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TELLINIDAE

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THE SUBFAMILY TELLININAE IN THE WESTERN ATLANTIC THE GENUS TELLINA (PART I)¹

BY
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The primary purpose of this monographic study is to review the systematics of the genus *Tellina* and related genera in the Western Atlantic and to present a synthesis of the taxonomy of the group consonant with modern evolutionary theory. The first, and most important step in the realization of this purpose is the recognition and definition of each species. The criteria utilized in the determination of each taxonomic element have out of necessity been morphological. It is purposeful and valuable to study the relationships among the species and within the species-groups, a process which leads ultimately to an arrangement of superspecific categories, which, in their association, reflect the patterns of phylogeny. Along with the presentation of the results of the systematic investigation are the formulation and discernment of generalities concerning the patterns of geographical distribution.

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¹ The subfamily Tellininae will appear in 3 parts, as Johnsonia, number 45 [*Tellina* (Part I)]; number 46 [*Tellina* (Part II) and *Tellidora*], and number 47 [*Strigilla*]. The plates are numbered consecutively and some of those referred to in this number will be published in number 46.

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ABBREVIATIONS

ANSP	Academy of Natural Sciences of Philadelphia
BMNH	British Museum (Natural History)
CM	Charleston Museum
CNM	Canadian National Museum
IMBPR	Institute of Marine Biology of Puerto Rico
MCZ	Museum of Comparative Zoology, Harvard University
USNM	United States National Museum
ZMK	Universitetets Zoologiske Museum, København

HISTORICAL NOTE

The nominate genus *Tellina* dates from Linnaeus, but it was well established in the pre-Linnean literature. According to Jeffreys (1863), the generalized name, 'tellen', was introduced by Dioscorides of Anazarba in the first century. No doubt, the term had an even greater classical antiquity, since *Tellina* and its near relatives in the Tellinacea were held in high regard for economic reasons, particularly as food. In the Linnean definition of the genus, twenty-five species were included, of which nineteen remain in the confines of the Tellinidae as it is presently understood; the remaining species have been assigned to other groups. Hanley (1855) and Dodge (1952) have discussed the Linnean species and their relation to the Linnean conchological collection.

By the end of the 18th century, a number of additional species of *Tellina* had been described and Spengler (1798) had published the first treatise to deal solely with the genus. His work is valuable in that locality data are given for each species and that, by citation, the nonbinomial but important work of Chemnitz becomes available.

The first important monograph of the genus in the 19th century came with the work of Hanley (1846). In the *Thesaurus Conchyliorum*, Hanley delineated the known species of *Tellina* with little regard for subgeneric organization. The same may be said for the *Conchologica Iconica* of Reeve in which Sowerby (1869) treated the genus *Tellina*.

Römer (1870-73) produced a more exhaustive treatise on the Tellinidae and employed a conservative approach to the breakdown of the family into genera and subgenera. Later, Bertin (1878) discussed the family in general terms of zoogeography, elevated a number of subgeneric categories to the generic level, and delineated the known species preserved in the Muséum d'Histoire Naturelle, Paris. The fruition of these various labors

culminated in the works of Dall (1900a, b). His work still ranks as the most serious attempt to arrange the infrageneric groups in a meaningful scheme. More recently Afshar (1950), in an unpublished study of recent and fossil forms, has revised the generic and infrageneric taxa of the family.

Tryon (1869) and Paetel (1890) have catalogued the specific names in the family and Salisbury (1934) has delineated most of the superspecific categorical names. The best sources for type designations of superspecific groups include Schmidt (1818), Children (1823), Gray (1847), Kobelt (1878), Stoliczka (1870), and Dall (1900b).

Broad and general works dealing with the arrangement of subgenera and the placement of species include H. & A. Adams (1856), Fischer (1887), and Thiele (1935).

The early work of Say and Conrad provides a basis for the knowledge of the eastern American continental fauna and the descriptive treatises of d'Orbigny constitute the fundamental assessment of the Antillean and South American faunas. Dall (1900a) gave a synopsis of the North American species, and Dall and Simpson (1901) treated the Puerto Rican forms. Recently, Warmke and Abbott (1961) have reviewed in general terms the species of the Caribbean. Numerous smaller but no less significant works have dealt with more restricted geographical areas.

The fossil history of the Tellininae in the Western Atlantic has been largely revealed through the work of Dall (1900b), Woodring (1925), Maury (1917; 1920) and Gardner (1928). In the general discussion for each taxon in the present work, pertinent remarks are made concerning the fossil record.

The basis of the faunal comparison between the tellini-form species of the Western Atlantic with that of the Eastern Pacific rests on the rather extensive literature on the bivalves of the Panamic Province. Dall (1900a) described a number of species from the Eastern Pacific and listed the occurrence and range of each. Hertlein and Strong (1949) and Keen (1958) have contributed greatly to the knowledge of the Eastern Pacific fauna, and Olsson (1961) has summarized the work of the early writers and presented a well illustrated and monographic treatment of the bivalves of that area.

SHELL MORPHOLOGY

The morphological characters of the shell are of great importance in the systematics of the Tellinidae (Plate 127). In a great measure, some of the most distinctive anatomical features are reflected in conchological characteristics so that great reliance upon 'hard-part' morphology is justified. In general, the higher categories in bivalve mollusks are determined to some extent upon the structural nature of the hinge and ligamental mechanisms; however, the number and placement of muscle scars and the structural nature of the ctenidia are also very important. At the generic and subgeneric levels in the Tellinidae, the most important traits include: 1, the structure, placement, and strength of the dentition of the hinge; 2, the configuration of the pallial sinus and its relationship to the pallial line and the adductor muscles; 3, the placement, extent, and development of the ligament; and 4, the peculiarities of external sculptural differentiation. In addition, the shape and size of the shell as well as its external and internal coloration have some measures of validity in the delineation of taxa.

The hinge of the Tellinidae always possesses two cardinal teeth, which are referred to as constituting the cardinal complex. These structures which rest upon a variously thick-

ened lateral or cardinal plate are situated beneath the umbo and serve to interlock the valves. At least one of the two cardinal teeth in each valve is bifurcate and is herein referred to as the bifid cardinal tooth; the other is generally a single structure and is herein called the laminate cardinal tooth. In the left valve, the bifid cardinal tooth is always in the anterior position while the laminate cardinal is posterior. The configuration of the cardinal complex in the right valve is reversed; the bifid cardinal is posterior and the laminate cardinal is anterior. The cardinal teeth exhibit but a small range of variation from species to species and are therefore of little use for specific identification. However, the lobes of the bifid cardinal are of variable size and they may be skewed from the dorso-ventral axis of the shell, in which case they assume some taxonomic importance. Likewise, the thickness and length of the laminate cardinal may function in the discrimination of species.

The presence of lateral teeth distinguishes the Tellininae from the Macominae, which are laterally edentate. The lateral teeth in the Tellininae are differentiated projections

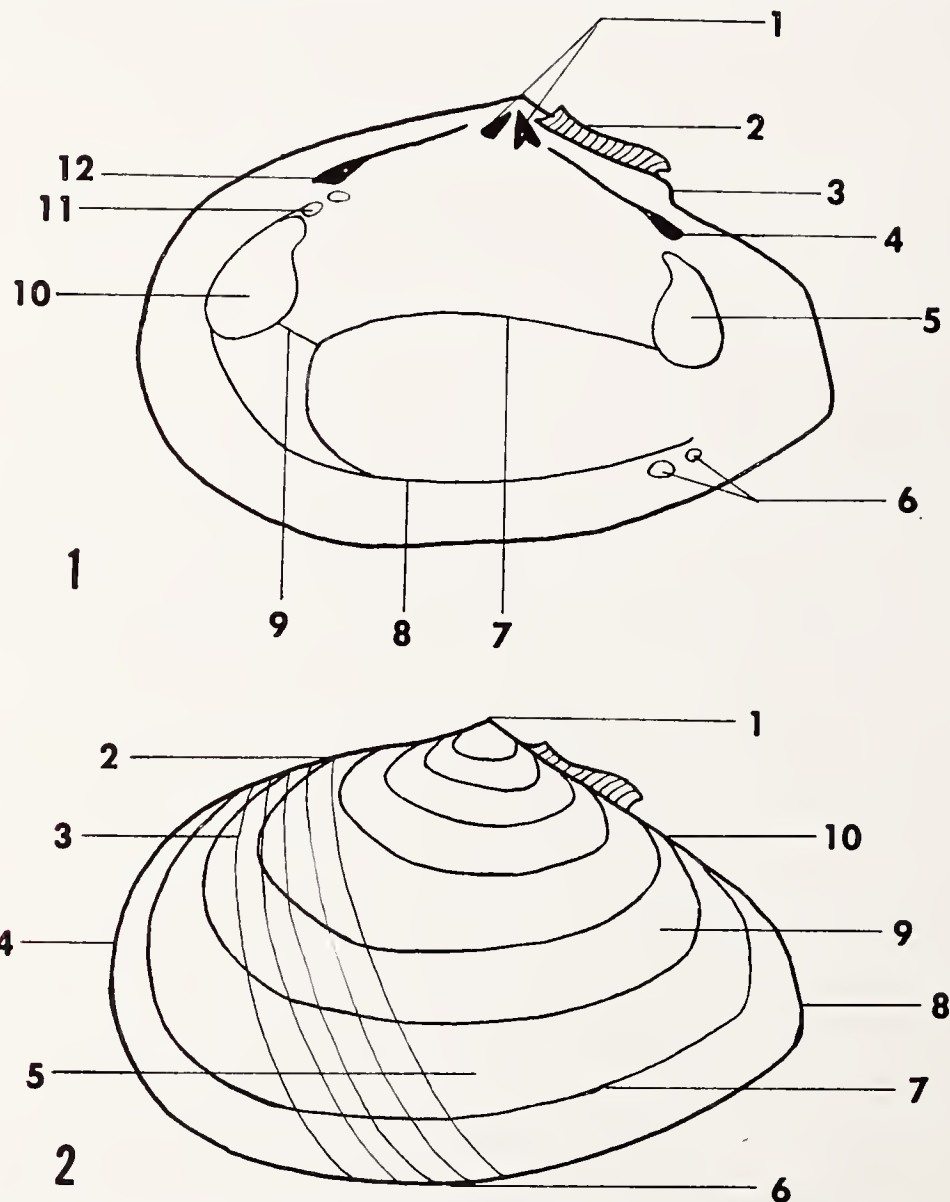


Plate 127. Diagrammatic representation of the shell morphology of a generalized *Tellina*. Fig. 1. Internal view of a right valve. 1. Cardinal complex with the single anterior laminate cardinal tooth and the bifid cardinal tooth. 2. Ligament. 3. Nymphal callosity. 4. Posterior lateral tooth. 5. Posterior adductor muscle scar. 6. Cruciform muscle scars. 7. Pallial sinus. 8. Pallial line. 9. Interlinear scar. 10. Anterior adductor scar. 11. Pedal retractor scars. 12. Anterior lateral tooth. Fig. 2. External view of a left valve. 1. Umbo. 2. Anterior dorsal margin. 3. Oblique sulcus or scissulation. 4. Anterior margin. 5. Disc. 6. Ventral margin. 7. Concentric sculpture. 8. Posterior margin. 9. Posterior slope. 10. Posterior dorsal margin.

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of the hinge line and interlock as well as stabilize the position of the two opposite valves. The maximum number of laterals is four, that is, two in each valve. The one behind the cardinal complex in the vicinity of the end of the ligament is called the posterior lateral, the other in front of the cardinal complex is the anterior lateral. In the left valve, the lateral dentition is less strongly developed than in the right valve. In most groups the right valve possesses the greatest development of the lateral teeth and, in particular, it is the right anterior lateral tooth which maintains the greatest strength while often the posterior lateral is diminished. Sockets or fossae for the interlocking of the teeth in opposite valves are sometimes developed. The position of the right anterior lateral tooth assumes some importance as a taxonomic character because it is variously placed in relation to the cardinal complex. In groups like *Eurytellina* and *Angulus*, this tooth is proximal to the cardinal complex whereas in *Tellina* s.s. and in *Tellinella*, the tooth is distal to the cardinal complex.

The ligament is opisthodontic or posterior to the umbos and mostly external. It consists of a horny external sheath which is yellow, brown, or black in color and of an internal, fibrous, calcareous element which is white. The nymph subtends the calcareous element of the ligament and consists of a thickened portion of the dorsum of the shell. When the nymphs are greatly thickened and protuberant, they are termed nymphal callosities. Trueman (1949) has discussed the structure of the ligament in *Tellina tenuis* in great detail.

The form of the ligament varies from the extremely long and narrow, as in *Phylloda*, to the short and high, as exemplified by *Angulus*. The nymphal callosities tend to be better developed in thin shells with a short ligament, and in the main, suborbicular species have a short ligament. In *Tellidora*, there is a tendency for the ligament with its calcareous element to become internal, as in the related family Semelidae.

The internal surface of each valve bears a number of muscle scars which delimit the attachment of muscles to the shell. Plate 127 illustrates these muscle impressions and their associated structures. The anterior adductor muscle tends to be long and narrow while the posterior adductor is more or less rounded to subquadrate. Dorsal to the adductors are the scars of the pedal musculature; the anterior pedal retractor impresses the greatest complex of scars along the anterior dorsal border of the shell and may, in fact, be largely confluent with the anterior adductor muscle. From the base of the posterior adductor the pallial sinus takes its origin. The siphonal musculature forms the scar of the definitive pallial sinus which extends anteriorly and which may or may not be confluent with the anterior adductor muscle. Ventrally the pallial sinus usually unites with the pallial line. If the pallial sinus does not touch or become confluent with the anterior adductor muscle scar, the distance which separates them may be traversed by a linear scar. In many cases the linear scar is absent and no direct connection exists between the sinus and the anterior adductor. Far posteriorly and closely aligned to the terminus of the pallial line are the cruciform muscle scars. These are four in number, two for each valve. In general, the scars are rounded, but the anterior one in the right valve tends to be rectangular.

The microscopic structure of the shell has been described by Trueman (1942). The periostracum is made up of a horny substance. The calcareous portion of the shell is aragonitic and divided into three layers of different crystallographic properties.

The external sculpture is predominantly concentric. Sulci of varying strength gener-

ally separate the broad concentric bands or narrower raised lirations. Dorsally the concentric sculpture may become differentiated into spinosities, particularly along the posterior slope. Radial sculpture is rare and in no case does it occur alone; therefore, a number of species present a pattern of cancellate sculpture. Acentric sculpture consisting of oblique sulci which cross the rectangular concentric sculpture is typical of a number of tellinid groups, particularly *Scissula* and *Strigilla*. This pattern of sculpture is herein referred to as being scissulate, and the oblique sulci are termed scissulations.

The sculptural pattern and thickness of the valves are adaptive characteristics which may be correlated with environment. Heavily shelled species, such as the European *Tellina crassa*, are found in substrates of coarse sand and shelly gravel whereas the thinly shelled species, such as *Tellina agilis*, occur in muddy sands. The sculptural pattern may be responsible for the maintenance of position in the substrate. Some *Tellina* live vertically whereas *Macoma*, which rarely tends to be sculptured, lies on its side in a horizontal position. Unfortunately, a quantitative evaluation of the adaptive significance of these characteristics is lacking.

ANATOMY

The following discussion is based largely on dissections of *Tellina alternata* Say and *Tellina punicea* Gmelin, both representatives of *Eurytellina*. These dissections were, except from minor portions, executed by Miss Vida C. Kenk of the Department of Mollusks, Museum of Comparative Zoology, Harvard University. Many of the statements concerning specific morphological traits have been derived from the literature. The European species, particularly the British species, of *Tellina* are best known from the morphological works of Atkins, Graham, and Yonge. Pelseneer laid the foundation for some comparative work on the species of the East Indies in his general discussion of pelecypod morphology in the Siboga report (1911). The anatomical features which are discussed below are illustrated on Plate 128.

Mantle. The mantle is thin and transparent. It is united dorsally and fused postero-ventrally in the region of the cruciform muscle where it is thickened at its edge. The pedal gape is large and extends ventrally from the anterior adductor muscle to the cruciform muscle. Posteriorly the mantle is modified to form portions of the siphonal apparatus and musculature.

Foot. The foot is large, generally laterally compressed and quite active. Yonge (1949) has described its great mobility and usefulness in burrowing. Pelseneer (1911) has shown that some species develop a plantar surface on the foot. The vestigial pedal gland and remnants of the byssiferous apparatus have been studied in detail by Carriere (1879) and Barrois (1885). A functional byssus is absent in the adult stage.

Musculature. The morphology of the musculature has been reviewed by Graham (1934b) who made a comparative study of the myology of selected members of the Tellinidae and related families. The anterior and posterior adductors are large and well developed. The anterior adductor is subdivided into two or three parts, the largest of which is ventral; the muscle tends to be irregularly elongate and semilunate in shape. The posterior adductor tends, on the other hand, to be more or less quadrate. A medial adductor courses through the viscera in the vicinity of the appendix of the stomach and is

attached to both valves anterior to the cardinal complex in the umbonal cavity. The extrinsic pedal musculature consists of anterior and posterior pedal retractors and of a pedal protractor; the entire complex of pedal musculature inserts into the foot. The narrow origin of the protractor pedis is immediately dorsal to the largest portion of the anterior adductor muscle and ventral to the origin of the anterior pedal retractor. The protractor splays out superficially over the foot.

The anterior pedal retractor which is generally separated from the protractor pedis by a small division of the anterior adductor muscle, forms a trigonal attachment along the anterior dorsal margin. The anterior retractor inserts deeply into the foot, lies under the protractor pedis fibers and portions of the posterior retractor although some of its fibers lie over those of the posterior retractor. Another section or portion of the anterior adductor is present along the anterior dorsal margin above the origins of the anterior pedal retractor. There are no elevator pedis muscles.

The posterior pedal retractor makes an oval attachment dorsal to the posterior adductor muscle along the posterior dorsal margin of the valve. This pedal muscle courses anteriorly through parts of the kidney into the foot where its fibers lie beneath the superficial fibers of the pedal protractor and intermesh with the fibers of the anterior pedal retractor.

The foot and viscera possess many intrinsic adductor muscle fibers while special siphonal muscles and the cruciform muscles are developed posteriorly. The pallial muscle defines the size and placement of the pallial sinus or cavity and generally is coextensive with the

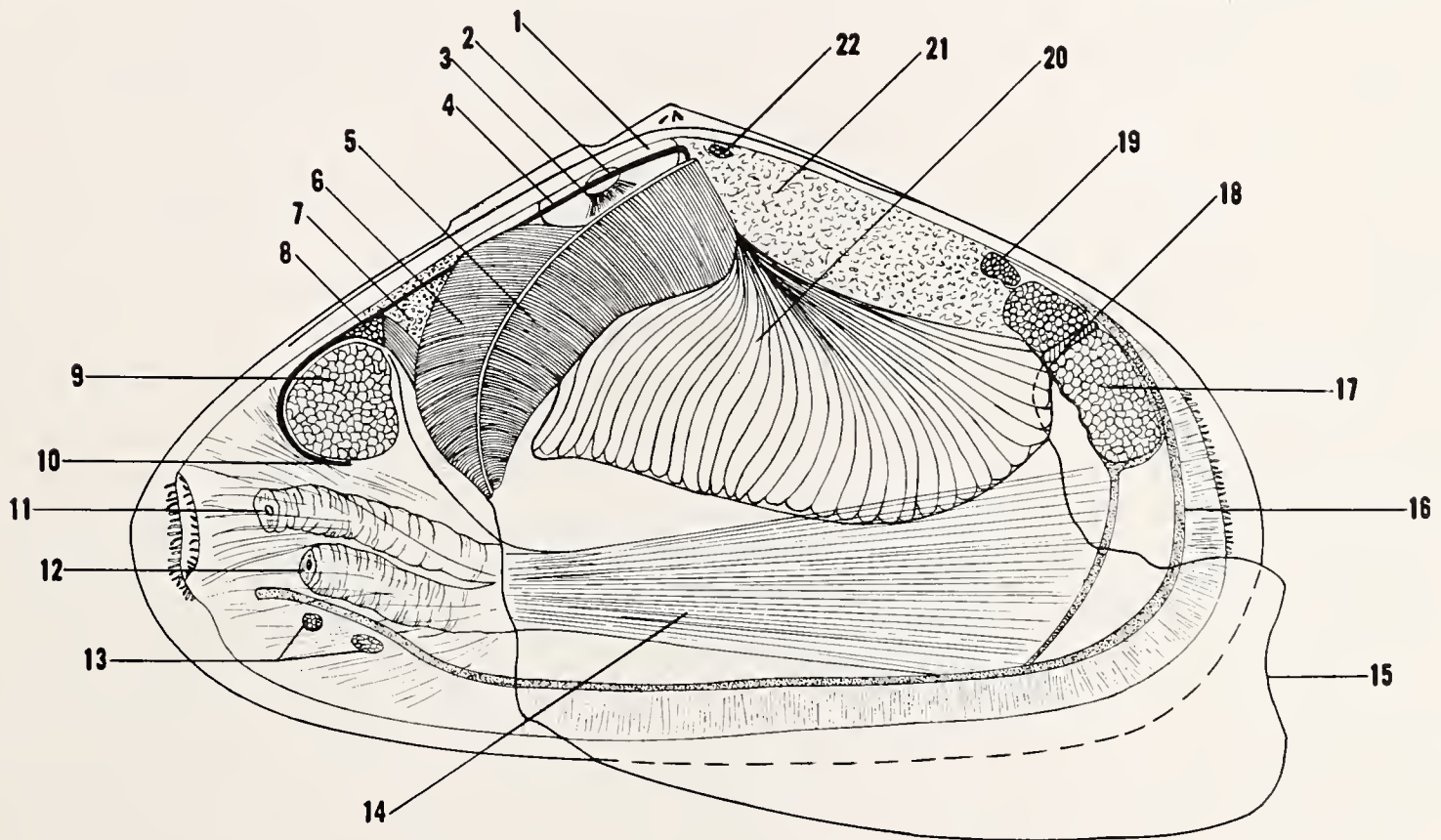


Plate 128. Semidiagrammatic illustration of the anatomy of *Tellina* (*Eurytellina*). Fig. 1. Specimen with the right valve removed to show general structural features. 1. Pericardium. 2. Ventricle. 3. Auricle. 4. Rectum. 5. Inner demibranch. 6. Outer demibranch. 7. Kidney. 8. Posterior retractor muscle. 9. Posterior adductor muscle. 10. Anus. 11. Excurrent siphon. 12. Incurrent siphon. 13. Cruciform muscles. 14. Siphonal retractor muscle. 15. Foot. 16. Pallial muscle. 17. Anterior adductor muscle. 18. Pedal protractor muscle. 19. Posterior retractor muscle. 20. Labial palps. 21. Digestive gland. 22. Medial adductor muscle.

muscular lobes of the mantle ventrally. A short supportive interlinear muscle may connect the anteriormost extension of the pallial muscle with the anterior adductor muscle.

Cruciform muscle. The posterior portion of *Tellina* is highly specialized. The cruciform muscle, a structure found only in the Tellinacea (see Graham, 1934a, b; Yonge, 1949), possesses a sensory pit and associated sensory structures as well as the uniquely crossed muscles. Deshayes (1848) pictured the muscle and its concomitant scars which are impressed on the shell. Von Ihering (1901) proposed that the muscle acted as an additional adductor and Graham (1934a) proposed the notion that the muscle and its associated sensory structures were used for water testing. Hoffman (1914) suggested that this sense organ in *Tagelus* functions in the perception and the regulation of blood-pressures in the neighborhood of the siphons. Yonge (1949) agreed with Graham (1934a) that the contention of von Ihering is hardly feasible but disagreed with Graham in pointing out that *Tellina* live deep in the substrate and that water detection would hardly serve a useful purpose, inasmuch as the siphons bring in water from the substrate, at least twenty centimeters away. It might further be suggested that a chemoreceptor is probably present in the structure of the siphonal organ and that an additional organ serving a similar purpose is hardly necessary. Yonge contends that the function of the cruciform muscle and organs is one of proprioception. The muscles themselves acting as a supportive structure for the highly extensile siphons and the sensory pit informing the animal of the relative position of the siphons. He argues that the siphons which are very large must be retracted before the mollusk can move with its foot. Since the movement of these structures is probably not a simultaneous one, the cruciform organ may serve to inform the animal about the conditions of blood pressure. It is of interest to note that the siphons of *Macoma* may be found 'swimming' over the substrate, after having been clipped by the edge of the valves during a quick closure.

According to Graham (1934a), *Tellina* and *Macoma* may be differentiated by the nature of the sensory pit associated with the cruciform muscle. In *Macoma*, the pit is connected to the environment by means of a narrow, short tube whereas in *Tellina* it is directly in contact with the external medium.

Siphonal and parasiphonal organs. Another complex of structures is associated with the incurrent siphon. These include the unilateral siphonal and paired parasiphonal organs. They were shown in *Tellina nitida* by Deshayes (1848), and were depicted in *Tellina planata* by Poli (1795), although he did not specifically mention them. Pelseneer (1911) noted the 'organe sensoriel siphonal' or 'valvule palleale' in *Tellina carnicolor* and *T. pretiosa*. Yonge (1949) discussed them as the mantle folds in the Tellinacea and compared them with similar structures in the Mactracea. The same structures in *Temnoconcha* have been illustrated by Boss and Kenk (1964). It is probable that the paired parasiphonal organs are used to keep pseudofaeces from being swept into the gill by the forceful incoming current, to act as valves covering the aperture of the incurrent siphon, and to direct the incoming particles to the distal portions of the ctenidia. The unique siphonal organ is probably associated with the detection of the quality of inflowing water. Both structures appear to be well innervated and a small ganglion is present in the tissues of the siphonal apparatus.

Ctenidia and palps. The ctenidia and the labial palps are the most conspicuous organs in the mantle cavity. Generally the palps are smaller than the ctenidia in *Tellina* while

the reverse situation may obtain in *Macoma*, although there are exceptions. The exact proportional relationship between palp size and ctenidial size may be an environmental corollary associated with substrate. The palps are plicate and generally somewhat trigonal in shape. They may be folded somewhat in the mantle cavity so that particular grooves are developed which lead to the mouth, and they are generally contiguous with the anterior boundary of the inner demibranch along a line which has been called the 'distal oral groove' (Kellogg, 1915; Graham, 1937).

The structure of the gills in the Tellinidae has been summarized by Ridewood (1903). The gill is unique. Its anterior portion lacks the outer demibranch and the inner demibranch alone extends dorsally and superficially over part of the pericardium. Centrally and along most of the ctenidial length, the outer demibranch is present and consists of a single dorsally upturned direct lamella. Posteriorly and distally, the lamella of the outer demibranch infolds to form a downwardly-directed portion. The lamellae of both demibranchs are flat and homorhabdic.

The ciliation of the gills has been discussed and described by Kellogg (1915) for *Macoma secta*, Graham (1937) for *Tellina crassa* and Atkins (1937a, b) for *Tellina donacina*, *T. fabula*, *T. tenuis*, *T. crassa*, and *Macoma balthica*. Yonge (1949) corroborated the findings of Atkins. In most species, food particles are carried across the inner demibranch in an antero-ventral direction in the ventral food groove to the labial palps and thence to the mouth. Specific differences, including the presence of supplementary food groove and alterations in kinds of ciliation are recorded by Atkins (1937b). By means of ciliary currents in the mantle cavity, pseudofaeces are collected ventrally at the siphonal organs and are expelled through the incurrent siphon. As Yonge (1949) noted, the sand grains expelled with the pseudofaeces are the largest taken into the mantle cavity; smaller grains enter into the digestive system.

Alimentary canal. The structure of the alimentary canal was figured by Deshayes (1848) for *Tellina nitida*. The functional and adaptive significance of the morphology of the digestive system has been illuminated by the work of Graham (1949), Yonge (1949), Owen (1955) and Purchon (1960). The relatively long, straight oesophagus enters the stomach anteriorly. The stomach consists of a medial globular portion and a postero-ventral extension, the style sac, which is typically united with the midgut. The style sac contains a large crystalline style which abrades against a well developed gastric shield located dorsally in the globular portion of the stomach. This latter portion of the stomach is invested with a complex of ciliated grooves and ridges which direct particulate matter into or out of the caeca of the stomach. Graham (1949) in his description of *Tellina crassa* identified right and left caeca which are antero-ventral and which are coextensive with the right and left lobes of the digestive gland, via a specific number of ducts. In addition, he described a dorsal pouch which is not connected with the digestive gland. The dorsal caecum is however in some species provided with connections to the left lobe of the digestive diverticula. Yonge (1949) added the postero-dorsal or posterior caecum which Purchon (1960) mercifully proposed to call the appendix, relieving the already congested vocabulary. This latter structure, the appendix, was overlooked by Graham (1949). Beneath the appendix courses the previously mentioned medial adductor muscle. As explained by Yonge (1949), the appendix serves as the receptacle for intermediate sized sand grains which are later triturated by the action of the revolving crystalline

style. Sand grains found in the compacted faeces, or faecal pellets, in the ascending portions of the midgut and posteriorly, are of a smaller size. With regard to the size and extent of the appendix, Yonge (1949) found that *Macoma balthica* possessed an unusually large structure filled with sand grains. Such an observation is comparable to conditions in *Macoma secta* as reported by Kellogg (1915), who found large quantities of sand in the intestine of this species.

The right and left caeca are connected by the major typhlosole and its concomitant intestinal groove. According to Yonge (1949), the dorsal caecum is connected via the proximal groove with the right or 'food sorting' caecum. The precise movement of materials into, out of, and between each caecum, as well as along the proximal and intestinal grooves is complex and still not fully explained and described. It is sufficient to say that sorted material of small size enters the respective caeca and from there is taken into the branching tubes and pouches of the digestive diverticula where intracellular digestion occurs. All three of the caeca may possess ducts connecting with the digestive gland. The occurrence of phagocytosis and other phenomena associated with movement of particles and digestion in the digestive diverticula have been discussed by Owen (1955). It must be remembered that extracellular digestion is instigated by the enzymes of the crystalline style and that the digestive diverticula, even though associated with the caeca may also connect directly with the globular portion of the stomach itself.

The midgut, combined with the style sac proximally arises independently in an ascending portion before going through a number of complex convolutions. Distally in the ascending portion, faecal pellets are formed. Yonge (1949) and Moore (1930; 1931) have discussed the size, shape and consolidation of the pellets in relation to the midgut length. In this regard, it is important to note that the complex convolutions of the midgut are greater in such species as *Macoma balthica* than they are in *Tellina tenuis*. This is another possible generic distinction first noted by Graham (1934b) and correlated by Yonge (1949) with the intake of mud.

Purchon (1960) has aptly summed up the structural features of the stomach of the Tellinidae in his comprehensive and analytic discussion of the 'Stomach Type V' in the Eulamellibranchia. In short, the major features include: 1) an oesophagus which enters the stomach anteriorly; 2) a union of the style sac with a portion of the midgut; 3) a crystalline style which projects into the stomach and revolves upon the shield on the entad surface of the dorsum of the stomach; 4) a minor and major typhlosole; 5) a left dorsal anterior pouch or caecum; and, 6) a number of specific sorting areas.

The midgut nominally terminates with the beginning of the rectum at its entrance into the pericardium. The rectum traverses the ventricle, passes out the pericardium, continues around the dorsal and ectad surface of the posterior adductor muscle to terminate in an anus near the opening of the excurrent siphon.

The reno-pericardial structures. The heart in *Tellina* is of a simple form. The pericardium is located dorsally between the kidney and the digestive diverticula and may be superficially covered by the dorsal extension of the inner demibranch. The heart itself consists of two large, laterally paired, thin-walled auricles connecting with a single medial, muscular ventricle which is traversed by the rectum. Dorsal aortae extend anteriorly and posteriorly from the ventricle. Deshayes (1848) has discussed in considerable detail the ramifications of the vascular system in *Tellina nitida*. White (1942) has re-

ported the presence of glandular matter in the mantle of *Tellina crassa* which was taken to be the remnants of the pericardial gland. The pericardial organs do not appear to be very well developed in *Tellina*. The pericardium is coextensive with the kidney by means of the paired ciliated funnels.

Odhner (1912) has discussed the reno-pericardial structures in the Tellinidae: his descriptions are based on the anatomy and histology of *Tellina* [*Macoma*] *balthica* and *Scrobicularia nitida* [which is presently referable to the Semelidae]. The gross anatomy of the macomoid *Temnoconcha* has been discussed by Boss and Kenk (1964). In *Tellina alternata* and *T. punicea*, the kidney and its associated structures are essentially alike and do not depart from the general structural features as described by Odhner.

The kidney lies between the heart and the posterior adductor muscle and is traversed by portions of the posterior pedal retractor. As in *Gari tellinella* (Graham, 1934b), the right and left kidneys are united medially, putting them into broad communication. Paired ciliated funnels connect the cavity of the pericardium with the central and proximal portions of the kidney. The nephroproct empties into the urogenital sinus, a common cavity into which the gametes are also released.

Nervous system. The structure of the nervous system conforms to the usual pattern of the lamellibranchs and is quite similar in its general aspects to that of *Psammobia vesperinalis* (Duvernoy, 1853) and *Gari tellinella* (Graham, 1934b). Paired cerebropleural ganglia are located anterior to the fusion of the labial palps on the entad surface of the anterior adductor muscle. These ganglia, which are united by a thin dorsal commissure, give rise to the anterior pallial nerves which course over the external surface of the anterior adductor muscle and innervate the pallial muscles of the mantle and to a short ramus which enters the anterior adductor muscle directly. Individual medially directed rami enter the labial palps. Extending postero-ventrally from the cerebropleural ganglia are the cerebropleural pedal connectives which lead to the closely juxtaposed pedal ganglia in the foot. The presence of otoliths has been indicated for an unidentified *Tellina* by von Ihering (1876) and for *Tellina assimilis* and *T. fabula* by Pelsener (1911). The pedal ganglia also send out branches which innervate the intrinsic muscles of the foot, certain portions of the alimentary canal, the digestive diverticula and the pedal retractors. Extending posteriorly from the cerebropleural ganglia are the cerebropleural-visceral connectives which communicate with the developed, large and partially united visceral ganglia. Running antero-dorsally from the visceral ganglia are the branchial nerves which ramify in the ctenidia. A small anterior nerve enters the kidney. A distinct ramus innervates the posterior adductor muscle and forms the dorsal pallial nerve. A large ventral ramus descends from the visceral ganglion to divide into a number of subsidiary rami which serve the various organs associated with the siphonal apparatus. The development of the nerves of the ventral ramus is complex. There is a divided ramus for the siphonal retractor muscles, another branch which divides sending a ramus into the cruciform muscles and another into the siphonal organs. Still another major nerve divides to enter the incurrent and excurrent siphons.

Reproduction. *Tellina* is dioecious. The gonad is imbedded in the foot and surrounds much of the style sac and midgut, extending dorsally and posteriorly in the viscera to the pericardium. The oviduct or vas deferens debouches reproductive products in the common urogenital sinus (Odhner, 1912).

The time of spawning appears to vary by species and geographical locality. Sullivan (1948) found that larval *Tellina agilis* were available at Prince Edward Island, Canada, from July to August while Odhner (1914) found that certain Adriatic *Tellina* have a fifteen day pelagic stage in mid-May. Lovén (1848) has pictured the young stages of an unidentified *Tellina* and Rees (1950) noted the taxodont dentition of the provinculum and the early development of the cardinal dentition. The settling spat of *Tellina* appear to be brightly colored, particularly with purple umbonally.

The pelagic larval stage and its length permit the distribution of species by currents. Those species with a greater range probably have longer larval periods whereas those with shorter pelagic stages may tend to have a restricted distribution. The substrate specificity for settling larvae has never been investigated, but the specificity exhibited by the adults can be used as a criterion in the interpretation of barriers to distribution. Impenetrable substrata are totally unsuitable and most species are adapted to the sand or mud habitat. Rocky coasts, coral reefs, or hard-packed sand are unsuitable habitats and may serve as minor features in the isolation of populations. Unfortunately, the state of the present knowledge of the period of larval development in the Tellininae is so poor that statements as to the relationship between range and length of pelagic stage can only be inferential.

ZOOGEOGRAPHICAL CONSIDERATIONS

Table I summarizes the distributional data for the subfamily Tellininae in the Western Atlantic. Tables II and III present a delineation of the patterns of allopatry in species-groups between the Western Atlantic and the Eastern Pacific and within the Western Atlantic.

Excepting *Acorylus*, all the Western Atlantic superspecific groups are polytypic. Groups of species representing each generic or subgeneric category are represented in the fauna of the Eastern Pacific or the Indo-Pacific. In general, it may be said that those groups poorly represented in the Western Atlantic are well developed in the Eastern Pacific and, vice versa. Thus, *Tellinella*, represented by *T. listeri* in the Western Atlantic and *T. cumingii* and *T. zacaе* in the Eastern Pacific, has numerous representatives in the Indo-Pacific. Similarly, *Angulus* and *Eurytellina*, as herein defined, are very richly developed in the Western Atlantic and Eastern Pacific, but not as highly differentiated in the Indo-Pacific. Western Atlantic species are clearly more closely allied to those of the Indo-Pacific than to either the Eastern Atlantic or the Mediterranean; however, a number of groups well represented in the Indo-Pacific are not present in the Western Atlantic.

When a comparison of superspecific categories is made for the Western Atlantic and the Eastern Pacific, only three of the Western Atlantic groups are absent from the Eastern Pacific. *Tellina s.s.*, *Arcopagia*, and *Acorylus*, mostly large and conspicuous elements of the Western Atlantic fauna, do not occur in the Eastern Pacific. The large and polytypic subgenera, *Eurytellina* and *Scissula* are nevertheless less well developed in the Western Atlantic, whereas *Angulus* appears to be more or less equally well developed in both areas.

Numerous authors have proposed faunal provinces for the Western Atlantic Ocean. Ekman (1953) discussed the problem in general zoogeographical terms. Much of his information regarding the distribution of mollusks is derived from von Ihering (1907;

1927). In a recent review, Coomans (1962) has summarized the faunal provinces of the Atlantic coast of continental North America with particular reference to the Virginian Subprovince. The following scheme is employed herein. Six provinces and five subprovinces are adopted. The Arctic Province extending from the polar area to Newfoundland has no representative of the subfamily Tellininae and is therefore beyond the scope of the present discussion. The Nova Scotian Province is boreal and extends from Newfoundland to Cape Cod. The Carolinian Province extends from Cape Cod to Eastern Florida in the vicinity of Cape Canaveral (=Cape Kennedy) and thence to the Gulf of Mexico from Cape Sable, Florida, to the vicinity of Veracruz, Mexico. The West Indian or Antillean Province is bounded by Cape Canaveral (=Cape Kennedy) and Key West, Florida, and the Golfo de Campeche near Veracruz in the north and extends south to Brasil. It may be divided into the Caribbean Subprovince which includes some of the Gulf of Mexico and the Caribbean Sea and is bounded on the south by Trinidad and the Gulf of Paria. The Brazilian Subprovince extends south of the Tropic of Capricorn to Santa Catharina. The Argentinian Province extends from southern Brasil to the Golfo de San Jorge, Argentina. South of the Argentinian Province is the Magellanic Province which because of a lack of representatives of the subfamily is omitted from the discussion.

The distributional data presented in Table I shows that only a single species, *T. agilis*, may be considered boreal while the remaining number of species are temperate, subtropical, or tropical. Thus, it is justifiably observed that the subfamily is predominantly Antillean or West Indian, for, excluding *agilis*, only two species, *T. versicolor* and *T. tenella*, normally occur in the Virginian Subprovince as far north as Cape Cod. Cape Hatteras is a geographic feature which demarcates the northernmost range for fourteen species, five of which are probably advectitious to the offshore shallows at Cape Hatteras. These include *T. listeri*, *laevigata*, *fausta*, *squamifera*, and *americana*. The presence of small and immature individuals actually constitute the records for these species in the north and indicate the absence of an adult breeding population. It is most probable that the larvae of these species have been transported from the south by the currents of the Gulf Stream. The same may be said for the records of *T. radiata* and *T. cristallina* in South Carolina. North of Cape Canaveral (=Cape Kennedy) and in the vicinity of Saint Augustine, two species, *T. lineata* and *T. tampaensis* have their northernmost range extension. The area near Lake Worth, Palm Beach, and Miami serves as a point of delimitation of the range of some twelve species in addition to the eight which advectitiously extend to the Carolinas. This area marks for the Tellininae the beginning of the Antillean fauna. Only six species are more or less limited to continental North America.

Over forty-five species of the Western Atlantic Tellininae are distributed in the Antillean Province, and of these, six possess distributions restricted to the Antilles. The remaining species are more widely ranging. The South American fauna, on the East coast of South America from the Guianas to Argentina possesses nineteen species, and of this number only five are endemic. Three of the endemics are strictly southern temperate in their range and are found in the Argentinian Province while the other two are represented by the very poorly known species, *T. brasiliiana* and *T. alerta*. The other fourteen South American species are in the Brazilian Subprovince and are all related and derived from the Antillean fauna. Among certain of the latter, some divergences are apparent between northern and southern populations corresponding roughly to populations of Caribbean and Brazilian Subprovinces.

The information accrued from an analysis of the distribution of each species in the sub-family is presented in Tables II and III. It can be seen that patterns of distribution are indicative of the importance of geographic isolation upon the formation of species. Of the fifty-two Western Atlantic species, twenty-six are represented by analogous species in the Eastern Pacific. The Isthmus of Panama has, since its establishment in the Pliocene, acted as an extrinsic barrier in the separation of populations and has thereby influenced the consequent pattern of speciation. Allopatric species-pairs, nominal genera and subgenera like *Phyllodina*, *Laciolina* and *Elliptotellina*, are good examples of super-species.

TABLE II. Western Atlantic species and their Eastern Pacific Analogs

<i>Western Atlantic</i>	<i>Eastern Pacific</i>
<i>listeri</i>	<i>cumingii</i>
<i>laevigata</i>	<i>viridotincta</i>
<i>squamifera</i>	<i>pristiphora</i>
<i>persica</i>	<i>fluctigera</i>
<i>americana</i>	<i>pacifica</i>
<i>crystallina</i>	<i>rhynchoseuta</i>
<i>aequistriata</i>	<i>reclusa</i>
<i>martinicensis</i>	<i>proclivis</i>
<i>juttingae</i>	<i>lyra</i>
<i>angulosa</i>	<i>eburnea</i>
<i>alternata</i>	<i>laceridens</i>
<i>punicea</i>	<i>simulans</i>
<i>nitens</i>	<i>inaequistriata</i>
<i>mera</i>	<i>meropsis</i>
<i>tampaensis</i>	<i>suffusa</i>
<i>exerythra</i>	<i>erythronotus</i>
<i>sybaritica</i>	<i>amianta</i>
<i>gibber</i>	<i>hiberna</i>
<i>iris</i>	<i>virgo</i>
<i>sandix</i>	<i>esmeralda</i>
<i>pseudocarnaria</i>	<i>chroma</i>
<i>pisiformis</i>	<i>panamensis</i>
<i>mirabilis</i>	<i>lenticula</i>
<i>gabbi</i>	<i>disjuncta</i>
<i>producta</i>	<i>ervilia</i>
<i>crystata</i>	<i>burnetti</i>

In Table III, a similar pattern within polytypic groups of the Western Atlantic is evident. Twelve species-pairs, representing nearly 50% of the total number of species are allopatrically distributed. Extrinsic mechanisms of isolation are not as obvious as the definitive features of the Isthmus of Panama but include the limitations of gene flow between allopatric populations imposed by shorter larval periods, adverse current conditions, or larval substrate specificities.

In summation, the pattern of distribution in the Tellininae is consistent with that exhibited by other littoral marine groups, namely that boundaries established by temperature, current, and other hydrographic conditions do delimit geographical ranges at such points as Cape Hatteras, the Straits of Florida, and southern Brasil. In addition, the pattern of distribution within and between species-groups is largely allopatric, that

is to say that the nearest relatives of a species are isolated geographically from each other. Such a fact is consonant with, as well as supportive of, the accepted thesis of geographic speciation.

TABLE III. Allopatric species-pairs in the Western Atlantic

sandix	iris
gibber	versicolor
tenella	sybaritica
diantha	probrina
euvitrea	probrina
agilis	texana
juttingae	martinicensis
alerta	aequistriata
angulosa	alternata
alternata	tayloriana
radiata	brasiliiana
squamifera	persica

SYSTEMATIC TREATMENT

Family **Tellinidae**

Gills small, posterior, not plicate, the outer demibranch dorsally directed and a reflected lamina obsolete or lacking; labial palps very large, more or less united posteriorly. Byssal apparatus obsolete. Foot compressed, short and not grooved. Mantle margins papillose with a large ventral pedal gap. Siphons long, extensile, separate to their bases and capable of retraction into an extensive pallial sinus. Ligament external, opisthodontic and generally subtended by nymphal callosities. Hinge with two cardinal teeth in each valve; lateral dentition present or absent. Cruciform muscles posterior.

Subfamily **Tellininae**

Shell narrowly or broadly lanceolate to ovate in shape, the posterior side generally shorter and often strongly flexed to the right posteriorly. Valves usually of unequal convexity, the left larger and more convex. Hinge with both cardinal and lateral teeth. Surface sculptured concentrically, sculpture generally heavier on the rostral areas.

KEY TO GENERA AND SUBGENERA OF TELLININAE IN THE WESTERN ATLANTIC

- External sculpture of shell with flexuous scissulations *Strigilla*
External sculpture of shell without flexuose scissulations 2
- Both anterior and posterior dorsal margins spinose *Tellidora*
Both anterior and posterior dorsal margins not spinose 3
- Posterior dorsal slope with strong radial sculpture *Elliptotellina*
Posterior dorsal slope with concentric sculpture 4
- Surface of disc obliquely grooved with scissulations *Scissula*
Surface of disc not obliquely grooved with scissulations 5
- Right anterior lateral tooth proximal or subproximal to the cardinal complex . . 6
Right anterior lateral tooth distal to the cardinal complex 9

- | | | |
|-----|--|-----------------------|
| 6. | Calcareous element of the ligament greatly thickened and sunken | <i>Laciolina</i> |
| | Calcareous element of the ligament, if thickened, not sunken | 7 |
| 7. | Pallial sinus obliquely ascending | <i>Arcopagia</i> |
| | Pallial sinus not obliquely ascending | 8 |
| 8. | Right posterior lateral tooth strong; supportive rib internally | <i>Eurytellina</i> |
| | Right posterior lateral tooth weak; internal rib lacking | <i>Angulus</i> |
| 9. | Shell smooth and polished externally | 10 |
| | Shell not smooth, with strong concentric sculpture | 11 |
| 10. | Pallial sinus confluent with the pallial line at the base of the anterior adductor muscle scar | <i>Acorylus</i> |
| | Pallial sinus confluent with the pallial line posterior to the base of the anterior adductor muscle scar | <i>Tellina</i> , s.s. |
| 11. | Pallial sinus not connected to the anterior adductor muscle scar by a linear scar | <i>Merisca</i> |
| | Pallial sinus connected to the anterior adductor muscle scar by a linear scar | 12 |
| 12. | Shell strongly flexed to the right posteriorly | <i>Tellinella</i> |
| | Shell not strongly flexed to the right posteriorly | <i>Phyllodina</i> |

Genus *Tellina* Linnaeus

Tellina Linnaeus 1758, *Systema Naturae*, Ed. 10, p. 674 (type species, *Tellina radiata* Linnaeus 1758, subsequent designation Schmidt 1818, p. 51).

Description. Shell small to large, elliptical to ovate in shape, left valve generally more convex than the right, variously flexed to the right posteriorly. Fragile to solid. Concentric sculpture predominant. Hinge with cardinal and lateral dentition. Cardinal teeth two in each valve: in the left valve, the anterior cardinal tooth is bifid and the posterior cardinal tooth is single and laminate; in the right valve, the anterior cardinal tooth is single and laminate and the posterior cardinal tooth is bifid. Lateral dentition variously developed, but lateral teeth of the right valve strong. Pallial sinus variously formed. Shell white to highly colored.

Considerable controversy has reigned over the question of the designation of the type species for the genus *Tellina*. Most early designations, including those of Children (1823, p. 305), Gray (1847, p. 186), and Stoliczka (1870, p. 116), cite *Tellina radiata* Linnaeus as type. In 1900, Dall employed *Tellina virgata* Linnaeus as the type species which was used with reference to Lamarck (1799). Thiele (1935) followed Dall in this usage and recently Olsson (1961) has adopted this designation.

This confusion has arisen in regard to the question of the validity of type species designations by Lamarck. Dodge (1947), quoting a statement from Lamarck's introduction to the *Prodrome*, has argued that the examples cited by Lamarck represent type designations. In Opinion 79 of the International Rules of Zoological Nomenclature, the examples cited by Lamarck in his *Systeme* of 1801 are rejected as bonafide type designations (Kennard, Salisbury, and Woodward, 1931). It is possible that this opinion may be extrapolated to the *Prodrome* of 1799. In the new Code of Zoological Nomenclature (1961), Article 69 (a) (iii) states:

“In the absence of a prior valid type-designation for a nominal genus, an author is considered to have designated one of the originally included nominal species, if he states that it is the type (or type-species), for whatever reason, right or wrong, and if it is clear that he himself accepts it as a type-species.”

Certainly Lamarck did not select a type in the rigidly construed sense since it can be seen that he changed the example under the genus *Tellina* in the 1801 work to *Tellina radiata* Linnaeus. The first type designation of *Tellina* is that of Schmidt (1818) and not that of Children (1823) as some workers have cited. Schmidt tabulated the work of Gmelin, Bruguière, Lamarck, von Mühlfeld and Oken. In the case of Lamarck, he referred to the Systeme of 1801 and thereby cited *Tellina radiata* as type; the genus then is defined as *Tellina* Linnaeus, *sensu* Lamarck 1801.

Subgenus *Tellina* s.s.

Tellina Linnaeus. Lamarck 1801, Systeme Animaux, p. 124 (type species, *Tellina radiata* Linnaeus 1758, subsequent designation Schmidt 1818, p. 51).

Tellinarius Dumeril 1806, Anat. Zool., Index.¹

Musculus Mörch 1853, Catalogus Conchyliorum Comes di Yoldi, 2: 13 (type species, *Tellina radiata* Linnaeus 1758, monotypy), *non* Röding 1798.

Liotellina Fischer 1887, Manuel Conchyliologie, p. 1147 (type species, *Tellina radiata* Linnaeus 1758, original designation).

Description. Shell of medium to large size, elongate-subelliptical in shape, moderately thick and flexed to the right posteriorly. Sculpture smooth, consisting of fine radial or concentric lines. Lateral dentition strong in the right valve and consisting of a distal anterior and a distal posterior tooth. Laterals of the left valve more or less poorly developed and equidistant from the cardinal complex. Pallial sinus large, extending near to the anterior adductor muscle scar and descending arcuately to the pallial line. The pallial sinus is posteriorly confluent with the pallial line for about half the ventral length.

The problems in the selection of a type species for the genus have been discussed under the generic heading. Schmidt's designation has the effect, as pointed out by Salisbury (1934) of reducing *Tellina* s.s. to a relatively small group or species. The subgenus appears to have attained its highest development in the Western Atlantic. The peculiarly twisted *Tellina chariessa* Salisbury (= *elegans* Gray) represents the group in the Indo-Pacific, and *Tellina* s.s. is conspicuously absent from the Eastern Pacific.

KEY TO THE SPECIES OF TELLINA s.s. IN THE WESTERN ATLANTIC

1. Shell large, exceeding 45 mm. in adult length; some red coloration . . . 2
Shell small, less than 45 mm. in adult length; no red coloration . . . 3
2. Internally, shell white with rays or suffusions of yellow orange or red . . . *radiata*
Internally, deep red purple *brasiliana*
3. Periostracum golden-brown; shell solid *iheringi*
Periostracum olivaceous green; shell thin *petitiana*

¹ As Dall, Bartsch and Rehder (1938) point out *Tellinarius* Dumeril was used as an exact definition of *Tellina* Linnaeus and therefore becomes an absolute synonym for *Tellina* s.s.

Tellina (Tellina) radiata *Linnaeus*

Plate 129; figs. 1-4; Plate 130, fig. 1

Tellina radiata Linnaeus 1758, Systema Naturae, Ed. 10, p. 675 (In Oceano Europaeo) [type locality, here corrected and restricted, Montego Bay, Jamaica; type specimens, in collection of Linnean Society, London].

Tellina unimaculata Lamarck 1818, Animaux s. Vertebres, 5: 521 (l'Océan d'Amérique) [type locality, here restricted, Montego Bay, Jamaica; syntypes, Museum d'Histoire Naturelle, Geneva].

Tellina (Musculus) radiata Linnaeus. Mörch 1853, Catalogus Conchyliorum Comes di Yoldi, 2: 13.

Tellina (Tellina) radiata Linnaeus. H. and A. Adams 1856, Genera Recent Mollusca, 2: 394.

Tellina (Eutellina; Liotellina) radiata Linnaeus. Fischer 1887, Manuel Conchyliologie, p. 1147.

Description. Shell extending to 114 mm. (about 4½ inches) in length and to 53 mm. (about 2¼ inches) in height, elongate-elliptical, solid, moderately tumid, with the left valve more convex and with a weak flexure to the right posteriorly. Umbos subcentral and slightly inflated. Anterior margin smoothly rounded; ventral margin straight and with a marked postbasal constriction; posterior dorsal margin gently sloping and long; posterior margin short and forming a sloping truncation. Sculpture consisting of evenly spaced obsolete concentric lines; fine radial lirations intersect the concentric lines and produce a microscopic cancellate pattern. Ligament dark brown and protuberant. Calcareous element of the ligament subtended by nymphal callosities. In the left valve, the cardinal complex consists of an anterior strong bifid tooth whose anterior lobe is larger and of a posterior thin laminate tooth; the lateral teeth are both distal to the cardinal complex and weak or obsolete. In the right valve, the cardinal complex consists of a posterior strong bifid tooth with equal lobes and of an anterior strong but thin laminate tooth; the lateral teeth are both distal to the cardinal complex, but extremely well developed and strong. An internal strong supportive ridge radiates from the umbonal region toward the anterior adductor muscle scar. Adductor muscle scars well impressed. Pallial sinus nearly contiguous with the anterior adductor scar, more or less linguiform, not rising above the adductor scars and confluent with the pallial line for about one half its ventral length. Externally the color of the shell varies from pure white to alternating

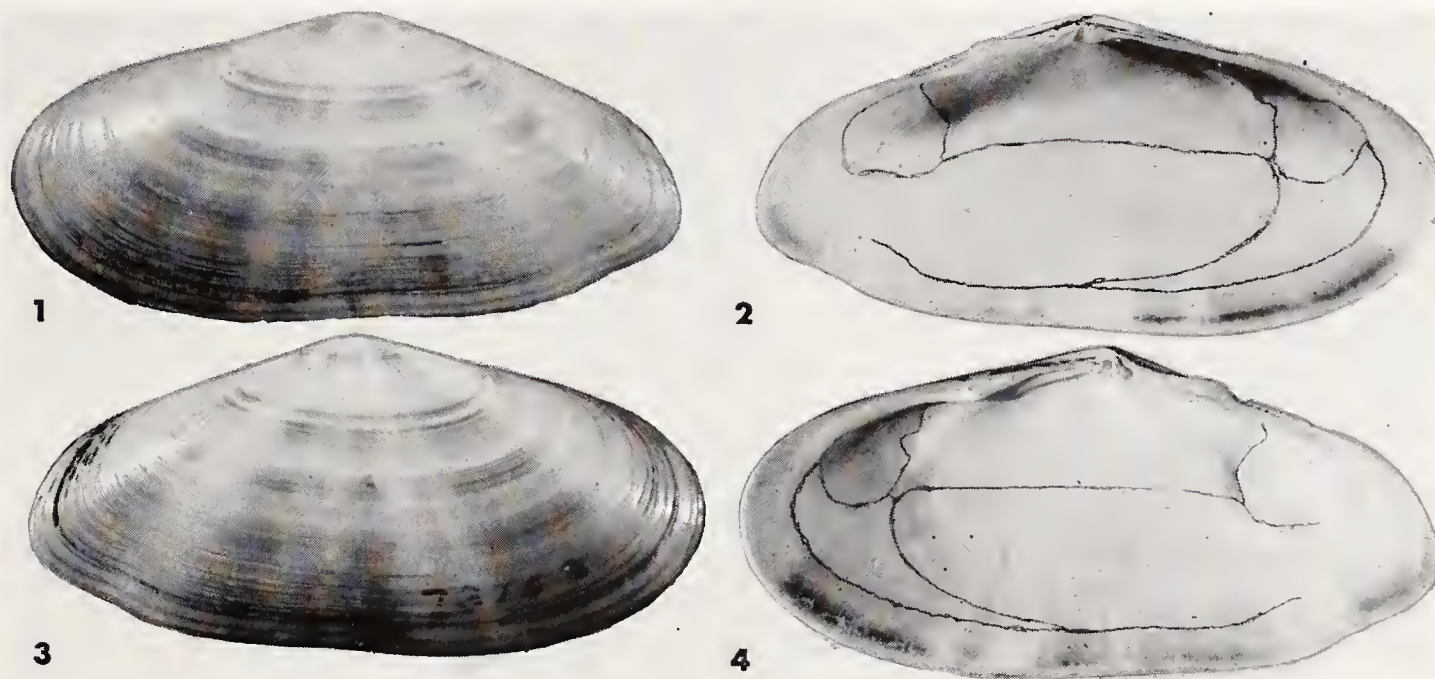


Plate 129. *Tellina radiata* Linnaeus. Fig. 1. External view of the left valve. Fig. 2. Internal view of the left valve. Fig. 3. External view of the right valve. Fig. 4. Internal view of the right valve. Great Abaco Island, Bahamas, USNM 73109 (about 1x) [L=70.2 mm.]. L=length

rays of red and pink which broaden peripherally. Internally, the shell may be suffused with pale yellow or red.

length	height	width	
88.0 mm.	41.0 mm	24.0 mm.	Syntype of <i>radiata</i> Linnaeus
86.0	42.0	20.0	Syntype of <i>unimaculata</i> Lamarck
114.0	53.0	28.5	Cat Island, Bahamas
64.0	32.0	16.5	Tortola, Virgin Islands
19.0	9.0	4.2	Great Inagua, Bahamas

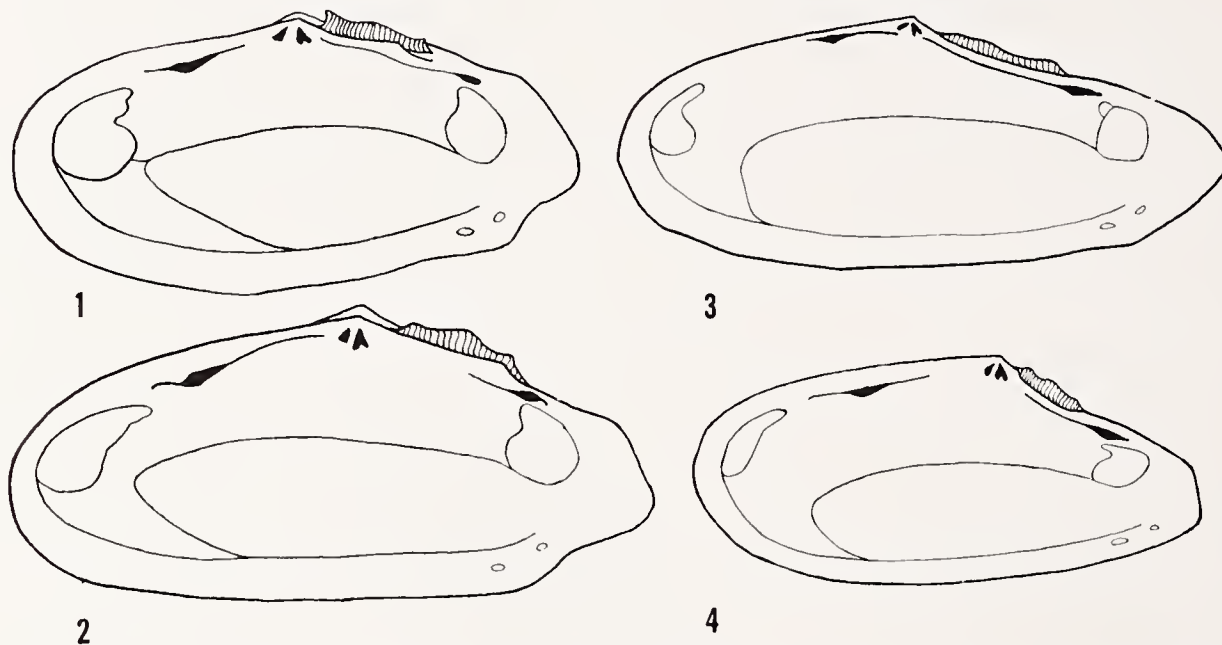


Plate 130. Figs. 1-4. Diagrammatic illustration of the internal surface of the right valve showing the dental configuration and muscle scars. Fig. 1. *Tellina radiata* Linnaeus (about 1.2x) [L=50 mm.]. Fig. 2. *Tellina brasiliiana* Spengler (about 1.4x) [L=50 mm.]. Fig. 3. *Tellina petitiana* d'Orbigny (about 2x) [L=33 mm.]. Fig. 4. *Tellina iheringi* Dall (about 1.7x) [L=30 mm.].

Remarks. This species may be considered one of the more successful species of *Tellina* in the Western Atlantic. Of a subtropical to tropical range, it seems to have a central, most concentrated population in the Bahamas.

In a series of individuals from the same locality, a continuum in the stages of growth and development may be observed. An allometric pattern is definitely evident when smaller and younger individuals are contrasted with larger and older ones. In the smaller individuals, the anterior dorsal margin is more elongate, more smoothly and gently sloping than in adults; this margin occupies a larger percentage of the total length as well. The nymphal callosity and the calcareous layer of the ligament are most often equal in length, but the total length of each of these structures varies in individuals according to age. In general, older individuals which possess heavier and larger shells also have a longer nymph. The posterior indented arcuation of the ventral margin also increases in strength with age.

The characters which are most variable are the color and the color pattern of the shell. Lamarck (1818) named the white rayless form, *unimaculata*. White individuals of *radiata* reflect the polymorphic nature of the species and are found in nearly all populations regardless of geographical distribution. Some kind of radial pattern of red seems to be the general configuration of external coloration. The same generalization is true of the pattern and coloration on the internal surface of the valves, but in addition, yellow coloration seems to be stronger and more intensely concentrated in the central disc area of the

internal surface. More often than not, there is a concentration of red on the umbonal region of the shell even in those individuals that are predominantly white.

This species is an inhabitant of the shallow slope waters, and Robertson (59) has indicated that it is a typical representative of the offshore sand community. Abbott (1958) described its habitat preferences in Grand Cayman; in this locality, *radiata* occurred in clear sand at depths between 6 and 48 feet; it seemed to prefer fairly clear ocean water and was not found in the warm inshore shallows.

The fossil record of this species is incomplete; it is known to occur in the Pleistocene (Rehder, 1962). The closest relative of *T. radiata* in the Western Atlantic is *T. brasili-ana* Spengler. In the Indo-Pacific, *Tellina chariessa* Salisbury is similar to *radiata*, but the former is asymmetrically twisted.

Range. *Tellina radiata* occurs from Lake Worth, Florida south through the Greater and Lesser Antilles to the Guianas in South America.

Specimens examined. FLORIDA: Lake Worth; Pompano (both MCZ); Fort Lauderdale (ANSP); Miami (USNM); Key Biscayne; Virginia Key; Hawks Channel, Garden Cove, Key Largo, in 2 fathoms (all MCZ); Conch Key, in 1-5 feet (USNM); Grassy Key (ANSP); Key Vaca; Bahia Honda Key (both MCZ); Key West; Loggerhead Key, Tortugas (both USNM); Sanibel (USNM; CNM); Boca Grande, Gasparilla Island (ANSP); Paradise Beach, Hog Island (ANSP); Cedar Keys (USNM; MCZ). MEXICO: 15 miles N of Tecolutla, Veracruz (MCZ); Campeche (ANSP); Progreso; Cabo Catoche (both MCZ); Cozumel Island (ANSP). BRITISH HONDURAS: Belize (MCZ); St. Georges Cay (USNM). HONDURAS: Utila Island (USNM). BERMUDA: Castle Roads, Castle Harbour, in 4-5 fathoms (MCZ); off Nonesuch, in 15 feet (USNM); Long Beach, Warwick (MCZ). BAHAMAS: Cay Sal; Alicetown, North Bimini (both MCZ); Nixon's Harbour, South Bimini; Gun Cay (both ANSP); Dollar Harbour, South Cat Cay; West End, Wood Cay, Eight Mile Rock, Hawksville Creek, Holmes Cay, Sweetings Cay, and Freetown, Grand Bahama; Green Turtle Key, Tilloo Cut, and Marsh Harbour, Great Abaco (all MCZ); Mintie Bar, Andros (USNM); North Cay, Nassau Harbour, Dick's Point, Fox Hill, Culbert Point, North Cay, Adelaide, Old Fort and Lake Cunningham, New Providence; Governor's Harbour and Sandy Point, Eleuthera; Arthurstown, North End Point, Russell Creek, Orange Creek, Campdown and Landing Rock, Cat Island; Little San Salvador Island; Stocking Island, Great Exuma; Watlings Island; Cockburntown, San Salvador; Simms, Cape St. Marie, and Clarence Town, Long Island (all MCZ); Lobos Island; Rocky Point, Crooked Island (both USNM); Fortune Island; Atwood's Cay; Abraham's Bay, Mariguana Island; Turks Island; Matthew Town, Great Inagua (all MCZ). CUBA: Cape San Antonio; Cape Cajon; Cayo Levisa (all USNM); Habana; Pueblo Nuevo, Matanzas (both MCZ); Cayo Galindo, Cardenas (CNM); Cayo Cristo, Sagua la Grande, La Sortija, Cayo Caiman and Cayo Frances, Las Villas; Cayo Maja Figuro, Camagüey; Punta de los Colorados, Cienfuegos Bay (all MCZ); 20 miles W of Santiago (USNM). JAMAICA: Montego Bay (USNM); Portland Point; Middle Cay, Pedro Bank (both MCZ). HISPANIOLA. HAITI: Baie des Flamands; Les Sept Freres Islands (both USNM). SANTO DOMINGO: Monte Cristi; Puerto Plata (both MCZ). VIRGIN ISLANDS: Anegada Island (ANSP); Devil's Bay, Virgin Gorda; Tortola; Guana Island; Cancel Bay, St.

John; Bird Key, St. Thomas; Sandy Point, St. Croix (all MCZ). LESSER ANTILLES: St. Martins (ANSP); St. Kitts (MCZ); Nevis (ANSP); Falmouth Harbour, Antigua, in 3-6 fathoms (USNM); Guadeloupe; Barbados (both ANSP). CARIBBEAN ISLANDS: Georgetown, Low Point, West Bay and Little Bluff, Grand Cayman (all ANSP). Swan Island; Curaçao (both MCZ). VENEZUELA: La Guayra; Orchilla Island (both USNM). BRITISH GUIANA: SE coast of British Guiana (ANSP).

***Tellina (Tellina) brasiliiana* Spengler**

Plate 130, fig. 2; Plate 131, fig. 1

Tellina brasiliiana Spengler 1798, Skrivter Naturhistorie Selskabet, 4(2): 94, pl. 12, fig. 4 (Fra Brazilien), *nou* Lamarck 1818 [type locality, here restricted, Praia de Itapoan, Bahia, Brasil; holotype, Zoological Museum, Copenhagen].

Tellina semizonalis Lamarck 1818, Animaux s. Vertebres, 5: 521 (no locality given); Delessert, 1841, pl. 6, fig. 1 [type locality, here restricted, Praia de Itapoan, Bahia, Brasil; holotype, Museum d'Histoire Naturelle, Geneva].

Tellina (Tellina) brasiliiana Spengler. H. and A. Adams 1856, Genera Recent Mollusca, 2: 394.

Tellina (Musculus) brasiliiana Spengler. Römer 1870, Conchilien-Cabinet (2), 10(4): 9, pl. 5, figs. 1-3.

Description. Shell extending to 103 mm. (about 4 inches) in length and to 50.5 mm. (about 2 inches) in height, elongate-lanceolate, solid, with the left valve more convex and with a strong flexure to the right posteriorly. Umbos slightly posterior to the middle and pointed. Anterior margin very narrowly rounded; ventral margin straight and with a slight indented arcuation behind; anterior dorsal margin rather long and straight; posterior dorsal margin gently descending and straight; posterior margin slightly convex and forming a short oblique posterior truncation. Sculpture consisting of weak, evenly spaced concentric lines; radial lirae present. Ligament dark brown and protuberant. Calcareous element subtended by a thickened nymphal callosity. In the left valve, the cardinal complex consists of an interior thickened, strong bifid tooth whose anterior lobe is larger and of a posterior thin laminate tooth; the lateral teeth are both distal to the cardinal complex and quite weak or obsolete. In the right valve, the cardinal complex consists of a posterior strong bifid with subequal lobes and of an anterior strong but thin laminate tooth; the lateral teeth are both distal to the cardinal complex but extremely well developed and strong. Adductor muscle scars moderately well impressed; pallial sinus rises slightly behind, is slightly convex above and falls to the pallial line in a position beneath the umbos. The sinus extends to, but does not coalesce with the anterior adductor muscle scar. Externally the shell is polished and white with a purplish tinge and may appear banded with red and purple; internally the shell is polished and purple with a white periphery.

length	height	width	
103.0 mm.	50.5 mm.	33.0 mm.	Holotype of <i>brasiliiana</i> Spengler
45.0	21.0	9.0	Holotype of <i>semizonalis</i> Lamarck
78.0	39.0	—	Brasil
52.0	22.0	—	Praia de Itapoan, Brasil

Remarks. The status of this species has been somewhat controversial, due in part to its rare occurrence. The nearest relative of *Tellina brasiliiana* is the very common West Indian species, *T. radiata*. The distributions of the present species are allopatric and indicative of a geographical separation of the ancestral populations. The most spectacular

difference between *brasiliana* and *radiata* is the color of the shell. *Tellina brasiliana* possesses a purple interior and a variously rayed and banded exterior whereas *radiata* varies between a pure white shell and one which is rayed externally and internally with red, yellow or orange. Furthermore, the posterior flexure to the right, the radial lirae, the curvature of the right valve and the posterior internal ribs and rays are all stronger in *brasiliana*. Other important and diagnostic traits include the closely set, strongly incised, and parallel sculpture along the posterior slope in *brasiliana*.

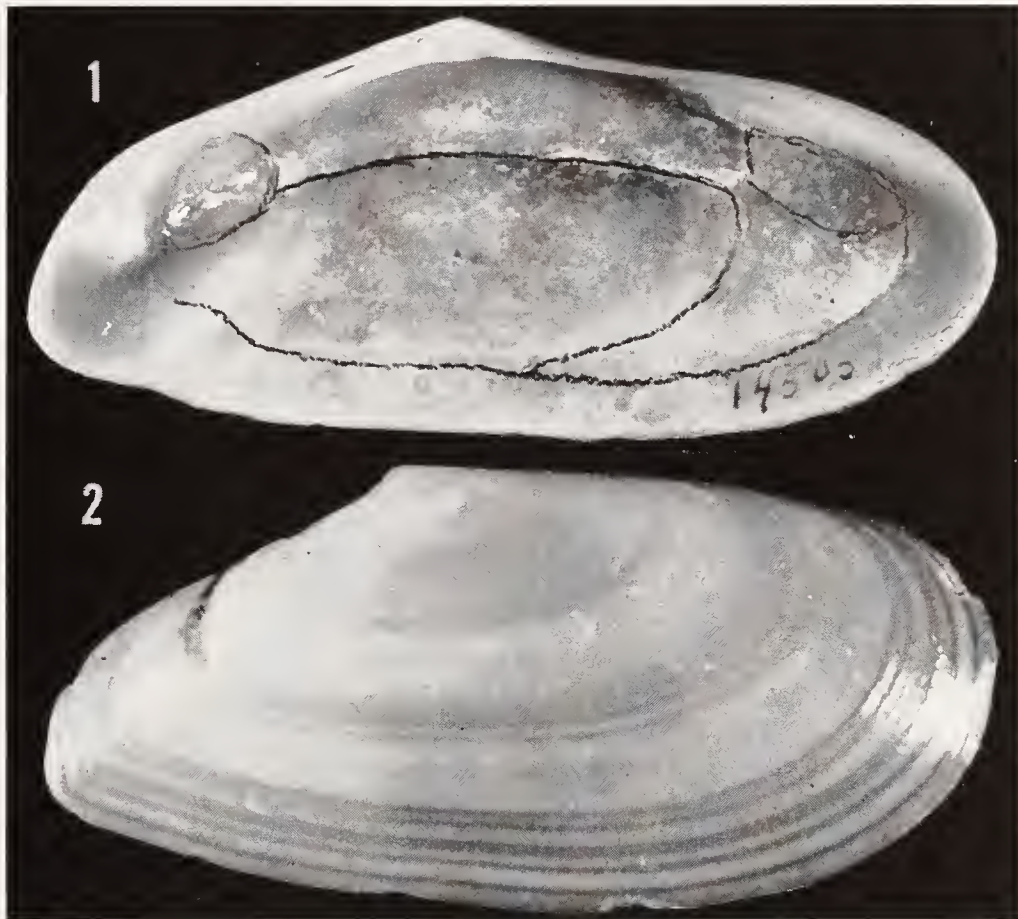


Plate 131. Fig. 1. *Tellina brasiliana* Spengler. Internal view of the left valve, Praia de Itapoan, Brasil, MCZ 145057 (about 2.2x) [L=52 mm.]. Fig. 2. *Tellina iheringi* Dall, external view of the right valve, Golfo San Matias, Argentina, MCZ 145058 (about 3x) [L=31.5 mm.].

Range. The distribution of this species seems to be wholly confined to the coast line of Brasil. Oliveira in an unpublished manuscript has given the single locality of Ceará (Fortaleza) for this species. The only other known specific locality is the Praia de Itapoan at Bahia.

Specimens examined. BRASIL: (BMNH; ZMK); Praia de Itapoan, Estado do Bahia (MCZ).

***Tellina (Tellina) iheringi* Dall**

Plate 130, fig. 4; Plate 131, fig. 2

Tellina (Liotellina) iheringi Dall 1900, Proc. U.S. Nat. Mus., 23: 311, fig. 2 (type locality, *Albatross I* station 2765, off Rio de la Plata, in 10½ fathoms [18 miles NE of Punta Mendanos, 36°43' S; 56°23' W]; holotype, USNM, no. 108531).

Description. Shell extending to 35.5 mm. (about 1¼ inches) in length and to 17.5 mm. (about ⅝ inches) in height, elongate, subsolid, with the right valve only slightly more

convex and with a weak posterior flexure to the right. Umbos posterior to the middle and blunt. Anterior margin narrowly rounded; ventral margin convex and gently rising posteriorly; anterior dorsal margin long and gently sloping; posterior dorsal margin gently sloping and slightly concave; posterior margin short and forming an ill-defined truncation. Concentric sculpture absent or consisting of weak lirations which are strongest on the posterior slope; radial vermiculations which broaden peripherally occur on the disc. Ligament short and deeply set. Calcareous element subtended by an elevated nymphal callosity. In the left valve, the cardinal complex consists of an anterior strong deltoid bifid tooth with subequal lobes and of a posterior weak, very long and thin laminate tooth; anterior lateral tooth distal and very weak; posterior lateral tooth distal, poorly developed, but stronger than the anterior lateral tooth. In the right valve, the cardinal complex consists of a posterior strong bifid tooth with subequal lobes and of an anterior thickened laminate tooth; the anterior lateral tooth distal, elongate and strong; the posterior lateral tooth distal and smaller than the anterior lateral; both lateral teeth socketed. Adductor muscle scars rather poorly impressed. Anterior adductor scar elongate, narrow and rounded below; posterior adductor rounded. Pallial sinus equal in both valves, slightly convex above and falling in a sharp arcuation to the pallial line. The pallial sinus is widely separated from the anterior adductor scar. The shell is polished and white, covered externally by a yellowish brown periostracum, which shows darker concentric bands. Internal surface white, polished and shining.

length	height	width	
27.0 mm.	13.0 mm.	5.5 mm.	Holotype of <i>iheringi</i> Dall
35.5	17.5	8.0	Punta Norte, Golfo San Matias
31.5	14.0	6.5	Punta Bermeja, Golfo San Matias
24.4	11.3	4.2	Montevideo, Uruguay

Remarks. *Tellina iheringi* is allied to *Tellina petitiana* and both of these species are more or less restricted to the continental slope fauna of southeastern South America. The close relationship of these species is expressed in a similarity of general characteristics. *Tellina iheringi* is more tumid or inflated than *T. petitiana*. There is a difference in the basic proportions of the shells and this is most easily discerned in the nature of the posterior dorsal slope. In *petitiana*, this margin drops off very sharply from the umbonal area whereas in *iheringi* there is only a gentle inclination with little indication of concavity. The valve thickness of *iheringi* is greater and the periostracum is of a yellowish brown coloration in contrast to the gray-green color exhibited by *petitiana*.

Range. This species is more or less restricted to the coast of Argentina at depths between 7 and 30 fathoms in sandy substrate; its northernmost record is off Montevideo, Uruguay and its southernmost, off Punta Bermeja, Argentina.

Specimens examined. URUGUAY: *Hassler* station, 8 miles SE of Montevideo (31°12' S; 55°30' W) in 7 fathoms (MCZ). ARGENTINA: *Albatross I* station 2764, 19 miles NE of Punta Mendanos (36°42' S; 56°23' W), in 11.5 fathoms; *Albatross I* station 2765, 18 miles NE of Punta Mendanos (36°43' S; 56°23' W), in 10.5 fathoms (both USNM); *Hassler* station, 17 miles NNE of Punta Rasa (40°22' S; 60°35' W), in 30 fathoms; *Hassler* station, off Bahia Rosas, Golfo San Matias (41°15' S; 63°50' W), in 25 fathoms;

Hassler station, off Punta Bermeja, Golfo San Matias (41°17' S; 63°00' W), in 17 fathoms (all MCZ).

***Tellina (Tellina) petitiana* d'Orbigny**

Plate 130, fig. 3; Plate 132

Tellina petitiana d'Orbigny 1846, Voyage Amer. Cent., p. 537, n. 540, pl. 81, figs. 26-27 (au large du cap Saint-Thomé, sur la côte du Brésil) [holotype, BMNH, no. 54.12.4.696].

Tellina petitiana d'Orbigny. Smith 1915, Terra Nova Reports, Mollusca, Pt. 1, p. 101.

Description. Shell extending to 45 mm. (about $1\frac{3}{4}$ inches) in length and to 23 mm. (about 1 inch in height, elongate, lanceolate posteriorly, thin, fragile, compressed, with the right valve slightly more convex than the left and with a weak posterior flexure to the right. Umbos central and pointed. Anterior margin broadly rounded; ventral mar-

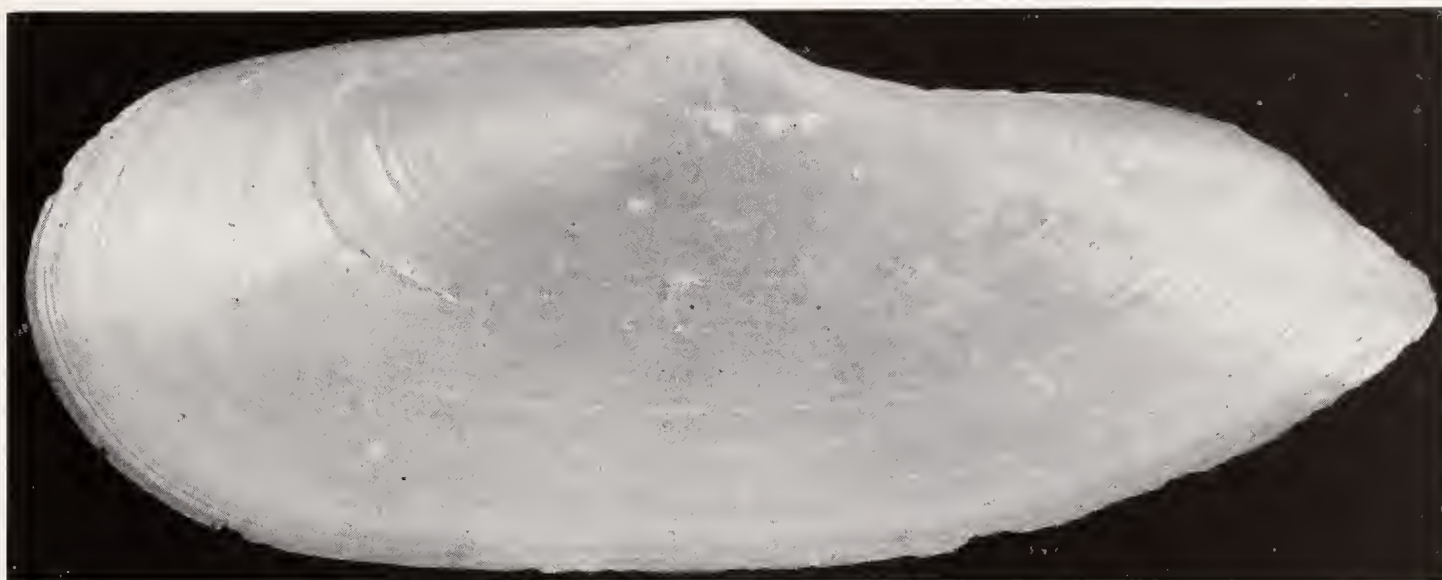


Plate 132. *Tellina petitiana* d'Orbigny, external view of the left valve of the holotype, São Tomé, Brasil, BMNH (about 3.8x) [L=38 mm.].

gin straight and rising in a postbasal arcuation; anterior dorsal margin long and slightly convex; posterior dorsal margin long and gently sloping. Sculpture consisting of closely set, weak concentric lirations; radial sculpture consisting of extremely fine vermiculations on the disc which broaden peripherally. Posterior ridge and sulcus present. Ligament dark brown and not protuberant. Calcareous element of the ligament not strongly developed and subtended by very weak nymphal callosities. In the left valve, the cardinal complex consists of an anterior deltoid bifid tooth with subequal lobes and of a posterior elongate, laminate tooth; anterior and posterior lateral teeth absent or obsolete, consisting of distal thickening of the hinge plate. In the right valve, the cardinal complex consists of a posterior subdeltoid bifid tooth whose anterior lobe is larger and of an anterior, divergent thickened laminate tooth; anterior lateral tooth subproximal, long, thin and rather fragile; the posterior lateral tooth distal and elongate; both laterals socketed. Adductor muscle scars moderately well impressed. The anterior adductor somewhat elongate but rounded below; the posterior adductor irregularly rounded. Pallial sinus equal in both valves, rising only slightly above the base of the posterior adductor, irregularly flattened above and descending in a smooth broad arcuation to the pallial line. The pallial sinus is widely removed from the anterior adductor scar. Shell

predominantly white, covered by a thin olivaceous periostracum which often adheres peripherally; rarely iridescent. Internally, white, shining, but not polished.

length	height	width	
38.0 mm.	14.8 mm.	2.3 mm.	Holotype of <i>petitiana</i> d'Orb.
45.0	23.0	7.0	San Antonio, Argentina
28.5	11.5	3.5	La Paloma Rocha, Uruguay
12.0	6.0	—	off Montevideo, Uruguay

Remarks. *Tellina petitiana* appears to be most closely related to *Tellina iheringi*; both species inhabit a similar area off the coast of southern South America. From *iheringi*, *petitiana* may be distinguished by its thinner and more fragile shell, its lateral compression and its predominantly gray-green periostracum. The posterior dorsal slope in *petitiana* falls sharply from the umbonal region and is more convex and longer than the same margin in *iheringi*. In addition, the posterior slope of *petitiana* is demarcated by a superficial ridge or a number of ridges.

It may appear that the relationship of this species with other members of the subgenus *Tellina* is somewhat distant, because the shell lacks the bright coloration and thickness so typical of *Tellina radiata*; however, the smoothness of the sculpture, the configuration of the pallial sinus and the position of the right lateral dentition serve to justify its subgeneric placement.

Range. The northernmost record is the type locality at Cape São Tomé, in Estado do Rio de Janeiro, Brasil; the species ranges south from this locality to the Golfo de San Matias in Argentina. Depth records show that this species occurs between seven and forty fathoms.

Specimens examined. BRASIL: São Tomé (BMNH); Rio de Janeiro (E. A. Smith). URUGUAY: La Paloma Rocha (E. Duarte); *Hassler* station, 8 miles SE of Montevideo (31°12' S; 55°30' W), in 7 fathoms (MCZ). ARGENTINA: *Hassler* station, Port San Antonio, Golfo San Matias; *Hassler* station, off Bahia Rosas, Golfo San Matias (41°15' S; 63°50' W), in 25 fathoms (both MCZ).

Subgenus *Tellinella* Mörch

Tellinella Mörch 1853, *Catalogus Conchyliorum Comes di Yoldi*, 2: 13 (type species, *Tellina virgata* Linnaeus 1758, subsequent designation, Stoliczka 1870, p. 116¹).

Telinella Mörch. H. and A. Adams 1856, *Genera Recent Mollusca*, 2: 394, error for *Tellinella*.

Eutellina Fischer 1887, *Manuel de Conchyliologie*, p. 1147 (type species, *Tellina virgata* Linnaeus 1758, original designation).

Tellinarius 'Froriep' Salisbury 1934, *Proc. Mal. Soc. London*, 21: 78 and 90 (type species, *Tellina virgata* Linnaeus 1758, original designation), *non* Dumeril 1806.

Description. Shell medium to large size, ovate, elongate or elliptical in outline, solid to subsolid, generally equivalve and nearly equilateral, more or less flexed to the right posteriorly. Concentric sculpture developed, strong and often squamose posteriorly; radial sculpture rare. Lateral dentition developed in both valves. In the right valve,

¹The type species is not *Tellina antonii* Philippi as indicated by Salisbury (1934), for Mörch did not cite any type species in his use of the name *Tellinella*; the first known designation was made by Stoliczka.

both lateral teeth are distal to the cardinal complex and strongly developed. In the left valve, both lateral teeth are distal to the cardinal complex and moderately developed. Ligament generally strong with subtending nymphal callosities. Pallial sinus linguiform and removed from the anterior adductor muscle scar; confluences of the pallial sinus and pallial line short and limited to the posterior half of the shell.

The subgenus is particularly well represented in the Indo-Pacific where the type, *Tellina virgata* Linnaeus, appears to be widespread. The subgenus is tropical to subtropical in its distribution with a single representative in the Western Atlantic and two species in the Eastern Pacific. Stoliczka (1870) has documented the occurrence of the group in the Cretaceous of India. The subgenus also appears to be well established in the Eocene of Europe and North America.

***Tellina (Tellinella) listeri* Röding**
Plate 133, figs. 1-3; Plate 134, fig. 1

Tellina listeri Röding 1798, Museum Boltenianum, p. 185 (West Indies) [type locality, here restricted, St. Kitts; types not seen], *non* Hanley 1844.

Tellina interrupta Wood 1815, General Conchology, p. 146, pl. 36, fig. 3 (Indian and American Seas) [type locality, here restricted, St. Kitts; types lost].

Tellina maculosa Lamarck 1818, Animaux s. Vertèbres, 5: 521 (Indian Seas) [type locality, here restricted, St. Kitts; syntypes, Museum d'Histoire Naturelle, Geneva].

Tellina mexicana Petit 1841, Revue Zoologique, Société Cuvier, 4: 183 (coast of Mexico at Veracruz) [syntypes, Museum d'Histoire Naturelle, Paris].

Tellina (Tellinella) listeri Röding. Mörch 1853, Catalogus Conchyliorum Comes di Yoldi, 2: 13.

Tellina antoni 'Philippi' Krebs 1864, The West-Indian Marine Shells, p. 100, *antoni* *non* Philippi 1844.

Tellina (Tellina) interrupta Wood. Dall 1900, Proc. U.S. Nat. Mus., 23: 293.

Description. Shell extending to 79 mm. (about $2\frac{3}{4}$ inches) in length to about 41 mm. (about $1\frac{1}{2}$ inches) in height, elongate, solid, somewhat inflated with the left valve slightly more convex and with a very sharp posterior flexure to the right. Umbos central and pointed. Anterior margin narrowly rounded; ventral margin broadly arcuate; anterior dorsal margin long and gently sloping; posterior dorsal margin elongate and straight; posterior margin irregular, divided into two short portions which are more or less oblique to the dorso-ventral axis. Sculpture consisting of strong concentric ridges, separated by well incised sulci; the concentric ridges are stronger along the posterior slope. Rarely radial lirations occur and form a cancellate pattern. Two strong posterior ridges extend from the umbo to the posterior margin in the right valve. Ligament dark brown, strong and protuberant. Calcareous portion of the ligament subtended by thickened nymphal callosities. In the left valve, the cardinal complex consists of an anterior strong bifid tooth with subequal lobes and of a posterior thin laminate tooth; anterior and posterior lateral teeth rather small and equidistant from the cardinal complex. In the right valve, the cardinal complex consists of a posterior strong slightly skewed bifid tooth whose anterior lobe is the larger and of an anterior slightly thickened laminate tooth; the anterior and posterior lateral teeth distal, well developed and socketed above. Adductor muscle scars well impressed. Posterior adductor scar subquadrate; anterior adductor scar subovate. Pallial sinus rising gently posteriorly, broadly convex above, extending toward the anterior adductor muscle scar but well separated from it; the sinus falls obliquely to the pallial line and the confluence is short; a small linear scar often unites the pallial

sinus and the anterior adductor scar. Externally, the shell is white to purplish, rarely suffused with yellow and vermiculated with chevrons of purple or brown. Internally, the shell is shining but not polished, white, rarely purple and often suffused centrally with yellow.

length	height	width	
79 mm.	41 mm.	22 mm.	Cayo Frances, Caibarién, Cuba
66	36	18	Cat Island, Bahama Islands
53	27	13	Lake Worth, Florida
14	6	4	Anegada Island, Virgin Islands

Remarks. Variation in *Tellina listeri* is considerable and accounts for the lengthy synonymy. The proportions of individuals vary greatly. Small, immature or young individuals tend to be more narrowly elongate than adults. There is evidence for allometric differences where young stages are of a lower height-length ratio than adults. The strength of both concentric and radial sculpture is also variable. Individuals with strong

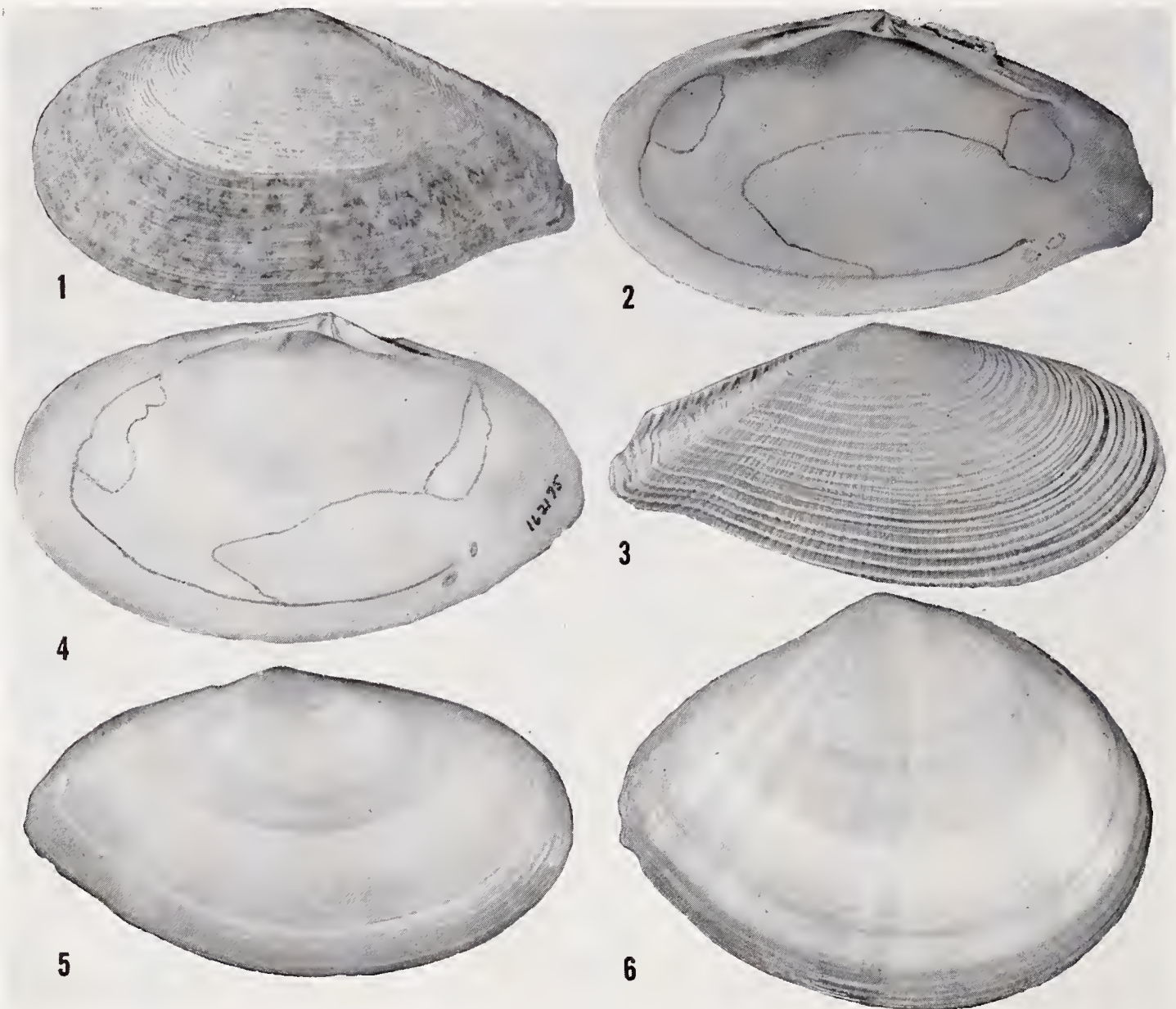


Plate 133. Figs. 1-3. *Tellina listeri* Röding. Fig. 1. External view of the left valve. Fig. 2. Internal view of the right valve, Jamaica, MCZ 155663 (about 1.3x) [L=56 mm.]. Fig. 3. External view of the right valve, Sanibel Island, Florida, MCZ 13503 (about 2x) [L=37 mm.]. Figs. 4-5. *Tellina magna* Spengler. Fig. 4. Internal view of the right valve. Fig. 5. External view of the right valve, Pass-a-grille Beach, Florida (about 0.8x) [L=86 mm.]. Fig. 6. *Tellina laevigata* Linnaeus, external view of the right valve, Abbott's Cliff, Bermuda, MCZ 218421 (about 1.3x) [L=53 mm.].

concentric lamellae may possess only weakly developed radial lirations whereas some specimens have strong sculpture of both the radial and concentric types. Radial sculpture may be developed posteriorly more than it is anteriorly. The color of *listeri* is its most variable characteristic. Pure white individuals are less rare than pure purple specimens. In general, the external surface of the valves is colored with purple or brown. Internally the valves are generally white with a suffusion of yellow; however, individuals with dark purple interiors also occur.

Tellina listeri is very closely related to *Tellina cumingii* Hanley of the Eastern Pacific. The differences between *listeri* and *cumingii* are often matters of degree wherein some individuals of either species remain virtually indistinguishable. In general, populations of *listeri* have more individuals which have higher and larger shells and fewer individuals with serrated or squamous posterior ridges. In *cumingii*, the shell tends to be narrowly elongate and most specimens are rayed with purple. True *Tellina antonii* is a close relative of *T. listeri* and has been reported from St. Helena by Smith (1890), but specimens of this species though very close to *T. listeri*, appear to be predominantly purple in color.

The precursors of *Tellina listeri* first appear in the Eocene of Vicksburg, Alabama. Dall (1900b), Mansfield (1938) and Gardner (1928) have described related forms from the Oligocene and Miocene of Florida. Olsson and Harbison (1953) have recorded the occurrence of the *T. mexicana* from the Pliocene of Florida, and *T. listeri* has been found in Pleistocene strata in Cuba, Grand Cayman Island, and Brasil.

Tellina listeri appears to be characteristic of offshore, coarse sandy substrates. The species lives in depths from one to fifty fathoms and Abbott (1958) found the species limited to sand substrates between six and forty-eight feet in Grand Cayman.

Range. *Tellina listeri* occurs from Cape Lookout, North Carolina and Bermuda through the Bahamas, the Antilles, the Gulf of Mexico and Caribbean Sea to off the coast of Brasil in the vicinity of Bahia.

Specimens examined. NORTH CAROLINA: *Albatross I* station 2607, 18 miles E of Cape Lookout (34°38' N; 76°12' W), in 18 fathoms; *Albatross I* station 2608, 17 miles ESE of Cape Lookout (34°32' N; 76°12' W), in 22 fathoms; *Albatross I* station 2610, 27 miles SE of Cape Lookout (34°20' N; 76°12' W), in 22 fathoms; *Albatross I* station 2616, 25 miles SE of Cape Fear (33°42' N; 71°31' W), in 17 fathoms; *Albatross I* station 2617, 25 miles SE of Cape Fear (33°37' N; 77°36' W), in 14 fathoms; *Albatross I* station 2615, 31 miles ESE of Cape Fear (33°45' N; 77°25' W), in 18 fathoms; *Albatross I* station 2619, 37 miles SE of Cape Fear (33°38' N; 77°36' W), in 15 fathoms; *Fish Hawk* station 7965, 22 miles SSE of New River Inlet (34°14' N; 77°05' W), in 14.5 fathoms (all USNM). GEORGIA: *Pelican* station 178-14, 63 miles E of Altamaha Island (USNM). FLORIDA: *Pelican* station 172-4, 23 miles NE of New Smyrna, in 14 fathoms; *Pelican* station 172-3, 17 miles E of Daytona Beach (both USNM); South Inlet, Lake Worth in 2-3 fathoms; off Palm Beach in 130 fathoms (both MCZ); off Miami in 6-30 fathoms; Hawk Channel, in 3-4 fathoms; off Fowey Light in 6-45 fathoms; off Long Reef in 38 fathoms (all USNM); off Carysfort Reef, Key Largo in 66-117 fathoms (MCZ); Pepper Fish Key in 9 fathoms (USNM); Grassy Key (ANSP); Key Vaca; Sombrero Key; Looe Key; Boca Chica Key (all MCZ); Key West; Tortugas (both USNM); Naples; Sanibel; Boca Grande, Gasparilla Island (all ANSP); off

Longboat Pass (USNM); Egmont Key; Clearwater Harbor; Madeira Beach Treasure Island (all ANSP); off Anclote Key (USNM); Fort Walton (ANSP); Destin (ANSP; MCZ). MEXICO: Veracruz; Isla del Carmen, Campeche; Isla Mujeres, Yucatan (all MCZ). BRITISH HONDURAS: Belize (MCZ). NICARAGUA: (ANSP). PANAMA: off Panama City (USNM). BERMUDA: Castle Harbor (MCZ); Truck Island, Harrington Sound (USNM); Grace Island (ANSP). BAHAMA ISLANDS: West End, Wood Cay, Hawksbill Creek and Holmes Cay, Grand Bahama Island (all MCZ); Marsh Harbour and Sandy Point, Great Abaco; North and South Bimini Islands; Adelaide, Dick's Point and Foxhill, New Providence; off Mintie Bar, SE of South Bight, Andros; Governor's Harbour and Tarpum Bay, Eleuthera; Arthurstown and Orange Creek, Cat Island; Little San Salvador (all MCZ); Rum Cay (USNM); Clarence Town, Cape St. Maria, and Simms, Long Island (all MCZ); NE Point and Abraham's Bay. Mari-guana (both MCZ); Matthew Town, Alfred Island, and Mangle Bush, Great Inagua (all MCZ); Lobos Island (USNM). CUBA: *Barrera* station 224, Cape San Antonio; *Barrera* station 211, Cape Cajon; *Barrera* station 209, Santa Rosa, in 3-6 fathoms; *Barrera* station 218, Cayo Hutia Reef; *Barrera* station 208, Bahía Honda, in 1-12 fathoms; *Barrera* station 202, Cabanas Harbor, in 25 fathoms (all USNM); La Chorrera, Habana (USNM; MCZ); Veradero Beach, Matanzas (USNM; MCZ); Cayo Cruz, Cayo Bupas, and Comacho Beach, Cardenas (all CNM); Punta de los Colorados, Cienfuegos Bay; Cayo Frances, Caibarién; Leeward Point and Fish Point, Guantánamo (all MCZ). JAMAICA: Montego (USNM); St. Anne's (MCZ); Spanish Point, Pembroke Parish; Great Pedro Bay; Caymanas; Carlisle Bay, in 6 fathoms (all USNM).

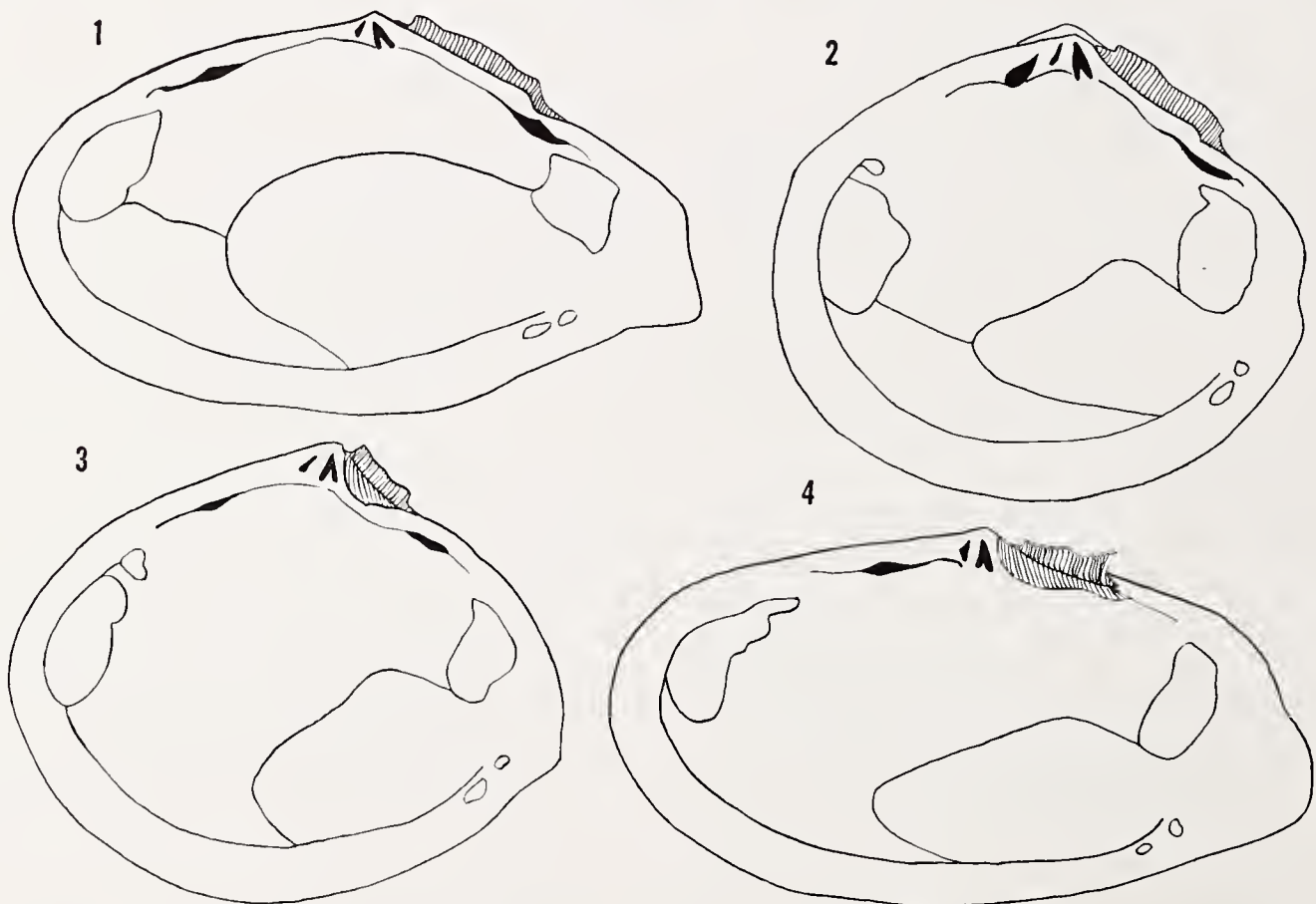


Plate 134. Figs. 1-4. Diagrammatic illustration of the internal surface of the right valve showing the dental configuration and muscle scars. Fig. 1. *Tellina listeri* Röding (about 1.2x) [L=60 mm.]. Fig. 2. *Tellina fuusta* Pulteney (about 1.2x) [L=66 mm.]. Fig. 3. *Tellina laevigata* Linnaeus (about 1.3x) [L=45 mm.]. Fig. 4. *Tellina magna* Spengler (about 1.2x) [L=60 mm.].

(all MCZ). VIRGIN ISLANDS: Anegada Island, in 4–20 feet (ANSP); Virgin Gorda; Marine Cay, Tortola; White Bay and Monkey Point, Guana; St. Thomas; Altona, Lagoon, St. Croix (all MCZ). LESSER ANTILLES: St. Kitts (MCZ); St. Lucia, in 10 HISPANIOLA. HAITI: Baie des Flamands; Jérémie (both USNM); Miragoane (MCZ); SANTO DOMINGO: Siete Hermanos (USNM); Puerto Sosua; Monte Cristi; Puerto Plata fathoms; St. Vincent; Guadeloupe; Barbados (all USNM); Carriacou Island, Grenadines; Pigeon Point, Tobago (both MCZ). CARIBBEAN ISLANDS: Georgetown Harbor, Frank Sound Reef and Palmetto Point, Grand Cayman (all ANSP); Swan Island (MCZ). COLOMBIA: Covenas, off Bolivar; Cartagena; Santa Marta (all USNM). VENEZUELA: El Roque Island; Aruba Beach (both USNM). BRASIL: 150 miles NE of Bahia (MCZ).

Subgenus *Laciolina Iredale*

Scrobiculina Dall 1900, Proc. U.S. Nat. Mus., 23: 290 (type species, *Scrobicularia viridotincta* 'Carpenter' Dall, *non* Carpenter 1864, original designation).¹

Laciolina Iredale 1937, Australian Zoologist, 8(4): 241 (type species, *Tellina quoyi* Sowerby 1868, original designation).

Description. Shell medium to large in size, ovate to elliptical in shape, subsolid to solid, left valve somewhat inflated and with a flexure to the right posteriorly. Sculpture more or less smooth. Ligament of variable strength but with a strong thickened calcareous element subtended by a flattened nymphal callosity. Lateral teeth variously developed. In the right valve, both a subproximal anterior and a distal posterior lateral tooth present. In the left valve, the subproximal anterior lateral tooth developed; posterior lateral tooth developed or obsolete; rarely both laterals weak. Pallial sinus linguiform, pointed or rounded anteriorly and well separated from the anterior adductor muscle scar. Confluence of the pallial sinus with the pallial line limited to the posterior quarter of the valve.

The members of *Laciolina* tend to be rather large shelled and are therefore conspicuous. By and large, their simplest characterization rests in the structure of the ligament which possesses a typically thickened calcareous element. This internal portion of the ligament is greater in dorso-ventral proportion nearer the umbo and tapers posteriorly to the end of the nymph (see Plate 134, figs. 3–4). *Laciolina* has representatives in the tropical seas of the world, but it has not been discovered in the fossil record in the Western Atlantic.

KEY TO THE SPECIES OF *LACIOLINA* IN THE WESTERN ATLANTIC

1. Shell suborbicular; right posterior lateral dentition developed *laevigata*
Shell elongate-elliptical; right posterior lateral dentition obsolete *magna*

Tellina (Laciolina) laevigata Linnaeus

Plate 133, fig. 6; Plate 134, fig. 3

Tellina laevigata Linnaeus 1758, Systema Naturae, Ed. 10, p. 675 (In O Europaeo et Indico) [type locality, here restricted, Harrington Sound, Bermuda; type specimens, Collection of Linnean Society, London].

¹*Scrobularia viridotincta* Carpenter is macomoid in its morphological features. Dall's *Scrobiculina* has been given the rank of a junior synonym of *Psammotreta* (See Boss, 1964, The Veliger, 6(4): 208–210).

Tellina concinna Philippi 1844, *Abbildungen und Beschreibungen Conchylier*, 1: p. 11, *Tellina*, pl. 2, fig. 1 (no locality) [type locality, here restricted, Harrington Sound, Bermuda; types not seen], *non concinna* Edwards 1847.

Tellina laevis 'Chemnitz' Krebs 1864, *The West Indian Marine Shells*, p. 102.

Tellina bayleana Bertin 1876, *Nouv. Arch. Mus.*, Paris, 2 ser., 1: 256, pl. 8, figs. 3a-b (Guadeloupe) [type specimens, L'Ecole des Mines, Paris].

Tellina (Tellina) laevigata Linnaeus. Dall 1900, *Proc. U.S. Nat. Mus.*, 23: 293.

Tellina laevigata stella Davis 1904, *Nautilus*, 17(11): 128, pl. 4, fig. 2 (Flatt's Inlet, Bermuda) [syntypes, ANSP, nos. 86921 and 109554].

Description. Shell reaching 94 mm. (about $3\frac{3}{4}$ inches) in length and 78 mm. (about 3 inches) in height, suborbicular, with a rather sharp posterior flexure to the right posteriorly. Valves thin, nearly fragile in young specimens. Umbos subcentral, elevated and pointed. Anterior margin broadly rounded; ventral margin with a postbasal arcuation; anterior dorsal margin gently sloping; posterior dorsal margin descending steeply; posterior margin nearly straight and forming a characteristic truncation. Sculpture consisting of regular concentric lines of growth which become heavy and coarse peripherally; radial lirations often present. Ligament dark brown to black and sunken. Calcareous portion of the ligament rather thick and supported by a nymphal callosity. In the left valve, the cardinal complex consists of an anterior elongate strong bifid tooth with the anterior lobe being much the larger, and of a posterior elongate laminate tooth; anterior lateral tooth weak and closer to the cardinal complex than the posterior tooth which is distal and well developed. In the right valve, the cardinal complex consists of a posterior thin bifid tooth with subequal lobes and of an anterior weak laminate tooth; the posterior lateral tooth is weaker and further removed from the cardinal complex than the strong, somewhat proximal anterior lateral tooth. Adductor muscle scars well impressed. Anterior and posterior adductor scars subequal and of a similar shape. Pallial sinus short, widely separated from the anterior adductor scar, rising only slightly and descending gently to a point more or less beneath the anterior lateral tooth where it falls abruptly to the pallial line; confluence short. Externally the shell is predominantly white in color but traces of yellow, fleshy-pink, orange and red are often evident either in a suffused or radial pattern.

length	height	width	
94 mm.	78 mm.	—	Bermuda
72	55	19 mm.	Lake Worth, Florida
57	40	14	Grand Bahama, Bahama Islands
57	45	16	Harrington Sound, Bermuda
43	34	12	St. Croix, Virgin Islands

Remarks. Among the characters of this species, none is as variable as the color and the pattern of color exhibited externally. The synonyms of *laevigata* have all been established on the basis of color. Some individuals are pure white, cream-yellow, or suffused with orange; others possess a peripheral band of similar colors while still others are variously rayed with orange, pink or red.

Tellina magna Spengler has been placed with *T. laevigata* in *Laciolina* because of the great similarity in the shape of the pallial sinus, the formation of the hinge and ligamental mechanisms and the disposition of the right anterior lateral tooth. From *magna*, *laevigata* is immediately separated by its orbicular shape, the radial dispensation of its coloration and the presence of a developed right posterior lateral tooth.

In the Eastern Pacific, *Tellina ochracea* Carpenter [= *viridotincta* of authors] is the nearest relative to *laevigata*; it is immediately separated by its distinctly thinner shell, and different coloration and proportions. *Tellina chloroleuca* Lamarck from the Philippines is closely related but is differentiated by its thinner shell, more elongate form, red umbos and somewhat sharper posterior flexure.

The fossil record of *Tellina laevigata* is not documented. In habit, it prefers relatively shallow water from depths of two feet to six fathoms; the usual substrate seems to be sand.

Range. This species has been found as far north as Beaufort Harbor, North Carolina. It occurs in Bermuda, throughout the Bahama Islands, and on the west coast of Florida as far north as Tampa Bay; it ranges southward through the Antilles to Venezuela.

Specimens examined. NORTH CAROLINA: Beaufort Harbor (ANSP); *Albatross I* station 2597, 20 miles ESE of Cape Hatteras (34°57' N; 75°43' W), in 15 fathoms (USNM). FLORIDA: Lake Worth; Bird Key, Biscayne Bay; Hawk Channel; Caesar's Creek Bank; Turtle Harbor (all USNM); Key West (MCZ); Charlotte Harbor; Tampa Bay (both USNM). BERMUDA: St. George; Castle Harbour; Trunk Island; Long Bay, Warwick (all MCZ). BAHAMA ISLANDS: Grand Bahama; Long Island; Turks Island (all MCZ). CUBA: Cape Cajon; Santa Rosa; Esperanza; Havana (all USNM); Matanzas; Cayo Frances, Caibarien; Punta Alegre, Camagüey (all MCZ). VIRGIN ISLANDS: Anegada; St. Thomas; St. Croix (all ANSP). LESSER ANTILLES: Barbados; Tobago (both MCZ). CARIBBEAN ISLANDS: Grand Cayman (ANSP). VENEZUELA: La Guaira (USNM); *Atlantis* Cruise 240, 30 miles N of Cabo Cadera, in 150 fathoms (MCZ).

Tellina (Laciolina) magna Spengler

Plate 133, figs. 4-5; Plate 134, fig. 4

Tellina magna Spengler 1798, *Skrivter Naturhistorie-Selskabet*, 4(2): 76, p. 12, fig. 1 (Fra de Middelhavet) [type locality, here corrected and restricted, St. Croix, Virgin Islands; lectotype, here selected, Zoological Museum, Copenhagen].

Tellina acuta Wood 1815, *General Conchology*, p. 157, pl. 44, fig. 1 (West Indies) [type locality, here restricted, St. Croix, Virgin Islands; types not seen].

Tellina elliptica Lamarck 1818, *Animaux s. Vertèbres*, 5: 524 (provenance inconnue), [type locality, here restricted, St. Croix, Virgin Islands; holotype, Museum d'Histoire Naturelle, Paris], *non* Brocchi 1814, *nec* Sowerby 1867.

Tellina vitrea d'Orbigny 1842 [in] Sagra, *Hist. L'île Cuba, Atlas*, pl. 26, figs. 4-5; 1845, *Spanish Text*, 2(5): 304 (Guadeloupe); 1853, *French Text, Mollusques*, 2: 253 [holotype, BMNH, no. 54.10.4.510].

Tellina sol Hanley 1844, *Proc. Zool. Soc. London*, p. 142 (locality unknown) [type locality, here restricted, St. Croix, Virgin Islands; holotype, BMNH].

Phylloda sol Hanley. Bertin 1878. *Nouvelles Arch. Mus., Paris*, 2 ser., 1: 329.

Tellina (Angulus) magna Spengler. Dall 1900, *Proc. U.S. Nat. Mus.*, 23: 295.

Tellina (Scrobiculina) magna Spengler, Warmke and Abbott 1961, *Caribbean Sea Shells*, p. 194.

Description. Shell extending to 122 mm. (about 4¾ inches) in length and to 65 mm. (about 2½ inches) in height, laterally compressed, not tumid and valves uniformly thin. Umbos just posterior to the middle and not inflated. Anterior margin smoothly rounded; ventral margin arcuate; anterior and posterior dorsal margins gently sloping. Shell sculptured with regularly and closely spaced concentric lines of growth which are stronger on the left valve and with extremely fine radial lirations which are most evident on the anterior slope. Ligament light brown in color with an exceptionally thick calcareous por-

tion which is sunken. In the left valve, the cardinal complex consists of an anterior strong deltoid bifid tooth with subequal lobes and of a thin posterior laminate tooth; lateral teeth totally absent or obsolete; rarely there is a weak proximal anterior tubercle. In the right valve, the cardinal complex consists of an elongate posterior bifid tooth with subequal lobes and a variously developed anterior laminate tooth; anterior lateral tooth well developed, small and proximal; posterior lateral absent or represented by an obsolete distal tubercle. Adductor muscle scars fairly well impressed. The posterior adductor muscle scar long, narrow and crescent shaped; the anterior adductor scar irregular. Pallial sinus short, shallow and constricted; its dorsal margin extends little above the ventral borders of the adductor scars; it is far removed posteriorly from the anterior adductor and confluent with the pallial line for about one third of its length. The pallial line swings sharply upward posteriorly and its terminus is far removed from the posterior margin of the shell. Externally the color may be white or fleshy-pink; often concentric alterations of color are evident as well as yellowish or pinkish rays emanating from the umbos. The right valve tends to be more strongly colored. The umbos are generally a rich golden yellow, often tending toward red. Internally the shell is mostly white with some suffusion of yellow radiating from the umbo.

length	height	width	
91.0 mm.	51.9 mm.	17.0 mm.	Lectotype of <i>magna</i> Spengler
20.5	11.0	3.6	Holotype of <i>vitrea</i> d'Orb.
96.0	58.8	17.2	Holotype of <i>sol</i> Hanley
122.0	65.0	22.0	Pass-a-grille, Florida
82.0	48.0	13.0	Trinity Bay, Martinique
22.0	10.5	3.5	Great Inagua, Bahamas

Remarks. This is one of the largest if not the largest of Western Atlantic tellins. Among the variable characters possessed by the species, the color and its pattern of distribution seems to be the greatest. Generally the shell is white with umbonal concentrations of yellow, fleshy-pink, orange or red; however, these colors in some individuals permeate the whole shell while in others they are disposed in a radial pattern emanating from the umbo. The hinge of *magna* is deeply inset and its calcareous portion very well developed. In respect to this character, *magna* may be compared with *laevigata*, *oehraeea* of the Eastern Pacific and even *ehloroleuea* of the Indo-Pacific, but its total lack of true lateral hinge dentition save for the right anterior lateral tooth precludes a too closely assigned relationship with *laevigata*. Dall (1900a) included this species in his diagnosis of *Angulus* and went on to say that though the species attained a large size, it agreed with the characteristics of *Angulus*; however, the strong, inset ligament and the subproximal, but quite well removed, right anterior lateral are unlike other species of *Angulus* and the nature of these characters alone places this species with *Laciolina*.

Ardeamia columbiensis (Hanley) of the Eastern Pacific is very close to *Tellina magna* in all its characteristics except in the complete lack of lateral dentition. It is probable that the great similarity in shape as well as the similarity of the configuration of the pallial sinus and of the ligamental structure are convergent. *Tellina magna* lacks the greenish-gray periostracum of *Ardeamia*.

Range. In the north, this species is found in Bermuda throughout the Bahamas, on the east coast of Florida as far north as Lake Worth and on the west coast of Florida as far north as Fort Walton. It ranges south through the Antilles to Martinique.

Specimens examined. FLORIDA: Peanut Island, Lake Worth; Grassy Key (both ANSP); Big Pine Key; Western Dry Rocks; Tortugas; Captiva; Long Key; Anne Marie Key; Pass-a-grille Beach (all MCZ); Anclote Keys; Cedar Keys (both USNM); Fort Walton (ANSP). BERMUDA: Castle Harbor; Trunk Island (both MCZ). BAHAMA ISLANDS: Grand Bahama; South Bimini Island; New Providence; Long Island; Great Inagua Island (all MCZ). CUBA: Habana; Cardenas (CNM); Punta Alegre, Camagüey (MCZ). VIRGIN ISLANDS: St. John (IMBPR); St. Croix (ANSP). LESSER ANTILLES: Trinity Bay, Martinique (BMNH). CARIBBEAN ISLANDS: Georgetown, Grand Cayman (ANSP).

Subgenus *Arcopagia* Brown

Arcopagia Brown 1827, Illustrations Conch. Great Britain and Ireland, pl. 16, fig. 8 (type species, *Tellina crassa* Pennant 1776, subsequent designation, Hermannson 1846, p. 76).

Cyditippe Leach 1852, Synopsis Moll. Great Britain, p. 314 (type species, *Cyditippe listeriana* Leach [= *Tellina crassa* Pennant], monotype), non Escholtz 1821.

Description. Shell medium to large in size, ovate, solid, equivalve and more or less equilateral. Lateral dentition well developed. In the right valve, both lateral teeth distinct and strong; posterior lateral tooth distal to cardinal complex and anterior lateral tooth subproximal or distal to the cardinal complex. Pallial sinus of various configurations. In the type, it rises obliquely and descends to the terminus of the pallial line so that no confluence occurs; however, the pallial sinus may be confluent with the pallial line for nearly all its length. Sometimes a linear scar connects the anterior adductor muscle scar and the pallial sinus.

Arcopagia in its broad sense is herein treated as a subgenus whereas some authors have used it as a full genus and many workers have divided it into numerous sections. Some traits which typify the group are unstable and liable to alteration among related species; however, the orbicular shape and general thickness of the valves typify the group. The lateral dentition is stronger in the right valve than in the left, and the position of these teeth is variable although the posterior lateral tooth is nearly always distally removed from the cardinal complex. The left lateral dentition is characterized by the obsolescence of the distal posterior tooth and by a variable placement of the anterior tooth.

The subgenus may be traced back to the Cretaceous (Stoliczka, 1870). Numerous species have been described in Cenozoic deposits. For example, the group is well represented in the Eocene of the Paris Basin. In the Recent fauna, the group appears to be most highly concentrated in the Indo-Pacific. Most species seem to prefer a tropical habitat, but there are some exceptions, for some species are temperate or even boreal in their distribution.

Tellina (Arcopagia) fausta Pulteney

Plate 134, fig. 2; Plate 135, figs. 1-2

Tellina remies 'Linnaeus' Born 1870, Museum Caesarum Vindobonensis, p. 36, pl. 2, fig. 11.

Tellina fausta Pulteney 1799, Catalogues of Dorsetshire, p. 92; 1813, 2 ed., p. 30, pl. 5, fig. 5 (British shore, Dorsetshire) [type locality, here corrected and restricted, Kingston, Jamaica; types lost].

Tellina laevis Wood 1815, General Conchology, p. 181, pl. 37, fig. 1 (West Indies) [type locality, here restricted, Kingston, Jamaica; types not seen].

Tellina (Arcopagia) fausta Donovan. H. and A. Adams 1856, Genera Recent Mollusca, 2: 396.

Tellina elliptica Sowerby 1868, Conch., Icon., 17, *Tellina*, pl. 43, fig. 251 (locality unknown), [type lo-

cality, here restricted, Kingston, Jamaica; holotype, BMNH, no. 1900.3.19.6], *non* Sowerby 1867, *nec* Brown 1814, *nec* Lamarek 1818, *nec* Brown 1827.

Tellina ellipsis Sowerby 1869, *Ibid.*, Index.

Cyclotellina (Cyclotellina) fausta Pulteney. Thiele 1935, *Handbuch Weichtierkunde*, 2: 915.

Arcopagia fausta Pulteney, Warmke and Abbott 1961, *Caribbean Seashells*, p. 197, pl. 4, fig. 1.

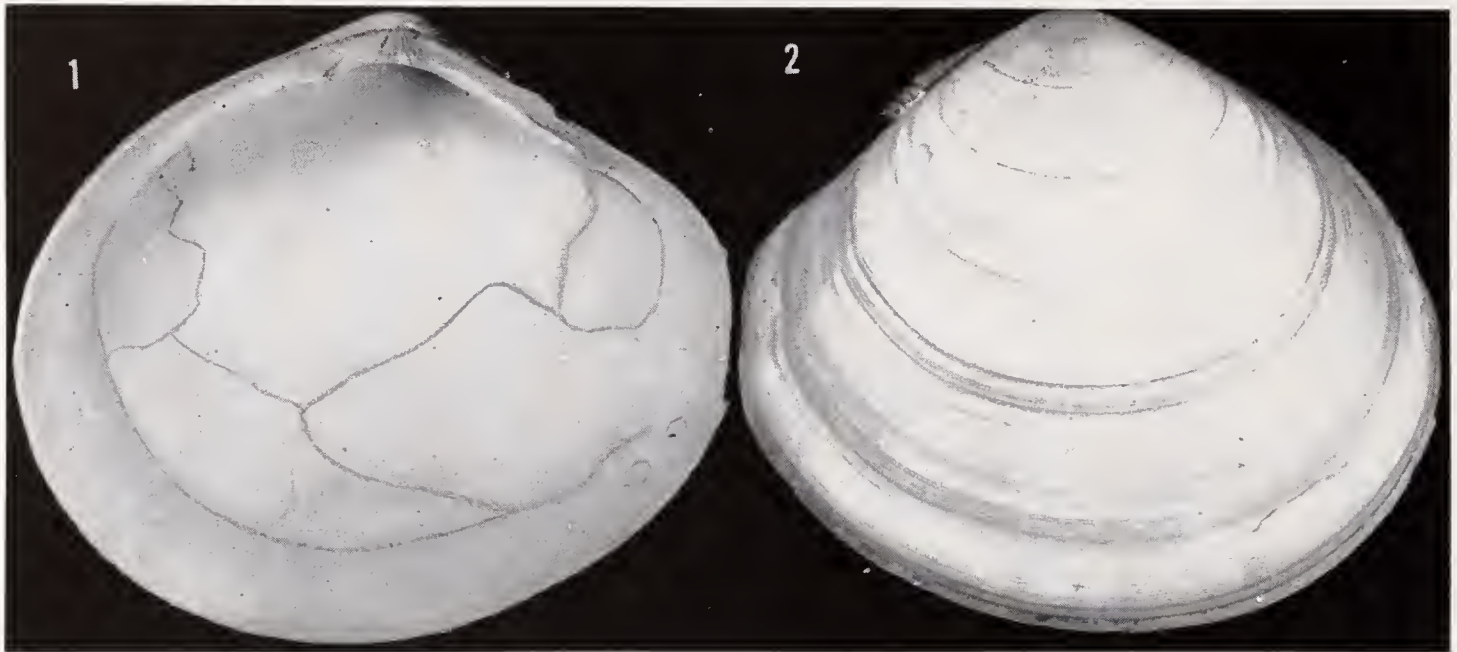


Plate 135. *Tellina fausta* Pulteney. Fig. 1. Internal view of the right valve, Biscayne Bay, Florida, MCZ 209049 (about 1.2x) [L=59 mm.]. Fig. 2. External view of the right valve, Tobago, West Indies, MCZ 143625 (about 1.1x) [L=64 mm.].

Description. Shell reaching 98 mm. (about 4 inches) in length and 90 mm. (about $3\frac{1}{2}$ inches) in height, suborbicular, solid and rather tumid. Umbos subcentral and somewhat inconspicuous. Anterior and ventral margins broadly rounded; anterior dorsal margin very gently sloping; posterior dorsal margin somewhat steep; posterior margin straight and forming a characteristic truncation. Sculpture consisting of somewhat irregularly spaced growth bands which have a tendency to become stronger on the anterior and posterior slope; an extremely fine, microscopic pattern of radial striae is evident. In the left valve, the cardinal complex consists of an anterior strong, slightly skewed bifid tooth and of a posterior thin, elongate laminate tooth; the anterior lateral tooth strong and proximal to the cardinal complex; the posterior lateral tooth distal and smaller than the anterior tooth. In the right valve, the cardinal complex consists of a posterior, skewed, strong bifid tooth and of an anterior elongate laminate tooth; the anterior lateral tooth proximally adjacent to the cardinal complex, protuberant and well developed. A strong internal rib extends radially from the umbo to the anterior adductor muscle scar. Ligament black or dark brown and protuberant. Calcareous element of the ligament subtended by a nymphal callosity. Adductor muscle scars well impressed. Anterior adductor scar large; posterior adductor scar irregularly oval. Pallial sinus not equal in opposite valves; pallial sinus in the left valve longer and closer to the anterior adductor scar than that of the right valve. The sinus rises sharply posteriorly but only for a short distance, then it descends gently anteriorly and falls to the pallial line far posteriorly; confluence short. Externally, the shell is usually a dull white. Internally polished and with traces of a pale yellow suffusion.

length	height	width	
26 mm.	20.8 mm.	9.5 mm.	Holotype of <i>elliptica</i> Sow.
98	90.0	40.0	New Providence, Bahamas
69	63.0	28.0	Punta Jorobado, Puerto Rico
30	26.0	12.0	Guantanamo, Cuba
17	8.0	6.0	Jamaica

Remarks. *Tellina fausta* is one of the largest of all Western Atlantic tellinids; it possesses the thickest, strongest and heaviest shell of all the species in that area and is quite distinguishable from all others on that basis alone. Its immediate ally and its closest relative, *Tellina remies* Linnaeus, occurs in the Indo-Pacific region. In *fausta*, the shell is more or less smooth whereas in *remies*, heavy, rounded, raised concentric sculpture is typical.

Dall (1900b, p. 1031) has documented the occurrence of *Tellina fausta* in the Pliocene marl of Caloosahatchie, Florida. He also listed a number of Eocene species from the Claibornian formation which may have some relationship with the ancestry of *fausta*.

In young individuals of *Tellina fausta*, the interior of the shell is often brightly colored with yellow and this coloration may show through externally. In adults, most of this external coloration is lost. There is present a brownish periostracum on living individuals.

Robertson (1961) has noted that *Tellina fausta* at Bimini lives in a coarse sand substrate at a depth of one foot, mostly among *Thalassia* rhizomes. Abbott (1958, p. 135) reported the occurrence of this species at Grand Cayman in water 4–6 feet deep over clear sand. The maximum depth record is 15 fathoms.

Range. This species is distributed from off the east coast of Florida near Lake Worth through the Florida Keys and the Bahamas, south to Tobago and the north coast of South America.

Specimens examined. NORTH CAROLINA: Cape Lookout (USNM). FLORIDA: Lake Worth (MCZ); Hillsboro Inlet (ANSP); Key Biscayne (CNM); Elliot's Key (MCZ); Rodriguez Island and Garden Cove, Key Largo (both ANSP); Grassy Key; Key Vaca; Bonfish Key; Boca Chica Key (all MCZ); Key West; Tortugas (both USNM). MEXICO: Veracruz; Isla del Carmen, Campeche (both MCZ). BRITISH HONDURAS: Belize (USNM; MCZ). HONDURAS: (BMNH). NICARAGUA: (ANSP). COSTA RICA: (ANSP). PANAMA: Mt. Hope (subfossil, ANSP); Brujas Point (MCZ); Cristobal; Colon; Fox River (all USNM). BERMUDA: Castle Harbor (subfossil, MCZ). BAHAMA ISLANDS: West End Point, Hawk's Bill Creek and Holmes Cay, Grand Bahama; Alicetown, North Bimini; Dick's Point, Nassau, New Providence; Eleuthera (all MCZ); Lisbon Creek Reef, Andros (USNM); Orange Creek and Little San Salvador, Cat Island (MCZ); Cockburn Town, Watlings Island; Exuma (both USNM); Long Island; Matthew Town, Great Inagua (both MCZ); Turks Island (USNM). CUBA: *Barrera* station 218, Cayo Hutia Reef; *Barrera* station 20, Santa Lucia, in 2–4 fathoms (both USNM); Jaimanitas, Habana (MCZ); Cayo Galendo, Cardenas Bay (ANSP); Cabanas Bay (USNM); Cayo Francés, Caibarien; Santa Maria Key, off Punta Alegre, Camagüey; Rancho Aluna, Cienfuegos Bay; Castillo de Jagua, Cienfuegos; mouth of Yateras River, Oriente; Guantánamo (all MCZ). JAMAICA: Green Island Harbour; Abingdon (both USNM); Montego (MCZ); Runaway Bay (USNM); Whitehouse Bay (MCZ); Ocho Rios; Port Maria; Jack's Bay; Robin's Bay; Harboreale, Annotta Bay; Port Antonio; Black River; Great Pedro Bay; Kingston; Buff Bay (all USNM); Pedro

Bank (MCZ); Port Royal; Palisadoes (both USNM). HISPANIOLA. HAITI: Cape Haitien (MCZ); Carpentier; Port au Prince (both USNM); Miragoane (MCZ); Jerémié; Baie Anglaise; Coteaux; Les Cayes (all USNM); Aquin (MCZ); Bizoton; Petit Groove; Saltrou (all USNM). SANTO DOMINGO: Siete Hermanos (USNM); Monte Cristi; Puerto Plata; Santa Bárbara de Samaná; Santo Domingo (all MCZ). PUERTO RICO: Mayaguez (MCZ); Porto Real (USNM); Cabo Rojo Light House (IMBPR); Ponce; Punta Jorobado; San Juan (all MCZ); Culebra Island (USNM); La Parquera (MCZ). VIRGIN ISLANDS: Loblolly Bay, Anegada (ANSP); Tortola (USNM); Monkey Point, Guana Island; Norman Island; St. Croix; St. Thomas (all MCZ). LESSER ANTILLES: Anguilla Island (BMNH); St. Martins (ANSP); Orange Bay, St. Eustatius Island (MCZ); St. Kitts (ANSP); Nevis Island (MCZ); Mill Reef Club, St. Philip, Antigua (MCZ); Falmouth Harbour, Antigua, in 3-6 fathoms (USNM); Guadeloupe; Martinique (BMNH); Villa, St. Vincent (USNM); Port Castries, St. Lucia (MCZ; USNM); Bathsheba and St. Lawrence, Barbados (both USNM); Maxwell's Coast, Barbados (MCZ); Grande Anse, Grenada (MCZ); Union, Admiralty Bay, Bequia Island and Carriacou Island, The Grenadines (both MCZ); Pigeon Point, Tobago (MCZ). CARIBBEAN ISLANDS: Gun Bay, Grand Cayman Island (ANSP); Swan Islands (USNM; MCZ); Aruba (USNM). COLOMBIA: Cartagena Bay (USNM; MCZ); Puerto Colombia (USNM). VENEZUELA: La Guaira (USNM).

Subgenus *Phyllodina* Dall

Phyllodina Dall 1900, Proc. U.S. Nat. Mus., 23: 290 (type species, *Tellina squamifera* Deshayes 1855, original designation).

Description. Shell of small and medium size, elongate-elliptical, mostly equilateral and equivalve. Umbo pointed, central to subcentral. Sculpture primarily concentric and sometimes differentiated posteriorly in the weakly flexed rostral area. Ligament short and somewhat sunken. Lateral dentition of right valve consisting of developed anterior and posterior lateral teeth distally placed in relation to the cardinal complex. Pallial sinus rising obliquely and falling obliquely to the pallial line; confluence short, limited to the posterior quarter of the ventral length of the pallial line. The pallial sinus is connected to the anterior adductor muscle scar by a linear scar.

The taxon *Phyllodina* of Dall forms a more or less natural group characterized by an obliquely rising, dorsally flattened, narrow and short pallial sinus which is connected with the anterior adductor scar by means of a single linear scar. The particular shape of the shell, being more or less elongate but not ovate, and the distinctive concentric sculpture circumscribe the whole group.

Phyllodina has representatives in the Miocene of North America and possessed a more northerly distribution during the Tertiary. It is represented by two species in the Eastern Pacific and two in the Western Atlantic, and there also are some Indo-Pacific representatives.

KEY TO SPECIES OF *PHYLLODINA* IN THE WESTERN ATLANTIC

1. Shell with spinose sculptural foliation along the posterior slope . . . *squamifera*
 Shell without spinosities posteriorly *persica*

Tellina (Phyllodina) squamifera Deshayes
 Plate 136, fig. 1; Plate 137, fig. 1; Plate 140, fig. 3

Tellina squamifera Deshayes 1855. Proc. Zool. Soc. London, 22: 365 (Chinese Seas) [type locality, here corrected and restricted, off Miami Beach, Florida; holotype, BMNH].

Tellina (Arcopagia; Phyllodina) squamifera Deshayes. Dall 1900, Proc. U.S. Nat. Mus., 23: 290.

Phylloda (Phyllodina) squamifera Deshayes. Thiele 1935, Handbuch Weichtierkunde, 2: 918.

Phyllodina squamifera Deshayes. Olsson 1961, Panamic-Pacific Pelecypoda, p. 397.

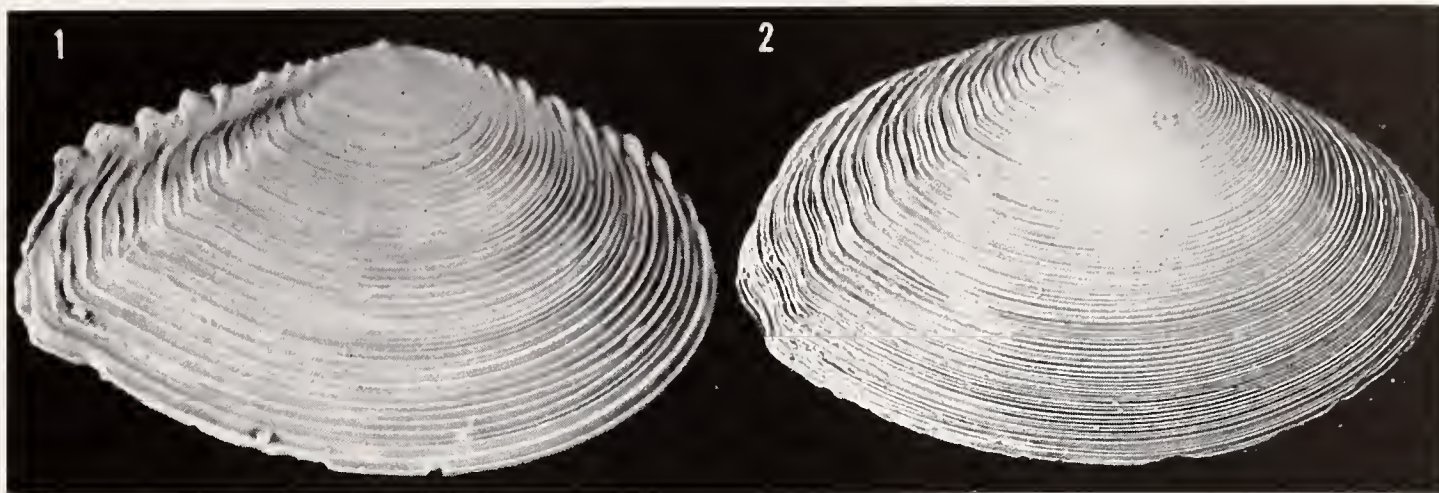


Plate 136. Fig. 1. *Tellina squamifera* Deshayes, external view of the right valve, off Sombrero Key, Florida MCZ 168730 (about 5x) [L=15.5 mm.]. Fig. 2. *Tellina persica* Dall and Simpson, external view of the right valve, Tobago, West Indies, MCZ 243066 (about 4.5x) [L=21.5 mm.].

Description. Shell extending to 26.8 mm. (about 1 inch) in length and to 16.4 mm. (about $\frac{1}{2}$ inch) in height, elongate, somewhat compressed with the left valve markedly more convex and with a strong flexure to the right posteriorly. Umbos small and pointed. Anterior margin smoothly and somewhat narrowly rounded; ventral margin convex, rising slightly posteriorly; anterior and posterior dorsal margins straight, subequal and gently sloping; posterior margin more or less straight, and forming an oblique truncation. Sculpture consisting of rather evenly spaced, slightly raised ribs separated by broad depressed bands; radial sculpture lacking. Strong posterior ridge developed in the right valve; concentric sculpture strongest on the posterior slope. The raised concentric ribs extend beyond the dorsal margin of the valve to form trigonal foliations which give the shell a serrate appearance. Ligament light to dark brown, short and protuberant. Calcareous element of the ligament subtended by a narrow, weak nymphal callosity. In the left valve, the cardinal complex consists of an anterior, elongate bifid tooth whose posterior lobe is the larger and of a posterior thin laminate tooth with a broadened base; anterior lateral tooth distal, weak and poorly developed; no true posterior lateral. In the right valve, the cardinal complex consists of a posterior strong subdeltoid bifid tooth with subequal lobes and of an anterior, thin, laminate tooth; anterior lateral distal, strong and well developed; posterior lateral distal, strong and well developed; the laterals are very long with grooves above. Adductor muscle scars poorly impressed. Pallial sinus rising obliquely, more or less flattened above and obliquely descending to the pallial line and uniting far posteriorly; it is connected to the anterior adductor scar by a short linear scar; confluence short. Externally the shell is white; internally, white suffused with yellow in the umbonal region and sometimes red or yellow on the posterior slope.

length	height	width	
20.8 mm.	12.0 mm.	4.7 mm.	Holotype of <i>squamifera</i> Deshayes
26.8	16.4	—	off Fowey Light, Florida
19.2	11.9	3.9	off Sombrero Key, Florida
11.7	6.9	2.3	off Miami, Florida
5.7	3.7	—	off Fowey Light, Florida

Remarks. This species may be at once separated from the nearest living ally in the Western Atlantic, *Tellina persica* Dall and Simpson, by its strong posterior dorsal foliations and its more coarse and raised concentric sculpture. In the Eastern Pacific, *squamifera* is most closely related to *T. pristiphora* Dall which is shorter and higher in the proportions of the shell. In addition, Dall has indicated that *pristiphora* is greenish whereas *squamifera* is usually white with suffusions of yellow and some red along the posterior slope. *Tellina leptalea* Gardner from the Shell Bluff, Shoal River formation of Florida is a Middle Miocene ancestor of *T. squamifera* and *T. dodona* Dall from the Miocene Oak Grove formation of Florida appears to be related to the lineage of both *T. squamifera* and *T. pristiphora*.

There is some variation in the thickness of the valves, especially in older individuals where the shell becomes quite solid. In some cases, the shell is less elongate than normal and it may become even somewhat subtrigonal. In immature stages, the shell has a slightly different form. The posterior truncation is broader, the shell tends to be vitreous, almost transparent, extremely fragile and thin, and the concentric growth lines are fewer, being wider and more undulate in immature specimens.

According to Parker (1960, p. 335), *Tellina squamifera* is a member of the 12–14 fathoms assemblage on sandy bottoms in the northern Gulf of Mexico,

Range. This species possesses a range which extends as far north as Cape Hatteras, North Carolina and south throughout the Florida Keys and Reefs, into the Gulf of Mexico and as far west as Texas and Mexico.

Specimens examined. NORTH CAROLINA: *Albatross I* station 2595, 22 miles ESE of Cape Hatteras (35°08' N; 75°05' W), in 63 fathoms (USNM). FLORIDA: off Palm Beach, in 50–100 fathoms (ANSP); off Miami, in 10–60 fathoms; off Fowey Light, in 25–125 fathoms; off Ragged Key; off Triumph Reef; off Ajax Reef; off Turtle Harbor (all USNM); off Sombrero Key, in 20–66 fathoms; off Looe Key, in 25–30 fathoms; off American Shoals, in 25–30 fathoms (all MCZ); off Sambo Reef; off Key West (both USNM); off Pelican Shoals, in 45 fathoms (MCZ); *Albatross I* station 2410, 80 miles N of Dry Tortugas (26°47' N; 83°25' W), in 28 fathoms; *Albatross I* station 2404, 35 miles S of Cape San Blas (28°44' N; 85°16' W), in 60 fathoms (both USNM). ALABAMA: *Albatross I* station 2367, 60 miles S of Mobile Bay 29°24' N; 88°04' W), in 32 fathoms (USNM). TEXAS: off Port Isabel, in 50 fathoms; 80–100 miles S of Port Isabel, in 40 fathoms (both MCZ).

Tellina (Phyllodina) persica Dall and Simpson

Plate 136, fig. 2; Plate 137, fig. 2

Tellina (Arcopagia; Phyllodina) persica Dall and Simpson 1901, Bull. U.S. Fish. Comm., 20(1): 479, pl. 55, fig. 1 (Mayaguez Harbor, in 20–30 fathoms) [holotype, USNM, no. 159991].

Tellina (Arcopagia) persica Dall and Simpson. McLean 1951, N.Y. Acad. Sci., 17(1): 94.

Tellina (Eurytellina) persica Dall and Simpson. Warmke and Abbott 1961, Caribbean Seashells, p. 195, pl. 29, fig. g.

Description. Shell extending to 25 mm. (about 1 inch) in length and to 13 mm. (about $\frac{1}{2}$ inch) in height, subquadrate, slightly inflated with the left valve slightly more convex and with a short but distinct posterior flexure to the right. Umbos central, small and markedly pointed. Anterior margin smoothly, but very narrowly rounded; ventral margin slightly convex and rising gently posteriorly; anterior dorsal margin gently sloping and straight; posterior dorsal margin somewhat convex, very gently sloping and short; posterior margin biangulate, with both portions straight and forming a rather blunt truncation. Sculpture consisting of raised concentric ribs rather evenly spaced and separated by narrow bands except on the posterior half of the right valve where the ribs become fewer, much stronger, lamellate and separated by wider bands. Radial sculpture consisting of exceedingly weak and faint lirations which are totally absent on the posterior half of the right valve. Ligament brown, strong and somewhat sunken. Calcareous portion of the ligament not strongly developed and subtended by weak nymphal callosities. In the left valve, the cardinal complex consists of an anterior strong deltoid bifid tooth whose posterior lobe is the stronger and of a posterior extremely well developed, elongate, subdeltoid laminate tooth; anterior lateral tooth distal, rather weak, but stronger than the distal obsolete posterior lateral. In the right valve, the cardinal complex consists of a posterior, skewed, strong, bifid tooth with subequal lobes and a well developed, short, anterior laminate tooth which is much weaker than the same in the opposite valve; anterior lateral tooth strong and distal; posterior lateral tooth stronger and distal. Adductor muscle scars rather poorly impressed. Anterior adductor muscle scar longer and narrower than the posterior. Pallial sinus rising abruptly and obliquely, flattened above, falling obliquely to and uniting with the pallial line far behind the anterior adductor scar; confluence short. A faint linear scar sometimes unites the anterior adductor scar with the pallial sinus. Externally and internally, the shell is white suffused with apricot, concentrated in the umbonal region and on the disc.

length	height	width	
20.6 mm.	12.7 mm.	5.8 mm.	Holotype of <i>persica</i> Dall and Simpson
24.2	13.2	5.8	Mayaguez, Puerto Rico
16.2	10.1	4.0	" " "
14.5	9.2	3.8	" " "
7.0	4.0	—	off Scarborough, Tobago

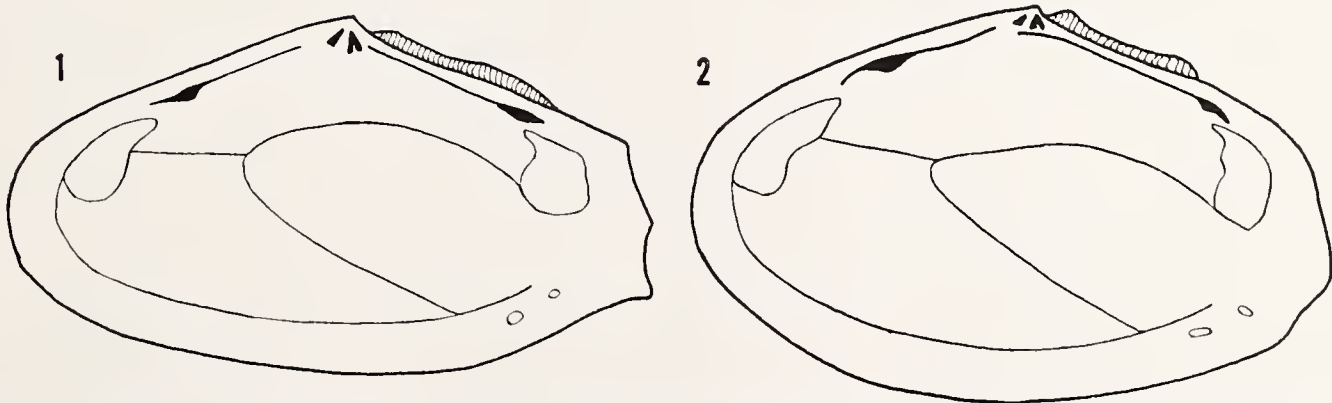


Plate 137. Figs. 1-2. Diagrammatic illustration of the internal surface of the right valve showing the dental configuration and muscle scars. Fig. 1. *Tellina squamifera* Deshayes (about 4.4x) [L=20 mm.]. Fig. 2. *Tellina persica* Dall and Simpson (about 4.2x) [L=21 mm.].

Remarks. By the paucity of material in various collections, *Tellina persica* may be judged to be a relatively rare species with a restricted distribution. In the Atlantic fauna, it is most closely related to *T. squamifera* Deshayes from which it may be immediately distinguished by its lack of posterior dorsal foliations, its subquadrate shape, and its smooth and regular concentric sculpture. It is also quite similar to the Eastern Pacific species, *T. fluetigera* Dall from which it can be separated by the nature of the umbos which are flat in *fluetigera*. In addition, *fluetigera* possesses slightly serrated anterior and posterior dorsal margins and a larger shell.

The fossil lineage of *Tellina persica* begins in the Miocene of the Bowden formation of Jamaica. *Tellina hallistreptra* Dall from the Bowden is virtually indistinguishable from the modern species. *Tellina francisca* Olsson from the Esmeraldas formation at Punta Gorda, Ecuador, which is of Late Miocene–early Pliocene age and an unnamed fossil species from Miocene of Limon, Costa Rica also belongs to the lineage of *T. persica*.

This species seems to be most variable in the character of its margins. The anterior margin is narrowly rounded in adults while in immature stages it may be broadly rounded. The ventral margin which is convex in the adult stage seems to be straight in the smaller and younger individuals. The species tends to be a deeper water one, having been taken in 30–50 fathoms off Puerto Rico.

Range. This species, rare as it appears to be, possesses a range which extends from a northern limit off Matanzas, Cuba to a southern boundary at Tobago, Lesser Antilles.

Specimens examined. CUBA: *Atlantis* station 2999, off Bahia de Matanzas (23°10' N; 81°11' W), in 145–230 fathoms; *Atlantis* station 3332, off Bahia de Cochinos (22°09' N; 81°11' W), in 175–225 fathoms (both MCZ). PUERTO RICO: *Fish Hawk* station 6062, Mayaguez, in 30 fathoms; *Fish Hawk* station 6064, Mayaguez, in 33 fathoms; Johnson-Smithsonian station 104¹, off Salinas Island (18°30' N; 66°13' W), in 50 fathoms (all USNM). LESSER ANTILLES: ¾ mile S of Fort St. Louis, Fort de France, Martinique, in 14–16 fathoms; 2 miles S of Scarborough, in 36 fathoms (both MCZ).

Subgenus *Elliptotellina* *Cossmann*

Elliptotellina Cossmann, *Annales Société Royale Malacologique Belgique*, 21: 58, pl. 4, figs. 5–6 (type species, *Donax tellinella* Lamarek 1805, original designation).

Description. Shell small, elliptical, inaequilateral, equivalve, and with both ends rounded. Sculpture consisting of concentric ribs and radial lirations variously distributed on the surface. The ligament is small, strong and subtended by a well developed nymphal callosity. Hinge especially strong in the right valve; the right lateral teeth are subequal in strength and grooved above; the left lateral teeth are obsolete or absent. The pallial sinus is obliquely ascending and separated from the pallial line below except for an extremely short and posterior confluence.

The subgenus *Elliptotellina* was established for species occurring in the Eocene of the Paris Basin. Dall was the first to recognize the existence of two recent species in America. *Elliptotellina* is also represented in the Indo-Pacific by such species as *Tellina fabrefaeta*

¹ The published record for this station (Bartsch, 1933, p. 29) is “the depth ranged from 80–100 fathoms.” The catalog in the USNM reads for station 104, 50 fathoms.

Pilsbry from Japan. In the Western Atlantic, the fossil record may be traced to the Miocene.

***Tellina (Elliptotellina) americana* Dall**

Plate 149, fig. 6; Plate 155, fig. 4

Tellina (Elliptotellina) americana Dall 1900, Proc. U.S. Nat. Mus., 23: 311, pl. 2, fig. 8 (*Albatross I* station 2612, off Cape Lookout, North Carolina (34° 11' N; 76° 10' W), in 52 fathoms) [holotype, USNM, no. 92154].

Description. Shell extending to 8.5 mm. (about 5/16 inch) in length and to 5.5 mm. (about 3/16 inch) in height, elliptical, solid, inflated with the valves of an equal convexity and with a slight posterior flexure. Umbos small and rounded. Anterior margin smoothly and narrowly rounded; ventral margin convex and rising gently posteriorly; anterior dorsal margin long and convex; posterior dorsal margin short and straight; posterior margin forming an oblique truncation. Concentric sculpture consisting of evenly spaced, raised and rounded ribs. Radial sculpture absent from the anterior slope and disc but markedly evident on the posterior slope. Ligament brown, short, protuberant and subtended by short nymphal callosities. In the left valve, the cardinal complex consists of an anterior strong bifid tooth with subequal lobes and a small, thin posterior laminate tooth; no true laterals developed. In the right valve, the cardinal complex consists of a posterior skewed bifid tooth with subequal lobes and an anterior strong laminate; anterior and posterior lateral teeth distal, strong and well developed. Both laterals set on a strong hinge plate with grooves above. Adductor muscle scars poorly impressed. Anterior and posterior adductors rounded and subequal. Pallial sinus extending straight out from the base of the posterior adductor, flattened above, rounded behind and falling obliquely and almost parallel to the pallial line; sinus is far removed from the anterior adductor scar; confluence short. Shell predominantly white or pale straw color with a crimson or brown spot on the dorsal margin near each end.

length	height	width	
8.5 mm.	5.5 mm.	3.2 mm.	Holotype of <i>americana</i> Dall
8.2	5.1	3.3	off Miami, Florida
6.9	4.5	3.5	Lantana, Florida
5.4	3.3	2.0	off Miami, Florida

Remarks. *Tellina americana* is the only member of the subgenus in the recent fauna of the Atlantic. Its nearest living relative is *T. pacifica* Dall of the Eastern Pacific. In *americana*, the radial sculpture is localized on the posterior slope only and the obliquely ascending pallial sinus is shorter than that of *pacifica* where the radial sculpture may extend far anteriorly. Woodring (1925) has described *T. cymobia* from the Miocene of Jamaica which is the precursor of the recent *Elliptotellina*.

Range. This species possesses a range which extends from off Cape Lookout, North Carolina south through the Florida Keys to a southernmost point off Barbados. It has also been found in the Gulf of Mexico, off Horn Island, Mississippi.

Specimens examined. NORTH CAROLINA: *Albatross I* station 2612, off Cape Lookout (34° 11' N; 76° 10' W), in 52 fathoms (USNM). FLORIDA: off Palm Beach; off Lantana, in 60 fathoms (both MCZ); off Miami, in 24–60 fathoms; off Fowey Light, in 25–70 fathoms; off Ajax Reef, in 40 fathoms; off Key West, in 90 fathoms; off Sand Key,

in 30–100 fathoms (all USNM). MISSISSIPPI: Horn Island (ANSP). LESSER ANTILLES: off Lazaretto and off Pelican Island, Barbados, in 75–95 fathoms (both USNM).

Subgenus *Merisca* Dall

Merisca Dall 1900, Proc. U.S. Nat. Mus., 23: 290 (type species, *Tellina crystallina* Wood 1815 (= *Tellina crystallina* Spengler 1798), original designation).

Lyratellina Olsson 1961, Panamic-Pacific Pelecypoda. Paleontological Research Inst., Ithaca, N. Y., p. 383 (type species, *Tellina lyra* Hanley 1844, original designation).

Description. Shell medium to small in size, trigonal-subovate-subquadrate in shape and partially rostrate posteriorly. Umbos centrally placed. Sculpture consisting of variously spaced and strong concentric lirations. Lateral teeth developed in the right valve. Lateral dentition of the left valve obsolete or totally lacking. Pallial sinus extensive and sometimes coalescing with the anterior adductor muscle scar. Confluence of the pallial sinus and the pallial line generally complete but rarely the pallial sinus may parallel the pallial line for some distance before becoming confluent with it. Generally the shell is dull white in color.

Merisea as defined and utilized herein may well constitute a heterogeneous but closely related assemblage of species. For example, *Merisea* closely approaches *Quadrans*, as represented in its type *Tellina gargadia* Linnaeus of the Indo-Pacific. In shell shape, concentric sculpture and in the development of the lateral dentition of the left valve, *Quadrans* possesses some differences to the Western Atlantic species of *Merisea*, *Tellina aequistriata* and *T. alerta*, which resemble it most closely. Likewise, *Tellina juttingae* might be compared to *Tellina lyra* Hanley and *T. lyrica* Pilsbry and Lowe from the Eastern Pacific, species for which Olsson (1961) erected the new genus, *Lyratellina*. The Eastern Pacific species have also been referred to Cossmann's *Macaliopsis*, which is based upon *Tellina barrandei* Deshayes, an Eocene species from the Paris Basin. Olsson considers the similarity of *Lyratellina* to *Macaliopsis* to be merely superficial. One of the major distinguishing traits of both *Lyratellina* and *Macaliopsis* is that the umbos are prosogyrous. However, the prosogyrate condition of the umbos is an inconstant trait and in such species as *Tellina martinicensis* of the Western Atlantic the umbos may vary in orientation from the orthogyrate to the prosogyrate position. *Merisca* is represented in the Atlantic, Pacific and Indian Oceans. Although a number of species extend into the more temperate zones, most are concentrated in the tropics. The group is well established in the Eocene.

KEY TO SPECIES OF *MERISCA* IN THE WESTERN ATLANTIC

1. Right anterior lateral tooth subproximal to the cardinal complex *crystallina*
Right lateral teeth more or less equidistant from the cardinal complex 2
2. Pallial sinus extending parallel to the pallial line for about half its length before becoming confluent 3
Pallial sinus uniting with the pallial line without paralleling it 4
3. Anterior dorsal margin short and deeply concave *juttingae*
Anterior dorsal margin long and weakly concave *martinicensis*
4. Pallial sinus uniting with the pallial line very near the base of the anterior adductor muscle scar *aequistriata*
Pallial sinus well removed from the anterior adductor muscle scar and uniting with the pallial line in the posterior portion of the valve *alerta*

Tellina (Merisca) cristallina Spengler

Plate 138, fig. 5; Plate 139, fig. 6

Tellina cristallina Spengler 1798, Skrivter Naturhistorie Selskabet, 4(2): 113 (Newport, Long Island) [type locality, here corrected, St. Thomas, Virgin Islands; holotype, Zoological Museum, Copenhagen].

Tellina cristallina Wood 1815, General Conchology, p. 149 (no locality given) [refers to Chemnitz, Conch. Cab. (1), 11: 210, pl. 199, fig. 1947, 1948].

Tellina schrammi Récluz 1853, Jour. de Conchy., 4: 152, pl. 6, figs. 7-8 (Point-a-Pitre, Guadeloupe) [types not seen].

Tellina (Merisca) cristallina Wood. Dall 1900, Proc. U.S. Nat. Mus., 23: 293.

Tellina (Merisca) cristallina Spengler, Warmke and Abbott 1961, Caribbean Seashells, p. 196, pl. 40, fig. b.

Description. Shell extending to 24 mm. (about 1 inch) in length and to 18 mm. (about $\frac{3}{4}$ inch) in height, ovate-subtrigonal, produced posteriorly, rather compressed with the left valve somewhat convex and the right valve concave or flattened and with a strong and marked posterior flexure to the right. Umbos central and conspicuous. Anterior margin broadly rounded; ventral margin convex and rising posteriorly; anterior and

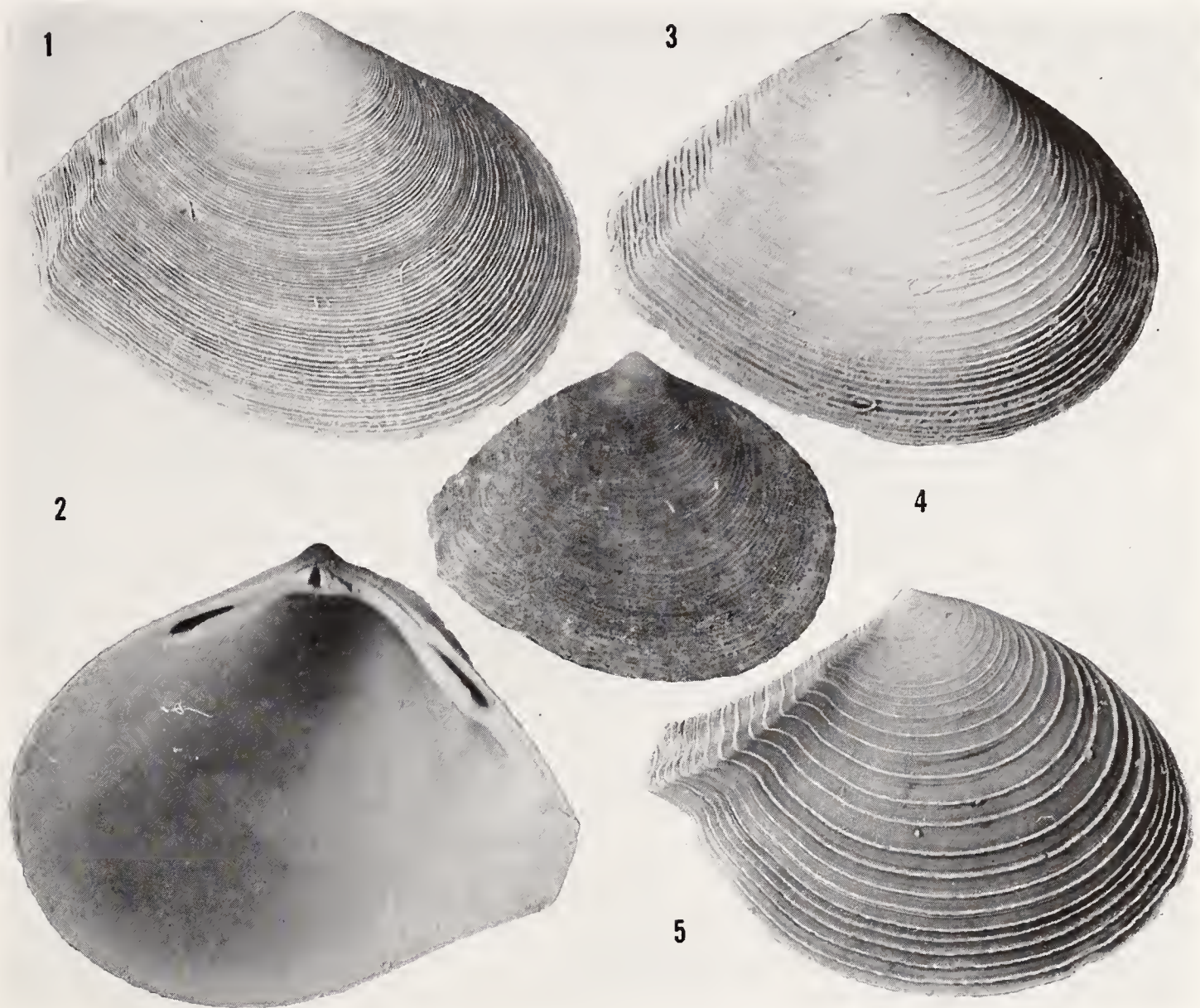


Plate 138. Figs. 1-4. *Tellina martinicensis* d'Orbigny. Fig. 1. External view of the right valve, Tobago, West Indies, MCZ 243067 (about 5.8x) [L=12 mm.]. Fig. 2. Internal view of the right valve, Puerto Rico, MCZ 243128 (about 6.4x) [L=11 mm.]. Fig. 3. External view of the right valve, Puerto Rico, MCZ 243128 (about 8x) [L=8.5 mm.]. Fig. 4. External view of the right valve of a syntype, Martinique, BMNH (about 6x) [L=7.5 mm.]. Fig. 5. *Tellina cristallina* Spengler, external view of the right valve, Bahia Bramadero, Puerto Rico, MCZ 243127 (about 3x) [L=24 mm.].

posterior dorsal margin long and steeply descending; posterior margin short, straight and giving the shell a truncate appearance. Sculpture consisting of strong, widely spaced concentric ridges separated by broad flattened bands; no true radial sculpture evident. Posterior ridges and sulci in both valves. Ligament brown and somewhat sunken. Calcareous element of the ligament small and not supported by a raised nymphal callosity. In the left valve, the cardinal complex consists of an anterior, narrow and elongate bifid tooth, with the anterior lobe the larger and of a posterior and elongate laminate tooth; anterior lateral tooth weak, obsolete and subproximal to the cardinal complex; posterior lateral stronger, thin and distal to the cardinal complex. In the right valve, the cardinal complex consists of a posterior elongate, slightly skewed bifid tooth with the anterior lobe the larger and of an anterior long laminate tooth; the anterior lateral tooth is subproximal to the cardinal complex, rather well developed, but weaker than the distal posterior lateral tooth. Adductor muscle scars poorly impressed. Anterior adductor elongate, narrow and lunate; posterior adductor irregularly circular. Pallial sinus dissimilar in opposite valves, generally rising to an apex, descending gently and uniting with the pallial line close to the anterior adductor. The shell is thin, rather opaque, lustreless and white.

length	height	width	
24 mm.	18 mm.	—	Cartagena, Colombia
24	17	6 mm.	St. Thomas
22	16	5	Barcelona Beach, Venezuela
12	8	—	Baie Anglaise, Haiti

Remarks. The holotype of *Tellina cristallina* Spengler consists of a broken right valve and is preserved in the Zoological Museum of Copenhagen. The type locality originally given was Newport, Long Island [Rhode Island] and is in error since the species does not range that far north. In all probability, the original specimen came from the then Danish West Indies and for this reason, the type locality is here corrected to St. Thomas, Virgin Islands. Some early workers considered that this species was Eastern Pacific whereas Dall (1900a) contended that it was distributed in both the Atlantic and the Pacific. Recently Olsson (1961) has considered the problem and arrived at a satisfactory result, for he has been able to separate a distinct Eastern Pacific analog of *cristallina*. In contrast to *Tellina (Merisca) rhynchoscuta* Olsson of the Eastern Pacific, *cristallina* may be distinguished by its straight anterior and posterior dorsal margins. Olsson has also noted that *rhynchoscuta* has heavier, more stubby valves, stronger and coarser concentric sculpture and a deeper sulcus which extends in front of the rostral ridges.

Tellina cristallina has been discovered in the Pliocene and Miocene strata of the Western Atlantic. Maury (1917) has documented its occurrence in the Miocene of Santo Domingo. *Tellina sancti-dominici*, closely allied to *cristallina* but no longer living in the modern fauna, was also described by Maury from the Miocene of Santo Domingo. According to Hertlein and Strong (1949), Lynge (1909) described an Indo-Pacific species, *Tellina martensi*, which may be distinguished from *cristallina* by its less rostrate shell; unfortunately no specimens of *martensi* have been available for study.

Range. This species ranges from Sullivan's Island, South Carolina through the Greater Antilles and Virgin Islands. It also occurs on the eastern coast of Central America and on the northern coast of South America.

Specimens examined. SOUTH CAROLINA: Sullivan's Island (USNM). GUATEMALA: (BMNH). JAMAICA: Black River, St. Elizabeth (USNM). HISPANIOLA. HAITI: Jerémié; Baie Anglaise (both USNM). SANTO DOMINGO: Monte Cristi; Puerto Plata (both MCZ). PUERTO RICO: Bahia Bramadero (IMPBR). VIRGIN ISLANDS: St. Thomas (USNM). COLOMBIA: Cartagena (MCZ). VENEZUELA: Barcelona (USNM); Margarita Island (ANSP).

Tellina (Merisca) martinicensis d'Orbigny

Plate 138, figs. 1-4; Plate 139, fig. 5

Tellina martinicensis d'Orbigny 1942 [in] Sagra, Hist. L'Ile Cuba, Atlas, pl. 26, figs. 6-9; 1845, Spanish Text, 2(5): 305; (Martinica y la Guadalupe); 1853, French Text, Mollusques, 2: 253 [type locality, here restricted, Martinique; syntypes, BMNH, no. 54.10.4.511].

Tellina (Moerella) martinicensis d'Orbigny. Dall, 1900 Proc. U.S. Nat. Mus., 23: 295.

Tellina (Moerella) obtusa 'Sowerby' Dall 1900, Proc. U.S. Nat. Mus., 23: 295, *non* Sowerby 1817, *nee* Sowerby 1868.

Tellina (Moerella) tumida 'Sowerby' Dall 1900, Proc. U.S. Nat. Mus., 23: 295, *non* Sowerby 1867.

Tellina (Tellinella) versluyisi Dautzenberg 1900, Mem. Soc. Zool., Paris, 13: 115, pl. 10, fig. 5 (Santa Marta Colombia; syntypes, Dautzenberg collection, Institut Royal des Sciences Naturelles, Bruxelles).¹

Tellina (Eurytellina) martinicensis d'Orbigny. Dall and Simpson 1901, Bull. U.S. Fish. Comm., 20(1): 480.

Tellina (Merisca) martinicensis d'Orbigny. Warmke and Abbott 1961, Caribbean Seashells, p. 196, pl. 40 i.

Description. Shell extending to 12.2 mm. (about $\frac{1}{2}$ inch) in length and to 10.1 mm. (about $\frac{3}{8}$ inch) in height, ovate, solid, slightly produced posteriorly, inflated with valves of equal convexity and with a strong posterior flexure to the right. Umbos subcentral, inflated and blunt. Anterior margin broadly rounded; ventral margin convex and with a strong postbasal arcuation; anterior dorsal margin gently sloping and straight; posterior dorsal margin long, steeply sloping and convex; posterior margin short, straight and forming an oblique truncation. Sculpture consisting of raised and strong concentric ridges (about 4 per millimeter) separated by broad bands. No radial sculpture. Ligament brown, inconspicuous and sunken; no true nymphal callosities. In the left valve, the cardinal complex consists of an anterior strong bifid tooth with subequal lobes and of a posterior protuberant laminate tooth; both lateral teeth consisting of localized thickenings of the hinge plate. In the right valve, the cardinal complex consists of a posterior strong bifid tooth with subequal lobes and of an anterior thickened laminate tooth; both laterals strong. Adductor muscle scars not well impressed. The anterior adductor elongate and narrow; posterior adductor rounded. Pallial sinus more or less equal in both valves, rising high posteriorly, rounded and extending far anteriorly, nearly to the anterior adductor scar, arcuate ventrally and extending parallel to the pallial line for nearly one half its ventral length; confluence short. Shell white and rarely iridescent.

length	height	width	
12.2 mm.	10.1 mm.	—	Santa Lucia, Cuba
10.0	8.5	5.5 mm.	Florida
9.0	7.0	4.0	Mayaguez, Puerto Rico
8.1	6.4	3.2	Bahia de Samana, Santo Domingo

Remarks. In the Western Atlantic, *Tellina martinicensis* appears to be most closely

¹The author is indebted to Dr. C. O. van Regteren Altena of the Rijksmuseum van Natuurlijke Historie, Leiden for checking the syntypes of the Dautzenberg species.

related to the rare *Tellina juttingae*. It never attains the great size exhibited by *juttingae*, which appears to be four or five times greater in its dimensions. In addition, the anterior dorsal margin of *juttingae* is strongly convex and the umbo appears to be prosogyrous, although this latter characteristic appears rarely in *martinicensis*.

Tellina aequistriata Say may be confused with *martinicensis*; however, in the latter, the shell is more tumid, the umbos higher, and the concentric sculpture stronger. The

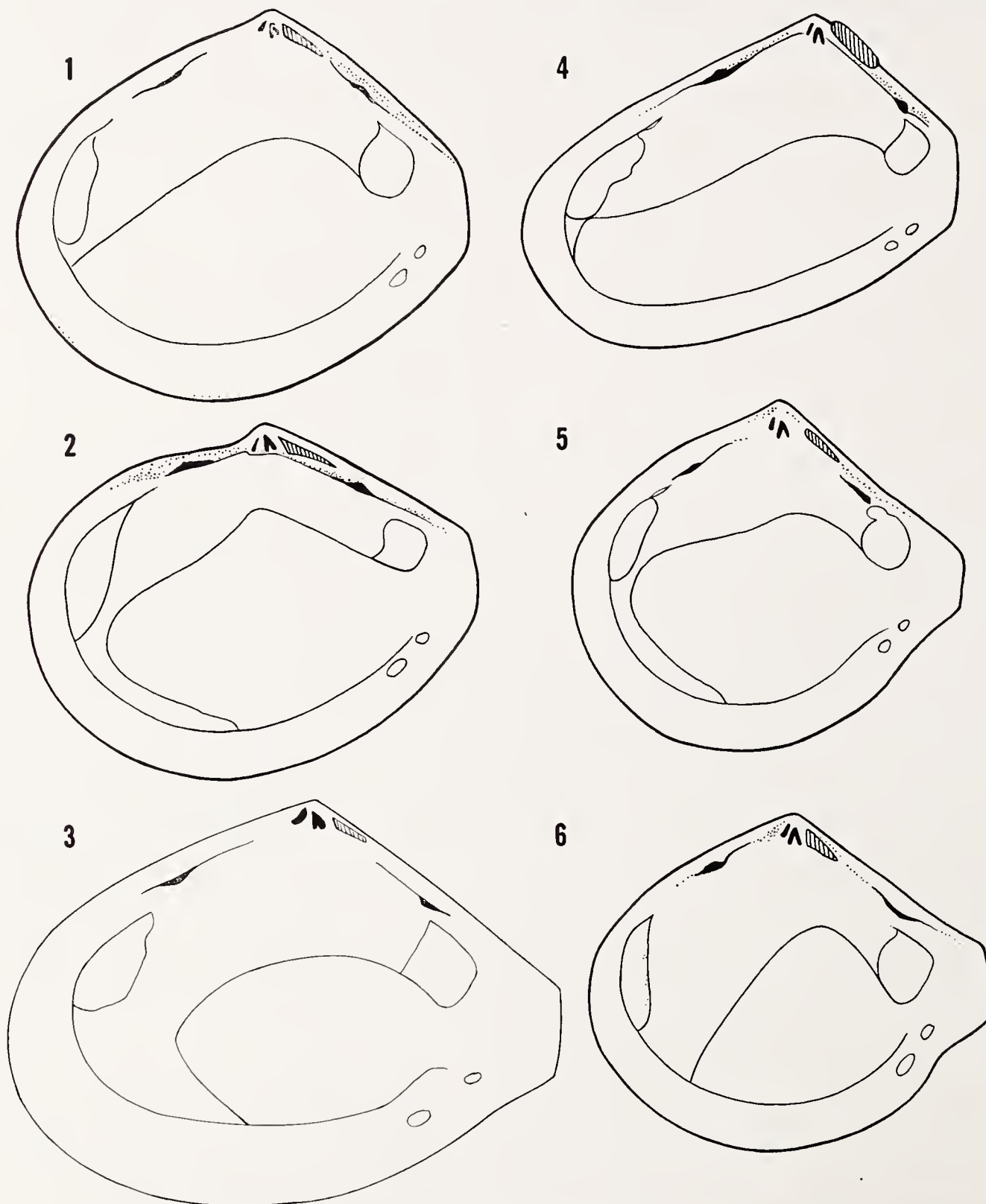


Plate 139. Figs. 1-6. Diagrammatic illustration of the internal surface of the right valve showing the dental configuration and muscle scars. Fig. 1. *Tellina aequistriata* Say (about 3x) [L=21 mm.]. Fig. 2. *Tellina juttingae* Altena (about 3x) [L=22 mm.]. Fig. 3. *Tellina alerta* Boss (about 10x) [L=8 mm.]. Fig. 4. *Tellina gouldii* Hanley (about 7x) [L=9 mm.]. Fig. 5. *Tellina martinicensis* d'Orbigny (about 4.5x) [L=12 mm.]. Fig. 6. *Tellina cristallina* Spengler (about 4.4x) [L=20.].

species are distinct with regard to the pallial sinus. In *martinicensis*, the sinus unites with the pallial line posteriorly and in *aequistriata* it is confluent at or near the base of the anterior adductor muscle scar.

The earliest precursor to *Tellina martinicensis* occurs in the Miocene of the Bowden marls of Jamaica. Woodring (1925) has described *Tellina sclera lerasca* which exhibits a similarity of dentition, sculpture and tumidity. The recent species is also represented by *Tellina caloosana* in the Pliocene of the Caloosahatchee in Florida (Dall, 1900b). In the Eastern Pacific, *Tellina proclivis* Hertlein and Strong appears to be the analog of *Tellina martinicensis*.

Range. This species is found from Tampa Bay, Florida south through the Greater and Lesser Antilles to Scarborough, Tobago.

Specimens examined. FLORIDA: off Main Channel, Key West, in 10–20 fathoms; Western Dry Rocks (both MCZ); Tortugas, in 15 fathoms (USNM); Gulfport, Tampa Bay (ANSP). BRITISH HONDURAS: Belize; Monkey River (both ANSP). PANAMA: Mt. Hope (Pleistocene, ANSP). CUBA: *Barrera* station 209, Santa Rosa, in 3–6 fathoms; *Barrera* station 200, Santa Lucia, in 2–4 fathoms; *Barrera* station 208, Bahía Honda, in 1–12 fathoms; *Barrera* station 203, Cabanas Harbor, in 3–12 fathoms; *Barrera* station 212, Cardenas Bay, in 1–3 fathoms (all USNM). JAMAICA: (MCZ). HISPANIOLA. SANTO DOMINGO: Puerto Plata (ANSP); Santa Barbara de Samana (USNM). PUERTO RICO: Mayagüez; off Enrique Reef, La Parguera, in 30–75 feet (both IMPBR); San Juan Harbor, in 5 fathoms (USNM). VIRGIN ISLANDS: St. Thomas (ANSP). LESSER ANTILLES: $\frac{3}{4}$ mile S of Fort St. Louis, Martinique (MCZ); Carlisle Bay, Barbados, in 12 fathoms (USNM); 2 miles S of Fort George, Scarborough, Tobago (MCZ).

Tellina (Merisca) juttingae Altena

Plate 139, fig. 2; Plate 140, figs. 1–2

Lyratellina juttingae Altena 1965, *Basteria*, 29: 52–54, figs. 1a–e (N of the mouth of the Surinam River, 20 miles off the coast, at 15 fathoms; holotype, Rijksmuseum van Natuurlijke Historie, Leiden).

Description. Shell extending to 28.5 mm. (about $1\frac{1}{8}$ inches) in length and to 21 mm. (about 3.4 inches) in height, elongate-subquadrate, with both valves of more or less equal convexity and with a very weak flexure to the right. Umbos subcentral, prosogyrous and pointed. Anterior margin broadly rounded; ventral margin broadly arcuate and rising posteriorly; anterior dorsal margin falling abruptly from the umbonal region and distinctly concave; posterior dorsal margin rather steeply inclined and long; posterior margin short and straight, forming a blunt truncation. Sculpture consisting of broadly and evenly spaced slightly raised ridges (2–4 per millimeter), separated by broad flat bands; no radial sculpture. Ligament not observed; no nymphal callosities. In the left valve, the cardinal complex consists of an anterior small and weak bifid tooth with subequal lobes and of a posterior thin laminate tooth; no true anterior lateral tooth; posterior lateral absent or obsolete. In the right valve, the cardinal complex consists of a posterior, small subdeltoid bifid tooth with the posterior lobe the larger and of an anterior thickened laminate tooth; anterior and posterior lateral teeth well developed, distal to the cardinal complex, subequal in strength and with sockets above. Adductor muscle scars moderately impressed. Anterior adductor scar elongate and narrow; posterior adductor

transversely quadrate. Pallial sinus extensive, rising abruptly behind, extending in a broad arcuation anteriorly but not touching the anterior scar; the sinus parallels the pallial line ventrally and unites posteriorly; confluence short. Shell white, partly covered with an olivaceous gray periostracum, rarely iridescent.

length	width	
28.5 mm.	21 mm.	Trinidad
25.5	19	"
23.0	17	"
22.5	16	"

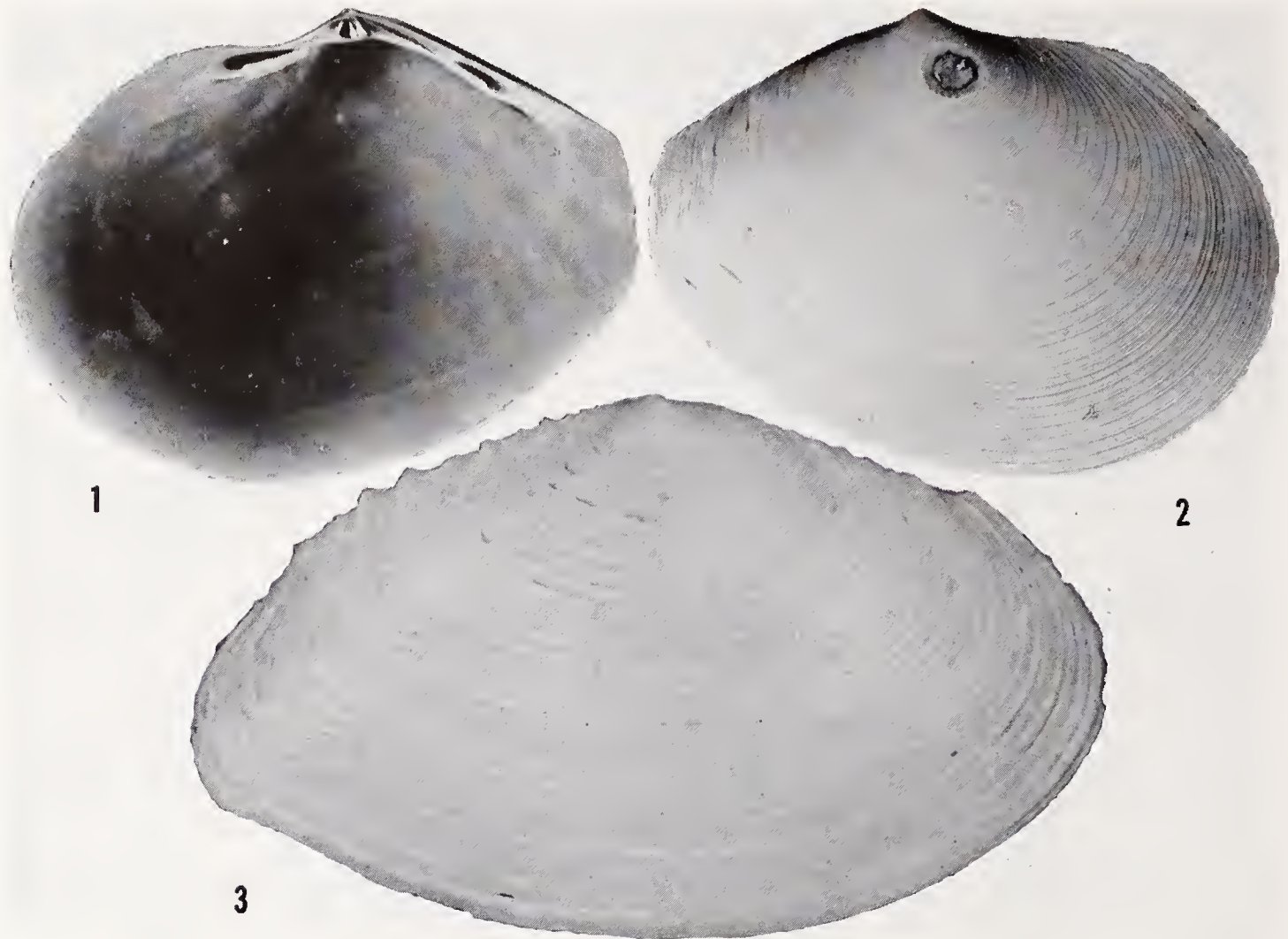


Plate 140. Figs. 1-2. *Tellina juttingae* Altona. Fig. 1. Internal view of the right valve, Trinidad, MCZ 239112 (about 3.4x) [L=22.5 mm.]. Fig. 2. External view of the right valve, Trinidad, MCZ 239112 (about 3.4x) [L=23 mm.]. Fig. 3. *Tellina squamifera* Deshayes, external view of the right valve of the holotype, 'Chinese Seas', BMNH (about 5.5x) [L=20.8 mm.].

Remarks. This species is extremely rare. The shell is rather thin, rounded in front, and bluntly truncated behind; the peculiar shape of the anterior dorsal margin is certainly diagnostic. Of the Western Atlantic tellins, *Tellina martinicensis* is most closely related. The dentition, the external sculpture and the configuration of the pallial sinus in *martinicensis* are quite similar to *juttingae*; however, *juttingae* attains a much greater size. In contrast to *juttingae*, the shell is thicker, the postbasal arcuation stronger and the posterior truncation shorter in *martinicensis*. *Tellina lyra* Hanley is the Eastern Pacific analog of *juttingae*.

Range. This species occurs from off Surinam to Trinidad.

Specimens examined. TRINIDAD: Saut d'Eau Bay, in 10–20 fathoms (MCZ). SOUTH AMERICA: N of the mouth of the Surinam River (Rijksmuseum, Leiden).

Tellina (Merisca) aequistriata Say

Plate 139, fig. 1; Plate 141, figs. 1–2; Plate 142, figs. 1–3

Tellina aequistriata Say 1824, Jour. Acad. Nat. Sci., Philadelphia, 4: 145, pl. 10, fig. 7 (Maryland, Miocene) [types lost], non Sowerby 1868.

Tellina lintea Conrad 1837, Jour. Acad. Nat. Sci., Philadelphia, 7: 259, pl. 20, fig. 3 (Mobile Point, Alabama) [types lost], non Conrad 1848, nec Hutton 1873.

Tellina guadaloupeensis d'Orbigny 1842 [in] Sagra, Hist. L'Ile Cuba, Atlas, pl. 26, figs. 1–3 (Guadeloupe) [holotype, BMNH, no. 54.10.4.508].

Tellina guadalupensis d'Orbigny 1845 [in] Sagra, Hist. Isla Cuba, Spanish Text, 2(5): 304, error for *guadaloupeensis* d'Orbigny.

Tellina guadalupiensis d'Orbigny 1853 [in] Sagra, Hist. L'Ile Cuba, Mollusques, French Text, 2: 253, error for *guadaloupeensis* d'Orbigny.

Tellina tumida Sowerby 1867 [in] Reeve, Conch. Icon., 17, *Tellina*, pl. 23, figs. 120a and b (Jamaica) [holotype, BMNH, no. 67.10.7.18].

Tellina (Tellinella) ostracea 'Lamarck' Dautzenberg 1900, Mem. Soc. Zool., Paris, 13: 259, non Lamarck 1818.

Tellina (Merisca) aequistriata Say. Dall 1900, Trans. Wagner Free Inst. Sci., Philadelphia, 3(5): 1020.

Tellina (Merisca) lintea Conrad. Dall 1900, Proc. U.S. Nat. Mus., 23: 293.

Quadrans lintea Conrad. Warmke and Abbott 1961, Caribbean Seashells, p. 198, pl. 41 k.

Description. Shell extending to 24.5 mm. (about 1 inch) in length and to 19 mm. (about $\frac{3}{4}$ inch) in height, subrhomboid, produced behind, subsolid, with the left valve markedly more convex and with a strong, sharp posterior flexure to the right. Umbos nearly central and pointed. Anterior margin broadly rounded; ventral margin arcuate, convex and rising posteriorly; anterior dorsal margin long and gently sloping; posterior dorsal margin straight and steeply inclined; posterior margin short, straight and forming a truncation. Sculpture consisting of raised, more or less sharp and evenly spaced concentric ridges (4–8 per millimeter), separated by rather broad sulci; no radial sculpture. Ligament light yellow to dark brown, inconspicuous and sunken. Calcareous element of the ligament short and resting on the flattened hinge plate; no true nymphal callosities. In the left valve, the cardinal complex consists of an anterior elongate bifid tooth with thin subequal lobes and of a posterior elongate and somewhat curved laminate tooth; both lateral teeth poorly developed, posterior one distal. In the right valve, the cardinal complex consists of a posterior elongate strong bifid tooth with subequal lobes and of an anterior elongate and thickened laminate tooth; the lateral teeth strong, distal to the cardinal complex and socketed. Adductor muscle scars well impressed. Anterior adductor dorsoventrally elongate and lunate; posterior adductor quadrate. Pallial sinus equal in opposite valves, rising abruptly behind, rounded above, descending gently without an anterior arcuation and uniting with the pallial line just beneath the anterior adductor scar; confluence entire. Shell white, sometimes covered by an adhering brownish periostracum.

length	height	width	
9.5 mm.	6.9 mm.	3.3 mm.	Holotype of <i>guadaloupeensis</i> d'Orb.
24.5	19.0	—	off Cape Hatteras, North Carolina
16.0	11.5	6.0	Pass Cabello, Texas
4.6	3.1	—	Matanzas Bay, Cuba

Remarks. The fossil history of *Tellina aequistriata* extends back to the Miocene and there are ample records of the occurrence of this species in North American strata. Dall (1900b) and Mansfield (1932) have documented the fossil records for this species from Virginia, North Carolina, South Carolina and Florida. In addition, Woodring (1925) has listed *Tellina acrocosmia* Dall, which is a predecessor of *Tellina aequistriata*, from the Bowden marls of Jamaica.

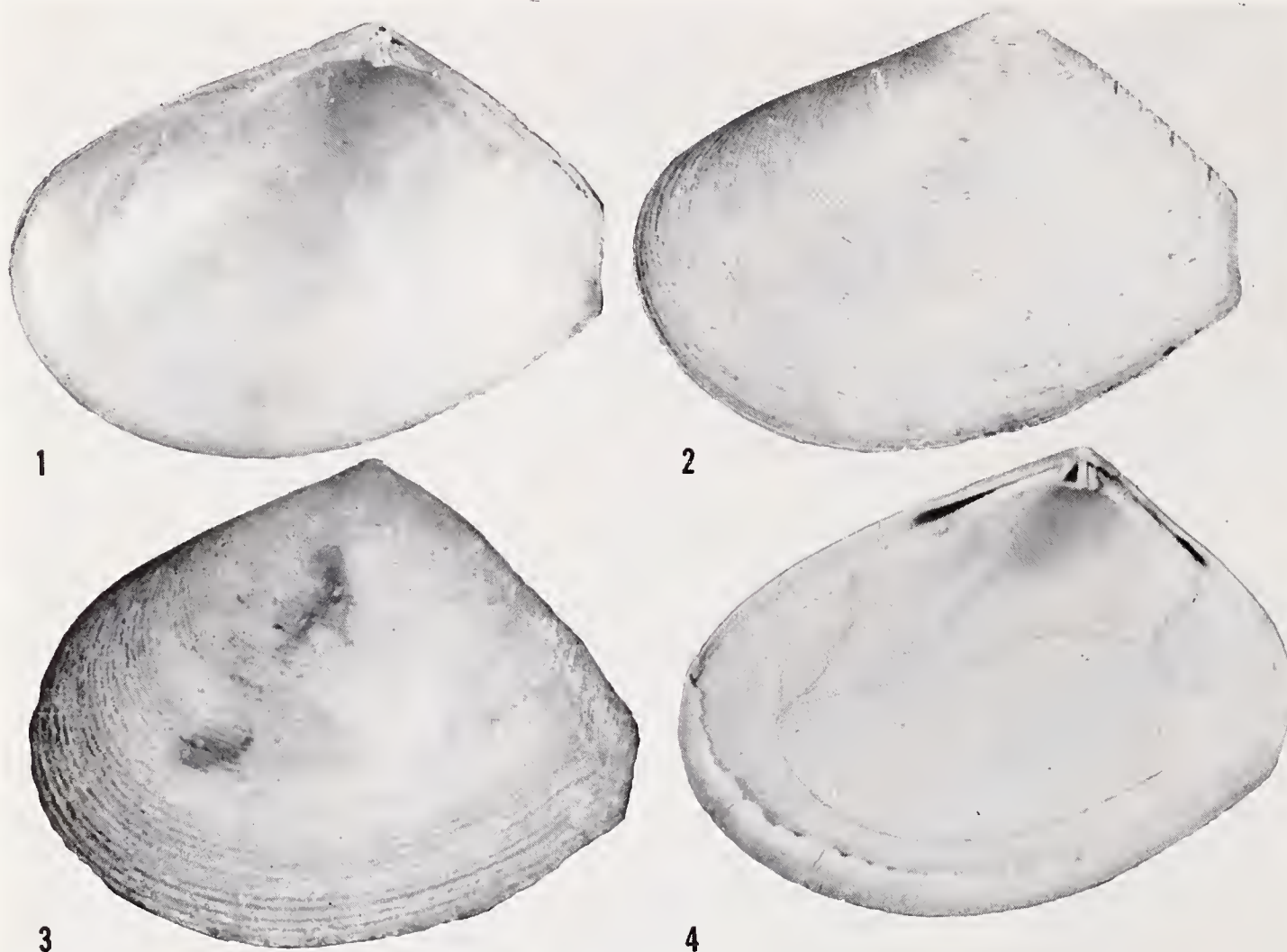


Plate 141. Figs. 1-2. *Tellina aequistriata* Say. Fig. 1. Internal view of the right valve. Fig. 2. External view of the right valve, Red Fish Pass, Captiva, Florida, MCZ 236307 (about 5x) [L=15.5 mm.]. Figs. 3-4. *Tellina alerta* Boss. Fig. 3. Internal view of the right valve of the paratype (about 9x) [L=8.3 mm.]. Fig. 4. External view of the left valve of the holotype, 32°45' S; 50°39' W, BMNH (about 9x) [L=8 mm.].

Heretofore, *Tellina aequistriata* Say and *T. lintea* Conrad have been maintained as separate entities but there are no morphological differences which can distinctly separate *aequistriata* into two species. Dall (1900b) noted that equal sized specimens were not divisible into separate species but he maintained that a difference of proportions was evident in adults. The differences of proportions in *aequistriata* are amply exhibited in any sizable sample from a population.

The near allies, *Tellina martinicensis* and *T. juttingae* are distinguished from *T. aequistriata* by the short confluence of the pallial line and the pallial sinus. *Tellina alerta* is the nearest relative of *T. aequistriata*, but in *alerta* the pallial sinus is widely separated from the anterior adductor muscle scar and the periostracum is dull red-brown. In the Eastern Pacific, the analog of *T. aequistriata* is *T. reclusa* Dall, which may be distinguished by its shorter more trigonal shape and its rasplike sculpture.

According to Parker (1960, p. 323), *Tellina aequistriata* is characteristically a member of the sandy bottom community along the intermediate shelf in the Gulf of Mexico at depths from 12–35 fathoms.

Range. This species is found from off Beaufort, North Carolina south throughout the Bahama Islands, the Greater and Lesser Antilles to off Bahia, Brasil.

Specimens examined. NORTH CAROLINA: Beaufort; off Cape Hatteras, in 9–22 fathoms; Pivers Island (all USNM). SOUTH CAROLINA: Sullivan's Island (CM). FLORIDA: Lake Worth; off Miami; off Caesar's Creek Bank; off Pacific Reef; Key Largo; Sombrero Key; Looe Key (all MCZ); Key West; Charlotte Harbor; Sarasota; Cedar Keys (all USNM); Destin; Pensacola (both MCZ). ALABAMA: Fort Morgan (MCZ). MISSISSIPPI: Horn Island (ANSP). TEXAS: Pass Cabello. MEXICO: Veracruz; Yucatan (both MCZ). GUATEMALA: Puerto Barrios (ANSP). BAHAMA ISLANDS: Little Abaco (MCZ): off North Bimini Island, in 20 fathoms (USNM); New Providence (MCZ): off Green Cay, in 9 fathoms (USNM). CUBA: *Barrera* station 211, Cape Cajon; *Barrera* station 209, Santa Rosa, in 3–6 fathoms; *Barrera* station 200, Santa Lucia, in 2–4 fathoms; *Barrera* station 204, Cayo Arenas, in 2 fathoms; *Barrera* station 208, Bahía Honda, in 1–12 fathoms; *Barrera* station 202, Cabanas Harbor, in 25 fathoms (all USNM): Matanzas Bay; Rio Arimas (both MCZ); off Isle of Pines, in 3 fathoms (USNM). JAMAICA: Montego Bay (USNM). HISPANIOLA. HAITI: Jerémié (USNM). PUERTO RICO: off Mayagüez, in 30 fathoms (USNM); off Enrique Reef, La Parguera, in 30–75 feet (IMPBR). VIRGIN ISLANDS: Charlotte Amalie, St. Thomas, in 30 feet (ANSP). LESSER ANTILLES: English Harbour, Antigua, in 7 fathoms (USNM); $\frac{3}{4}$ mile S of Fort St. Louis, Martinique (MCZ); Carlisle Bay, Barbados, in 6–12 fathoms (USNM); 2 miles S of Fort George, Scarborough, Tobago, in 36 fathoms (MCZ). CARIBBEAN ISLANDS: off the Stack, Georgetown, Grand Cayman Island, in 8 fathoms (ANSP). BRASIL: *Albatross I* station 2758, 34 miles SE of Natal ($06^{\circ}59' S$; $34^{\circ}47' W$), in 20 fathoms (USNM); off Bahia ($11^{\circ}49' S$; $37^{\circ}27' W$), in 12 fathoms (MCZ).

Tellina (Merisca) alerta Boss

Plate 139, fig. 3; Plate 141, figs. 3–4

Quadrans linteus 'Conrad' Richards and Craig, 1963, Proc. Acad. Nat. Sci. Philadelphia, **115**: 135, pl. 1, figs. 8, 8, *non* Conrad 1837.

Tellina (Merisca) alerta Boss 1964, Occ. Pap. Dept. Mollusks, Harvard University, **2**: 309, pl. 55, figs. 1–2 (about 15 miles SE of Rio Grande do Sul, Brasil, in 48 fathoms ($32^{\circ}45' S$; $50^{\circ}39' W$); holotype, BMNH, no. 79.10.15.171.2).

Description. Shell extending to 8.2 mm. (about $5/6$ inch) in length and to 6.5 mm. (about $1/4$ inch) in height, elongate-subtrigonal, subsolid to thin, a little tumid with the left valve more convex and with a sharp flexure to the right posteriorly. Umbos central and pointed. Anterior margin smoothly rounded; ventral margin gently convex and rising in a concave basal arcuation posteriorly; anterior dorsal margin straight and gently inclined; posterior margin short, parallel with the dorso-ventral axis and forming a blunt truncation. Sculpture consisting of regularly spaced, raised lamellae (about 10–12 per millimeter) separated by sulci. Ligament light brown and slightly protuberant. Calcareous portion of the ligament poorly developed. In the left valve, the cardinal complex consists of an anterior subdeltoid tooth with subequal lobes and of a posterior extremely

elongate laminate tooth; distal anterior and posterior lateral teeth present, protruding and weak. In the right valve, the cardinal complex consists of a posterior thickened bifid tooth with subequal lobes and of an anterior subdeltoid laminate tooth; distal anterior and posterior lateral teeth present, elongate, strong upcurled and socketed. Adductor muscle scars well impressed. Anterior adductor scar elongate, pointed above and rounded below; posterior adductor scar subquadrate. Pallial sinus equal in opposite valves, rising gently behind, widely separated from the anterior adductor scar and forming a short confluence posteriorly. Periostracum dull reddish-brown, the external surface of the valves eroded in the umbonal region and the remainder a dull white.

length	height	width	
8.3 mm.	6.5 mm.	3.0 mm.	Paratype of <i>alerta</i>
8.0	6.0	2.8	Holotype of <i>alerta</i>

Remarks. *Tellina alerta* is most closely allied to *Tellina aequistriata*. The shape of the shell, the concentric sculpture and the configuration of the lateral teeth of the right valve serve to indicate the close relationship between these species. The pallial sinus is the most important character used to distinguish the species. In *aequistriata*, the sinus falls to and is confluent with the pallial line at or very near the base of the anterior adductor muscle scar while in *alerta* it is widely separated from the anterior adductor scar and the confluence of the sinus and the pallial line is short. *Tellina alerta* possesses a dark periostracum which differs from the white periostracum of *aequistriata*, and the lateral compression of the valves appears to be greater in *alerta*.

Range and specimens examined. This species is known from the type locality and from off Uruguay ($34^{\circ}47' S$; $52^{\circ}47' W$) in 54.9 meters as figured by Richards and Craig (1963).

Subgenus *Acorylus* Olsson and Harbison

Acorylus Olsson and Harbison 1953, Acad. Nat. Sci., Philadelphia, Monograph 8, p. 128 (type species, *Tellina suberis* Dall 1900, original designation).

Description. Shell small, solid, obliquely subovate, with a right posterior flexure. Hinge line strong and heavy. Two strong lateral teeth in the right valve, equidistant from the cardinal complex and socketed. No true lateral teeth in the left valve. Pallial sinus large, reaching to the anterior adductor muscle scar and extensively confluent with the pallial line.

Acorylus is employed herein as described by Olsson and Harbison (1953). *Morella* with *Tellina donaeina* Linnaeus as type is closely allied but differs in the increased strength of its concentric sculpture and the protuberant nature of the right lateral dentition. *Cadella*, a genus of Dall, Bartsch, and Rehder, with the Indo-Pacific *Tellina leehiogramma* Melville as type, is also close to *Acorylus*, but *Cadella* has a stronger sculpture and the confluence of the pallial line and the pallial sinus is not extensive.

Acorylus is monotypic in the recent fauna of the Western Atlantic.

Tellina (Acorylus) gouldii Hanley

Plate 139, fig. 4; Plate 142, fig. 4

Tellina cuneata d'Orbigny 1842 [in] Sagra, Hist. L'Ile Cuba, Atlas, pl. 26, figs. 21-23; 1845, Spanish Text, 2(5): 306 (Cuba y a las Floridas); 1853, French Text, Mollusques, 2: 256 [type locality, here restricted, Habana, Cuba; holotype, BMNH, no. 54.10.4.5.2], non Spengler 1798.

Tellina gouldii Hanley 1846 [in] Sowerby, Thesaurus Conchyliorum, 1: 272, pl. 56, fig. 26 (West Indies) [type locality, here restricted, Habana, Cuba; holotype, BMNH], *non* Carpenter 1864.

Tellina (*Moera*) *gouldii* Hanley. H. and A. Adams 1856, Genera Recent Mollusca, 2: 396.

Tellina (*Acorylus*) *gouldii* Hanley. Olsson and Harbison 1953, Acad. Nat. Sci., Philadelphia, Monograph 8, p. 128.

Tellina (*Moerella*) *cuneata* d'Orbigny. Abbott 1958, Acad. Nat. Sci., Philadelphia, Monograph 11, p. 134, pl. 5 j and k, map 8.

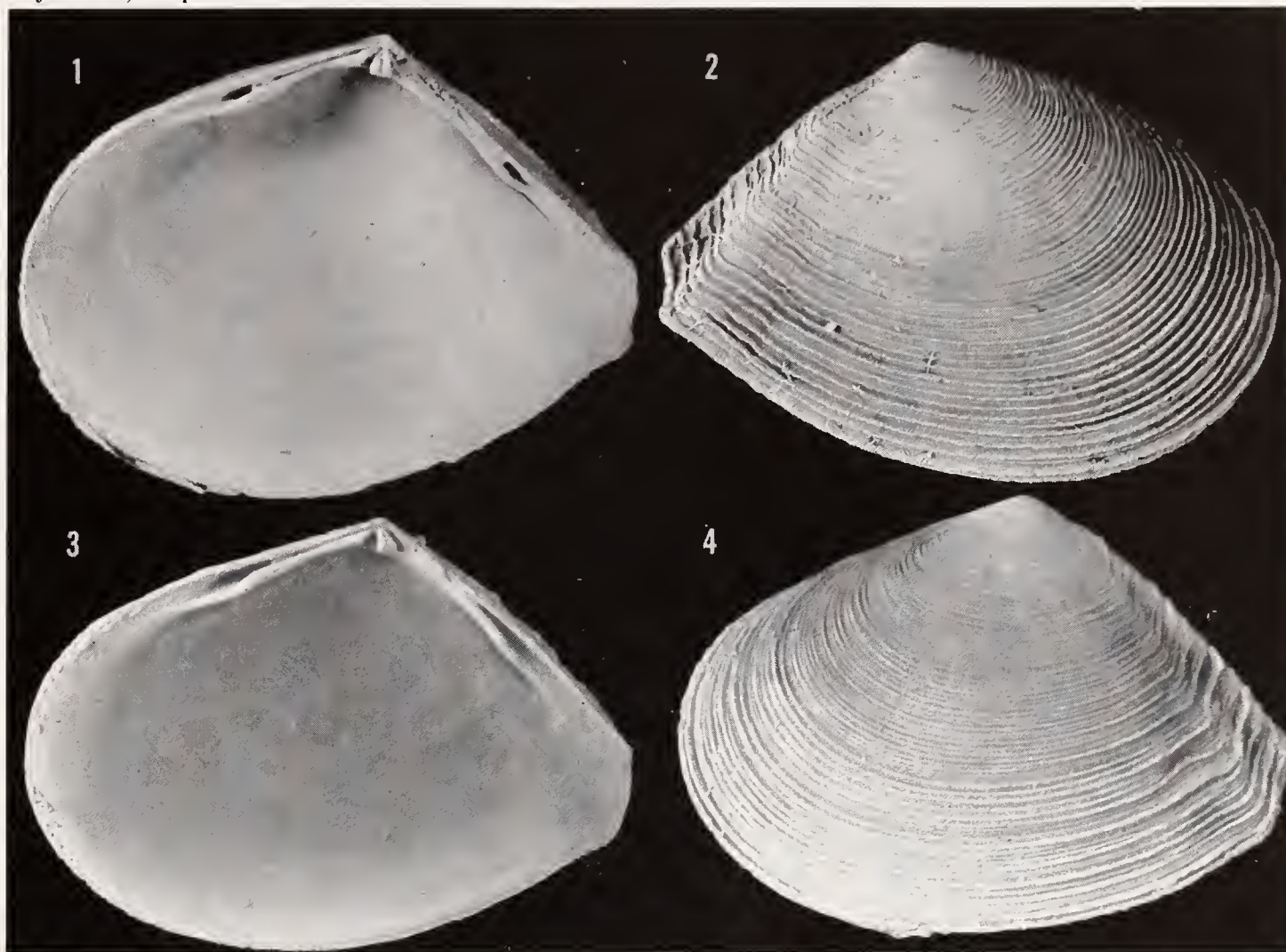


Plate 142. Figs. 1-2. *Tellina guadaloupensis* d'Orbigny [= *Tellina aequistriata* Say]. Fig. 1. Internal view of the right valve of the holotype. Fig. 2. External view of the left valve of the holotype, Guadeloupe, West Indies, CMNH (about 7x) [L=9.5 mm.]. Fig. 3. *Tellina tumida* Sowerby [= *Tellina aequistriata* Say], external view of the left valve of the holotype, Jamaica, BMNH (about 9x) [L=8.7 mm.]. Fig. 4. *Tellina gouldii* Hanley, internal view of the right valve, Bermuda, MCZ 243073 (about 8x) [L=9.5 mm.].

Description. Shell extending to 10.3 mm. (about $\frac{3}{8}$ inch) in length and to 7.8 mm. (about $\frac{1}{4}$ inch) in height, solid, heavy, obliquely subovate and with a very slight flexure to the right posteriorly. Umbos posterior to the middle, somewhat elevated and rounded. Anterior margin narrowly rounded: ventral margin convex and gently rising posteriorly: anterior dorsal margin long, straight and steeply sloping: posterior dorsal margin short and steep: posterior margin short and forming a truncation. Sculpture consisting of weak concentric lirations: obsolete radial sculpture sometimes evident. Ligament light golden-brown or yellow, not prominent and deeply set. In the left valve, the cardinal complex consists of an anterior small bifid tooth with subequal lobes and of a posterior thin laminate tooth; lateral teeth obsolete. In the right valve, the cardinal complex consists of a posterior deltoid bifid tooth with subequal lobes and of an anterior thin laminate tooth; lateral teeth equidistant from the cardinal complex, strong and socketed. Adductor muscle scars fairly well impressed. Anterior adductor lunate: posterior adductor large and

ovate. Pallial sinus rising abruptly, descending arcuately and touching the anterior adductor scar; confluence nearly entire. Shell white internally and externally; rarely iridescent.

length	height	width	
8.7 mm.	6.7 mm.	3.3 mm.	Holotype of <i>gouldii</i> Hanley
7.2	5.5	3.0	Holotype of <i>cuneata</i> d'Orb.
10.3	7.2	4.2	Bailey's Bay, Bermuda
9.2	7.8	4.1	Long Island, Bahamas
4.7	3.6	1.7	Grand Cayman Island

Remarks. This is a distinctive species whose small size and characteristic shape serve to distinguish it from other *Tellina*. The ancestors of *gouldii* are well represented in the Tertiary of North America and the Caribbean. The immediate predecessor to *gouldii* is *suberis* Dall from the Pliocene of Caloosahatchie, Florida. The species *gouldii* stands rather alone in its distant relationship to the other *Tellina* in the Western Atlantic and for that reason the subgeneric position given it by Olsson and Harbison is adopted.

In shape, *gouldii* might be confused with *Tellina candeana* d'Orbigny, but the latter may be immediately identified by its scissulate sculpture. Also, *gouldii* may be confused with *Semele nuculoides* Conrad, but the latter is distinguished by its internal ligament, its distinct escutcheon and its free pallial sinus.

Tellina gouldii prefers a sandy substrate within an association of sea grass in shallow water. Abbott (1958) has remarked that this species at Grand Cayman was found at depths between 6 and 25 feet in lagoons facing the open sea.

Range. From Bermuda, the Bahamas, Palm Beach, Florida in the north, this species extends through the Greater Antilles and Lesser Antilles to the north coast of South America.

Specimens examined. FLORIDA: off Palm Beach, in 100–130 fathoms (MCZ); off South Inlet, Lake Worth, in 7 fathoms (ANSP); off Miami, in 8–30 fathoms; off Fowey Light, in 25–38 fathoms; off Gov't Cut, in 5–35 fathoms; off Bear's Cut, in 18–20 fathoms; off Ajax Reef, in 4–40 fathoms; off Turtle Harbor, in 10 fathoms; Little Duck Key; off Conch Key, in 1–5 feet (all USNM); Tea Table Key (ANSP); Newfound Harbor Key; Key West; Garden Key, Tortugas (all USNM). MEXICO: *Albatross I* station 2365, 46 miles N of Cabo Catoche, Yucatan (22°18' N; 87°04' W), in 24 fathoms (USNM). BERMUDA: Castle Roads, Castle Harbor, in 4–5 fathoms; North Rock, 11 miles N of Hamilton, in 4 fathoms; Bailey's Bay, in 8 feet (all MCZ); Casper's Island (USNM); Shelly Bay (ANSP; MCZ). BAHAMA ISLANDS: off Gun Cay, in 9 fathoms (USNM); Dick's Point, Nassau, New Providence (MCZ); Mintie Bar, South Bight, Andros (USNM); Little San Salvador; Orange Creek, Cat Island; Simms, Long Island; Matthew Town, Great Inagua (all MCZ). CUBA: *Barrera* station 211, Cape Cajon; *Barrera* station 208, Bahia Honda, in 1–12 fathoms; *Barrera* station 206, off Arroyos; *Barrera* station 202, Cabanas Harbor, in 25 fathoms; Habana; *Barrera* station 201, Cayo Levisa (all USNM); Pueblo Nuevo, Matanzas; *Atlantis* station 2999, Bahia de Matanzas (23°10' N; 81°29' W), in 145–280 fathoms; Guarda la Vaca. Banes (all MCZ). HISPANIOLA. HAITI: Jerémié (USNM). VIRGIN ISLANDS: 1 mile E of East Point, Anegada Island, in 3–6 feet (ANSP); White Bay, Guana Island (MCZ); Judith's Fang, St. Croix (IMPBR). LESSER ANTILLES: Marigot Harbor, St. Lucia (MCZ); Carlisle Bay, Barbados, in 6–12 fathoms (USNM). CARIBBEAN ISLANDS: off Bowse Bluff and West Beach, Grand Cayman (both MCZ); SE of Swan Island, in 5 fathoms (MCZ). VENEZUELA: off Punta de Piedras, Isla de Margarita (ANSP).