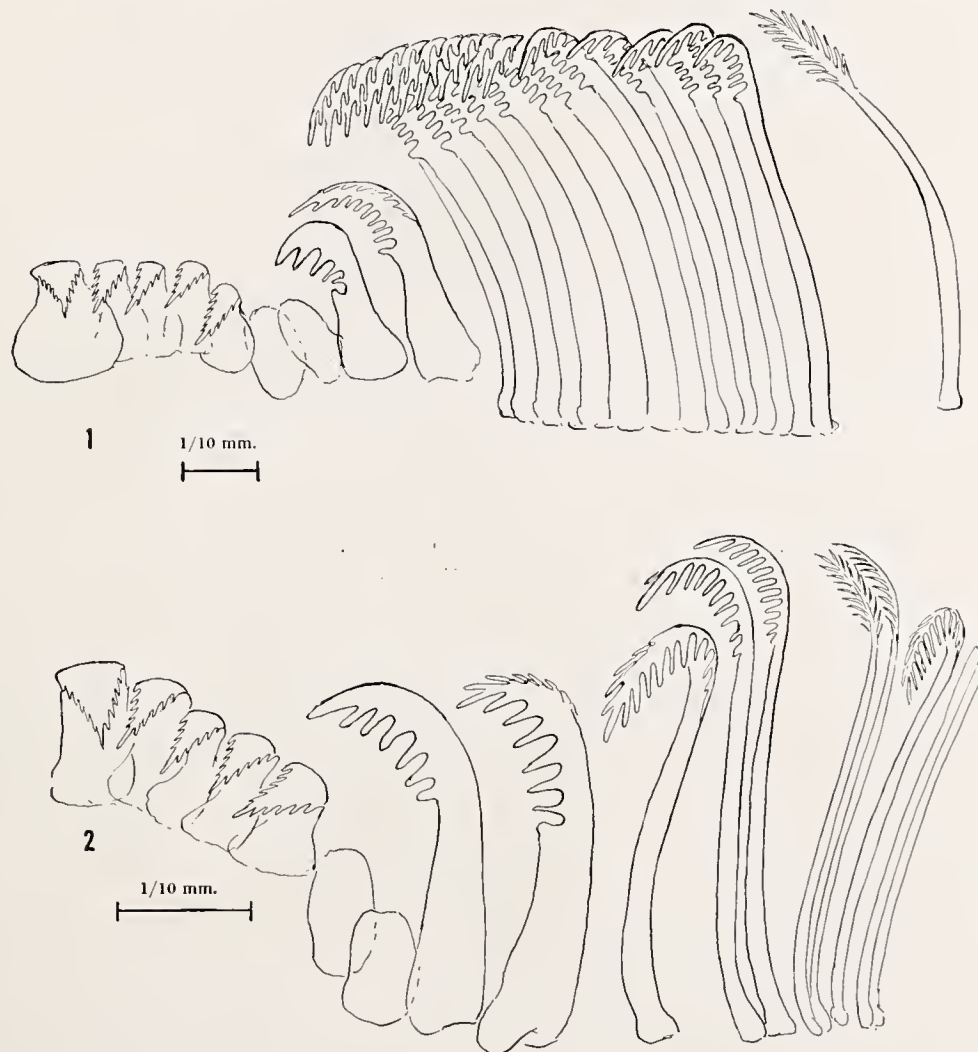


Plate 5. Radulae. Fig. 1. *Calliostoma bullisi* Clench and Turner, from the Oregon, station 2054, about 65 miles ESE of Cabo Orange, Amapá, Brasil. Fig. 2. *C. jujubinum* Gmelin, Marco, Florida.

3 and 4). It is very prominent and, because the remaining marginals are proportionally shorter, it is not covered by the overlapping marginals as in Plate 2. In the subgenus *Kombologion* the first marginal tooth, though somewhat of the same shape as in *Calliostoma* ss., lacks the heavy base and is much less conspicuous as is shown in Plates 2, 6 and 7. In the subgenus *Elmerlinia* the first marginal is similar to that in *Kombologion*, but the radula differs by having the two outer lateral teeth reduced to a large flat plate-like structure lacking cusps or having very long slender cusps as shown in Plate 5.

When arranging the species we have placed in subgenera those for which we had radulae and jaws; the remaining we have left only in the genus *Calliostoma* and these will be placed in the appropriate subgenera as soon as material is available.

Several species of Western Atlantic *Calliostoma* have been placed in the subgenus *Astele* Swainson, but the examination of the jaws and radula of *C. subcarinatum* Swainson, the type species of *Astele*, showed it to have a very different type of radula. (See under notes.)

The operculum in *Calliostoma* appears to be very uniform and shows but slight if any

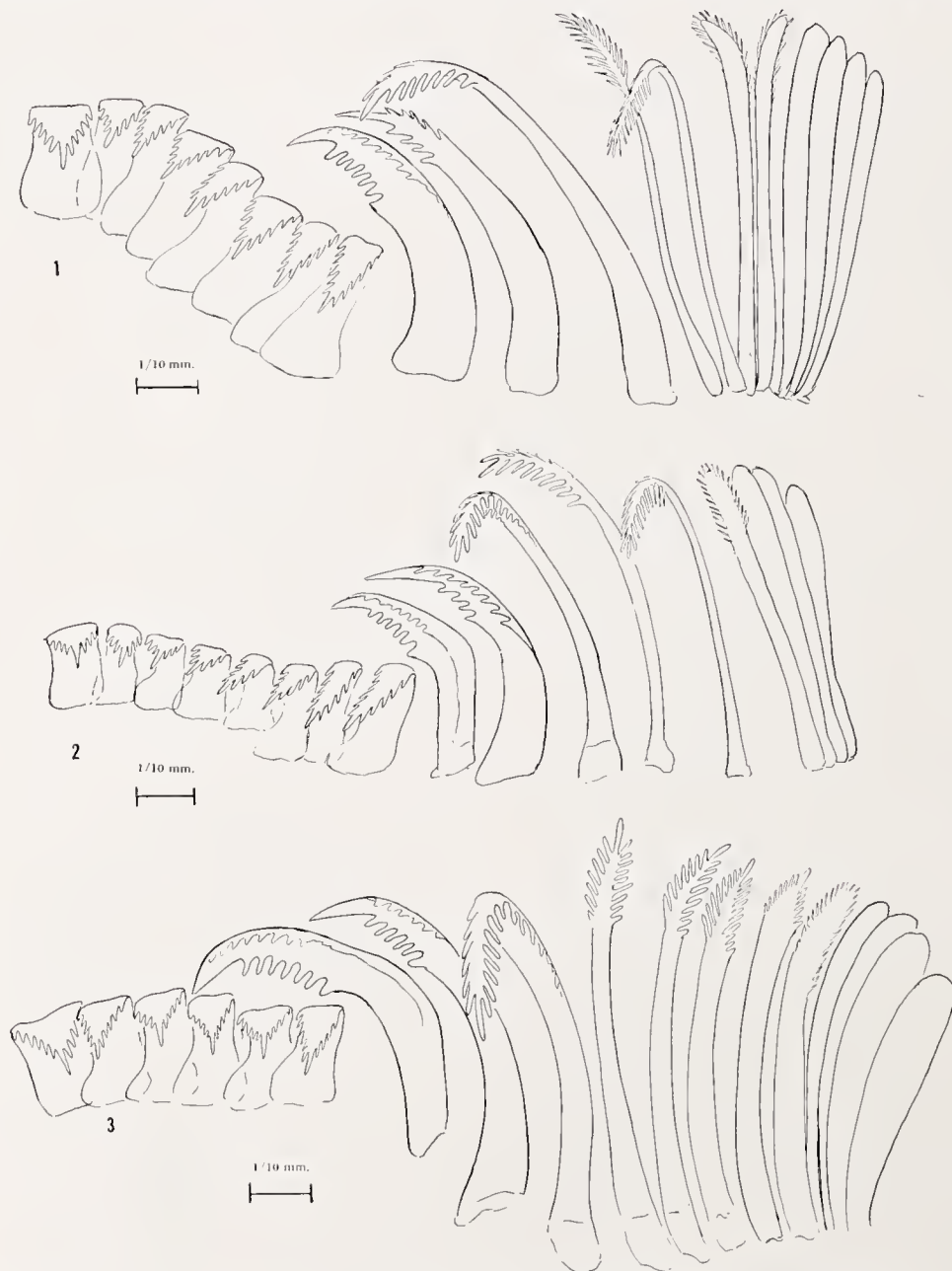


Plate 6. Radulae. Fig. 1. *Calliostoma bairdii* Verrill and Smith, about 120 miles E of Barnegat Bay, New Jersey. Fig. 2. *C. oregon* Clench and Turner, about 70 miles SE of Corpus Christi, Texas. Fig. 3. *C. rosewateri* Clench and Turner, about 90 miles SE of Galeota Point, Trinidad.

differences between the species. In fact, the opercula of all of the Trochidae are very uniform so far as we know, differing mainly in size, number of whorls and somewhat in color (see Plate 1).

The dominant sculpture in this genus consists of cords or ridges which may be smooth or beaded and which are separated by grooves or incised lines. The beading, when present, is fairly uniform on any one cord, but the size of the cords and consequently the beading may vary greatly at different levels of the whorl. Variation is also expressed in

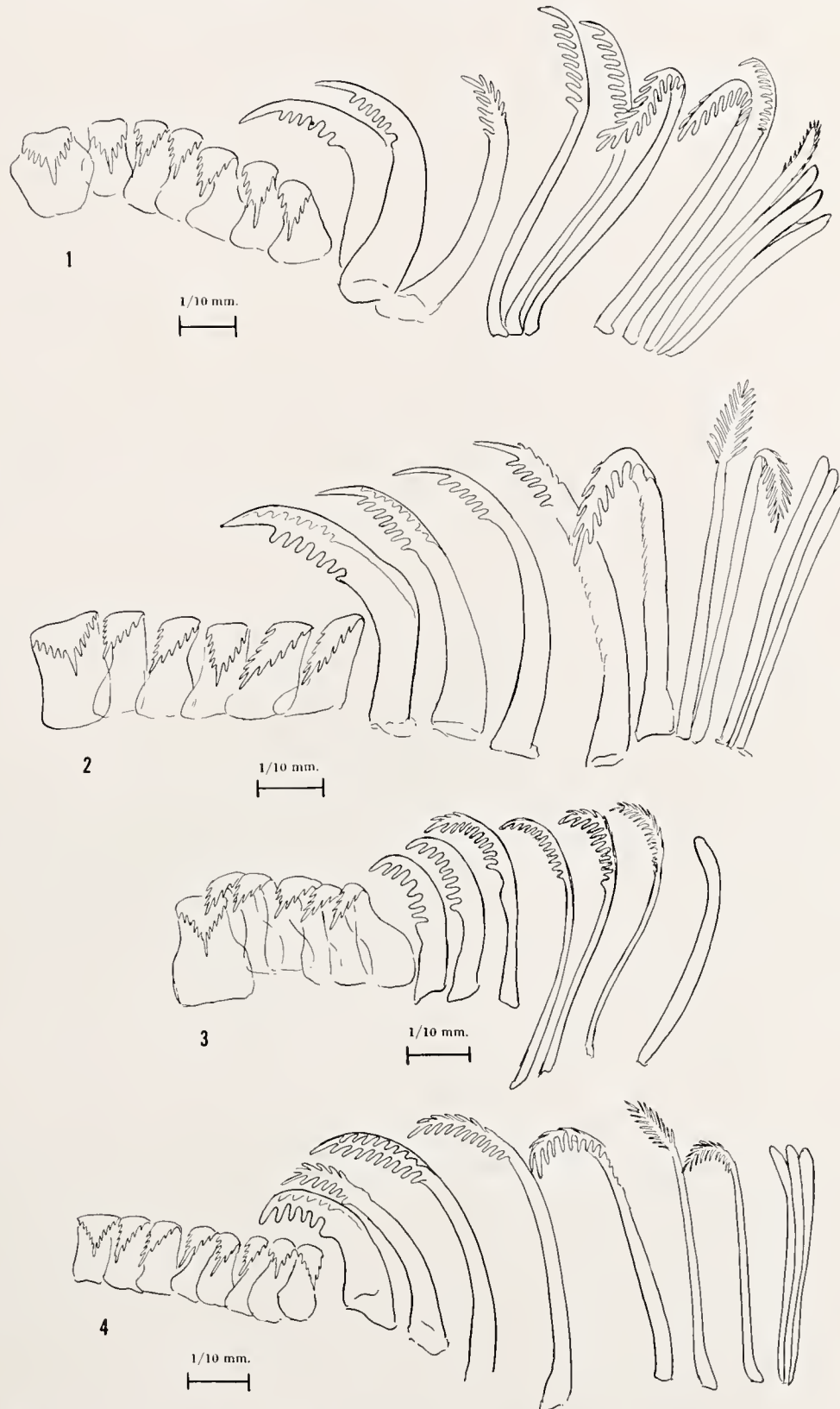


Plate 7. Radulae. Fig. 1. *Calliostoma psyche* Dall, from the *Combat*, station 91, about 60 miles E of Daytona, Florida. Fig. 2. *C. schroederi* Clench and Aguayo, from the *Combat*, station 235, off Matanilla Shoals, Little Bahama Bank, Bahama Islands. Fig. 3. *C. marionae* Dall, from the *Combat*, station 101, about 50 miles E of St. Augustine, Florida. Fig. 4. *C. hendersoni* Dall, from the *Oregon*, station 1349, about 8 miles NE of Cay Sal Bank, Bahama Islands.

the average number of cords characteristic of a given species, but specimens of a single species will show some variation in the number of cords and in the size of the beads. In species which have a reduced number of cords, those remaining are usually at the periphery of the whorl; the area near the suture or the columella is often smooth. In many species there are one or two cords at the periphery which may or may not be beaded and which are usually larger than the other cords.

In the descriptions of several species of deepwater *Calliostoma* described by Dall, he mentions that the embryonic whorls are sinistral. His most pertinent note on this character is under *C. roseolum* Dall (1889, Bull. Museum of Comparative Zoology 18: 366). We have examined all of Dall's holotypes and in no case have we found the nuclear or embryonic whorls sinistral. All appear dextral. All of the various *Calliostoma* larval shells studied by Lebour are dextral. The embryonic whorls are small and are somewhat flattened, but the direction of coiling is apparent even under moderate magnification (14× to 20×).

Little is known of the embryology and development of the many species of *Calliostoma*. Jeffreys (1865) was the first to mention that the fry of *millegraus* and *zizyphinus* were slightly umbilicate. Roberts (1902) in his paper on the development of the Trochidae described the eggs, cell lineage, and early development of several species in this family and illustrated the veliger larvae of *Trochus striatus* (= *Calliostoma*) and young of *C. canuloides* and *C. magus*. Lebour (1936) described and figured the young of *Calliostoma zizyphinus* Linné which spawned in the tanks at the marine laboratory in Plymouth, England. The eggs were laid in a gelatinous ribbon, several inches long and 3 or 4 mm. wide.

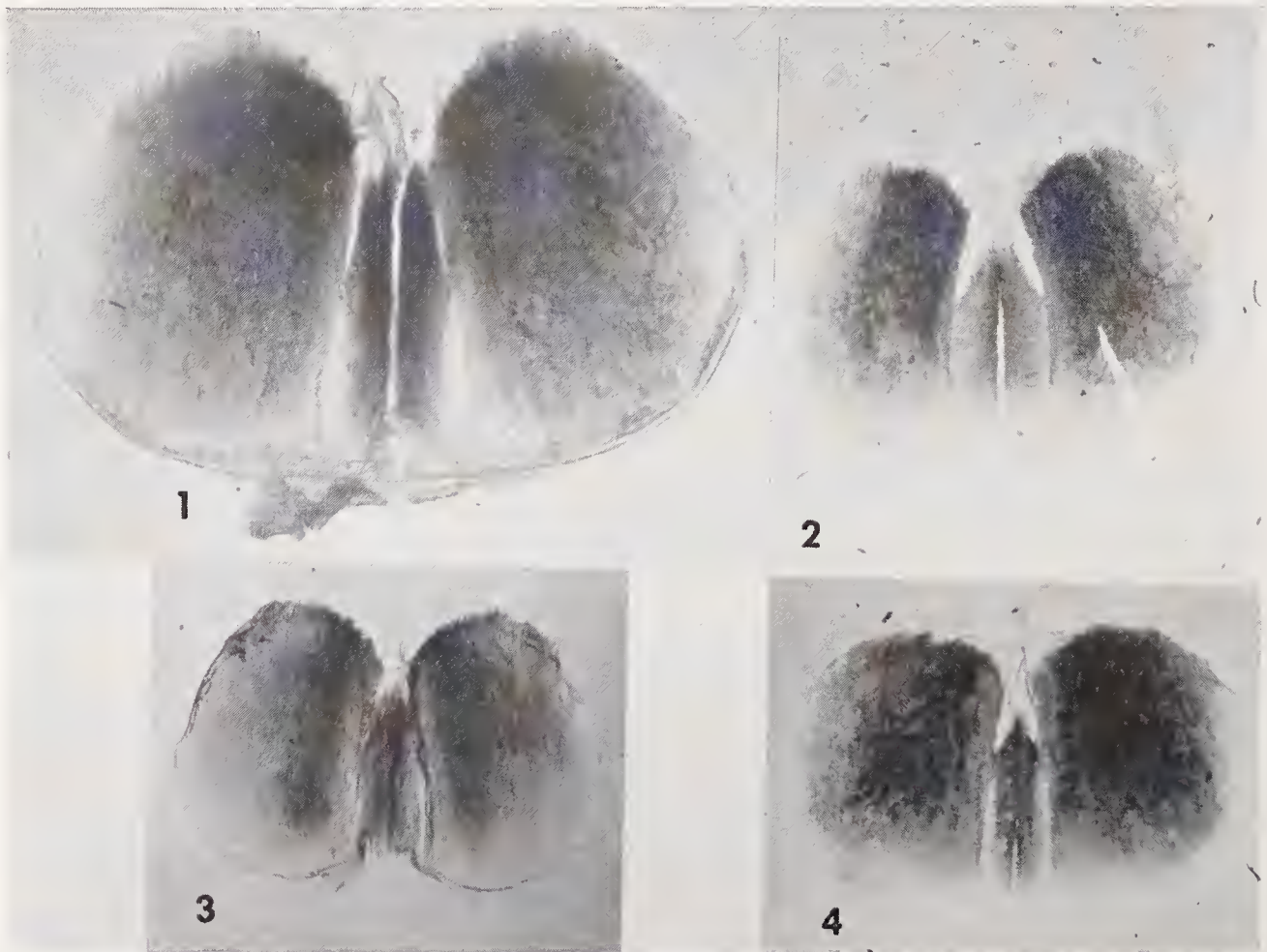


Plate 8. Jaws. Fig. 1. *Calliostoma zizyphinum* Linné, Millport Harbour, Scotland. Fig. 2. *C. jucundum* Gould, off Rio de la Plata, Argentina. Fig. 3. *C. occidentale* Mighels and Adams, Eastport, Maine. Fig. 4. *C. yucatecanum* Dall, off Port Isabel, Texas in $10\frac{1}{2}$ fathoms (all about 25x).

It was attached at intervals to the glass of the aquarium and part of it was floating. Inside the ribbon were numerous, yellowish eggs irregularly arranged, each 0.25 mm. to 0.28 mm. when newly laid, covered by a thin membrane, and floating in a nutritive medium within the egg covering, and this was surrounded by a thick layer of jelly. A micropyle was present in the egg-covering of the unfertilized egg. According to Lebour "Fertilization is usually regarded as external, but the second specimen, taken from the tank and placed in a bowl whilst depositing its spawn continued to lay eggs which developed into crawling young." For the species of *Calliostoma* where the embryology is known, the trochophore and veliger stages are passed within the egg membrane. The veliger stage is reached in two days and at this stage the developing larva has a spiral shell of about $1\frac{1}{4}$ whorls, and a round velum in front of, and dorsal to, the foot (text fig. 1c). At the time of hatching the velum has disappeared; the tentacles, eyes, and two pairs of slender, branched, epipodial outgrowths are well-developed and the shell is about 0.32 mm. across. The shell is sculptured with rounded to elongate pits. Lebour stated the *zizyphinus* spawned in June at Plymouth, but Roberts (1902) stated that *Calliostoma papillosum* daCosta (= *granulatus* Born.) spawned all year round at Roscoff, France. The egg mass was similar to that of *zizyphinus*. He figures the newly hatched young of *conuloides*, showing four pairs of short, broad epipodial outgrowths.

Lebour has suggested that good characters for distinguishing the various genera of the Trochidae may be found in the type of egg mass laid, progressing from the genera *Monodonta* and *Gibbula* which produce eggs singly, to *Margarites* which lays the eggs in small shining lumps, to *Calliostoma* which produces its eggs in gelatinous ribbons, and *Cantharidus* which produces the eggs in gelatinous masses.

According to Shimer and Shrock (Index Fossils of North America, p. 480) the genus *Calliostoma* first appeared in the Upper Cretaceous and has a world distribution as fossils. In the Western Atlantic area several fossil species have been described mainly from Argentina (Oligocene to Pleistocene), Bowden, Jamaica (Miocene), Florida (Miocene and Pliocene), South Carolina and Virginia (Miocene). Many of the fossil species are remarkably similar to the recent species, differing but little in sculpture and shape.

ACKNOWLEDGMENTS

We are deeply indebted to many people for the loan or the gift of specimens used in this study. As with all previous numbers of *Johnsonia*, this one has benefited greatly because of the interest and cooperation of our many friends and we wish to thank the following for their kindness:

R. Tucker Abbott, Academy of Natural Sciences, Philadelphia; C. G. Aguayo, Muséo Poey, Universidad de la Habana, Cuba; Frederick M. Bayer, United States National Museum; E. Binder, Muséum d'Histoire Naturelle, Genève, Switzerland; Harvey J. Bullis, Bureau of Commercial Fisheries, Pascagoula, Miss.; Alberto R. Carcelles, Cordoba, Argentina; Marion L. Chambers, Sarasota, Florida; Vincent Conde, Redpath Museum, Montreal, Canada; Bernard C. Cotton, South Australian Museum, Adelaide, South Australia; Marion W. Dewey, Paxton, Mass.; C. John Finlay, Varadero, Cuba; Mrs. W. C. Frisbey, Port Isabel, Texas; Harry and Kathleen Johnstone, Mobile, Alabama; Myra Keen, Stanford University, Stanford, California; George and Mary Kline, Madison, New Jersey; Hope Macpherson, National Museum of Victoria, Melbourne, Australia; Thomas L. McGinty, Boynton Beach, Florida; Donald F. McMichael, The

Australian Museum, Sydney, Australia; Arthur Merrill, United States Fisheries Laboratory, Woods Hole, Mass.; Donald Moore, Gulf Coast Research Laboratory, Ocean Springs, Miss.; Percy Morris, Peabody Museum, Yale University; Robert H. Parker, Scripps Inst. of Oceanography; Juan J. Parodiz, Carnegie Museum, Pittsburgh, Penn.; R. E. Petit, Ocean Drive Beach, South Carolina; Thomas Pulley, Houston Museum, Houston, Texas; Harald A. Rehder, United States National Museum; Emma B. Richardson, Charleston Museum, Charleston, South Carolina; Robert Robertson, Academy of Natural Sciences, Philadelphia; David and Nevada Schmidt, Sarona, Wisconsin; Jeanne S. Schwengel, Scarsdale, New York; Frederick Sibley, Boston, Mass.; Daniel and Barbara Steger, Tampa, Florida; Gordon Usticke, St. Croix, Virgin Islands; Gilbert Voss, Marine Laboratory, University of Miami, Miami, Florida; Germaine Warmke, Institute of Marine Biology, Mayagüez, Puerto Rico; J. A. Weber, Miami, Florida; Robert Work, Marine Laboratory, University of Miami, Miami, Florida.

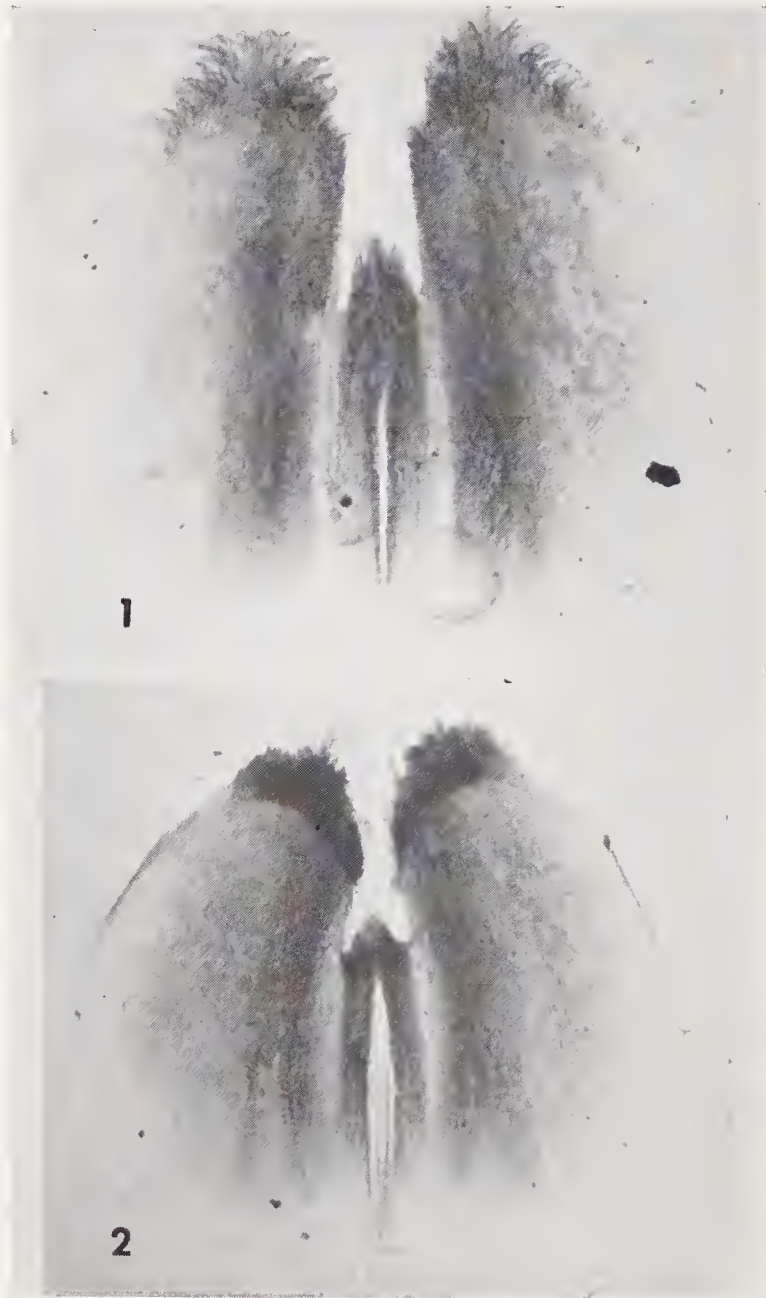


Plate 9. Jaws. Fig. 1. *Calliostoma jujubinum* Gmelin, Marco Island, Florida. Fig. 2. *C. bullisi* Clench and Turner, from the *Oregon*, station 2050, about 75 miles ESE of Cabo Orange, Amapá, Brasil (both about 25x).

ABBREVIATIONS

ANSP—Academy of Natural Sciences, Philadelphia
 CM—Charleston Museum
 MCZ—Museum of Comparative Zoology
 SU—Stanford University
 UMML—Univ. of Miami, Marine Laboratory
 USFW—United States Fish and Wildlife Service
 USNM—United States National Museum

Genus *Calliostoma* Swainson

Calliostoma Swainson 1840, Treatise on Malacology, p. 218 and p. 351 (type species, *Trochus zizyphinus* Linné, monotypic).

Conulus Nardo 1841, Atti Sci. Ital., p. 244 [we have not seen this publication].

Callisostoma 'Swainson' Sowerby 1842, Conchological Manual, 2nd edition, p. 90 [error for *Calliostoma* Swainson].

Zizyphinus Gray 1840, Synopsis of the Contents of the British Museum ed. 42, p. 147 [nomen nudum]; Gray 1843 [in] Dieffenbach, Travels in New Zealand 2: 237.

Callistomus Herrmannsen 1846, Indicis Generum Malacozoorum 1: 155.

Zizyphinus 'Gray' Souverbie 1875, Journal de Conchyliologie 23: 40.

Zizyphimus 'Gray' Crosse 1876, Journal de Conchyliologie 24: 118.

Manotrochus Fischer 1885, Manuel de Conchyliologie, Paris, p. 827 (type species, *Trochus unidentatus* Phil., monotypic).

Jacinthinus Monterosato 1889, Bull. Soc. Malacologica Italiana 14: 79 (type species, *Zizyphinus conulus* Linné, monotypic).

Ampullotrochus Monterosato 1890, Naturalista Siciliano 9: 145 (type species, *Trochus granulatus* Born, original designation).

Callistoma 'Swainson' Cossmann 1918, Essais Paleoconchologie Comparée, Paris, 11: 286.

Dymares Schwengel 1942, Notulae Naturae, no. 106, p. 1 (type species, *Calliostoma agalma* Schwengel, original designation).

Type species, *Trochus zizyphinus* Linné, monotypic.

The shells are trochoid in shape and sculptured generally with spiral, beaded cords. The aperture is subquadrate, the columella usually arched and frequently truncate at the base. Both umbilicate and imperforate species occur. The coloration varies among the many species but when present it usually appears as a dull yellow or brown ground color with axial flames of red or red-brown as a secondary coloration. The interior of the aperture is highly iridescent in most if not all species.

Remarks. On page 218 where Swainson first introduced the name *Calliostoma* he stated: "The *Trochus zizyphinus* of British writers will give a very good idea of these shells." This is the only name he associates with *Calliostoma* on this page. On page 351 he lists eight species under this genus and places *zizyphinus* first. Gray in 1847 gives *zizyphinus* as the type species. Herrmannsen 1846 was in error in using *T. conulus* Linné as the type species.

Subgenus *Calliostoma* Swainson

Shells generally imperforate, marked with axial flames of reddish brown or unicolored. Sculptured with beaded cords, occasional species are found having these cords beaded only on the early whorls. Aperture subquadrate.

Radula with a denticulate central tooth, five rather uniform lateral teeth, the first marginal tooth broad, the succeeding marginals becoming more attenuate, and having numerous, fine denticles (see Plates 3 and 4).

Jaws subcircular with their anterior ends broadly rounded and with a short fringe (see Plate 8).

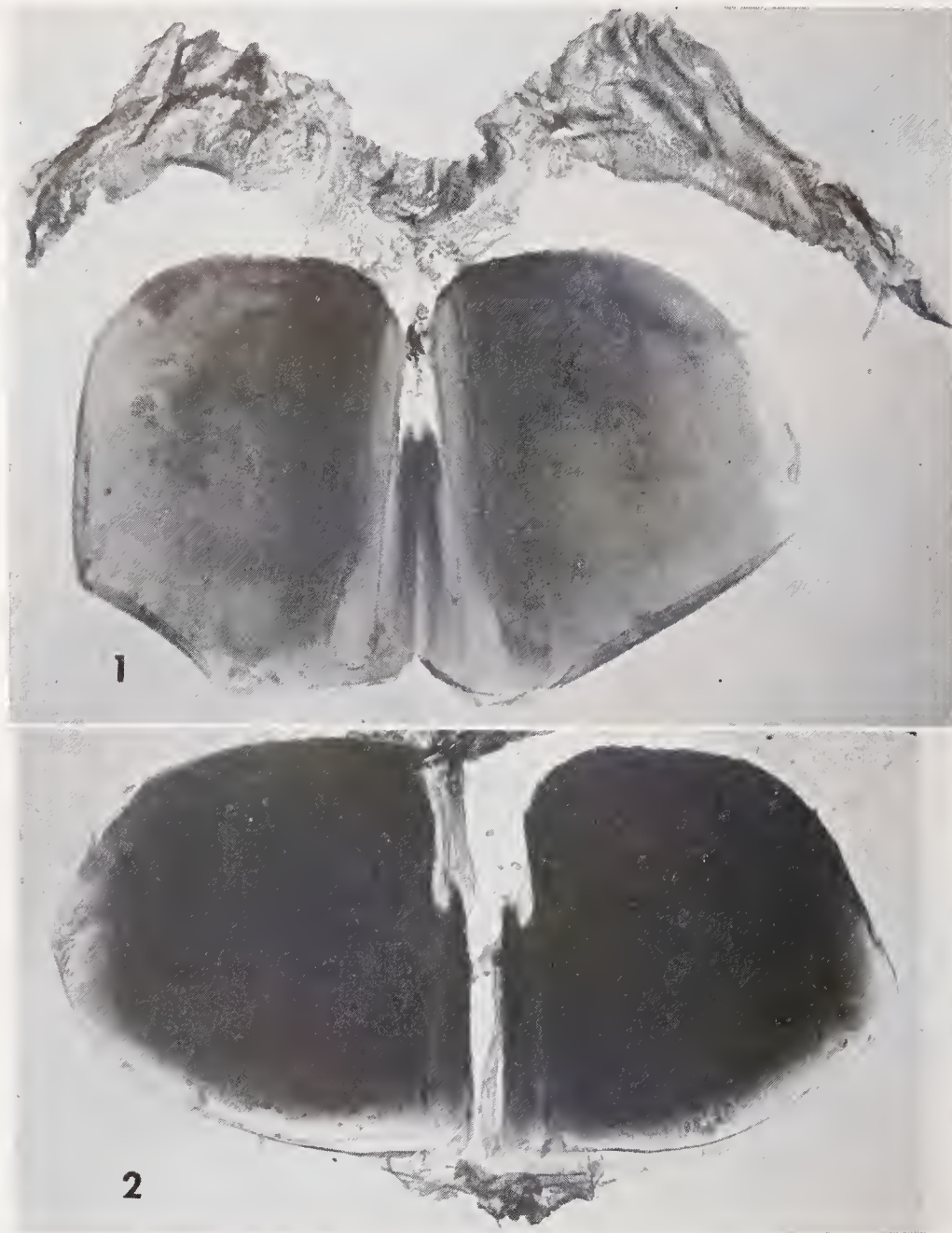


Plate 10. Jaws. Fig. 1. *Calliostoma bairdii* Verrill and Smith, south side of Little Georges Bank, Massachusetts in 77 fathoms. Fig. 2. *C. rosewateri* Clench and Turner, from the *Oregon*, station 1989, about 90 miles SE of Galeota Point, Trinidad (both about 25x).

Calliostoma (Calliostoma) zizyphinum Linné

Plate 1; Plate 3, fig. 1; Plate 8, fig. 1; Plate 12

Trochus zizyphinus Linné 1758, Systema Naturae, ed. 10, p. 759 (M. Mediterraneo & Europaeo).

Trochus discrepans Brown 1818, Mem. Wernerian Nat. Hist. Soc. 2: 501, pl. 24, fig. 4 (Holywood, Belfast Lough, Ireland).

Trochus conuloides Lamarek 1843, Animaux sans Vertèbres (2) 9: 142 (l'Océan européen et la Méditerranée).

Zizyphinus vulgaris Gray 1850, Figures of Molluscous Animals 4: 89, pl. 43, fig. 3 [refers to S. della Chiage in Poli 1826, 3: pl. 52, figs. 3 and 5].

Trochus zizyphius Linné. Hanley 1855, Ipsa Linnaei Conchylia, London, p. 322.

Description. Shell reaching 35 mm. (about $1\frac{3}{8}$ inches) in length, trochoid, solid in structure, rather finely sculptured and imperforate. Color a light reddish brown with axial flames of red at the whorl periphery. Whorls 10, flat sided and with a rounded carina at the periphery. Base of shell slightly convex. Spire extended and produced at an angle of 65° to 70° . Aperture subquadrate, the outer lip simple and produced at an angle of 45° from the base. Columella thickened, arched and truncate. Suture slightly indented. Sculpture of the first 5 postembryonic whorls beaded, the remaining whorls with flattened cords. The base of the shell nearly smooth or with flattened cords. Operculum circular, multispiral and corneous. Nuclear whorl $1\frac{1}{4}$, minute, brownish and smooth.

length	width	
35 mm.	33 mm.	Cannes, France
23	21	Millport Harbour, Scotland
23.5	23.5	Pino, Corsica
21.5	23	Swanage, England

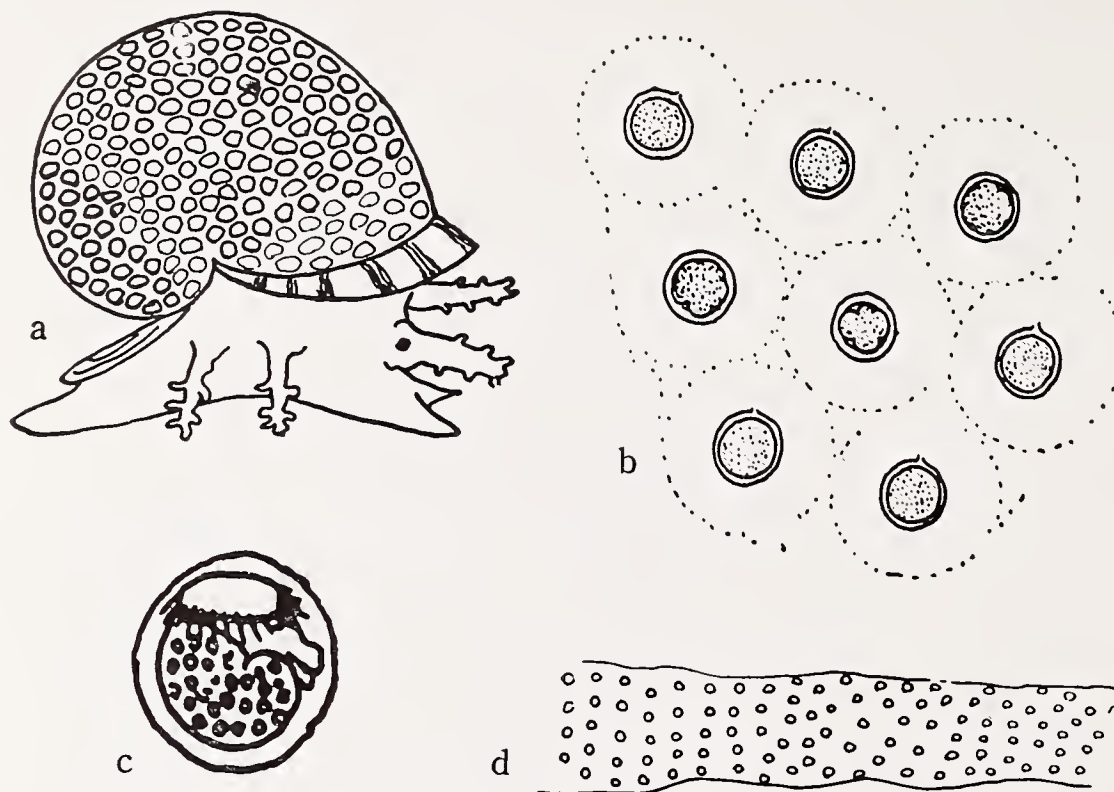
Types. In 1855 Hanley reported that the original specimens of Linné were in the Linnean Society, London. These specimens are still in their possession to judge by the photographs made of this collection a few years ago. The type figure, here selected, is that of Martin Lister, *Historiae Animalium Angliae*, London, 1678, p. 116, pl. 3. fig. 14. This referenee was given among others by Linné.

Remarks. This species would appear to be related to *C. conulum* Linné, differing in being more coarsely sculptured and also somewhat in its proportions. Based upon shell



Plate 11. Jaws. Fig. 1. *Calliostoma schroederi* Clench and Aguayo, from the *Combat*, station 235, off Matanilla Shoals, Little Bahama Bank, Bahama Islands. Fig. 2. *C. hendersoni* Dall, from the *Oregon*, station 1349, off Cay Sal Bank, Bahama Islands (both about 25x).

characters, *C. zizyphinum* Linné does not appear to be closely related to any species other than *C. marionae* in the Western Atlantic. The jaws and radula, however, are quite different.



Text fig. 1. Eggs and young of *Calliostoma zizyphinum* Linné. a. Young at the time of hatching. b. Eggs greatly enlarged showing the egg membrane and the thick gelatinous layer which surrounds each egg. c. Veliger larva. d. Section of the egg ribbon. (All from Lebour.)

The following is from J. G. Jeffreys 1865, *British Conchology* 3: 332. "The spelling of the specific name has partaken of the variability of the objects designated. *Zezyphinus*, *zyziphinus* and *sisyphinus* are the readings proposed by Chemnitz, Born, Montagu and Macgillivray. The last of these writers imagined that the name was derived from the rolling stone of Sisyphus and not from *zizyphum*, the fruit of the jujube-tree."

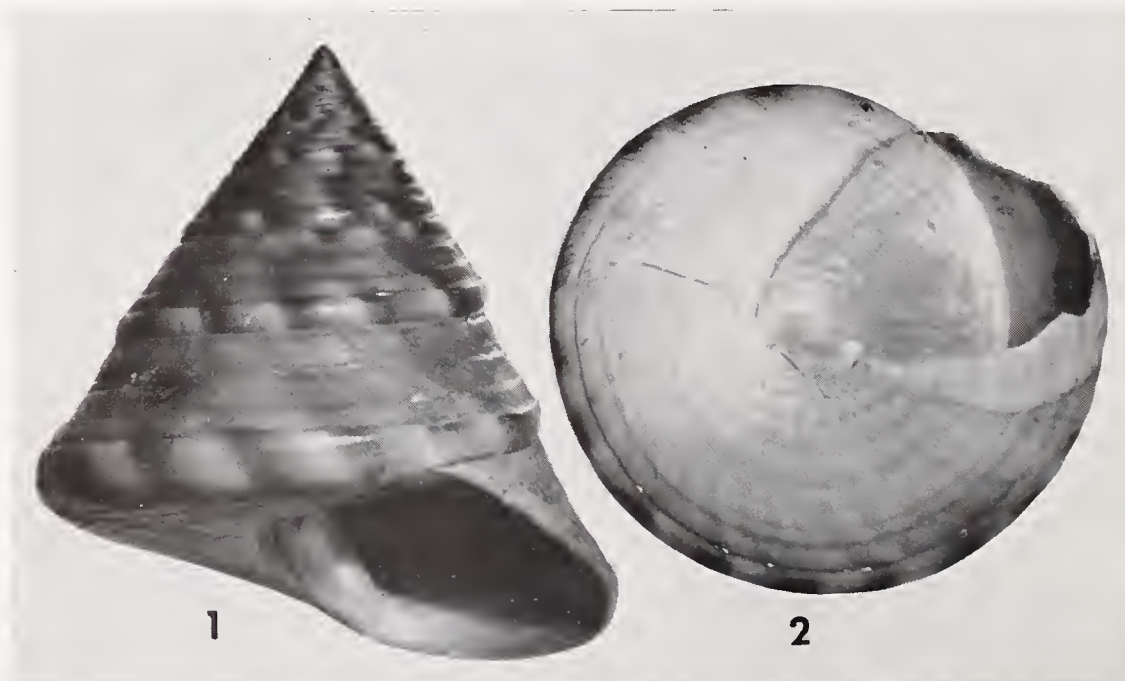


Plate 12. Figs. 1-2. *Calliostoma zizyphinum* Linné, Millport Harbour, Scotland (about 2.9x).

Names for several varieties have been proposed but they appear to have little or no value as their designation applies to minor morphological or color differences.

Specimens examined. GREAT BRITAIN: Aberdeen Bay; Oban; Millport Harbour (all Scotland). Grimsby; Hastings; Swanage; Weymouth; Torquay; Scilly Isles; Guernsey, Channel Islands (all England, all MCZ). FRANCE: Cherbourg and St. Vaast, Manche; St. Servan, St. Lunaire and St. Malo, Ille et Vilaine; Bréhec, Cotes du Nord; Cannes, Alpes Maritimes (all MCZ). PORTUGAL: Lisboa (MCZ). JUGOSLAVIA: Dalmatia (MCZ). MEDITERRANEAN ISLANDS: Pino, Corsica (MCZ). TUNIS: Gulf of Gabes (MCZ).

Calliostoma (Calliostoma) occidentale *Mighels and Adams*

Plate 4, fig. 2; Plate 8, fig. 3; Plate 13

Trochus occidentalis Mighels and Adams 1842, Boston Journal of Nat. Hist. 4: 47-48, pl. 4, fig. 16 (Casco Bay, Maine from stomach of a haddock); Clench and Turner 1950, Occasional Papers on Mollusks 1: 319, pl. 40, fig. 13.

Trochus quadricinctus Wood 1842, Annals and Magazine of Nat. Hist. 9: 531 [nomen nudum]; Wood 1848, The Crag Mollusca (Palaeontographical Society, London) 1: 125, pl. 13, figs. 2a-b (Coralline and Red Crag of Sutton, England [in the synonymy of *Trochus formosus* McAndrew and Forbes]).

Margarita alabastrum 'Beck' Lovén 1846, Ofversigt K. Vet. Acad. Föhr. 3: 152 (Bergen-Finm. [Norway]).

Trochus formosus McAndrew and Forbes 1847, Annals and Magazine of Nat. Hist. 19: 96, pl. 9, fig. 1 (Seas around the Zetland [Shetland] Islands, Scotland).

Trochus alabastrum 'Beck' Philippi 1849 [in] Martini and Chemnitz, Conchilien Cabinet (2) 2: pt. 3, p. 91, pl. 15, fig. 14 (Norwegische Meer von Bergen bis Finnmarken); Forbes and Hanley 1853, History of British Mollusca 2: 497, pl. 66, figs. 7-8.

Description. Shell reaching 16.5 mm. ($\frac{5}{8}$ of an inch) in length, top shaped, imperforate, rather thin but strong and highly sculptured. Color yellowish ivory when covered with thin periostracum. Where the periostracum is very thin or worn away the shell is highly opalescent. Whorls 8 and convex. Spire moderately extended, the angle variable, being produced at an angle of between 70° to 80° . Aperture subcircular, the outer lip simple and produced at an angle of about 45° from the base. Columella iridescent, short and arched. Suture slightly indented and defined mainly by the wider space between the spiral cords. Sculpture consisting of 3 to 5 strong spiral cords above the whorl periphery. Below the periphery there may be 9 to 12 somewhat weaker cords which vary in width and height. On the first 3 to 4 whorls the cords are all finely beaded; on the later whorls the beading is indefinite and restricted to the uppermost cord. Embryonic whorls $1\frac{1}{2}$, minute, smooth and opaque white. Operculum thin, corneous, circular, with a central nucleus and multispiral coiling. Periostracum thin, light yellowish ivory and occasionally deciduous.

height	width	
10 mm.	9 mm.	lectotype
16	16	off Georges Bank, Mass.
14	12.5	off Eastport, Maine
16	14.5	off Isle of Shoals, New Hampshire

Types. The lectotype of *Trochus occidentalis* Mighels and Adams, here selected, is in the Museum of Comparative Zoology, no. 156007, from Casco Bay, Maine. This specimen, received from Mighels, was originally in the C. B. Adams collection which is now

in this museum. This has been selected as the lectotype because the collection of J. W. Mighels in the museum of the Portland Society of Natural History, Portland, Maine, was destroyed by fire in 1853 (Johnson 1949, p. 214).

Remarks. This species appears to be most closely related to *Calliostoma ligatum* Gould (= *costatum* Martyn) of the west coast of North America. It differs by being smaller, much lighter in structure, and having a much thinner and translucent periostracum. In addition, the cords on the early whorls of the west coast species are not beaded, and this species also lacks the highly iridescent surface of *C. occidentale*.

In England, *C. occidentale formosum* was reported in the Pliocene (Crag mollusca) by S. V. Wood.

The range in depth of this species is rather extensive, (6 to 980 fathoms). The depth of 980 fathoms was based on a specimen collected alive by the *Blake* in 1877.

As far as we can trace, nothing is known of the biology of this species. They are apparently plant and detritus feeders.

Range. EASTERN ATLANTIC: Finmarks, Norway south to Bergen and south to northern Scotland, including the Shetland and Orkney Islands.

WESTERN ATLANTIC: From off Nova Scotia and south on the Banks off Massachusetts, continuing in deeper water on the continental slope south to the latitude of Barnegat Bay, New Jersey.

Specimens examined. WESTERN ATLANTIC: NOVA SCOTIA: off Sable Island in 55 fathoms (MCZ); *Speedwell*, station 103, about 70 miles E of Liverpool (44°02' N; 63°20' W) in 92 fathoms (USNM); Emerald Bank in 45 fathoms; about 40 miles SW of Cape Sable in 76 fathoms; off Digby (all MCZ). NEW BRUNSWICK: St. Andrews (F. Sibley); Grand Harbor, Grand Manan (MCZ; USNM). MAINE: off Campobello Island, Eastport in 10 fathoms (USNM); off Eastport in 20 fathoms (Yale Univ.); Perry in 6 fathoms (MCZ); off Little River Head, Machias in 40 fathoms (USNM); Casco Bay (MCZ); *Bache*, station 6, about 68 miles E of Portland (43°38' N; 69°01' W) in 82 fathoms (USNM). NEW HAMPSHIRE: 250 miles E of Portsmouth (42°58' N; 65°57' W) in 250 fathoms (USFW); off Isle of Shoals; Jeffreys Ledge in 70 fathoms (both MCZ). MASSACHUSETTS: *Bache*, station 52, Cashe Ledge, about 112 miles E of Newburyport (42°51' N; 68°52' W) in 27 fathoms; *Bache*, station 29, about 23 miles E of Newburyport (42°47' N; 70°20' W) in 33 fathoms; *Speedwell*, station 39, Brown's Bank, about 240 miles E of Newburyport (42°44' N; 66°27' W) in 75 fathoms; *Albatross*, station 2520, about 330 miles E of Newburyport (42°41' N; 64°55' W) in 62 fathoms (all Yale Univ.); off Ipswich Bay in 13 fathoms; off Thatchers Island in 45 fathoms (both MCZ); *Speedwell*, station 124, about 22 miles SE of Gloucester (42°32' N; 70°22' W) in 51 fathoms (USNM); Stellwagen Bank, off Boston in 35 fathoms; *Albatross II*, station 21159, about 200 miles E of Provincetown (42°16' N; 66°34' W) in 160 fathoms; Georges Bank (42°04' N; 60°00' W) in 55 fathoms (all MCZ); Cultivator Shoals, about 95 miles E of Chatham (41°44' N; 68°15' W) in 21 fathoms (USFW); *Albatross*, station 2526, about 205 miles E of Chatham (41°40' N; 65°46' W) in 121 fathoms (Yale Univ.); *Blake*, station 307, off Georges Bank (41°29' N; 65°47' W) in 980 fathoms (MCZ); *Albatross*, station 2580, about 57 miles E of Nantucket Island (41°25' N); 69°

01' W) in 83 fathoms (USNM). NEW JERSEY: *Blake*, station 310, about 200 miles E of Barnegat Bay (39°59' N; 70°18' W) in 260 fathoms (MCZ); *Fish Hawk*, station 945, about 210 miles E of Barnegat Bay (39°58' N; 71°13' W) in 207 fathoms; *Fish Hawk*, station 894, about 170 miles E of Barnegat Bay (39°53' N; 70°58' W) in 365 fathoms (both USNM).

EASTERN ATLANTIC: NORWAY: Finnmarks (USNM); Tromsö (MCZ).



Plate 13. *Calliostoma occidentale* Mighels and Adams. Figs. 1-2. *Blake*, station 302, off Georges Bank, Massachusetts in 73 fathoms. Fig. 3. Casco Bay, Maine. Lectotype (all about 4.6x).

***Calliostoma (Calliostoma) pulchrum* C. B. Adams**

Plate 3, fig. 3; Plate 14

Trochus pulcher C. B. Adams 1850, Contributions to Conchology, no. 5, p. 69 (Jamaica); Clench and Turner 1950, Occasional Papers On Mollusks 1: 331, pl. 40, fig. 7.

Calliostoma veliei Pilsbry 1900, Nautilus 13: 128 (Caxambas Pass, S. W. Florida).

Description. Shell reaching 14.5 mm. (about $\frac{1}{2}$ inch) in length, trochoid, imperforate, rather thin in structure and finely sculptured. Color a mottled ivory-white and light yellowish brown with small brownish red spots more or less evenly dispersed on beaded spiral cords. In addition, there may be similar spots of white, particularly on the peripheral cords. Whorls 8 to 10, flat sided and with a sharply angulated keel. Spire extended and produced at an angle of about 55°. Aperture subquadrate, the outer lip simple and produced at an angle of about 45° from the base. Columella white, arched inwardly and thickened to form a ridge which is subtruncate at the base. Suture generally indistinct but defined by the larger beaded cords which mark the periphery of the whorl above. In some specimens the succeeding whorl is slightly inset so that the beaded cords overhang. Sculpture consisting of numerous and rather finely beaded cords, those on the periphery

being slightly larger and more coarsely beaded. There are from 4 to 10 finer, beaded cords above the periphery. On the base of the shell the cords are very fine, numerous and variable in number. Four to six of these cords are spotted with reddish dots. These spotted cords are more or less evenly distributed. Operculum thin, corneous, circular, with a central nucleus and multispiral coiling.

Jaws and radula similar to those figured for *C. jucundum* (see Plate 8, fig. 2).

length	width	
9 mm.	6 mm.	Holotype of <i>C. pulchrum</i> C. B. Adams
12	10.5	Paratype of <i>C. veliei</i> Pils.
13.5	11.5	off Cayo Muerto, Bahía Honda, Cuba in 3 fathoms
10	11	Holotype of <i>veliei</i> Pils.

Types. The holotype of *Calliostoma pulchrum* C. B. Adams is in the Museum of Comparative Zoology, no. 156356, from Jamaica. The holotype of *C. veliei* Pilsbry from Caxambas Pass, Florida is in the Academy of Natural Sciences, Philadelphia, no. 77893. A paratype is in the Museum of Comparative Zoology, no. 140372.

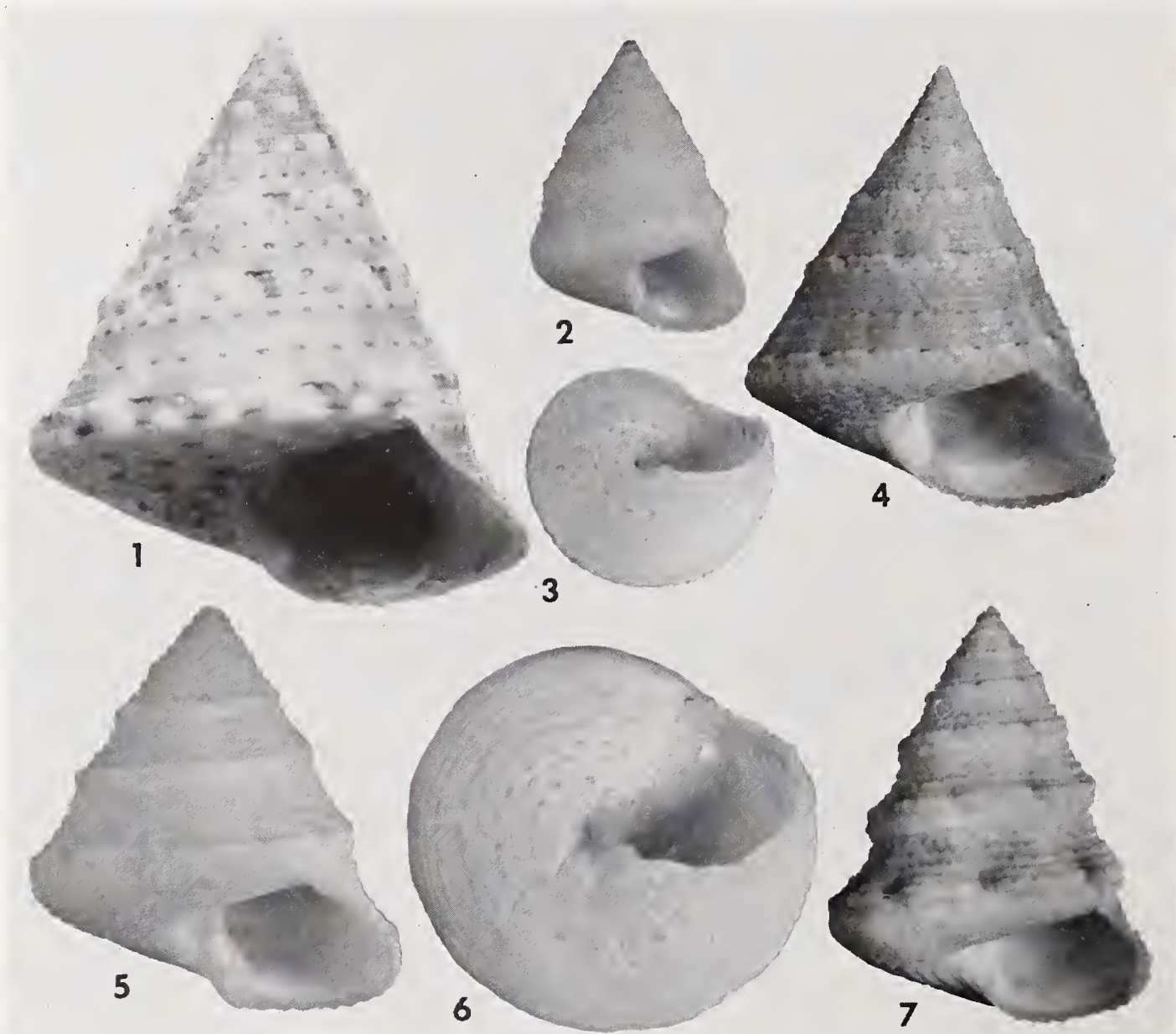


Plate 14. *Calliostoma pulchrum* C. B. Adams. Fig. 1. Nassau, New Providence, Bahama Islands (about 5.4x). Fig. 2. Jamaica. Holotype (4x). Fig. 3. Basal view, Marco, Florida (4x). Fig. 4. Off Cayo Muerto, Bahía Honda, Pinar del Río, Cuba (4x). Fig. 5. Holotype of *C. veliei* Pilsbry [= *C. pulchrum* C. B. Ad.], Caxambas Pass, Florida (about 4.6x). Fig. 6. Paratype of *C. veliei* Pilsbry (4.6x). Fig. 7. Marco, Florida (4x).

Remarks. See under *C. roseolum* Dall and *juvundum* Gould. This species occurs in the littoral zone and to depths of about 80 fathoms.

Range. North Carolina, Florida, Gulf of Mexico and south to the Caribbean.

Specimens examined. NORTH CAROLINA: *Albatross*, station 2596, about 17 miles SE of Cape Hatteras (35°08' N; 75°10' W) in 49 fathoms (USNM). FLORIDA: Palm Beach (J. Schwengel); Lake Worth, Boynton (T. McGinty); off Cape Florida, Key Biscayne in 8 fathoms (MCZ); *Eolis*, station 147, off Fowey Light, Biscayne Bay in 35 fathoms; *Eolis*, station 173, off Fowey Light, Biscayne Bay in 58 fathoms; *Eolis*, station 136, off Long Reef, off Elliot Key in 58 fathoms; *Eolis*, station 350, off Triumph Reef, off Elliot Key in 70 to 90 fathoms (all USNM); Turtle Harbor, Key Largo in 6 fathoms (USNM); off Sombrero Light, Key Vaca in 20 fathoms; off Looe Key, Big Pine Key in 29 fathoms (both MCZ); *Eolis*, station 196, off Sambo Reef in 58 fathoms; *Eolis*, station 160, off Sand Key in 62 fathoms; Key West in 40 fathoms (all USNM); Wash-erwoman Shoal, Key West in 3 fathoms (J. S. Schwengel); off Fort Walton in 13 to 19 fathoms (MCZ); off Destin in 20 fathoms (T. McGinty); off Panama City in 84 fathoms (D. Moore); *Albatross*, station 2405, about 60 miles S of Cape San Blas (28°45' N; 85°02' W) in 30 fathoms; *Albatross*, station 2406, about 70 miles SE of Cape San Blas (28°46' N; 84°49' W) in 26 fathoms (both USNM); Cedar Keys (UMML); off Anclote Key, Pasco Co. in 12½ fathoms (USNM); off Johns Pass, St. Petersburg in 27 fathoms (J. Schwengel); off Egmont Key in 14 fathoms (T. McGinty); Sanibel Island in 4 to 7 fathoms (J. Schwengel; T. McGinty); Marco Island (D. and N. Schmidt; USNM); Caxambas Pass (MCZ). MISSISSIPPI: off Mississippi Delta in 40 fathoms (ANSP). LOUISIANA: *Oregon*, station 297, about 100 miles south of Morgan City (28°05' N; 91°00' W) in 51 fathoms. MEXICO: Campeche Bank, 170 miles NE of Progreso, Yucatan in 30 fathoms (T. McGinty); off Alacran Reef, Yucatan in 65 fathoms (D. Steger); off Cabo Catoche, Yucatan in 18 fathoms (USNM). BAHAMA ISLANDS: Parrot Cays and Cooper Jacks Cay, Great Abaco (R. Robertson); Moraine Cay, Little Abaco (USNM); Nassau, New Providence (USNM; ANSP; T. McGinty); Dieks Point, Nassau, New Providence (MCZ); South Beach, New Providence (MCZ); North Bimini Island (USNM; Robert Robertson); 4 miles E of Arthurs Town, Cat Island (MCZ); Black Point, Great Guana Cay, Exuma Group (G. and M. Kline). CUBA: Cape San Antonio, Pinar del Río; Punta Cajón, Pinar del Río; La Esperanza, Pinar del Río (all USNM); Bahía Honda, Pinar del Río in 1 to 12 fathoms (USNM; T. McGinty); Cayo Muerto, Bahía Honda, Pinar del Río (C. G. Aguayo); La Chorrera, Habana (MCZ); Matanzas, Matanzas (D. Steger); Bahía de Cárdenas, Matanzas (ANSP; T. McGinty; J. A. Weber); off Punta de Hicacos in 11 fathoms and off Cayo Blanco in 15 fathoms, Cardenas; off Cayo Galindo in 5 fathoms; off Cayo Mono Grande in 5 fathoms, all Matanzas (all V. Condé); Cayo Santa Maria, off Punta Alegre, Camagüey (R. Humes). JAMAICA: (MCZ). VIRGIN ISLANDS: Altana Bay and Frederiksted, St. Croix (G. Usticke); St. Thomas (USNM). CARIBBEAN ISLANDS: off Old Providence Island (USNM).

Calliostoma (Calliostoma) roseolum Dall

Plate 4, fig. 3; Plate 15

Calliostoma roseolum Dall 1880, Bulletin Museum of Comparative Zoology 9: 45 (Blake, station 11, off Habana, Cuba, 24°43' N; 83°25' W, in 37 fathoms); Dall 1889, Bulletin Museum of Comparative Zoology 18:

366, pl. 24, figs. 6-6a; not *C. roseolum* Guppy and Dall 1896, Proc. United States Nat. Mus. 19: 324.

Calliostoma apicinum Dall 1881, Bulletin Museum of Comparative Zoology 9: 46; Dall 1889, Bulletin Museum Comparative Zoology 18: 366, pl. 24, figs. 3-3a (Blake, station number not given, off Barbados in 100 fathoms).



Plate 15. *Calliostoma roseolum* Dall. Fig. 1. Blake (no station number) off Barbados in 100 fathoms. Holotype of *C. apicinum* Dall [= *C. roseolum* Dall]. Fig. 2. Paratype from the same locality (both 10.7x). Fig. 3. Blake, station 11, off Habana, Cuba in 37 fathoms. Holotype of *C. roseolum* Dall (about 5.5x).

Description. Shell reaching 13.7 mm. (about $\frac{1}{2}$ inch) in length, trochoid, imperforate, or occasionally slightly rimate in the young, rather strong in structure and finely sculptured. Color ivory, mottled with patches of yellowish brown. Whorls 9 to $9\frac{1}{2}$. Early whorls strongly convex and often somewhat keeled. Succeeding whorls often slightly inset below the periphery of the preceding whorl giving a stepped appearance. Spire extended and produced at an angle of about 50° . Aperture subquadrate, outer lip simple and produced at an angle of about 40° from the base. Columella white, slightly twisted and truncate. Suture indistinct, indicated mainly by the inset of the whorls. Sculpture consisting of numerous and rather coarsely beaded cords with the peripheral cord being somewhat large and more coarsely beaded. Larger beaded cords may alternate with smaller ones above the periphery but below they are all uniform. Embryonic whorls very small, white and smooth. Operculum thin, corneous, dark brown in color and multispiral.

length	width	
9.4 mm.	6.8 mm.	Holotype of <i>roseolum</i> Dall
12	8	off Cape Hatteras, North Carolina
12.5	8.4	off Tortugas, Florida
13.7	8.2	off Hillsboro, Florida
12	8.5	off Sanibel Island, Florida
7.5	5.8	Holotype of <i>apicinum</i> Dall

Types. The holotype of *Calliostoma roseolum* Dall from the *Blake*, station 11, off Habana, Cuba ($24^{\circ}43' N$; $83^{\circ}25' W$) in 37 fathoms is in the Museum of Comparative Zoology, no. 7563. The holotype of *C. apicinum* Dall is in the United States National Museum, no. 95013 from the *Blake* (station number not given), off Barbados in 100 fathoms. Paratypes from the same station and from the *Blake*, station 56, off Habana, Cuba in 175 fathoms are in the Museum of Comparative Zoology, no. 7564 and no. 7565.

Remarks. This species is fairly close in its relationship to *C. pulchrum* C. B. Adams. It differs in being more attenuate and in having the cords on the base larger and more strongly beaded. In general, there is less coloration in *roseolum* than in *pulchrum*.

C. apicinum Dall appears to be only a young specimen of *roseolum*. In young specimens, the whorls are more flat sided, the keel sharper, and sometimes young specimens may be rimately perforate. As the animal matures the whorls become more convex. In 1872, William Stimpson, dredging with the *Bache* some 40 miles off Sanibel Island, Florida, obtained a fine growth series of *roseolum* Dall. This series shows the young with the whorls flat sided and the gradual change to the adult where the whorls are rounded. *C. roseolum* ranges in depth from 7 to 175 fathoms.

Range. North Carolina, Florida and Mexico, and south to the Barbados.

Specimens examined. NORTH CAROLINA: *Albatross*, station 2596, 19 miles SE of Cape Hatteras ($35^{\circ}08' N$; $75^{\circ}10' W$) in 49 fathoms (USNM). FLORIDA: *Triton*, station 800, off Palm Beach Inlet in 25 fathoms; off Lake Worth in 60 fathoms (both T. McGinty); off Lantana in about 66 fathoms (J. S. Schwengel); off Boynton Beach in 10 fathoms; off Delray Water Tank in 80 fathoms; off Hillsborough Inlet in 80 fathoms (all MCZ); *Eolis*, station 312, off Government Cut, Miami in 25 fathoms (USNM); south of Government Cut, Miami in 27 fathoms (T. McGinty); *Eolis*, station 68, off Miami in 45 fathoms; *Eolis*, station 76, off Fowey Light in 40 fathoms; *Eolis*, station 80, off Fowey Light in 38 fathoms (all USNM); 5 miles SSE of Carysfort Light, Key Largo in 75–83 fathoms; 3 miles E of Molasses Reef, Key Largo in 33–66 fathoms; $3\frac{1}{2}$ miles E of The Elbow, Key Largo in 21 fathoms (all MCZ); 2 miles off Conch Reef, Plantation Key in 35 fathoms (USNM); 6 miles SE of Sombrero Light, off Marathon in 66 fathoms (MCZ); *Albatross*, station 2414, about 70 miles NW of Key West ($25^{\circ}04' N$; $82^{\circ}59' W$) in 26 fathoms; *Albatross*, station 2317, about 7 miles SW of Key West ($24^{\circ}25' N$; $81^{\circ}46' W$) in 45 fathoms (both USNM); *Oregon*, station 1021, off Tortugas ($24^{\circ}54' N$; $83^{\circ}25' W$) in 38 fathoms (H. Bullis); *Blake*, station 12, off Tortugas ($24^{\circ}43' N$; $83^{\circ}16' W$) in 36 fathoms (MCZ); SW of Tortugas in 35 fathoms (USNM); off Sanibel Island in 7 fathoms (J. S. Schwengel); *Bache*, station 55S, about 40 miles off Sanibel Island ($26^{\circ}16' N$; $82^{\circ}45' W$) in 16 fathoms; off Captiva Island in 27 fathoms (both USNM); SW of Egmont Key in 70 fathoms (D. Steger); *Oregon*, station 937, 90 miles W of Egmont Key, Tampa Bay ($27^{\circ}30' N$; $84^{\circ}14' W$) in 38 fathoms; *Oregon*, station 935, about 51 miles W of Egmont Key, Tampa Bay ($27^{\circ}36' N$; $83^{\circ}40' W$) in 27 fathoms (both H. Bullis); WSW of John's Pass, Pinellas Co. (D. Steger); *Albatross*, station 2407, about 71 miles SE of Cape San Blas ($28^{\circ}47' N$; $84^{\circ}37' W$) in 24 fathoms; *Albatross*, station 2370, about 30 miles SW of Cape San Blas ($29^{\circ}18' N$; $85^{\circ}32' W$) in 25 fathoms; *Pelican*, station 137-2, about 63 miles SSW of Pensacola ($29^{\circ}36' N$;

87°29' W) in 35 fathoms (all USNM); off Panama City in 21 fathoms; off Pensacola in 35 fathoms (both T. McGinty). ALABAMA: *Albatross*, station 2390, about 58 miles S of Mobile Bay (29°27' N; 87°48' W) in 30 fathoms (USNM); *Oregon*, station 634, about 65 miles S of Mobile (29°33' N; 87°58' W) in 21 fathoms (H. Bullis). LOUISIANA: *Oregon*, station 303, about 100 miles S of Vermillion Bay (27°57' N; 92°02' W) in 48 fathoms (H. Bullis). MEXICO: off Campeche Banks in 30 fathoms (T. McGinty; W.C. Frisbey); *Albatross*, station 2363, about 30 miles N of Cabo Catoche, Yucatan (22°07' N; 87°06' W) in 21 fathoms (USNM); 135 miles ENE of Alacran Reef, Campeche Bank, Yucatan in 65 fathoms (ANSP). CUBA: *Blake*, station 56, off Habana (23°09' N; 82°21' W) in 175 fathoms (MCZ). LESSER ANTILLES: *Blake*, station 290, off Barbados (13°11' N; 59°38' W) in 73 fathoms (USNM); *Blake* (station number not given), off Barbados in 100 fathoms (USNM; MCZ).

Calliostoma (Calliostoma) fascinans Schwengel and McGinty

Plate 16

Calliostoma fascinans Schwengel and McGinty 1942, Nautilus 56: 15, pl. 6, fig. 2 (dredged off Lake Worth, Florida in about 400 feet).

Description. Shell reaching 10.5 mm. (about $\frac{1}{2}$ inch) in length, trochoid, imperforate, moderately strong in structure and coarsely sculptured. Color ivory-white and mottled with faint reddish brown. Whorls 9, flat sided and sharply keeled. Spire extended and produced at an angle of 50°. Aperture subquadrate, outer lip simple and produced at an angle of about 60° from the base. Columella white, slightly arched and truncated. Suture indistinct. Sculpture consisting of numerous and rather coarsely beaded cords, the peripheral cord being the largest and most coarsely beaded. There are 4 to 6 beaded cords above the periphery and 7 to 8 finely beaded cords on the flattened base. Beads on succeeding cords aligned axially and connected by a slight axial ridge giving the shell a reticulate appearance. Nuclear whorls small, white and smooth. Operculum circular, multispiral and corneous.

Jaws broadly rounded anteriorly, with large scales and a narrow fringe on the anterior margins, closely resembling those illustrated on Plate 8. Radula similar to that of *roseo-*

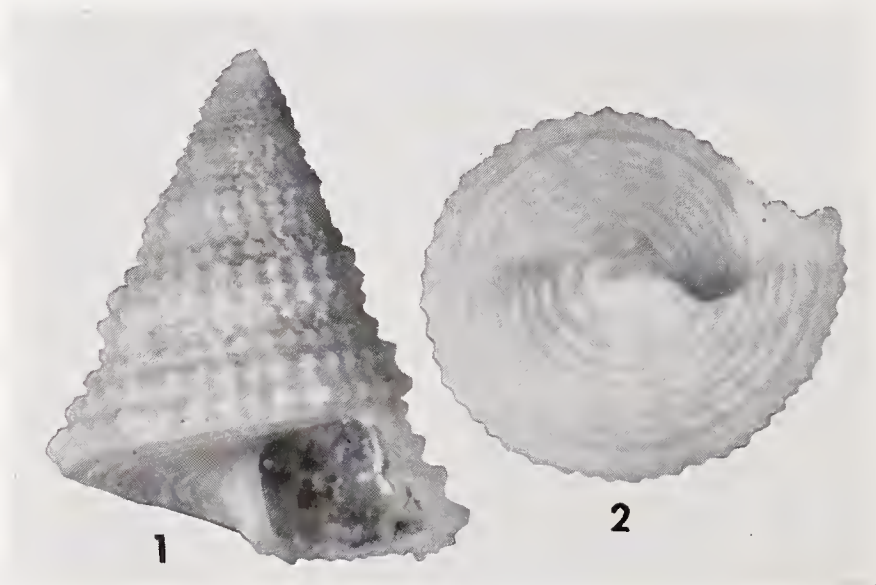


Plate 16. *Calliostoma fascinans* Schwengel and McGinty. Off Lake Worth, Florida. Fig. 1. Holotype. Fig. 2. Paratype (both 8x).

lum differing mainly in that the first marginal tooth is proportionately larger with a heavier base and only five denticles.

length	width	
7 mm.	5.8 mm.	Holotype
10.5	8.5	ENE of Alacran Reef, Yucatan, Mexico

Types. The holotype of *C. fascinans* Schwengel and McGinty is in the Academy of Natural Sciences Philadelphia, no. 178785, not 178634 as published. The type locality is from off Lake Worth, Florida in about 400 ft. [66 fathoms], T. L. McGinty, collector. Paratypes from the same locality are in the Museum of Comparative Zoology, no. 207074.

Remarks. This species is most closely related to *C. roseolum* Dall differing mainly in having sharply angled whorls and a much coarser sculpture.

It appears to be a rare species, which occurs at intermediate depths of about 30 to 100 fathoms to judge from the few records available. It probably has a much wider range than that indicated by records.

Range. Southeast Florida and west Florida to Yucatan.

Specimens examined. FLORIDA: off Lake Worth in 66 fathoms (ANSP; MCZ); off Lantana in 40 fathoms (T. McGinty); Oregon, station 937, about 90 miles W of Egmont Key (27°30' N; 84°14' W) in 38 fathoms (H. Bullis); SSE of Pensacola in 37 fathoms (T. McGinty). MEXICO: About 140 miles ENE of Alacran Reef, Yucatan in 69 fathoms (D. Steger; T. McGinty).

Calliostoma (Calliostoma) jucundum Gould

Plate 3, fig. 2; Plate 8, fig. 2; Plate 17

Trochus jucundus Gould 1849, Proc. Boston Soc. Nat. Hist. **31**: 91 (New Zealand); Gould 1852, United States Exploring Expedition **12**: 177, pl. 12, figs. 209a-b; Gould 1862, Otia Conchologica, p. 56.

Calliostoma rioensis Dall 1890, Proc. United States Nat. Mus. **12**: 345, pl. 12, fig. 5 (Rio de Janeiro, Brazil); Clench 1938, Mem. Soc. Cubana Hist. Nat. **12**: 376.

Calliostoma bellicosum von Ihering 1907, Anales del Museo Nacional de Buenos Aires (3) **7**: 439, pl. 17, fig. 117 (Pampien and post-Pampien formation of Bahía Blanca, Argentina).

Calliostoma lahillei von Ihering 1907, Anales del Museo Nacional de Buenos Aires (3) **7**: 440, pl. 17, fig. 118 (Punta Villarino, northern Patagonia, Argentina).

Calliostoma (rioense var. ?) *hermosanum* Dall 1927, Proc. United States Nat. Mus. **70**: 6 (Monte Hermosa, Argentina).

Calliostoma jucundum Gould. Clench 1938, Mem. Soc. Cubana Hist. Nat. **12**: 376.

Description. Shell reaching 22.5 mm. (about $\frac{7}{8}$ of an inch) in length, turbinata, solid in structure, rather coarsely sculptured and imperforate. Color a pinkish brown and mottled with white and red-brown. Whorls 8, flat sided and with a rounded keel. Base of shell flat to slightly convex. Spire somewhat extended and produced at an angle of 55° to 70°. Aperture subquadrate, the outer lip simple and produced at an angle of 40° from the base. Columella somewhat thickened and slightly oblique. Suture slightly indented but relatively obscure. Sculpture consisting of 7 to 8 beaded cords above the periphery

and 12 smooth to finely beaded cords on the base of the whorl. Operculum circular, multispiral and chitinous. Nuclear whorl one, minute, opaque, white and smooth.



Plate 17. *Calliostoma jucundum* Gould. Fig. 1. Holotype of *C. hermosanum* Dall [= *C. jucundum* Gould], from Monte Hermoso, Argentina (3.2). Holotype of *Trochus jucundus* Gould [= *C. jucundum* Gould], from "New Zealand," Brasil (4.6x). Fig. 3. Holotype of *C. rioense* Dall [= *C. jucundum* Gould], from Encreados Islets, Rio de Janeiro, Brasil (4.8x).

length	width	
22.5 mm.	18.3 mm.	Mar del Plata, Argentina
13	12.5	Holotype of <i>C. rioense</i> Dall
10	9.5	Holotype of <i>C. jucundum</i> Gould

Types. The holotype of *C. jucundum* Gould is in the United States National Museum, no. 5609 and a paratype is in the Museum of Comparative Zoology, no. 38059. The locality New Zealand given by Gould was in error. Other specimens of this species also collected by the United States Exploring Expedition, now in the United States National Museum and the Museum of Comparative Zoology, are labeled Rio de Janeiro, Brasil, and this is here considered to be the type locality. The type of *C. rioense* Dall is in the United States National Museum, no. 18716 from Encuados Islets, Rio de Janeiro, Brasil, collected by the United States Exploring Expedition. Paratypes from *Albatross*, station 2762, off Rio de Janeiro (23°08' S; 41°34' W) in 59 fathoms are in the United States National Museum, no. 96139. The holotype of *C. hermosanum* Dall from Monte Hermosa, Argentina is in the United States National Museum, no. 152887.

The holotypes of *C. bellicosum* von Ihering which was described from the Pampien formation of Bahía Blanca, Argentina (Pleistocene) and that of *C. lahillei* von Ihering from Punta Villarino, northern Patagonia, Argentina are probably in the Musée de São Paulo, Brasil.

Remarks. Based upon shell characters this species is close in its relationship to *C. pulchrum* C. B. Adams. It differs from *pulchrum*, however, by being somewhat larger, and

in having a reddish brown rather than ivory-white ground color. The beaded cords of *juvundum* are much coarser and more uniform in size. The jaws and radulae are very similar (see Plate 3). These two species have widely separated ranges.

Calliostoma rioense Dall was based on material collected by the United States Exploring Expedition, probably from a portion of the same lot used by Gould in describing *juvundum*. This was another unfortunate error brought about by the loss of data in many of the lots collected by the Exploring Expedition. Dall mentioned the great similarity between his new species and *juvundum* Gould which at that time was still thought to be from New Zealand.

Range. From Rio de Janeiro, Brasil south to Cabo Bermeja, Argentina.

Specimens examined. BRASIL: Rio de Janeiro (MCZ; USNM); Praia do Leste, Ilha Guaiba, Est. do Rio de Janeiro (P. de Oliveira). URUGUAY: Cabo Polonia; Puerto de la Polonia, Cabo Santa Maria; Cabo Santa Maria (all USNM). ARGENTINA: *Albatross*, station 2764, off Río de la Plata (36°42' S; 56°23' W) in 12 fathoms; *Albatross*, station 2765, off Río de la Plata (36°43' S; 56°23' W) in 10 fathoms; *Albatross*, station 2766, off Río de la Plata (36°47' S; 56°23' W) in 10½ fathoms (all USNM); Mar de la Plata (MCZ; USNM); Puerto San Blas, Prov. Río Negros (A. Careelles); off Cabo Bermeja (41°17' S) *Hassler* Voyage, in 17 fathoms (MCZ).

Calliostoma (Calliostoma) coppingeri Smith

Plate 4, fig. 1; Plate 18

Trochus (Ziziphinus) coppingeri E. A. Smith 1880, Annals and Magazine of Natural History (5) 6: 320 (off the mouth of the Río de la Plata, 36°47' S; 55°17' W, in 28 fathoms).

Calliostoma coppingeri Smith. Dall 1889, Proc. United States Nat. Mus. 12: no. 7, p. 344, pl. 12, fig. 4.

Calliostoma coppingeri var. *cymatium* Dall 1889, Proc. United States Nat. Mus. 12: no. 7, p. 343 (*Albatross*, station 2768, off Cape Delgado in 43 fathoms).

Calliostoma coppingeri Smith. Carcelles 1944, Revista de la Plata (NS) Zoologia 3: 240.

Description. Shell reaching 11 mm. (about ½ inch) in length, trochoid in shape, rather light in structure, imperforate, and rather finely sculptured. Color ivory-white and iridescent. Whorls 6½, convex, with a broad and flattened keel at the whorl periphery. Base of shell convex. Spire moderately extended and produced at an angle of 70° to 80°. Aperture subquadrate, outer lip simple and produced at an angle of 50° from the base. Columella broad, inwardly arched and obtusely angled with the base of the aperture. Suture distinct. Sculpture variable, consisting of numerous fine, spiral threads which may be smooth or very finely beaded. The broadened, flattened keel is margined by two stronger threads which are generally beaded, particularly on the early whorls. The sub-sutural cord is often stronger than the remaining cords and may be beaded. Nuclear whorls one, smooth and glass-like. Opereulum thin, corneous and multispiral.

length	width	
11 mm.	12.5 mm.	60 miles E of Peninsula Jabali, Argentina
10	11.6	“ “ “ “
11.5	12	“ “ “ “
12.5	13.5	Mar del Plata, Argentina

Types. The holotype of *C. coppingeri* E. A. Smith is in the British Museum (Natural History). The type locality, off the mouth of Río de la Plata, Uruguay, as given by Smith is, in reality, about 88 miles SE of Cabo San Antonio, Province of Buenos Aires, Argentina. It was found at 36°47' S; 55°17' W in 28 fathoms, taken by the HMS *Alert*.



Plate 18. *Calliostoma coppingeri* Smith. Figs. 1-2. Mar del Plata, Prov. Buenos Aires, Argentina (about 4.7x). Figs. 3-4. Hassler, station 27, about 60 miles E of Peninsula Jabali, Argentina in 30 fathoms (4.8x). Fig. 5. Holotype of *C. coppingeri* var. *cymatium* Dall [= *coppingeri* Smith], Albatross, station 2768, off Cape Delgado, Argentina in 43 fathoms (4.8x).

Remarks. The species appears like a diminutive *C. atlantis*, though it is proportionately more coarsely sculptured and the space between the upper and lower peripheral cords is straight rather than concave.

On the basis of material available, this species ranges in depth from the littoral zone to about 45 fathoms, living on rocky shell bottoms and mussel beds. According to Carcelles (1938) it is commonly fed upon by *Astropecten cingulatus* Sladen.

Range. From off Maldonado, Uruguay south to Peninsula Valdes, Argentina (42°24' S). The record given by Carcelles for Rio de Janeiro appears to be in error. We have not seen any material of this species from Brasil.

Specimens examined. URUGUAY: off Maldonado (USNM); Hassler, station 25, about 30 miles SW of Punta del Este, Uruguay (35°12' S; 55°30' W) in 7 fathoms (MCZ). ARGENTINA: Albatross, station 2765, about 18 miles NE of Punta Médanos, Prov. Buenos Aires (36°43' S; 56°23' W) in 10.5 fathoms; Albatross, station 2766, about 17

miles NE of Punta Médanos, Prov. of Buenos Aires ($36^{\circ}47' S$; $56^{\circ}23' W$) in 10.5 fathoms (both USNM); about 112 miles NE of Mar del Plata ($37^{\circ}31' S$; $55^{\circ}33' W$) in 48 fathoms; 38 miles NNE of Mar del Plata ($37^{\circ}36' S$; $57^{\circ}05' W$) in 7 fathoms (both Museo Poey); about 80 miles E of Mar del Plata, Prov. Buenos Aires ($37^{\circ}42' S$; $56^{\circ}20' W$) in 44 fathoms; off Puerto Quequén, Prov. Buenos Aires; *Hassler*, station 27, about 60 miles E of Peninsula Jabalí ($40^{\circ}22' S$; $60^{\circ}35' W$) in 30 fathoms; *Hassler*, station 28, about 22 miles S of Punta Redonda ($41^{\circ}17' S$; $63^{\circ}00' W$) in 17 fathoms; *Hassler*, station 30, about 45 miles S of Punta Redonda ($41^{\circ}40' S$; $63^{\circ}13' W$) in 30 fathoms (all MCZ); *Albatross*, station 2768, about 90 miles due E of Peninsula Valdez ($42^{\circ}24' S$; $61^{\circ}38' W$) in 43 fathoms (USNM).

Calliostoma (Calliostoma) yucatecanum Dall

Plate 4, fig. 4; Plate 8, fig. 4; Plate 19

Calliostoma yucatecanum Dall 1881, Bulletin Museum Comparative Zoology 9: 47 (*Blake* station in Yucatan Strait in 640 fathoms); Dall 1889, Bull. Museum Comp. Zool. 18: 370, pl. 24, figs. 4-4a.

Calliostoma (Astele) agalma Schwengel 1942, Notulae Naturae, no. 106, pp. 1-2, fig. 1 (off Destin, Florida in 18-20 fathoms).

Description. Shell reaching 15 mm. (about $\frac{2}{3}$ of an inch) in length, trochoid in shape, rather solid in structure, umbilicate and rather finely sculptured. Color a light pink with numerous and irregular patches of light brown on the spiral cords. Whorls 8, slightly convex and produced at an angle of about 85° . Aperture subcircular, the outer lip simple and produced at an angle of about 35° from the base. Columella white, arched and truncated. Umbilicus white, narrow, deep and smooth. Cords margining the umbilicus smooth or only slightly beaded. Suture very indistinct. Sculpture consisting of numerous cords. On the early whorls there are three to four large cords which are faintly beaded and between these are numerous thread-like cords which are also faintly beaded. The cords on the later whorls of adult specimens are usually smooth, though occasionally there is a faint indication of beading. Below the periphery there are 9 to 13 large cords with a few small thread-like cords in between. Embryonic whorl one, white and smooth. Operculum circular, corneous, thin, multispiral, with a central nucleus and exceedingly small nuclear whorls.

length	width	
15 mm.	13.5 mm.	off Flagler Beach, Florida
13.5	13.5	off Yucatan
12.5	13.5	off Brunswick, Ga.
12	13.5	off Savannah River, Ga.
7.5	10	off Cedar Keys, Fla.
7	9.5	Holotype of <i>C. agalma</i>
6.5	9	Paratype of <i>C. agalma</i>
7	9	Holotype of <i>C. yucatecanum</i>

Types. The holotype of *Calliostoma yucatecanum* Dall is in the Museum of Comparative Zoology, no. 7567 from the Yucatan Strait off Yucatan in 640 fathoms, collected by the *Blake*.

The holotype of *C. agalma* Schwengel from off Destin, Florida in 18 to 20 fathoms is in the Academy of Natural Sciences Philadelphia, no. 178758. Paratypes from the same

locality are in the Museum of Comparative Zoology, no. 204717 and the United States National Museum, no. 617432.

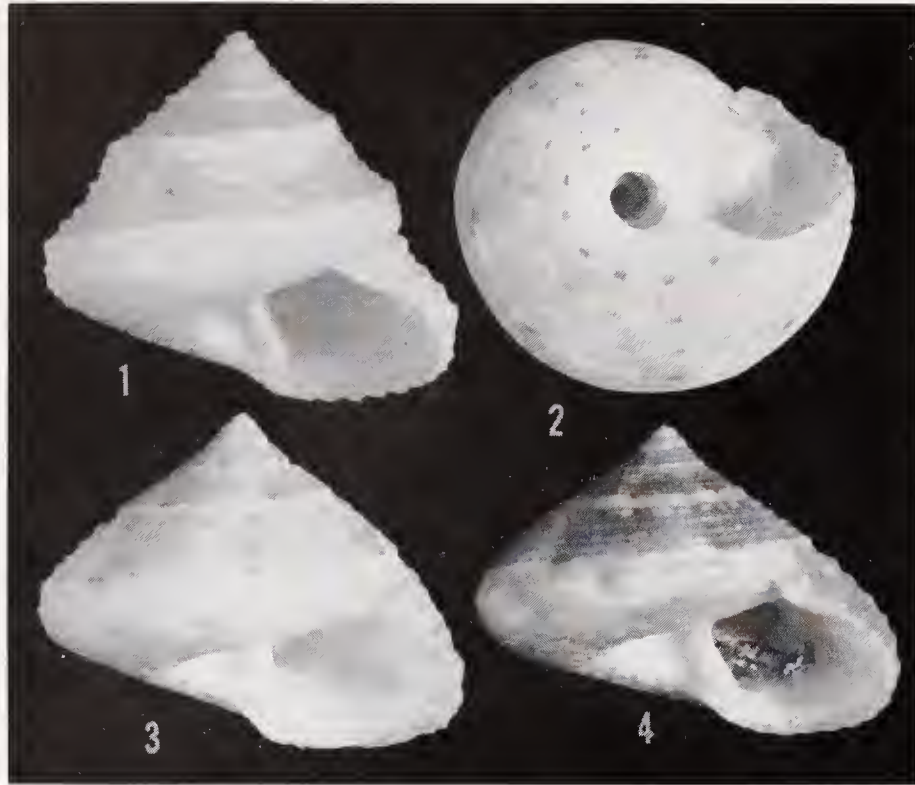


Plate 19. *Calliostoma yucatecanum* Dall. Fig. 1. *Blake* (no station number), Yucatan Strait in 640 fathoms. Holotype of *C. yucatecanum* Dall. Fig. 2. Off Destin, Florida in 18-20 fathoms. Paratype of *C. agalma* Schwengel [= *C. yucatecanum* Dall]. Fig. 3. Off Fort Walton, Florida. Fig. 4. Off Destin, Florida in 18-20 fathoms. Holotype of *C. agalma* Schwengel [= *C. yucatecanum* Dall]. (All about 4.6x.)

Remarks. This species is quite different from all the umbilicate forms we have dealt with from the Western Atlantic. The convex spire and the type of sculpturing are very characteristic and readily distinguish it.

It is questionable that this species lives at the depth of 640 fathoms as given for the *Blake* station in the Yucatan Channel as all other depth records range from 5 to 35 fathoms. The *Blake* specimen was alive when taken, however. There are some questions in our minds regarding this "station" of the *Blake*. Many lots in the *Blake* collections simply carry "Yucatan Channel in 640 fathoms" with no station number. Mr. Sander-son Smith¹ who listed all the dredging stations of the *Blake* along with other vessels which had dredged from 1867 to 1887 gave no station number showing a depth of 640 fathoms.

We introduce this note here just in case other discrepancies may be noted later among other species.

The occurrence of this species in the relatively shallow water off the coast of North Carolina, northern Florida and Georgia may possibly date from the time of the Suwannee Trough which extended across northern Florida in the Pliocene. Future dredging may very well extend the range of this species south along the east coast of Florida. It did not appear, however, among the large collections made by the *Eolis* dredgings along the Lower Keys of Florida.

Range. Off North Carolina to northern Florida and the Gulf of Mexico from north-west Florida west to Texas and south to Yucatan.

¹S. Smith 1888, Annual Report of the Commissioner of Fish and Fisheries for 1886, pp. 963-972.

Specimens examined. NORTH CAROLINA: *Albatross*, station 2607 about 18 miles due east of Cape Lookout (34°38' N; 76°12' W) in 18 fathoms; *Albatross*, station 2605, about 46 miles E of Cape Lookout (34°35' N; 75°45' W) in 35 fathoms; *Albatross*, station 2615, about 31 miles ESE of Cape Fear (33°45' N; 77°24' W) in 18 fathoms (all USNM). SOUTH CAROLINA: *Pelican*, station 182-22, about 33 miles E of Bulls Island (32°52' N; 79°04' W) in 11 fathoms (USNM). GEORGIA: *Pelican*, station 180-5, about 23 miles SE of the mouth of the Savannah River (31°53' N; 80°34' W) in 8 fathoms; *Pelican*, station 197-1, about 36 miles NE of Brunswick (31°31' N; 81°01' W) in 5 fathoms; *Pelican*, station 178-16, about 80 miles ENE of Brunswick (31°21' N; 80°12' W) in 21 fathoms; *Pelican*, station 178-6, about 35 miles E of Brunswick (31°11' N; 80°52' W) in 9 fathoms; *Pelican*, station 178-5, about 31 miles E of Brunswick (31°10' N; 80°56' W) in 8 fathoms; *Pelican*, station 177-11, about 24 miles SE of Brunswick (30°59' N; 81°06' W) in 9 fathoms (all USNM). FLORIDA: *Pelican*, station 213-1, about 2 miles SE of Flagler Beach, Flagler Co. (29°28' N; 81°06' W) in 5 fathoms (USNM); Long Boat Key, Sarasota (M. L. Chambers); SW of Egmont Key, Tampa Bay, in 29 fathoms (D. Steger); *Albatross*, station 2374, about 71 miles W of Cedar Keys (29°11' N; 85°29' W) in 26 fathoms (USNM); *Oregon*, station 891, about 118 miles W of Cedar Keys (29°00' N; 85°02' W) in 21 fathoms (H. Bullis); off Panama City in 21 fathoms (T. McGinty); off Destin in 20 fathoms (T. McGinty, H. & K. Johnstone); off Fort Walton in 13-19 fathoms (MCZ, UMML). ALABAMA: *Albatross*, station 2387, about 66 miles S of Mobile Bay (29°24' N; 88°04' W) in 32 fathoms (USNM). TEXAS: Off Port Isabel in 10½ fathoms (R. H. Parker). MEXICO: 170 miles NE of Progreso, Yucatan in 10-15 fathoms (T. McGinty); *Albatross*, station 2362, about 40 miles N of Cabo Catoche (22°08' N; 86°53' W) in 25 fathoms (USNM); *Blake* (no station number), Yucatan Strait in 640 fathoms (MCZ).

Subgenus **Elmerlinia**, new subgenus¹

Shell perforate in all known species, marked with axial flames of reddish brown or nearly unicolored. Sculpture with beaded cords. Aperture subquadrate with the columella arched and truncated at the base.

Radula with a central tooth having serrate or denticulate margins, six lateral teeth, four of which are denticulate, the two outer laterals plate-like or with extremely slender cusps. First two marginal teeth narrow with rather large denticulations; remaining marginal teeth long and finely denticulate (see Plate 5).

Jaws long, with the anterior ends sharply rounded and with a long fringe at the anterior margin (see Plate 9).

Type species, *Calliostoma jujubinum* Gmelin.

Calliostoma (Elmerlinia) javanicum Lamarek

Plate 20, figs. 1-4

Trochus javanicus 1822, Histoire Naturelle des Animaux Sans Vertèbres 7: 25 (Java); Delessert 1841, Recueil de Coquilles décrites par Lamarek, Paris, pl. 35, figs. 2a-b; P. Fischer [in] Kiener 1875 Coquilles Vivantes 11: pl. 17, fig. 5.

Zizyphinus zonamestus A. Adams 1851 [1853] Proc. Zoological Society London, p. 166 (Honduras).

¹ Named for our three young, enthusiastic Saturday helpers, Elsa Nyberg, Meredith Turner and Madeline Pini.

Description. Shell reaching 29 mm. (about $1\frac{1}{4}$ inches) in length, trochoid in shape, rather solid in structure, umbilicate and finely sculptured. Color variable, usually a light brownish red which may appear somewhat mottled, or a tan mottled with brownish orange markings. In addition, there are usually spiral bands of red-brown between the spiral cords. Whorls 9 to 10, flat sided and with a sharp peripheral keel. Base of shell nearly flat. Spire moderately extended and produced at an angle of about 65° . Aperture subquadrate, the outer lip simple and slightly crenulated. It is cast at an angle of about 50° from the base. Columella strongly arched, thickened, white and with a slight truncation. Umbilicus profound, white in color, narrowly funnel-shaped and bordered by a coarsely beaded cord. Sutures very indistinct. Spiral sculpture consisting of numerous fine beaded cords. Axial sculpture consisting of very fine diagonal ridges in between the cords. On the base, just below the peripheral keel, there is a nearly smooth area devoid of beaded cords. In profile, this appears as a somewhat flattened area with a slight depression on its inner margin. The remainder of the base is sculptured with 12–13 beaded cords which are considerably finer than those above the keel.

length	width	
23.5 mm.	31 mm.	Garden Key, Dry Tortugas, Florida
29	31	St. Kitts, Lesser Antilles
27.5	29.5	St. Thomas, Virgin Islands
33	35	Arenas de la Chorrera, Habana, Cuba

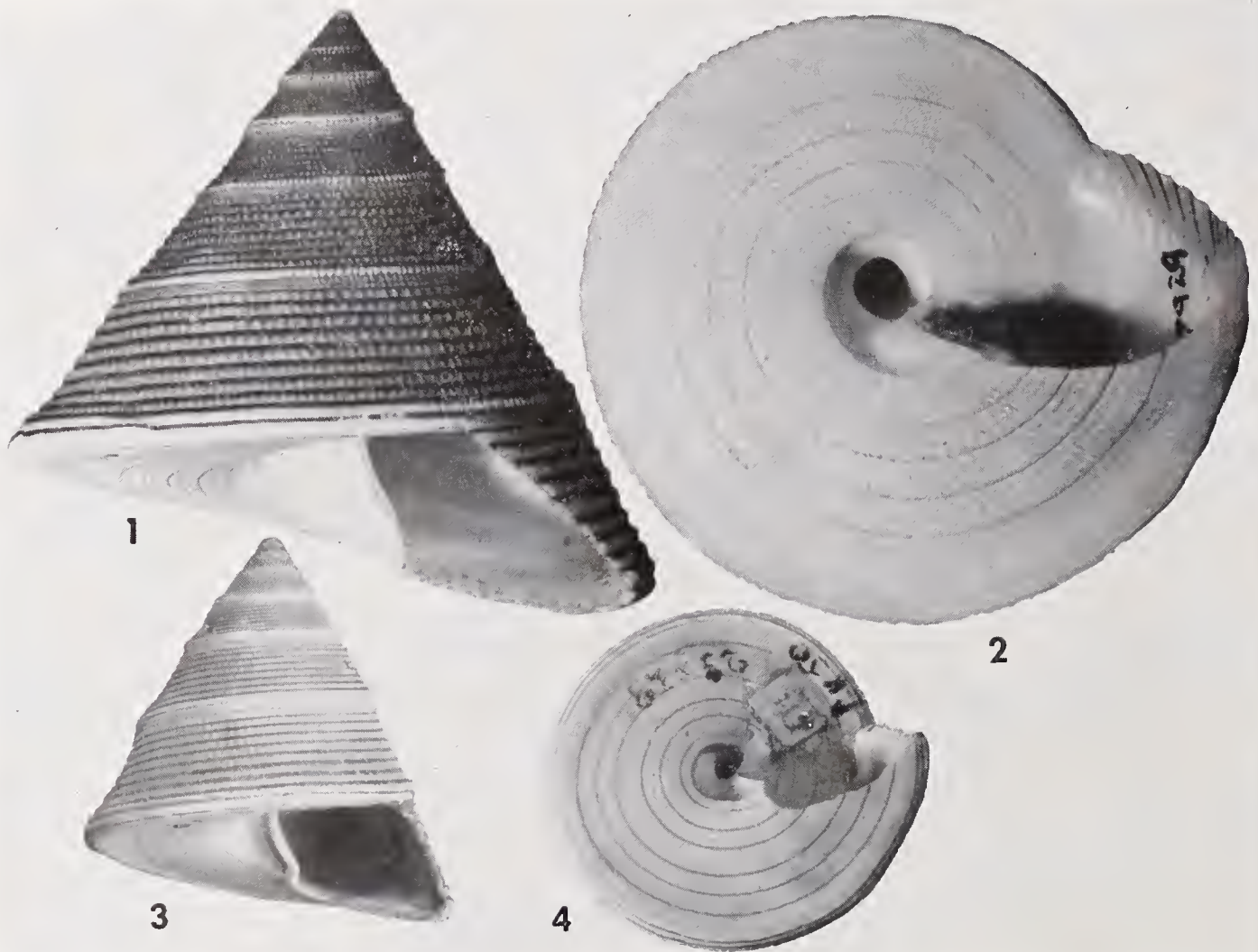


Plate 20. *Calliostoma javanicum* Lamarck. Fig. 1. St. Kitts, Lesser Antilles (2.4x). Fig. 2. Garden Key, Dry Tortugas, Florida (2.4x). Figs. 3 and 4. Holotype of *Trochus javanicus* Lamarck. Photographs through the courtesy of the Muséum d'Histoire Naturelle, Genève, Switzerland (2x).

Types. The holotype of *Trochus javanicus* Lamarek is in the Geneva Museum. Through the kindness of Dr. E. Binder, Curator of Mollusks of the Muséum d'Histoire Naturelle, Genève, we are able to figure the holotype.

The type of *Zizyphinus zonamestus* A. Adams is probably in the British Museum.

Remarks. *C. javanicum* is fairly close in its relationships to *C. jujubinum*, differing from *jujubinum* in being proportionately wider, having a larger umbilicus as well as a more acute peripheral carina. The beaded sculpture is more regular in *javanicum* both above and below the periphery. In *jujubinum* there is much variation in the size of the beaded cords. The jaws and radulae are very similar in both species.

Range. From southern Florida, the Bahamas and south through the Greater and Lesser Antilles to Panama.

Specimens examined. FLORIDA: Yamato (ANSP); Bache Shoal, off Elliott Key (UMML); Garden Key, Dry Tortugas (T. Bayer). BAHAMA ISLANDS: Bimini Island (UMML). CUBA: Arenas de la Chorrera, Habana (MCZ; V. Conde); Banes (D. Steger); Cuzco Beach, Guantánamo Naval Base (MCZ). JAMAICA: Negril, West Moreland (USNM). PUERTO RICO: Punta Agujereada; Punta Algorrobo (both G. Warmke). VIRGIN ISLANDS: St. Thomas (USNM); Tortola (ANSP); Cane Bay, St. Croix (G. Usticke). LESSER ANTILLES: St. Kitts (USNM); Dominica (T. McGinty); Barbados (MCZ). CARIBBEAN ISLANDS: Aruba (J. A. Webber). PANAMA: Colón (T. McGinty).

Calliostoma (Elmerlinia) jujubinum Gmelin

Plate 5, fig. 2; Plate 9, fig. 1; Plate 21

Trochus jujubinus Gmelin 1791, Systema Naturae, ed. 13, p. 3570 (ad insulam S. Mauritii, et in mari Americam australem alluente); non *T. jujubinus* Röding 1798.

Trochus lunatus Röding 1798, Museum Boltenianum, p. 82 (refers to Chemnitz 1781 (1), 5: pl. 167, figs. 1612-1613).

Trochus perspectivus 'Koch' Philippi 1843, Abbildungen und Beschreibungen Conchylien 1: 32, pl. 1, fig. 5 (locality unknown); non *Trochus perspectivus* Linné 1758; non *T. perspectivas* A. Adams 1864.

Trochus taupaensis Conrad 1846, Proc. Academy Natural Sciences Philadelphia 3: 26, pl. 1, fig. 35 (Tampa Bay [Florida]).

Eutrochus alternatus Sowerby Nov. 1873 [April 1874], Proc. Zool. Soc. London, p. 719, pl. 59, fig. 5 (Australia?).

Calliostoma (Eutrochus) jujubinum rawsoni Dall 1889, Bulletin Museum Comparative Zoology 18: 369 (St. Croix [Virgin Islands]).

Description. Shell reaching 34 mm. (about 1 $\frac{3}{8}$ inches) in length; trochoid in shape, solid in structure, umbilicate, and finely sculptured. Color ranging from a uniform dark mahogany-brown to a yellowish brown and generally marked with irregular blotches of a lighter tone at the periphery of the whorl. Whorls 9 to 10, generally flat-sided and with a somewhat angled or rounded keel. Base on young shells flat and sometimes slightly concave, while in the adult stage the keel is rounded and the base slightly convex. Occasionally the keel bulges slightly beyond the contour of the rest of the whorl and so forms a spiral ridge at the suture. Spire somewhat extended and produced at an angle of from 50° to 60°. Aperture subquadrate, the outer lip simple and produced at an angle of about 42° from the base. In adult specimens, there is a series of small ridges inside of the outer

lip which extend well within the aperture. Columella white, thickened to form a ridge, arched inwardly and truncated at the base in adults. Umbilicus white, narrow, deep, smooth, and bordered by beaded cords. Suture indistinct, particularly on the early whorls. Sculpture somewhat variable, consisting of numerous rather fine beaded cords. These cords may be of two or more sizes, the coarser cords alternating with the finer ones, particularly on the base of the shell. In most adult specimens the cords over the rounded keel are much finer, more closely set and less strongly beaded and occasionally smooth. Operculum circular, entirely corneous, thin, with a central nucleus and multi-spiral coiling. Microscopic sculpture on the operculum consisting of numerous and exceedingly fine radiating threads.

The sole of the foot is ivory-white, smooth, the sides papillose, spaces between the papillae a dark chocolate brown, the papillae white. Anterior portion of the head and snout is maculated with brown, the tentacles and posterior portion of the head area a uniform dark brown. Edge of the mantle has irregular patches of dark brown.

length *	width	
18.5 mm.	21 mm.	Lectotype of <i>T. tampaensis</i> Conrad
34	29	Looe Key, off Big Pine Key, Florida
31	28	Washerwoman Shoals, off Boca Chica Key, Florida
30	25.5	Arenas de la Charrera, Habana, Cuba
23	22.5	St. Croix, Virgin Islands
20	16	E. of Alacran Reef, Yucatan, Mexico

* All specimens measured were adult showing the truncated columella and the ridges in the aperture.

Types. The lectotype, here selected, of *Trochus tampaensis* Conrad from Tampa Bay, Florida is in the Academy of Natural Sciences, Philadelphia, no. 40659. The type figures of *Trochus jujubinus* Gmelin and *Trochus lunatus* Röding are figures 1612 and 1613 on Plate 167 of Chemnitz 1781, Conchylien-Cabinet (1) 5: 82, both authors having referred to the same figures. The type locality is here restricted to St. Croix, Virgin Islands, as from this locality we have material which is almost identical with the figures of Chemnitz. Chemnitz states that the species was from the West Indian Sugar Islands and St. Maurice [Mauritius]. The latter locality undoubtedly is in error. Gmelin took his localities from Chemnitz. The holotype of *C. j. raxsoni* Dall from St. Croix, Virgin Islands is in the United States National Museum, no. 94931.

Remarks. This is the most abundant shallow water species of *Calliostoma* in the Western Atlantic. It is found from the low tide area to depths of 80 fathoms. It lives on a variety of bottoms including rocks, broken shells, sand and sea-grass.

Calliostoma jujubinum varies considerably in the angle of the spire, the width of the umbilicus, and the extent to which the whorls may be inset. The coloration also varies in intensity, color and pattern.

See also *Remarks* under *C. javanicum* Lamarck.

The subgeneric name *Eutrochus* A. Adams has been used for various species in this genus based on the work of Dall (1889) who gave *T. javanicum* Lamarck as the type species. This was in error as only a single species was given by Adams in the original description of *Eutrochus*, *E. perspectivus* A. Adams [= *Astele subcarinata* Swainson] non *perspectivus* Philippi. Consequently, *Eutrochus* becomes an absolute synonym of *Astele*. See also the discussion of *Astele* under Notes at the end of this paper.

Range. From Florida west to Texas and south to Colombia; the Bahama Islands and south through all of the West Indies.

Specimens examined. FLORIDA: *Pelican*, station 172-5, 28 miles NE of New Smyrna, Volusia Co. (29°16' N; 80°33' W) in 15 fathoms; *Pelican*, station 207-6, 9 miles SE of Cape Canaveral (28°20' N; 80°27' W) in 8 fathoms; 27 miles ENE of Melbourne Beach, Brevard Co. in 18 fathoms (all USNM); off Palm Beach in 75 fathoms (MCZ); Lake Worth Inlet (UMML); off Ocean Ridge, Palm Beach Co.; off Lantana in 80 fathoms; off Boynton in 10 fathoms (all MCZ); Hillsboro (D. Moore; UMML); off Government Cut, Miami in 27 fathoms (T. McGinty); *Eolis*, station 62, off Miami in 20 fathoms (USNM); Bakers Haulover, Biscayne Bay (R. Humes); Soldier Key, Biscayne Bay (T. McGinty); *Eolis*, station 129, off Fowey Light, Biscayne Bay, in 48 fathoms

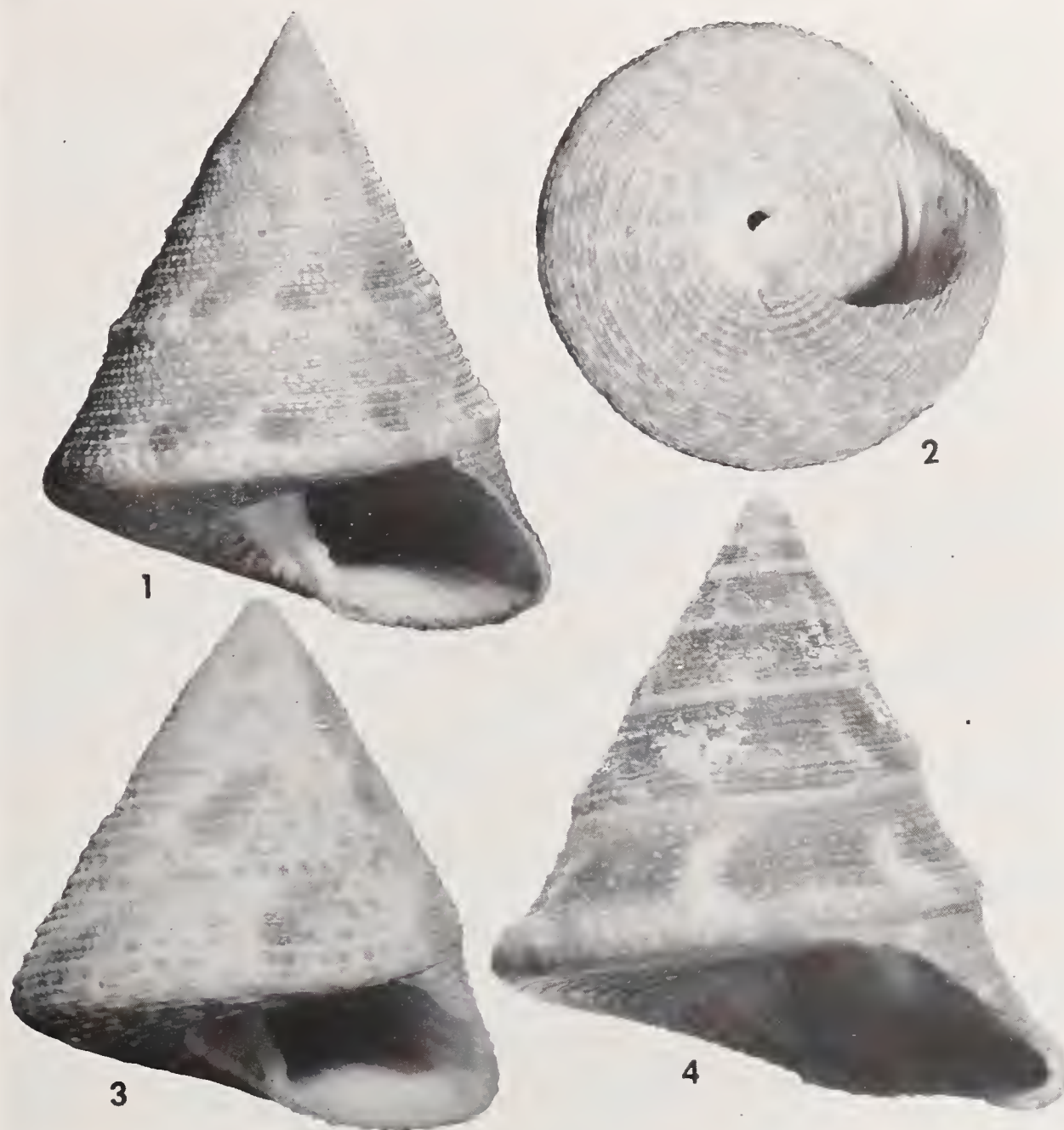


Plate 21. *Calliostoma jujubinum* Gmelin. Fig. 1. Off Campeche, Yucatan, Mexico in 60 fathoms (about 2.4x). Fig. 2. Dead Mans Bay, Florida (about 2.4x). Fig. 3. Holotype of *Trochus tampaensis* Conrad [= *C. jujubinum* Gmelin], Tampa Bay, Florida (about 3.2x). Fig. 4. Holotype of *Eutrochus rawsoni* Dall [= *C. jujubinum* Gmelin], St. Croix, Virgin Islands (about 5.4x).

(USNM); Long Reef, off Elliott Key (A. Merrill); Dry Rocks, Key Largo (ANSP; UMML); French Reef, Key Largo (H. and K. Johnstone); Molasses Reef, Key Largo in 45 fathoms (T. McGinty; J. A. Weber); Lower Matecumbe Key (UMML); Ohio Key (J. A. Weber); No Name Key (ANSP); Bahia Honda Key (USNM); Looe Key, off Big Pine Key (MCZ); Washerwoman Shoals, off Boca Chica Key (J. S. Schwengel); Boca Chica Key (D. and N. Schmidt); Middle Sambo Shoal, Key West (ANSP; T. McGinty); Pelican Shoals, Key West (T. McGinty); Key West in 2 fathoms (J. S. Schwengel); Eastern Dry Rocks, Key West (H. and K. Johnstone; UMML); *Eolis*, station 101, off Sand Key, Key West in 38 fathoms (USNM); Tortugas (USNM; CM; T. McGinty; UMML); *Oregon*, station 1022, off Tortugas (24°59' N; 83°35' W) in 39 fathoms (H. Bullis); Loggerhead Key (USNM); FLORIDA (West Coast): 15 to 35 miles off Fort Walton (MCZ); *Albatross*, station 2774, about 30 miles S of Cape San Blas (29°11' N; 85°29' W) in 26 fathoms; *Albatross*, station 2406, about 55 miles S of Apalachicola (28°46' N; 84°49' W) in 26 fathoms (both USNM); off Panama City in 21 fathoms (T. McGinty); Alligator Harbor, Franklin Co. (R. Work); Dead Man's Bay, Dixie Co. (MCZ); off Cedar Keys in 15 fathoms (MCZ; H. Bullis); off North Key, Cedar Keys (H. and K. Johnstone); off Tarpon Springs (J. S. Schwengel); Clearwater (S. Kaicher; ANSP); Boca Ciega Bay, St. Petersburg (CM); SSW of John's Pass, St. Petersburg in 29 fathoms (D. and B. Steger); Tampa Bay in 4 fathoms (USNM); Bradenton (J. A. Weber); *Oregon*, station 961, off Bradenton (27°01' N; 83°27' W) in 25 fathoms (H. Bullis); Anna Maria Key, Sarasota (USNM); Long Boat Key, Sarasota (L. Chambers); Gasparilla Id. (ANSP; USNM); Pineaire, Pine Island (D. and N. Schmidt); Lacosta Id., Charlotte Harbor (MCZ); Sanibel Id. (CM; MCZ; D. and N. Schmidt); Punta Rassa, Lee Co. (MCZ; ANSP); Fort Myers Beach (D. and N. Schmidt; ANSP); Bonita Springs (CM; D. and N. Schmidt); Naples, Lee Co. (MCZ; ANSP; T. McGinty); Marco (MCZ; CM; USNM; T. McGinty); Caxambas Pass, 5 miles S of Marco (MCZ); near Cape Romano (D. and N. Schmidt; ANSP; USNM); Kice Id., Cape Romano (D. and N. Schmidt); *Oregon*, station 993, off Cape Romano (25°50' N; 81°52' W) in 6 fathoms (H. Bullis). TEXAS: *Atlantis*, station about 210 miles E of Corpus Christi (27°53' N; 93°48' W) in 20 fathoms (MCZ). BAHAMA ISLANDS: Great Abaco; Nassau, New Providence (MCZ; G. and M. Kline); Alice Town, Bimini Ids. (MCZ); North Bimini Id., Bimini Ids. in 20 fathoms (USNM); Frazier Hog Cay, Berry Ids. (T. McGinty); Staniard Creek, Andros Id. (G. and M. Kline; MCZ; ANSP); Pigeon Cays, Andros Id. (T. McGinty; G. and M. Kline; MCZ); Arthurs Town, Cat Id. (MCZ); Conception Id. (G. and M. Kline). CUBA: Cabo San Antonio, Pinar del Río; off Los Arroyos, Pinar del Río (both USNM); Arenas de la Chorrera, Habana (MCZ; V. Condé); off Bahía de Cárdenas, Matanzas (ANSP); Pueblo Nuevo, Matanzas (MCZ); off Punta de Hicacos in 11 fathoms and off Cayo Blanco in 15 fathoms, Cárdenas, Matanzas (V. Condé); Cayo Santa Maria, off Punta Alegre, Camagüey (R. Humes); Guantánamo Bay, Oriente (MCZ). JAMAICA: (MCZ). PUERTO RICO: about $\frac{3}{4}$ mile N of Punta Garza in 33–40 fathoms (USNM); Ramey Air Force Base; Rincon; Punta Algarrobo; Punta Arenas; near Cabo Rojo Light House (all G. Warmke; MCZ); Vieques Id. (USNM). VIRGIN ISLANDS: The Baths, Virgin Gorda; Guana Id. and Scrub Id., Tortola (all M. W. Dewey); Water Id., St. Thomas (J. A. Weber); St. Thomas (MCZ; USNM); St. John (M. W. Dewey; ANSP); St. Croix (MCZ; G. Usticke; USNM). LESSER ANTILLES: Parham Sound, Antigua (CM);

Anguilla and Antigua Id. (both G. Usticke). CARIBBEAN ISLANDS: Aruba, Dutch West Indies (USNM; J. A. Weber). HISPANIOLA: Santa Bárbara de Samaná, Santo Domingo (MCZ). MEXICO: Veracruz, Veracruz (ANSP; USNM); Tuxpan, Veracruz (T. Pulley); off Campeche, Yucatan in 60 fathoms (W. C. Frisbey); 170 miles NE of Progreso, Yucatan in 34 fathoms (T. McGinty); E of Alacran Reef, Yucatan in 27 fathoms (D. and B. Steger); *Albatross*, station 2366, about 60 miles N of Cabo Catoche ($22^{\circ}28' N$; $87^{\circ}02' W$) in 27 fathoms (USNM); off Isla Mujeres, Quintana Roo, Yucatan (MCZ; Museo Pocy). PANAMA: Bocas del Toro, Colón (T. McGinty); Lemón Bay (J. A. Weber); 5 miles N of Colón (USNM) all Canal Zone. COLOMBIA: Carthagena (MCZ).

***Calliostoma (Elmerlinia) adelae* Schwengel**

Plate 22, figs. 1-2

Calliostoma (Eutrochus) jujubinum adelae Schwengel 1951, *Nautilus* 64: 119, pl. 8, figs. 4-5 (Indian Key, Florida).

Description. Shell reaching 18.5 mm. (about $\frac{3}{4}$ inch) in length, top shaped, rather solid in structure, umbilicate and finely sculptured. Color a light brown mottled with white. Whorls 8 to 10, generally flat sided and with a sharply angled keel. Spire somewhat extended and produced at an angle of about 60° . Aperture subquadrate, the outer lip simple and produced at an angle of about 50° from the base. In adult specimens there is a series of small ridges inside the outer lip which extend well within the aperture. Columella white, arched inwardly and thickened to form a ridge which is truncated at the base. Umbilicus white, rather narrow, deep, smooth and bordered by a beaded cord. Suture indistinct. Sculpture consists of numerous, rather fine, beaded cords. The two cords on the keel are larger, mottled with white and generally protrude somewhat at the suture. The remainder of the cords above the keel are rather evenly spaced and all are beaded. There may be 4 to 6 of these cords. There are 7 to 8 finely beaded cords on the base of the shell. Operculum thin, circular, corneous, with a central nucleus and multispiral coiling.

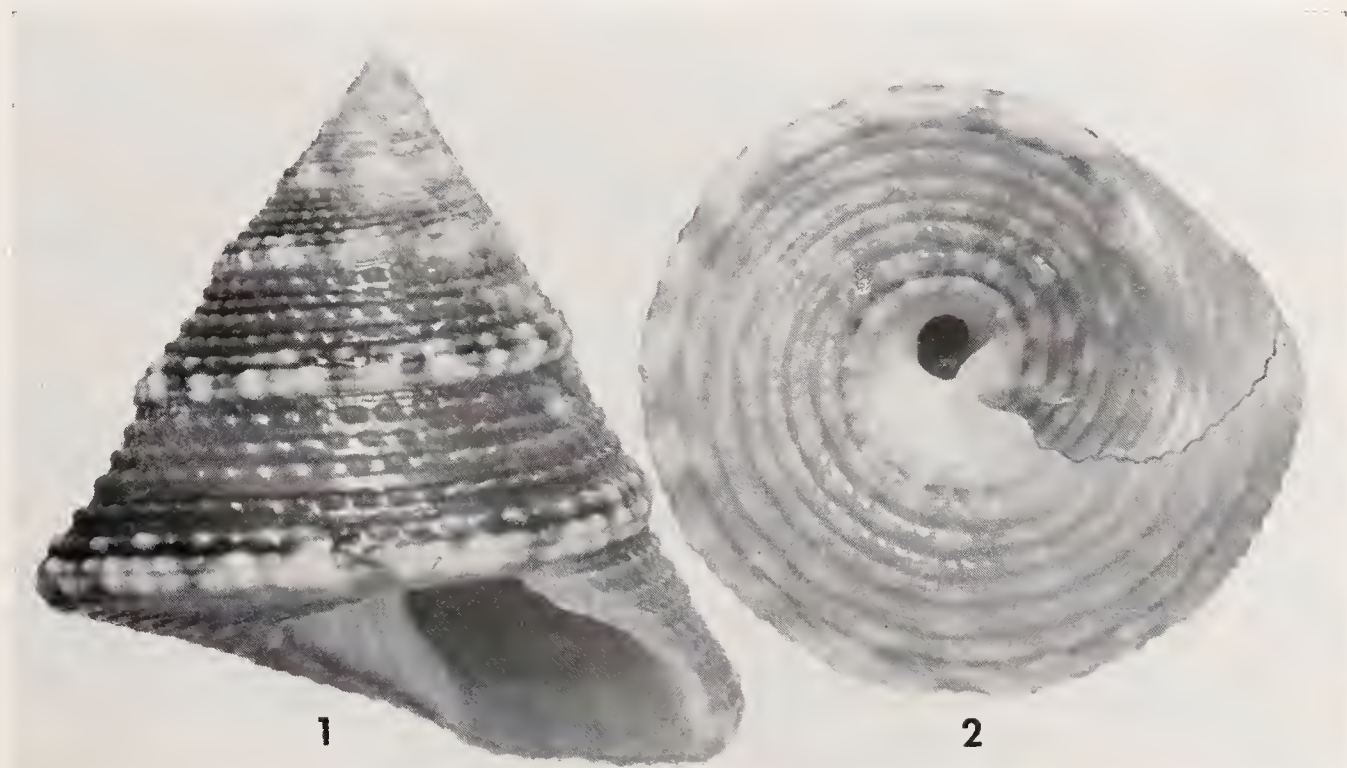


Plate 22. *Calliostoma adelae* Schwengel. Fig. 1. Indian Key, Florida. Holotype. Fig. 2. Basal view of paratype from the same locality (both about 5.4x).

length	width	
15 mm.	14.5 mm.	Holotype
13.5	12	Paratype
18.5	17	Key Biscayne, Fla.
15	13.5	off Hillsboro Inlet, Fla.

Types. The holotype is in the Academy of Natural Sciences Philadelphia, no. 187203, from Indian Key, Lower Florida Keys. Paratypes from the same locality are in the Museum of Comparative Zoology.

Remarks. This species appears to be close in its relationships to *C. jujubinum*. It differs, however, by being, on the average, much smaller, and in having all of the spiral cords beaded, the peripheral cords on the keel being much larger than those above and below them. In *C. jujubinum*, the peripheral cords are generally finer than those on the rest of the whorl and are often smooth. On the base of *adelae* there are only 6 to 8 spiral cords which are of about equal strength, while in *jujubinum* there are 10 to 15 spiral cords which are strongest near the umbilicus but become progressively finer toward the periphery. Adult specimens of *jujubinum* have a rounded periphery while the periphery of *adelae* is strongly keeled.

Range. From Hillsboro Inlet, Florida, south through the Lower Florida Keys.

Specimens examined. FLORIDA: Hillsboro Reefs, off Hillsboro Inlet; Virginia Key (J. K. Howard); North Biscayne Bay; Biscayne Flats, Soldier Key (both T. McGinty); Key Biscayne (J. K. Howard); Key Largo (MCZ); Lower Matecumbe Key (USNM); Old Rhodes Key (MCZ); Tea Table Key (D. & N. Schmidt); Indian Key (A. Koto; J. S. Schwengel; T. McGinty; ANSP); Grassy Key (D. and N. Schmidt); No Name Key (USNM); Big Pine Key, east side old bridge (MCZ).

Calliostoma (Elmerlinia) bullisi, new species

Plate 5, fig. 1; Plate 9, fig. 2; Plate 23

Description. Shell reaching 24.2 mm. (about one inch) in length. Trochoid in shape, rather solid in structure, umbilicate and finely sculptured. Color a nearly uniform light pinkish brown mottled with a series of large dark reddish brown patches at the periphery. Whorls 8, slightly convex, with a rounded peripheral keel. Base of shell slightly convex in adult specimens. Spire moderately extended and produced at an angle of 80°. Aperture subquadrate. Outer lip simple and cast at an angle of about 40° from the base. Columella arched, thickened, white and truncated. Umbilicus profound and white. Sculpture consisting of numerous beaded spiral cords which may vary somewhat in size. There are from 30 to 34 cords on the body whorl. Nuclear whorls 1-1½, white and smooth. Operculum corneous, circular, multispiral; the nucleus not papilliform.

In preserved specimens of *C. bullisi*, the foot is red-brown in appearance when contracted, the color pattern being composed of very fine reticulations and streaks of red-brown and white papillose spots. The thickened edge of the mantle is marked with bands of diffused red-brown triangular flames, the inner band being diffused inwardly for a considerable distance. Top of head heavily streaked with the same color; tentacles, except at the base, a uniform red-brown.

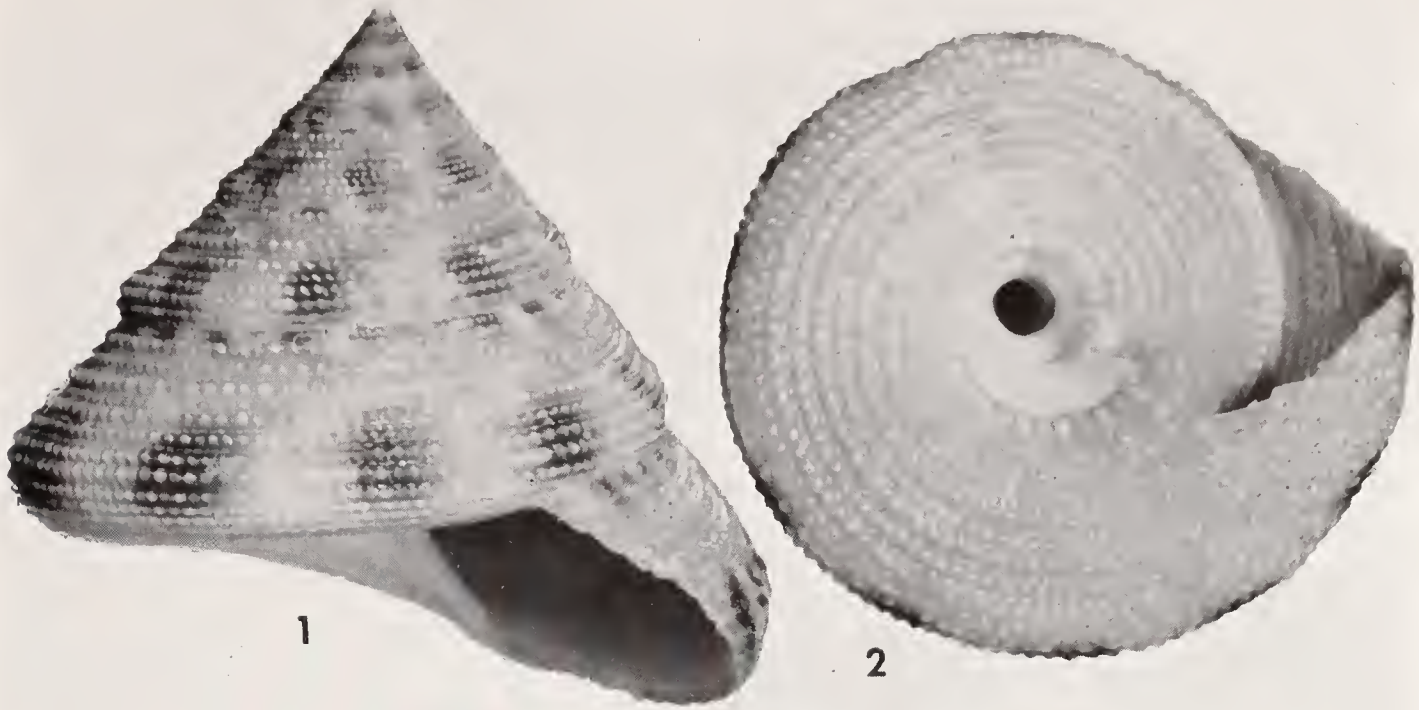


Plate 23. *Calliostoma bullisi* Clench and Turner. Fig. 1. Oregon, station 2049, about 65 miles ESE of Cabo Orange, Amapá, Brasil in 38 fathoms. Holotype. Fig. 2. Oregon, station 2050, about 75 miles ESE of Cabo Orange, Amapá, Brasil in 40 fathoms. Paratype (both about 4x).

length	width	
24.2 mm.	26.5 mm.	Holotype
21.5	23	Paratype

Types. The holotype of *C. bullisi* is in the United States National Museum, no. 612702, from the Oregon, station 2049, about 65 miles ESE of Cabo Orange, Amapá, Brasil ($04^{\circ}02' N$; $50^{\circ}33' W$) in 38 fathoms. There are two paratype specimens from the same general area in the collection of H. Bullis.

Remarks. The shell characters of this species are close to *Calliostoma hassler* Clench and Aguayo, but differ in having a definite color pattern which is obscure in *C. hassler*. *Calliostoma bullisi* is proportionately wider and, in addition, has a truncated columella.

Range. Known only from the vicinity of Cabo Orange, Amapá, Brasil.

Subgenus **Kombologion**, new subgenus¹

The shell is generally imperforate, though most of the species have an umbilical depression. The sculpture consists of numerous beaded cords which may cover the entire surface or be formed only at the whorl periphery or above the base.

Radula with 5 to 7 nearly uniform lateral teeth, the first and second marginal teeth rather long and not too dissimilar to the remaining marginal teeth. Outermost marginal teeth non-serrated (see Plate 6, figs. 1-3 and Plate 7, figs. 1-4).

Jaws rounded, the anterior ends rather broadly rounded and having a very short edge of fringe along the anterior margin (see Plates 10 and 11).

Type species, *Calliostoma bairdii* Verrill and Smith.

¹From the Greek, meaning a string of beads, in reference to the beaded cords.

Calliostoma (Kombologion) bairdii *Verrill and Smith*

Plate 6, fig. 1; Plate 10, fig. 1; Plate 24

Calliostoma bairdii Verrill and Smith 1880, American Journal Science **20**: 396 (*Fish Hawk*, stations 865 to 880, about 150 to 200 miles east of Barnegat Bay, New Jersey in 65 to 252 fathoms); Verrill 1882, Trans. Connecticut Academy of Sciences **5**: 580, pl. 57, fig. 26.

Description. Shell reaching 31.5 mm. (about $1\frac{1}{4}$ inches) in length, trochoid in shape, solid in structure, imperforate and rather coarsely sculptured. Color a light brownish yellow with occasional irregular and rather faint blotches of reddish brown. Whorls $7\frac{1}{2}$ to 8, flat sided with a pronounced keel at the whorl periphery. Spire moderately extended and produced at an angle of about 70° . Aperture subquadrate, outer lip simple and produced at an angle of about 30° from the base. Columella slightly arched and truncated at the base. Umbilical area smooth and somewhat iridescent. Suture very indistinct. Sculpture consisting of 6 to 7 cords on the body whorl above the periphery, the one at the periphery being the strongest. Below the periphery there are 10 to 15 cords which vary in both size and extent of beading. Operculum nearly circular, thin, corneous, multispiral and light brown in color. Periostracum very thin, light golden brown in color. Nuclear whorls $1\frac{1}{2}$, small, white and smooth.

In *C. bairdii* the foot is ivory colored, marked with streaks of red-brown with light diffused patches of the same color on either side and on top of the head. The mantle is a uniform ivory with small flame-like patches of brownish orange along the edge on the muscular rim. There are irregular patches of opaque white spots on the mantle of most specimens examined.

length	width	
30 mm.	31 mm.	Lectotype
27.5	28	140 miles E of Seagirt, New Jersey
31.5	31	215 miles E of Seagirt, New Jersey
30.5	33	225 miles E of Barnegat Bay, New Jersey

Types. The lectotype, here selected, is from the *Fish Hawk*, station 874, about 150 miles E of Barnegat Bay, New Jersey ($40^\circ 00' N$; $70^\circ 57' W$) in 85 fathoms and is in the United States National Museum, no. 44722. Paratypes from *Fish Hawk*, stations 867, 871, 872, 873, and 877 are also in the United States National Museum. Paratypes from *Fish Hawk* stations 867, 871 and 873 are in the Peabody Museum, Yale University. Paratypes from station 871 are in the Academy of Natural Sciences Philadelphia and from station 874 are in the Museum of Comparative Zoology.

Remarks. This species differs from *C. psyche* Dall by being larger, having a narrower angle to the spire and lacking the luster of *psyche*. In addition, it is more coarsely sculptured than *psyche* and there appears to be much less red mottling.

The ranges of the two species overlap in the area between Cape Hatteras and Cape Lookout, North Carolina, but we have seen no intermediate specimens.

Range. From off Chatham, Massachusetts ($41^\circ 40' N$) south to off Cape Lookout, North Carolina ($34^\circ 39' N$) in depths from 43 to 254 fathoms.

Specimens examined. MASSACHUSETTS: *Albatross*, station 2526, about 205 miles E of Chatham ($41^\circ 40' N$; $65^\circ 46' W$) in 121 fathoms (MCZ). NEW JERSEY: *Blake*, station

145, about 140 miles E of Seagirt ($40^{\circ}10' N$; $71^{\circ}04' W$) in 71 fathoms (MCZ); *Fish Hawk*, station 867, about 175 miles E of Barnegat Bay ($40^{\circ}05' N$; $70^{\circ}22' W$) in 64 fathoms (USNM; Yale); *Fish Hawk*, station 871, about 170 miles E of Barnegat Bay ($40^{\circ}02' N$; $70^{\circ}23' W$) in 115 fathoms (USNM; Yale; ANSP); *Fish Hawk*, station 873, about 150 miles E of Barnegat Bay ($40^{\circ}02' N$; $70^{\circ}57' W$) in 100 fathoms (USNM; Yale); *Fish Hawk*, station 941, about 200 miles E of Barnegat Bay ($40^{\circ}01' N$; $69^{\circ}56' W$) in 79 fathoms (MCZ; USNM; Yale; ANSP); *Fish Hawk*, station 874, about 150 miles E of Barnegat Bay ($40^{\circ}00' N$; $70^{\circ}57' W$) in 85 fathoms; *Fish Hawk*, station 877, about 155 miles E of Barnegat Bay ($39^{\circ}56' N$; $70^{\circ}54' W$) in 126 fathoms (both USNM); *Fish Hawk*, station 939, about 235 miles E of Barnegat Bay ($39^{\circ}53' N$; $69^{\circ}50' W$) in 264 fathoms (USNM); *Albatross III*, station 34, about 340 miles E of Barnegat Bay ($40^{\circ}27' N$; $68^{\circ}00' W$) in 77 fathoms; *Albatross II*, station 20399, about 100 miles E of Atlantic City ($39^{\circ}23' N$; $72^{\circ}18' W$) in 88 fathoms (both MCZ); *Albatross*, station 2591, about 100 miles E of Cape May ($38^{\circ}53' N$; $72^{\circ}52' W$) in 188 fathoms (Yale). MARYLAND: *Fish Hawk*, station 1047, about 85 miles E of Ocean City ($38^{\circ}31' N$; $73^{\circ}21' W$) (USNM; Yale). VIRGINIA: *Bill II*, station 146, about 75 miles E of Chincoteague Island ($38^{\circ}33' N$; $73^{\circ}18' W$) in 63–65 fathoms; *Albatross*, station 2021, about 70 miles E of Metumken Inlet ($37^{\circ}36' N$; $74^{\circ}15' W$) in 179 fathoms (both MCZ); *Fish Hawk*, station 896, about 65 miles E of Great Machpongo Inlet ($37^{\circ}26' N$; $74^{\circ}19' W$) in 56 fathoms (Yale). NORTH CAROLINA: *Albatross*, station 2307, about 45 miles NE of Cape Hatteras ($35^{\circ}42' N$; $74^{\circ}54' W$) in 43 fathoms; *Albatross*, station 2592, about 25 miles SE of Cape Hatteras ($35^{\circ}02' N$; $75^{\circ}12' W$) in 120 fathoms; *Albatross*, station 2600, about 50 miles E of Cape Lookout ($34^{\circ}39' N$; $75^{\circ}35' W$) in 85 fathoms (all MCZ); *Albatross*, station 2601, about 53 miles E of Cape Lookout ($34^{\circ}39' N$; $75^{\circ}33' W$) in 107 fathoms (MCZ).

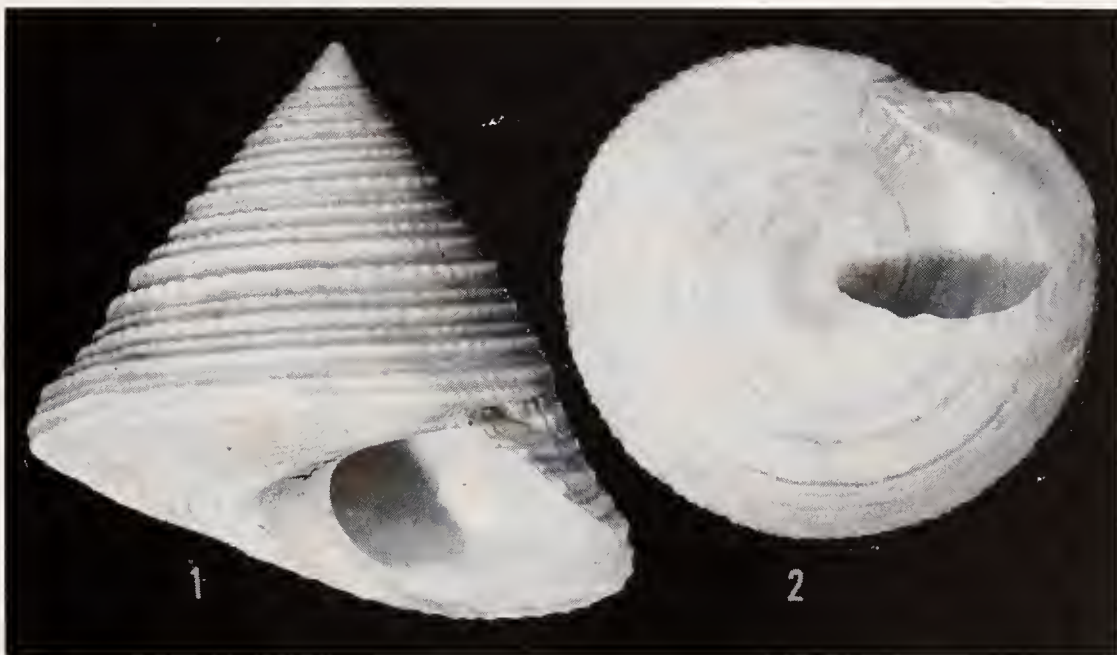


Plate 24. *Calliostoma bairdii* Verrill and Smith. Fig. 1. *Fish Hawk*, station 874, about 150 miles E of Barnegat Bay, New Jersey ($40^{\circ}00' N$; $70^{\circ}57' W$) in 85 fathoms. Lectotype. Fig. 2. Paratype from the same locality (both 2x).

Calliostoma (Kombologion) *psyche* Dall

Plate 7, fig. 1; Plate 25

Calliostoma psyche Dall 1878, Bulletin Museum Comparative Zoology 5: 61 [nomen nudum]; Dall 1880, Bulletin Museum Comparative Zoology 6: 45 [nomen nudum].

Calliostoma bairdii psyche Dall 1889, Bulletin Museum Comparative Zoology **18**: 364 (off Florida Reefs in 100–200 fathoms, Pourtales collector).

Description. Shell reaching 20.5 mm. (about $\frac{3}{4}$ inch) in length, trochoid in shape, relatively thin but strong, imperforate and moderately sculptured. Color a light golden yellow marbled with irregular patches of brownish red. Base with 5 to 8 brownish yellow lines alternating with the beaded cords which are white. Whorls 8, flat sided with a pronounced keel at the whorl periphery. Spire moderately extended, usually slightly concave and produced at an angle of about 75° . Aperture subquadrate, outer lip simple and produced at an angle of about 35° from the base. Columella arched and usually truncated at the base. Umbilical area margined by a smooth ridge, white to iridescent. Nearly all specimens have a slight depression in the umbilical area and in occasional specimens it may be quite deep. Sutures indistinct. Sculpture consisting of 7 to 8 beaded cords including the two at the periphery of the whorl with 12 to 15 beaded cords on the base. The spaces between the spiral cords are usually a shiny yellow-brown in color. Operculum circular, thin, corneous, multispiral and colored a light yellowish brown. Periostracum very thin, golden brown. Nuclear whorls small, $1\frac{1}{2}$, white and shiny.

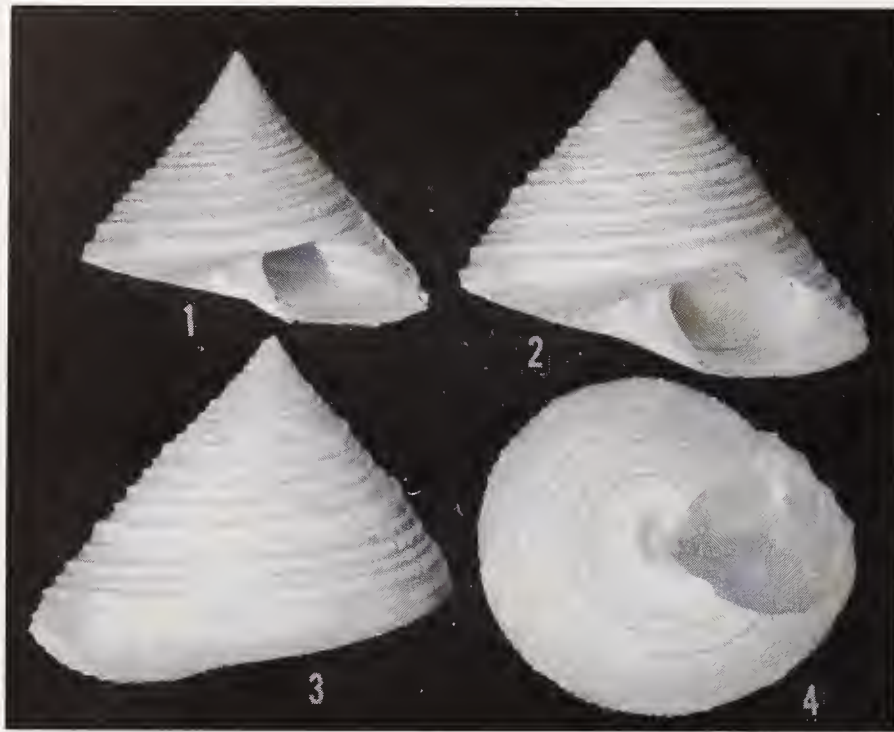


Plate 25. *Calliostoma psyche* Dall. Fig. 1. Off the Florida Reefs in 100–200 fathoms. Lectotype. Figs. 2–4. Off Palm Beach, Florida (both 1.9x).

length	width	
20.5 mm.	24 mm.	off Palm Beach, Fla., 115 fathoms
20	24	SW Egmont Key, Fla., 100 fathoms
16.5	19.3	Lectotype

Types. The lectotype of *C. psyche*, here selected, is in the Museum of Comparative Zoology, no. 224572 from off the Florida Reefs in 100–120 fathoms, collected by Count Pourtales.

Remarks. See under *C. bairdii* V. & S.

Range. From off Cape Hatteras, North Carolina south through the Florida Keys and on the west coast of Florida off Tarpon Springs; in depths from 14 to 200 fathoms.

Specimens examined. NORTH CAROLINA: *Combat*, station 70, about 23 miles ESE of Cape Hatteras, (35°07' N; 75°04' W) in 190 fathoms (H. Bullis); *Albatross*, station 2603, 49 miles E of Cape Lookout (34°38' N; 75°33' W) in 124 fathoms; *Albatross*, station 2614, 36 miles SE of Cape Lookout (34°09' N; 76°02' W) in 168 fathoms (both USNM). GEORGIA: *Pelican*, station 179, 109 miles ESE of Altamaha Id., McIntosh Co. in 45 fathoms; *Pelican*, station 197, 85 miles ENE of St. Andrews Id., Camden Co. in 50–100 fathoms (both USNM). FLORIDA: SE of Fernandina, in 200 fathoms (T. McGinty); *Combat*, station 79, about 70 miles E of St. Augustine (30°00' N; 80°14' W) in 110 fathoms; *Combat*, station 91, 60 miles E of Daytona (28°50' N; 80°04' W) in 80 fathoms (both H. Bullis); *Pelican*, station 205, 38 miles E of Melbourne, Brevard Co. in 70–95 fathoms (USNM); off Palm Beach in 80–115 fathoms (T. McGinty; MCZ; ANSP; H. & K. Johnstone); off Lantana in 100 fathoms (T. McGinty; MCZ; ANSP); off Boynton Beach, 105–115 fathoms (T. McGinty; MCZ); off Yamato Rocks (UMML); off Delray Beach in 85 fathoms (T. McGinty); off Boca Raton in 14 fathoms; off Hillsboro in 30–70 fathoms (both J. A. Weber); off Fort Lauderdale in 90 fathoms (T. McGinty); off Miami Beach in 100 fathoms (J. A. Weber; H. & K. Johnstone); *Albatross*, station 2648 off Cape Florida (25°53' N; 80°03' W) in 84 fathoms (USNM); off Fowey Light in 47–130 fathoms (USNM; MCZ); *Eolis*, Triumph Reef in 70–80 fathoms; *Eolis*, Ajax Reef in 70–100 fathoms (dead); *Eolis*, Caesar Creek, Elliott Key in 90 fathoms (all USNM); off Carysfort Light, Key Largo in 70 fathoms (T. McGinty); *Albatross*, station 2641 off Carysfort Light (25°11' N; 80°10' W) in 60 fathoms (USNM); off Key Largo in 125 fathoms (J. A. Weber); off Sombrero Key in 110 fathoms (MCZ; ANSP; T. McGinty); off American Shoals in 100 fathoms; Pelican Shoals (both J. A. Weber); *Eolis*, off Sambo Reef in 118–120 fathoms (USNM); off Key West (UMML); off Sand Key in 69–134 fathoms (MCZ; USNM); *Eolis*, off Western Dry Rocks in 90 fathoms (USNM); *Oregon*, station 1392, 120 miles E of Tarpon Springs (28°11' N; 85°07' W) in 107 fathoms (H. Bullis); SW of Egmont Key in 100 fathoms (D. Steger).

Calliostoma (Kombologion) rosewateri, new species¹

Plate 6, fig. 3; Plate 10, fig. 2; Plate 26

Description. Shell reaching 32 mm. (about 1¼ inches) in length, trochoid in shape, thin in structure, imperforate and rather coarsely sculptured. Color an iridescent golden yellow, often with an iridescent green on the early whorls and with more or less regular patches of reddish brown. The base may be without color or with as many as 5 or 6 spiral lines of red-brown which may be entire or broken. Whorls 10, nearly flat sided and with a keel at the whorl periphery. Spire moderately extended, slightly concave and produced at an angle of about 80°. Aperture subquadrate, outer lip simple and produced at an angle of about 45° from the base. Columella strongly arched and truncated at the base. Umbilical area deep and iridescent. Suture indistinct. Sculpture consisting of 12 or 13 beaded cords on the body whorl, the third cord above the periphery being the strongest. Sculpture below the periphery variable. The surface may be smooth or may be sculptured with numerous fine, slightly beaded cords. Operculum nearly circular, thin, corne-

¹ Named for Dr. Joseph Rosewater, student and colleague, now in the Division of Mollusks, United States National Museum.

ous, multispiral and light brown in color. Periostracum very thin and iridescent. Nuclear whorls $1\frac{1}{2}$, white, smooth and very small.

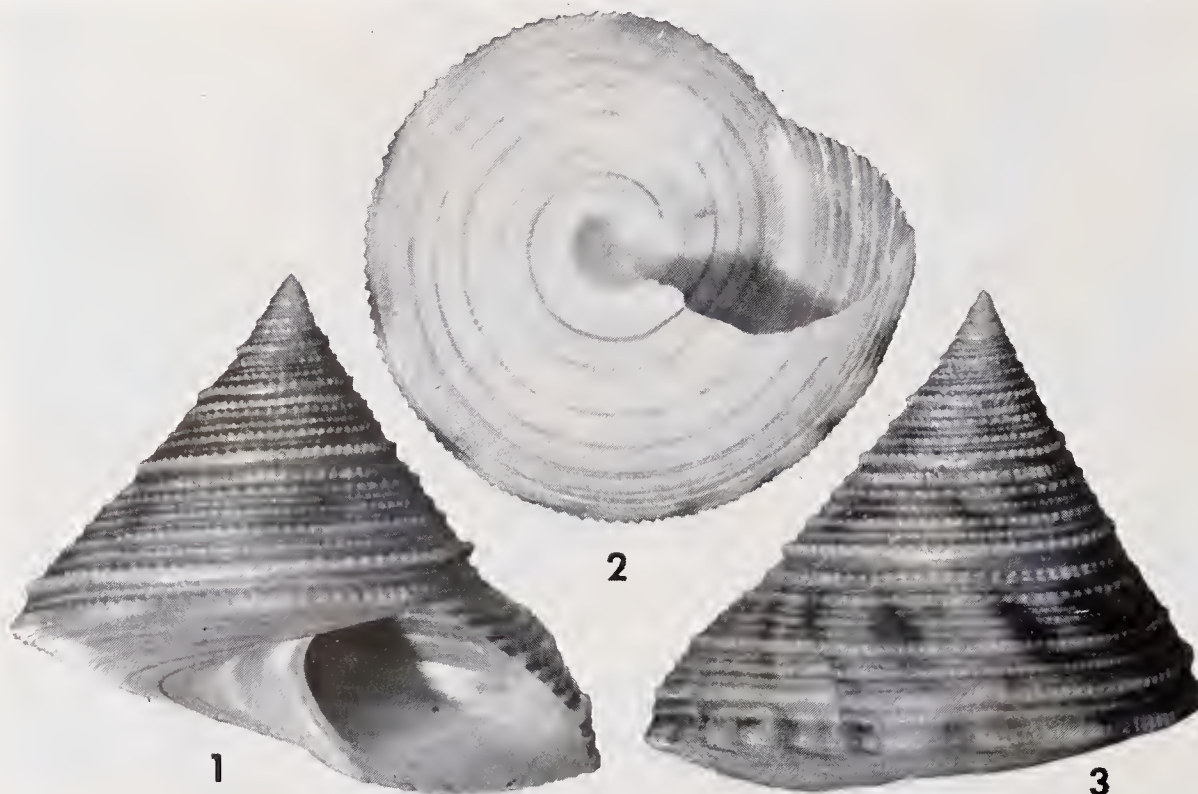


Plate 26. *Calliostoma rosewateri* Clench and Turner. Fig. 1. *Oregon*, station 1985, about 85 miles SE of Galeota Point, Trinidad. Holotype. Fig. 2 and 3. Paratypes from the same locality (all 4x).

length	width	
28 mm.	34 mm.	Holotype
32	37	60 miles E of Galeota Pt., Trinidad
27	34	85 miles SE of Galeota Pt., Trinidad

Types. The holotype is in the United States National Museum, no. 612704 from the *Oregon*, station 1985, about 85 miles SE of Galeota Point, Trinidad ($09^{\circ}04' N$; $59^{\circ}47' W$) in 150 fathoms. Paratypes from the same locality and from *Oregon*, station 1981, about 60 miles E of Galeota Point, Trinidad ($10^{\circ}03' N$; $60^{\circ}01' W$) in 200 fathoms and *Oregon*, station 1989, about 90 miles SE of Galeota Point, Trinidad ($09^{\circ}45' N$; $59^{\circ}45' W$) in 175 fathoms, are in the collection of H. Bullis.

Remarks. *Calliostoma rosewateri* is close in its relationship to *C. oregon* but is much larger, proportionately broader and has a nearly smooth base. Both species are highly colored and have a golden coloration not nearly so well developed in other species in the subgenus *Kombologion*.

Range and Specimens examined. See under *Types*.

Calliostoma (Kombologion) oregon, new species¹

Plate 2; Plate 6, fig. 2; Plate 27

Description. Shell reaching 20 mm. (about $\frac{3}{4}$ inch) in length, trochoid in shape, rather thin in structure, perforate or imperforate and highly sculptured. Color a golden red with

¹ Named for the M/V *Oregon*, research vessel of the U.S. Fish and Wildlife Service.

the spiral cords white. Whorls 8, flat sided, with an acute keel and produced at an angle of about 70° . Spire moderately extended and slightly concave. Aperture subquadrate and produced at an angle of 55° from the base. Outer lip simple and thin. Columella thickened, arched but not truncate. Umbilicus narrow, partially or completely closed by a thin umbilical pad. Suture indistinct. Sculpture consists of 7 subequal beaded cords above the periphery. Below the periphery the cords vary in width, become somewhat flattened and the beading becomes less distinct except on the two cords at the umbilical area. Nuclear whorl white and smooth. Operculum circular, multispiral, corneous and with a papilliform nucleus.

Animal (preserved specimen) with the foot heavily streaked and reticulated with red-brown on a ground color of ivory with fine streaks of the same color on the side of the bead below the eye and across the top. Tentacles with two to four streaks of red-brown, extending the entire length. Mantle very thin, the muscular edge thin and not colored.

length	width	
20 mm.	21 mm.	Holotype
17	19	Paratype
16	18	Paratype

Types. The holotype is in the United States National Museum, no. 612705, from the *Oregon*, station 550, about 70 miles SE of Corpus Christi, Texas ($26^\circ 55' N$; $96^\circ 25' W$) in 125 fathoms.

Remarks. See under *C. roseocateri*.



Plate 27. *Calliostoma oregon* Clench and Turner. *Oregon*, station 550, about 70 miles SE of Corpus Christi, Texas in 125 fathoms. Fig. 1. Holotype. Fig. 2. Paratype (both about 2.3x).

Specimens examined. FLORIDA: *Silver Bay*, station 157, about 50 miles SW of Cape San Blas ($29^\circ 12' N$; $86^\circ 06' W$) in 116 fathoms; *Oregon*, station 947, about 70 miles SSE of Pensacola ($29^\circ 30' N$; $86^\circ 56' W$) in 190 fathoms (both H. Bullis). TEXAS: *Oregon*, station 550, about 70 miles SE of Corpus Christi ($26^\circ 55' N$; $96^\circ 25' W$) in 125 fathoms (USNM).

Calliostoma (Kombologion) *hendersoni* Dall

Plate 7, fig. 4; Plate 11, fig. 2; Plate 28

Calliostoma hendersoni Dall 1927, Proc. United States National Museum 70: 7 (off Sambo Reefs, Florida in 118 fathoms).

Description. Shell reaching 19.5 mm. (about $\frac{3}{4}$ inch) in length, trochoid in shape, solid in structure, umbilicate and rather coarsely sculptured. Beaded cords above the periphery a glistening ivory, the spaces between the cords a golden brown. The peripheral keel consists of two cords without interspaces which are regularly mottled with patches of deep pink. Below the periphery the cords are smooth; they may be single or grouped in pairs, the interspaces being a golden brown. Whorls 8, generally flat sided, and with a sharp keel. Base flat to slightly convex. Spire moderately extended, slightly concave, produced at an angle of about 75° . Aperture subquadrate, the outer lip simple and produced at an angle of about 35° from the base. Columella iridescent, arched inwardly and truncate. Umbilicus relatively narrow and profound. It is margined by a rather large and coarsely beaded cord. Suture relatively indistinct, indicated by the peripheral cord. Sculpture consists of 6 beaded cords above the periphery; below the periphery cords are usually paired, flattened and smooth. Operculum circular, corneous, thin, multispiral, with a central nucleus. Nuclear whorls $1\frac{1}{2}$, smooth and white in color.

Animal ivory-white streaked with red-brown. The base of the foot a uniform ivory. Mantle streaked with red-brown. Eyes black.

length	width	
19.5 mm.	23 mm.	Holotype
17	19.5	off Cay Sal Bank, Bahama Ids.
16.5	19	“ “ “ “ “ “

Types. The holotype is in the United States National Museum, no. 333703, from *Eolis*, station 331 from off Sambo Reef, Florida in 118 fathoms [about 8 miles SE of Key West, Florida].

Remarks. *Calliostoma hendersoni* is closely related to *C. oregon*, differing by being less coarsely sculptured and having the cords on the base smooth rather than beaded. In addition, the umbilicus is always present and is wider than that found in some specimens of *C. oregon*.

Range. Known only from the two localities in the Straits of Florida.

Specimens examined. FLORIDA: off Sambo Reef, about 8 miles SE of Key West in 118 fathoms (USNM). BAHAMA ISLANDS: *Oregon*, station 1349, about 8 miles NE of Cay Sal Bank (H. Bullis).

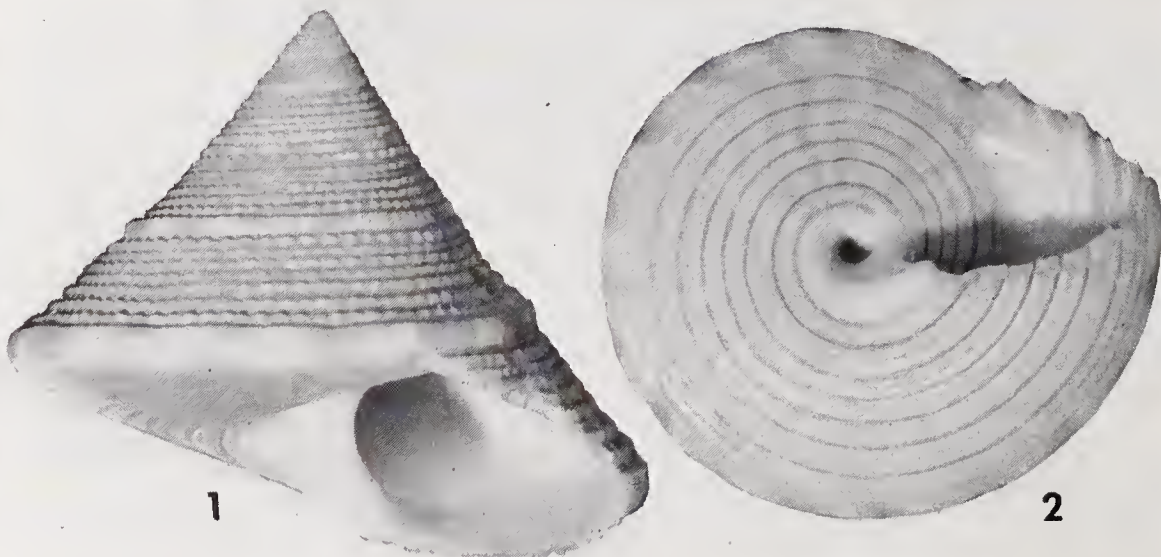


Plate 28. *Calliostoma hendersoni* Dall. Fig. 1. *Eolis*, station 321, off Sambo Reef, Florida in 118 fathoms. Holotype. Fig. 2. *Oregon*, station 1349, off Cay Sal Bank, Bahama Islands in 150 fathoms (both 2.8x).

Calliostoma (Kombologion) schroederi *Clench and Aguayo*

Plate 7, fig. 2; Plate 11, fig. 1; Plate 29

Calliostoma (Calliostoma) schroederi Clench and Aguayo 1938, *Memorias de la Sociedad de Historia Natural* 12: 377, pl. 28, fig. 3 (*Atlantis*, station 2981, off Punta Alegre, Camagüey, Cuba ($22^{\circ}48' N$; $78^{\circ}48' W$) in 225 fathoms).



Plate 29. *Calliostoma schroederi* Clench and Aguayo. Fig. 1. *Atlantis*, station 3409, off Punta Alegre, Camagüey, Cuba in 200 fathoms (2.6x). Fig. 2. *Combat*, station 235, off Mantanilla Shoals, Little Bahama Bank, Bahama Islands (2.6x) Fig. 3. *Atlantis*, station 2981, off Punta Alegre, Camagüey, Cuba in 225 fathoms. Holotype (2.2x).

Description. Shell reaching 29 mm. (about $1\frac{1}{8}$ inches) in length, trochoid in shape, fairly solid in structure, imperforate and sculptured. Color a uniform ivory-white with 4 to 5 thread-like bands of yellow above and below the periphery. Entire shell highly opalescent. Whorls 8 to 9, nearly flat-sided, with a very pronounced peripheral keel. Spire somewhat extended, slightly concave and produced at an angle of about 70° . Aperture subquadrate; the outer lip simple and produced at an angle of about 65° from the base. Columella arched inwardly and slightly truncated at the base in adults. Suture very indistinct. Sculpture consisting of two high, beaded peripheral cords with a much finer and lower cord between them on the body whorl of adult specimens. Above the periphery there are numerous fine, smooth, spiral threads. Base of the shell smooth other than a few fine spiral threads around the columella area. Axial sculpture consists of numerous fine oblique growth lines. The first 3 to 5 post-embryonic whorls often have a reticulated sculpture. The axial riblets disappear beyond the fifth whorl. Nuclear whorl very small, white, opaque and smooth. Operculum thin, multispiral and corneous, sculptured with exceedingly fine radiating threads.

The soft parts of preserved specimens of *C. schroederi* are a uniform ivory color with

no indication of color markings. The foot appears to be proportionately much smaller than in other species of *Calliostoma* and is smooth, while in other species examined it is usually papillose.

length	width	
25 mm.	25 mm.	Holotype
29	31	off Punta Alegre, Camagüey, Cuba
26	28	“ “ “ “ “

Types. The holotype of *C. schroederi* Clench and Aguayo is in the Museum of Comparative Zoology, no. 135002. The type locality is *Atlantis*, station 2981, off Punta Alegre, Camagüey, Cuba (22°48' N; 78°48' W) in 225 fathoms. Three paratypes from the same station are in the Museum of Comparative Zoology and the Museo Poey, Habana, Cuba. A single paratype from *Atlantis*, station 2999A from off Matanzas, Cuba (23°10' N; 81°29' W) in 145 fathoms is in the Museum of Comparative Zoology, no. 135149.

Remarks. This beautiful *Calliostoma* is characterized by its high pearly opalescence and its double peripheral carina. On the basis of its jaws and radula this species is placed in the subgenus *Kombologion*. In appearance it most closely resembles *C. atlantis* Clench and Aguayo.

Range. Northern Bahamas south to Camagüey, Cuba.

Specimens examined. BAHAMA ISLANDS: *Combat*, station 235, off Mantanilla Shoals, Little Bahama Bank (27°27' N; 78°58' W) in 180 fathoms (H. Bullis). CUBA: *Atlantis*, station 2999A, off Matanzas (23°10' N; 81°29' W) in 145–190 fathoms; *Atlantis*, station 3415, off Punta Alegre, Camagüey (22°51' N; 78°55' W) in 210 fathoms; *Atlantis*, station 3414, off Punta Alegre, Camagüey (22°50' N; 78°52' W) in 230 fathoms; *Atlantis*, station 2981, off Punta Alegre, Camagüey (22°48' N; 78°48' W) in 225 fathoms; *Atlantis*, station 3409, off Punta Alegre, Camagüey (22°44' N; 78°41' W) in 200 fathoms; *Atlantis*, station 3404, off Cayo Coco, Camagüey (22°37' N; 78°23' W) in 215 fathoms (all MCZ).

Calliostoma (*Kombologion*) *adpersum* Philippi

Plates 30 and 31

Trochus eximius 'Reeve' Philippi 1844, *Abbildungen Neuer Conchylien* 1: pt. 6, p. 17 (pt. 39 of volume), pl. 4, fig. 7 (no locality given) non *T. eximius* Reeve 1842 [1843].

Trochus adpersus 'Beck' Philippi 1851, *Conchylien Cabinet* (2) 2: pt. 3, p. 217, pl. 32, fig. 8 (Brazil).

Calliostoma depictum Dall 1927, *Proc. United States National Museum* 70: 6 (Bahia, Brazil).

Calliostoma aspersum 'Philippi' Lange de Morretes 1949, *Acquívios do Museu Paranense* 7: pt. 1, p. 58 [non *C. aspersum* Philippi 1846].

Description. Shell reaching 20.5 mm. (about $\frac{3}{4}$ inch) in length, depressed trochoid in shape, solid in structure, imperforate and rather finely sculptured. Color ivory, with large, irregular blotches of brownish red which are more or less axially aligned. Base of whorl with irregularly spaced, fine, reddish brown color spots on the cords. Whorls 8, flat sided, with a pronounced flattened keel at the whorl periphery. Spire moderately extended and produced at an angle of about 65°. Aperture subquadrate, outer lip simple

and produced at an angle of about 45° from the base. Columella arched and truncate at the base. Umbilical area iridescent, with a lengthened depression to the left of the columella. Suture indistinct. Sculpture consists of numerous, large and small, finely beaded cords above the periphery. Below the periphery the cords are smooth or nearly so, the cord at the umbilical area being much larger and smooth. The flattened keel consists of two large marginal cords and two inner smaller cords. Operculum circular, thin, corneous, multispiral and light golden brown in color. Nuclear whorls $1\frac{1}{2}$, small, white and smooth. Periostracum exceedingly thin and inconspicuous.



Plate 30. *Calliostoma adpersum* Philippi. Fig. 1. Praia do Leste, Ilha Guaiba, Rio de Janeiro, Brasil. Fig. 2. Basal view of a specimen from the same locality (both 2.4x).

length	width	
20 mm.	21.5 mm.	São Paulo, Brasil
17	19	Ilha Guaiha, Rio de Janeiro, Brasil
10	10.6	Holotype of <i>C. depictum</i> Dall

Types. The holotype of *Trochus adpersus* 'Beck' Philippi is probably in the Berlin Museum. The type locality which was given only as Brasil, is here restricted to Praia do Leste, Ilha Guaiba, Estado de Rio de Janeiro, a locality from which we have had living



Plate 31. *Calliostoma depictum* Dall (= *adpersum* Phil.), Bahia [Baia], Brasil. Holotype (6x).

material. The holotype of *Calliostoma depictum* Dall is in the United States National Museum, no. 152667, from Bahia [Baia], Brasil.

Remarks. This species appears to be related to *C. yneatecanum* Dall but differs by being imperforate, in lacking the exceedingly fine spiral threads between the cords and in having the spiral cords on the body whorl of adult specimens beaded rather than smooth.

The radula and jaws of *adpersum* place it in the subgenus *Kombologion*.

So far as we know this is a littoral species, occurring just below the low tide line. It is apparently rather rare to judge by the few lots available for study.

Calliostoma depictum Dall was based on a young specimen of *adpersum*.

Range. From Salvador, Estado Baia and probably south as far as Florianopolis, Estado Catarina, Brasil.

Specimens examined. BRASIL: Salvador, Est. Baia (USNM); Praia do Leste, Ilha Guaiba, Est. Rio de Janeiro (de Oliveira; Lopez); Santos, Est. São Paulo (SU); Villa Bella, Ilha de São Sebastiano, Est. São Paulo (P. de Oliveira; USNM).

Calliostoma (Kombologion) euglyptum *A. Adams*

Plate 32, figs. 1-2

Zizyphinus euglyptus A. Adams 1854 [1855], Proceedings Zoological Society London, p. 38 (Van Diemen's Land [Tasmania]); Reeve 1863, Conchologia Iconica 14: *Zizyphinus*, pl. 3, fig. 17.

Calliostoma euglyptum A. Adams. Dall 1889, Bulletin Museum Comparative Zoology 18: 363; Pilsbry 1889, Manual of Conchology (1) 11: 374, pl. 15, fig. 37, pl. 57, fig. 9.

Description. Shell reaching 25 mm. (1 inch) in length, turbate, solid in structure, rather coarsely sculptured and imperforate. Color a pinkish brown, often mottled with white. The apical whorls often a dark purplish brown as a result of the wearing away of the prismatic layer to expose the surface beneath. Whorls $7\frac{1}{2}$, slightly convex and with a rounded keel. Base of shell flat to slightly convex. Spire somewhat extended and produced at an angle of about 70° . Aperture subquadrate, the outer lip simple and produced at an angle of about 40° from the base. Columella is arched, thickened and white; suture indented, but relatively obscure. Sculpture consists of numerous rather fine beaded cords. The sculpture is somewhat variable and on some areas of the shell these cords may vary in size, alternating with finer cords interspersed with the more normal ones. On the early whorls the cords appear about equal in size. There are about 12 cords on the base of the shell. Nuclear whorls $1\frac{1}{2}$, minute, opaque white and smooth; first two post nuclear whorls with two beaded cords and faintly axially costate. Operculum thin, corneous, circular, multispiral and a light golden brown in color.

Jaws narrowly rounded anteriorly and with long tufts of scales. The radula is similar to that shown for *bullisi* and *jujubinum* differing in having seven marginals, the outermost having very long, thread-like cusps on a large somewhat triangular base.

length	width	
20 mm.	20 mm.	Egmont Key, Tampa Bay, Florida
16.5	18	Hillsboro, Florida
25	26	Marco Island, Florida

Types. The holotype of *Z. euglyptum* A. Adams described from the Cuming collection is probably in the British Museum (Natural History). The type locality Tasmania, as originally given by A. Adams, was in error. We here restrict the type locality to Tampa Bay, Florida, as this is a possible locality from which Cuming could have received material at that early date.

Remarks. On the basis of shell characters *C. euglyptum* does not appear to be closely related to other species in the subgenus *Kombologion*. In general, comparison can be made with *C. adpersum* Philippi. *Calliostoma euglyptum* differs by having the periphery of the whorl rounded rather than somewhat flattened. In addition, *euglyptum* has beaded cords on the base of the shell while in *adpersum* the cords are smooth or finely sculptured by growth lines. There is a somewhat similar pattern of flame-like color marks on both species though it is more intense in *adpersum*.

The ranges of the two species are widely separated.

Calliostoma euglyptum is found from low water to depths of at least 32 fathoms.

Range. Continental North America from Cape Hatteras, North Carolina south on the east coast of Florida to Hillsboro Inlet, and west Florida from Marco north to off Destin and on the Campeche Banks, Mexico.

Specimens examined. NORTH CAROLINA: *Albatross*, station 2605, 41 miles off Cape Hatteras ($34^{\circ}35' N$; $75^{\circ}34' W$) in 32 fathoms (USNM); Breakwater, Fort Macon (T. A. Stephenson); Piver's Island, Beaufort (MCZ); 11 miles SSW of Beaufort in 9 fathoms; Black Rocks, New River; *Pelican*, station 183, 21 miles SW of Cape Fear, Hanover County, in 9 fathoms; 44 miles SSW of Cape Fear (all USNM). SOUTH CAROLINA: Ocean Drive Beach (R. E. Petit); 47 miles ESE of Bulls Island, Charleston Co. in 17 fathoms (USNM). GEORGIA: *Pelican*, station 180-5, about 20 miles SE of mouth of Savannah River ($31^{\circ}53' N$; $80^{\circ}34' W$) in 8 fathoms; *Pelican*, station 180-4, about 25 miles SE of the mouth of the Savannah River ($31^{\circ}52' N$; $80^{\circ}29' W$) in 9 fathoms; *Pelican*, station 196-2, about 38 miles SE of mouth of Savannah River ($31^{\circ}41' N$; $80^{\circ}24' W$) in 12 fathoms (all USNM). FLORIDA: St. Augustine; *Pelican*, station 172-3,

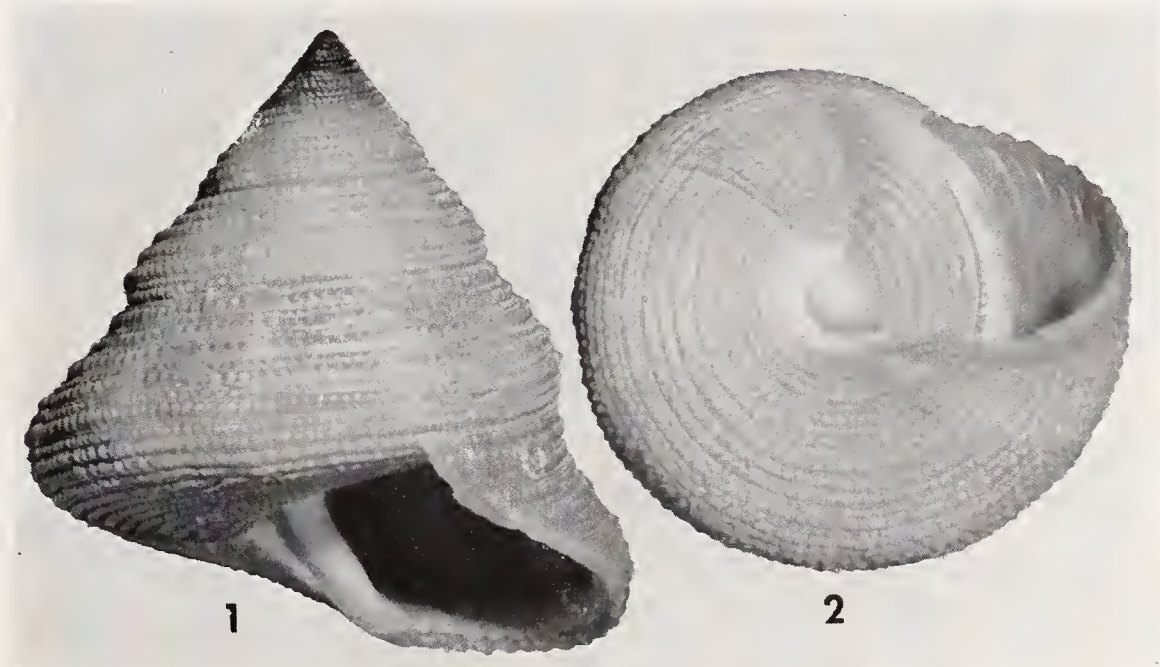


Plate 32. *Calliostoma euglyptum* A. Adams. Marco Island, Florida (2.6x).

about 17 miles E of Daytona Beach (29°11' N; 80°43' W) in 12 fathoms (both USNM); Daytona (MCZ); Coco Beach (G. & M. Kline); Vero Beach (H. & K. Johnstone); Fort Pierce, Hutchinson Island (D. & N. Schmidt); Jupiter Inlet (USNM); Lake Worth Inlet (UMML); Palm Beach (F. Bayer; ANSP); Boynton Beach (T. McGinty); Hillsboro (D. Moore); off Destin in 14 fathoms (T. McGinty); Cedar Keys (UMML); off Tarpon Springs (J. S. Schwengel; ANSP); off Clearwater (7–10 fathoms) (S. Kaicher); SSW of Johns Pass, St. Petersburg in 29 fathoms (D. & B. Steger); Egmont Key, Tampa Bay (MCZ); Anna Maria Key, Sarasota (USNM); Bradenton Beach (D. & N. Schmidt; A. Koto); Long Boat Key, Sarasota (Mrs. Leo Chambers; USNM); Casey Key, Sarasota Co. (Carnegie Mus.); SW of Big Pass, Sarasota Co. (7–8 fathoms) (MCZ); Midnight Pass, Sarasota (D. & N. Schmidt); Gasparilla Island (ANSP); off Sanibel Island in 6 fathoms (J. S. Schwengel; ANSP); Bonita Springs (USNM); Marco Island (D. Steger; ANSP). MEXICO: Veracruz (USNM); Campeche Banks, Yucatan in 15 fathoms (T. McGinty).

Calliostoma (Kombologion) marionae Dall

Plate 7, fig. 3; Plate 33

Calliostoma marionae Dall 1906, *Nautilus* 19: 131 (off Fowey Rocks [Miami] Florida).

Calliostoma (Eutrochus) faustum Schwengel and McGinty 1942, *Nautilus* 56: 14, pl. 6, fig. 1 (Lake Worth, Florida in 80 fathoms).

Description. Shell reaching 29 mm. (about 1 $\frac{1}{8}$ inches) in length, trochoid in shape, moderately solid in structure, perforate and finely sculptured. Color a nearly uniform brown or pinkish brown with most specimens mottled with small patches of white. Whorls 10, slightly convex and with a keel on the whorl periphery. Spire extended and produced at an angle of 65°. Aperture subquadrate, outer lip simple and produced at an angle of about 27° from the base. Columella arched and truncated at the base. Umbilicus deep and margined with a strong cord. Suture distinct. Sculpture consists of 5 or 6 finely beaded cords on the first 4 whorls following the nuclear whorls. On the fifth whorl, these beads disappear and the shell becomes smooth other than for 4 or 5 fine, incised lines. On the base there are 12 to 14 incised lines, the 3 nearest the umbilicus separating three rather indistinct and irregular cords. Operculum nearly circular, thin, corneous, multi-spiral and light golden brown in color. Nuclear whorls white, the first whorl smooth, the second whorl beaded. Foot ivory colored with fine reticulated markings of a medium red-brown and streaks of a dark red-brown. Sole of foot a uniform ivory. The head is a uniform red-brown anteriorly, becoming mottled posteriorly. Tentacles mottled red-brown, eye stalk short, streaked with red-brown. Eyes black. Mantle ivory, the edge having more or less uniform squarish dots of red-brown.

length	width	
20.5 mm.	18 mm.	Holotype of <i>C. marionae</i>
8	7.5	Holotype of <i>C. faustum</i>
25	23	50 miles E of St. Augustine, Florida
29	27.5	126 miles W of Cedar Keys, Florida

Types. The holotype of *C. marionae* Dall is in the United States National Museum, no. 187233 from the *Fish Hawk*, station 7571, off Fowey Rocks, Miami, Florida in 45 fathoms. The holotype of *C. faustum* Schwengel and McGinty is in the Academy Nat-

ural Sciences Philadelphia, no. 178786 (not 178635 as published). Paratypes are in the Museum of Comparative Zoology, no. 207073 and 204718, and in the United States National Museum, no. 617422. The type locality is Lake Worth, Florida in 80 fathoms.

Remarks. This is a relatively rare species as our records would indicate. *C. faustum* is based upon a young specimen of *C. marionae*.

C. marionae is not closely related to any Western Atlantic species known to us. In sculpture it simulates *C. conulum* Linné of the western Mediterranean Sea. In both, the first 3 or 4 post-embryonic whorls have finely beaded cords; the remaining whorls have the cords smooth, flat, relatively broad and separated by fine grooves. *C. conulum* is, however, imperforate while *C. marionae* is umbilicate.

Range. From off St. Augustine, Florida, the west coast of Florida to off Campeche, Mexico in 23 to 90 fathoms.

Specimens examined. FLORIDA: *Combat*, station 101, about 50 miles E of St. Augustine ($29^{\circ}48' N$; $80^{\circ}23' W$) in 23 fathoms (H. Bullis); Lake Worth in 60–90 fathoms (ANSP; USNM; MCZ); *Fish Hawk*, station 7571 off Fowey Rocks, Miami, in 45 fathoms (USNM); off Tortugas in 15 fathoms (T. McGinty); *Oregon*, station 1022, about 45 miles N of Tortugas ($24^{\circ}59' N$; $83^{\circ}35' W$) in 39 fathoms; *Oregon*, station 1020 about 22 miles NW of Tortugas ($24^{\circ}47' N$; $83^{\circ}18' W$) in 35 fathoms; *Oregon*,

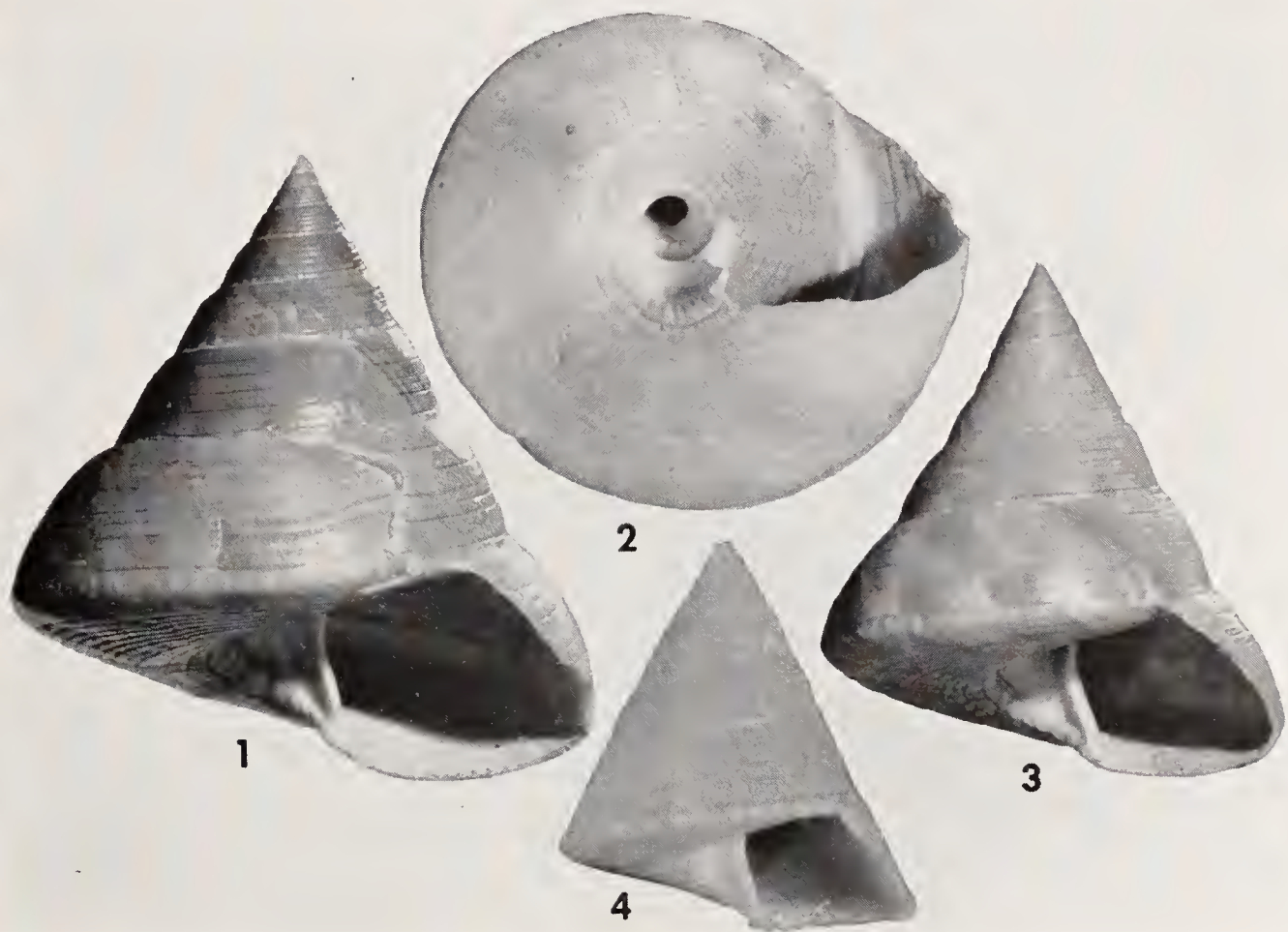


Plate 33. *Calliostoma marionae* Dall. Fig. 1. *Combat*, station 101, about 50 miles E of St. Augustine, Florida. Fig. 2. *Eolis*, station 187, off Fowey Rocks, Florida in 45 fathoms. Fig. 3. *Fish Hawk*, station 7571, off Fowey Rocks, Florida in 45 fathoms. Holotype. Fig. 4. *C. faustum* Schwengel (= *C. marionae* Dall), Lake Worth, Florida. Holotype (figs. 1–3, all 3x; fig. 4, 5.3x).

station 896, about 131 miles W of Cedar Keys ($28^{\circ}50' N$; $85^{\circ}06' W$) in 35 fathoms; Oregon, station 917, about 131 miles W of Tarpon Springs ($28^{\circ}22' N$; $84^{\circ}53' W$) in 48 fathoms (all H. Bullis); SW of Egmont Key in 90 fathoms; SSW of Johns Pass, off St. Petersburg in 29 fathoms (both D. Steger). MEXICO: off Campeche (W.C. Frisbey).

SPECIES NOT ASSIGNED TO SUBGENERA

The species which follow cannot be placed in a subgenus until the jaws and the radulae are known. The relationships of these species as given in the *Remarks* are based entirely upon shell characters. They will be of aid in determining a species but do not necessarily indicate actual relationship.

Calliostoma indiana Dall

Plate 34, fig. 1

*Calliostoma (Eucasta)*¹ *indiana* Dall 1889, Bulletin Museum Comparative Zoology 18: 368, pl. 32, figs. 3, 5 (Blake, station 267, off Grenada, $12^{\circ}05' N$; $51^{\circ}47' W$, in 170 fathoms).

Description. Shell reaching 8 mm. (about $\frac{1}{3}$ inch) in length, trochoid, imperforate, rather thin in structure and coarsely sculptured. Color ivory-white with irregular patches of light brownish red. Whorls $7\frac{1}{2}$, flat sided and with a sharp keel. Spire extended and produced at an angle of about 55° . Aperture subquadrate, the outer lip simple and produced at an angle of about 45° from the base. Columella white, arched inwardly, slightly thickened and truncate. Suture indistinct. Sculpture consisting of numerous spiral cords which are coarsely beaded, alternating with finer beaded cords, the peripheral cord being the most coarsely sculptured. On the flattened base there are 6 or 7 finer cords with the beads smaller and somewhat lengthened. Axial sculpture consists of numerous and somewhat regular thin thread-like ridges which cross the spiral cords at the point of the beads and give the shell a fine reticulated pattern. Nuclear whorls $1\frac{1}{2}$, white and smooth. Operculum unknown.

length	width	
8 mm.	6.5 mm.	Holotype

Types. The holotype of *C. indiana* Dall is in the United States National Museum, no. 214273. The type locality is Blake, station 247, off Grenada ($12^{\circ}05' N$; $61^{\circ}41' W$) in 170 fathoms.

Remarks. Dall overemphasized many of the characters which he mentioned in his original description, creating an impression of greater differences between this and other species of *Calliostoma* than actually exist. The fasciole which he mentions in his description of *indiana* is nothing more than the interspaces between two of the spiral cords.

On shell characters this species appears to be close to both *C. roseolum* Dall and *C. pulchrum* C. B. Adams, differing from *roseolum* by its much flatter whorls and finer basal

¹Dall erected the section *Eucasta* (1889, Bull. Mus. Comp. Zool. 18: 368) for a single species, *Calliostoma indiana* Dall, which was based upon a single dead specimen. As discussed in the remarks under *C. indiana*, he overemphasized many of the characters, implying differences between this and other species of *Calliostoma* which certainly do not exist. Based on shell characters only, *Eucasta* is probably a synonym of *Calliostoma* s.s.

cords. The spiral cords in *C. indiana* are more widely spaced than in either of these species, the keel is sharper and there is a definite axial sculpture giving the shell a reticulated pattern. *Calliostoma indiana* is also similar in appearance to *C. sapidum* Dall but is much more finely sculptured.

Range and Specimens examined. Known only from the type locality.

Calliostoma sapidum Dall

Plate 34, fig. 2

Calliostoma sapidum Dall 1881, Bulletin Museum Comparative Zoology **9**: 46 (*Blake*, station 2, off Habana, Cuba, 23°14' N; 82°25' W, in 805 fathoms); Dall 1889, Bull. Mus. Comparative Zoology **18**: 364, pl. 21, fig. 214.

Description. Shell reaching 6.2 mm. (about $\frac{1}{4}$ inch) in length, trochoid, imperforate, rather strong in structure and finely sculptured. Color ivory-white with occasional spots of very faint reddish brown. Whorls 8, flat sided and sharply keeled. Spire extended and produced at an angle of about 45°. Aperture subquadrate, outer lip simple and produced at an angle of about 40° from the base. Columella white, nearly straight and truncated. Suture indistinct, indicated mainly by the larger size of the peripheral cord. Sculpture consisting of numerous, rather coarsely beaded cords with the peripheral cord being largest and more coarsely beaded. There are 4 beaded cords, including the peripheral one, above the periphery. There are 8 smooth cords on the flattened base. Nuclear whorl small, white and smooth. Operculum unknown.

length	width	
6.2 mm.	5.4 mm.	Holotype
5.4	4.2	Barbados

Types. The holotype of *Calliostoma sapidum* Dall is in the United States National Museum, no. 214271. The type locality is *Blake*, station 2, off Habana, Cuba (23°14' N; 82°25' W) in 805 fathoms.

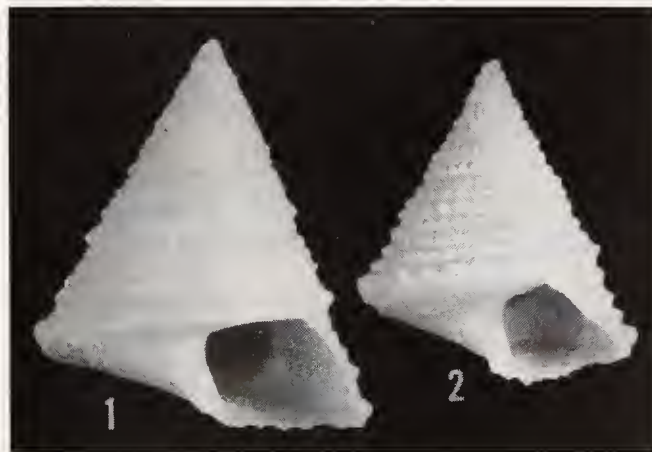


Plate 34. Fig. 1. *Calliostoma indiana* Dall, *Blake*, station 247, off Grenada, Lesser Antilles in 170 fathoms. Holotype (5.3x). Fig. 2. *Calliostoma sapidum* Dall, *Blake*, station 2, off Habana, Cuba in 805 fathoms. Holotype (5.3x).

Remarks. The description of this species was based upon dead specimens only. It is perhaps most closely related to *C. pulchrum* C. B. Adams from which it differs by being smaller in size and in having the peripheral cord heavier and more strongly beaded. See also *Remarks* under *C. indiana* Dall.

Specimens examined. FLORIDA: 90 miles SW of Egmont Key in 66 to 70 fathoms (D. Steger). CUBA: *Blake*, station 2, off Habana (23°14' N; 82°25' W) in 805 fathoms (USNM). LESSER ANTILLES: off Barbados in 80 fathoms; off Pelican Island, Barbados in 100 fathoms; off English Harbour, Antigua in 120 fathoms (all USNM).

Calliostoma orion Dall

Plate 35; figs. 1-2

Calliostoma orion Dall 1889, Bulletin Museum Comparative Zoology 18: 367, pl. 28, fig. 2 (*Blake*, station 62, off Habana, Cuba in 80 fathoms).

Description. Shell reaching 12.5 mm. (about $\frac{1}{2}$ inch) in length, trochoid in shape, imperforate, thin in structure and finely sculptured. Color a uniform ivory-white. Whorls 9, moderately convex with a rounded keel. Spire moderately extended and produced at

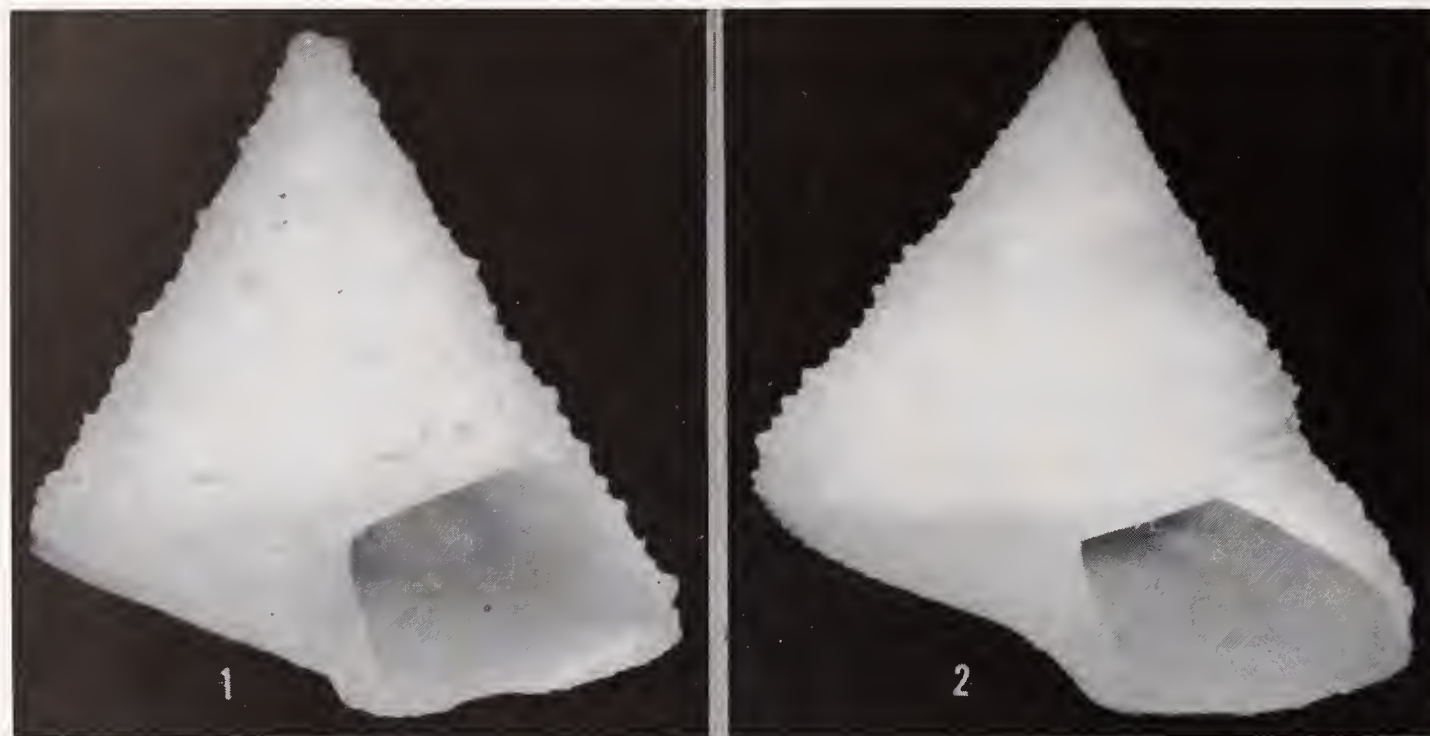


Plate 35. *Calliostoma orion* Dall. Fig. 1. *Blake*, station 62, off Habana, Cuba in 80 fathoms. Holotype (17.5x). Fig. 2. Arenas de la Chorrera, Habana, Cuba (6x).

an angle of about 70°. Aperture subquadrate, outer lip simple and produced at an angle of about 40° from the base. Columella white, slightly arched and subtruncate. Suture indistinct. Sculpture consisting of numerous fine beaded cords above the periphery; below the periphery the cords are much finer and the beading exceedingly fine. There are four peripheral cords, the outer two being larger and more coarsely beaded. The beads are more or less pointed. Nuclear whorls $1\frac{1}{2}$, smooth and white. Operculum unknown.

length	width	
12.5 mm.	11.5 mm.	Habana, Cuba
4.4	4	Holotype

Types. The holotype of *Calliostoma orion* Dall is in the United States National Museum, no. 214272. The type locality is *Blake*, station 62, off Habana, Cuba in 80 fathoms.

Remarks. This species appears to be allied to *C. echinatum* Dall differing by having the spiral cords more numerous and much more finely beaded. The peripheral cord is only slightly larger than the rest while in *echinatum* it is pronounced.

There are only two known specimens of this species. The holotype specimen is a very young shell. The second specimen is probably fully adult.

Range. Known only from the vicinity of Habana, Cuba.

Specimens examined. CUBA: *Blake*, station 62, off Habana in 80 fathoms (USNM). Arenas de la Chorrera, Habana, Cuba (V. Condé).

Calliostoma echinatum Dall

Plate 36

Calliostoma echinatum Dall 1881, Bulletin Museum Comparative Zoology 9: 47; Dall 1889, Bulletin Museum Comparative Zoology 18: 364, pl. 21, figs. 2a, 5 (*Blake*, station 62, off Habana, Cuba in 80 fathoms).

Description. Shell reaching 5 mm. (about $\frac{1}{4}$ inch) in length (a young specimen), trochoid in shape, imperforate, thin in structure and highly sculptured. Whorls 6, moderately convex. Spire moderately extended and produced at an angle of about 50° . Aperture subquadrate, outer lip simple and produced at an angle of about 40° from the base. Columella nearly straight, narrow and forming a near right angle with the base of the shell. Suture indistinct. The sculpture consists of 7 beaded cords above the periphery which generally alternate between large and small. Below the periphery there are 13 very small and faintly beaded cords. Nuclear whorls $1\frac{1}{2}$, white and smooth. Operculum unknown.



Plate 36. *Calliostoma echinatum* Dall. *Blake*, station 62, off Habana, Cuba in 80 fathoms. Holotype (15.7x).

length	width	
5 mm.	4.5 mm.	Holotype

Types. The holotype of *Calliostoma echinatum* Dall is in the United States National Museum, no. 214270. The type locality is *Blake*, station 62, off Habana, Cuba in 80 fathoms.

Remarks. This species probably is most closely related to *C. orion* Dall from which it differs in being more coarsely sculptured and in having the whorls flat sided. The holotype is an uncolored, young specimen and until more material is available its position must remain uncertain. See also under *C. orion* Dall.

Range and Specimens examined. Known only from the type specimen.

Calliostoma sarcodum Dall

Plate 37, figs. 1-2

Calliostoma sarcodum Dall 1927, Proc. United States National Museum 70: 7 (off "Lord's Castle," Barbados in 4-6 fathoms).

Calliostoma jaumei Clench and Aguayo 1946, Revista de la Sociedad Malacologica 4: 88, text figure (Arenas de la Chorrera, Habana, Cuba.)

Description. Shell reaching 10 mm. ($\frac{3}{8}$ inch) in length, turbinate, solid in structure, finely sculptured and perforate. Color a uniform medium to dark brownish red, some specimens having a few small white patches on the spire. On the base and occasionally at the periphery of some specimens, two or more of the beaded spiral cords are marked with interrupted deep reddish spots. Whorls 7 to 8, slightly convex, and not keeled. Base of shell slightly convex, spire moderately extended and produced at an angle of 75° . Aperture subquadrate, the outer lip simple and produced at an angle of about 45° from the base. Columella thickened, white in color and inclined to the right of the axis. Umbilical area defined by a shallow depression. Suture slightly indented but obscure. Sculpture consisting of numerous fine beaded cords, the cords on the base being somewhat finer than those above the periphery. Nuclear whorls $1\frac{1}{2}$, very small and smooth. Operculum unknown.

length	width	
9 mm.	9.5 mm.	Holotype of <i>C. jaumei</i>
7.5	7.5	Holotype of <i>C. sarcodum</i>
10	10.5	Turks Islands, Bahama Islands
9.5	9.5	St. Croix, Virgin Islands

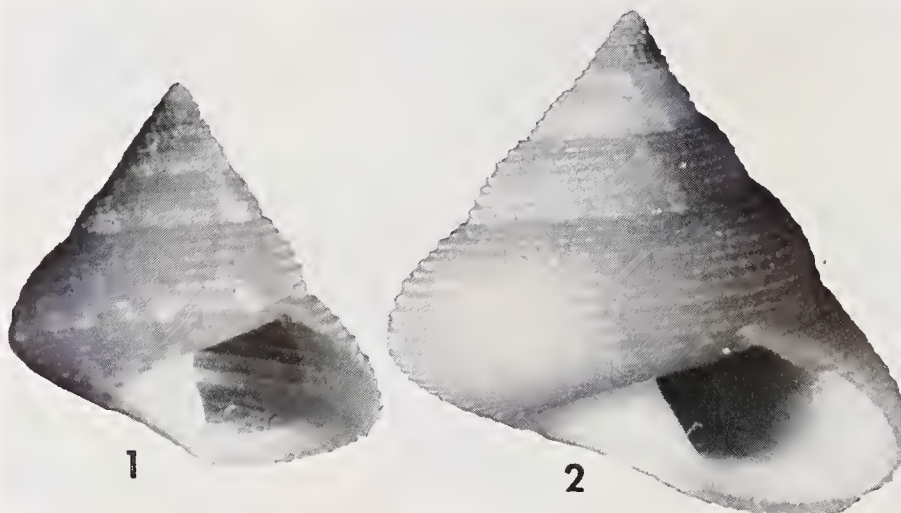


Plate 37. *Calliostoma sarcodum* Dall. Fig. 1. Holotype of *Calliostoma sarcodum* Dall, off "Lord's Castle," Barbados in 4 to 6 fathoms (5.3x). Fig. 2. Holotype of *C. jaumei* Clench and Aguayo [= *C. sarcodum* Dall], Arenas de la Chorrera, Habana, Cuba (about 5.5x).

Types. The holotype of *C. sarcodum* Dall is in the United States National Museum, 216955, from off "Lord's Castle," Barbados in 4 to 6 fathoms. The holotype of *C. jaumei* Clench and Aguayo is in the Museum of Comparative Zoology, no. 178127, from the Arenas de la Chorrera, Habana, Cuba.

Remarks. This is a rare species to judge by the amount of material we have had for study. It is apparently a fairly shallow water species, living in sandy areas.

Calliostoma jaumei Clench and Aguayo is a unicolored form of *sarcodum* Dall and has no significance even as a geographic race. Dall did not figure his species but a study of the holotype specimen indicates that they are the same species.

Calliostoma sarcodum, on the basis of shell characters, appears to be most closely related to *C. euglyptum* Adams.

Range. The Bahama Islands and south through the Greater and Lesser Antilles to Barbados.

Specimens examined. BAHAMA ISLANDS: Clifton Point, New Providence (T. McGinty); Turks Islands (MCZ). CUBA: Arenas de la Chorrera, Habana (MCZ; V. Condé; D. Steger); Cayo Santa Maria, Camagüey (MCZ). PUERTO RICO: Rincón (G. Warmke). VIRGIN ISLANDS: St. Thomas (USNM); St. Croix (G. Usticke). LESSER ANTILLES: off "Lord's Castle" Barbados (USNM).

Calliostoma carcellesi Clench and Aguayo

Plate 38, figs. 1-2; Plate 39

Calliostoma (Calliostoma) carcellesi Clench and Aguayo 1940, Memorias de la Sociedad de Historia Natural 14: 80, pl. 14, fig. 4 (*Hassler* voyage, off Punta Rubio, Argentina, 40°22' S; 60°35' W, in 30 fathoms).

Description. Shell reaching 20.5 mm. (about $\frac{3}{4}$ inch) in length, trochoid in shape, imperforate, rather thin but strong in structure and finely sculptured. Color a uniform ivory-white. Whorls $8\frac{1}{2}$ to 9, moderately convex with a rounded keel. Spire extended and produced at an angle of about 55°. Aperture subquadrate, the outer lip simple and

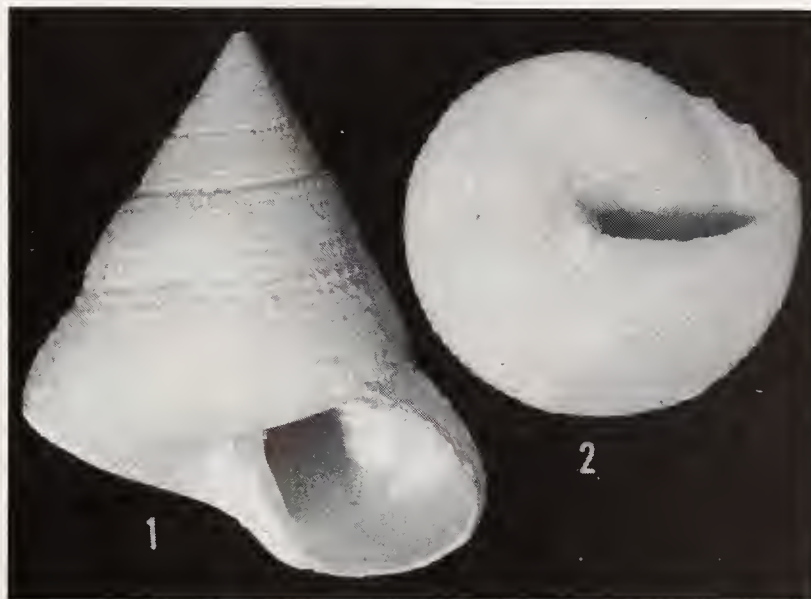


Plate 38. *Calliostoma carcellesi* Clench and Aguayo. Fig. 1. *Hassler*, station 27, about 100 miles E of Bahía Anegada, Rio Negro Prov., Argentina in 30 fathoms. Holotype. Fig. 2. *Hassler*, station 30, about 50 miles S of Punta Redonda, Rio Negro Prov., Argentina in 30 fathoms. Paratype (both 2.8x).

produced at an angle of about 55° from the base. Columella iridescent, slightly arched and subtruncate at the base of the aperture. Suture slightly indented. Sculpture consists of numerous fine, beaded cords above the whorl periphery; below the periphery the cords are finer, more thread-like and interrupted only by the growth lines. Operculum thin, corneous and circular.

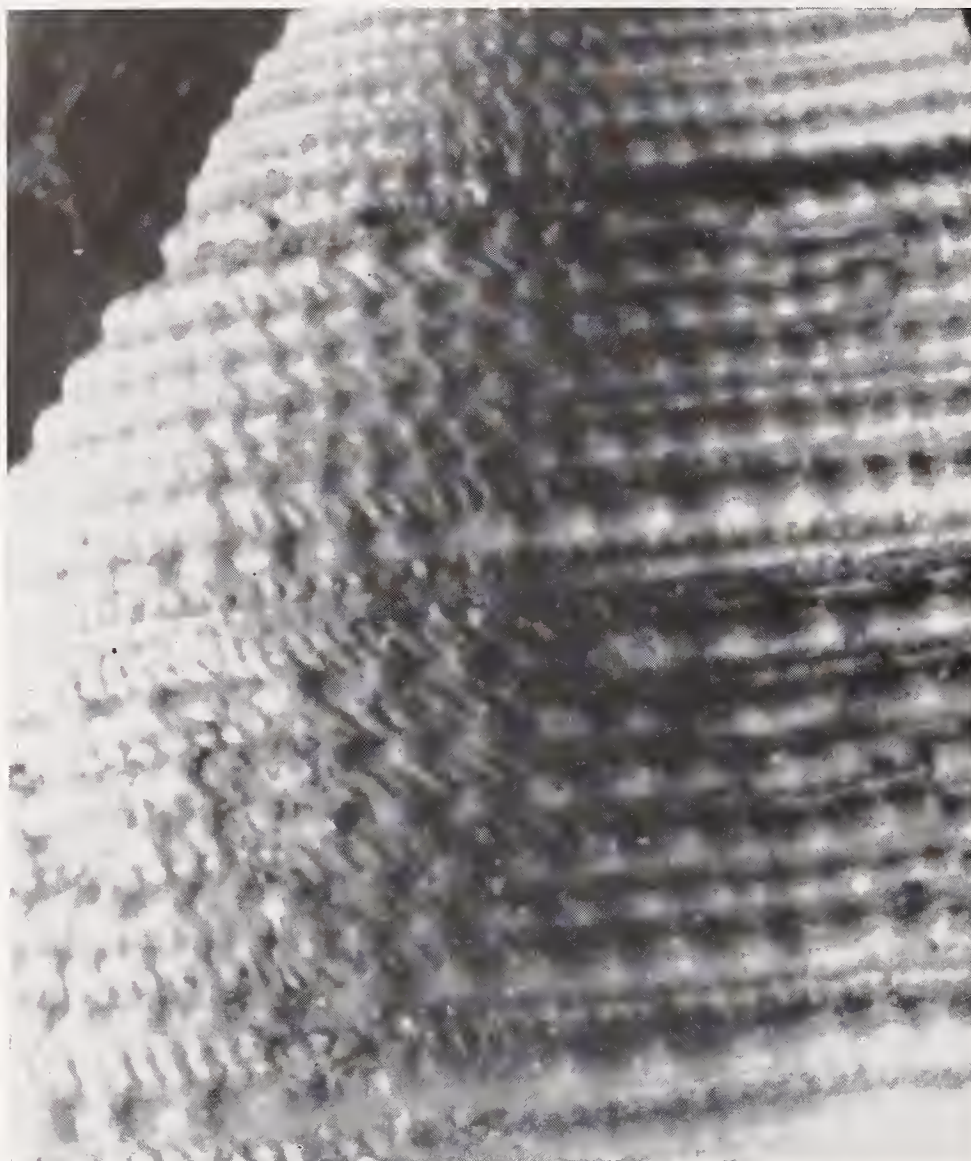


Plate 39. *Calliostoma carcellesi* Clench and Aguayo. Off Punta Rubio, Argentina. Holotype (about 16.5x).

length	width	
20.5 mm.	17.1 mm.	Holotype
17.1	14.2	Paratype (Museo Poey)

Types. The holotype of *Calliostoma carcellesi* is in the Museum of Comparative Zoology, no. 104719, from the voyage of the *Hassler*, station 27, about 100 miles E of Bahía Anegada, Río Negro Prov., Argentina ($40^\circ 22' S$; $60^\circ 35' W$) in 30 fathoms. Paratypes from the same locality are in the Museum of Comparative Zoology and the Museo Poey, University of Habana, Habana, Cuba.

Remarks. On the basis of shell characters this species appears to be most closely related to *C. jucundum* Gould but differs in being more attenuate, having slightly convex rather than flat sided whorls and being a uniform ivory in color. In addition, the base of the body whorl in *jucundum* is flatter and the sculpture, though similar, is somewhat coarser.

Range. Known only from off the Province of Río Negro, Argentina.

Specimens examined. ARGENTINA: *Hassler*, station 27, about 100 miles E of Bahía Anegada, Río Negro Prov. ($40^{\circ}22' S$; $60^{\circ}35' W$) in 30 fathoms; *Hassler*, station 30, about 45 miles S of Punta Redondo, Río Negro Prov. ($41^{\circ}40' S$; $63^{\circ}13' W$) in 30 fathoms (both MCZ).

***Calliostoma torrei* Clench and Aguayo**

Plate 40

Calliostoma (Calliostoma) torrei Clench and Aguayo 1940, *Memorias de la Sociedad Cubana de Historia Natural* 14: 79, pl. 14, fig. 5 (off Matanzas, Matanzas Prov., Cuba in 385 fathoms).

Description. Shell reaching 41 mm. (about $1\frac{1}{2}$ inches) in length, trochoid in shape, solid in structure, imperforate and rather coarsely sculptured. Color a light reddish brown [dead specimen]. Whorls $9\frac{1}{2}$, flat sided and with a broad keel at the whorl periphery. Base of shell convex. Spire moderately extended and produced at an angle of 66° [not 76° as given in the original description]. Aperture subquadrate, outer lip simple and produced at an angle of about 40° from the base. Columella thick, inwardly arched and obtusely angled with the base of the aperture. Suture distinct. Sculpture consisting of 19 finely beaded spiral cords above the periphery and about 22 non-beaded spiral cords below the periphery. Nuclear whorls $1\frac{1}{2}$, small, smooth and glass-like, the first two post-nuclear whorls finely axially costate. Operculum unknown.



Plate 40. *Calliostoma torrei* Clench and Aguayo. *Atlantis*, station 3985, off Matanzas, Cuba in 385 fathoms. Holotype (2.6x).

length	width	
41 mm.	36 mm.	Holotype

Types. Holotype, Museum of Comparative Zoology, no. 135165, *Atlantis*, station 3985 from off Matanzas, Matanzas Prov., Cuba ($23^{\circ}13' N$; $81^{\circ}22' W$) in 385 fathoms.

Remarks. This species is known only from the type specimen. It is one of the largest species of *Calliostoma* in the Western Atlantic and is exceeded in size by but few species elsewhere. This is a very distinctive species and apparently not closely related to any other in the Western Atlantic though it seems to be closest to *C. amazonicum* Finlay. See *Remarks* under that species.

Range and Specimens examined. Known only from the type locality.

Calliostoma amazonicum Finlay

Plate 41; Plate 42

Calliostoma iheringi Dall 1927, Proc. United States National Museum **70**: Art. 19, p. 5 (Nicochea, Brasil [Necochea, Argentina]).

Calliostoma amazonica Finlay 1930, Trans. New Zealand Institute **61**: 40 [new name for *C. iheringi* Dall 1927, non *C. iheringi* Ortmann 1900].

Calliostoma quequensis Carcelles 1944, Revista del Museo de la Plata (N.S.) Zoologia **3**: 241 [new name for *C. iheringi* Dall 1927, non *C. iheringi* Ortmann 1900].



Plate 41. *Calliostoma amazonicum* Finlay. Puerto Quequén, Argentina (2.3x).

Description. Shell reaching 34 mm. (about $1\frac{1}{4}$ inches) in length, trochoid in shape, solid in structure, rather coarsely sculptured and imperforate. Color ivory-white, mottled lightly with reddish brown in a more or less diagonal pattern. Whorls $5\frac{1}{2}$, strongly convex, with two large cords at the rounded whorl periphery. Base of shell convex. Spire moderately extended and produced at an angle of about 75° . Aperture subquadrate, outer lip simple and produced at an angle of about 35° from the base. Columella rather thin, inwardly arched and obtusely angled with the base of the aperture. Suture indis-

inct. Sculpture consisting of numerous beaded cords. Above the periphery large and small cords alternate while below the periphery they are of equal size. Nuclear whorls $1\frac{1}{2}$, small, smooth and glass-like. Operculum unknown.

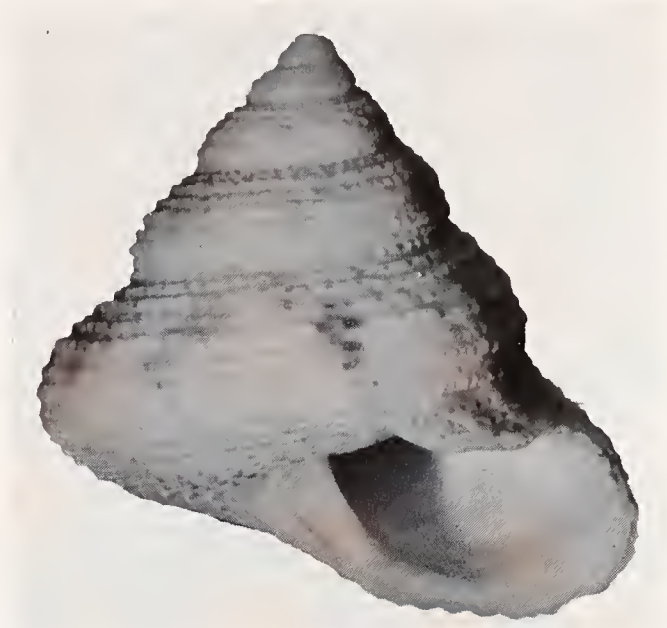


Plate 42. *Calliostoma amazonicum* Finlay. Holotype of *Calliostoma iheringi* Dall [= *amazonicum* Finlay] Nicochea, Brasil [Necochea, Argentina] (about 2x).

length	width	
34 mm.	34 mm.	Holotype
34	32	Puerto Quequén, Argentina

Types. The holotype of *C. iheringi* Dall [= *amazonicum* Finlay] is in the United States National Museum, no. 333701. The type locality, Nicochea, Brazil as given by Dall was in error; it is Necochea, Prov. of Buenos Aires, Argentina.

Remarks. This species is known from only a very few specimens. It is, however, very distinctive and on shell characters would appear to be a member of the *atlantis-torrei* complex. From *C. torrei* Clench and Aguayo it differs by being somewhat smaller, proportionately wider, having a more coarsely beaded sculpture and more convex whorls.

Range. From Necochea and Puerto Quequén south and west to Monte Hermosa, Argentina.

Specimens examined. ARGENTINA: Puerto Quequén (ANSP); Necochea and Monte Hermosa (both USNM), all in the Prov. of Buenos Aires.

Calliostoma cubanum Clench and Aguayo

Plate 43

Calliostoma (*Calliostoma*) *cubanum* Clench and Aguayo 1940, Memorias de la Sociedad Cubana de Historia Natural 14: 78, pl. 16, fig. 4 (*Atlantis*, station 3474, off Cárdenas, Matanzas Prov., Cuba, 23°18' N; 80°46' W, in 490 fathoms).

Description. Shell about 15 mm. ($\frac{5}{8}$ inch) in length, trochoid in shape, solid in structure, minutely perforate and coarsely sculptured. Color probably yellowish brown [dead specimen]. Whorls probably about 9, rather flat sided and with a double knobbed keel

at the periphery. Spire moderately extended and produced at an angle of 65° . Aperture subquadrate, outer lip simple and produced at an angle of 55° from the base. Columella narrow, inwardly arched and obtusely angled with the base of the aperture. Suture indistinct. Sculpture consisting of coarsely beaded spiral cords, the uppermost peripheral cord being the strongest; between this cord and the suture above there are five alternating fine and coarse beaded cords. Between the upper and the lower peripheral cord there is a broad smooth band. The base of the whorl has 13 fine, smooth, spiral cords. The umbilicus is finely perforated. The periostracum, nuclear whorls and operculum are unknown.

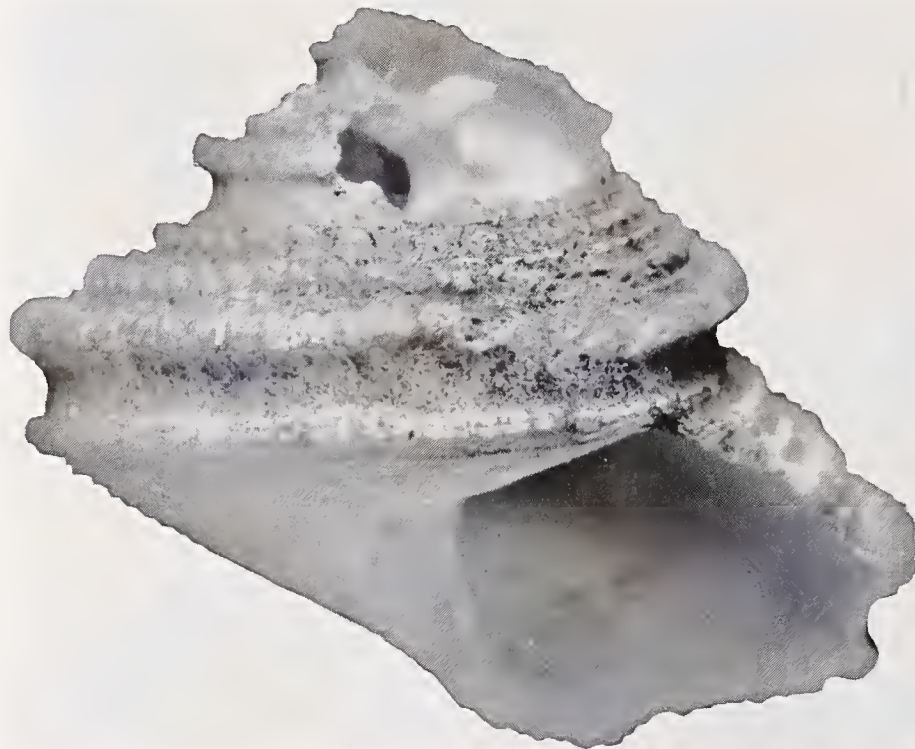


Plate 43. *Calliostoma cubanum* Clench and Aguayo. *Atlantis*, station 3474, off Cárdenas, Matanzas Province, Cuba in 490 fathoms. Holotype (about 5.3x).

length	width	
15 mm. (estimated)	16.5 mm.	Holotype

Types. Holotype, Museum of Comparative Zoology, no. 135163, *Atlantis*, station 3474, off Cárdenas, Matanzas Province, Cuba ($23^\circ 18' N$; $80^\circ 46' W$) in 490 fathoms.

Remarks. The description above is based on a single dead and broken specimen. It is a member of the *atlantis-torrei* species complex which is characterized by having two well marked cords at the periphery of the whorl with a broad smooth area between them, the suture being built on the lower cord.

This is the most highly sculptured *Calliostoma* in the Western Atlantic.

Calliostoma atlantis Clench and Aguayo

Plate 44

Calliostoma (*Calliostoma*) *atlantis* Clench and Aguayo 1940, Memorias de la Sociedad Cubana de Historia Natural 14: 81, pl. 15, fig. 4 (*Atlantis*, station 3306, off Mariel, Pinar del Río, Cuba, $23^\circ 04'$; $82^\circ 37' W$, in 330 fathoms).

Description. Shell reaching 35.5 mm. ($1\frac{1}{4}$ inches) in length, turbinata, solid in structure, imperforate, sculptured and shining. Color a creamy white and opalescent. Whorls

eight, acutely angled and regularly increasing in size. Base of shell convex. Spire acute, moderately extended and produced at an angle of about 80° . Aperture subquadrate and produced at an angle of about 45° from the base. Outer lip simple; inner lip consisting of a very thin glaze. Columella thickened and nearly straight. Umbilical depression slight. Suture slightly indented with the upper margin of the aperture being built forward on the lower of the two peripheral keels. Sculpture consists of the two beaded keels, the beading becoming obsolete on the lower keel of the body whorl. Microscopic sculpture consisting of numerous fine, somewhat irregular spiral threads. Axial sculpture of very fine and irregular growth lines. Nuclear whorl smooth and white, the early post-nuclear whorls finely reticulate. Operculum thin, corneous and multispiral with a central nucleus.

length	width	
31.5 mm.	32.5 mm.	Holotype

Types. The holotype is in the Museum of Comparative Zoology, no. 135164 from *Atlantis*, station 3306, off Mariel, Pinar del Río, Cuba ($23^\circ 04' N$; $82^\circ 37' W$) in 330 fathoms.

Remarks. The *Atlantis* obtained only a single specimen of this species. In general shell shape it is similar to *C. torrei* Clench and Aguayo, and *C. amazonica* Finlay, but differs in being nearly devoid of sculpture. The shell also resembles that of *C. schroederi* Clench and Aguayo from which it differs in having the beading on the keels exceedingly fine, having fine spiral threads, and a strongly convex base. In addition, *C. atlantis* is devoid of any spiral bands of color.

Range and Specimens examined. Known only from the type specimen.



Plate 44. *Calliostoma atlantis* Clench and Aguayo. *Atlantis*, station 3306, off Mariel, Cuba in 330 fathoms. Holotype (about 2.8x).

Calliostoma aurora Dall

Plate 45, figs. 1-2; Plate 46

Calliostoma aurora Dall 1888 [in] Agassiz, Three Cruises of the Steamer "Blake." Bull. Mus. Comp. Zool. 15: 68, fig. 285 (no locality given); Dall 1889, Bull. Mus. Comp. Zool. 18: 366, pl. 37, fig. 2 (off Grenada and off Barbados).

Description. Shell reaching 21 mm. ($\frac{3}{4}$ inch) in length, trochoid in shape, thin, imperforate and finely sculptured. Color a uniform straw-yellow above the periphery and a light cream color below. Whorls probably 10, slightly convex with a pronounced, sharp keel at the whorl periphery. Spire moderately extended, concave and produced at an angle of about 70° . Aperture subquadrate, outer lip simple and produced at an angle of 50° from the base. Columella slightly arched. Umbilical area smooth and iridescent. Suture very indistinct. Sculpture consisting of 12 beaded cords on the body whorl above the periphery, while below the periphery the shell is smooth except for the very fine growth lines. The umbilical area is margined by two rather indistinct cords. Operculum unknown. Periostracum very thin and straw-yellow in color. Nuclear whorls $1\frac{1}{2}$, white and smooth.

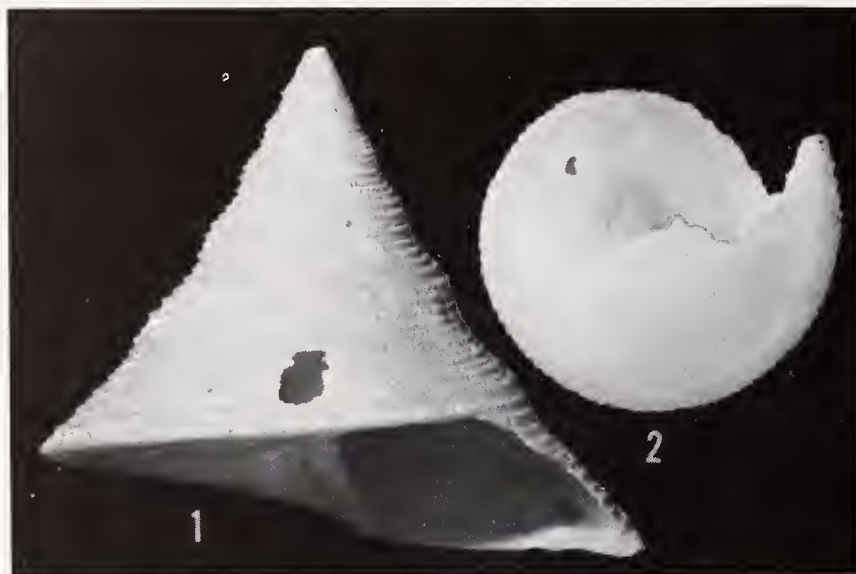


Plate 45. *Calliostoma aurora* Dall. Fig. 1. *Blake*, station 265, off Grenada, Lesser Antilles in 576 fathoms. Holotype. Fig. 2. *Blake*, station 299, off Barbados, Lesser Antilles in 140 fathoms. Paratype (both 2.4x).

length	width	
21 mm.	26.5 mm.	Holotype
8	15.5	off Barbados, Lesser Antilles

Types. The holotype is in the Museum of Comparative Zoology, no. 73808, from *Blake*, station 265, off the west coast of Grenada, Lesser Antilles ($12^\circ 03' 55''$ N; $61^\circ 49' 40''$ W) in 576 fathoms. Paratypes in the United States National Museum, no. 95005, are from *Blake*, station 299, off the west coast of Barbados, Lesser Antilles ($13^\circ 05' 00''$ N; $59^\circ 39' 40''$ W) in 140 fathoms.

Remarks. This is a very rare and beautiful species and on the basis of its shell characters it may be compared to *C. bairdii* Verrill and Smith, and *C. psyche* Dall. It is readily distinguished, however, by its lighter structure, concave spire, finer sculpture, smooth base and uniform coloration. See also *Remarks* under *C. jeanneae* Clench and Turner.

Range and Specimens examined. This species is known only from the two localities given under types.

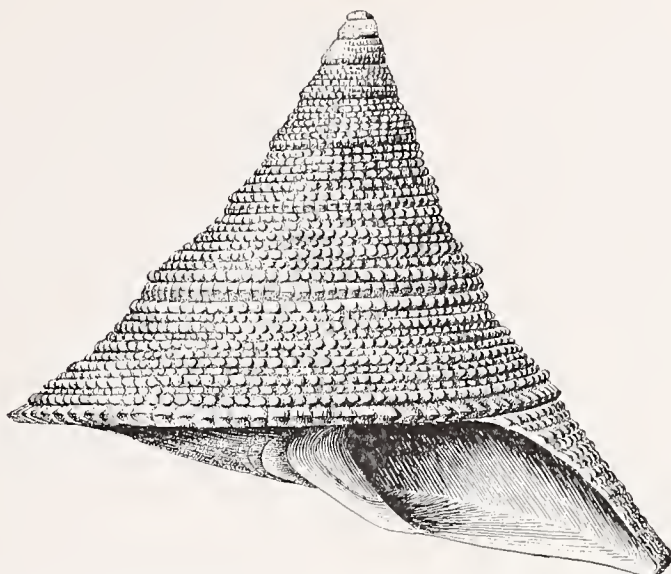


Plate 46. *Calliostoma aurora* Dall. This figure appeared first in a chapter by W. H. Dall in Alexander Agassiz' report on "Three Cruises of the United States Coast and Geodetic Survey Steamer *Blake*" (1888, Bulletin Museum of Comparative Zoology 15: 68, fig. 285). This is a new engraving of the original drawing by McConnell (2.6x).

Calliostoma jeanneae,¹ new species

Plate 47, figs. 1-2

Description. Shell reaching 11.5 mm. (about $\frac{1}{2}$ inch) in length, depressed trochoid, rather thin in structure, imperforate and very finely sculptured. Color iridescent with small, spirally arranged flecks of brown on the cords forming the periphery with smaller and much fainter spots of the same color on the whorl above the periphery. Below the periphery the spots are more elongate. Whorls $7\frac{1}{2}$, flat sided and with an acute keel at the whorl periphery; spire moderately depressed and produced at an angle of 70° . Aperture subquadrate, the outer lip simple and thin and produced at an angle of 30° from the base. Columella iridescent, slightly arched, truncate and margined on the parietal area with a strong, smooth cord. Suture indistinct. Spiral sculpture consists of two closely spaced smooth cords, the lower one being the larger and forming the acute keel at the periphery. Above these peripheral cords there are a few faint, regularly spaced incised lines. The two post-nuclear whorls are sculptured with 3 to 4 finely beaded cords. These cords disappear on the fourth whorl. Base of shell flat and with a few incised lines crossed by very fine growth lines. Nuclear whorls $1\frac{1}{2}$, white and smooth. Operculum unknown.

length	width	
11.5 mm.	13 mm.	Holotype

Types. The holotype of *C. jeanneae* is in the Museum of Comparative Zoology, no. 228370, from off Habana, Cuba, dredged by the *Atlantis*, but without station number.

Remarks. This species does not appear to be closely related to any other *Calliostoma* in the Western Atlantic. In general shape it is similar to *C. aurora* Dall, but this latter species has a concave spire and an elaborate beaded sculpture.

Range and Specimens examined. Known only from the type locality.

¹ It is a pleasure to name this species in honor of Dr. Jeanne S. Schwengel of Scarsdale, New York, who has done so much to help others in the field of Malacology.



Plate 47. *Calliostoma jeanneae* Clench and Turner. *Atlantis* cruise, off Habana, Cuba. Holotype. Fig. 1 (6.6x). Fig. 2 (5.5x).

Calliostoma hassler Clench and Aguayo

Plate 48, figs. 1-2

Calliostoma (Astele) hassler Clench and Aguayo 1939, *Memorias de la Sociedad Cubana de Historia Natural* 13: 191, pl. 28, fig. 3 (off Cabo Frio, 75 miles E of Rio de Janeiro, Brasil).

Description. Shell reaching 30 mm. (about $1\frac{1}{4}$ inches) in length, trochoid in shape, rather light in structure, umbilicate and finely sculptured. Color pattern mottled with white and yellowish brown. Whorls 10, slightly convex, with a slightly rounded peripheral keel. Base of shell slightly convex. Spire extended and produced at an angle of 65° . Aperture subquadrate, the outer lip simple and cast at an angle of 55° from the base. Columella arched, thickened, white and not truncate. Umbilicus profound, white to slightly mottled with yellow. Spiral sculpture consisting of numerous fine, beaded cords with about 30 cords on the body whorl. There does not appear to be any axial sculpture. Operculum unknown.

length	width	
30 mm.	31 mm.	Holotype
31.6	32	Paratype
25	25.7	"

Types. The holotype is in the Museum of Comparative Zoology, no. 104554, from off Cabo Frio, Brasil in 35 fathoms. Paratypes are in the Museum of Comparative Zoology and the Museo Poey, Universidad de la Habana, Cuba, with the same data.

Remarks. On the basis of shell characters this species appears to be close in its relationships to both *C. javanicum* Lamarek and *C. barbouri* Clench and Aguayo, from which it differs by having a somewhat rounded rather than an acute keel and by lacking the colored spiral threads and axial sculpture. In addition, it has slightly convex rather than flat sided whorls and has a much finer mottled color pattern. From *C. jujubinum* it differs

in having a much lighter shell structure, being proportionately wider and in having a much wider umbilicus.

Range. Known only from the coast of Brasil between Salvador and Cabo Frio.

Specimens examined. BRASIL: Salvador [Baia] (USNM); off the Abrolhos Ids., Baia; off Cabo Frio, Est. Rio de Janeiro (both MCZ).

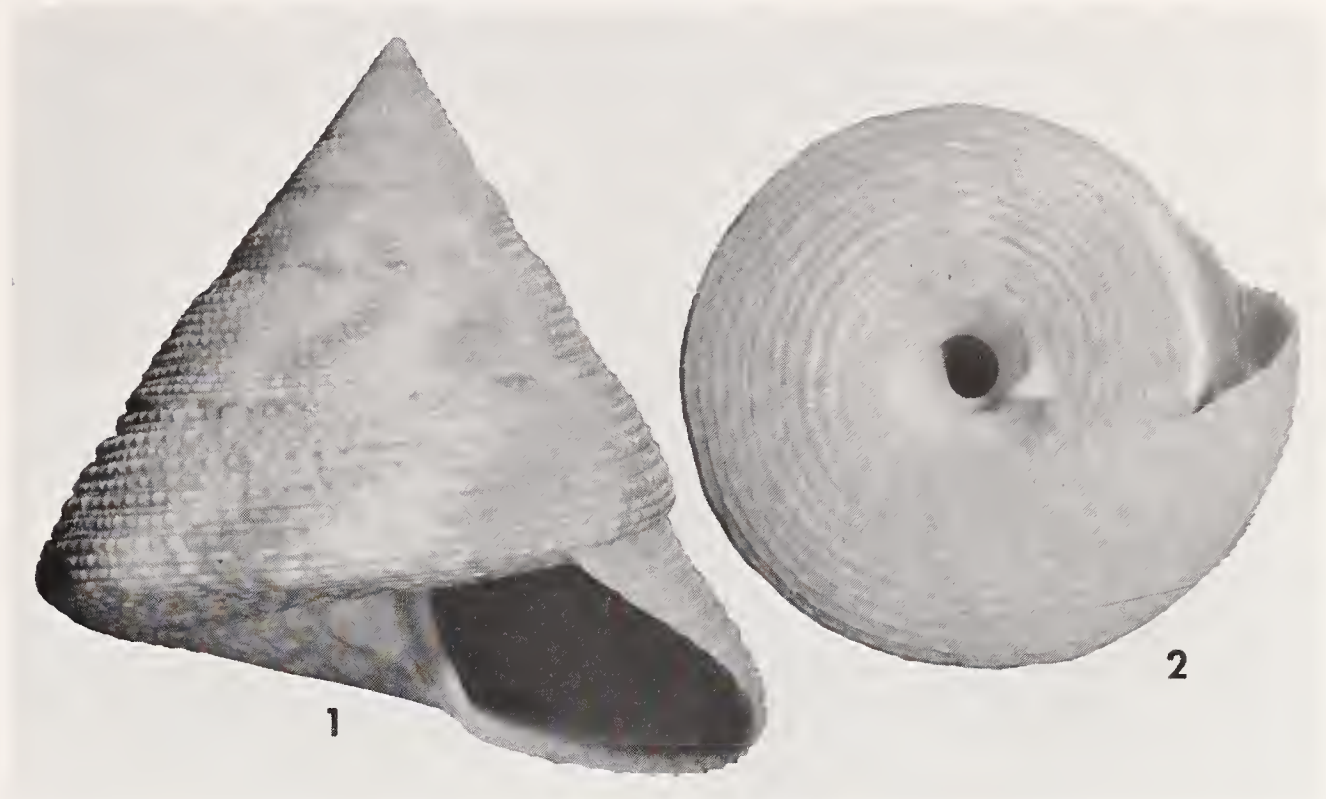


Plate 48. *Calliostoma hassler* Clench and Aguayo. Fig. 1. *Hassler* voyage, off Cabo Frio, Brasil. Holotype. Fig. 2. Basal view of a paratype from the same locality (both 2.5x).

***Calliostoma barbouri* Clench and Aguayo**
Plate 49, figs. 1-3

Calliostoma barbouri Clench and Aguayo 1946, *Revista de la Sociedad Malacologia* 4: 89, text figure (Arenas de la Chorrera, Habana, from sand dredged in 3-15 fathoms at Santa Fé, Cuba).

Description. Shell reaching 22.5 mm. (about 1 inch) in length, trochoid in shape, rather solid in structure, umbilicate and finely sculptured. Ground color a yellowish to reddish brown with a broad band of purplish brown above the periphery, base of the shell with the ground color only. Occasionally this purplish brown band is somewhat mottled. In addition, there are fine reddish spiral threads between the beaded cords. Whorls 10, flat sided, with a sharp peripheral keel. Spire moderately extended, slightly convex and produced at an angle of about 70°. Aperture subquadrate, the outer lip simple and cast at an angle of 60° from the base. Columella strongly arched, slightly thickened, white in color and with a slight truncation. Umbilicus profound, reddish brown in color, narrowly funnel-shaped and bordered by a beaded cord. Suture indistinct. Spiral sculpture consisting of numerous fine, beaded cords. Axial sculpture consists of very fine diagonal ridges between the cords. Beaded cords on the base are variable in number and size, the cords varying from 19 to 25. Operculum unknown.

length	width	
19.2 mm.	19.5 mm.	Holotype
21.5	23.4	Paratype
22.5	25	Arenas de la Chorrera, Habana, Cuba

Types. The holotype is in the Museum of Comparative Zoology, no. 178128, from Arenas de la Chorrera, Habana, Cuba, from sand dredged in 3 to 15 fathoms in the vicinity of Santa Fé, a short distance from Habana.

Remarks. The shell of *Calliostoma barbouri* is similar in appearance to that of *C. javanicum* Lamarek. It differs by being narrower, by having a dark mottled coloration and by having the base uniformly beaded throughout. The base of *C. javanicum* is smooth near the periphery while the beaded cords on the whorls are much stronger and more regularly developed than on *C. barbouri*. In addition, the funnel-shaped umbilicus of *C. barbouri* is brownish red, while it is white in *C. javanicum*. Both these species occur in the dredged sands at Habana, Cuba. See also *Remarks* under *C. hassler* Clench and Aguayo.

Range. Known only from the type locality.

Specimens examined. CUBA: All specimens so far known are from the Arenas de la Chorrera, Habana (MCZ; ANSP; C. J. Finlay; V. Condé).

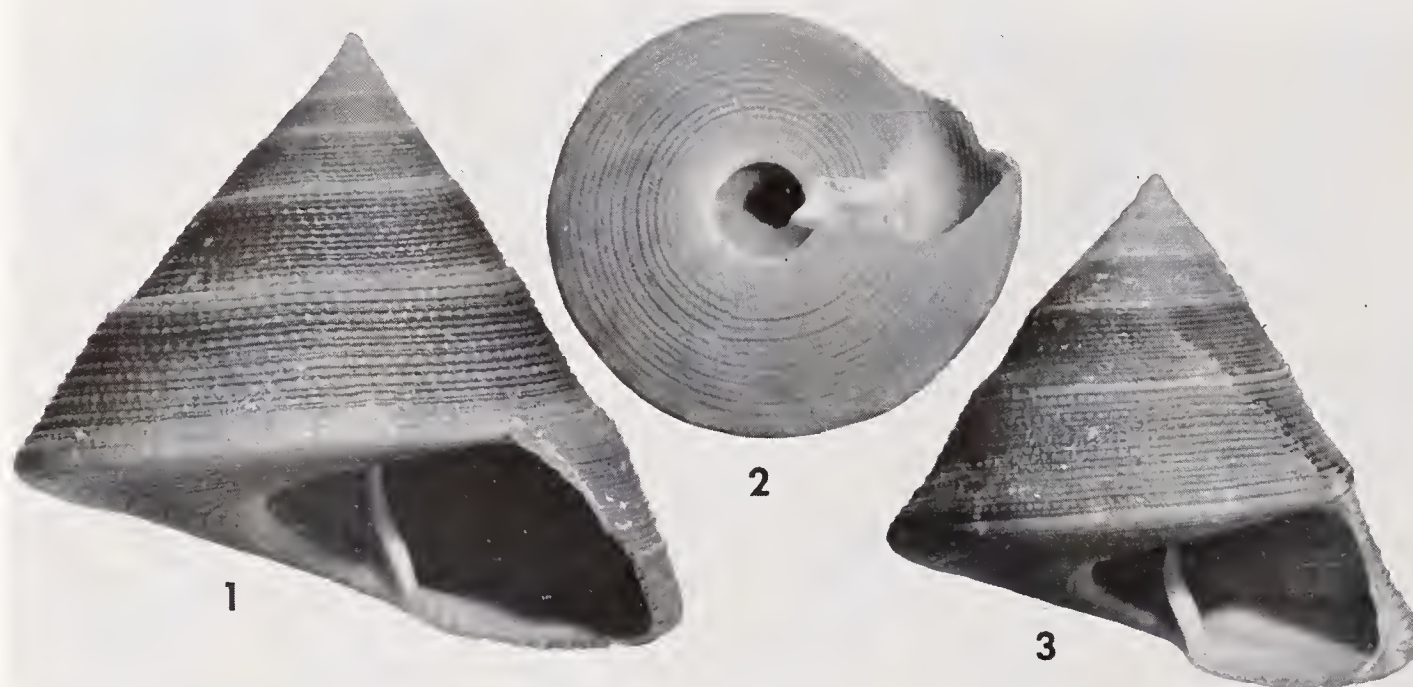


Plate 49. *Calliostoma barbouri* Clench and Aguayo. Fig. 1. Arenas de la Chorrera, Habana, Cuba. Fig. 2. Basal view of a specimen from the same locality. Fig. 3. Holotype from the same locality (all 2.7x).

Calliostoma sayanum Dall

Plate 50; figs. 1-3

Calliostoma (Eutrochus) sayanum Dall 1889, Bulletin Museum Comparative Zoology **18**: 370, pl. 33, figs. 10-11 (*Albatross*, station 2594, 20 miles SE of Cape Hatteras, North Carolina in 120 fathoms).

Description. Shell reaching 35 mm. (about $1\frac{3}{8}$ inches) in length, trochoid in shape, solid in structure, umbilicate and finely sculptured. Ground color a rich golden brown with a red band at the whorl periphery. Occasionally this band is diffused, rendering the whole shell somewhat reddish. Whorls $8\frac{1}{2}$, generally flat sided and with a rounded periphery. Base of shell slightly convex. Spire moderately extended, flat sided and produced at an angle of about 90° . Columella arched and somewhat thickened, ending in a truncation at the base of the lip. Aperture subquadrate, the outer lip simple and produced at an angle of 50° from the base. Umbilicus white, profound, smooth and margined by a strongly beaded cord. Sutures slightly indented and generally defined by the

red band. Sculpture consisting of numerous and finely beaded cords, about 15 cords on the base of the shell. Above the periphery the cords usually alternate large and small, and occasionally there are narrow bands of red between them. Microscopic sculpture consists of very fine diagonal growth lines. Operculum circular, multispiral, corneous, and having on the inner surface a papilliform nucleus.

length	width	
34 mm.	39 mm.	Holotype
31	38.5	75 miles E of St. Augustine, Florida
33.5	38.5	25 miles ESE of Cape Hatteras, North Carolina
33	39	“ “ “ “ “ “ “ “ “

Types. The holotype of *Calliostoma sayanum* Dall is in the United States National Museum, no. 61240, from 20 miles SE of Cape Hatteras, North Carolina, *Albatross*, station 2594 (35°01' N; 75°12' W) in 160 fathoms, not 120 fathoms as given by Dall.

Remarks. This is a very attractive species. Unfortunately, most of the specimens we have seen were dead when collected though they were in very good condition. Our two southern records are based only on fragments. On the basis of shell characters this species appears to be most closely related to *C. springeri* Clench and Turner, but differs in having the sides of the spire straight rather than slightly concave and in having a much narrower umbilicus.

Range. From off Cape Hatteras, North Carolina to off Key West, Florida, ranging in depth from 65 to 200 fathoms.



Plate 50. *Calliostoma sayanum* Dall. Fig. 1. 20 miles SE of Cape Hatteras, North Carolina. Holotype. Fig. 2. *Combat*, station 170, 23 miles ESE of Cape Hatteras, North Carolina. Fig. 3. *Combat*, station 499, 75 miles E of St. Augustine, Florida (all 1.6x).

Specimens examined. NORTH CAROLINA: *Albatross*, station 2594, about 20 miles SE of Cape Hatteras (35°01' N; 75°12' W) in 160 fathoms (USNM); *Combat*, station 170, about 23 miles ESE of Cape Hatteras (35°07' N; 75°04' W) in 190 fathoms (H. Bullis); *Albatross*, station 2601, about 35 miles S of Cape Hatteras (34°39' N; 75°33' W) in 107 fathoms (USNM). FLORIDA: *Combat*, station 79, about 70 miles E of St. Augustine (30°00' N; 80°14' W) in 110 fathoms; *Combat*, station 499, about 75 miles E of St. Augustine, (29°50' N; 80°10' W) in 200 fathoms (both H. Bullis); SE of Fernandina in 200 fathoms (T. McGinty); *Pelican*, station 70, about 50 miles ENE of Dayton (29°32' N; 80°08' W) in 190 fathoms (H. Bullis); off Melbourne in 90 fathoms (ANSP); off Palm Beach in 75 fathoms; off Sand Key Light, Key West in 65 fathoms (both T. McGinty); *Oregon*, station 1009, about 46 miles W of Tortugas (24°34' N; 83°34' W) in 200 fathoms (H. Bullis).

Calliostoma benedicti Dall

Plate 51

Calliostoma (Eutrochus) benedicti Dall 1889, Bulletin Museum Comparative Zoology **18**: 371, pl. 32, fig. 7 (off Cape Lookout, North Carolina in 200 fathoms).

Description. Shell reaching 14 mm. (about $\frac{1}{2}$ inch) in length, trochoid in shape, solid in structure, umbilicate and finely sculptured. Color a golden ivory, the cords white and the interspaces a golden yellow. Base of shell shiny white. Whorls 7, convex, with a rounded keel. Base of shell slightly convex. Spire depressed, slightly concave and produced at an angle of about 90°. Aperture suboval, the outer lip simple and produced at an angle of about 55° from the base. Columella rather thin, truncate and arched inwardly. Umbilicus white, rather narrow, and extending to the nuclear whorls. It is margined by a cord possessing very large beads. Suture slightly indented and rather indistinct. Sculpture consisting of spiral cords which may be smooth or beaded. On the body whorl there is a broad smooth cord at the periphery with 3 unequal, narrow, smooth cords immediately above. Above these cords there are 5 beaded cords, three larger cords alternating with two smaller cords. The earlier whorls have fewer cords. Microscopic sculpture consisting of exceedingly fine axial striae in the areas between the cords. Operculum circular, multispiral, corneous, and having on the inner surface a papilliform nucleus.

length	width	
14 mm.	17.5 mm.	Holotype

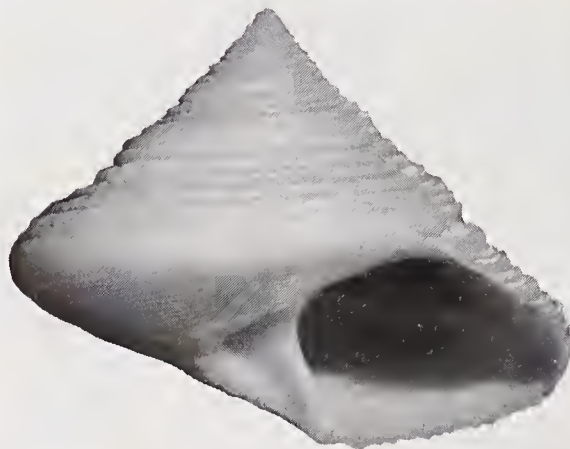


Plate 51. *Calliostoma benedicti* Dall. Off Cape Lookout, North Carolina. Holotype (about 3.2x).

Types. The holotype and only known specimen of *C. benedicti* Dall is in the United States National Museum, no. 61241, from off Cape Lookout, North Carolina in about 200 fathoms.

Remarks. On the basis of shell characters this species is closely related to *C. springeri* Clench and Turner, but differs in being much lighter in color, smaller in size, and in having a much narrower funicular umbilicus.

The following is taken from Dall's original account of *C. benedicti*. "It is named in honor of Mr. J. S. Benediet, former naturalist of the *Albatross* party, who rescued it from a pilfering and aesthetic sailor, by whose theft the exact station number was lost. It was living when obtained."

Range and Specimens examined. Known only from the type locality.

Calliostoma springeri, new species¹

Plate 52, figs. 1-2

Description. Shell reaching about 30 mm. (about $1\frac{1}{4}$ inches) in length, trochoid in shape, rather solid in structure, umbilicate and finely sculptured. Color pattern consisting of white beaded cords interspaced with brownish red spiral bands. Whorls 9, flat sided and with a rounded periphery. Base of shell slightly convex. Spire moderately extended, slightly eoneave and produced at an angle of about 90° . Aperture subquadrate, the outer lip simple and produced at an angle of about 40° from the base. Columella arched, slightly thickened and ending in a truncation at the base of the lip. Umbilicus white, profound, smooth and margined by a non-beaded cord. Suture slightly indented and poorly defined. Sculpture consisting of numerous finely beaded cords above the periphery. Below the periphery these cords are much less strongly beaded, becoming smooth toward the umbilicus. There are 19-20 cords on the base of the shell. Micro-

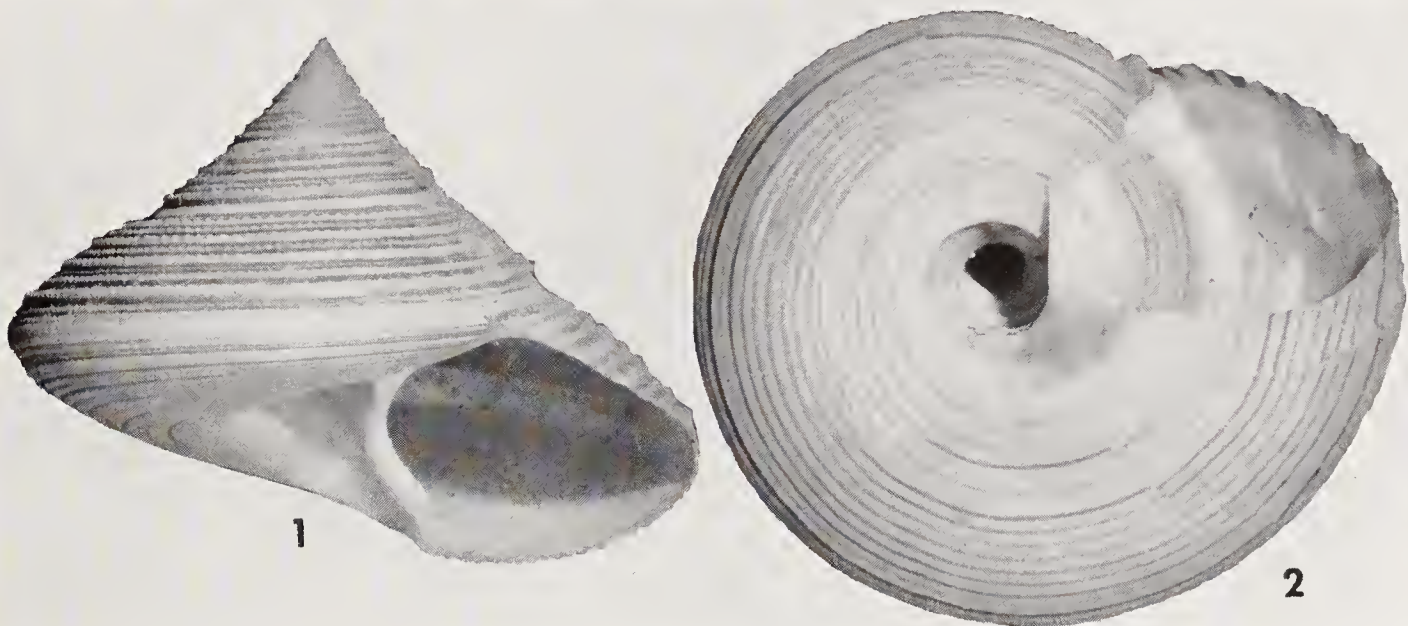


Plate 52. *Calliostoma springeri* Clench and Turner. Fig. 1. Oregon, station 1283, off the Mississippi Delta, 38 miles E of Southeast Pass ($29^\circ 06' N$; $88^\circ 19' W$) in 260 fathoms. Holotype. Fig. 2. Basal view of a paratype from the same locality (both 1.8x).

¹ Named for Stuart Springer, of the U.S. Fish and Wildlife Service and formerly Chief Naturalist of the M/V *Oregon*.

scopic sculpture consists of very fine diagonal growth lines. Operculum circular, multi-spiral, corneous and lacking a papilliform nucleus on the inner surface.

length	width	
30 mm.	38.4 mm.	Holotype
30.2	39	Paratype

Types. The holotype is in the United States National Museum, no. 612703, from about 38 miles east of Southeast Pass, Mississippi Delta, Louisiana. *Oregon*, station 1283 (29°06' N; 88°19' W) in 260 fathoms, March 13, 1955.

Remarks. This species is superficially close to *C. sayanum* Dall. It differs in having the cords on the base of the shell smooth or only very finely beaded. Above the periphery there is no color other than the brownish red threads between the cords, while in *sayanum* there is a peripheral color band of red and the beaded cords are colored a light brown. In addition, *springeri* has a golden iridescence but the surface of *sayanum* though highly colored is dull. The umbilicus of *springeri* is nearly twice as wide as that of *sayanum* when specimens of equal width are compared.

See also *Remarks* under *C. bigelowi* and *C. benedicti*.

Range and Specimens examined. This species is known only from the type locality.

Calliostoma bigelowi *Clench and Aguayo*
Plate 53, figs. 1-2

Calliostoma (Astele) bigelowi Clench and Aguayo 1938, *Memorias de la Sociedad de Historia Natural* 12: 378, pl. 28, figs. 4-5 (*Atlantis*, station 2963-C, off Bahía Cochinos, Las Villas, Cuba, 22°07' N; 81°08' W, in 205 fathoms).

Description. Shell reaching 25 mm. (about 1 inch) in length, depressed trochoid, keeled, fairly light in structure, widely umbilicate and finely sculptured. Ground color grayish white, with narrow spiral bands of brownish orange above the periphery. On the base of the shell there are numerous bands of the same color many of which have become somewhat diffused. At the periphery there is a band of flame-like markings of reddish brown which are more or less evenly spaced. Whorls $7\frac{1}{2}$, regularly increasing in size,



Plate 53. *Calliostoma bigelowi* Clench and Aguayo. Fig. 1. *Atlantis*, station 2963-c, off Bahía Cochinos, Las Villas, Cuba in 205 fathoms. Holotype (2x). Fig. 2. Basal view of the same specimen (2.1x).

convex and sharply keeled. Spire somewhat depressed, concave and produced at an angle of about 100° . Suture indistinct. Aperture subquadrate and nacreous within. Palatal wall thinly glazed. Columella thickened and arched toward the umbilicus. Umbilicus broadly funnel shaped and deep. The first three and one half postnuclear whorls sculptured with three minutely beaded cords. On the succeeding two whorls the cords are not beaded, then gradually the cords become increasingly beaded to the body whorl where they are pronounced. Base of the shell smooth, having only very fine growth lines. Operculum corneous, multispiral, with 10 whorls, crossed with numerous fine, somewhat sinuous growth lines.

length	width	
25 mm.	33.5 mm.	Holotype

Types. The holotype is in the Museum of Comparative Zoology, no. 135003, from the *Atlantis*, station 2963C, off Bahía Cochinos, Las Villas, Cuba ($22^\circ 07' N$; $81^\circ 08' W$) in 205 fathoms.

Remarks. This species is moderately close in its relationships to *C. springeri* Clench and Turner, but differs in having the base smooth without any indication of cords, in having a more deeply concave columella and in having the peripheral area marked with brown-red spots. Above the periphery the two species are similar in general outline and sculpture, though the beading on *C. bigelozzi* is much weaker than on *C. springeri*. See also *Remarks* under *C. tejedori* Aguayo.

Range. Known only from the north and south coasts of Cuba.

Specimens examined. CUBA: *Atlantis*, station 2963C, Bahía Cochinos, Las Villas ($22^\circ 07' N$, $80^\circ 08' W$) in 205 fathoms; *Atlantis*, station 2999, off Matanzas, Matanzas Prov. ($23^\circ 10' N$; $81^\circ 29' W$) in 145–230 fathoms (both MCZ).

Calliostoma tejedori Aguayo

Plate 54, figs. 1–2

Calliostoma (Astele) tejedori Aguayo 1949; Revista de la Sociedad Malacologica "Carlos de la Torre" 6: 94, pl. 4, fig. 7 (Arenas de la Chorrera, Habana, Cuba).

Description. Shell reaching 22.5 mm. (about 1 inch) in length, depressed trochoid, keeled, fairly light in structure, widely umbilicate and nearly smooth. Color a light brownish orange with irregular and discontinuous patches of brown across the whorl periphery. Above the periphery there are three incised lines which are brown in color. The entire outer surface shiny but not iridescent. Whorls $8\frac{1}{2}$, strongly convex, with a rounded keel. Spire somewhat depressed, slightly concave and produced at an angle of about 90° . Suture slightly indented. Aperture subquadrate with the palatal lip thin and cast at an angle of about 50° from the base. Parietal wall thinly glazed. Columella thin, arched and truncated. Umbilicus broadly funnel-shaped, deep, and colored a reddish brown. Sculpture consists of a single large, smooth cord at the whorl periphery. Above the periphery there are numerous very fine incised lines, three of which are colored brown. Nuclear whorls and two postnuclear whorls reticulate, the fourth whorl with finely beaded cords. Remaining whorls sculptured as described for the body whorl above. Operculum unknown.

length	width	
22.5 mm.	32 mm.	Holotype

Types. The holotype of *C. tejedori* Aguayo is in the Muséo Poey, Universidad de la Habana, Cuba, no. 12389, from the Arenas de la Chorrera, Habana, Cuba.

Remarks. So far as we know this is the only species of *Calliostoma* in the Western Atlantic which has reticulated nuclear whorls. In relationship it appears to be nearest to *C. bigelowi* Clench and Aguayo because of its general shape and widely opened umbilicus, though this is not a close relationship. From *C. jeanneae* Clench and Turner, the only other nearly smooth *Calliostoma* in the Western Atlantic, it differs in being much larger and umbilicate.

Range and Specimens examined. Known only from the holotype specimen which was taken from the pile of construction sand at Habana, Cuba, known as the Arenas de la Chorrera. This sand is dredged in from 3 to 15 fathoms near Habana, Cuba.

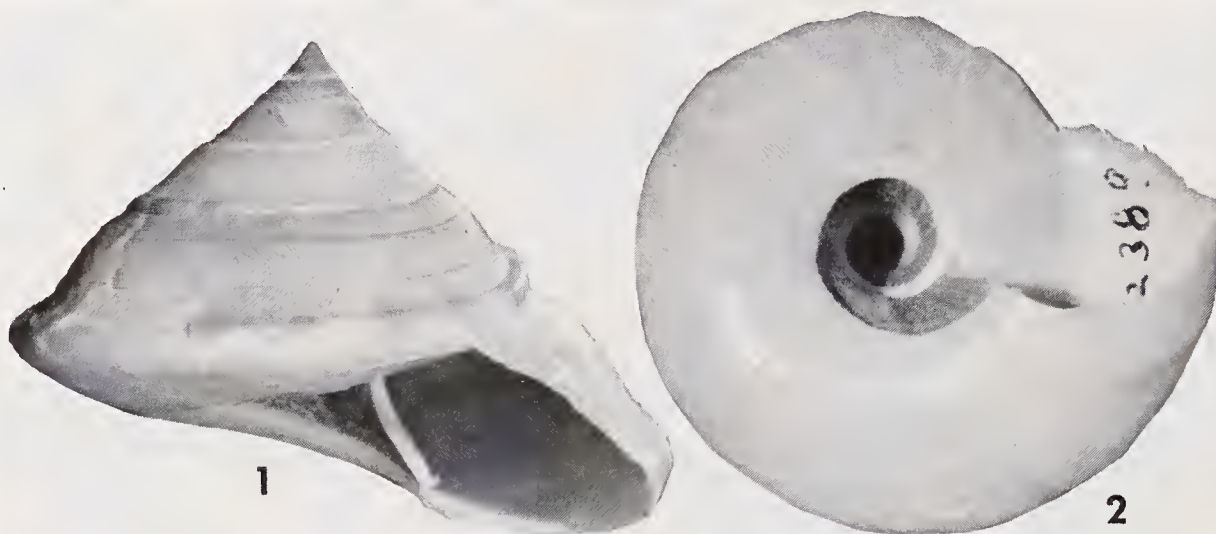


Plate 54. *Calliostoma tejedori* Aguayo. Fig. 1. Arenas de la Chorrera, Habana, Cuba. Holotype. Fig. 2. Basal view of the same specimen (both 2.2x).

Calliostoma gemmosum Reeve

Trochus gemmosus Reeve 1842, *Conchologia Systematica* 2: 165, pl. 218, fig. 9 (no locality given); 1842 [1843] *Proc. Zool. Soc. London*, p. 184 (locality unknown).

Zizyphinus gemmosus Reeve 1863, *Conchologia Iconica* 14, *Zizyphinus*, pl. 4, fig. 23 (Puerto Galero, Mindanao, Philippines).

Trochus (Eutrochus) gemmosus Reeve. Smith 1890, *Journal Linnean Society of London* 20: 494 (Fernando Noronha).

Calliostoma gemmosum Reeve. Lopes and Alvarenga 1955, *Boletim do Instituto Oceanográfico* 4: 163, pl. 2, figs. 18-19.

Description. Shell reaching 19 mm. (about $\frac{3}{4}$ inch) in length, trochoid, umbilicate and sculptured. Color yellowish straw lightly mottled with brownish and with a few reddish prominent spiral lines. Whorls 7 to 8, convex and with a flattened peripheral keel. Spire moderately extended and produced at an angle of about 67° . Aperture subquadrate and produced at an angle of about 45° from the base. Columella margined by a ridge and arched inwardly. Umbilicus deep and margined by a heavy cord with coarse beading. Suture inconspicuous. Sculpture consists of numerous rather fine beaded cords which are more or less equal in size. Nuclear whorl smooth and a brownish purple in color. Operculum unknown.

length	width	
14 mm.	15.5 mm.	Itapoan, Salvador, Baia, Brasil

Types. The location of the holotype of *Trochus gemmosus* Reeve is unknown (see under *Remarks*).

Remarks. This species was first figured in the *Conchologia Systematica* in 1842 without description. In 1843, in the *Proceedings of the Zoological Society of London* it was formally described and at that time the locality was stated to be unknown. The specimens were said to be in the Museum Stainforth. In 1863, Reeve, in the *Conchologia Iconica*, described and figured a species which he called *Zizyphinus gemmosus* from the Cuming Collection with the locality of Puerto Galero, Mindanao, Philippine Islands. J. Davy Dean (1936, p. 239) stated that the Stainforth Collection was sold at auction about 1860, but that he could give no further information about it. Sherborn (1940) does not mention the collection. It would appear then that the shell figured by Reeve in 1863 was not the same as that figured in 1842. The type locality still remains unknown. Smith (1890) listed the species as coming from Fernando Noronha, Brasil and stated that his specimens were identical with the 'types' in the British Museum. Obviously these were the specimens in the Cuming collection for he mentioned the Philippine locality and stated that he believed it was in error. Lopes and Alvarenga (1955) recorded and figured specimens from Itapoan, Salvador, Baia, Brasil which, following Smith, they referred to *gemmosum* Reeve. Certainly Lopes' specimens are different from any other we have from the Western Atlantic and the figure of Lopes and Alvarenga as well as the rather poor specimen which we have seen do agree with the description and figure of Reeve. In all probability the locality given in the *Conchologia Iconica* is wrong and this is a Western Atlantic species. However, it is really necessary to obtain more material from both the Atlantic and the Pacific before it will be possible to say definitely that there are not two species involved and that *gemmosum* is from the Brazilian area. This is particularly true since the location of the Stainforth specimens is unknown.

We have seen only a single dead and faded specimen of this Brazilian species and are tentatively calling it *Calliostoma gemmosum* Reeve as this name, as shown above, has been used for it by two authors.

In relationship, based on shell characters only, it appears to be close to *C. javanicum* Lamarek, differing by being smaller, having more complex whorls and in not having a straight-sided spire. The sculpturing is similar except that it is more pronounced on *gemmosum*, particularly so on the base of the shell.

Range. The island of Fernando Noronha and Est. Baia, Brasil.

Specimens examined. BRASIL: Itapoan, Salvador, Est. Baia (H. deS. Lopes).

***Calliostoma militaris* von Ihering**

Calliostoma militaris von Ihering 1907, *Anales Museo Nacional de Buenos Aires* (3) 7: 438, pl. 17, fig. 116 (Necochea, Argentina).

Calliostoma dalli von Ihering 1907, *Anales Museo Nacional de Buenos Aires* (3) 7: 437, pl. 17, figs. 114a-c (Pampienne Formation, Deseado, Argentina).

Calliostoma militaris von Ihering. Carcelles 1944, *Revista del Museo de la Plata* (n.s.) Zoologia 3: 240.

Remarks. We have not seen specimens of this species and the figures of both *militaris* and *dalli* given by von Ihering are too poor to reproduce. It appears to be a very rare

species and is known only from the area extending from Necochea south to Río Negro, Argentina. We have followed the work of Carcelles in the above synonymy. Until material is available for study we cannot deal further with this species.

* * * *

Notes

The following section includes references to and comments concerning subgenera and species which have been referred to *Calliostoma* in the Western Atlantic. Some are placed in other genera but in several cases we have made no attempt to assign them to a genus. Many were based upon dead and broken specimens and some were immature.

Subgenus *Astele* Swainson

Astele Swainson 1855, Papers and Proc. Royal Soc. Van Diemen's Land **3**: 38.

Eutrochus A. Adams 1863 [1864], Proc. Zool. Soc. London, p. 506 [Type species, *Eutrochus perspectivus* A. Adams (= *Astele subcarinata* Swainson) monotypic].

Type species, *Astele subcarinata* Swainson, monotypic.

Shells, so far as known, umbilicate, marked with patches of brown or red-brown and sculptured with smooth and beaded cords. Aperture subquadrate.

Radula with the central tooth having a long, narrow, denticulate cusp. The four lateral teeth have a large plate-like base and long narrow cusps which are denticulate only at their distal ends. The first marginal tooth is very broad and heavy with a large denticulate cusp and a small cusp on the base. The other marginal teeth are fairly uniform, long, narrow and denticulate at their distal ends. They decrease somewhat in length toward the outer margin of the ribbon and vary in number, averaging about 20.

Jaws rather heavy, dark brown in color, subcircular in outline with the anterior ends broadly rounded, smooth and lacking a fringe.

Calliostoma (*Astele*) *subcarinatum* Swainson

Plate 55, figs. 1-2; Plate 56, figs. 1-2

Astele subcarinata Swainson 1855, Papers and Proc. Royal Soc. Van Diemen's Land **3**: 38, pl. 6, figs. 1-2 (Tasmania).

Eutrochus perspectivus A. Adams 1863 [1864] Proc. Zool. Soc. London, p. 506 (Tasmania); non *perspectivus* Philippi 1843.

Zizyphinus subgranularis Dunker 1871, Malakozoologische Blätt. **18**: 170 (Bass Strait, Australia).

Calliostoma (*Eutrochus*) *adausi* Pilsbry 1890, Manual of Conchology (1) **11**: 402 [new name for *Eutrochus perspectivus* A. Adams 1864, non Philippi 1843].

Calliostoma subgranulatum 'Dunker' Pilsbry 1890, Manual of Conchology (1) **11**: 403 (Bass Strait, Australia) [error for *C. subgranularis* Dunker].

Astele subcarinatum Swainson. Cotton 1959, South Australian Mollusca, Part III, Archeogastropoda, Adelaide, South Australia, p. 145, text figure 79.

Description. Shell reaching 34 mm. (about 1½ inches) in length, trochoid in shape, rather light in structure, widely umbilicate and coarsely sculptured. Color a light ivory-yellow with faint irregular patches of brown and tinges of lavender on living specimens. Whorls 9, very flat sided with a pronounced keel at the whorl periphery. Spire moderately extended and produced at an angle of about 70°. Aperture subquadrate, outer lip

simple and produced at an angle of about 45° from the base. Columella slightly arched and truncated at the base. Umbilicus rather wide, deep and margined with 2 or 3 beaded cords. Suture indistinct, but indicated by the presence of a large beaded cord. Sculpture consisting of 8 to 11 spiral cords on the body whorl above the periphery. These cords vary in size, and the uppermost, which is the largest, is generally beaded while the remainder are smooth. Below the periphery there are 12 to 14 cords. The two or three cords margining the umbilicus are beaded, the others are smooth. Operculum circular, corneous, thin, multispiral and colored a light yellowish brown. Nuclear whorls $1\frac{1}{2}$, white and smooth.

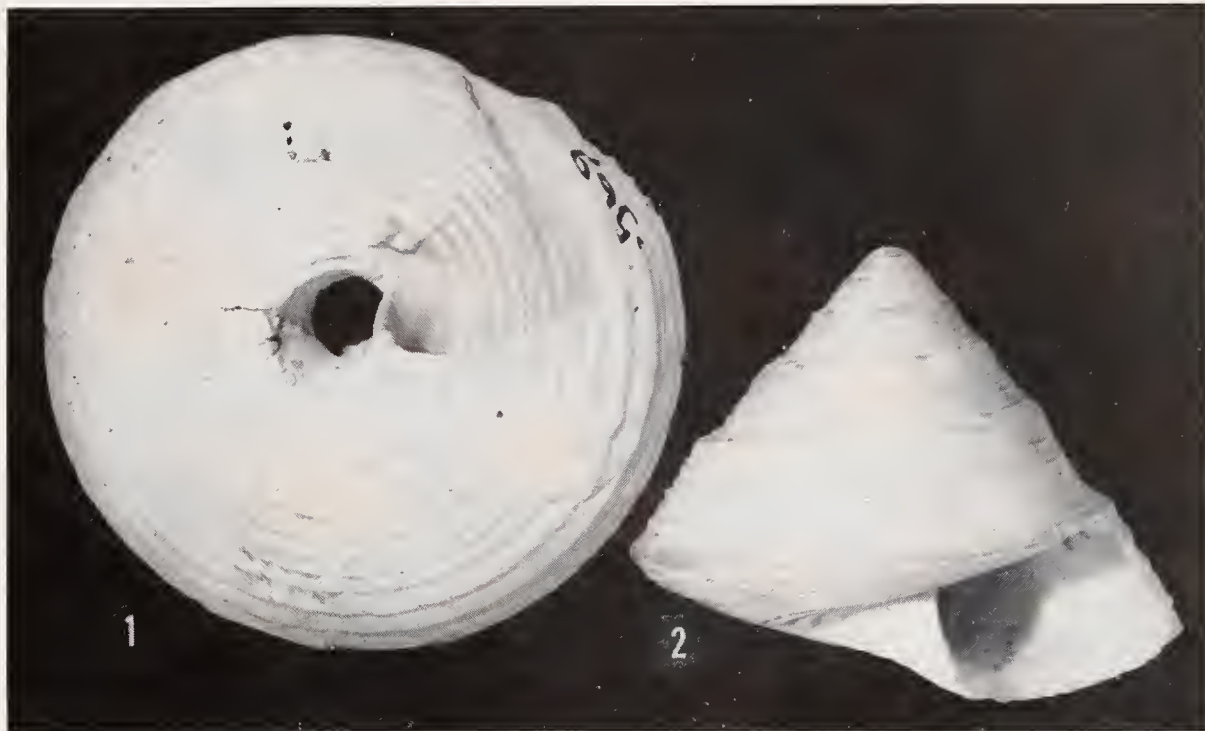


Plate 55. *Calliostoma (Astele) subcarinatum* Swainson. Fig. 1. Tasmania. Fig. 2. Gulf of St. Vincent, South Australia (both about 1.7x).

length	width	
34 mm.	37 mm.	Tasmania
28	33	about 11 miles E of Baronda Head, New South Wales, Australia
26	30.5	Gulf of St. Vincent, South Australia

Types. The location of the type specimen of *Astele subcarinata* Swainson is unknown; the type locality is Tasmania. The holotype *E. perspectivus* A. Adams is probably in the British Museum; the type locality is Tasmania. The location of the type of *Zizyphinus subgranularis* Dunker is unknown.

Remarks. We have described this species in full as it is the type species for the subgenus *Astele*. This subgenus, either as *Astele* or *Eutrochus*, has been used for umbilicate Western Atlantic species, but so far as we now know, no species in this subgenus occurs in the Western Atlantic. Its relationship to other Indo-Pacific *Calliostoma* will remain uncertain until the anatomy of the various species of the Australian region is known.

Range. New South Wales and Tasmania west to Western Australia and ranging in depth from 16 to 200 fathoms according to Allen, 1950, p. 62.

Specimens examined. NEW SOUTH WALES: about 11 miles E of Baronda Head ($150^\circ 12' E$; $36^\circ 40' S$) (H. Macpherson). SOUTH AUSTRALIA: Gulf of St. Vincent in 17 fathoms (B. C. Cotton). TASMANIA: East Tasmania (MCZ; Australian Mus.).

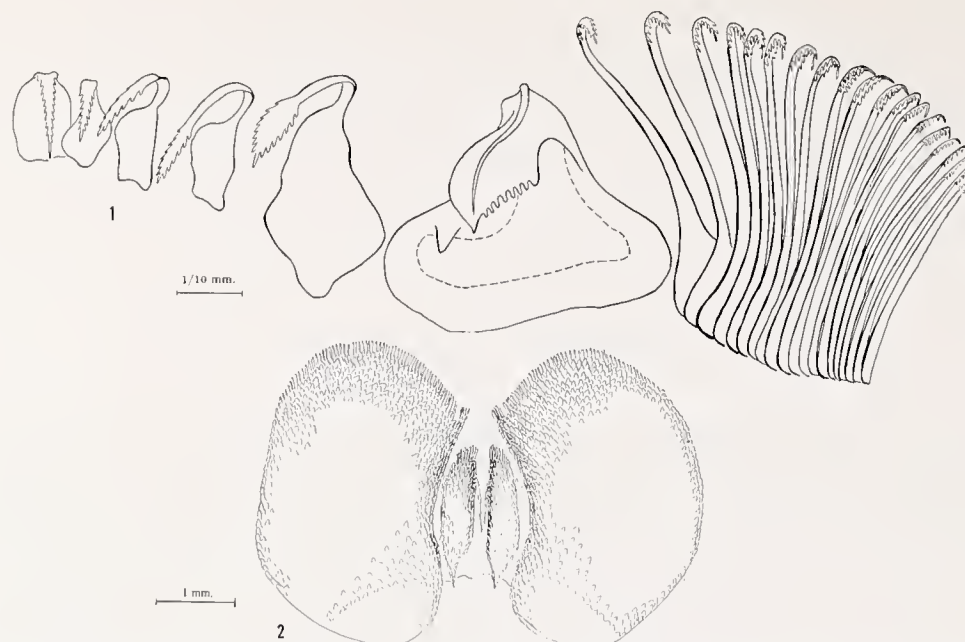


Plate 56. *Calliostoma (Astele) subcarinatum* Swainson. Fig. 1. Radula showing the greatly enlarged first marginal tooth and the dissimilar lateral teeth. All marginal teeth are included. Fig. 2. Jaws, partially reconstructed, showing the rounded anterior end and the narrow fringe. Only a portion of the scales on the surface of the jaws is indicated.

Genus *Alertalex* Dell

Alertalex Dell 1956, Bull. Dominion Museum, Wellington, New Zealand, no. 18, p. 46.

Type species, *Alertalex blacki* Dell, original designation.

Dell instituted this genus for a New Zealand species which we believe belongs to *Calliostoma* s.s. Unfortunately the jaws were not figured, nor were the bases of the marginal teeth of the radula, but the shape of the lateral teeth and the upper portion of the two innermost marginals as well as his written description of the radula appear to be very similar to the figures shown on our plates 3 and 4 for species belonging to *Calliostoma* s.s.

Dell related his species among others to *C. coppingeri* Smith which is a member of the subgenus *Calliostoma*. (See page 26, plate 18.)

Genus *Solariella* S. V. Wood

Solariella S. V. Wood 1842, Annals and Magazine of Natural History 9: 531.

Type species, *Solariella maculata* S. V. Wood, monotypic.

Solariella tiara Watson

Trochus (Zizyphinus) tiara Watson 1879, Journal Linnean Society London 14: 696; Watson 1885, Report of the Voyage of the HMS Challenger 15: 60, pl. 6, fig. 4 (*Challenger*, station 24, off Culebra Island, West Indies, 18°38'30" N; 65°5'30" W, in 390 fathoms).

Calliostoma tiara Watson. Dall 1889, Bull. Museum Comparative Zoology 18: 365.

Subgenus *Dentistyla* Dall

Dentistyla Dall 1889, Bull. Museum Comparative Zoology 18: 373.

Antillachelus Woodring 1928, Carnegie Institution of Washington Pub. no. 385, p. 433 (type species, *Calliostoma (Dentistyla) asperrimum* var. *dentiferum* Dall, original designation).

Type species, *Margarita asperrima* Dall, subsequent designation, Woodring 1928.

Dentistyla was introduced by Dall as a subgenus in *Calliostoma*, but in our opinion it should be placed as a subgenus in *Solariella*.

Solariella (Dentistyla) asperrima Dall

Margarita asperrimum Dall 1881, Bull. Museum Comparative Zoology **9**: 40 (*Blake*, station 12, west of Tortugas, Florida, 24°34' N; 83°16' W, in 36 fathoms [not 177 fathoms as given by Dall]).

Calliostoma (Dentistyla) asperimum Dall 1889, Bull. Museum Comparative Zoology **18**: 373.

Dentistyla asperrima Dall. Woodring 1928, Carnegie Institution of Washington Pub., no. 385, p. 430.

Antillachelus vaughani Woodring, which he describes as having "a much smaller columellar tooth" than *dentiferum* Dall, is probably this species. The type specimens of *asperrimum* do show a small tooth on the columella.

Solariella (Dentistyla) dentifera Dall

Calliostoma asperrimum var. *dentiferum* Dall 1889, Bull. Museum Comparative Zoology **18**: 373, pl. 23, figs. 7-8 (*Blake*, station 299, off Barbados, Lesser Antilles, 13°05' N; 59°39'40" W, in 140 fathoms).

Antillachelus dentiferum Dall. Woodring 1928, Carnegie Institution of Washington Pub. no. 385, p. 433.

This species is the type of *Antillachelus* Woodring which we consider a synonym of *Dentistyla*. The characters mentioned by Woodring are certainly of no more than specific value. There is a small tooth on the columella of *asperrima*, and the lirae within the aperture of the unique specimen of *dentiferum* is a juvenile character. These "lirae" are nothing more than the spiral cords which show through on the young specimen before the shell is sufficiently thickened.

Solariella (Dentistyla) sericifila Dall

Calliostoma (Dentistyla) sericifilum Dall 1889, Bull. Museum Comparative Zoology **18**: 373, pl. 24, figs. 1-1a (*Blake*, station 262, off Grenada, 12°01'45" N; 61°47'25" W, in 92 fathoms).

Subgenus **Mirachelus** Woodring

Mirachelus Woodring 1928, Carnegie Institution of Washington Pub. no. 385, p. 434.

Type species, *Calliostoma corbis*, Dall, original designation.

Solariella (Mirachelus) corbis Dall

Calliostoma corbis Dall 1889, Bull. Museum Comparative Zoology **18**: 365, pl. 33, fig. 1 (off Habana, Cuba in 450 fathoms and off Bahia Honda, Cuba in 220 fathoms).

* * * *

The following species which were originally described as *Calliostoma* we feel do not belong in this genus. These we are unable to assign to a genus without much additional study.

arestum Dall, *Calliostoma* 1927, Proc. United States National Museum **70**: 127 (*Albatross*, station 2415, about 123 miles east of Fernandina, Florida, 30°44' N; 79°26' W, in 440 fathoms). Holotype, USNM 108412.

blakei Clench and Aguayo, *Calliostoma (Calliostoma)* 1938, Memorias de la Sociedad Cubana de Historia Natural **12**: 376, pl. 28, fig. 6 (*Hassler* voyage, off Cape Bermeja, Argentina, 41°17' S, in 17 fathoms). Holotype MCZ 89661.

[Is probably in the genus *Photinula*.]

- cinctellum** Dall, *Calliostoma* (**Eutrochus**) 1889, Bull. Museum Comparative Zoology **18**: 372, pl. 32, figs. 1-4 (*Blake*, station 101, off Habana, Cuba in 174 fathoms). Holotype USNM 214274. [Is probably in the genus *Basilissa*.]
- circumcinctum** Dall, *Calliostoma* 1880, Bull. Museum Comparative Zoology **9**: 44 (*Blake*, station 2, off Habana, Cuba, 23°14' N; 82°25' W, in 805 fathoms); Dall 1889, Bull. Museum Comparative Zoology **18**: 364, pl. 22, figs. 3-3a. Holotype MCZ 7558.
- halibrectum** Dall, *Calliostoma* 1927, Proc. United States National Museum **70**: 127 (*Albatross*, station 2668, about 107 miles east of Brunswick, Georgia, 30°58' N; 79°38' W, in 294 fathoms). Holotype USNM 108126.
- kampsia** Dall, *Calliostoma* 1927, Proc. United States National Museum **70**: 128 (*Albatross*, station 2415, about 123 miles east of Fernandina, Florida, 30°44' N; 79°26' W, in 440 fathoms). Holotype USNM 108423.
- tittarium** Dall, *Calliostoma* 1927, Proc. United States National Museum **70**: 127 (*Albatross*, station 2415, about 123 miles E of Fernandina, Florida, 30°44' N; 79°26' W, in 440 fathoms) [Lectotype, here selected USNM 108417].
- trachystum** Dall, *Calliostoma* 1927, Proc. United States National Museum **70**: 128 (*Albatross*, station 2415, about 123 miles E of Fernandina, Florida, 30°44' N; 79°26' W, in 440 fathoms). Holotype USNM 108419.

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