THE SUBFAMILY TELLININAE IN SOUTH AFRICAN WATERS (BIVALVIA, MOLLUSCA)

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CONTENTS

INTRODUCTION

The family Tellinidae is a widely distributed, entirely marine, eulamellibranch group of bivalves with three subfamilial elements—the Tellininae, the Macominae and the Strigillinae. With its phylogenetic roots in the Mesozoic, the family had already undergone considerable radiation by the Upper Cretaceous, and by the base of the Neogene, the lineages culminating in the Recent representatives had been established. The Tellininae is a rather conspicuous member of the tropical and subtropical infaunal benthos, whereas the Macominae, possibly less highly speciated, has its stronghold in the cold temperate, boreal, and arctic realms.

The Strigillinae, rounded in shape, sculptured with scissulations, and usually highly colored, is also tropical and subtropical in its distribution and richest in number of species in the eastern Pacific-Caribbean region (Boss, 1969).

Having been for some time interested in the systematics of the genus *Tellina* (Boss 1966b), I began studying the species of South African waters while working on board the R/V ANTON BRUUN during Cruise 7 of the International Indian Ocean Expedition off the coast of southeast Africa.

The species taken in South Africa bear considerable resemblance to those of the western Atlantic-eastern Pacific as well as the Mediterranean areas. Thus my interest in the evolution of this group and in the interrelationships of the faunas expanded into the present review of the South African species. Any geographically restricted study of widely dispersed organisms in the marine habitat is necessarily incomplete, since not all the species—either fossil or Recent—can be taken into consideration, and since the interpretation of the differentiation of the group can be, at best, only an approximation of what has actually happened.

When one studies the species-complexes of the South African area that are in

reality of Indo-Pacific distribution, one fact becomes immediately apparent: most species live throughout the Indo-Pacific from east African waters to as far south as Durban and as far east as the Hawaiian Islands. These species have been subject to overnaming. Species such as *Tellina semen, T. capsoides,* and *T. perna* have extensive synonymies, which will no doubt be increased as more of the obscure, named forms of the Philippines, Indonesia, and India are recognized for what they really are.

The major papers dealing with the taxonomy of the Tellinidae have recently been discussed (Boss, 1966b). The genus *Tellina* was established by Linnaeus (1758), and the species that he originally included have been reviewed by Hanley (1855), Römer (1871), and Dodge (1952). Monographic revisions or surveys of the family began with Spengler (1798), though Schröter (1788) discussed numerous species, and were continued in the 19th century with the work of Hanley (1846), Sowerby (1869), Römer (1870–73), and Bertin (1878). Dall (1900) treated the superspecific taxa; Salisbury (1934) listed the superspecific groups and renamed a number of homonyms; and Afshar (1950) attempted a revision of the generic and infrageneric taxa.

Barnard (1958) presented an historical résumé of the workers who have described South African mollusks. With regard to the tellens, Krauss (1848) was among the earliest malacologists to publish specifically on the South African fauna. Later, von Martens (1874) reported on specimens collected by Fritsch. In a series of papers, Sowerby (1889a and b; 1892; 1894; 1897; 1904) described many new species, including some collected by the trawler PIETER FAURE; Tomlin (1926) also worked on some of that material. The collection made by Turton was reported on by Bartsch (1915) and later by Turton himself (1932). The latest and most important contribution to the knowledge of the South African malacofauna is the work of Barnard (1964b). Boshoff (1965) discussed the bivalves of Inhaca Island, Mozambique. The large national oceanographic expeditions usually rounded the Cape on their way home and collected in these waters. Smith (1885) did the CHALLENGER lamellibranchs and Thiele and Jaeckel (1931) worked up those of the VALDIVIA.

Recently an extensive paper on the superfamily Tellinacea in Chinese seas has been published by Skarlato (1965). He discusses 54 species of the family Tellinidae. Of these, more than half are referable to *Tellina* in its broadest sense. In general, what I have reduced to subgenera, Skarlato employs as genera. Of particular interest, however, is his excellently detailed geographic analysis and recognition of certain species that are widely distributed in the Indo-Pacific region.

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ABBREVIATIONS

AMNH — American Museum of Natural History, New York.
ANSP — Academy of Natural Sciences of Philadelphia, Pennsylvania.
BMNH — British Museum (Natural History).
DM — Durban Museum, Durban.
MCZ — Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.
MHNG — Muséum d'Histoire Naturelle, Geneva.
MNHNP — Muséum National d'Histoire Naturelle, Paris.
NM — Natal Museum, Pietermaritzburg.
SAM — South African Museum, Cape Town.
UCT — University of Cape Town, Ecology Survey.
USNM — United States National Museum, Washington, D. C.

TAXONOMIC CHARACTERS

The characteristics of the shell serve as the basis for the systematics of the family Tellinidae — all its genera and all its species. Certain of the more noticeable anatomical features of the animals are reflected in the structure of the shell — a fact which at least in part justifies the reliance of the system on shell morphology.

Plate 1 illustrates the major conchological traits of *Tellina.* The most important elements are the teeth, which are comprised of two portions: (1) a cardinal complex consisting in the right valve of an anterior, single, variously thickened cardinal tooth and of a posterior, variously thickened and skewed, bifid cardinal tooth, and in the left valve of an anterior bifid cardinal tooth and of a single posterior cardinal tooth; and (2) a lateral dental complex of variable development. Interlocking the valves medially, the cardinal complex is supported by a hinge plate and is virtually the same throughout the family or within related families of the superfamily Tellinacea (e.g., Semelidae). The cardinal complex offers little of diagnostic value at levels below the family, although in certain species the right posterior bifid tooth is protuberant and strongly skewed posteriorly.

The lateral teeth, on the other hand, have been employed as the basis for distinguishing the Tellininae (with lateral teeth) and the Macominae (without lateral teeth). These teeth are differentiated projections of the hinge line and serve to stabilize and interlock the two opposing valves. A complete complement of lateral teeth totals four — one anterior and one posterior (in each valve). Those of the left valve tend to be less strongly developed, and the right anterior lateral tends to be the most strongly developed. The relative distances from the cardinal complex at which the lateral elements are developed are important in the recognition of certain groups. Thus, in *Tellina sensu stricto* and *Tellinella,* the right anterior lateral tooth is distal to the cardinal complex, whereas in *Tellinides* and *Homalina* that anterior lateral is virtually incorpo-

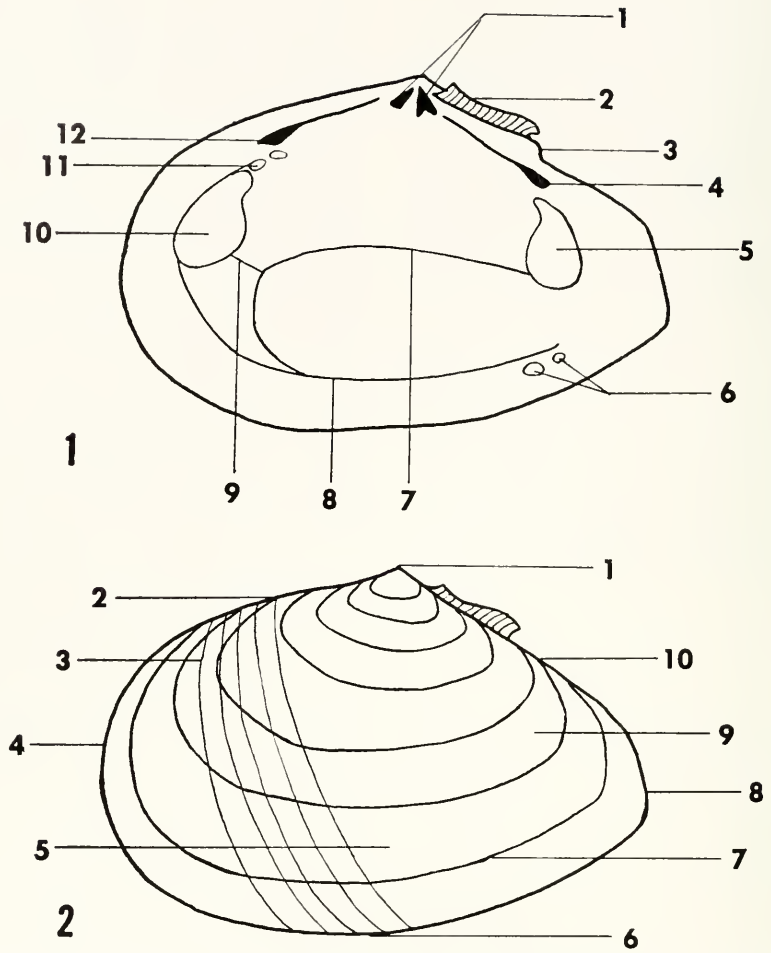


Plate 1. Diagrammatic representation of the shell morphology of a generalized *Tellina*. Fig. 1. Internal view of a right valve: 1, cardinal camplex with the single, anterior, laminate cardinal tooth and the bifid, posterior cardinal tooth; 2, ligament; 3, nymphal callosity; 4, posterior lateral tooth; 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 slape; 10, posterior dorsal margin.

rated into the cardinal complex, and in *Eurytellina* the tooth is proximal to it.

The ligament is opisthodetic (situated behind the umbos) and consists of an outer horny external sheath and a white internal calcareous element. The latter is supported by a thickening of the hinge line, which is called the nymphal callosity.

The ligament is usually short and protuberant, though in certain species it is elongate and thin (e.g., *Tellina* (*Phylloda*) *foliacea* Linnaeus) or tending to become internal (e.g., *Tellidora cristata* Recluz).

The external surface of the valves may be invested with variously developed sculpture, though the overwhelming majority of the species tend to be smooth or, at most, weakly and concentrically incised with fine sulcations. Acentric sulcations are found in the subfamilial Strigillinae and in a

number of subgenera (e.g., *Scissula, Fabulina, Scissulina*) (Boss 1966a). Raised and differentiated ridges or rasps are found in some species-complexes and groups (e.g., *T. scobinata* Linnaeus, *T. rastellum* Hanley, *T. palatam* Iredale).

Relatively strong concentric lirations are found in such groups as *Serratina, Tellinella,* and *Merisca.* Differentiated dorsal spines are usually extensions of sublamellate concentric sculptures (*Quadrans* and *Tellidora*). The lirations in *Cadella* and *Moerella* are closely spaced and rather smooth.

The internal surface of the valves shows many anatomical traits: the size and disposition of the anterior and posterior adductor muscles, the anterior and posterior pedal retractor muscles, and the ventral cruciform muscles. The pallial scars include those of the pallial sinus, impressed by the siphonal retractors, and the pallial line made by the muscles of the edge of the mantle. Infrequently an interlinear scar connects the pallial sinus with the anterior adductor muscle scar. The *Gestalt* of these muscle scars is usually specifically diagnostic — particularly when it is employed in conjunction with less easily described features, such as the outline of the valves, the truncation of the posterior end, or the thickness or color of the shell.

The shapes of all the muscles, though very similar in closely related species, may be very different in separate lineages. Thus in *T. liliana* Iredale from New Zealand, the anterior adductor is very long, narrow, and semilunate; in *T. palatam* Iredale of the Indo-Pacific, the posterior adductor muscle has an unusual ventral extension. The pallial sinus itself may be coextensive with the anterior adductor muscle in one valve only (e.g., *T. trilatera* Gmelin from South Africa) or in both valves (e.g., *T. punicea* Born of the western Atlantic). It may be coalescent with the pallial sinus for a short distance ventrally (*T. crassa* Pennant of the eastern Atlantic), or parallel to it for some time before becoming confluent (*T. capsoides* Lamarck of the Indo-Pacific), or completely coalescent (*T. madagascariensis* Gmelin of west Africa).

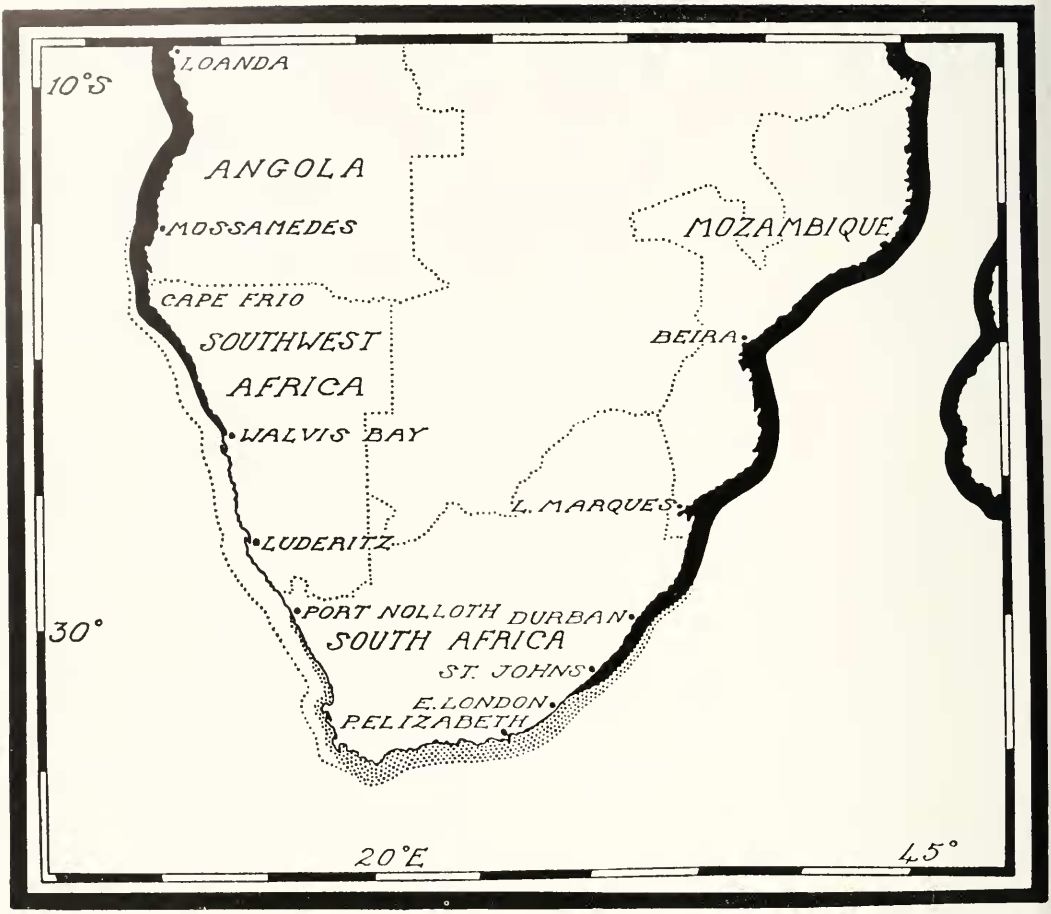
The cruciform muscle scars exhibit little variation and are characteristic of all the families of the Tellinacea. They are paired and may be subtended by colored rays or some differentiation of the shell (*T. opalina* Gmelin of the Indian Ocean and the East Indies). Usually the scars are rounded, but the right anterior one sometimes tends to be rectangular.

REMARKS ON ZOOGEOGRAPHY

The salient feature of the distribution of marine plants and animals in South Africa is the steady increase in the number of species from the west to the east coast. This species gradient was proposed by Gilchrist (1905) for offshore organisms and carefully documented for intertidal plants and animals by Stephenson (1947). Correlated with temperature, the gradient shows an increase in numbers of species of organisms from the cooler waters of the southwestern coast to the tropically influenced waters of Natal. Stephenson (1944) illustrated the decline in species numbers from Durban in the east to Port Nolloth in the west. Gilchrist also postulated that the number of individuals was greater in areas with a reduced number of species. The distribution of mollusks in South African waters was also discussed by von Martens (1903), Tomlin (1922), and Barnard (1958).

Three rather distinct faunal provinces were established for intertidal animals by Stephenson, and such faunal divisions are also recognizable for offshore organisms (see Map 1). Exhibiting a degree of overlap and, thereby, imperfectly circumscribed, these areas include:

1) A cold-water fauna along the west coast, extending from the Cape of Good Hope north to southwest Africa, where the tropical West African zone is encountered near Cape Frio, Angola. This element has been referred to as the Namaqua fauna.



Map 1. Southern Africa, showing the approximate distribution of its principal coastal faunas. The two tropical faunas are shown in black—the southern part of the tropical west African fauna on the left, southwestern termination of the Indo-Pacific fauna on the right. The 'Cape' fauna in the strictest sense, a warm-temperate fauna centering about the south coast of the Republic of South Africa, is stippled. The cold-water or Namaqua fauna of the southern part of the west coast is shown in white bounded by a dotted line. Overlap between these faunas is indicated (after Stephenson, 1947).

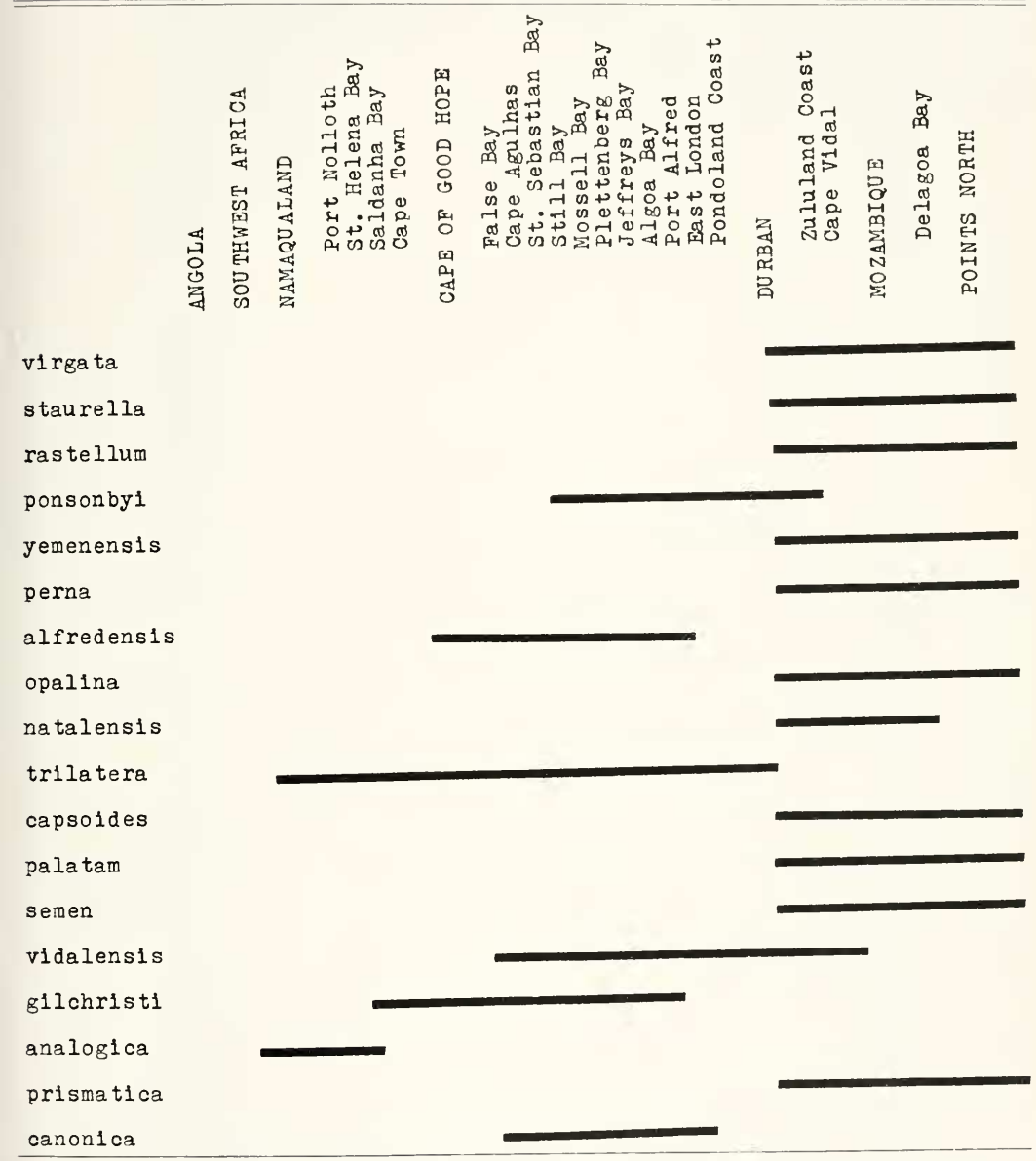
2) A southern, warm-temperate fauna between Port Elizabeth in the east and Cape Agulhas in the south.

3) A tropical and subtropical element from the Natal coast southward to East London.

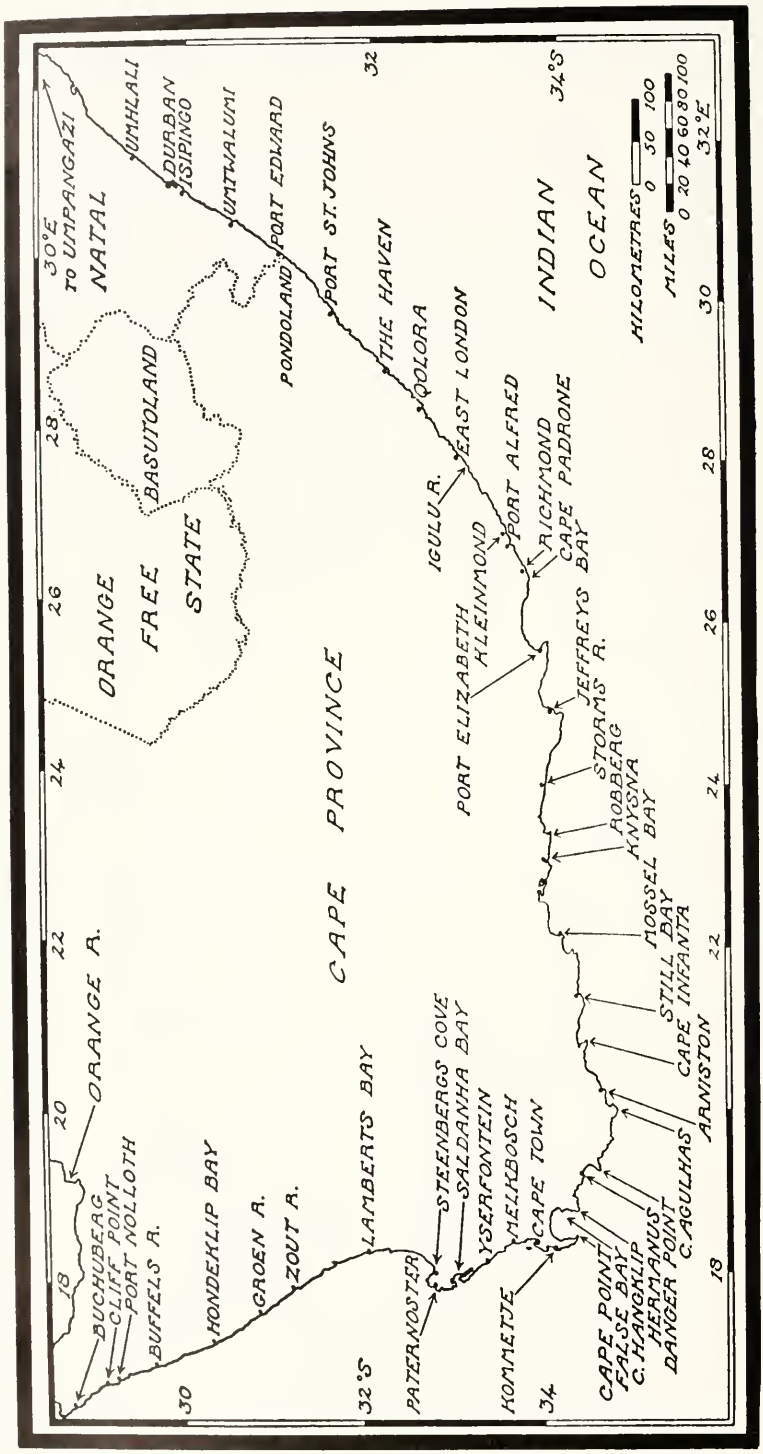
Although Stephenson's results and interpretations are based on an intensive study of intertidal organisms, his generalizations in regard to the three faunal elements apply in most respects to subtidal and offshore organisms. Species of *Tellina* are sublittoral or offshore infaunal animals that live in sandy, muddy, or gravelly substrates in predominantly tropical warm-temperate waters. Their distribution in South Africa, however, is similar to that of *Siphonaria*, an intertidal limpet-like pulmonate gastropod, which Allanson (1958) has recently discussed.

Table 1 gives the distribution of the species of South African *Tellina*, and Map 2 shows the main localities along the South African coast. The number of species in-

Table 1. The distribution of Tellininae along the coast of South Africo.



creases from west to east; this increase is related to the coastal water temperatures. The cold waters of the west coast are obviously a barrier to *Tellina*. A single species, *analogica*, is strictly western, whereas the other two that occur in that area, *gilchristi* and *trilatera*, have ranges that overlap the southern region and, in the case of *trilatera*, even the subtropical eastern area. Of the remaining species of South African *Tellina*, two have ranges entirely within the southern province: *alfredensis* and *canonica;* three occur in the south but overlap into the subtropical



Map 2. Principal localities along the coast of the Republic of South Africa (after Stephenson, 1944).

area near Durban: *ponsonbyi*, *trilatera*, and *vidalensis*. Eleven species are eastern forms, with distributions that usually range into the tropical Indo-Pacific. Species such as *virgata*, *staurella*, *rastellum*, *perna*, *opalina*, *capsoides*, *palatam*, and *semen* are extensively distributed throughout the Indian and Pacific Oceans.

Species apparently endemic to South Africa include: *ponsonbyi*, *alfredensis*, *canonica*, *analogica*, *trilatera*, *gilchristi*, and *vidalensis*. Of these, the relatively well-known and more conspicuous species exhibit interesting relationships to species in other parts of the world. They are not closely related to the western Atlantic-eastern Pacific species or to those complexes of the European north Atlantic and Mediterranean groups, but rather to those isolated in regions of South Australia and New Zealand. In the case of *ponsonbyi*, its closest ally is *victoriae* of South Australia, while *trilatera* is related to *gaimardi* of New Zealand. On the other hand, the *gilchristi-analogica* complex is close to the West African *rubicincta*. The relatives, possibly once-removed, of *alfredensis* and *trilatera* are the West African *madagascariensis* and *hyalina*, respectively. In the absence of fossil evidence, it is impossible to establish the ranges of the precursors of the *ponsonbyi-victoriae*, *alfredensis-albinella*, *trilatera-gaimardi* lineages, but it appears probable that these species once were widely distributed in the Indo-Pacific area and have been displaced and isolated in Africa, Australia, and New Zealand.

SYSTEMATIC SECTION

FAMILY TELLINIDAE

Gills small, posterior, not plicate, outer demibranch dorsally directed, 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 large ventral pedal gap. Siphons long, extensile, separate to their bases, and capable of retraction into extensive pallial sinus. Ligament external, opisthodetic, 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, posterior side generally shorter, and often strongly flexed to right posteriorly. Valves usually of unequal convexity, left larger and more convex. Hinge with both cardinal and lateral teeth. Surface sculptured usually concentrically, generally heavier on rostral areas.

Genus *Tellina* Linnaeus

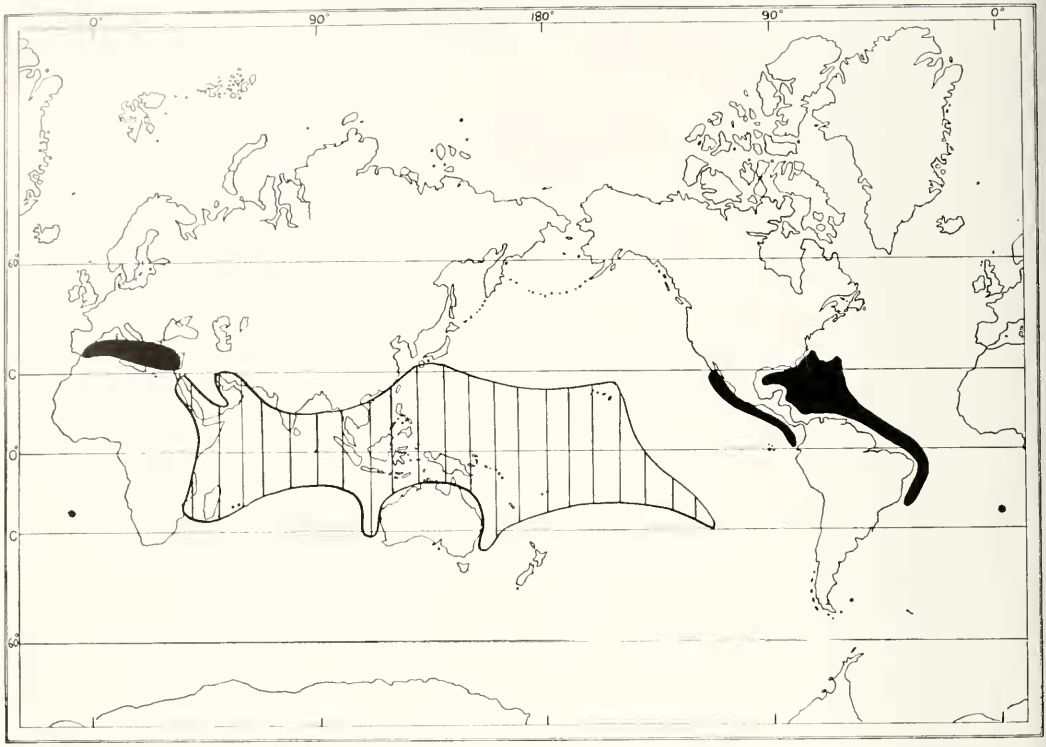
Tellina Linnaeus 1758, Syst. Nat., ed. 10: 674 (type-species, *Tellina radiata* Linnaeus 1758, subsequent designation Schmidt 1818: 51).

Description. Shell small to large, elliptical to ovate in shape, left valve generally more convex than 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.

The correct type designation for the genus has been discussed by Boss (1966b). *Tellina sensu stricto* does not occur in South African waters. It is represented in the western Atlantic by such species as *T. radiata* Linnaeus and *T. brasiliana* Spengler, and in the Indo-Pacific by *T. chariessa* Salisbury (= *elegans* Gray).

Subgenus *Tellinella* Mörch

Tellinella Mörch 1853, Catalogus Conchyliorum . . . Comes di Yoldi, 2: 13 (type-species, *Tellina*



Map 3. The distribution of *Tellinella*. The species included are: in the Indo-Pacific, *virgata, staurella, crucigera, rastellum, pulcherrima, asperrima,* and *verrucosa;* in the western Atlantic, *listeri;* in the central Atlantic on St. Helena, *antonii;* in the eastern Pacific, *cumingii* and *zacae;* in the Mediterranean, *pulchella*. The group is largely of tropical distribution and, in the Indo-Pacific, replaces *Eurytellina* as a conspicuous element of the tellinid fauna.

virgata Linnaeus 1758, subsequent designation Stoliczka 1870: 116[1]).

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

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

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

Description. Shell medium to large, ovate, elongate, or elliptical in outline, solid to subsolid, generally equivalve and nearly equilateral, more or less flexed to right posteriorly. Concentric sculpture developed, strong and often squamose posteriorly; radial sculpture rare. Lateral dentition developed in both valves. In right valve, both lateral teeth distal to the cardinal complex and strongly developed. In left valve, both lateral teeth distal to the cardinal complex and moderately developed. Ligament generally strong with subtending nymphal callosities. Pallial sinus linguiform and removed from anterior adductor muscle scar; confluence of pallial sinus and pallial line short and limited to the posterior half of the shell.

Remarks. Tellinella consists of a rather well-defined group of species that are characterized by having shells that are relatively strongly and lirately sculptured,

[1] The 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.

with a complement of right lateral teeth more or less distally removed from the cardinal complex. The pallial sinus is rather extensive, extending near to the anterior adductor muscle scar and then falling in an irregular or subsigmoid arcuation to the pallial line, there to become confluent for about one half the length of the line posteriorly. Frequently an interlinear scar connects the pallial sinus and the anterior adductor muscle scar. The internal surface of the valves is usually rather highly polished and shining; nevertheless, the muscle scars are normally well impressed and easy to discern. Posteriorly, a complex of ridges and sulci are developed in conjunction with raised or stronger concentric sculpture and a more or less distinct flexure to the right.

The Indo-Pacific is the richest area in the world for the species of *Tellinella*. Largely tropical, usually conspicuous because of their brilliant coloration and considerable size, species of this group have been frequently collected, are well represented in collections, and are often taken in series. Of relatively shallow water habitat and often associated with the sandy areas around reefs, they are commonly encountered. Two more or less distinct species-complexes occur in the Indo-Pacific. On the one hand, there is the *T. virgata* complex, characterized by more or less regular concentric sculpture; on the other, the *T. rastellum* complex has the concentric sculpture raised, and broken into rasp-like structures. Both of the groups are widely distributed. In the western Atlantic, the well-known *T. listeri* occurs rather abundantly from North Carolina to Bahia, Brasil. The isolated population on St. Helena has been referred to *T. antonii* (Smith, 1890). The narrowly elongate, rather highly colored *T. cumingii* is found in the eastern Pacific. In the Mediterranean, the bright red, posteriorly pointed *T. pulchella* has been allocated to *Tellinella*. Map 3 shows the distribution of *Tellinella*.

Early fossil records of the group are from the Cretaceous of India (Stoliczka, 1870); later, it underwent a wide radiation in the Eocene of Europe and North America.

Tellina (*Tellinella*) *virgata* Linnaeus
Plate 2, figure 1; Plate 4, figure 1.

Tellina virgata Linnaeus 1758, Syst. Nat., ed. 10: 674; 1767, ed. 12: 1116 (type-locality, in O. Indico; type in collection of the Linnean Society, London[1]).

Tellina marginalis 'Lightfoot' Dillwyn 1817, Des. Cat., p. 74, *non* Lightfoot 1786.[2]

Tellina jubar Hanley 1844, Proc. Zool. Soc. London, pt. 12, no. 134: 60 (type-locality, unknown; syntypes, BMNH, unnumbered; labelled Swan River [Perth] and Montebello Ids., Western Australia); 1846 [*in*] Sowerby, Thes. Conch., vol. 1, *Tellina*, p. 229, pl. 63, fig. 214; Sowerby 1867 [*in*] Reeve, Conch. Icon., vol. 17, *Tellina*, figs. 48 and 48 b.

Description. Shell extending to 96 mm in length and to 56 mm in height, irregularly subtrigonal, slightly inequilateral, equivalved, subsolid to solid, somewhat inflated with left valve of greater convexity and with strong flexure to right posteriorly Umbo slightly behind middle, slightly elevated, rather inconspicuous and blunt. Anterior margin broadly rounded; ventral margin slightly convex, rising arcuately posteriorly; anterior dorsal margin straight to gently convex, elongate, and gently descending; posterior dorsal margin elongate, more steeply descending and straight; posterior margin irregularly biangulate, concave, and forming irregular oblique truncation posteriorly. Sculpture consisting of regularly spaced, rather well-developed, concentric lirations (3–4 per mm); extremely fine radial threads evident umbonally; concentric sculpture not smooth along posterior right dorsal slope and not highly

[1] According to Hanley (1855: 33), the specimen figured by him in the Thesaurus Conchyliorum (1846), vol. 1, *Tellina*, pl. 63, fig. 204, is the type; this is construed to be a lectotype.

[2] Lightfoot's *marginalis* is based on a figure in Lister (1770: pl. 387) without reference to type-locality; it is a synonym of the common West Atlantic *T. laevigata* Linnaeus 1758. The Portland Catalogue and its valid names have been reviewed recently by Rehder (1967).

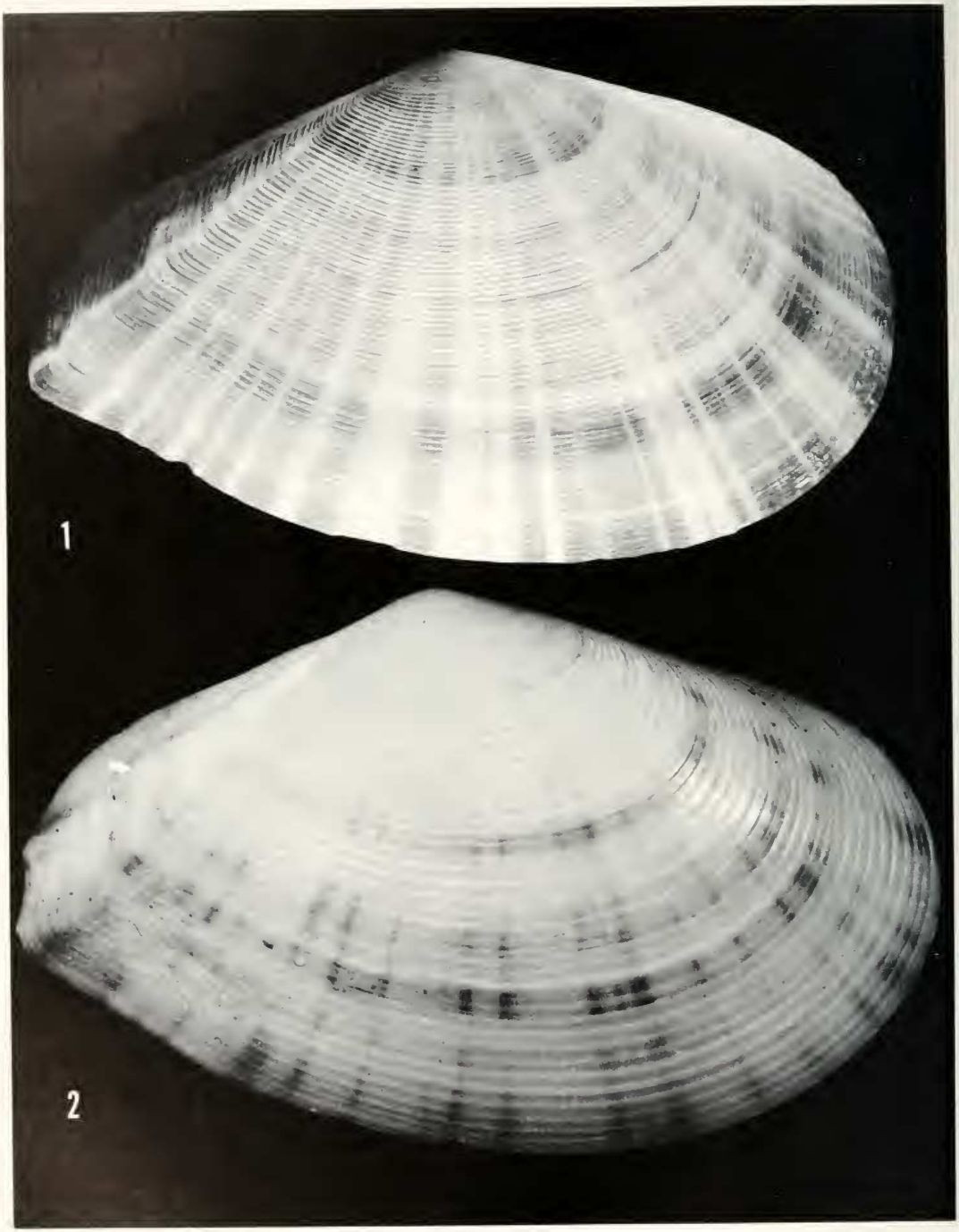


Plate 2. Fig. 1. *Tellina* (*Tellinella*) *virgata* Linnaeus: external view of the right valve, Durban, NM (length = 57.2 mm). Fig. 2. *Tellina* (*Tellinella*) *staurella* Lamarck: External view of the right valve, Apia, Upalu, Samoa, MCZ 235107 (length = 44 mm).

differentiated in right valve. Well-developed posterior ridge in right valve and concomitant sulcus in left valve.

Ligament generally yellowish brown, strong, protuberant, and elongate, set in weakly developed escutcheon; lunule consisting of poorly developed, depressed, semilanceolate area in right valve only; calcareous portion of ligament subtended by moderate to well-developed nymphal callosities. Hinge line well developed. In left valve, cardinal complex consisting of anterior, strong, subdeltoid, bifid tooth with subequal lobes, and of posterior, elongate, shelflike, thin, laminate tooth adpressed to base of calcareous portion of ligament; anterior lateral tooth distal to cardinal complex and consisting of thickened, somewhat pointed denticle of hinge margin; posterior lateral tooth obsolete, distal to cardinal complex; cardinal hinge plate extensive, particularly anteriorly. In right valve, cardinal complex consisting of posterior, slightly skewed, well-developed, bifid cardinal tooth with subequal lobes, and of anterior slightly thickened, laminate, cardinal tooth; anterior lateral tooth strong, shelflike, socketed above, and upcurled; posterior lateral tooth, strong, socketed above, pointed, slightly upcurled, and distal to cardinal complex; anterior lateral tooth closer to cardinal complex. No true rib present.

Muscle scars moderately well impressed; anterior adductor muscle scar irregularly semilunate; posterior adductor muscle scar subovate; ventral extension of posterior adductor muscle scar irregular. Pallial sinus subequal in opposite valves, arising at junction of ventral and lateral boundaries of posterior adductor muscle scar, rising subarcuately above, rounded anteriorly, and falling in convex arcuation to the pallial line; confluence posterior and irregular; pallial line with accessory pallial attachments paralleling it dorsally; pallial sinus connected to anterior adductor muscle scar by short, irregular interlinear scar. Cruciform muscle scars moderately developed, rounded, close to terminus of pallial line, left anteriormost subrectangular. Color basically white with suffusions of red, pink, orange, or yellow; externally with rays of white, or broken rays of red or pink and infrequently bands of red or pink; internally bands or rays showing through shells in immature individuals. In adults, interior highly polished; with central suffusions of yellow and white peripherally. Umbos generally red or pinkish.

Length mm	Height mm	Width mm	
95.7	55.1	22.7	Tuléar, Madagascar
75.2	45.4	19.3	Calatagan, Batangas, Luzon, Philippine Ids.
51.6	34.3	15.3	Lugger Cove, Western Australia
39.9	23.3	10.4	Apiang, Gilbert Ids.
27.1	16.0	06.5	Hayman Id., Queensland, Australia
21.5	13.5	05.0	Hayman Id., Queensland, Australia

Remarks. Probably the most cogent comments concerning *T. virgata* were presented by Rumph (1705), who not only established the meaningful and descriptive name of this species, but noted certain localities in the East Indies (e.g., Amboina and Ceram), the kinds of substrates it preferred, and the noticeable variations in shape and color it exhibited. His original illustration is here selected as type-figure. Although Linnaeus (1758) also cited a reference to Argenville, we are assured by Römer (1871) that in the manuscript for the 13th edition of the Systema, Linnaeus had deleted the reference to the illustrious Frenchman. In the published 13th edition, Gmelin (1791) managed to retain Argenville and expanded *virgata* to include the western Atlantic *T. listeri* Röding; he also cited Chemnitz (1782, pl. 8, figs. 66–72), who presented *virgata* in its range of variation, as well as *T. staurella*. Like Rumph, he also discussed the morphological variation. Shapes and color patterns were also recognized by Spengler (1798).

Since *T. virgata* is one of the most common tellens in the Indo-Pacific, it has been recorded in the literature numerous times.

Prashad (1932) had the stamina to ferret out its mention in checklists, dictionaries, encyclopedias, and other useful compilations, so he included, for the two specimens collected by the SIBOGA, over seventy bibliographic citations. More importantly, however, he came to the conclusion — safely based on the suggestion of Oostingh (1925) — that *jubar* Hanley and *marginalis* Dillwyn [= 'Lightfoot' Dillwyn, *non* Lightfoot] were based on only slight variations of *T. virgata*. A similar although somewhat earlier and independent conclusion had been reached by Römer (1871).

T. virgata is typically rounded anteriorly, with a pointed biangulate posterior margin. In color it is usually dull white, with variously disposed, red radiations that broaden from the umbonal region to the peripheral margins. The umbo is usually red or pink. Young stages of the shell are rounded in outline, with rather widely spaced, slightly raised concentric lirations and fine radial lines in the interstices, so that the sculptural pattern is cancellate. From the closely related *T. staurella*, *virgata* may be distinguished by the row of accessory pallial attachment muscle scars that parallel the pallial line on the internal surface of the valve. The pallial sinus is often not distinctly confluent. The ventral extension of the posterior adductor muscle scar is irregular and usually not broadly coextensive. The pallial sinus connects with the posterior adductor muscle scar at the junction of the ventral and lateral portions of the scar and usually not on the medial lateral surface. There are further, though somewhat more ephemeral, distinctions: the shell of *virgata* is thinner and less heavy, the concentric sculpture on the anterior slope is stronger, sharper, and more closely spaced, the cardinal and hinge plates are thicker and dorso-ventrally larger, and the maximum total size of *virgata* is larger than that of *T. staurella*.

Range. Tellina virgata, a relatively common shallow water species that prefers sandy substrates, occurs from Natal, South Africa, throughout the Indian Ocean, Indonesia, the Philippine Islands, Melanesia, to Tahiti in the Society Islands. It has been taken south to Shark's Bay in western Australia and as far north as Okinawa in the Ryu Kyu Islands.

Specimens examined. REPUBLIC OF SOUTH AFRICA: Natal (USNM). MOZAMBIQUE: Mozambique City; Porto Amélia (both USNM). TANZANIA: Mboa Maji, 9 mi. S of Dar-es-Salaam (USNM); Zanzibar (BMNH); 1 mi. N of Paje, 1 mi. SW of Nguruwe Id., Pwani Mehangani, and Mazizini, Zanzibar (all ANSP). RED SEA: (MCZ). MADAGASCAR: Tuléar (MCZ); between Ambatoloaka and Madirokely, SW of Nossi Bé and Befotake, NW of Nossi Bé (both ANSP). SEYCHELLES IDS.: Anse Parnel, Mahé (BMNH). MAURITIUS: S side of Tombeau Bay, 1 mi. NE of Le Morne, and Flic en Flacq (all ANSP). MALDIVE IDS.: Miladummadulu Atoll, S half of Kendikolu Ids. (5°57'N; 73°24'E) (ANSP). CEYLON: (MCZ). ANDAMAN IDS.: Port Blair (DM; MCZ). MALAYSIA: Singapore (ANSP); Palau Hautu, SW Keppel Harbor (USNM). THAILAND: Koh Samui (USNM). INDONESIA: Java (MCZ); Denpasar, Bali (USNM); Koeta Beach, Bali (MCZ); Semporna Reef, Sibuan Id., and Mandibarrah Id., N. Borneo (all ANSP; USNM); Misool Id.; Amboina; Tengah Id., off Buru; Banda Nera; Jamna Id., New Guinea (all MCZ); E side of Rouw Id., Aoeri Ids., Geelvink Bay, New Guinea (ANSP). CHINA: Kanna (MCZ); Plover Cove, near Hong Kong (ANSP). JAPAN: Abu, Ishikawa Beach, Ora Wan, Itoman Shioya, all Okinawa, Ryu Kyu Ids. (all USNM). PHILIPPINE IDS.: E coast of Polillo; Manila, Luzon; Subic Bay, Zambales, Luzon; Calatagan, Batangas, Luzon (all USNM); E side of Sisiman Bay, Bataan; SW side of Talin Bay, Luzon; Badang, near Gubat, Luzon (all ANSP); Gigmoto, Catanduanes (ANSP); Tilic Bay, Lubang; Calapan, Mindoro; Catbalogan, Samar; (all MCZ); Cebu City, Cebu; E side of Jago-

lias Id., NW end of Bohol; Zamboanga, Mindanao (all ANSP); Malcochin Harbor, Linapacan Id., N of Palawan; Palawan (both MCZ); Makesi Id., off Palawan; Port Ciego, Balabac; Tawi Tawi Group (all USNM); Bongao Channel, SW end of Sanga Sanga Id. (ANSP). AUSTRALIA: Lugger Cove, Shark's Bay, and Augustus Id., Western Australia (both MCZ); Port Essington, Coburg Peninsula, Northern Territory; Bickerton Id., and NE end of Groote Eylandt, Gulf of Carpentaria (all USNM); Cooktown, Queensland (MCZ); Palm Id., Challenger Bay (ANSP); Dunk Id. (ANSP; BMNH); Brampton Reef and Port Denison, off Bowen Id. (both USNM); Stone Id. (ANSP); Gloucester Id., Whitsunday Group (USNM); Hayman Id., Cumberland Group, Whitsunday Passage (MCZ); near Gladstone (USNM). PALAU IDS.: Schonian Harbor, Peleliu Id. (ANSP). MARIANA IDS.: Tanapag Harbor, Saipan (ANSP; USNM); Apaca Point, Agat Bay, Guam (ANSP). MARSHALL IDS.: Pokaakku Atoll (USNM). GILBERT IDS.: Apiang, Kingsmill Group (MCZ; USNM). LOYALTY IDS.: Lifu (USNM). NEW CALEDONIA: Paagoumene; Plage de Poe; Pt. Akaia, Bourail; Tonghouen; Anse Vata Bay, Noumea (all ANSP). FIJI IDS.: Suva, Titi Levu (MCZ; USNM); Bega Id. (MCZ); Komo, Lau Group (USNM). SAMOA IDS.: Pago Pago Harbor, Tutuila (MCZ; USNM); Toloa Point, Upolu Id. (ANSP). TONGA IDS.: Vavau (BMNH); Haapai (USNM). COOK IDS.: W side of Akitua, NE Aitutaki (ANSP). SOCIETY IDS.: Tereia Point, Bora Bora (ANSP); Tahiti (USNM).

Tellina (*Tellinella*) *staurella* Lamarck
Plate 2, figure 2; Plate 3, figures 1, 2; Plate 4, figure 2.

Tellina cruciata Spengler 1798, Skrivter af naturhistorie Selskabet, København, 4 (2): 83 (type-locality, Fra Niquebar; types, ? Zoological Museum, Copenhagen), *nomen dubium*.

Tellina staurella Lamarck 1818, Anim. sans Vert., 5: 522 (type-locality, . . . Nouvelle Hollande; syntypes, MNHNP, *teste* Bertin 1878: 236); Delessert 1841, Rec. Coq., pl. 6. fig. 2.

Tellina scalaris Lamarck 1818, Anim. sans Vert., 5: 527 (type-locality, unknown; holotype, MNHNP, *teste* Bertin 1878: 236).

Tellina incerta Deshayes 1854, Proc. Zool. Soc. London [1855] pt. 22, no. 282: 367 (type-locality, Philippines [Islands]; syntypes, BMNH, unnumbered); Sowerby 1867 [*in*] Reeve, Conch. Icon., vol. 17, *Tellina*, pl. 38, fig. 217.

Tellina petalina Deshayes 1854, Proc. Zool. Soc. London [1855] pt. 22, no. 282, p. 367 (type-locality, unknown; holotype, BMNH, unnumbered).

Tellina rufa Deshayes 1854, Proc. Zool. Soc. London [1855] pt. 22, no. 282: 367 (type-locality, unknown; holotype, BMNH, unnumbered); Sowerby 1869 [*in*] Reeve, Conch. Icon., vol. 17, *Tellina*, pl. 57, fig. 337.

Tellina petallina Deshayes. Sowerby 1868 [*in*] Reeve, Conch. Icon., vol. 17, *Tellina*, pl. 49, fig. 292, error for *petalina* Deshayes 1855.

Tellina (*Tellinella*) *staurella apicifusca* (Jousseaume MS) Lamy 1918, Bull. Mus. Natl. Hist. Nat. Paris, 24: 27 (type-locality, Massaouah, Djibouti; types, ? MNHNP; refers to Chemnitz 1782, 6: 86, pl. 8, fig. 70).

Tellina aeropisthus Barnard 1964, Ann. Natal Mus., 16: 26, fig. 5b (type-locality, off Cape Natal (Durban); syntypes, SAM 9547).

Description. Shell extending to 65 mm in length and to 37 mm in height, subelliptical, pointed behind, rather equilateral and equivalved, rather solid and slightly inflated, with left valve slightly more convex than right, and with moderate flexure to right posteriorly. Umbo central or slightly behind middle, relatively inconspicuous, small, pointed, and slightly elevated. Anterior margin rather narrowly and smoothly rounded; ventral margin gently convex and rising in slight arcuation posteriorly; anterior dorsal margin straight to slightly convex, rather long, and gently descending; posterior dorsal margin slightly concave, more steeply descending, and shorter; posterior margin irregularly biangulate, forming irregular oblique truncation. Sculpture consisting of finely incised, slightly raised lirations (2–3 per mm); radial vermiculations sometimes evident; concentric sculpture often subscissulate[1]

[1] The terms scissulate, scissulation, etc., have been defined by Boss and Kenk (1964) and Boss (1966a).

Plate 3. Figs. 1 and 2. *Tellina (Tellinella) acropisthus* Barnard [= *T. staurella* Lamarck], the holotype, off Cape Natal, Durban, SAM A9547 (length = 14.6 mm): Fig. 1, external view of the right valve; Fig. 2, internal view of the right valve. Figs. 3 and 4. *Tellina (Tellinella) rastellum* Hanley, Durban, NM (length = 42.5 mm): Fig. 3, external view of the right valve; Fig. 4, internal view of the right valve.

along posterior dorsal slope of left valve and often lost or obsolete in that area, forming indistinct or strongly developed, radial, smooth band from umbo to ventral margin at junction of posterior and ventral margins. Posterior ridge biangulate and rather well developed in right valve; concomitant sulcus in left valve.

Ligament yellow to dark brown, rather strong, slightly protuberant, broad, elongate, and set in a weakly developed, elongate, sublanceolate escutcheon; lunule obsolete, developed somewhat in right valve, elongate and lanceolate; calcareous portion of ligament set on short, slightly raised nymphal callosities. Hinge line well developed. In left valve, cardinal complex consisting of anterior, subdeltoid, bifid tooth with irregular lobes, and of posterior, thin, short, laminate cardinal tooth adpressed to base of calcareous element of ligament; anterior lateral tooth distal to cardinal complex, poorly developed, consisting of blunt thickening of hinge line; posterior lateral tooth obsolete, distal, and consisting of weak thickening of hinge line; cardinal plate rather narrow, with irregular proximal thickening infrequently occurring in hinge line anterior to cardinal complex. In right valve, cardinal complex consisting of posterior subdeltoid, posteriorly skewed, bifid cardinal tooth with subequal lobes, and of anterior thickened to subdeltoid laminate cardinal tooth; anterior lateral tooth strong, shelflike, upcurled, and socketed above; posterior lateral tooth slightly less well developed, socketed above, upcurled and shelflike; anterior lateral tooth closer to cardinal complex; posterior lateral tooth distal. No true rib developed.

Muscle scars moderately well developed, impressed and conspicuous; anterior muscle scar broadly and irregularly sublunate; posterior scar subquadrate to subovate; posterior extension of posterior adductor muscle scar broadly coextensive with adductor scar. Pallial sinus subequal in opposite valves, arising from lateral surface of posterior adductor muscle scar, coursing straight anteriorly in gentle arcuation, rounded anteriorly, and falling in a semi-

sigmoid arcuation to the pallial line; confluence about one half length of pallial line; no accessory pallial muscle scars paralleling pallial line. Cruciform muscle scars moderately developed, rounded, with anteriormost scar in left valve subquadrate. Color basically white, externally with bands of purple and white rays or red suffusions; infrequently, shell entirely suffused with purple or yellow; internal suffusions of yellow common. Umbo white or often red and infrequently streaked with brilliant red.

Length mm	Height mm	Width mm	
64.2	37.0	17.4	Zanzibar, Tanzania
38.6	25.2	12.6	Bay of Batavia, Java, Indonesia
36.4	23.4	11.5	Ibajay, Panay, Philippine Ids.
26.7	15.8	07.1	Calapan, Mindoro, Philippine Ids.
21.6	12.3	05.7	Calapan, Mindoro, Philippine Ids.
10.7	06.6	03.1	Guiuan, Samar, Philippine Ids.

Remarks. Due to its remarkable range of variation, *T. staurella* may be easily confused with the closely related tellinelloid species of the Indo-Pacific, *T. virgata* and *T. crucigera*. The most variable characteristic appears to be shell color. Most specimens are in the yellow-white spectrum, with suffusions of yellow concentrated centrally and umbonally; the internal surfaces of the valves are normally polished and shining, and the periphery is whitish. However, a number of names have been established on the deep purple variants, those with brilliant red streaks on the umbo, and others with variously developed red or pink radiations. Not infrequently, pure white individuals occur.

The concentric sculpture of *T. staurella* is well developed. It is usually strengthened posteriorly, whereas on the anterior slope of the disc it tends to be moderately sulcate. Along an axis from the umbo to the junction of the posterior and ventral margins on the posterior slope of the right valve, the rather widely spaced concentric lirations may suddenly fade out, forming a radial band of various widths, which is smooth and devoid of any noticeable sculpture. The concentric sculpture on the disc may end abruptly or simply become much weaker; it also may tend to be slightly acentric or subscissulate. However, not all individuals in a population have the smooth posterior radial band. Specimens with the band and those without were often considered as separate species, and the absence of any smooth area on the right posterior slope in the shell of *T. virgata* was used to distinguish that species. Since both extremes and all intermediates occur in *T. staurella*, such a trait is unsatisfactory as a diagnostic characteristic.

T. staurella differs from *T. virgata* in a number of general aspects. Bertin (1878) detailed some of these differences, but they are rather difficult if not impossible to quantify and are frequently not stable. In general appearance, *T. staurella* is more elongate, more narrowly rounded anteriorly, and less pointed or biangulate posteriorly. The species has a weaker, less thickened hinge line, is more heavily shelled, and is less densely sculptured — in adults — than is *T. virgata*. In addition to these less than ideal differentiating characteristics, *T. staurella* has a simple pallial line without accessory pallial attachments, and the ventral extension of the posterior adductor muscle scar is strongly impressed and broadly connected with the muscle scar. The pallial sinus tends to connect with the posterior muscle scar on the lateral surface of that scar. Further, as explained in the *Remarks* under *T. virgata*, the young of *T. staurella* are not distinctly cancellate and have closely set concentric lirations.

Range. Tellina staurella is a common species found in relatively shallow water, usually in rather coarse substrates from Durban, South Africa, throughout the Indian Ocean, Indonesia, the Philippine Islands, Melanesia, to the Tonga Islands in Polynesia.

Specimens examined. REPUBLIC OF

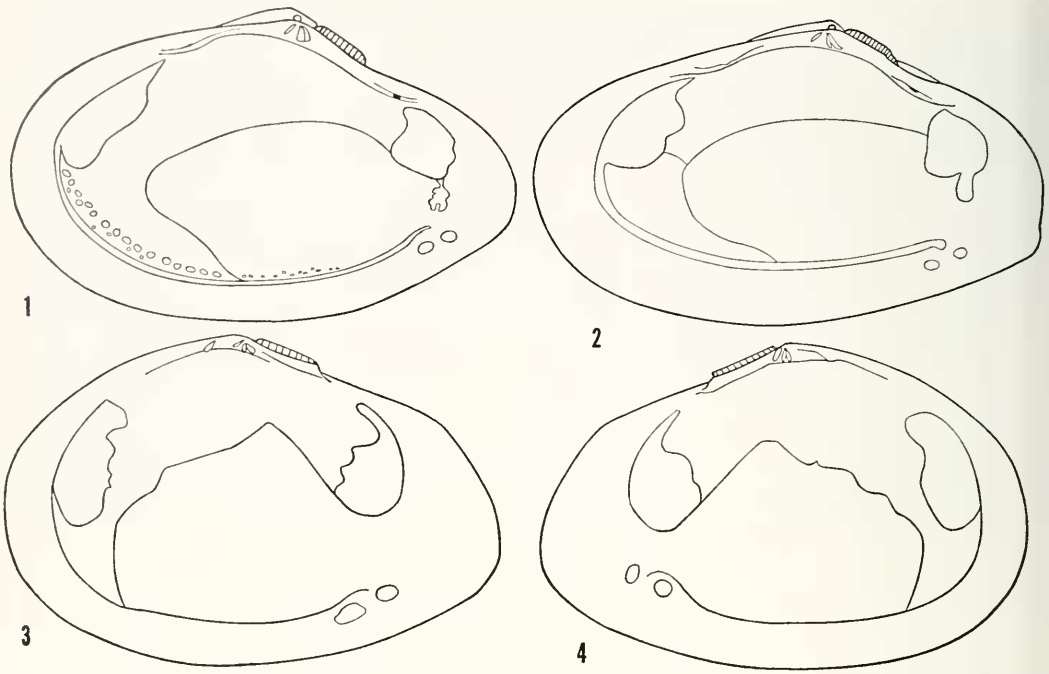


Plate 4. Diagrammatic illustrations of the internal surface of the valves, showing the dental configuration and muscle scars. Fig. 1. *Tellina* (*Tellinella*) *virgata* Linnaeus: right valve, Hayman Island, Whitsunday Passage, Queensland, Australia, MCZ 257176 (length = 21 mm). Note the distinct accessory pallial attachment muscle scars. Fig. 2. *Tellina* (*Tellinella*) *staurella* Lamarck: right valve, Calapan, Mindoro, Philippine Islands, MCZ 257177 (length = 21.6 mm). Figs. 3 and 4. *Tellina* (*Tellinides*) *opalina* Gmelin, Delagoa Bay, Mozambique, SAM A6181 (length = 29 mm): Fig. 3, right valve; Fig. 4, left valve.

SOUTH AFRICA: Durban (DM; NM; SAM; USNM). MOZAMBIQUE: Santa Carolina Id., Bazaruto Bay (MCZ); Lumbo (BMNH; MCZ); Porto Amélia (USNM). TANZANIA: Mboa Maji, 9 mi. S of Dares-Salaam (USNM); Bweleo and Bweju, Zanzibar (both USNM); Mazizini, Zanzibar (ANSP). KENYA: Diana Beach, 20 mi. S of Mombasa (USNM). SOMALIA: Isla di Serpenti, Chisimaio (ANSP). RED SEA: (MCZ). SAUDI ARABIA: Jidda Harbor (USNM). ADEN PROTECTORATE: Aden (BMNH). MADAGASCAR: Nossi Bé (MCZ); W of Pointe Mahatsinjo, S of Nossi Bé; Nossi Kisimani, 12 mi. SSW of Nossi Bé; N end of Nosy Kalakajoro, Iles Radama, 52 mi. SSW of Nossi Bé; 3 mi. NNE of Nossi Fali (all ANSP). SEYCHELLES IDS.: Mahe in 4–11 fms. (BMNH). MAURITIUS: Near Port Louis (BMNH; MCZ). CEYLON: (ANSP; MCZ; USNM). ANDAMAN IDS.: Port Blair (BMNH). NICOBAR IDS.: (ANSP). MALAYSIA: Singapore (BMNH; MCZ; USNM). THAILAND: 3 mi. NE of lighthouse, Laam Phan Wa, and airport beach, Phuket Id. (all ANSP); Goh Sindarar Nui [= Chance Id.] (USNM). INDONESIA: Pulau Melila and Pulau Bai, Batu Group, off Sumatra (both USNM); Bay of Batavia, Java (MCZ); Sandakan, Sabang, Jesselton, Semporna Reef, and Mandibarrah Id., all N. Borneo (all ANSP; USNM); Bali; Wawoni Id., off Celebes; Misool; Karakelong Id., Talauer Ids.; Buru; Tengah Id., off Buru; Amboina; Laratoeka Straits, Flores Ids. (all MCZ); near Gamododo, Milne Bay, New Guinea (USNM);

2 mi. W Korido Village, Soepiori Id., Schouten Ids.; Ambai, Japen Id.; S side of Rouw Id., Aoeri Ids., Geelvink Bay, New Guinea (all ANSP). JAPAN: Sagami Bay, Honshu (ANSP); southern Kyushu (ANSP); Gima, Kumejima Id., Okinawa (ANSP); Abu, Kanna, Nago, and Shuri, all Okinawa, Ryu Kyu Ids. (all USNM). PHILIPPINE IDS.: Sabtan Id., Batanes Group (USNM); Camiguin Id. (USNM); Masinloc Bay, Zambales, Luzon (USNM); Baga Bay and Sisiman Bay, Mariveles, Bataan, Luzon (ANSP; USNM; MCZ); in 11 fms., off Corregidor; 4 mi. SW of San Nicholas Shoals Light, Manila Bay, Luzon; SW side of Talin Bay and Calatagan, Batangas, Luzon; Badang, near Gubat, Sorsogon, Luzon (all ANSP); Cabila Point, Cueva, and the Tilic Bay (all Lubang) (USNM; MCZ); Gigmoto, Catanduanes (ANSP); Calapan, Mindoro (MCZ; USNM); Santa Crux Harbor, Marinduque; San Pascual, Burias; Busuanga (all USNM); Gyo, Palawan (ANSP); Araceli, Dumaran Id., off Palawan (MCZ); Cagayancillo, Cagayanos Ids. (USNM); Calbayog, Samar Id.; Guiuan, Samar Id.; Ibajay, Panay (all MCZ); Cebu; Mantacas Id., off Bohol (both USNM); Mambajao, Camiguin Id., N of Mindanao (ANSP); Davao, Mindanao (MCZ); Tawi Tawi Group (USNM); Bongao Channel, Sanga Sanga Id. (ANSP). AUSTRALIA: Augustus Id., NW Australia (MCZ); Torres Straits; Trinity Bay (both BMNH); Michaelmas Cay, Green Id., near Cairns (MCZ); Brampton Reef, off Bowen Id. (USNM); Hayman Id. and Langford Reef, Whitsunday Group (MCZ). PALAU IDS.: W end of Gorokoru; Malakal Harbor, Koror; SE corner of Eil Malk (all ANSP). MARIANA IDS.: Piti Bay and Agana Bay, Guam (MCZ; USNM). CAROLINE IDS.: Tomil Harbor, Yap (USNM). MARSHALL IDS.: off SW end of Bikini (USNM). GILBERT IDS.: Apiang, Kingsmill Group (MCZ). BISMARCK ARCHIPELAGO: Kaniet, Admiralty Ids. (ANSP). SOLOMON IDS.: Buin, Bougainville (ANSP); Roviana Lagoon, New Georgia (MCZ); Ata'a, Malaita (ANSP). NEW CALEDONIA: Koë Reef, 2 mi. SSE of Touho; Ile Ain, 3 mi. ENE of Touho; SE side of Touho Bay; Bourail; off Gatope Id.; Port Ngea, Magenta, Baie des Canards, Anse Vata Bay; Ricaudy Reef, near Noumea (all ANSP). FIJI IDS.: Yasawa Group (USNM); Bega Ids. (MCZ); off Suva and off Nandronga, Viti Levu (both USNM); off Tunuloa and off Natuvu, Vanua Levu (both MCZ); Komo, Lau Group (USNM). SAMOA IDS.: W side of Apia Harbor, Vailele Bay, and Samatau, all Upolu; Pago Pago Harbor, Tutuila (all ANSP). TONGA IDS.: Tongatapu, Tukutonga Reef, E of Nukualofa (USNM).

Tellina (*Tellinella*) rastellum Hanley
Plate 3, figures 3, 4; Plate 5, figures 1, 2.

Tellina rastellum Hanley 1844, Proc. Zool. Soc. London, pt. 12, no. 134: 59 (type-locality, Zanzibar; syntypes, BMNH, unnumbered); [1842–1856], Recent Bivalve Shells, Appx., p. 347 [1856], pl. 14, fig. 14 [1844]; 1847 [*in*] Sowerby, Thes. Conch., vol. 1, *Tellina*, p. 225, pl. 64, fig. 231, pl. 65, fig. 242.

Tellina philippii (Anton MS) Philippi 1844, Abbild. Beschreib. Conch., vol. 1, *Tellina*, pl. 2, p. 126 [4], fig. 8 (type-locality not given; types not known).

Tellina dissimilis Deshayes 1854, Proc. Zool. Soc. London [1855], pt. 22, no. 283: 370 (type-locality not given; syntypes, BMNH, unnumbered); Sowerby 1869 [*in*] Reeve, Conch. Icon., vol. 17, *Tellina*, pl. 56, figs. 338 a-b, *non* von Martens 1865.

Description. Shell extending to 103 mm in length and to 51 mm in height, elongate-sublanceolate, nearly equilateral, subequivalve, solid, rather compressed, with left valve of slightly greater convexity, and with posterior flexure to right. Umbos central or slightly behind middle, not elevated, somewhat pointed; umbonal cavity shallow and sometimes filled. Anterior margin smoothly and narrowly rounded; ventral margin gently convex, rising in concave arcuation posteriorly; anterior dorsal margin long, gently descending, and weakly convex; posterior dorsal margin equally as

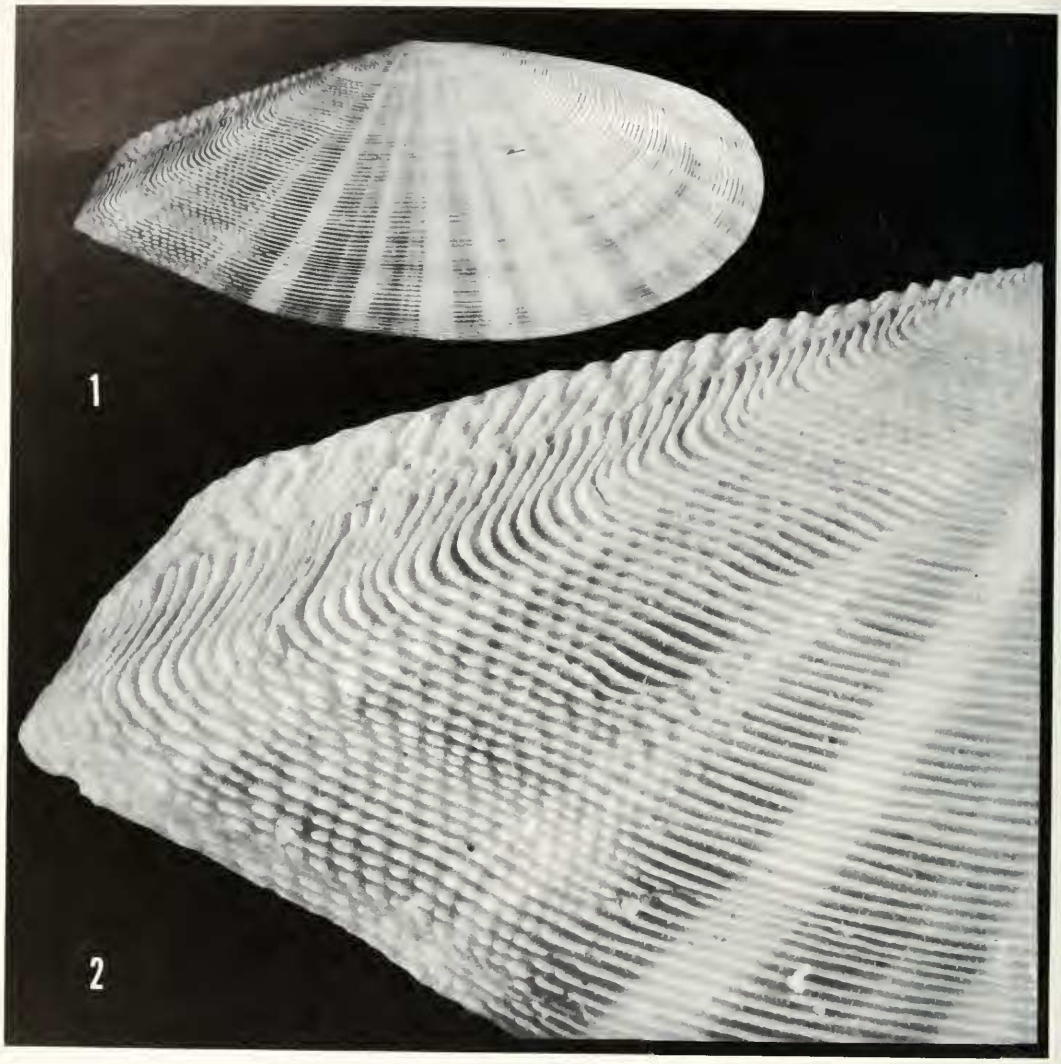


Plate 5. *Tellina* (*Tellinella*) *rastellum* Hanley, Mozambique, USNM 628938 (length = 88.3 mm). Fig. 1. External view of the right valve. Fig. 2. Enlargement of Figure 1, to show the rasplike sculpture on the posterior slope.

long, somewhat more sharply descending and rather straight; posterior margin oblique, subdivided into dorsal and ventral portions, each irregularly concave. Concentric sculpture consisting of narrow, raised, and regularly spaced lirations (about 14–17 per cm in adult specimens), becoming stronger and differentiated along posterior slope. Area of strengthened sculpture greater in right valve. Differentiation consisting of sharply raised lirations, irregularly spaced concentrically, and forming rasplike structures along posterior slope. Lirations also somewhat stronger on anterior slope, but not differentiated into thin, rasplike pattern. Extremely fine, regularly spaced, radial sculpture most evident on umbonal region of disc, but also discerned in deep sulci or interspaces separating concentric lirations. At least two strong posterior

radial ridges in right valve; similar ridges in left valve, but not as strongly differentiated. Irregular, rather deep sulcus separating ridges in right valve. Concentric sculpture sharp, sublamellose over ridges; generally rasps absent.

Ligament strong, dark brown to black, protuberant, and somewhat set in indistinct lanceolate escutcheon; no true lunule, but elongate, depressed, anterior area stronger in right valve. Calcareous portion of ligament elongate and narrowed, subtended by slightly raised nymphal callosities. Hinge line strongly developed. In left valve, cardinal complex consisting of strong, subdeltoid, bifid anterior tooth with subequal lobes, and of posterior narrowed, laminate tooth closely adpressed to calcareous portion of ligament; both cardinal teeth often lost in large adult specimens; lateral teeth moderately developed, shelflike thickenings of hinge line, bluntly pointed; anterior lateral stronger and distal to cardinal complex, but closer than posterior lateral tooth. In right valve, cardinal complex consisting of posterior strong, subdeltoid, bifid tooth with lobes often skewed posteriorly, and of anterior strong, narrowed tooth; lateral dentition strong, socketed above, pointed, and upcurled; anterior lateral tooth closer to cardinal complex than posterior lateral tooth, but both somewhat distally removed.

Muscle scars rather well impressed. Anterior adductor muscle irregularly semilunate, round ventrally; posterior adductor muscle scar subquadrate with small ventral extension. Pallial sinus more or less equal in opposite valves, rising only slightly posteriorly, then gently and regularly descending, bluntly pointed anteriorly, then descending in convex arcuation and forming confluence with pallial line for posterior half of shell length; anteriormost portion of pallial sinus connected to anterior muscle scar with interlinear scar; pallial sinus itself well removed from anterior scar; confluence of pallial sinus and pallial line shorter in right valve. Cruciform muscle scars moderately impressed, generally rounded, closely juxtaposed in right valve, somewhat more widely separated in left valve, and with anterior scar slightly flattened or subrectangular. External color white to yellow, with reddish rays of various widths and numbers. Internally polished, with external radial patterns showing through shell, and often central and umbonal suffusions of yellow.

Length mm	Height mm	Width mm	
102.8	50.5	22.1	The Bluff, Durban
83.7	36.7	15.8	Porto Amélia, Mozambique
74.3	34.6	14.7	Porto Amélia, Mozambique
61.0	26.4	11.8	Bawi Id., Zanzibar
48.5	19.8	07.9	Durban
43.1	17.5	07.1	Durban

Remarks. Among the Tellinacea, and certainly within the Tellininae, *T. rastellum* is one of the species with the largest dimensions. No other member of *Tellinella* exceeds it in size, and only *Tellina* (*Laciolina*) *magna* from the western Atlantic is larger in overall length.

Unfortunately, a complete ontogenetic series of this species is not available. However, as in many other tellinoid species, *T. rastellum* exhibits differences of proportions between the smaller or more immature specimens and the larger adults. As the measurements indicate, individuals of shorter length tend to be proportionately of less height. That is, immature specimens are narrower and more lanceolate in outline. Deshayes (1855) established his *T. dissimilis* on the young of *T. rastellum.*

A number of Indo-Pacific species of *Tellinella* have peculiar rasplike sculpture; they are all relatives of *T. rastellum.* These include *T. pulcherrima* Sowerby 1825, *T. asperrima* Hanley 1844, and *T. verrucosa* Hanley 1844. Prashad (1932) has given a complete historical résumé of these species. Smith (1885) noted the resemblance between species with the rasplike sculpture, which differ chiefly in the extent of the distribution of this sculpture over the surface of the valves. In *rastellum,* the rasps are developed posteriorly, whereas in

pulcherrima, both the anterior and posterior slopes have them; in *asperrima* and *verrucosa*, the entire valve surface, including the central area of the disc, has this sculpture. The relative proportions of the shell differ in these species. *Tellina rastellum* is distinct in having the umbo central or slightly behind the middle. Further, its rasps are not present on the extreme posterior dorsal slope, the area set off by the radial ridges.

Range. From all available evidence, there may be two disjunct populations of *T. rastellum*. One, the more extensive, occurs from the Persian Gulf through the Arabian Sea and Indian Ocean south along the coast of East Africa to the vicinity of Durban, Natal, South Africa. Offshore islands, including the Seychelles and Madagascar, are also inhabited by this western population. The other population ranges through Indonesia and the northern Philippines to the Palau Islands of the western Caroline Islands.

Numerous authors have documented the occurrence of *T. rastellum* through the range delineated above. The following is a selected bibliography of records of this species. Natal (Sowerby, 1897); Ponta Torres (Paes da Franca, 1960a); Inhaca (Boshoff, 1965); Kerimba (von Martens, 1880); Madagascar (Bertin, 1878; Dautzenberg, 1929); Seychelles (von Martens, 1880); Dar-es-Salaam (Spry, 1964); Zanzibar (Römer, 1871); Djibouti, Périm, Aden (Lamy, 1918); Red Sea (Issel, 1869); Attaka (Vaillant, 1865); Gulf of Oman, Muskat (Melvill and Standen, 1907); Minikoy, Maldive Islands (Smith, 1906); Philippines (Hidalgo, 1903). The species has also been found fossilized in the Quaternary deposits along the Red Sea (Bertin, 1878; Nardini, 1937).

Specimens examined. REPUBLIC OF SOUTH AFRICA: The Bluff, Durban (NM); Durban Beach (USNM); Durban Bay (DM; NM); Natal (BMNH; MCZ). MOZAMBIQUE: Inhaca Island (ANSP); Mozambique City (ANSP); near Porto Amélia (USNM). TANZANIA: Chumbe Island; 1 mi. N of Paje in 0–10 ft. (0–3 m); Mazizini; Mkunguni; Mnemba Island in 0–6 ft. 0–1.8 m); Ras Nungwe, Zanzibar (all ANSP); Bawi Island (USNM). ADEN PROTECTORATE: Aden (BMNH). MADAGASCAR: 3 mi. SE of Nosy Iranja in 11 fms. (20 m), sand; Andilana, Nosy Bé in 0–5 ft. (0–1.5 m), mud, sand and rock (both ANSP). INDONESIA: Padang, Sumatra (BMNH). PHILIPPINE ISLANDS: S side of Corregidor Island, Luzon in 11 fms. (20 m) (ANSP). CAROLINE ISLANDS: off Arakabesan Island, Palau Islands (ANSP).

Subgenus *Arcopagia* Brown

Arcopagia (Leach MS) Brown 1827, Illus. Conch. Great Britain and Ireland, pl. 16, figs. 8, 9, 10 (type-species, *Tellina crassa* Pennant 1776, subsequent designation Herrmannsen, 1846, p. 76).

Cydippe (Leach MS) Gray 1852, Syn. Moll. Great Britain, p. 314 (type-species, *Cydippe listeriana* Leach 1852 [= *Tellina crassa* Pennant 1776], monotypy), *non* Eschscholtz 1829 (Coel.).

Areopagia '(Leach MS) Brown' von Martens 1860, Proc. Zool. Soc. London, pt. 28 [1], p. 18, error for *Arcopagia* (Leach MS) Brown 1827.

Arcopogia '(Leach MS) Brown' Guéranger 1867, Album Paléont. Sarthe, p. 12 and explan. pl. xv, fig. 11, error for *Arcopagia* (Leach MS) Brown [original not seen, *teste* Neave 1939, p. 283].

Acropagia '(Leach MS) Brown' Carus 1868–75 [*in*] Carus, J. V. and C. E. A. Gerstaecker, Handbuch Zool., 1: 734, error for *Arcopagia* (Leach MS) Brown 1827.

Arcopagella Meek 1871, Prelim. Rept. U. S. Geol. Surv. Wyoming and Territories, p. 308 (type-species, *Arcopagella mactroides* Meek 1871, monotypy).

Pseudarcopagia Bertin 1878, Nouv. Arch. Mus. Paris, Sér. 2, 1: 229, 264 (type-species, *Tellina decussata* Lamarck 1818, *non* Wood 1815 [= *victoriae* Gatliff and Gabriel 1914], subsequent designation Dall 1900: 1011).

Cyclotellina Cossmann 1886, Ann. Soc. R. Malac. Belg., 21: 79 (type-species, *Tellina lunulata* (Lamarck MS) Deshayes 1824, original designation).

Arcopagiopsis Cossmann 1886, Ann. Soc. R. Malac. Belg., 21: 81 (type-species, *Tellina pustula* Deshayes 1825, subsequent designation, Dall 1900: 1005).

Pseudoarcopagia 'Bertin' Tate and May 1901, Proc. Linn. Soc. New South Wales, 26 (3): 426, error for *Pseudarcopagia* Bertin 1878.

Arcopaginula (Jousseaume MS) Lamy 1918, Bull. Mus. Natl. Hist. Nat. Paris, 24: 167 (type-species, *Tellina inflata* Chemnitz 1782 [= *T. inflata* Gmelin 1791], *non* Sowerby 1867, original designation).

Scutarcopagia Pilsbry 1918, Proc. Acad. Nat. Sci. Philadelphia, 69: 332 (type-species, *Tellina scobinata* Linnaeus 1758, original designation).

Pinguitellina Iredale 1927, Rec. Australian Mus., 16: 76 (type-species, *Tellina robusta* Hanley 1844, original designation).

Zearcopagia Finlay 1927, Trans. Proc. New Zealand Inst., 57: 466 (type-species, *Tellina disculus* Deshayes 1855, original designation).

Arcopella (Monterosato MS) Thiele 1935, Handbuch der systematischen Weichtierkunde, vol. 2, pt. 3: 914 (type-species, *Tellina balaustina* Linnaeus 1758, monotypy).

Description. Shell small to large, usually ovate, solid, equivalve, and more or less equilateral. Lateral dentition well developed. In right valve, both lateral teeth distinct and strong; posterior lateral tooth distal to cardinal complex and anterior lateral tooth subproximal or distal to cardinal complex. Pallial sinus of various configurations; sometimes linear scar connecting anterior adductor muscle scar and pallial sinus.

Remarks. 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 that typify the group are unstable and liable to alteration among related species; however, the orbicular shape and general thickness of the valves are typical. 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. In the type-species, the pallial sinus ascends obliquely and descends to the terminus of the pallial line, so that no confluence occurs; however, the sinus may be confluent with the pallial line for nearly all its length in other species.

Many of the so-called genera delineated in the synonymy have been established on characteristics of trivial or specific significance. Species such as *Tellina victoriae* Gatliff and Gabriel, the type of *Pseudarcopagia*, and *T. disculus* Deshayes of *Zearcopagia* are so closely related to one another, and in turn to *T. ponsonbyi*, that it is difficult to see how anyone could have justified a 'generic' difference. Although the placement of the pallial sinus in these species differs from that in *T. crassa* Pennant, the type of *Arcopagia*, the existence of many species with an intermediate or medially confluent pallial sinus and pallial line indicates the relationship between these geographically separated lineages. The relative strength of the concentric or radial sculpture is likewise an unsatisfactory basis for generic distinction in *Arcopagia*, since many of the forms show a reduction in the strength of the sculpture ontogenetically. *Scutarcopagia* is unique in its rasplike sculpture, but it may be compared to *T. rastellum* and its congeners in *Tellinella*, a species-complex which is consubgeneric with *T. virgata*. One might be inclined to treat *Scutarcopagia* separately, if a genuine radiation of species existed but, as it is, only two forms could be relegated to it: *T. scobinata* and *T. elizabethae* Pilsbry 1917. *Pinguitellina* may constitute a natural group—the type-species being distinct and a number of forms being obviously related. Yet the sculpture is rather strongly concentric in youthful stages and is subsequently worn down to give the smooth appearance of the adult. The pallial sinus, which in *T. robusta* extends near to the anterior adductor muscle scar and then parallels the pallial line for much of its length before becoming confluent for a short distance posteriorly, is widely variable in closely allied species, the confluence often being extensive. The fossil groups *Arcopagiopsis*,

Cyclotellina, and particularly *Arcopagella* Meek, are tentatively placed here, since their relationship to the lineage of the Recent *Arcopagia* is not positively discerned.

Arcopagia is found in the Cretaceous (Stoliczka, 1870). Many species have been described in Cenozoic deposits, and it is well represented in the Eocene of the Paris Basin. In the Recent fauna, the group is most highly developed in the Indo-Pacific. Most species prefer a tropical habitat in rather coarse substrates, but some have cool temperate or even boreal distributions.

Tellina (Arcopagia) ponsonbyi Sowerby
Plate 6, figures 1–3; Plate 14, figure 1.

Tellina ponsonbyi Sowerby 1889, Jour. Conch., 6: 155, pl. 3, fig. 1 (type-locality not given, 'South Africa' on original label, here designated, Port Alfred, Republic of South Africa; holotype and three paratypes, BMNH 89.4.14.2904–2908).

Tellina rietensis Turton 1932. The marine shells of Port Alfred, South Africa, p. 248, pl. 66, no. 1747 (type-locality, Port Alfred, Republic of South Africa; holotype, Oxford University Museum).

Tellina kraussi Turton 1932. The marine shells of Port Alfred, South Africa, p. 248, pl. 66, no. 1748 (type-locality, Port Alfred, Republic of South Africa; syntypes, Oxford University Museum).

Description. Shell extending to 34 mm in length and to 28 mm in height, irregularly subovate to subtrigonal in outline, inequilateral, equivalve, solid, moderately inflated, with both valves of equal convexity and without a noticeable flexure to the right posteriorly. Umbos subcentral or a little before middle in subtrigonal specimens, not elevated, somewhat pointed and orthogyrous. Anterior margin broadly rounded and convex; ventral margin convex and rising gently posteriorly; anterior dorsal margin short, rather sharply descending and straight to slightly convex or concave; posterior dorsal margin long, irregularly convex, and rather steeply descending; posterior margin not well defined, short, irregularly convex. (In subovate individuals the posterior dorsal margin and posterior margin are not distinguished at all; rather there is an irregularly convex outline to the posterior portions of the shell.) Sculpture consisting of concentric lirations (about 4–7 per mm on central disc) and of radial riblets (about 6–10 per mm on central disc) forming definite reticulate pattern. Concentric growth lines coincident with crowding of concentric lirations present and probably indicative of annual growth—six growth lines in individuals at 2.5 cm and often associated with color differences. Small distinct central portion of ligament subtending umbos. Weak radial ridge emanating from umbo and convexly paralleling posterior dorsal margin posteriorly.

Ligament yellow to brown, elongate, strong, not protuberant, sunken in poorly defined escutcheon; calcareous portion of ligament short, triangular, about 1/2 length of horny portion. No true lunule developed. Hinge line strongly developed. In left valve, cardinal complex consisting of anterior narrowly subdeltoid, bifid cardinal tooth with subequal lobes, and of posterior obsolete elongate cardinal tooth coalesced with internal ligamental element; anterior and posterior lateral teeth strong and pointed, not socketed above; anterior tooth closer to cardinal complex; posterior lateral tooth distal, well beyond end of ligament. In right valve, cardinal complex consisting of weakly bilobed posterior cardinal and obsolete anterior cardinal, often lost or consisting of irregular wrinkle on cardinal plate; anterior and posterior lateral teeth strong, pointed, socketed above; anterior tooth closer to cardinal complex and posterior tooth distal. Distinct groove coextensive with socket above posterior tooth extending length of external ligament.

Muscle scars moderately impressed. Anterior scar irregularly semilunate and posterior subrectangular. Pallial sinus more or less equal in opposite valves, gently rising, sometimes pointed dorsally, rounded anteriorly and coalescent with pallial line for about 1/3 its ventral length posteriorly. Pallial sinus widely separated from the anterior adductor muscle scar. Cruciform

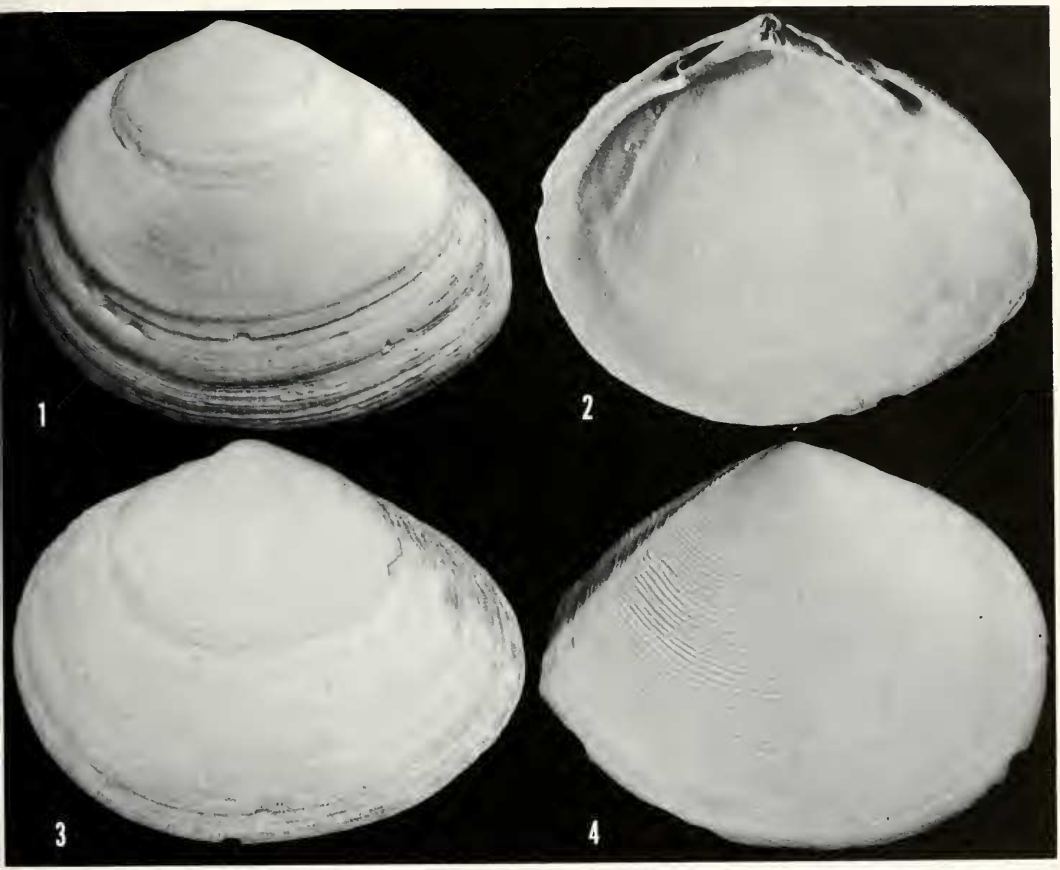


Plate 6. Figs. 1, 2, and 3. *Tellina (Arcapagia) ponsonbyi* Sowerby: Fig. 1, external view of the left valve, Albany, South Africa, USNM 98045 (length = 22.9 mm); Fig. 2, internal view of the right valve, Still Bay, South Africa, SAM A30022 (length = 17.9 mm); Fig. 3, external view of the left valve, Still Bay, South Africa, SAM A30022 (length = 23.9 mm). Fig. 4. *Tellina (Serratina) capsoides* Lamarck: adult individual, external view of the right valve, Durban, NM (length = 57.3 mm).

muscle scars rather distinct, posterior scar larger and set somewhat outward, toward posteroventral margin. Shell white to dirty off-white; internally polished, externally dull with darker concentric growth rings.

Length mm	Height mm	Width mm	
33.5	28.0	12.5	Port Alfred
32.7	26.8	12.7	Algoa Bay
29.0	25.0	12.6	Jeffrey's Bay
25.0	20.0	—	holotype of *ponsonbyi*
22.2	19.4	09.7	Durban
16.0	12.0	—	holotype of *rietensis*
15.0	13.0	—	syntype of *kraussi*
13.8	11.4	06.5	off Tugela River
10.2	08.9	—	Still Bay
03.7	02.8	—	Port Alfred

Remarks. Tellina ponsonbyi is distinguished from other South African tellens by its distinctly cancellate or reticulate sculpture. The concentric portions of the sculpture are strongest peripherally and along the posterior dorsal slope, where they may even become somewhat sublamellate. The synonyms *Tellina rietensis* and *T. kraussi*, introduced by Turton, were based on shape and on beach-worn material, respectively.

As has been indicated in the description, *T. ponsonbyi* undergoes considerable change of shape during ontogeny. Immature

specimens up to 5 mm in length are subquadrate or subrectangular in outline. Gradually they assume the typically subovate to subtrigonal outline of adult specimens. The distinctive sculpture begins to develop when the shell is about 3.5 mm in length. Internally, the dentition and configuration of the pallial sinus are diagnostic.

Specimens of *T. ponsonbyi* could possibly be confounded with *Gastrana abildgaardiana* (Spengler), since the species bear a superficial resemblance to each other. The latter, however, has distinctly stronger concentric sculpture, lacks lateral dentition, and possesses extremely well-developed cardinal teeth—particularly the extremely strong, bilobed, protuberant anterior cardinal in the left valve.

T. ponsonbyi conforms to the morphological patterns seen in *Arcopagia*. The type-species of this group is the European species, *T. crassa* Pennant. The main features that distinguish this subgenus are the presence of well-developed lateral teeth, particularly in the right valve, where the anterior lateral tooth is a little more closely placed in relation to the cardinal complex than is the posterior lateral tooth, and the more or less basically rounded or subovate shape of the valves. A number of other superspecific taxa conform to this generalized pattern and have been established on criteria that cannot be construed as being of subgeneric, much less generic, importance; these are included in the synonymy of *Arcopagia*. In point of fact, these nominal superspecific taxa cloud the true phylogenetic relations of the representative species.

T. victoriae Gatliff and Gabriel 1914 (= *T. decussata* Lamarck 1818, *non* Wood 1815), of New South Wales and South Australia, is a near relative of *T. ponsonbyi*. The pattern again singles out the relationships between the Australian and South African faunas. *T. victoriae* is more nearly perfectly rounded, larger in size (adults longer than 50 mm), and has stronger concentric sculpture than does *T. ponsonbyi*. Further, the pallial sinus in *T. victoriae* is more extensively coalescent with the pallial line. The New Zealand analog is *T. disculus* Deshayes 1854, which has been referred to *Zearcopagia*. The roundly inflated *T. hirasei* Pilsbry 1904 is a Japanese relative of *ponsonbyi*.

Range. *Tellina ponsonbyi* lives in southeast African waters from Still Bay in Cape Province to Zululand; it prefers offshore waters of depths to 95 m. Boshoff (1965) has recorded what he called '*ponsonbyi*' as far north on the eastern coast as Inhaca, Mozambique, where he took a recently dead specimen from under coral talus. The specimen identified by Boshoff is definitely not *T. ponsonbyi* but another Indo-Pacific species, probably *T. fimbriata* Hanley.

Specimens examined. REPUBLIC OF SOUTH AFRICA: Still Bay (SAM); Mossel Bay (UCT); Jeffrey's Bay (MCZ; USNM); Port Elizabeth (BMNH); Algoa Bay (NM; SAM); Albany District (USNM); Port Alfred (BMNH; MCZ; USNM); Port Alfred, near Grahamstown (USNM); Durban (DM; NM); off Tugela River (SAM); off O'Neill Peak, Zululand (SAM).

Tellina (Arcopagia) yemenensis (Melvill)
Plate 7, figures 3, 4; Plate 17, figures 5, 6.

Tellina (Angulus) yemenensis Melvill 1898, Ann. Mag. Nat. Hist., (7) 1: 203, pl. 12, fig. 11 (type-locality, Aden; holotype, BMNH 98.3.17.6).

Tellina siebenrocki Sturany 1901, Denkschrift. Kaiser. Akad. Wiss., Math.-Naturw. Class, Wien, 69: 278–9, pl. 6, figs. 4–7 (type-locality, Ghulejfaka, Landzunge Ras Medjamila [14°35′N, 74°58′E, Yemen Coast, Red Sea]; holotype, ? Vienna Mus.).

Tellina (Arcopagia) bertini (Jousseaume MS) Lamy 1918, Bull. Mus. Natl. Hist. Nat. Paris, 24: 120 (type-locality, Aden, Djibouti; holotype, ? MNHNP).

Description. Shell extending to 18 mm in length and to 13 mm in height, subtrigonal, inequilateral, equivalve, rather solid, inflated with short, rather sharp posterior flexure to right. Umbo slightly behind middle, opisthogyrous, elevated,

Plate 7. Figs. 1 and 2. *Tellina* (*Quidnipagus*) *palatam* Iredale 1929, Bweju, Zanzibar, USNM 604319: Fig. 1, external view of the right valve (length = 79 mm); Fig. 2, external view of the left valve of an immature individual (length = 9.7 mm). Figs. 3 and 4. *Tellina* (*Arcopagia*) *yemenensis* Melvill, Durban Bay, DM (length = 15.6 mm); Fig. 3, external view of the right valve; Fig. 4, internal view of the right valve.

and somewhat blunt; umbonal cavity shallow. Anterior margin smoothly and usually narrowly rounded; ventral margin gently convex, rising in subsigmoid arcuation posteriorly; anterior dorsal margin rather steeply descending, long, and straight to weakly convex; posterior dorsal margin steeply descending, straight, and long; posterior margin short, blunt, irregularly convex, and forming subrostrate outline to posterior aspect of valve. Sculpture consisting of weakly incised, very closely spaced lirations (10–15 per mm), most evident peripherally; centrally smooth; no true radial sculpture. Radial posterior ridges in each valve with weakly depressed sulcal area in front of ridges.

Ligament brownish, protuberant, short, subtended by short, flattened nymphs. No true lunule; escutcheon short, broadly lanceolate; posterior ridges forming broad, flattened, posterior dorsal surface. Hinge line moderately well developed. In left valve, cardinal complex of anterior, subdeltoid to somewhat bifid tooth with more or less equal lobes, and of posterior long, thin, oblique laminate tooth; anterior lateral tooth moderately developed, consisting of thickening hinge line; rather distal to cardinal complex; posterior lateral tooth distal to cardinal complex, weakly pointed. In right valve, cardinal complex consisting of posterior, rather weak, slightly skewed bifid tooth, and of anterior, single, strong,

subdeltoid tooth; posterior lateral tooth distal, slightly upcurled, pointed, and socketed above; anterior lateral tooth very strong, subproximal, upcurled and socketed above. No true internal rib; weakly radially vermiculate.

Muscle scars moderately impressed. Anterior adductor muscle scar irregularly semilunate; posterior adductor muscle scar subelliptical. Pallial sinus rising very steeply posteriorly, arched beneath umbo, falling in straight to subconcave arcuation anteriorly, not confluent with anterior adductor muscle scar and uniting with pallial line just ventral to it. Cruciform muscle scars small, round in left valve; anteriormost in right valve subrectangular, close to periphery. Shell usually flesh colored externally and internally, rarely white or pinkish; sometimes with iridescent sheen.

Length mm	Height mm	Width mm	
17.2	12.6	07.2	Durban Bay
16.5	11.5	06.7	Durban Bay
15.6	11.1	05.7	Durban Bay
12.2	08.2	04.4	Durban Bay

Remarks. Tellina yemenensis is typified by its rather sturdy, solid shell and its thickened dentition in the right valve. The apricot-flesh coloration and the smooth external sculpture are helpful in the recognition of this species. It is variable in color, with the apricot sometimes reduced to a pale yellow-white, though the coloration may be intense and the suffusion complete. Also, all specimens are not so definitively subrostrate posteriorly. The fine illustrations of Sturany (1901) show the typical posterior outline and the form of the pallial sinus.

Salisbury (1934) remarked that he thought *T. yemenensis* belonged to the *T. rutila* Dunker complex; however, the *rutila* group possesses the anguloid facies and is discussed under *canonica* (*q.v.*). Lamy (1918) placed the synonyms of *T. yemenensis* in with *Arcopagia.* Heretofore, the small arcopagoids have been placed in *Pinguitellina* Iredale, with *T. robusta* Hanley as type. Although some authors have employed this name at the generic level (Dall, Bartsch, and Rehder, 1938), *Pinguitellina* represents nothing more than a variation on an arcopagoid theme, which accounts for its appearance in the synonymy of *Arcopagia.* Having a sturdy, rounded, plump shell, *T. yemenensis,* with its strong development of a subproximal right anterior lateral tooth and a distal posterior lateral tooth, is certainly referable to *Arcopagia.*

Tomlin (1926) was the first to report *T. yemenensis* from South Africa, on a single specimen collected at Durban by a Mr. Falcon and preserved in the collection of the Natal Museum (no. 3649). Barnard (1964b), without seeing the specimen, incorrectly referred Tomlin's record to *H. ludwigii.* A number of other specimens have been taken in Durban Bay and, therefore, *T. yemenensis,* though relatively rare, occurs in the area.

Range. This species lives in the Red Sea and in the Indian Ocean from Aden to Durban, South Africa.

Specimens examined. REPUBLIC OF SOUTH AFRICA: Richards Bay, Zululand (UCT); Durban Bay (DM; NM). ADEN PROTECTORATE: Aden (BMNH).

Subgenus *Quidnipagus* Iredale

Quidnipagus Iredale 1929, Mem. Queensland Mus., 9: 266 (type-species, *Cochlea palatam* Martyn 1784 [not available] [= *Tellina palatam* Iredale 1929], original designation).

Description. Shell of medium length, ovate-subtrigonal, solid, inequivalve with right valve of greater convexity and flexed to right posteriorly. Umbos subcentral. Concentric sculpture consisting of lamellate undulations. Dentition well developed; right lateral teeth strong, anterior subproximal to cardinal complex. Pallial sinus extending nearly to anterior adductor muscle scar, broadly rounded, paralleling pallial line ventrally and confluent for posterior half of pallial line.

Remarks. Quidnipagus has hitherto been

considered a section of *Quadrans* (Thiele, 1935). Its relationship to both *Arcopagia* and *Serratina* is indicated by its general ovate shape and its developed right lateral dentition. However, the sculpture is exceptional and the group is evidently monotypic. The so-called *Scutarcopagia* (herein considered as a variation of the arcopagoid theme), including such species as *T. scobinata,* and the *rastellum*-group of *Tellinella,* approach in their scalelike or rasplike sculptures, respectively, the irregular undulations of *Quidnipagus.*

Tellina (*Quidnipagus*) *palatam* (Iredale)
Plate 7, figure 1, 2.

Tellina rugosa Born 1778, Index rerum naturalium Musei Caesarei Vindobonensis, pt. 1, Testacea, p. 18; 1780, Testacea Musei Caesarei Vindobonensis, p. 29, pl. 2, figs. 3, 4 (type-locality, not given; holotype, Vienna [see Brauer, 1878]), *non* Pennant 1777, *nec* Solander 1786, *nec* Römer 1836.

Cochlea palatam Martyn 1784, Univ. Conch., vol. 4, pl. 138 (type-locality, China; types, not known).[1]

Tellina (*Tellinella*) *rugosa obtusa* (Jousseaume MS) Lamy 1918, Bull. Mus. Natl. Hist. Nat. Paris, 24: 29 (type-locality, Red Sea; holotype, MNHNP), *non* Sowerby 1868.

Quidnipagus palatam Iredale 1929, Mem. Queensland Mus., 9: 266 (refers to *Cochlea palatam* Martyn 1787 [1784], Univ. Conch., vol. 4, pl. 138).

Description. Shell extending to 68 mm in length and 53 mm in height, ovate-subtrigonal, subequilateral, inequivalve, solid, somewhat inflated, with right valve of greater convexity, and with sharp and well-developed flexure to right posteriorly. Umbo subcentral, slightly in front of middle, pointed, slightly inflated and smooth. Anterior margin broadly and smoothly rounded; ventral margin gently convex, rounded anteriorly, rising in subconcave postbasal arcuation posteriorly; anterior dorsal margin convex, rounded and gently descending; posterior dorsal margin more steeply descending and more or less straight; posterior margin irregular, straight to slightly convex, forming oblique truncation. Sculpture consisting of concentric irregularly undulate raised lamellations (about 1 per mm) on central disc, becoming stronger on right posterior slope; extremely fine concentric lirations in sulci between lamellations. Extremely fine radial lirations also present in interlamellar sulci; weaker peripherally, most evident umbonally. Single strong posterior radial ridge in right valve and concomitant shallow sulcus in left valve.

Ligament brownish black, strong, slightly protuberant, somewhat sunken in elongate lanceolate escutcheon; lunule elongate, narrow, depressed, stronger in left valve. Calcareous portion of ligament set upon moderately developed and slightly raised nymphal callosities. Hinge line well developed. In left valve, cardinal complex consisting of anterior, very strong, protuberant, deltoid, bifid cardinal tooth with subequal lobes, and of posterior elongate, thin, laminate tooth adpressed to base of nymphal callosity; anterior lateral tooth closer to cardinal complex than posterior, consisting of generalized thickening of hinge line; posterior tooth at posterior end of hinge plate, and escutcheon, thickened and bluntly pointed. In right valve, cardinal complex consisting of posterior narrow bifid tooth with equal lobes and of anterior subdeltoid tooth; anterior and posterior lateral teeth strong, thin, laminate, pointed, slightly upcurled, and socketed above; anterior tooth closer to cardinal complex.

Muscle scars moderately well impressed. Anterior adductor muscle scar subsemilunate, rounded ventrally, with dorsal extension representing anterior pedal retractor scar; posterior adductor muscle scar rounded to subquadrate, with ventral digitiform extension. Pallial sinus more or less equal in opposite valves, rising gently posteriorly, irregularly convex above, falling in smoothly rounded convex arcuation

[1] This work is not available for nomenclatorial purposes. It has been suppressed by the ICZN, Opinion 456.

anteriorly, paralleling pallial sinus for some distance before becoming confluent with it; confluence approximately 1/2 of total ventral length of pallial line; anteriormost extension of pallial sinus close to but not confluent with anterior adductor muscle scar. Cruciform muscle scars rounded, usually conspicuous, large and closely juxtaposed. Externally, shell basically white with some suffusions of yellow umbonally; internally white, sometimes with considerable concentrations of yellow; rarely apricot or pinkish.

Length mm	Height mm	Width mm	
72.0	64.0	25.0	Inhaca, Mozambique
67.4	52.2	25.5	Pukoo, Molokai, Hawaiian Ids.
65.9	52.5	—	Tanapag Harbor, Saipan, Mariana Ids.
46.4	34.9	15.0	Onotoa Atoll, Gilbert Ids.
45.5	34.8	16.2	Bweju, Zanzibar
33.6	24.7	11.3	Bweju, Zanzibar
22.8	17.1	08.2	Bweju, Zanzibar
09.6	07.6	03.5	Bweju, Zanzibar

Remarks. Tellina palatam is primarily characterized by its peculiar undulate sculpture, which causes the surface of the valves to be roughened and sometimes rasplike. In this regard it may be compared to *T. scobinata* Linnaeus, which is clearly arcopagoid and disc-shaped; the sculpture in *scobinata* is formed by small semicircular flanges, its surface being more strongly rasplike than that of *T. palatam*. Likewise, the complex in *Tellinella* represented by such species as *T. rastellum* (*q.v.*) has rasplike sculpture, but it is not uniquely undulate. *T. linguafelis* Linnaeus is a closer relative with a similar but not as strong sculpture. Further, it is of slightly lower proportions and is not as inflated as *T. palatam*. It also is rayed, and its umbo is usually colored reddish.

In *T. palatam* there is some variation in the strength of the sculpture and in the degree of undulation. But the shape of the shell, particularly the extent of pointedness of the posterior slope, is much more variable. Some specimens are very much rounded or shortened behind, whereas others are more distinctly pointed and subtrigonal in outline. The species is noticeably inequivalve, with the right valve more convex, larger, and slightly overlapping the left. The usual basic color pattern is an internal, centrally concentrated, suffusion of yellow. Very infrequently, valves may have pink, orange, or apricot suffusions.

An allometric growth pattern is evident in the ontogeny of the species and has been graphically illustrated by Rost and Soot-Ryen (1955). Smaller individuals tend to be higher and more subquadrate than larger ones.

Range. T. palatam is a relatively common, widely distributed Indo-Pacific species. It is found along the East African coast south to Durban, throughout the Indian Ocean, Indonesia, the Philippine Islands, north to Mogi, Japan, east to the Hawaiian Islands in the north and to the Tuamotus in the south. The species lives in rather shallow water in coarse substrates. It has been found in the Pleistocene of French Somalia (Abrard, 1942), and Skarlato (1965) presented a map of its range.

Specimens examined. REPUBLIC OF SOUTH AFRICA: Durban Bay (NM); Natal (DM; NM). MOZAMBIQUE: Inhaca (Boshoff). TANZANIA: Dar-es-Salaam (ANSP; BMNH; USNM); Mboa Maji, 9 mi. S of Dar-es-Salaam (USNM); Leopard's Cove at Msasani (MCZ); 1.5 mi. NW of Magogoni (MCZ); fringe rock and sand, in 0–5 ft. (1.5 m), Dembiani, 2 mi. N of Kizimkazi, Zanzibar (ANSP; MCZ); Kiwengwa, 18 mi. N of Chwaka, Zanzibar (USNM); Bweju, Zanzibar (USNM); Mbweni, 4 mi. S of Zanzibar City (USNM); Uroa, Zanzibar (USNM); sand and reef, in 0–10 ft. (3 m), 1 mi. N of Paje, Zanzibar (ANSP); Kijangwami, Zanzibar (USNM); sand, grass and coral rock, in 0–4 ft. (1.2 m), Chwaka, Zanzibar (ANSP). KENYA: Mombasa Id. (ANSP); Malindi, 76 mi. N of Mombasa (USNM). FRENCH SOMALILAND: Djibouti (ANSP). RED SEA: (BMNH; MCZ). ETHIOPIA: Massawa, Eritrea

(MCZ). SUDAN: Port Sudan (ANSP). ISRAEL: Akaba (MCZ). ADEN PROTECTORATE: Aden (BMNH). MADAGASCAR: W of Sangeritela, 9 mi. NNW of Tuléar (MCZ); Faty (Ifatz), 13 mi. N of Tuléar (MCZ); shallows of beach, W of Marosoroka, 2.5 mi. N of Ambodifototra, Ile Ste. Marie (MCZ); Nossi Bé (MCZ); in 0–12 ft. (3.7 m), sand, grass, rock, coral, inside crater, Pte. du Cratere, SW Nossi Bé (dead) (ANSP); 0–10 ft. (3 m), muddy, sand ledge, rock, coral, W of Pte. de Tafondro, SE Nossi Bé (ANSP); 0–8 ft. (2.4 m), sand, rock, coral, Nosy Tanikely, 4 mi. S of Nossi Bé (ANSP). SEYCHELLES IDS.: (BMNH; MCZ); NW Bay, Mahé (BMNH). MAURITIUS: (MCZ); 0-10 ft. (3 m), sand, weed, rock and coral, Flic en Flacq (ANSP); Pt. d'Espy (ANSP); near Port Louis (MCZ); 0–12 ft. (3.7 m), sand flat, fine grass, sponge, Jerome Pt., 1 mi. SE Mahebourg (ANSP); 0–4 ft. (1.2 m), sand and weed, around rock point, 1/4 mi. SW Cap Malheureux (ANSP). MALDIVE IDS.: 150–210 ft. (32–64 m), E of Kohit Lowalafuri, NW of Maduwarils, Fadiffolu Atoll (ANSP); NW tip of Gan, Addu Atoll (ANSP). NICOBAR IDS.: (BMNH). COCOS-KEELING IDS.: 1–2 ft. (0.3–0.6 m), *Thalassia,* mixed *Caulerpa* and some corallines, few dead corals, lagoon, E side S end of West Id. (ANSP). THAILAND: coral reef and sand lagoon, Aokam, S end of Phuket Id. (ANSP); sand, live coral, basalt shore, Laam Phan Wa, Phuket Id. (ANSP); Kok Tao, Gulf of Siam (USNM). INDONESIA: Bay of Batavia, Java (USNM); Tjiperwagaran, Bantam, Java (USNM); Keleditan, Bantam, Java (USNM); Oedjoeng Genteng, SW Java (MCZ); Koeta Beach, Bali (MCZ); Biak Id., Schouten Ids. (USNM); Aitape, New Guinea (MCZ). CHINA: Sanya, Hainan (ANSP). JAPAN: Mogi (USNM); Ryukyu Ids. (ANSP; BMNH; MCZ; USNM); Homan, Okinawa (ANSP); Shioyas, Skanawan Bay, Okinawa (USNM); Abu, Okinawa (USNM); beach at Kanna, Okinawa (MCZ). PHILIPPINE IDS.: shore reef, Cape Santiago, Batangas, Luzon (ANSP); Masinloe Bay, Zambales, Luzon (USNM); Barrio-Lupi, Prieto Diaz, Sorsogon, Luzon (ANSP); E coast of Polillo Id. (USNM); Gigmoto, Catanduanes Id. (ANSP); Lubang Id. (USNM); Malug, Lubang (MCZ); Tilic Beach, Lubang (MCZ); Cabila, Barrio of Tagbac, Lubang (MCZ); Calapan, Mindoro (MCZ); Cabra Id. (MCZ); Busuanga, Calamian Group (USNM); Palawan (MCZ); Cuyo Cuyo Group (MCZ); Cagayancillo (USNM); Loran Id., Ubian (USNM); Tataan Id., Tawi Tawi Group (USNM); Bongao Channel, SW end Sanga Sanga Id., Sulu Archipelago (ANSP); Negros (USNM); Cebu City, Cebu (ANSP); Mantacao Id., Bohol (USNM; Zamboanga, Mindanao (ANSP); Little Santa Cruz Id. (USNM); Lianga Bay, Mindanao (USNM); Basilan (USNM). AUSTRALIA: Dunk Id., Queensland (ANSP); Innaminca Point, Queensland (ANSP). PALAU IDS.: Kayangel Id., Kayangel Atoll (USNM). MARIANA IDS.: Unai Fanunchuluyan, Saipan (USNM); Tanapag Harbor, Saipan (ANSP; USNM); Chalan, Kanoa, Saipan (MCZ); Agana Bay, Guam (ANSP); Apra Harbor, Guam (ANSP); Piti Bay, Guam (MCZ); Merizo, Guam (MCZ). CAROLINE IDS.: Ulithi (USNM); Yin, Yap (USNM); Tomil Harbor, Yap; Balabat, Yap (tide flats) (USNM); Ponape (ANSP). MARSHALL IDS.: Wotho Id., Wotho Atoll (USNM); Lea Atoll (USNM). GILBERT IDS.: Makin Id. (USNM); Onotoa Atoll (MCZ); S 50 W from Tekawa Church, at seaward edge of Aonte Baba reef, Onotoe Atoll (USNM); Apaiang (MCZ). BISMARCK ARCHIPELAGO: Kumbun Id., SW New Britain Id. (ANSP). NEW CALEDONIA: (BMNH; MCZ; USNM); Tonghoue, 45 mi. N. of Noumea (ANSP); Bourail (ANSP); Gatope Id., Voh (ANSP); Koë Reef, 2 mi. SSE Touho (ANSP). FIJI IDS.: (BMNH); between Port Ellington and Korokala, NE Viti Levu (USNM); near Port Ellington Wharf, Point Ellington,

5 mi. E of Rakiraki, NE Viti Levu (MCZ); Fring Reef, Lorolevu, Viti Levu (ANSP); Suva, Viti Levu (USNM); Nandronga, Viti Levu (USNM); Mbenga (MCZ); shore reef, 1/2 mi. N of Tunuloa, Vanua Levu (MCZ); Thithia Id., Lau Group (USNM); Mothe Id., Lau Group (USNM). SAMOA IDS.: (USNM); Upolu Id. (ANSP; MCZ; USNM); Massacre Bay, Tutuila Id. (MCZ; USNM). COOK IDS.: E side of Akitua, NE Aitutaki (ANSP); W side Akitua, NE Aitutaki, in 0–2 ft. (MCZ); N Puapuautu, SW of Motutua Id., NW Rarotonga (ANSP); Mangaia (USNM). SOCIETY IDS.: Faanui, Borabora (ANSP); Bora Bora (ANSP); Raiatea (ANSP); Huahine Id. (ANSP); Tahiti (MCZ; USNM); Atiue, Punaauia, Tahiti (ANSP); Tupai Id., Motu-iti, Austral Ids. (ANSP); Opara (Rapa) (ANSP). TUAMOTU ARCHIPELAGO: Maranguai Islet, Toau Atoll (ANSP). HAWAIIAN IDS.: Hilo Bay (MCZ); Keokea Bay (USNM); Kainalu, Molokai Id. (ANSP); Kapulei, Molokai Id. (ANSP); Pukoo, Molokai (USNM); Honolulu, Oahu (ANSP); Waikiki, Oahu (ANSP); Pearl Harbor (fossil) (USNM); Hospital Point Beach, Pearl Harbor (USNM); Ford's Id., Pearl Harbor (ANSP); 1.8 mi. E of Pearl City Road (ANSP; MCZ); Mokuoloe Id., Kaneohe Bay (ANSP); Makapu Peninsula, Kaneohe Bay (MCZ; USNM); E of Aiea station (ANSP); Hoaeae (ANSP); Heeia Pond (fossil) (USNM); Kewalo Reef (MCZ; USNM); Sanikai (USNM); 1/2 mi. W of Waipahaehoe station (ANSP); NW corner Weli Pond (fossil) (USNM); Kilauea Beach, Kauai Id. (ANSP).

Subgenus *Serratina* Pallary

Pristis Lamy 1918, Bull. Mus. Hist. Nat. Paris, 24: 29 (type-species, *Tellina pristis* Lamarck 1818, original designation), *non* Linck 1790, Latham 1794, Müller and Henle 1837 (Pisces), *nec* Brullé 1846 (Insecta).

Serratina Pallary 1922, Exploration scientifique du Maroc, Malacologie (1912), p. 95 (type-species, *Tellina serrata* [Renier MS] Brocchi 1814, original designation).

Striotellina Thiele 1935, Handbuch der systematischen Weichtierkunde, vol. 2, pt. 3: 917 (type-species, *Tellina serrata* Renier 1804,[1] monotypy).

Pistris Thiele 1935, Handbuch der systematischen Weichtierkunde, vol. 2, pt. 3: 917, new name for *Pristis* (Jousseaume MS) Lamy 1918, *non* Linck 1790, Latham 1794, Müller and Henle 1837 (Pisces) *nec* Brullé 1846 (Insecta).

Pristipagia Iredale 1936, Rec. Aust. Mus., 19 (5): 281 (type-species, *Pristipagia gemonia* Iredale 1936, here designated).[2]

Lyratellina Olsson 1961, Panamic-Pacific Pelecypoda, p. 383 (type-species, *Tellina lyra* Hanley 1844, original designation).

Description. Shell of small to medium size, somewhat compressed, subovate to subquadrate in shape, nearly equivalve, and more or less equilateral. Umbos rather centrally placed. Sculpture predominately concentric, consisting of more or less closely and regularly spaced lirations, sometimes sublamellate in immature stages. Dentition well developed, with anterior and posterior lateral teeth more or less equidistant from cardinal complex. Pallial sinus larger, extensive, rounded anteriorly, sometimes coextensive with anterior adductor muscle scar or rarely paralleling pallial line and confluent posteriorly. Color predominately white or dull grey.

Remarks. This group is typified by having rather solid, whitish or grayish shells that tend to be irregularly subquadrate in shape and that have a predominately concentric sculpture consisting of more or less regularly spaced, incised sulcations that may be sublamellate posteriorly. The pallial sinus is generally extensive and broadly rounded anteriorly or, in some

[1] The "Tavola alfabetica delle Conchiglie Adriatiche" of Renier (1804) was suppressed by the ICZN (Opinion 316); the next available usage of *T. serrata* was by Brocchi (1814).

[2] The slovenly work of Iredale! In establishing this 'genus,' he (1) does not designate a type-species, (2) implies a renaming of *Pristis* (Jousseaume MS) Lamy, and (3) mentions *capsoides* Lamarck, *botanica* Hedley, and *gemonia* Iredale. In Iredale and McMichael (1962), the latter is taken as the type-species by original designation; it is herein correctly and subsequently designated as type-species.

cases, coextensive with the anterior adductor muscle scar. The right lateral dentition is developed, and the anterior and posterior lateral teeth are more or less equidistant from the cardinal complex.

T. serrata represents the group in the eastern Atlantic, *T. aequistriata* in the western Atlantic, *T. alerta* in the southern Atlantic, *T. reclusa* in the eastern Pacific, and *T. capsoides* in the Indo-Pacific. The group is closely related to *Quadrans* Bertin, which differs in its smooth surface and peculiarly differentiated subspinose posterior lamellations.

I had earlier (Boss 1966b) placed *T. aequistriata* and *T. alerta*, here considered in *Serratina*, in *Merisca* Dall 1900 with *T. crystallina* Wood 1815 (= *T. cristallina* Spengler 1798) as type-species. This thin fragile species (with a rostrate posterior outline and a right anterior lateral tooth subproximal to the cardinal complex), along with the eastern Pacific *T. rhynchoscuta* Olsson and the Indo-Pacific *T. martensi* Lynge, may be considered as forming a rather distinct lineage related to, but not consubgeneric with, the *Serratina* group.

I have, however, included *Lyratellina* Olsson in this synonymy, which thereby brings such species as *T. martinicensis* d'Orbigny, *T. juttingae* Altena, *T. proclivis* Hertlein and Strong, and *T. lyra* Hanley into the fold of *Serratina*. The sole distinguishing character of *Lyratellina*, the prosogyrous proclivity of the umbos, is really not a constant trait, and the species exhibit a variation through the prosogyrate, orthogyrate, and opisthogyrate conditions.

Tellina (*Serratina*) *capsoides* Lamarck
Plate 6, figure 4; Plate 8, figures 5, 6; Plate 14, figure 3.

Tellina capsoides Lamarck 1818, Anim. sans Vert., 5: 531 (type-locality, à l'ile St. Pierre-St.-Francois[1]; types, MNHNP [see Bertin, 1878]); Hanley 1847 [*in*] Sowerby, Thes. Conch., vol. 1, *Tellina*, p. 268, pl. 62, fig. 185.

Tellina pristis Lamarck 1818, Anim. sans Vert., 5: 531 (type-locality, l'Ocean Indien; types, MNHNP [see Bertin, 1878]; refers to Bruguière, 1798, Encycl., Méthod., pl. 287, figs. 1a, b).

Tellina lima Philippi 1847, Zeitschr. Malakozool., 4: 74 (type-locality, China, insula Basilan; holotype, ?).

Tellina (*Arcopagia*) *concentrica* Gould 1850, Proc. Boston Soc. Nat. Hist., 3: 253 (type-locality, Feejee [Fiji] Islands; types, unknown [see Johnson, 1964]); 1852, U. S. Exploring Exped., 12: 404, pl. 36, fig. 519 a-b; 1862, Otia Conch., p. 80.

Tellina diaphana Deshayes 1854, Proc. Zool. Soc. London [1855] pt. 22, no. 282: 364 (type-locality, Japan; syntypes, BMNH, unnumbered).

Tellina denticulata Deshayes 1854, Proc. Zool. Soc. London [1855] pt. 22, no. 282: 365 (type-locality not given; syntypes, BMNH, unnumbered).

Tellina (*Areopagia* [*sic*]) *siamensis* von Martens 1860, Proc. Zool. Soc. London, pt. 28 [1]: 18 (type-locality, Siam; syntypes, BMNH 59.5.23.5).

Tellina negrosiensis Bertin 1878, Nouv. Arch. Mus. Hist. Nat. Paris, 2 Sér., 1: 250, pl. 8, figs. 6a-b (type-locality, îles Negros [Philippine Islands]; syntypes, MNHNP).

Tellina (*Tellinella*) *thymares* Melvill 1896, Proc. Malac. Soc. London, 2: 116, pl. 8, fig. 9 (type-locality, Bombay; holotype, BMNH 96.10.162).

Tellina (*Merisca*) *pristiformis* Pilsbry 1901, Proc. Acad. Nat. Sci. Philadelphia, 53: 400, pl. 19, fig. 8 (type-locality, Inland Sea, Japan; syntypes, ANSP 71029).

Pristis audouini (Jousseaume MS) Lamy 1918, Bull. Mus. Natl. Hist. Nat. Paris, 24: 30 (type-locality, Suez; types, MNHNP; refers to Savigny, 1817, pl. 8, fig. 11, 1–3) (see Audouin, 1827; Pallary, 1926).

Tellina (*Pristis*) *pristis major* Lamy 1918, Bull. Mus. Natl. Hist. Nat. Paris, 24: 30 (type-locality, Suez; types, MNHNP).

Description. Shell extending to 59 mm in length and to 47 mm in height, subovate to subtrigonal, nearly equilateral, nearly

[1] No author has pin-pointed this locality. There is a St. Peter's Island near the St. Francis Island Group of the Nuyts or Moyts Archipelago off South Australia (32°17′S; 133°35′ E), and since it is known that Péron and Lesueur collected along this coast (Péron and Lesueur, 1816) and that the type-specimens of *capsoides* were collected by them (Bertin, 1878, p. 250), it is possible that this locality is the one meant by Lamarck. However, *T. capsoides* does not occur in South Australia (Cotton and Godfrey, 1838), and it is presently assumed that the original locality is incorrect.

equivalve, solid, moderately inflated, with right valve slightly more convex and with weak flexure to right posteriorly. Umbo subcentral, sometimes slightly behind middle, somewhat oblate and pointed. Anterior margin broadly, smoothly, and convexly rounded; ventral margin convex, rising arcuately behind; anterior dorsal margin straight to slightly concave, short and gently descending; posterior dorsal margin longer, more steeply descending, and weakly convex; posterior margin short, biangulate, more or less straight, and forming blunt dorsoventral truncation, sculpture various, with concentric lirations (usually 2–4 per mm) and, in immature specimens, becoming lamellate and subspinose along anterior and posterior dorsal margins. Radial sculpture usually weak and incipient, rarely strong, rather regularly and finely spaced, most noticeable in interspaces or sulci between lirations, and forming microscopic cancellate pattern. Double posterior ridge with shallow sulcus in right valve, weaker in left valve.

Ligament dark brown to black, strong, elongate, slightly protuberant, set in elongate, lanceolate escutcheon; lunule lanceolate, generally impressed and sunken, somewhat more extensive in right valve. Calcareous portion of ligament well developed and subtended by slightly raised nymphal callosities. Hinge line strongly developed and thickened. In left valve, cardinal complex consisting of anterior, rather thin, deeply cleft bifid tooth with subequal lobes, and of posterior elongate, variously developed, laminate cardinal tooth; lateral teeth consisting of slightly pointed thickenings of hinge line, posterior somewhat weaker and somewhat more distally removed from cardinal complex. In right valve, cardinal complex consisting of posterior, strong, protuberant, subdeltoid, deeply cleft bifid tooth with elongate lobes, and of anterior, oblique, strong, laminate tooth; lateral teeth strong, bluntly pointed, and socketed above; posterior lateral more distally removed from cardinal complex.

Muscle scars moderately well impressed. Anterior adductor muscle scar irregularly semilunate and large; posterior adductor scar small, rounded to subquadrate and with ventral digitiform extension. Pallial sinus more or less equal in opposite valves, rising sharply from posterior adductor muscle scar, arcuately or slightly pointed above, descending normally in front, paralleling pallial line for some distance before becoming confluent with it; confluence 1/4 to 1/3 length of pallial line. Cruciform muscle scars closely juxtaposed; anterior scar flattened and larger. Color basically dull or powdery white; rarely, extremely pale yellowish suffusions externally, as well as dehiscent grayish periostracum; rarely, faint pinkish suffusion along hinge posteriorly.

Length mm	Height mm	Width mm	
58.0	46.4	22.4	Durban
56.7	46.1	19.6	Congella
49.0	35.0	15.3	Enoshima, Japan
43.9	33.0	15.0	Manila, Luzon, P. I.
32.9	25.2	11.5	Enoshima, Japan
32.2	26.1	10.9	Dar-es-Salaam, Tanzania
28.3	20.4	07.9	Aden
17.1	12.7	04.4	Durban

Remarks. T. capsoides is an extremely variable species, which accounts in part for the numerous synonyms. As variable as it is, the species is always recognized by the presence of its regular concentric sculpture and the strong development of its right lateral teeth, as well as the digitiform process extending ventrally from the posterior adductor muscle scar. Radial sculpture is usually evident in all specimens, but in some it becomes noticeably stronger; Bertin's *negrosiensis* is based on this variation. The exact proportions of the valves that determine the shape or outline of the shell are also variable, some individuals being less rounded than the East African populations. In Japanese populations that have been referred to *diaphana*, the concentric sculpture is rather weak on the anterior dorsal portions of the disc, and the incidence of individuals with a

slightly subtrigonal shape is greater. Melvill's *thymares* appears to have been founded on specimens of *capsoides* that were not as solid or thickly shelled as usual.

There is an ontogenetic difference in the placement and configuration of the pallial sinus. In young individuals the pallial sinus is smoothly and regularly rounded anteriorly and is distinctly separated from the anterior adductor muscle. In larger or adult specimens the anterior adductor muscle scar is larger and the pallial sinus more extensive. The pallial sinus in adults is, therefore, very closely juxtaposed or contiguous with the anterior adductor muscle scar, and its more or less regularly convex arcuation becomes irregular and slightly displaced.

Krauss (1848) noted the occurrence of this species on the Natal coast. In Mozambique it has been recorded by Braga (1956), Paes da Franca (1960b) and Boshoff (1965). The species has a tropical Indo-Pacific form that comes down the east coast of Africa into the Durban area, which is its southernmost range extension. However, the species thrives well in this area. Day and Morgans (1956) found that it prefers soft substrates of sands and muds and lives in the intertidal open bay and sanctuary of Durban, while Macnae and Kalk (1958) noted that it occurs in the upper and lower midlittoral sands of Inhaca. Specimens that are darkly colored externally often come from soft muddy substrates.

A close relative of *T. capsoides* is *T. serrata* Brocchi from the Mediterranean and the eastern Atlantic (Weinkauff, 1867). The latter is of slightly different proportions, being somewhat more subtrigonal and is generally smaller in size; it tends to be shorter and never as heavily shelled as *T. capsoides*. The concentric sculpture of *serrata* is somewhat finer and the anterior lateral tooth of the valve is closer to the cardinal complex.

Range. Tellina capsoides is an Indo-Pacific species that lives along the east coast of Africa as far south as Durban, throughout the Red Sea (Lamy, 1918; Moazzo, 1939), the Indian Ocean, the Philippine Islands, north to Hokkaido, Japan, south to Queensland, Australia, and east to Vanua Levu in the Fiji Islands. Biggs and Grantier (1960) documented its presence in the Persian Gulf.

Specimens examined. REPUBLIC OF SOUTH AFRICA: Durban (NM; SAM); Durban Bay (UCT; USNM); Congella (NM); Natal (BMNH). MOZAMBIQUE: Morrumbene Estuary (UCT); Inhaca Id. (MCZ). TANZANIA: Dar-es-Salaam (USNM); Zanzibar (MCZ); Mazizini, Zanzibar (ANSP); Mnazi Moja, Zanzibar City (USNM). ADEN PROTECTORATE: Aden (BMNH; USNM). MADAGASCAR: Faty (Ifatz), 13 mi. N of Tuléar (MCZ); Mangroves, mud flats and rocks, Ambatozavavy, E of Nossi Bé; 0–2 ft., NW Nossi Bé (both ANSP); Nossi Bé (MCZ). WEST PAKISTAN: Mekran Coast (MCZ); Baba Id., Karachi (BMNH). INDIA: Bandra, N of Bombay (USNM); Darwar, N Kanara (USNM); Madras (BMNH). ANDAMAN IDS.: (BMNH). BURMA: Akyab, Aracan (BMNH). MALAYSIA: Singapore: (ANSP; BMNH; MCZ; USNM); sand bed and shallow river, Kranji, Singapore (ANSP). THAILAND: sand flats, S end Pa Tong Bay, Phuket Id. (ANSP); intertidal mud flat, Ang Hiu, Cholburi Province (MCZ). CHINA: Tsi Mei, Amoy (ANSP); Whampoa, 12 mi. E of Canton (USNM); Hong Kong (USNM); Haik'ou, Kainan (ANSP; USNM). JAPAN: (BMNH; MCZ); Hokkaido (USNM); Tokyo (Jeddo) Bay (ANSP); Yokohama (BMNH; USNM); Tosa (ANSP); Hirado, Hizen (ANSP; USNM); Enoshima (USNM); Mogi (USNM) Otoshima, Bitchu (ANSP; MCZ; USNM); Satsuma (ANSP); Inland Sea (ANSP; MCZ); Ryukyu Ids. (USNM). PHILIPPINE IDS.: E coast of Polillo Id. (USNM); Manila, Luzon (USNM); Matabunkay Cove, 14 km south of Nasugbu, Manila Bay (ANSP);

Tilic Bay, Lubang Id. (MCZ); Marinduque Id. (USNM); Batangas Prov., Luzon (ANSP); Oago, 4 km north of Gubat, Sorsogon, Luzon (ANSP); Calbayog, Samar Id. (MCZ); near Cebu City, Cebu Id. (ANSP; MCZ); Negros Id. (USNM); Bago and Miranda Beach, Pontevedra, Negros (ANSP); Sinay, Mindanao (USNM); Miramis Beach, Mindanao (USNM); Basilan (MCZ). AUSTRALIA: mud and reef, 1 mi. SE of False Cape Bossut, La Grange Bay (ANSP); Buccaneer Rock, Broome (ANSP); Quailsoland, 35 mi. W of Darwin (MCZ); Darwin (MCZ); Port Essington, Coburn Peninsula (BMNH); Rockingham Bay, Queensland (MCZ); Hervey Bay, Queensland (BMNH); Moreton Bay (MCZ). NEW CALEDONIA: (BMNH; MCZ). FIJI IDS.: Suva, Viti Levu (ANSP; MCZ); between Port Ellington and Korokula, NE coast of Viti Levu (USNM); Buca Bay, Vanua Levu (Moutha Bay) (MCZ).

Subgenus *Pharaonella* Lamy

Pharaonella Lamy 1918. Bull. Mus. Natl. Hist. Nat. Paris, 24: 31 (type-species, *Tellina pharaonis* Hanley 1844, by virtual tautonymy).

Description. Shell of medium to large size, thin, subovate to elongate, posteriorly rostrate and slightly flexed to right posteriorly. Umbos rather small, pointed, median or slightly posterior. Smooth, or sculpture weakly developed. Ligament short, rather weak, not too protuberant, somewhat inset. Dentition small and weak; anterior and posterior lateral teeth developed in right valve, thin, shelf-like and pointed. Pallial sinus moderately large, rather pointed anteriorly, low dorsally, confluent with posterior quarter of pallial line. Color white to deep red, variously banded or rayed.

Remarks. The name *Pharaonella* was suggested by Jousseaume in an unpublished manuscript and then introduced by Lamy (1918). The group was not critically circumscribed, but it has been used at the generic level (Dall, Bartsch, and Rehder, 1938). Its major diagnostic characteristics include its rostrate posterior outline and its colorful, relatively smooth, thin shell; the right valve preserves a full complement of lateral dental elements. Since a number of so-called species are referable to *Pharaonella*, I shall deal with them in the remarks and synonymy of *T. perna*.

Pharaonella is related to *Laciolina* Iredale, a group with such members as *T. chloroleuca* Lamarck and *T. quoyi* Sowerby from the Indio-Pacific, *T. laevigata* Linnaeus and *T. magna* Spengler from the western Atlantic, and *T. ochracea* Carpenter from the eastern Pacific (Boss, 1964). *Laciolina* is more thickly shelled, usually rounded in outline and with a strong, inset calcareous ligamental element. Certain species indicate the propinquity of the lineages of these two groups—so much so, that at times, one tends to doubt their existence as distinct subgenera.

Tellina (*Pharaonella*) *perna* Spengler
Plate 8, figures 1–4.

Tellina perna Spengler 1798, Skrivter af naturhistorie Selskabet, København, 4(2): 79 (type-locality, Fra Ostindien; holotype, ex museo Moltkiano, ?Zoological Museum, Copenhagen; refers to Chemnitz 1782, Conch.-Cab., vol. 6: 112, pl. 11, fig. 104 [here selected as type-figure]).

Tellina pallescens Dillwyn 1817, Cat. Shells, 1: 84 (type locality, East Indian Seas; refers to Chemnitz 1782, Conch.-Cab., vol. 6: 112, pl. 11, fig. 104 [here selected as type-figure]).

Tellina latirostra Lamarck 1818, Anim. sans Vert., 5: 523 (type-locality, habite . . . les mers de l'Inde; holotype, MHNG).

Tellina sulphurea Lamarck 1818, Anim. sans Vert., 5: 523 (type-locality, habite l'Ocean Indien . . . ; syntypes, MHNG).

Tellina pharaonis Hanley 1844 (Dec.) Proc. Zool. Soc. London, pt. 12, no. 139: 148 (type-locality, Red Sea; type, Museum Metcalfe [not in the BMNH]); 1846 [*in*] Sowerby, Thes. Conch., 1: 235, pl. 63, fig. 215.

Tellina venusta Deshayes 1854, Proc. Zool. Soc. London [1855 (May)], pt. 22, no. 282: 368 (type-locality, Sandwich Islands; holotype, BMNH).

Tellina semilaevis von Martens 1865, Ann. Mag. Nat. Hist., (3) 16: 429 (type-locality, Querimba Islands, near Mossambique, here restricted; holotype, ?Berlin).

Tellina tenuilirata Sowerby 1868 (March) [*in*] Reeve, Conch. Icon., vol. 17, **Tellina**, pl. 43, fig.

253 (type-locality, unknown; ?syntypes, BMNH 77.5.12.75), *non tenuilirata* Sowerby 1867 (Sept.), *ibid.*, pl. 39, fig. 219a-b.

Tellina tenuisulcata Sowerby 1869 (April) [*in*] Reeve, Conch. Icon., vol. 17, **Tellina**, Index, p. 4, new name for *tenuilirata* Sowerby 1868 (March), *ibid.*, pl. 43, fig. 253, *non tenuilirata* Sowerby 1867 (Sept.), *ibid.*, pl. 39, fig. 219 a-b.

Tellina beadleiana Tryon 1869 (May), Amer. Jour. Conch. [1868], 4 (suppl.): 82, new name for *T. tenuilirata* Sowerby 1868, *non* Sowerby 1867.

Description. Shell extending in length to 77 mm and in height to 33 mm, subelliptical, pointed behind, inequilateral, equivalved, fragile or thin in immature stages to subsolid as adults. Valves only slightly inflated, of more or less equal convexity, and with a sharp flexure to the right posteriorly. Umbo slightly behind middle, little elevated, pointed, and rather inconspicuous. Anterior margin rather narrowly rounded; ventral margin broad or gently convex, rising behind in a postbasal arcuation; anterior dorsal margin gently descending, elongate and nearly straight; posterior dorsal margin gently descending, straight to slightly concave and elongate; posterior margin short, bisected by posterior sulcus, and forming blunt oblique posterior truncation. Posterior outline of valves rostrate. Sculpture consisting of weak concentric lirations (about 3–6 per mm); extremely fine radial vermiculations usually developed on posterior dorsal slope of right valve. Two primary posterior ridges in right valve generally moderately developed; anteriormost in posterior third of valve radiating from umbo to ventral margin; posteriormost in posterior eighth of valve radiating from umbo to junction of posterior margin and ventral margin. In left valve, ridges not nearly as well developed as in right valve.

Ligament yellow to dark brown in color, moderately strong, not protuberant, and set in narrowly lanceolate escutcheon; weak semi-lanceolate lunule present in left valve; calcareous portion of ligament well developed, subtended by hinge margin; no developed nymphal callosities. Hinge line rather moderately developed. In left valve, cardinal complex consisting of interior subdeltoid, bifid tooth with subequal lobes, and of posterior elongate, laminate tooth, slightly thickened or lost; no true anterior lateral tooth, but anterior margin slightly thickened distally; posterior lateral tooth distal, consisting of weak, slightly pointed or thickened tubercle at posterior end of hinge margin. In right valve, cardinal complex consisting of posterior, narrow, bifid tooth with subequal lobes and of weakly subdeltoid or thickened anterior laminate tooth; anterior lateral tooth concave or socketed above, slightly upcurled, and pointed; posterior lateral tooth socketed above, weaker, consisting of pointed, shelf-like extension of hinge margin. No true internal rib, but in right valve, posterior sulcus forming slightly rib-like structure internally.

Muscle scars moderately well impressed. Anterior adductor muscle scar irregularly semilunate and rounded below; posterior adductor muscle scar irregularly rectangular. Pallial sinus equal in both valves, arising from the base of the posterior adductor muscle scar in gentle arcuation, rounded or somewhat pointed above, gently descending anteriorly, forming pointed arcuation anteriorly, and united with pallial line basally for at least one half of its length. Cruciform muscle scars moderately well impressed, subequal in each valve, strongest in right; posterior cruciform scar in right valve on sulcal rib. Color basically white; yellow suffusions usual; umbo occasionally red; infrequent reds and pinks variously distributed in bands or rays.

Length mm	Height mm	Width mm	
76.2	32.9	11.8	Midway Island
66.3	33.3	14.7	Durban
53.0	23.0	08.5	Natal
37.8	19.6	07.4	Java
31.1	13.3	05.0	Durban
22.6	11.4	04.5	Durban

Remarks. Tellina perna Spengler exhibits considerable variation in conchological traits and has a very extensive

Plate 8. Figs. 1–4. *Tellina* (*Pharaonella*) *perna* Spengler: Fig. 1, external view of the right valve, showing extreme development of concentric liratians, Durban, NM (length = 45 mm); Fig. 2, internal view of the right valve, Durban, NM (length = 45 mm); Fig. 3, external view of the right valve, showing normal concentric sculpture, Durban, A3655 (length = 44.5 mm); Fig. 4, external view of the right valve, showing variation in height, Durban Bluff, NM 1775 (length = 20.5 mm). Figs. 5 and 6. *Tellina* (*Serratina*) *capsaides* Lamarck, young individual, Durban, NM 3650 (length = 17 mm): Fig. 5, internal view of the right valve; Fig. 6, external view of the left valve.

geographical range. The species is highly variable, with certain of its widely dispersed and somewhat isolated populations posing under different names; hence, the numerous synonyms. The populations which occur in the north central Pacific from Midway through Hawaii have been separately treated as *T. venusta* Deshayes (Dall, Bartsch, and Rehder, 1938). Individuals from this area are usually somewhat larger than typical *T. perna* from the central portion of the range and often possess reddish radiations on the beak. Such characters, for example, are relatively rare in populations from the Philippines, but in East Africa, individuals with reddish umbonal rays and slightly blunt posterior rostrations have been called *T. semilaevis* von Martens. Other variations that have been named include specimens with bright yellowish coloration, *T. sulphurea* Lamarck, those living in the Red Sea, *T. pharaonis* Hanley,

and those with slightly strengthened sculpture ventral to the posterior rostration, *T. tenuisulcata* Sowerby. None of these phenotypic variations is consistent enough to be of specific significance, and when large suites of specimens from all over the Indo-Pacific area are compared, it becomes evident that only a single species is involved.

Tellina vulsella, another species of *Pharaonella*, living in the Philippines and Japan, is thereby partially sympatric with *T. perna* and very closely related to it. Since the taxonomy of *T. vulsella* has been in confusion, I include its synonymy:

Tellina vulsella Hanley 1846 [*in*] Sowerby, Thes. Conch., 1: 235, pl. 61, figs. 162–163 (type-locality, Isle of Zebu [Philippine Islands]; type, BMNH no number).

Tellina sieboldii Deshayes 1854, Proc. Zool. Soc. London [1855 (May)], pt. 22, no. 282: 368 (type-locality, Japan; syntypes, BMNH no number).

Tellina perrieri Bertin 1878, Nouv. Arch. Mus., Paris, (2) 1: 255, pl. 8, fig. 8a-b (type-locality, Japan; syntypes, MNHNP).

Tellina consanguinea Sowerby 1903, Ann. Mag. Nat. Hist., (7) 12: 500 (type-locality, Hirado Hijan, Japan; holotype, BMNH 1903.12.7.1).

Since the *T. vulsella* of Chemnitz from the first edition of the Conchylien-Cabinet is not available, the first valid introduction of the name was by Hanley (1846). There is no doubt that this nomen is attached to the pharaonoid species of Japan and the Philippines. The species is typically reddish or flesh colored; it does not attain the size of *T. perna*, is more narrowly elongate, and has a more pronounced posterior rostration and greater compression.

The variety of colors found in *T. perna* is considerable. Although it appears that most specimens are white with some central suffusion of yellow, other individuals are completely permeated with lemon yellow. Reds and pinks are also frequently encountered, and occasionally the umbonal area may be rayed and suffused with pink. Bands of weak red occur much less frequently than bright rays, which extend from the umbo to the distal margins of the valves. The rays tend to be most broad and most intense posteriorly. More intensely banded and colored specimens are frequently found east of New Guinea.

The sculpture is also quite variable, as is the posterior outline of the shell. Younger individuals may possess fairly strong concentric lirations, which are usually more distinct in the right valve. Usually larger individuals are quite smooth, though some retain vestiges of stronger sculpture in the region of the posterior sulcus. Specimens with such sculpture, whose ventral margins are indented postbasally and are therefore more distinctly rostrate, have been called *T. tenuisulcata* or *T. pharaonis*. As noted previously, relatively large suites of specimens and good samples of the population show these characters to be inconstant.

Range. Tellina perna lives from Natal, South Africa, throughout the Indian Ocean, Indonesia, and the Philippines to Japan in the north, Australia in the south, the Samoan Islands in the southeast and the Hawaiian Islands in the northeast. It dwells in relatively shallow water in sandy substrates.

Specimens examined. REPUBLIC OF SOUTH AFRICA: Durban, Natal (BMNH; DM; NM; SAM; USNM). MOZAMBIQUE: Inhaca (ANSP; MCZ); Santa Carolina Id., Bazarutto Bay (MCZ). TANZANIA: Zanzibar (BMNH; MCZ); Bweju (USNM); Chumbe Id., in 0–6 ft., Mazizini, in mud and grass, Nguruwe Id., in 5–11 fms., and Ukombi Id., in 6–9 fms., all Zanzibar (all ANSP). EGYPT: Suez (BMNH). ADEN PROTECTORATE: Aden (BMNH). MADAGASCAR: (BMNH). Anakao, 20.5 mi. S of Tuléar (MCZ); Andilana and Nosy Antsaibory (ANSP); 1–2 mi. S of Nosy Iranja, white sand, in 11 fms. (ANSP).

SEYCHELLES IDS.: N.W. Bay, Mahe (BMNH). MAURITIUS: (BMNH). MALDIVE IDS.: S half of Kendikolu Id., 5°57′N; 73°24′E, Miladummadulu Atoll (ANSP); Kuda Huvadu, S Nilandu Atoll (ANSP). CEYLON: (MCZ). ANDAMAN IDS.: (BMNH). MALAYSIA: Singapore: (BMNH). THAILAND: Phuket Id. (ANSP). INDONESIA: Batavia, Java (MCZ; USNM); E Mios Woendi Id. and Konori Id., Padaido Ids. (both ANSP); E side Rouw Id., W side of Abroeki, 1 mi. SW of Maransabadi, Aoeri Ids., Geelvinck Bay (both ANSP). CHINA: Shanghai (MCZ). JAPAN: Sagami Bay (ANSP); Kyoto (MCZ); Wakayama (ANSP); Osima Osumi (? van Dieman Strait) (MCZ); Abu and Ishikawa Beach, Okinawa, Ryukyu Ids. (both USNM). PHILIPPINE IDS.: cove, S side of Corregidor Id., in 11 fms. (ANSP); east end of Sisiman Bay, Bataan, in 8 fms. (ANSP); Tilic Bay, Lubang Id. (MCZ); Jolo (USNM). AUSTRALIA: Abrolhos Ids. (USNM); Monte Bello Ids., Dampier Archipelago (BMNH); Port Essington, Northern Territory (BMNH); Moreton Bay, Queensland (MCZ). PALAU IDS.: Eil Malk, off Eomogan Id., 4 mi. SW of Eil Malk, in 3 ft., sand, west entrance of Kossol Passage, in 20 fms. and 1 mi. S of west passage Babelthuay Id. (all ANSP). MARSHALL IDS.: Bikini (USNM). SOLOMON IDS.: Ataa, Malaita Id. (ANSP). NEW CALEDONIA: (BMNH; MCZ); Bourail (ANSP); 2 1/2 mi. N Dumbea Pass, off Noumea, in 60 ft., sand (ANSP). FIJI IDS.: E end of Thakau Tanau Reef, 4–5 mi. NW of Port Ellington, NE Viti Levu; 1 1/2 mi. NE of Mbau Id., Viti Levu (both MCZ). SAMOA: Tutuila Id. (USNM). HAWAIIAN IDS.: Midway Id. (ANSP); Pearl and Hermes Reef (USNM); off Honolulu, in 6–8 fms., Oahu (ANSP; USNM); off Kaanapoli, in 4–8 fms., Maui (USNM).

Subgenus *Eurytellina* Fischer

Peronaeoderma 'Poli' Stoliczka 1870, Cretaceous Fauna of Southern India, vol. III: 116 (type-species, *Tellina punicea* Born 1778, original designation), *non* Poli 1795, *nec* Mörch 1853.

Eurytellina Fischer 1887, Manuel de Conchyliologie, p. 1147 (type-species, *Tellina punicea* Born 1778, monotypy).

Tellinota Iredale 1936, Rec. Aust. Mus., 19 (5): 281 (type-species, *Tellinota roseola* Iredale 1936, original designation).

Description. Shell elongate-elliptical to subtrigonal, somewhat compressed and slightly inequilateral; posterior flexure to the right, weak, obsolete or absent; surface sculpture rather poorly developed; ligament posterior more or less protuberant, and strong; lateral teeth of the left valve poorly developed, with a weak, tubercle-like proximal anterior tooth and an obsolete distal posterior lateral tooth; in the right valve, the distal posterior is often well developed and the proximal anterior is generally well developed and strong; pallial sinus rather flattened dorsally and extending far anteriorly, near to or contiguous with the anterior adductor; confluence of the pallial sinus with the pallial line extensive.

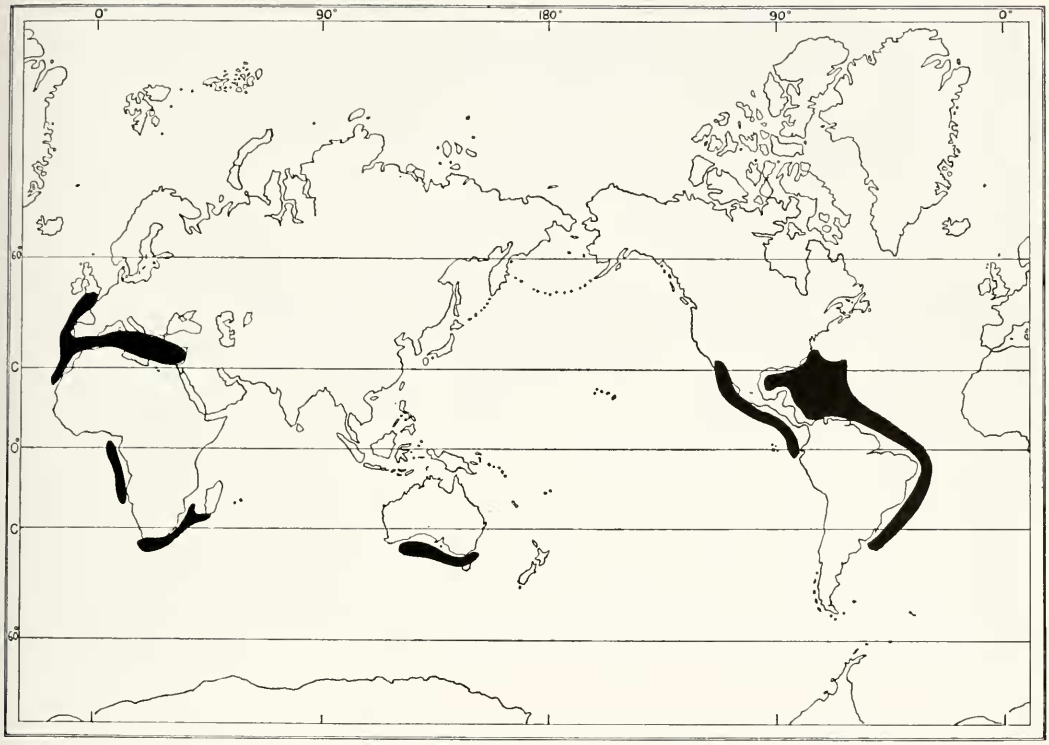
The group of *Eurytellina* forms a natural assemblage of species characterized by the right lateral dentition, the more or less elongate elliptical shape of the shell, the compression of the valves, and the relatively smooth superficial sculpture on the anterior slope and disc of each valve. Many of the species are highly or intensely colored with reds, pinks, and apricots.

Although *Eurytellina* appears to be most highly evolved in the western Atlantic-eastern Pacific region, it is represented in the eastern Atlantic and Mediterranean by *T. incarnata*, in tropical west Africa by *T. madagascariensis*, in cool temperate South Africa by *T. alfredensis* and in the Australian region by *T. albinella* and *T. roseola*. Map 4 shows the distribution of *Eurytellina*.

Tellina (*Eurytellina*) *alfredensis* Bartsch

Plate 9, figures 1, 2; Plate 10, figure 2.

Tellina rosea Spengler 1798, Skrivter af naturhistorie Selskabet København, 4 (2): 83 (type-locality, Fra Niquebar, here corrected and



Map 4. The distribution of species of *Eurytellina*. The species include: in South Africa, *alfredensis* and *prismatica*; in West Africa, *madagascariensis*; in Australia, *albinella* and *raseola*; in the northeastern Atlantic Ocean and Mediterranean Sea, *incarnata*; in the western Atlantic, *punicea* and allies (*alternata, tayloriana, angulosa, nitens, trinitatis, guildingii, vespuciana*, and *lineata*); and, in the eastern Pacific, *simulans* and allies (*lacerideus, hertleini, laplata, eburnea, rubescens, ecuadoriana, inaequistriata, mantaensis*, and *prora*). The group is obviously most highly differentiated in the New World, where it is predominantly tropical. In the Indo-Pacific and European areas it tends to occupy cooler waters.

restricted to Port Alfred, South Africa; types, ? Zoological Museum, Copenhagen; refers to Chemnitz 1782, Conch.-Cab., vol. 6: 105, fig. 96), *non* Gmelin 1791 *nec* Crouch 1827.

Tellina albinella alfredensis Bartsch 1915, Bull. U. S. Nat. Mus., 91: 205, pl. 46, figs. 7, 8 (type-locality, Port Alfred, South Africa; holotype, USNM 186948).

Tellina madagascariensis 'Gmelin' Barnard 1964, Ann. South African Mus., 47: 537, fig. 41a, *non* Gmelin 1791.

Description. Shell extending to 85 mm in length and to 53 mm in height, elongate-sublanceolate, nearly equilateral, solid, more or less compressed, with left valve of greater convexity than right, and with definite flexure to right posteriorly. Umbo central (little anterior in younger specimens), little elevated or inflated, white and blunt; umbonal cavity shallow and rather filled in, particularly in right valve. Anterior margin convex, narrowly and smoothly rounded; ventral margin long, gently convex, rising in arcuation posteriorly, some specimens with postbasal concave indentation; anterior dorsal margin long, gently sloping, and weakly convex to straight; posterior dorsal margin long, slightly more steeply descending, straight to slightly concave; posterior short, generally quite distinct, straight to weakly convex. Sculpture consisting of extremely weak and very closely spaced concentric threads and of extremely fine radial vermiculations; concentric lamellations present

on posterior third of discs and posterior dorsal slope of right valve (about 2 per mm). Growth lines evident, particularly in large individuals, and often coincident with concentric bands of darker or lighter coloration. Two posterior radial ridges with sulcus between in each valve, though stronger in right valve; distal biangulation of ridges nearly define extent of posterior margin; single anterior radial ridges define anterior dorsal margin, sharper in right valve.

Ligament brownish, strong, not protuberant, set into elongate, lanceolate escutcheon defined by dorsalmost radial ridges; calcareous portion of ligament elongate and subtended by narrow nymphal callosity. Elongate, thin, external horny ligament anteriorly. Hinge line moderately well developed. In left valve, cardinal complex consisting of anterior, subdeltoid, bifid cardinal tooth with subequal lobes, and of posterior, thin, laminate cardinal tooth generally obsolete, missing, or coalescent with anterior border of calcareous portion of ligament; anterior lateral tooth obsolete, consisting of subproximal thickening of hinge line; posterior lateral tooth obsolete or missing, consisting of weak distal enlargement of hinge line. In right valve, cardinal complex consisting of rather thin anterior cardinal tooth and of subdeltoid, bifid, posterior cardinal tooth with subequal lobes; anterior lateral tooth subproximal to cardinal complex, moderately strong, and little upcurled; posterior lateral tooth distal, grooved above, slightly protuberant, and weaker than anterior lateral tooth.

Muscle scars well impressed. Anterior adductor scar irregularly rounded, semilunate; posterior scar rounded, subquadrate. Pallial sinus hardly rising, gently arcuated and falling to pallial line in anterior quarter of its length, and widely separated from anterior adductor muscle scar. Cruciform muscle scars closely adjacent to pallial line, irregularly subequal. Color predominantly pink, pinkish red, and white; rarely with apricot-orange hues. Internally, red coloration stronger and more definitive. Externally, white and reddish often disposed in bands of no apparent pattern or regularity; hinge line and dorsal margins white internally.

Length mm	Height mm	Width mm	
84.4	52.9	—	Hermanus Beach [right valve only]
78.6	43.2	—	Still Bay
72.3	43.1	15.9	Still Bay
70.8	41.6	16.4	Algoa Bay
46.5	26.0	08.8	holotype of *alfredensis*
40.9	22.0	07.0	Knysna
38.2	20.5	06.4	Jeffreys Bay
28.8	14.7	—	Knysna (right valve)
20.5	11.1	—	Knysna (left valve)

Remarks. Tellina rosea Spengler is preoccupied by *T. rosea* Gmelin and Bartsch's name, *T. alfredensis*, the next available synonym, has to be used. It is necessary, however, to remark on the historical usages of the name *rosea* Spengler, as well as on the species *madagascariensis* Gmelin, which has often been confounded with the former. There has been considerable confusion in the appropriate name by which *T. alfredensis* should be known. The question is an historical one, and reference to the early literature is necessary. Furthermore, the assignations of type-localities for the species have been difficult. As indicated in the synonymy, *Tellina rosea* Spengler is based on a figure of Chemnitz (1782, vol. 6: 105, fig. 96). *Tellina madagascariensis* Gmelin is based on a figure of Lister (1770, pl. 386, fig. 233). The illustrations are herein considered as type-figures for the respective names. The type-localities of both *rosea* Spengler and *madagascariensis* Gmelin were originally in error. Chemnitz (1782) expressed doubt as to the exact geographical occurrence of *rosea* Spengler when he remarked: "Sie wohnet vermuthlich in den ostindischen Gewässern. Doch bekenne ichs gerne, dass mir ihr wahres eigentliches Vaterland mit keiner Gewissheit bekannt worden sey." Chemnitz's specimen came from Spengler's collection and is presumably in the Zoo-

Plate 9. Figs. 1 and 2. *Tellina* (*Eurytellina*) *alfredensis* Bartsch, Still Bay, South Africa, SAM A30018 (length = 41 mm): Fig. 1, internal view of the right valve; Fig. 2, external view of the right valve. Figs. 3 and 4. *Tellina* (*Tellinides*) *opalina* Gmelin, Chinde, Mozambique, SAM A6181 (length = 26 mm): Fig. 3, external view of the left valve; Fig. 4, internal view of the right valve.

logical Museum in Copenhagen. Yet Spengler (1798) was able to give a locality for *T. rosea* as 'Fra Niquebar,' which refers to the Nicobar Islands in the Bay of Bengal. Gmelin (1791) gives Madagascar as the type-locality for *T. madagascariensis* and this error was derived from Lister, whose figures indicate the locality.

The range of *T. madagascariensis* has been given by Nicklès (1950) as from the French Congo to Angola. Reference to the literature and museum specimens substantiates his statements and adds more specific data. From north to south, the documented range of *madagascariensis* is: São Thome (Nobre, 1909); Cape Lopez (USNM 348320); Mayumba, Gabon (Nicklès, 1952); Loango, Brazzaville, Congo (Nicklès, 1952); Loanda, Angola (Hoyle, 1887); Lobito and Moçâmedes, Angola (Dautzenberg, 1912; Paes da Franca, 1960b); Great Fish Bay (Dautzenberg, 1912; Thiele and Jaeckel, 1931) [= Baia dos Tigres] and Cape Negro, Angola (Odhner, 1923). The locality Porto Grande, St. Vincent, Cape Verde Islands, given by Stearns (1893), is based upon 2 dead and beach worn shells (USNM 125365) and therefore cannot be construed as evidence that the species lives there. Thus, more specifically, *T. madagascariensis* ranges from off São Thome and Cape Lopez, Gabon, south along the west coast of Africa to the Baia dos Tigres in the Porto Alexandre Park of Angola just north of Kunene River. The localities Rio de Janeiro and Sénégal given by Bertin (1878) are clearly in error. A single right valve of *T. madagascariensis*, probably ballast, was collected by de Villiers at Jeffreys Bay, Humansdorf Coast, Cape Colony (USNM 382492), and a single left valve has been

found in deposits at the mouth of the Klein River (SAM A 30017).

Tellina alfredensis appears to be exclusively South African while *T. madagascariensis* occurs along the coast of West Africa and does *not* occur in Madagascar. The type-locality of *T. rosea* Spengler [= *alfredensis*] is here corrected and restricted to Port Alfred, in agreement with the type-locality of *alfredensis*, and the type-locality of *T. madagascariensis* is here corrected and restricted to Loanda, Angola, West Africa.

The assumption of Salisbury (1934) that *Tellina dautzenbergi* Nobre 1894 was a synonym of *Tellina rosea* Spengler, *non* Gmelin, is incorrect. Nobre's figure, though not particularly good, is identical with *Tellina mars* Hanley of West Africa. Among other things which indicate that *dautzenbergi* is not *rosea* Spengler [= *alfredensis*] is the fact that *dautzenbergi*, which is from São Thome, is outside the range of *alfredensis*.

There have been two species with which *T. alfredensis* has been confused, namely, *T. madagascariensis*, a close relative, and *T. albinella*, an even more closely related species. A comparison and discussion of these two species follow.

The most singularly distinguishing characteristic that serves to contrast *T. alfredensis* and *madagascariensis* is the configuration of the pallial sinus (see Pl. 10, figs. 2–3). In *alfredensis*, the pallial sinus is widely separated from the anterior adductor muscle scar whereas in *madagascariensis*, it is confluent or nearly confluent with the anterior adductor scar. Further, the anterior adductor muscle scar of *madagascariensis* is much longer and larger than that of *alfredensis*. The species may even be distinguished externally. In *alfredensis*, the posterior outline differs from that of *madagascariensis* in being concavely arcuate ventrally and more definitively pointed posteriorly. The posterior ridge in *alfredensis* is more sharply defined and more closely parallel to the posterior dorsal margin than in *madagascariensis*.

Tellina alfredensis has often been confused with *T. albinella* Lamarck of South Australia, and, indeed, was described as a subspecies of *albinella*. For all of Bartsch's ability to distinguish species on even the most flimsy of grounds, it is remarkable that he never considered *alfredensis* as a distinct species. Van Bruggen (1952) compared *alfredensis*, which he called *rosea*, with *albinella* and concluded that they differed in heaviness. The similarity in the structure of the dentition of the right valve and in the general configuration of the pallial sinus indicates the close relationship. Further, they are very similar in shape and are both highly colored. However, they differ in so many features that there is no question that they are separate species (Pl. 10, figs. 1–2). *T. albinella* has a shell that is much thinner and therefore not as heavy as that of *alfredensis*. In conjunction, the right anterior lateral tooth is more proximal to the cardinal complex, and the cardinal teeth are consequently strengthened, with the right posterior bifid cardinal tooth considerably enlarged and protuberant. In *albinella*, the pallial sinus curves posteriorly as it coalesces with the pallial line, whereas in *alfredensis*, the pallial sinus maintains its gentle convexity and unites with the pallial line without such a curvature. The posterior margin is not as distinctly defined in *albinella* as it is in *alfredensis*, and there is only a slight, if any, flexure to the right posteriorly in *albinella*, whereas in *alfredensis* the posterior flexure is rather strong. As stated previously, both species have highly colored shells, but *alfredensis* is predominantly of a pink or reddish suffusion whereas *albinella*, though having pinks and reds, has a tendency to be suffused with apricot internally and may even be nearly pure white.

The unique structure of the anterior dorsal margin of *alfredensis* is elaborated by what I have called the anterior ridges.

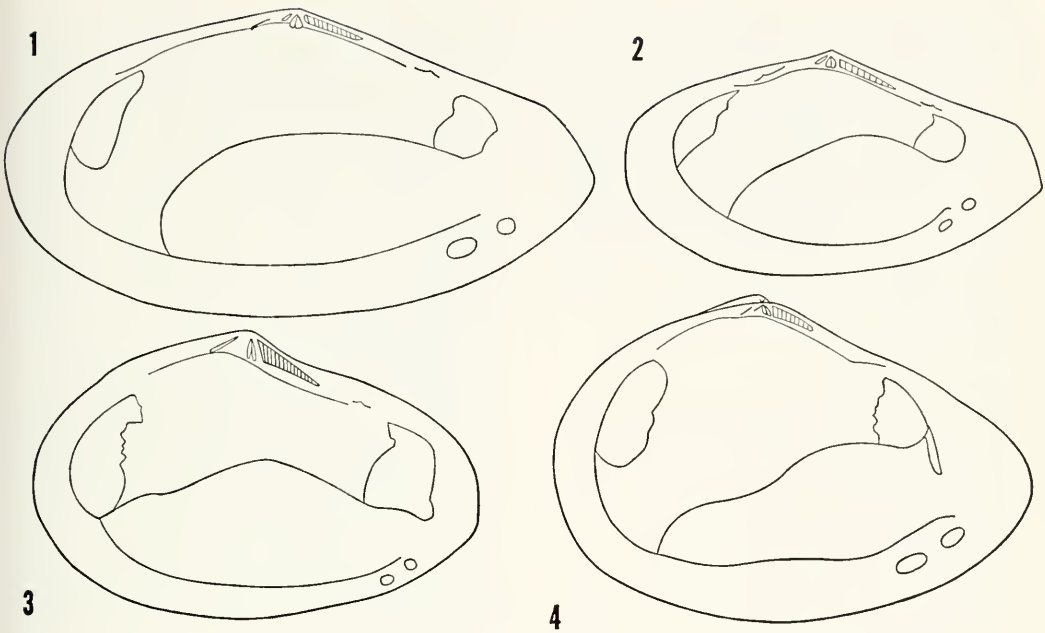


Plate 10. Diagrammatic illustrations of the internal surface of the valves, showing the dental configuration and muscle scars. Fig. 1. *Tellina* (*Eurytellina*) *albinella* Lamarck: right valve, South Australia, USNM 321610 (length = 32 mm). Fig. 2. *Tellina* (*Eurytellina*) *alfredensis* Bartsch: Right valve, Still Bay, South Africa, SAM A30018 (length = 21.2 mm). Fig. 3. *Tellina* (*Eurytellina*) *madagascariensis* Gmelin: right valve, Porta Grande, St. Vincent, Cape Verde Islands, USNM 125365 (length = 75 mm). Fig. 4. *Tellina* (*Hamalina*) *trilatera* Gmelin: right valve, Muizenberg, False Bay, South Africa, USNM 617728 (length = 26.7 mm).

In the right valve the ridge is much stronger, more sharply formed, and higher than in the left valve. Therefore, when the valves are adpressed, the right valve is slightly higher than the left and there is a deep cleft like an elongate lunule between the valves in the median longitudinal axis. The sheer entad walls formed by these ridges, particularly in the right valve, create a broad margination when the internal surface of the valve is viewed. At the bottom of this cleft, toward the umbos, an anterior external horny ligament is developed. Such a structure is not unusual in the Tellinidae, and Owen (1958) has pointed out these various parts of the ligament in detail. Only the conspicuous posterior ligament, with its well-developed external and internal portions, has generally been included in descriptions—usually because this anterior ligament is obscure and very often lost. But in *T. alfredensis* it is much more strongly developed and even conspicuous in adults. Occurrences of this species in the fossil record are numerous; they have been fully listed and documented by Barnard (1962b; 1964b).

Range. In South Africa, this species lives from the Cape of Good Hope to Port Alfred. Since it has been found in the Pleistocene north of Swakopmund, it may occur alive off the coast of South West Africa, but I have seen no specimens from that area. Records from West Africa, i.e. the Congo or Angola, are for true *T. madagascariensis*. *T. alfredensis* seems to prefer off-shore cool water habitats in sand and shell substrates and has been taken alive to 37 m. Although I have not seen specimens from Madagascar, a number of reports signal its occurrence on that island (see Dautzenberg, 1929).

Specimens examined. REPUBLIC OF SOUTH AFRICA: (BMNH); Cape of Good Hope (MCZ); Muizenberg, False Bay (UCT; USNM); Hermanus Beach, Caledon Coast (USNM); Riversdale District, Still Bay (SAM; MCZ); N of Cape Seal, Plettenberg Bay (UCT); Knysna (SAM); Jeffreys Bay (DM; MCZ; USNM); Green Island, Port Elizabeth (DM); Algoa Bay (ANSP; MCZ; NM); Port Alfred (BMNH; MCZ); near Grahamstown, Port Alfred (USNM).

Tellina (Eurytellina) prismatica Sowerby
Plate 11, figure 1; Plate 12, figures 1, 2.

Tellina prismatica Sowerby 1897, Appendix to Marine Shells of South Africa, p. 22, pl. 6, fig. 29 (type-locality, Durban; syntypes, BMNH 99.4.14-.2952 and 1905.10.23.55), *non* Sowerby 1905.

Description. Shell extending to 20 mm in length and 12 mm in height; sublanceolate to subtrigonal; inequilateral, equivalve, fragile to solid, rather compressed, with left valve of slightly greater convexity and with slight flexure to right posteriorly. Umbo slightly behind middle, slightly elevated, pointed, and inconspicuous; umbonal cavity shallow. Anterior margin smoothly and narrowly rounded; ventral margin more or less straight, rising slightly posteriorly; anterior dorsal margin elongate, straight to slightly convex, and gently descending; posterior dorsal margin relatively short, steeply descending, and irregularly convex; posterior margin short, forming blunt posterior, oblique truncation. Sculpture consisting of more or less regular, finely incised sulcations (about 8 to 12 per mm); no true radial sculpture, but radial vermiculations sometimes present. Posterior ridge in right valve variously developed, and concomitant sulcus present in left valve. Concentric growth lines often conspicuous.

Ligament short, protuberant, yellowish brown, set in weakly defined short sublanceolate escutcheon; no true lunule developed. Calcareous portion of ligament moderately developed and subtended by slightly raised nymphal callosities. Hinge line rather strongly developed. In left valve, cardinal complex consisting of anterior narrow, bifid tooth with subequal lobes, and of posterior elongate, thin laminate cardinal tooth; anterior lateral tooth subproximal to cardinal complex, consisting of slightly thickened to strongly thickened denticle on hinge margin; posterior lateral tooth at distal end of ligament, slightly socketed above, consisting of protuberant, slightly pointed thickening. In right valve, cardinal complex consisting of posterior, skewed, subdeltoid bifid tooth with subequal lobes, and of anterior strong, protuberant cardinal tooth; anterior lateral tooth subproximal to cardinal complex, strong, usually thickened and protuberant, sometimes narrow and upcurled; posterior lateral tooth distal, at posterior end of hinge line, narrow, shelf-like, slightly upcurled, and socketed above. No true rib developed.

Muscle scars moderately to well impressed. Anterior adductor muscle scar irregularly sublunate and posterior adductor muscle scar irregularly subquadrate. Pallial sinus equal in both valves, rising sharply behind, gently arcuate dorsally, falling in more or less straight line to base of anterior adductor muscle scar; confluence entire. Cruciform muscle scars generally well impressed, small, rounded, except right anterior rectangular scar. Shell white, suffused with red, pink, or rarely flesh colored, sometimes arranged in bands. Umbos generally white.

Length mm	Height mm	Width mm	
19.4	10.5	05.4	Durban Bay
18.0	11.7	06.2	Richards Bay
15.0	09.5	04.5	Durban Bay
12.0	06.6	02.6	Durban Bay
11.4	06.9	03.1	Durban Bay
08.2	04.5	—	Off Tegula River
07.8	04.6	—	Off Tegula River

Remarks. Sowerby (1897) described *T. prismatica* from Durban and mentioned that it was very thin, compressed, elongate, and iridescent. However, the definitive

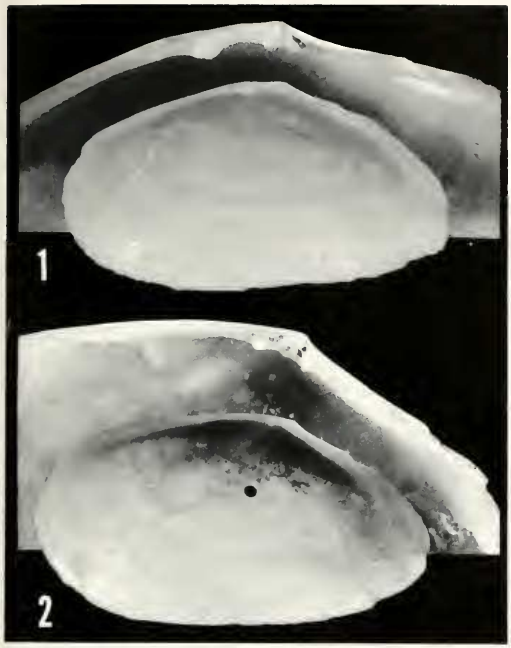


Plate 11. Fig. 1. *Tellina* (*Eurytellina*) *prismatica* Sowerby: internal view of the right valve and enlargement to show placement of the right anterior lateral tooth, Durban Harbor, NM (length = 19.4 mm). Fig. 2. *Tellina* (*Tellinides*) *natalensis* Philippi: internal view of the right valve and enlargement to show the right anterior lateral tooth nearly coextensive with the cardinal complex, Durban Harbor, NM (length = 21.3 mm).

diagnostic traits that serve to identify *T. prismatica* are not those related to the thinness of the valves, but include the strong dentition in the right valve, with the anterior lateral tooth rather proximal to the cardinal complex, and the configuration of the pallial sinus, which touches or nearly extends to the anterior adductor muscle scar. Also, the development of the left lateral dentition is another important diagnostic character which distinguishes this species.

Again we are confronted with a small tellen that exhibits a considerable range of variation. As indicated in the description, the valves may be fragile to solid. Smaller individuals usually tend to be transparent and thin-shelled, whereas individuals that approach the maximum size tend to be more heavily shelled. The shape is also variable, but most often elongate-sublanceolate specimens are encountered; strongly shelled, subtrigonal or subquadrate specimens do occur, however, and very much resemble *T. yemenensis* in structure, except that they lack the posterior rostration and apricot coloration of that species.

As Sowerby remarked, *T. prismatica* resembles *T. valtonis* from the Red Sea. Indeed, there are a number of species that have never been really completely described, which I have not had available, that belong to the complex of smaller tellens. In addition to *valtonis*, mention should also be made of *T. flacca* Römer, *T. hilaris* Hanley, *T. arsinoensis* Issel, *T. scitula* H. Adams, *T. erythraea* Römer, *T. nitens* Deshayes, and *T. felix* Hanley. *T. prismatica* might well be synonymous with one of them. Specimens that Barnard (1964b) discussed as *T. natalensis* and that Day and Morgans (1956) referred to as *T. scalpellum* are really *T. prismatica*.

Range. *T. prismatica* lives in the warmer waters of the Natal coast of South Africa.

Specimens examined. REPUBLIC OF SOUTH AFRICA: Durban Bay (BMNH; NM). Richards Bay estuary, Zululand (UCT-ES); all near mouth of Tegula River, 29°10′S, 31°51′E in 43 meters, 29°21.6′S, 31°35.7′E in 57 meters, coarse mud, sand, and shell, and 29°19.8′S, 31°26.2′E in 38 meters, coarse sand (all UCT-ES).

Subgenus *Tellinides* Lamarck

Tellinides Lamarck 1818, Anim. sans Vert., 5: 535 (type-species, *Tellina timorensis* Lamarck 1818, original designation).

Description. Shell of small to medium size (to 60 mm), elongate-subrectangular, rarely transversely subtrigonal, inequilateral, rather compressed, and slightly gaping posteriorly. Umbos rather small, inconspicuous, and usually median to anterior in position. Ligament moderately strong, protuberant. Dentition weak; cardinal teeth normal; lateral teeth obsolete or absent except for right anterior peglike

tooth, closely juxtaposed to cardinal complex. Pallial sinus rising sharply behind, pointed in apex dorsally beneath umbo, descending in oblique line anteriorly, and uniting with pallial line some distance from anterior adductor muscle scar. Tracts of cruciform muscle scar often marked by whitish ray posteriorly. Color purple-red to white.

Remarks. Certainly the lineage of *Tellinides* is close to that of *Homalina*, since large individuals of *T. opalina* are extremely similar to *T. trilatera*. The closely proximal right anterior lateral tooth also indicates the propinquity of *Tellinides* and *Homalina*. I use *Tellinides* separately, because its aforementioned dental element is generally strong and peglike, its shell very often highly colored, with posterior rays that indicate the attachment tracts for the cruciform muscles, and the outline of its valves, though at times subtrigonal, tends to be elongate-sublanceolate or subrectangular.

It should also be mentioned that *Tellinidella* Hertlein and Strong, represented by the eastern Pacific *Tellinides purpureus* Broderip and Sowerby 1829, must be a distant offshoot of the *Tellinides* lineage. That species is extremely highly colored with purple-red but has a single slight subproximal right anterior lateral tooth. Both characters are very reminiscent of what is found in species such as *T. opalina* or *T. timorensis*, and, for that matter, in *T. lanceolata* Linnaeus, the type-species of the controversial *Angulus*.

Tellina (Tellinides) opalina Gmelin
Plate 4, figures 3, 4; Plate 9, figures 3, 4.

Tellina apelina (*sic*) Gmelin 1791, Syst. Nat., ed. 13, p. 3236 (type-locality, in sinu Nicobarico; types, possibly in Spengler collection, Copenhagen; refers to Chemnitz, 1782, Conch.-Cab., vol. 6: 118, pl. 12, figs. 107 [108]).[1]

Tellina opalina Gmelin. Spengler 1798, Skrivter af naturhistorie Selskabet København, 4 (2): 106; Bosc 1801, Hist. Nat. Coq., 3: 26; Link 1807, Beschr. Nat. Samml. Univ. Rostock, 3: 147, *non* Sowerby 1868.

Tellinides rosea Crouch 1827, Lamarck's Conch., pp. 11 and 44, pl. 4, figs. 1a and b (type-locality not given, supposed to be from the Indian Ocean; types, not known); Sowerby 1828, Genera of Recent and Fossil Shells, pt. 31, *non* Gmelin 1791, *nec* Spengler 1798.

Tellina planissima Anton 1839, Verzeichniss, p. 4 (type-locality not given; types, not known); 1844 [*in*] Philippi, Abbild. Beschreib. Conch., vol. 1, *Tellina*, p. 123 [11], pl. 2, fig. 2 (type-locality, insulae Moluccae . . .).

Tellina (Angulus) immaculata 'Philippi' Barnard 1964, Ann. S. Afr. Mus., 47: 544, *non* Philippi 1849.

Description. Shell extending to 49 mm in length and to 33 mm in height, subrectangular to subacuminate, slightly inequilateral, nearly equivalve, usually rather thin and translucent in younger individuals, large adults sometimes subsolid, compressed, with right valve slightly more convex and with slight flexure to right posteriorly. Umbos subcentral, slightly in front of middle, white or pink and pointed. Anterior margin broadly and smoothly rounded; ventral margin broadly convex, rising in gentle convex arcuation posteriorly; anterior dorsal margin gently descending and slightly convex; posterior dorsal margin more sharply descending, long and more or less straight; posterior margin slightly convex, forming somewhat oblique truncation. Sculpture consisting of finely incised, closely spaced (4–7 per mm) concentric sulcations, frequently somewhat scissulate along anterior slope and stronger along posterior dorsal slope; radial vermiculations most evident on central disc. Posterior ridge weakly developed and poorly defined.

Ligament reddish brown to black, moderately strong, and protuberant. No true lunule present. Calcareous portion of ligament set upon slightly elevated nymphal callosities. Hinge rather weakly developed. In left valve, cardinal complex consisting of anterior, narrowly compressed, bifid tooth with subequal lobes and of posterior

[1] Chemnitz listed this species, ex museo Spengleriano, a collection which is housed in Copenhagen Museum; he gave the locality as: "Sie wohnet an den nicobarischen Meerufern."

elongate single laminate tooth; no true lateral dentition; narrow, subproximal fold representing anterior lateral tooth. In right valve, cardinal complex consisting of posterior fragile bifid tooth, with posterior lobe larger and skewed posteriorly, and of anterior short, slightly thickened, but weak laminate tooth; anterior lateral tooth closely juxtaposed to cardinal complex, short, protuberant, peglike, sometimes slightly upcurled; no true posterior lateral tooth.

Muscle scars moderately well impressed. Anterior adductor muscle scar narrowed and subsemilunate; posterior muscle scar subrectangular, rounded posteroventrally, and with dorsal extension of posterior pedal retractor muscle scar. Pallial sinus more or less equal in opposite valves, rising sharply from posterior adductor muscle scar, irregularly descending in arcuation anteriorly, not coalesced with and separated from anterior adductor muscle scar, and joining pallial line ventrally in convex arcuation; confluence extensive. Distance separating anteriormost extension of pallial sinus and anterior adductor muscle scar variable. Posterior termination of pallial line hook-shaped. Cruciform muscle scars generally well impressed, large and rounded, more widely separated in right valve; internal thickened rib in left valve with very weak radial vermiculation before it and two more or less equal riblets in right valve, corresponding to attachment of cruciform muscles. Shells white peripherally with pinkish-red suffusions throughout; white rays conspicuous posteriorly, especially in left valve, corresponding to ribs supporting cruciform musculature.

Length mm	Height mm	Width mm	
48.8	32.2	08.2	Dapitan, Mindanao, Philippines
47.2	32.2	08.2	Lampinegan Id., Philippines
38.3	25.1	05.7	Durban
35.1	23.5	05.2	Durban
31.0	22.1	05.3	Lunga, Guadalcanal, Solomon Ids.
26.2	18.4	04.6	Chinde
21.8	13.9	03.6	Delagoa Bay

Remarks. Tellina opalina was first described by Chemnitz (1782). Schröter (1786; 1788) also referred to the species. Since these works are non-binomial, their names are not available for nomenclatorial purposes. Gmelin (1791) used *T. apelina,* an obvious misspelling or *lapsus;* subsequent authors have used the spelling *opalina.* Spengler (1798), Bosc (1801), and Link (1807) cited *opalina;* these references are not to be construed as homonyms, although they are entered individually in the Index Animalium. Salis-Marschlins' (1793) mention of this species is based on a misidentification; the species does not occur in the Mediterranean. As pointed out by Smith (1878), Sowerby (1868) described and figured an homonymous *T. opalina* which is not to be confused with *T. opalina* Gmelin.

Since Sowerby did not include authors' names in his plate captions for the *Genera,* the name *Tellinides rosea* has been attributed to Sowerby by Smith (1878). According to notes compiled by Dall in the U. S. National Museum, the plate on *Tellinides* was included in part 31 of Sowerby's *Genera;* Sherborn (1894) has shown that the date of publication of this part was 22 December 1828. Since Crouch's work (1827) antedates this, it appears that Sowerby was referring to Crouch's species. The name *Tellinides rosea* Crouch should not be confused with *Tellina rosea* Gmelin or *Tellina rosea* Spengler (see the synonymy of *T. alfredensis* Bartsch).

Barnard (1964b) called this species *T. immaculata,* which was described by Philippi (1849: 55, *Tellina* (p. 27), pl. 5, fig. 2) from Mergui in Burma and is an elongate species of low proportions with the pallial sinus confluent for a short distance posteriorly; the shell is white; it is very closely related to, and possibly synonymous with, *T. vestalis* Hanley; it is not closely related to *T. opalina* Gmelin.

There is no doubt that the East African populations of *T. opalina* differ from those inhabiting the Indonesian and Philippine

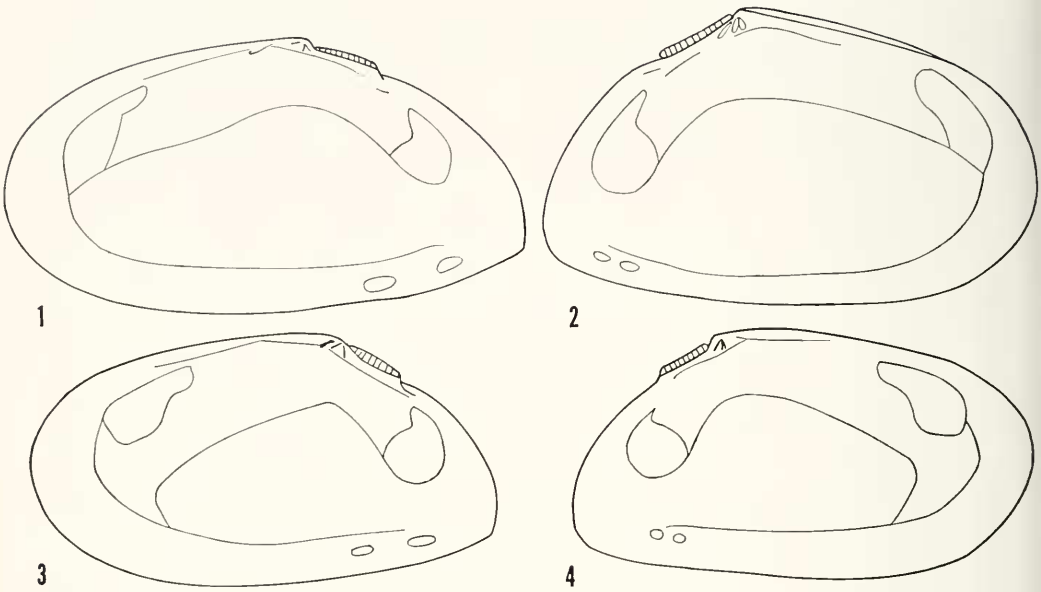


Plate 12. Diagrammatic illustrations of the internal surface of the valves showing the dental configuration and muscle scars. Figs. 1 and 2. *Tellina* (*Eurytellina*) *prismatica* Sowerby, Durban Harbor, NM (length = 19.4 mm): Fig. 1, right valve; Fig. 2, left valve. Figs. 3 and 4. *Tellina* (*Tellinides*) *natalensis* Philippi, Durban, DM (length = 17.2 mm): Fig. 3, right valve; Fig. 4, left valve.

regions. For example, the posterior margin of the Mozambique specimens is more oblique and less pointed. Smith (1878) also noted that the East African specimens were "more equilateral in form." None of the material I have examined from South or East Africa is as large as the specimens from the Philippines. However, in my opinion, these variations are not sufficiently great to be of specific significance. There is some indication that with increased size, the outline of the valves becomes increasingly more acuminate. Further, the placement of the pallial sinus alters with increased size. In smaller specimens the pallial sinus approaches the anterior adductor muscle scar more closely.

Large, whitish specimens of *T. opalina* may be very similar to large specimens of *T. trilatera*. The acentric sculpture on the postbasal surface of the right valve of *trilatera*, as well as the fact that the right anterior lateral tooth is almost incorporated into the cardinal complex of *trilatera*, serve to distinguish the species. Further, in *opalina* of this size (43 mm), the internal rib is well developed, and the umbo is not so far anterior.

Tellina adenensis Smith 1891 has been referred to *Tellinides* by Lamy (1918). This species is very similar to the *T. opalina* populations from East Africa, and I am tempted to place *T. adenensis* in the synonymy of *T. opalina*. Unfortunately, no specimens from the region around Aden were available for study.

Tellina sinuata Spengler 1798 [= *T. timorensis* Lamarck 1818] (see Hidalgo, 1903) is another relative of *T. opalina;* it is distinguished by its somewhat subquadrate outline and its different, less angulate, posterior slope.

T. opalina is conspicuous in its development of posterior radial ribs. The posteriormost rib of the left valve is the strongest and is thickened and white in color, so that it contrasts noticeably with the usual pinkish red of the shell matrix. The an-

teriormost rib of the left valve and the two slightly more divergent riblets of the right valve are all weaker, though they may be colored white and form conspicuous posterior rays. Functionally, these ribs or riblets are places of attachment and support for the cruciform muscles. It follows that the left posterior head of this muscle is the strongest of all four parts of the cruciform muscle.

Range. Tellina opalina is an Indo-Pacific species with two general areas of distribution. One group of populations is found in the western Indian Ocean as far south as Durban on the east African coast, while the main concentration of populations is in the East Indies, the Philippine Islands, and west to Fiji.

Selected literature references document the occurrences of the species: South Africa (Barnard, 1964b); Mozambique (mouth of the Macusi River, near Quelimane) (Smith, 1878); Tuléar, Ankilibé, and Tamatave, Madagascar (Dautzenberg, 1929); Persian Gulf (Melvill and Standen, 1907); Nicobar Islands (Chemnitz, 1782; Spengler, 1798); Lho Seumawe, Sumatra and Karange Hawae (Karang Hawo), Java (Adam and Leloup, 1939); Dapitan and Davao, Mindanao, the Philippine Islands (Hidalgo, 1903); the Moluccas (Philippi, 1849; Römer, 1871; Bertin, 1878).

Specimens examined. REPUBLIC OF SOUTH AFRICA: Durban Bay (DM; NM). MOZAMBIQUE: (BMNH) Delagoa Bay (SAM); mouth of the Zambesi River, near Chinde (SAM). INDONESIA: Tjiperwagaran, Keledjitan, and Pruput, Bantam, Java; Pelaboehan Ratoe, Java; Tanjong Aru, near Jesselton, North Borneo (all USNM); Molucca Ids. (ANSP; BMNH). PHILIPPINE IDS.: Sindangan Bay, Dapitan, Iligan Bay, Lupon, Davao Province, all Mindanao; Lampinegan Island, off Basilon; Apari, north Luzon (all USNM). SOLOMON IDS.: Lunga, Guadalcanal (USNM). FIJI IDS.: off Rukua, Mbega Id. (USNM).

Tellina (*Tellinides*) *natalensis* Philippi
Plate 11, figure 2; Plate 12, figures 3, 4; Plate 13, figure 3.

Tellina natalensis (Krauss MS) Philippi 1846, Abbild. Beschreib. Conch., 2: 91, *Tellina*, pl. 4, fig. 4 (no locality given); Krauss 1848, Die südafrikanischen Mollusken, p. 3 (type-locality, in litore natalensi; holotype, ? Stuttgart).[1]

Description. Shell extending to 24 mm in length and to 14 mm in height, subrectangular to subelliptical, inequilateral, nearly equivalve, subsolid, somewhat compressed, and with slight posterior flexure to right. Umbo behind middle, small, not conspicuous, opisthogyrous, pointed, compressed, not elevated or inflated, but with moderately deep cavity. Anterior margin rather narrowly and smoothly rounded; ventral margin slightly convex, rising with slightly indented arcuation behind; anterior dorsal margin long, very gently sloping; posterior dorsal margin short, straight to weakly concave; posterior margin variable, irregularly and obliquely truncated, giving outline pointed or bluntly truncated appearance. Sculpture consisting of finely incised sulcations, generally becoming obscure on posterior portion of disc and slope; umbonal concentric sculpture lirate and intercalated posteriorly; radial sculpture obsolete. Posterior ridge weak and gentle.

Ligament short, yellow to brownish black, and set upon variously developed nymphal callosities; escutcheon and lunule obsolete. Hinge line weakly developed. In left valve, cardinal complex consisting of anterior, narrow bifid tooth with subequal lobes, and of flat, shelf-like laminate posterior tooth closely adpressed to base of nymphal callosity; no lateral teeth developed. In right valve, cardinal complex consisting of small, posteriorly skewed, posterior bifid tooth with anterior lobe smaller, and of anterior, slightly thickened, laminate tooth; no true posterior lateral tooth; anterior lateral tooth small, rounded, blunt,

[1] The type-specimens of the species described by Krauss were probably destroyed in World War II (Dance, 1966).

peglike, and very closely juxtaposed to anterior cardinal tooth.

Muscle scars rather weakly impressed. Anterior adductor muscle rounded ventrally, irregularly semilunate; posterior adductor muscle irregularly rounded to subquadrate; retractor scar evident. Pallial sinus rising sharply posteriorly, pointed apex beneath umbo, more or less straight and steeply descending centrally, rounded and arcuate anteriorly, but well separated from anterior adductor muscle scar and confluent with pallial line for about two thirds of its ventral length. Cruciform muscle scars variously impressed, rounded, except for subrectangular right anterior scar, and close to ventral margin. Shell white, pink, or red, and combinations thereof; often rayed in white posteriorly; generally shining and polished internally with radial vermiculations.

Length mm	Height mm	Width mm	
23.8	13.3	—	Durban
19.1	10.5	05.0	Durban
17.1	09.1	04.0	Durban
14.2	08.2	03.8	Durban
07.6	03.9	02.1	Durban

Remarks. Tellina natalensis exhibits a considerable range of variation in the shape of the posterior portion of its shell. The length of the posterior dorsal margin and its angle of obliquity determine the posterior outline or aspect of the shell. Most individuals are broadly truncate with a slightly inclined and relatively short posterior margin, but not infrequently some individuals have the posterior dorsal and posterior margins nearly coextensive, in which case the shell is pointed behind and the truncation rather sharply angular.

The shell in *T. natalensis* is usually rather highly colored with red or pink and may be rayed posteriorly. Some iridescence is exhibited, due generally to the finely incised sulcations, which are slightly acentric peripherally and which disappear on the posterior quarter of the disc.

The relationships of this species to other South African tellens are obscured by the current concepts of the generic and subgeneric groups within the Tellinidae. The small tellens, i.e. *T. prismatica, T. vidalensis,* and *T. gilchristi,* are most easily confused with *T. natalensis.* The key distinguishing traits of *T. natalensis* are illustrated on Plate 12, figures 3 and 4, including the structure of the dentition of the right valve and the configuration of the pallial sinus in both valves. The sinus does not coalesce with the anterior adductor muscle scar and is really quite widely separated from it. Further, in *T. natalensis,* the right anterior lateral tooth is very closely juxtaposed if not virtually coextensive with the anterior laminate tooth of the cardinal complex.

I have placed *T. natalensis* in *Tellinides* because it shares so many common characters with that group and is apparently most closely related (in South African waters) to *T. opalina.* First, *T. natalensis* has the centrally placed peglike right anterior lateral tooth and the tendency to be posteriorly rayed along the growth axis of the cruciform muscle scars. In addition, the pallial scars of both species are quite similar, particularly in regard to the shape of the sinus and its angle of ascent from the base of the posterior adductor muscle scar. The species are distinguished most easily by the shape of the shell and the location of the umbo.

The specimens referred to as *T. scalpellum* Hanley by Day and Morgans (1956), and later referred to as *T. natalensis* by Barnard (1964b), have a strong right anterior lateral tooth some distance removed from the cardinal complex and are not *T. natalensis* but *T. prismatica* (*q.v.*).

In the description of *T. natalensis,* Barnard (1964b) spoke of the three cardinal teeth of the right valve. In the present interpretation, the anteriormost of these teeth is considered an anterior lateral tooth.

Range. Smith (1904) reported this species from Port Alfred, although it prob-

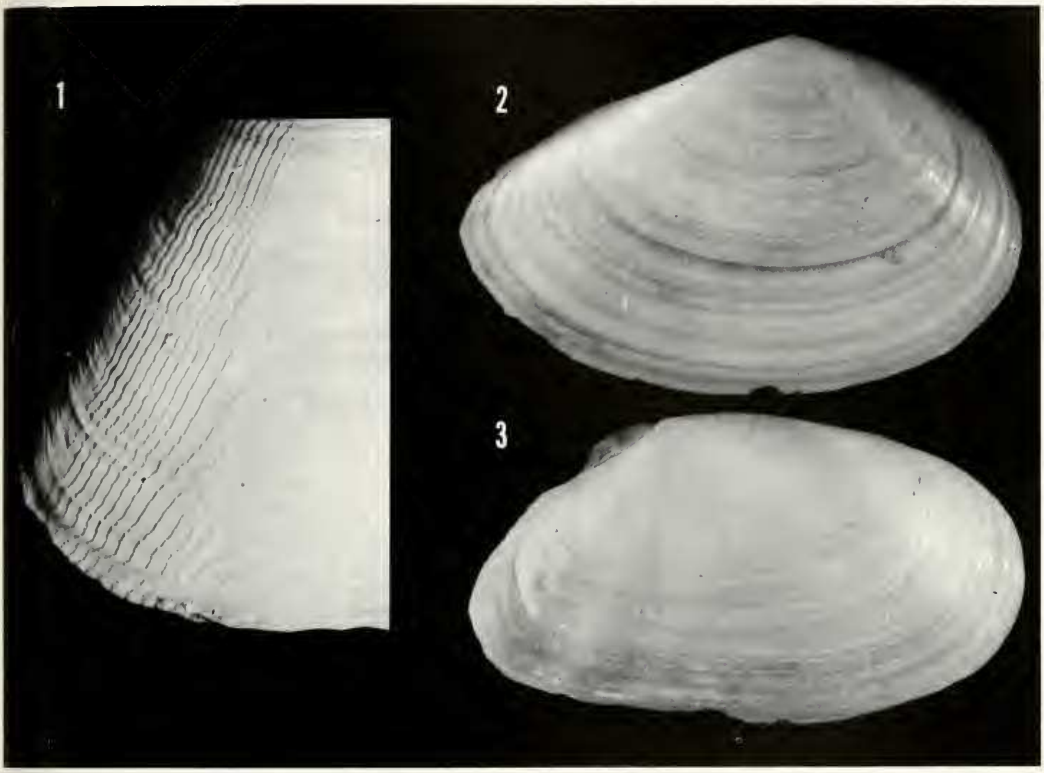


Plate 13. Figs. 1 and 2. *Tellina* (*Hamalina*) *trilatera* Gmelin, Muizenberg, False Bay, South Africa, USNM 623580 (length = 31.2 mm): Fig. 1, enlargement of the posterior slope of the right valve to show acentric sculpture; Fig. 2, external view of the right valve. Fig. 3. *Tellina* (*Tellinides*) *natalensis* Philippi: external view of the right valve, Durban, SAM A7637 (length = 14.2 mm).

ably lives only in the warm waters of east Africa as far south as Durban.

Specimens examined. REPUBLIC OF SOUTH AFRICA: Durban (DN; NM; SAM). MOZAMBIQUE: Morrumbene Estuary (UCT).

Subgenus *Homalina* Stoliczka

Homalina Stoliczka 1870, Cretaceous Fauna of Southern India, 3: 118 (type-species, *Tellina triangularis* (Chemnitz) Röding 1798 [= *Tellina trilatera* Gmelin 1791], original designation).

Description. Shell medium in size, generally subtrigonal in shape, compressed, inequilateral. Umbos anterior, slightly elevated, with cavities. Ligament moderate, protuberant. Dentition rather weak; cardinal teeth normal; right anterior lateral tooth very closely adjacent to the cardinal complex. Pallial sinus usually extensive, sometimes coalescent with anterior adductor muscle scar. Color generally white with polished periostracum.

Remarks. Mörch (1853) used a "*Homala* Schumacher," which was an unnecessary emendation for *Omala* Schumacher 1817. He included *T. triangularis* (Chemnitz) Röding 1798 [= *T. trilatera* Gmelin] and three synonyms. This is apparently just Mörch's placement of *T. trilatera* in '*Homala*.' *Homala* was truly introduced as an emendation for *Omala* Schumacher 1817 by Agassiz (1846: 258). But it is not only unnecessary, it is useless, since it is preoccupied by *Homala* Eschscholtz 1831. *Omala* Schumacher is monotypic and the correct subgeneric name for *T. hyalina*.

The relationship between the monotypic

Omala and *Homalina* becomes immediately obvious when the respective type-species for these subgenera (the West African *T. hyalina* Gmelin and the South African *T. trilatera* Gmelin) are compared. The shells of these species are similar in having an anterior placement of the umbo. Both have a very small to obsolete right anterior lateral tooth virtually incorporated into the cardinal complex. In shell structure they have similar sculpture, texture, thickness, and color. I have treated *Homalina* separately—that is, I have not synonymized it with *Omala*—because *T. hyalina* is so obviously unique. No other tellen has the umbo placed so far anteriorly, the peculiarly elliptical outline of the valves, or the inset ligament with a flange on the posterior dorsal margin.

Homalina is also very similar to *Tellinides*. Yet there is some justification for maintaining a separate status for these groups, in as much as *Homalina* is characterized by species that are distinctly subtrigonal and whose right anterior lateral tooth is almost coalescent with the cardinal complex. *Homalina* is represented in New Zealand by the large, posteriorly pointed, and transversely trigonal *T. gaimardi* Iredale. Another trigonal group—in the Australian-New Zealand region—is *Macomona*, with the New Zealand *T. liliana* Iredale as type, and with *T. tristis* Deshayes and three other species in New South Wales in Australia (Iredale and McMichael, 1962). *Macomona* is certainly more distantly related to *Homalina* and is distinguished by its very strong subproximal anterior lateral tooth, its thickened, heavy shell, its sharp posterior flexure, and an extensive semilunate anterior adductor muscle.

Tellina (Homalina) trilatera Gmelin
Plate 10, figure 4; Plate 13, figures 1, 2; Plate 14, figure 2.

Tellina trilatera Gmelin 1791,[1] Syst. Nat., ed. 13, p. 3234 (type-locality not given, here restricted to Port Alfred, Republic of South Africa; holotype, ? Zoological Museum, Copenhagen; refers to Chemnitz 1782, Conch.-Cab., vol. 6, p. 96, pl. 10, fig. 85).

Tellina strigilata Spengler 1798. Skrivter af naturhistorie Selskabet, København, 4 (2): 98 (type-locality, Fra Kysten Guinea, here corrected and restricted to Port Alfred, Republic of South Africa; holotype, ? Zoological Museum, Copenhagen; refers to Chemnitz 1782, Conch.-Cab., vol. 6, p. 96, pl. 10, fig. 85).

Tellina triangularis Röding 1798, Mus. Bolt., p. 188 (type-locality not given, here restricted to Port Alfred, Republic of South Africa; holotype, ? Zoological Museum, Copenhagen; refers to Chemnitz 1782, Conch.-Cab., vol. 6, p. 96, pl. 10, fig. 85), *non* Gmelin 1791.

Tellinides politus Sowerby 1825, Catalogue . . . Tankerville, Append., p. 4 (type-locality, not given, here restricted to Port Alfred, Republic of South Africa; type not known[2]).

Description. Shell extending to 47 mm in length and to 33 mm in height, subtrigonal, inequilateral, thin to subsolid, compressed, with right valve slightly more convex than left, and with very slight flexure to right posteriorly. Umbos well in front of middle, small, pointed, smooth, and slightly inflated. Anterior margin broadly rounded and of irregular convexity; ventral margin gently convex, extensive, rising convexly posteriorly; anterior dorsal margin short, convex, and gently descending; posterior dorsal margin more sharply descending, elongate, and more or less straight; posterior margin indistinct and short, forming pointed, subacuminate outline. Sculpture consisting of extremely fine, weak, concentric lirations somewhat stronger on posterior dorsal slope; periostracum with finely incised subconcentric sulci; fine radial sulci evident on posterior slope in right valve. Posterior radial ridge in right valve, setting off dorsal posterior

[1] First referred to in the non-binomial Chemnitz (1782) as *T. triangularis*; the locality was originally unknown: "Das wahre Vaterland derselben ist mir unbekannt." Next mention of the species, but not named except for the common epithet "Die dreyseitige Telline" was Schröter (1786: 3).

[2] This name is included following its citation by Mörch (1853: 11) and Römer (1872: 180). The short Latin description certainly applies to *T. trilatera*. To my knowledge *politus* was never figured.

flattened area; weak concomitant ridge and sulcus in left valve.

Ligament black-brown, moderately strong, slightly protuberant and set in lanceolate escutcheon; no true lunule. Calcareous portion of ligament subtended by flattened nymphs. Hinge line rather weakly developed. In left valve, cardinal complex consisting of anterior, narrow, protuberant bifid tooth with subequal lobe, and of posterior, very thin, oblique laminate tooth, adpressed and partly coalesced with base of nymphs, often lost, broken or obscure; slight distal thickening of hinge line representing obsolescent posterior lateral tooth, and anterior lateral tooth closely proximal to cardinal complex, laminate and arcuate. In right valve, cardinal complex consisting of posterior, oblique, narrow, bifid tooth with subequal lobes, and of anterior, narrow, laminate tooth; posterior lateral tooth distal, thin, weakly pointed, slightly upcurled and socketed above; anterior lateral tooth immediately anterior to laminate cardinal tooth and often partially coalescent, thin, shelf-like and bluntly pointed.

Muscle scars rather weakly impressed. Anterior adductor muscle scar rounded anteriorly, flattened ventrally, and subsemilunate; posterior adductor muscle scar subtrigonal to subquadrate. Pallial sinus unequal in opposite valves. In right valve, pallial sinus descending in more or less straight line from posterior adductor muscle scar to point separated from anterior adductor scar and above pallial line, then falling in short, straight line to pallial line; confluence over 3/4 ventral length of pallial line. In left valve, pallial sinus extending more or less straight from base of posterior adductor muscle scar directly across interior of valve to unite with anterior adductor muscle scar; confluence entire. Cruciform muscle scars difficult to discern, rounded, closely juxtaposed, and with internal radial vermiculations or weak riblets marking their attachment. Shell white, covered externally with pale yellowish green periostracum, usually partially eroded; rust discolorations often evident on posterior dorsal slope; internally white, weakly polished.

Length mm	Height mm	Width mm	
46.6	32.7	—	Jeffrey's Bay
44.2	31.8	—	Hout's Bay
42.3	28.9	09.5	Muizenberg, False Bay
30.6	21.2	07.8	Durban Bay
29.0	20.4	07.0	Durban Bay
26.4	17.7	05.8	Muizenberg, False Bay

Remarks. The occurrence of this species in South Africa was recognized by von Martens (1874). Specimens from Saldanha Bay taken at a depth of 6.5 m in a substrate of fine white sand and grey mud were found to have the posterior slope of the valves discolored (probably by some iron compound in the substrate). The discoloration is present on both valves but more extensively on the right. Small epizoic organisms were found on several individuals. Their greatest concentration is on the posterior slope of the right valve. From these facts, it is apparent that the species lives in the substrate on its left side just below the surface, at an angle which allows a slight protrusion of the posterior part of the valves out of the substrate.

The closest relative of *T. trilatera* is *T. gaimardi* Iredale 1915 (= *T. alba* Quoy and Gaimard 1835, *non* Wood 1815) from New Zealand. The similarity in shape, the structure of the hinge, and the kind of dentition indicate the close relationship between these species. *T. gaimardi* has no flattened posterior dorsal slope and attains a larger size. In the left valve of *T. gaimardi,* the pallial sinus does not coalesce with the anterior adductor muscle scar as it does in *T. trilatera.*

Barnard (1962b) has listed the occurrences of this species in the fossil record in South Africa. It has been found as far north as Port Nolloth, Little Namaqualand (Haughton, 1932) and as far east as Knysna.

Range. Tellina trilatera is exclusively South African and occurs in shallow coastal

waters in fine sandy or muddy substrates from South West Africa to Durban Bay. Recently, Grindley and Kensley (1966) obtained it off the mouth of the Orange River, South West Africa.

Specimens examined. REPUBLIC OF SOUTH AFRICA: Saldanha Bay (MCZ; UCT); Langebaan Lagoon, Saldanha Bay (UCT); Hoedjies, Saldanha Bay (ANSP); Hout's Bay (NM); Cape of Good Hope (MCZ); False Bay (NM; UCT); Muizenberg, False Bay (USNM); Satt Vlei Beach, Hermanus, Klein River (ANSP); Still Bay (SAM); Plettenberg Bay (MCZ); Humansdorp Coast, Jeffrey's Bay (SNM); Albany (USNM); Port Alfred, near Grahamstown (USNM); Port Alfred, Bathurst District (BMNH; MCZ); Natal (BMNH); Durban Bay (DM).

Subgenus *Cadella* Dall, Bartsch and Rehder

Cadella Dall, Bartsch and Rehder 1938, Bishop Museum, Bull., 153: 196 (type-species, *Tellina lechiogramma* Melvill 1893, original designation).

Description. Shell small, solid, and ovate-subelliptical. Umbos behind middle, opisthogyrous and blunt. Sculpture consisting of rather strong, closely spaced lirations. Ligament short, strong, and sunken in escutcheon; small subumbonal internal ligamental element sometimes developed. Pallial sinus extending close to anterior adductor muscle scar, sharply descending, and forming short confluence with pallial line posteriorly.

Remarks. Dall, Bartsch, and Rehder (1938) have given a long description for this group. Its affinities are clearly with *Moerella*, but it apparently is distinct in its heavy strong shell and its concomitantly thickened hinge line and strong lateral teeth. The Caribbean *Acorylus* Olsson and Harbison 1953 (with *Tellina suberis* Dall 1900 as type-species and with *T. gouldii* Hanley 1846 as a living representative) differs in its smooth sculpture and its pallial sinus, which is basally confluent with the anterior adductor muscle scar. *Elliptotellina* Cossmann 1886 (type-species *Donax tellinella* Lamarck 1805) is also related to *Cadella*. However, species of *Elliptotellina*, for example, *T. fabrefacta* Pilsbry in the Indo-Pacific, are variously sculptured radially along the posterior surfaces of the valves and are, by and large, equilateral, with the umbos nearly always centrally placed. The tiny subumbonal internal ligament of *Cadella* is similar to the conspicuous, developed internal ligament of the semelid group, *Semelangulus*. Apparently this condition is convergent.

Tellina (*Cadella*) *semen* Hanley
Plate 14, figure 5; Plate 15, figures 1–4.

Tellina semen Hanley 1844, Proc. Zool. Soc. London [1845], pt. 12, no. 141: 164 (type-locality, Corregidor [Philippine Islands]; types not known, not in type collection in BMNH; 1846 [*in*] Sowerby, Thes. Conch., vol. 1, *Tellina*, p. 249, pl. 56, fig. 8; Sowerby 1867 [*in*] Reeve, Conch. Icon., vol. 17, *Tellina*, pl. 41, fig. 232.

Tellina fabagella Deshayes 1854, Proc. Zool. Soc. London [1855], pt. 22, no. 174: 355 (type-locality, Albay Islands of Luzon, Philippine Islands; syntypes, BMNH unnumbered).

Tellina semitorta Sowerby 1867 [*in*] Reeve, Conch. Icon., vol. 17, *Tellina*, pl. 39, figs. 221 a-b (type-locality, Watson's Bay, Port Jackson, New South Wales, Australia; syntypes, BMNH 70.10.26.17).

Tellina striatissima Sowerby 1868 [*in*] Reeve, Conch. Icon., vol. 17, *Tellina*, pl. 45, fig. 226 (type-locality not given; holotype, BMNH 1900.3.9.13).

Tellina miracyllium Melvill and Standen 1906, Proc. Zool. Soc. London [1907], 2 (4): 820, pl. 56, fig. 4 (type-locality, Koweit [*sic*], Persian Gulf; holotype, BMNH 1907.5.3.87).

Tellina europisthus Barnard 1964, Ann. Natal Mus., 16: 27, fig. 5 c (type-locality, off Cape Natal, Durban, in 54 fathoms; syntypes, SAM A 9549).

Description. Shell extending to 12 mm in length and to 9 mm in height, subelliptical-subovate, inequilateral, equivalve, solid, inflated, and with slight posterior flexure. Umbos behind middle, inflated, little elevated, and blunt. Anterior margin narrowly and smoothly rounded; ventral margin gently convex, rising in regular arcuation posteriorly; anterior dorsal margin long, gently descending, and generally

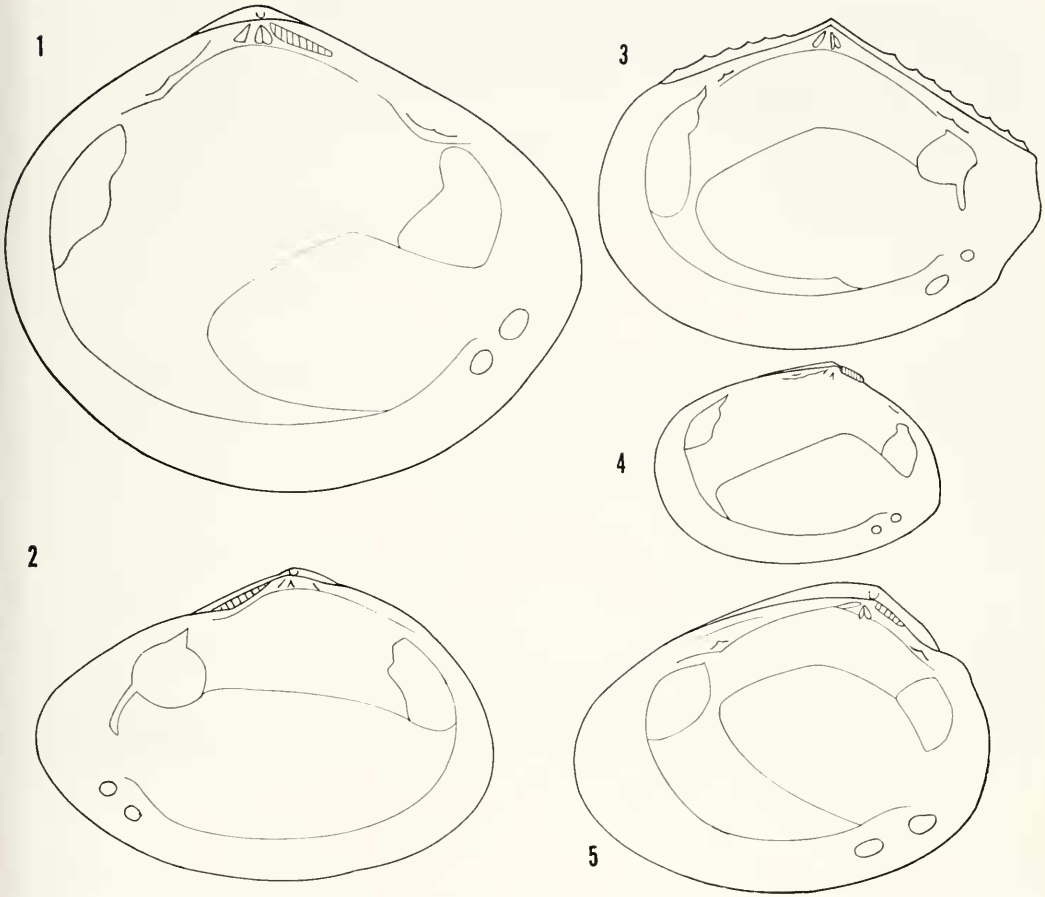


Plate 14. Diagrammatic illustrations of the internal surface of the valves, showing the dental configuration and muscle scars. Fig. 1. *Tellina* (*Arcopagia*) *ponsonbyi* Sowerby: right valve, Albany, South Africa, USNM 98045 (length = 21.5 mm). Fig. 2. *Tellina* (*Homalina*) *trilatera* Gmelin: left volve, Langebaan Lagoon, Saldanha Bay, South Africa, UCT-LB 63 (length = 18 mm). Fig. 3. *Tellina* (*Serratina*) *capsaides* Lamarck: right valve of young individual, Durban, DM 3650 (length = 17 mm). Fig. 4. *Tellina* (*Angulus*) *canonica* Salisbury: right valve, Still Bay, South Africa, SAM A30019 (length = 11 mm). Fig. 5. *Tellina* (*Cadella*) *semen* Hanley: right valve, Delagoa Bay, Mozambique, SAM A9552 (length = 8.8 mm).

straight; posterior dorsal margin short, steeply descending, and generally straight; posterior margin weakly convex and forming bluntly rounded truncation. Sculpture consisting of closely spaced, raised, concentric lirations (7–9 per mm on the disc); no true radial sculpture. Concentric lirations sublamellate and intercalated along posterior slope, particularly in right valve. Broad radial depression along posterior slope in left valve; no defined posterior ridges developed.

Ligament yellow to brown, opisthodetic, short, slightly protuberant, and sunken in depressed short escutcheon; secondary, inconspicuous, subumbonal resilium element sometimes developed. Calcareous portion of ligament subtended by strong hinge line, but elevated nymphal callosity hardly developed. Elongate, lanceolate lunule present, stronger in left valve, defined by anterior dorsal marginal ridge. Hinge line well developed. In left valve, cardinal complex consisting of anterior subdeltoid

bifid tooth with subequal lobes and of elongate sublaminate tooth often coalesced with base of nymphs or broken; lateral dentition narrow, flattened, and pointed; anterior tooth far removed and posterior tooth subproximal to cardinal complex. In right valve, cardinal complex consisting of posterior strong subdeltoid bifid tooth with posterior lobe larger and skewed posteriorly and of anterior sturdy sublaminate tooth; lateral dentition strong, heavy, socketed above, and pointed; anterior lateral distal and posterior lateral subproximal to cardinal complex.

Muscle scars moderately or poorly impressed. Anterior adductor scar elongate-rounded; posterior adductor subquadrate-rounded; pallial sinus equal in both valves, rising gently, narrowly rounded anteriorly, sharply descending and forming short confluence with pallial sinus posteriorly. Pallial sinus extending very close to anterior adductor muscle scar along its dorsal arcuation. Cruciform muscle scars difficult to discern, closely juxtaposed, rounded to somewhat flattened. Shell generally white; internal surface polished; external surface dull, often dirty white to yellowish brown; some yellow suffusions internally and occasionally reddish concentrations along hinge line.

Length mm	Height mm	Width mm	
11.8	08.5	05.5	Durban
10.2	07.2	04.5	Durban
09.5	06.5	—	syntype of *europisthus*
09.1	06.2	03.8	Mekran Coast
08.0	05.6	03.6	Delagoa Bay
07.3	05.2	—	syntype of *europisthus*

Remarks. Tellina semen is a widely distributed Indo-Pacific species. It exhibits a considerable range of variation, particularly in regard to its shape and its sculpture on the posterior dorsal slope of the right valve. A number of the synonyms of this species have been established on the character of the outline of the valves. I do not hesitate to consider *T. semitorta* a synonym of *T. semen,* though both Smith (1885) and Lynge (1909) treated each separately. Smith noted that *semen* and *semitorta* were closely allied but stated that *semen* was more elongate; he also noted that *semitorta* had some reddish coloration along the hinge line. Lynge showed that the populations that he referred to *semitorta* in the Gulf of Siam possessed no red coloration and were extremely variable in form. Comparison of specimens throughout the Indo-Pacific region, from Natal, South Africa, to the Fiji Islands, indicates that there are no consistent differences between isolated populations that would merit interpretation of any of these populations as distinct species or even subspecies. By any means, the populations referred to *T. semen* and *T. semitorta* by Smith and Lynge were sympatric.

The synonyms *miracyllium* Melvill and Standen, *striatissima* Sowerby, *fabagella* Deshayes, *europisthus* Barnard, and *semitorta* Sowerby have been established upon examination of type-material. Salisbury (1934) had already suggested that *miracyllium* and *striatissima* were synonymous with *semen.* The status of *semen,* the type-material of which cannot be located, is based upon the plates cited in the synonymy.

Tellina semen belongs to the subgenus *Cadella* Dall, Bartsch, and Rehder (1938). The concentric sculpture, the strong dentition of the right valve, and the configuration of the pallial sinus in *T. semen* are extremely similar to those of *T. lechiogramma* Melvill, the type-species of *Cadella.* In some respects *Cadella* is related to *Moerella* (type-species, *T. donacina* Linnaeus of European seas), but the pallial sinus in *Moerella* has a considerable coalescence with the pallial line, whereas in *Cadella* the sinus is confluent distally. Melvill and Standen (1907) and Lynge (1909) placed *T. semen* in *Moerella.*

One of the curious traits of *T. semen,* noted by Smith (1885), is the tendency of the resilial part of the ligament to form a separate, tiny, subumbonal portion. Although always inconspicuous, this feature

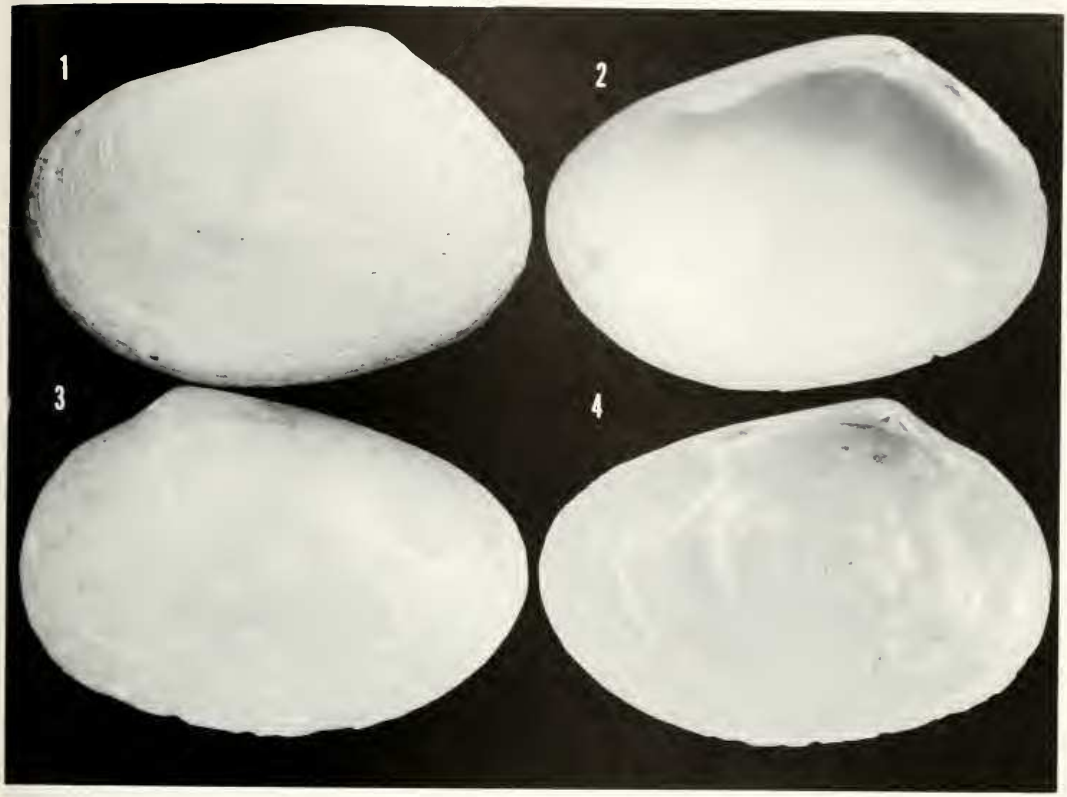


Plate 15. *Tellina* (*Cadella*) *semen* Hanley. Fig. 1. External view of the left valve, Durban, NM 1809 (length = 18 mm). Fig. 2. Internal view of the right valve, Durban, NM 1809 (length = 12.1 mm). Figs. 3 and 4. Syntype of *Tellina europisthus* Barnard [= *T. semen*], off Cape Natal, Durban, SAM 9549 (length = 8.5 mm): Fig. 3, external view of the right valve; Fig. 4, internal view of the right valve.

is variously developed, and in some specimens an extremely small chondrophore-like structure is evident. This morphological configuration indicates the relationship of the Tellinidae with the Semelidae; the latter normally have a larger conspicuous internal resilium supported by a well-developed chondrophore. Striking similarities are most evident between *Cadella* and the various species of the semelid genus *Semelangulus*, as noted by Dall, Bartsch, and Rehder (1938).

Another variable morphological characteristic exhibited in populations of *T. semen* is the nature of the concentric sculpture along the posterior slope in the right valve. Usually the concentric lirations become stronger, somewhat raised, and sublamellate. They are often reduced in number, becoming confluent with each other at various distances from the posterior margin. Such a pattern of intercalations of concentric lirations was chosen by Barnard (1964a) as the best distinguishing trait in his synonym *europisthus*.

Range. Tellina semen lives in offshore waters, usually in relatively coarse substrates from along the coast of east Africa as far south as Durban, through the East Indies and the Philippine Islands to as far east as the Fiji Islands. Smith (1903) first listed the species from Durban, and further documentation of range has been given by Lynge (1909). Under the name

semitorta, Maes (1967) noted that this species was abundant at Cocos-Keeling in fine, soft sand in shallow water. It was not an intertidal or beach species and rapidly buried itself in the substrate if disturbed. Odhner (1919) recorded this species as *semitorta* from Madagascar.

Specimens examined. REPUBLIC OF SOUTH AFRICA: Durban (BMNH; NM); Cape Natal (SAM); Morewood Cove (SAM); Tugela River, Zululand (SAM). MOZAMBIQUE: Delagoa Bay (SAM). SEYCHELLES IDS.: NW Mahe (BMNH). PERSIAN GULF: (BMNH). WEST PAKISTAN: Mekran Coast (BMNH; USNM); Karachi (BMNH). INDIA: Tuticorin, Gulf of Mannar (BMNH); Madras (BMNH). ANDAMAN IDS.: Port Blair (BMNH). MALAYSIA: Singapore: (BMNH). PHILIPPINE IDS.: (BMNH). AUSTRALIA: Flinders Passage and Cape York, Torres Straits (both BMNH). FIJI IDS.: (BMNH).

Subgenus *Moerella* Fischer

Donacilla Gray 1851, (British) Mollusca Acephala and Brachiopoda. List of the . . . British Animals in the . . . Museum, Part 7, p. 39 (type-species, *Tellina donacina* Linnaeus 1758, subsequent designation, Herrmannsen 1852, p. 47), *non* Lamarck 1819 (Mollusca).

Moera H. and A. Adams 1856, Genera Recent Moll., 2: 396 (type-species, *Tellina donacina* Linnaeus 1758, subsequent designation, Kobelt 1881: 328), *non* Huebner 1819 (Lepidoptera), *nec* Milne-Edwards 1840 (Crustacea), *nec* Michelin 1855 (Echinodermata).[1]

Maera H. and A. Adams 1858, Genera Recent Moll., Index, p. xxvii, error for *Moera* H. and A. Adams 1856, *non* Leach 1814 (Crustacea).

Moerella Fischer 1887, Manuel de Conch., p. 1147 (type-species, *Tellina donacina* Linnaeus 1758, monotypy).[2]

Description. Shell usually small, elongate-subelliptical, solid, somewhat inflated to compressed, inequilateral, and more or less equivalve, with posterior flexure to right. Umbos behind middle, low and opisthogyrous. Concentric sculpture consisting of more or less regularly spaced, strong, lirations, usually intercalated and sublamellate on right posterior slope. Hinge well developed. Right anterior and posterior lateral teeth strong and socketed above; anterior tooth subproximal to cardinal complex. Pallial sinus extending near to but separated from anterior adductor muscle scar and extensively confluent with pallial sinus posteriorly. Color often reddish with bands and/or rays.

Remarks. Moerella approaches *Cadella* in many respects. Yet the latter has a stronger, heavier, and thicker shell, with concomitantly stronger hinge teeth. In outline, *Moerella* tends to be somewhat pointed posteriorly, and its pallial sinus, largely confluent with the pallial line ventrally, extends close to the anterior adductor muscle scar. In addition, the right anterior lateral tooth of *Cadella* is thick, socketed above, and more distantly disposed in relation to the cardinal complex than is the homologous tooth in *Moerella,* which, though developed, tends to be shelf-like, upcurled, and more proximally juxtaposed to the cardinal complex.

Tellina donacina Linnaeus, the type-species of *Moerella,* lives in the Mediterranean Sea and the eastern Atlantic Ocean (Bucquoy, Dautzenberg, and Dollfus, 1887–98) and is very closely related to *T. vidalensis* of South Africa. Also in European waters, *T. pulchella* Lamarck is very similar to *T. gilchristi.* In the Americas, species such as *T. sybaritica* Dall, which I had once considered in *Angulus* (Boss, 1968), appear to belong to the *Moerella* complex. Nevertheless, the distinctions between *Angulus* and *Moerella* are tenuous.

[1] The type-species is not *T. distorta* Poli 1795, as given by Salisbury 1934. (Actually, since *Moera* is a replacement name for *Donacilla* Gray, *non* Lamarck, its type-species automatically becomes *T. donacina* so indicated by Herrmannsen for *Donacilla.* Stoliczka (1870) gave no designation.)

[2] Fischer does not state that he is giving a replacement name for *Moera* H. and A. Adams 1856 [= *Donacilla* Gray 1851], for he does not indicate that it was preoccupied. Since he lists *T. donacina* as an example, we construe that as type-species by monotypy.

Tellina (*Moerella*) *vidalensis* Sowerby
Plate 16, figures 2–5; Plate 17, figures 1, 2.

Tellina vidalensis Sowerby 1904, Marine Investigations South Africa, 4: 13, pl. 7, fig. 5 (type-locality, Cape Vidal, NE by N, 9 miles, in 13 fathoms; holotype, SAM Reg. No. 14848).

Description. Shell extending to 19 mm in length and to 10 mm in height, elongate, sublanceolate, inequilateral, more or less equivalve, solid, right valve slightly more inflated with short, sharp flexure to right posteriorly. Umbo well behind middle, opisthogyrous, small, inconspicuous, not inflated or elevated, flattened, and with shallow cavity. Anterior margin smoothly and narrowly rounded; ventral margin weakly convex, rising in concave arcuation posteriorly; anterior dorsal margin very long, weakly convex to straight, and gently descending; posterior dorsal margin short, straight to weakly concave, and steeply descending; posterior margin short, irregularly convex, forming slight truncation and rather sharply pointed outline at junction with ventral margin. Sculpture consisting of incised, fine concentric lirations, intercalated and stronger along posterior dorsal slope; no true radial sculpture; lirations imparting silky, sheen-like appearance to external surface of valves. Posterior ridge in both valves weak and rounded.

Ligament short, yellowish brown to black, protuberant, and set in rather wide, lanceolate escutcheon; lunule indistinct, elongate, lanceolate, stronger in left valve. Hinge well developed. In left valve, cardinal complex consisting of anterior strong, deltoid bifid tooth with subequal lobes, and of posterior, thin, oblique laminate tooth; lateral teeth consisting of distal thickenings of hinge line. In right valve, cardinal complex consisting of anterior, strong, laminate tooth, and of posterior, somewhat skewed, subdeltoid bifid tooth with subequal lobes; anterior lateral tooth distal, strong, upcurled and shelf-like; posterior lateral tooth distal, blunt, and socketed above.

Muscle scars moderately well impressed. Anterior adductor scar rounded ventrally, irregularly semilunate; posterior adductor scar irregularly subquadrate. Pallial sinus equal in opposite valves, rising slightly posteriorly, gently pointed in apex beneath umbo, gently descending in straight or concave arcuation, rounded or sharply falling to pallial line anteriorly; not reaching anterior adductor muscle scar, and coalescent with pallial line for more than three-quarters its ventral length. Cruciform muscle scars closely juxtaposed, near ventral margin, and rounded except for subrectangular left anterior scar. Shell salmon pink, dark red, apricot or white; sometimes rayed or banded; internally shining, polished, and suffused with pink.

Length mm	Height mm	Width mm	
18.6	09.9	05.0	off Nonoti River, Natal
17.3	09.6	04.8	off Flat Rock, Natal
15.5	08.5	04.2	Holotype of *vidalensis*
10.4	05.2	02.4	off Flat Rock, Natal

Remarks. Tellina vidalensis is a rather heavily shelled species. It has regular lirate sculpture, which imparts a sheen-like appearance to the external surface of the valves. As illustrated in the figures, the concentric sculpture becomes stronger along the posterior dorsal slope.

The species is relatively easily distinguished from other small tellens in South Africa. *T. gilchristi* is more thinly shelled, with more pointed and conspicuous umbos; it has a longer posterior portion. *T. natalensis* is comparatively fragile, and its right anterior lateral tooth is closely juxtaposed to the cardinal complex, and *T. prismatica* has the pallial sinus coalescent with the anterior adductor muscle scar. In *T. vidalensis,* a left posterior lateral tooth is developed as a small, somewhat pointed, distal thickening of the hinge line posterior to the ligament.

Since the nature of the pallial sinus, the structure of the sculpture, and the form and strength of the shell are very similar, there is, no doubt, a relationship between

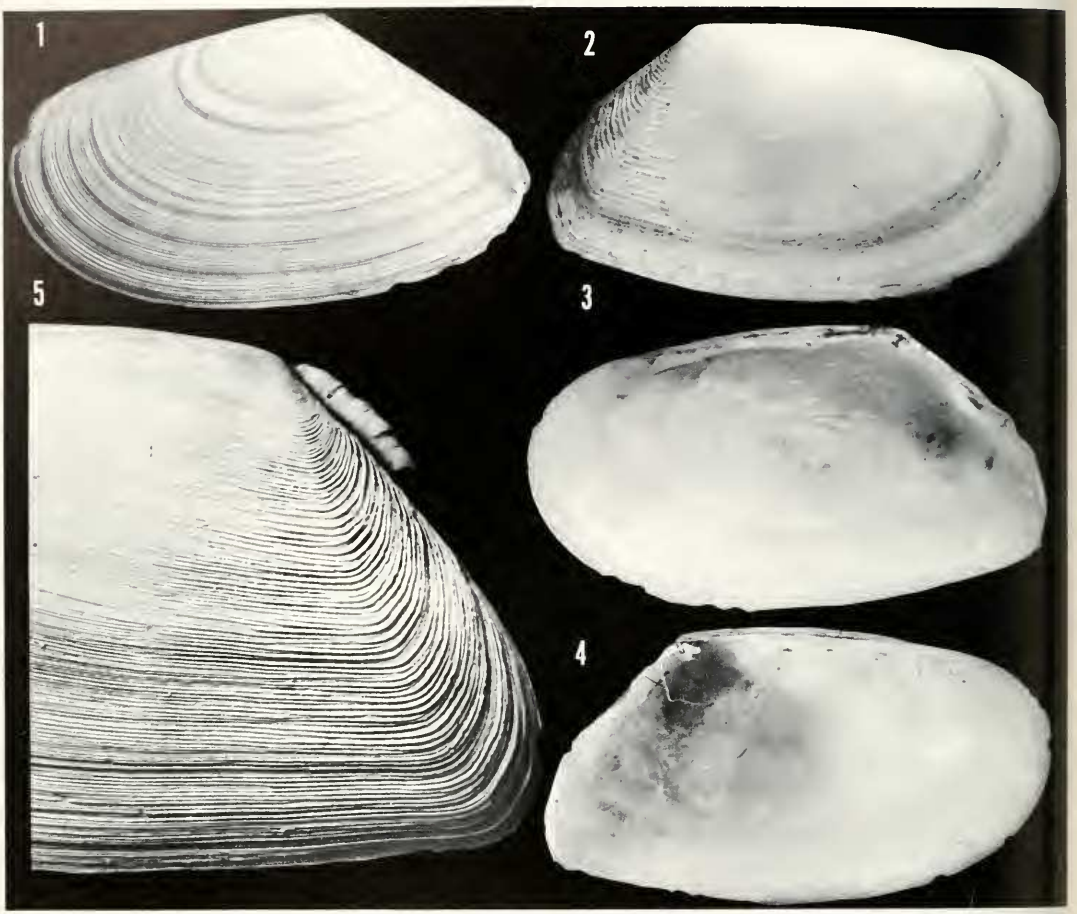


Plate 16. Fig. 1. Paratype of *Tellina* (*Moerella*) *gilchristi* Sowerby: external view of the left valve, showing strength of concentric lirations anteriorly, off Cape Point, South Africa, SAM 14751 (length = 24.8 mm). Figs. 2–4. Holotype of *Tellina* (*Moerella*) *vidalensis* Sowerby, off Cape Vidal, Zululand, SAM 14848 (length = 15.5 mm): Fig. 2, external view of the right valve; Fig. 3, internal view of the right valve; Fig. 4, internal view of the left valve, to show development of posterior lateral tooth. Fig. 5. *Tellina* (*Moerella*) *vidalensis* Sowerby: external surface of left valve to show strength of sculpture, off Nonoti River, Natal, UCT-63F (length = 13.5 mm).

T. donacina of European waters—the type-species of *Moerella*—and *T. vidalensis*. The former attains a slightly larger size, is less pointed posteriorly and somewhat higher in proportion, and its right anterior lateral tooth is closer to the cardinal complex.

As noted by Barnard (1964 b), the record of the occurrence of *T. vidalensis* at *Valdivia* Station 100 in Francis Bay (Thiele and Jaeckel, 1931) is questionable. However, the specimens collected by Stimpson in 1853 from False Bay, cited by Bartsch (1915), and referred to *T. gilchristi* by Barnard, are without doubt *T. vidalensis*.

The identity and status of many of these smaller tellens may remain a mystery for some time to come. I have no doubt that, for example, *T. vidalensis* is much more widely distributed in Indo-Pacific waters than the present record indicates. But larger series of specimens of small, shallow water species from widely different areas are not presently available. For example,

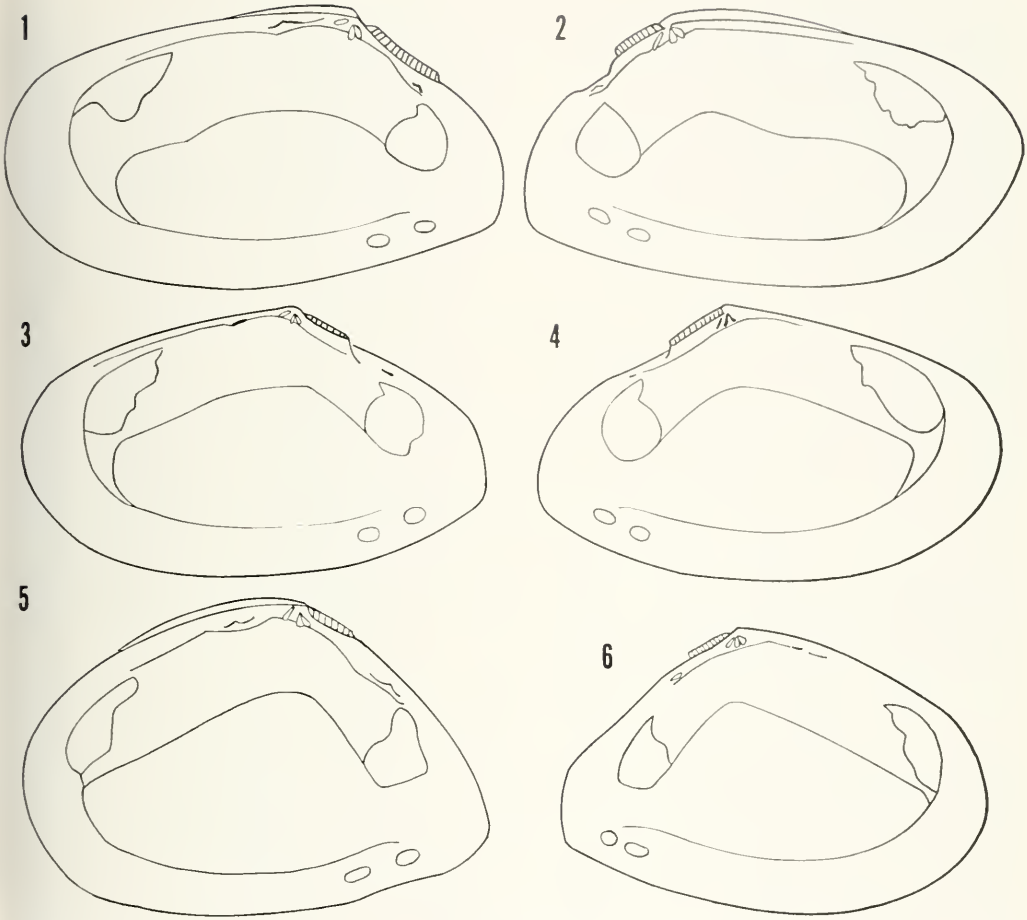


Plate 17. Diagrammatic illustrations of the internal surface of the valves, showing the dental configuration and muscle scars. Figs. 1 and 2. *Tellina* (*Moerella*) *vidalensis* Sowerby, off Cape Vidal, Zululand, SAM 14848 (length = 15.7 mm): Fig. 1, right valve; Fig. 2, left valve. Figs. 3 and 4. *Tellina* (*Moerella*) *gilchristi* Sowerby, off Kowie, South Africa, SAM 11491 (length = 14.6 mm): Fig. 3, right valve; Fig. 4, left valve. Figs. 5 and 6. *Tellina* (*Arcopagia*) *yemenensis* Melvill, Durban, DM: Fig. 5, right valve (length = 14.5 mm); Fig. 6, left valve (length = 13.5 mm).

in the Caribbean area, *T. sybaritica* Dall can hardly be separated from *T. vidalensis* of small size, yet *T. sybaritica* is usually thinner and never attains the overall size of adult *T. vidalensis*.

Range. *Tellina vidalensis* is predominantly an offshore warm water species found along the Natal and Zululand coast of South Africa in depths to 40 fathoms, in coarse sandy or muddy substrates.

Specimens examined. REPUBLIC OF SOUTH AFRICA: False Bay, Cape Province (USNM); off Umhlanga River in 22–26 fms.; off Umhloli River in 40 fms. (Barnard, 1964b); off Morewood Cove in 27 fms. (SAM); off Flat Rock in 57 m (29°19.1′S; 31°26.8′E); off Nonoti River in 38 m (29°21.6′S; 31°35.7′E) (both UCT); off Tugela River, Zululand, in 37 fms. (Barnard, 1964b); off Cape Vidal, near St. Lucia Bay, Zululand in 13 fms. (SAM).

Tellina (Moerella) gilchristi Sowerby
Plate 16, figure 1; Plate 17, figures 3, 4; Plate 18, figures 1, 2.

Tellina gilchristi Sowerby 1904, Marine Investigations South Africa, 4: 12, pl. 7, fig. 3 (type-locality, off Cape Point Lighthouse, NW by W, 11 3/4 miles, in 45 fathoms; holotype, BMNH 1904.12.23.156).

Tellina becki Turton 1932, The marine shells of Port Alfred, p. 247, pl. 66, no. 1741 (type-locality, Port Alfred; holotype, ? Oxford).

Description. Shell extending to 27 mm in length and to 16 mm in height, elongate-sublanceolate, inequilateral, equivalve, fragile to subsolid, rather compressed, with valves of near equal convexity and with a slight flexure to right posteriorly. Umbo behind middle, small, pointed, rather inconspicuous, and not elevated; umbonal cavity shallow. Anterior margin rather broadly and smoothly rounded; ventral margins slightly convex and rising behind; anterior dorsal margin long, straight, slightly convex, and gently descending; posterior dorsal margin short, rather steeply descending, and straight to slightly concave; posterior margin oblique, short, biangulate, and forming slightly pointed posterior outline. Sculpture consisting of finely incised concentric sulcations (about 8–12 per mm); intercalated lamellations present on posterior dorsal surface of each valve; sculpture stronger on right valve; no true radial sculpture. Posterior ridge slightly developed in right valve, ending at posterior ventral biangulation.

Ligament yellowish brown in color, rather strong, protuberant, weakly set in indistinct, sublanceolate escutcheon; no true lunule present; calcareous portion of ligament subtended by variously developed nymphal callosity, stronger in right valve. Hinge line moderately well developed. In left valve, cardinal complex consisting of anterior, narrow, bifid tooth with subequal lobes, and of elongate, posterior, thin laminate tooth; anterior lateral tooth obsolete, consisting of subproximal thickening of hinge line; posterior lateral tooth small, shelf-like, short, and pointed laterally. In right valve, cardinal complex consisting of posterior, narrow, bifid tooth, subequal lobes, and of anterior small, relatively thin, subdeltoid tooth; anterior lateral tooth subproximal to cardinal complex, elongate, shelf-like, thin, socketed above, and upcurled; posterior lateral tooth, distal, shelf-like, narrow, pointed, socketed above, and upcurled.

Muscle scars moderately well impressed. Posterior adductor scar irregularly subrectangulate; anterior adductor muscle scar irregularly semilunate. Pallial sinus equal in both valves, rising gently behind, apex pointed, gently descending anteriorly, forming a concave arcuation ventrally before uniting with pallial line. Pallial sinus well separated from anterior adductor muscle scar. Cruciform muscle scars rounded except for right anterior rectangular scar. Color basically white, suffused or banded with red or pink.

Length mm	Height mm	Width mm	
27.0	15.5	06.0	(Barnard)
24.8	14.3	05.5	Cape Point
18.7	10.1	04.0	False Bay
15.7	08.5	03.2	False Bay
13.2	08.8	02.9	off Kowie
10.1	05.5	02.1	False Bay
08.9	05.0	01.8	False Bay

Remarks. Probably the greatest variation exhibited by this species is its color pattern. The reds or pinks vary in intensity and they may be arranged in rays or bands. Rarely pure white individuals occur. The incised sculpture of the disc may be replaced by raised intercalated lirations on the posterior slope—particularly in the right valve.

The South African species that is most closely related to *T. gilchristi* is *T. analogica*. The former is distinct in its proportionately more narrow and elongate form, in its tendency to be somewhat pointed posteriorly rather than broadly and obliquely truncated, and in its usual red-pink coloration.

The species apparently occurs in considerable abundance in False Bay (Bar-

nard, 1964b; Dell, 1964). The University of Cape Town's Ecological Survey took the species at numerous stations in the Bay; living individuals were always found in depths beyond 10 m and most often occurred in fine green or khaki sands with some shell inclusions. It has been taken alive in depths of at least 87 m.

T. gilchristi is very closely related to *T. pulchella* from the Mediterranean. However, the latter is more elongate and pointed behind and attains a greater maximum size.

The West African *T. rubicincta* Römer[1] is very closely related to *T. gilchristi*. Nicklès (1955) cites the West African literature, lists a number of stations at which *rubicincta* occurs, and gives as its range, Mauritania to Angola. Not enough material from west Africa was available for study and I have seen no specimens of *gilchristi* from north of St. Helena Bay, in which case there may be a complete geographical separation of *gilchristi* and *rubicincta*. There is some indication that *rubicincta* is more tumid and more strongly sculptured on the right posterior dorsal slope than *gilchristi*.

Barnard (1964b) thought that the specimen collected by Stimpson in 1853 and referred to as *T. vidalensis* by Bartsch (1915) was really *T. gilchristi*. This specimen (USNM no. 66), from False Bay, Cape of Good Hope, is truly *T. vidalensis* (*q.v.*).

Range. *T. gilchristi* is found in the cool waters of South Africa from St. Helena Bay to off Port Alfred. Thiele and Jaeckel's (1931) record from Great Fish Bay, Angola, extends its range north, though I have not seen the VALDIVIA specimens. Boshoff's record (1965) from the north point lighthouse (Farol) at Inhaca, Mozambique, is doubtful.

Specimens examined. REPUBLIC OF SOUTH AFRICA: St. Helena Bay, in 69 m (UCT); Saldanha Bay, in 16 m (UCT); Langebaan Lagoon, Saldanha Bay (UCT); off Duyker Point, in 84 m (UCT); Buffels Bay (SAM); off Green Point (SAM); off Cape Point (SAM); False Bay, in 33–84 m (UCT); off Cape Infanta, St. Sebastian Bay (UCT); Aguilhas Bank (MCZ); off Cape St. Blaize, Mossel Bay (SAM); St. Francis Bay; Algoa Bay; off False Island and Nanquas Peak, Algoa Bay (after Barnard, 1964b); off Kowie or Port Alfred (MCZ; SAM).

Tellina (*Moerella*) *analogica* Sowerby
Plate 18, figures 3, 4; Plate 19, figure 1.

Tellina analogica Sowerby 1904, Marine Investigations South Africa, 4: 12, pl. 7, fig. 4 (type-locality, Constable Hill (Saldanha Bay) SE by E, 10 miles; holotype, not known).

Description. Shell extending to 22 mm in length and to 15 mm in height, subtrigonal to subrectangular, subsolid, inequilateral, nearly equivalve, with left valve slightly more convex and with posterior flexure to right. Umbos behind middle, small, not conspicuous, bluntly pointed, and opisthogyrous. Anterior margin somewhat narrowly rounded and convex; ventral margin straight to weakly convex, rising slightly posteriorly; anterior dorsal margin long, gently descending, more or less straight; posterior dorsal margin short, straight, and steeply descending; posterior margin usually biangulate, short, forming irregularly steep, blunt truncation. Sculpture consisting of fine, incised, concentric lirations and of extremely fine, radial vermiculations; concentric growth lines evident. Posterior ridge weak, extending to basal junction of posterior and ventral margins.

Ligament yellow-brown, moderately well developed, short, protuberant, set upon

[1] Römer's (1870: 32) spelling *rubicincta* is herein construed as the next available synonym for Gould's *rubicunda*. The references of Tomlin and Shackleford (1915) and Salisbury (1934) to a "*rubicincta* Gould 1845" are unfounded. The correct citation is: *Tellina rubicunda* Gould 1845, Proc. Boston Soc. Nat. Hist., 2: 37 (type-locality, Liberia; holotype, MCZ 169346); 1862, Otia Conch., p. 196; Johnson 1964, Bull. U. S. Nat. Mus., 239: 142, pl. 24, fig. 4, *non* Röding 1798.

Plate 18. Figs. 1 and 2. Paratype of *Tellina* (*Moerella*) *gilchristi* Sowerby, off Cape Point, South Africa, SAM 14751 (length = 18.8 mm): Fig. 1, external view of the left valve; Fig. 2, internal view of the right valve. Figs. 3 and 4. *Tellina* (*Moerella*) *analogica* Sowerby, Baboon Point, Saldanha Bay, SAM 14996 (length = 18.3 mm): Fig. 3, external view of the left valve; Fig. 4, internal view of the right valve.

slightly raised, short nymphal callosities; escutcheon and lunule indistinct, obscure, elongate, and lanceolate. Hinge line moderately developed. In left valve, cardinal complex consisting of anterior, protuberant, narrowed bifid tooth with subequal lobes, and of posterior oblique, elongate, thin laminate tooth adpressed to base of nymphal callosity; no true lateral teeth, but hinge line slightly thickened anteriorly and posteriorly. In right valve, cardinal complex consisting of posterior, very narrow, bifid tooth with subequal lobes and of anterior somewhat thickened laminate tooth; posterior lateral tooth distal, shelf-like, pointed, with small socket above; anterior lateral tooth stronger, more proximal to cardinal complex, upcurled, pointed, socketed, with central flange contiguous with anterior laminate cardinal tooth.

Muscle scars moderately impressed. Anterior adductor muscle scar irregularly oval; posterior adductor muscle scar irregularly subquadrate. Pallial sinus equal in both valves, rising rather steeply posteriorly, rounded dorsally, gently descending in irregular convex arcuation, rounded anteriorly and recurving to unite with pallial line basally; confluence extensive, over three quarters of ventral length of pallial line; pallial sinus well separated from anterior adductor muscle scar. Cruciform muscle scars obscure, irregularly rounded, small, far posterior, and close to shell margin. White, shining, with rather chalky texture; some specimens with grayish dehiscent periostracum peripherally; marked subpellucid concentric bands.

Length mm	Height mm	Width mm	
22.1	14.6	06.5	Baboon Point, Saldanha Bay
21.5	14.0	05.5	holotype of *analogica*
18.7	11.9	05.2	off Bottel Fontein, Helena Bay
16.3	10.1	—	Baboon Point, Saldanha Bay

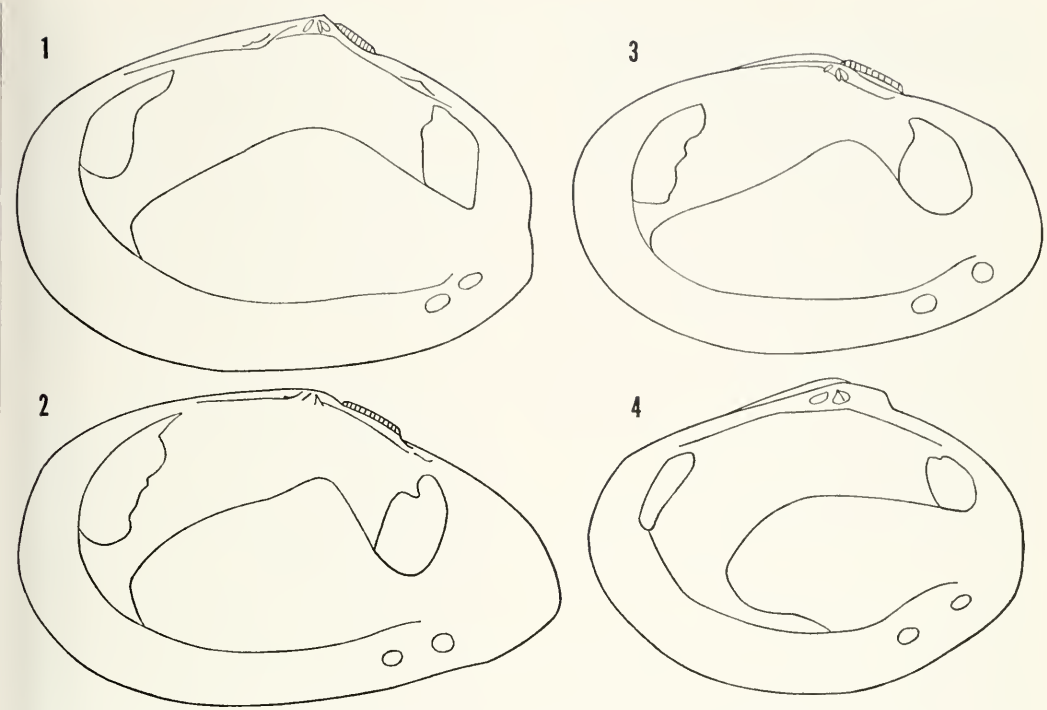


Plate 19. Diagrammatic illustrations of the internal surface of the valves, showing the dental configuration and muscle scars of the right valve. Fig. 1. *Tellina* (*Moerella*) *analogica* Sowerby, Babaan Point, Saldanha Bay, South Africa, SAM 14996 (length = 19.1 mm). Fig. 2. *Tellina* (*Fabulina*) *fabula* Gmelin, "Natal" [in error], SAM A30016 (length = 19.5 mm). Fig. 3. *Macama* (*Scissulina*) *dispar* (Conrad), Goh Sindarar Nua, Thailand, USNM 661365 (length = 16.9 mm). Fig. 4. *Heteradonax ludwigii* (Krauss), Delagoa Bay, Mozambique, SAM A30021 (length = 15.8 mm).

Remarks. The whereabouts of the holotype of *Tellina analogica* Sowerby is unknown. Barnard (1964b) could not find the type, and it is not in the type collection of the British Museum (Natural History).

Since only a relatively few specimens are known, it appears that this species is quite rare. Both Sowerby (1904) and Barnard (1964b) have pointed out that *T. analogica* is closely allied to *T. gilchristi*, and Barnard even suggested that they might be indistinguishable and synonymous. The species are sympatric and very closely related; their hinge elements, especially the lateral teeth, and the configuration of their pallial scars are virtually the same. But the few specimens available seem quite distinct from *T. gilchristi*. Although the outline of the valves varies from subtrigonal to subrectangular, *T. analogica* is proportionately higher and wider that *gilchristi*. The posterior truncation of *analogica* is more blunt and usually biangulate, while in *gilchristi* the posterior end appears to be more distinctly pointed. Further, the shell of *analogica* is white, whereas *gilchristi* is normally rayed or banded with pink or red. White individuals of the latter have the usual longer dimensions, a narrowed posterior aspect, and are distinguishable from *analogica*.

Range. Tellina analogica is a southwest African species living in depths to 160 m in soft substrates from north of Lüderitz Bay to Saldanha Bay, Cape Province. Dell (1964) reported it from Tristan da Cunha in 40 m.

Specimens examined. REPUBLIC OF

SOUTH AFRICA: 26°32′S; 14°50′E, N of Lüderitz Bay in 160 m (UCT); 32°24′S; 18°07′E, NW of Bottel Fontein, Helena Bay in 69 m; 33°02′S; 17°58.9′E, Saldanha Bay, in 16 m (UCT); off Baboon Point, Saldanha Bay in 31 fms. (57 m) (SAM).

Subgenus *Angulus* Megerle von Mühlfeld

Angulus Megerle von Mühlfeld 1811, Gesellschaft Naturforschender Freunde Berlin, Magazin, 5: 57 (type-species, *Tellina lanceolata* Gmelin 1791, subsequent designation, Gray 1847, p. 186).

Oudardia Monterosato 1884, Nomenclatura generica e specifica di alcune Conchiglie Mediterranee, Palermo, p. 22 (type-species, *Tellina oudardii* Payraudeau 1826 [= *T. compressa* Brocchi 1814], original designation).

Moerella 'Fischer' Gardner 1928, U. S. Geol. Sur., Prof. Paper 142-E: 195, *non* Fischer 1887.

Anbulus Megerle von Mühlfeld. McLean 1951, New York Acad. Sci., Scientific Survey of Porto Rico and Virgin Islands, 17 (1): 96, error for *Angulus*.

Description. Shell small to medium in size, fragile to solid, ovate to elliptical in shape, with the left valve generally more convex and with a flexure to the right posteriorly. Sculpture primarily concentric and weakly incised over the surface of the valves; rarely differentiated along the posterior dorsal slope. Hinge without lateral dentition in the left valve. Right valve with the anterior lateral tooth adjacent to the cardinal complex and with an obsolete posterior lateral tubercle. Pallial sinus generally extensive, confluent with the pallial line for much of its ventral length.

Numerous interpretations of *Angulus* have been utilized—none perhaps as ambiguous and as broad as that of Megerle von Mühlfeld (1811). In designating a type-species, Gray (1847) diminished the original extent of *Angulus*. Salisbury (1934) went so far as to claim that only two species belonged to the group *sensu stricto* —the type-species *T. lanceolata* Gmelin, and another, probably synonymous, *T. armata* Sowerby. Yet Salisbury used *Angulus* at least five times in naming the species he figured. Some authors (Gardner, 1928; Olsson and Harbison, 1953) have used *Moerella* for species that had previously been placed in *Angulus*. Admittedly the interpretation of the dental configuration is most important, and *Moerella*, with *T. donacina* Linnaeus as type-species, has a strong right posterior lateral tooth. *Angulus*, then, is reserved for those species with that tooth weak, obsolete, or absent. Nevertheless, the system is still unsatisfactory, because the posterior lateral dentition is difficult, if not impossible, to quantify.

Tellina (*Angulus*) *canonica* Salisbury
Plate 14, figure 4; Plate 20, figures 1, 2.

Tellina regularis Smith 1904, Jour. Malacology, 11 (2): 25, 39, pl. 3, fig. 18 (type-locality, Port Alfred, Cape Colony; syntypes, BMNH 1903.12.-19.1281–95), *non* Carpenter 1855.

Tellina canonica Salisbury 1934, Proc. Malac. Soc. London, 21 (2): 86, new name for *T. regularis* Smith 1904, *non* Carpenter 1855.

Description. Shell extending to 14 mm in length and to 10 mm in height, subrectangular to suboval, inequilateral, equivalve, fragile to subsolid, compressed, with weak posterior flexure to right. Umbos behind middle, small, inconspicuous, pointed, opisthogyrous, and not inflated or elevated. Anterior margin broadly to narrowly rounded; ventral margin gently convex, rising slightly posteriorly; anterior dorsal margin long, gently descending, and usually straight; posterior dorsal margin short, steeply descending, and straight; posterior margin short, straight to weakly convex, and forming broad, blunt, oblique truncation. Sculpture consisting of concentric, closely spaced, incised lirations tending to become somewhat acentric peripherally and obsolete posteriorly in left valve, and of fine obsolete radial vermiculations. Posterior ridge absent, indistinct, or weak.

Ligament yellow-brown, protuberant, short, not well developed, set in weak, lanceolate escutcheon; lunule lanceolate, long, weak, and indistinct, but stronger in left valve; internal extension of ligament

present and subtending low, indistinct nymphal callosities. Hinge with rather fragile dentition. In left valve, cardinal complex consisting of anterior, weak, narrow bifid tooth with subequal lobes, and of posterior, thin, laminate tooth subtending oblique lateral internal ligament and often broken or lost; lateral teeth absent or obsolete, consisting of distal, weak thickenings of hinge line. In right valve, cardinal complex consisting of posterior, narrow, weak, elongate, bifid tooth with subequal lobes, and of anterior short, protuberant, somewhat thickened laminate tooth; anterior lateral tooth strong, shelf-like, protuberant, subproximal to cardinal complex, and weakly upturned; posterior lateral tooth distal, weak, laminate, and socketed above.

Muscle scars weakly impressed. Anterior adductor muscle scar flattened dorsally and rounded ventrally; posterior adductor muscle scar irregularly subrectangular. Pallial sinus more or less equal in both valves, rising only slightly posteriorly, weakly convex dorsally, irregularly descending, roundly pointed anteriorly, well separated from anterior adductor muscle scar and recurving basally to unite with pallial line for about three quarters of its ventral length. Cruciform muscle scars irregularly rounded, closely juxtaposed with right anterior subrectangular scar. Color white with central suffusions of yellow, pellucid, shining and polished internally.

Length mm	Height mm	Width mm	
14.5	10.1	—	Port Alfred, near Grahamstown
14.0	10.0	04.5	syntype of *regularis*
11.0	07.8	—	Still Bay
10.1	07.4	03.8	East London
07.1	05.2	02.5	East London

Remarks. Tellina canonica appears to be rather rare. Its most variable characteristic is the outline of the valves. Though it is usually somewhat subrectangular, with an oblique posterior truncation, short specimens tend to be oval, with a broadly arcuate anterior margin and a short convex ventral margin. Typically the shell is suffused centrally with yellow, but this coloration may be completely lacking, in which case the shell is simply a pellucid white.

The unique, minute internal ligament, which is a ventral oblique branch of the anterior portion of the larger external ligament, distinguishes *T. canonica* from other South African tellinids. This structure is quite similar to the configuration encountered in *T.* (*Cadella*) *semen* and can even be compared to the internal ligament of the semelid *Semelangulus.* A strong, distinct internal resilium, resting on a chondrophore, characterizes the family Semelidae. Both *T. canonica* and *T. semen* exhibit an incipient internal ligament and, in this respect, converge with each other as well as with the Semelidae.

Tellina canonica is included in *Angulus* since it has the anguloid facies of a poorly developed or obsolete right posterior lateral tooth and of a thin, shelf-like, right anterior lateral tooth closely juxtaposed to the cardinal complex. Along with a number of other closely related tellens—the *T. rutila* Dunker complex of the Indo-Pacific, *T. tenuis* da Costa in the eastern Atlantic, *T. tampaensis* Conrad, *T. mera* Say, and *T. paramera* Boss in the western Atlantic, and *T. suffusa* Dall and *T. meropsis* Dall of the eastern Pacific—*T. canonica* departs in its subrectangular-subovate, subtrigonal shape from the typically elongate-lanceolate anguloids, as seen in the type-species of *Angulus, T. lanceolata.*

Martin (1956; 1962) found this species in Pleistocene deposits at Sedgefield, west of Knysna.

Range. In South Africa, this species occurs from Still Bay to East London. Barnard (1964b) recorded it from Port Elizabeth and Jeffreys Bay. Boshoff (1965) found it among *Cymodocea* near Ilha des Portugueses, Inhaca, Mozambique. Evidently it prefers soft substrates like black mud, although it has been taken in sand (van Bruggen, 1962).

Specimens examined. REPUBLIC OF SOUTH AFRICA: False Bay in 18 m (UCT); Still Bay (SAM); Sedgefield (SAM); Port Alfred (BMNH; MCZ; SAM; USNM); East London (NM).

Species Incorrectly Placed in the Tellininae

At least two well-known tellinacean bivalves in South Africa have been treated frequently and incorrectly in the genus *Tellina*. They are discussed in the following section.

Macoma (Scissulina) dispar (Conrad)
Plate 19, figure 3; Plate 20, figure 3.

Tellina dispar Conrad 1837, Jour. Acad. Nat. Sci. Philadelphia, 7: 259 (type-locality, inhabits the Sandwich Islands [Hawaiian Islands]; type, not found in ANSP; not listed in Moore, 1962).

Tellina fabula var. *major* Krauss 1848, Die südafrikanischen Mollusken, p. 3 (type-locality, in der Natalbai; types, ? Stuttgart).[1]

Tellina (*Fabulina*) *dispar* Conrad. Bertin 1878, Nouv. Arch. Mus. Natl. Hist. Nat. Paris, 1: 277, no. 117.

Tellina (*Scissulina*) *dispar* Conrad. Dall 1924, Proc. Biol. Soc. Washington, 37: 88.

Tellina fabula 'Gmelin' Turton 1932, The marine shells of Port Alfred, South Africa, p. 248, pl. 67, no. 1751, *non* Gmelin 1791.

Description. Shell extending to 33 mm in length and to 23 mm in height, elongate to subrectangular, slightly inequilateral, inequivalve, subsolid, slightly inflated, with left valve of greater convexity than right and with definitive posterior flexure to right. Umbos slightly behind middle, rounded, not elevated, blunt, and slightly inflated. Anterior margin broadly and smoothly rounded; ventral margin gently convex rising in arcuation posteriorly; anterior dorsal margin long, gently descending and gently convex; posterior dorsal margin shorter, more steeply inclined, more or less straight, occasionally concave; posterior margin short, straight to weakly convex, forming blunt, oblique truncation. Sculpture consisting of more or less regular, weakly developed concentric striations, strongest on anterior and posterior slope of right valve; growth lines sometimes evident; scissulate or acentric sculpture on right valve only and consisting of finely incised, closely set sulcations crossing concentric lirations over central disc of valve; weak radial vermiculations evident on left valve but no scissulations on left valve; weak, gently posterior ridge in right valve.

Ligament light brown to black, rather strong, protuberant, set on flattened and slightly raised nymphal callosities; escutcheon obsolete or absent; weak, indefinite lunule. Hinge line weakly developed. No lateral teeth. Left cardinal complex with anterior, narrow, bifid tooth and posterior elongate, thin, laminate tooth closely adpressed to base of nymphal callosity; sometimes obsolete or lost. Right cardinal complex with posterior, narrow, often skewed, bifid tooth, and anterior, protuberant, thickened, subdeltoid tooth. Internal, somewhat thickened, anterior rib present in both valves.

Muscle scars moderately well impressed. Anterior adductor muscle scar irregularly elongate and curved; posterior adductor muscle scar irregularly rounded to subquadrate. Pallial sinus more or less equal in opposite valves, rising rather abruptly posteriorly, arched dorsally beneath the beaks, descending gently to unite with pallial line in gentle arcuation anteriorly. Pallial sinus extending very close to base of anterior adductor muscle scar, usually slightly separated from it, infrequently becoming subcoalescent. Cruciform muscle scars difficult to discern, rather closely set, rounded or sometimes slightly flattened, close to margin of shell. Color basically white, frequently with central and umbonal suffusions of yellow, rarely pinkish or pale orange suffusions umbonally; translucent

[1] It cannot be certain that Krauss's specimens from Natal Bay were *M. dispar*, since he says, "Ich habe Exemplare aus europäischen Meeren verglichen und kann zwischen diesen und den meinigen in Form und Zeichnung nich den geringsten Unterschied finden, nur in der Grösse übertreffen sie die europäischen ums Doppelte."

Plate 20. Figs. 1 and 2. *Tellina* (*Angulus*) *cananica* Salisbury, East London, South Africa, NM 2983 (length = 10.2 mm): Fig. 1, external view of the left volve; Fig. 2, internal view of the right volve. Fig. 3. *Macoma* (*Scissulina*) *dispar* (Conrad): external view of the right valve, to show fine acentric sculpture, Santa Carolina, Bazaruto Bay, Mozambique, MCZ (length = 26.2 mm). Fig. 4. *Heterodonax ludwigii* (Krauss): external view of the right valve, Delagoa Boy, Mozambique, SAM A30021 (length = 23 mm).

in young stages; generally shining or polished internally.

Length mm	Height mm	Width mm	
32.8	22.5	10.3	Hilo, Hawaii
31.7	23.0	09.7	Hawaiian Islands
26.3	17.1	07.4	Durban
24.9	16.8	06.8	Durban Bluff
22.3	14.5	06.2	Cocos-Keeling Id.
14.2	08.6	03.7	Mala Bay, Maui, Hawaii

Remarks. The nature of the dentition is of subfamilial importance in the Tellinidae. The Macominae are laterally edentate, whereas the Tellininae have one to four variously developed lateral teeth. Notwithstanding the obsolescence or disappearance of certain lateral dental elements in the Tellininae, all Tellininae have some development of the right anterior lateral tooth, even though that tooth may be almost incorporated into the cardinal complex, as in *T.* (*Homalina*) *trilatera* (*q.v.*).

The complete absence of lateral dentition in *S. dispar*, and particularly the lack of any evidence of a right anterior lateral tooth, indicates that this species is not a *Tellina* and, further, that it is truly of macomoid affinities. The species has been variously dealt with in the literature and has been considered in the superspecific grouping named *Fabulina* Gray 1851 with *Tellina fabula* Gmelin as type-species. As a matter of fact, *S. dispar* has been con-

fused with *T. fabula* which is of European distribution (Forbes and Hanley, 1848; Grossu, 1962). Barnard's remark (1964b: 545) is illustrative: "The identification of Natal shells with an Indo-Pacific species is preferable to identifying them with a European species (*fabula*). No European material is available for comparison." Unfortunately, there was European material available to Barnard, but these specimens were labelled as coming from Natal (SAM A 30016). This lot consists of a good series of specimens of *T. fabula* that somehow were brought from Europe and found their way into the collection with incorrect locality data. There is no indication that *T. fabula* lives or ever lived in South African or Indo-Pacific waters.

T. fabula and S. *dispar* are easily distinguished (see Pl. 19, figs. 2 and 3); the former has a right anterior lateral tooth, whereas the latter, as mentioned above, does not. In addition to this fudamental difference, the shells of each species are of different shapes, that of *fabula* being rather pointed or attenuate behind, that of *dispar* rather bluntly truncate. Their similarity consists in being acentrically sculptured on the right valve only, and is the result of convergence (Boss, 1966a). This unique type of sculpture is widespread within the Tellinacea and particularly within the Tellinidae. Both the Tellininae and the Macominae have a number of species that are scissulate. The very closely related macomoids, *Jactellina* Iredale 1929 and *Loxoglypta* Dall, Bartsch, and Rehder 1938, exhibit scissulate sculpture on both right and left valves. Occasionally, *Loxoglypta rhomboides* (Quoy and Gaimard) has been taken in East Africa, including the warm waters of Natal.

Macoma (*Scissulina*) *dispar* lives in relatively shallow water from below the low tide zone to depths of up to 10 fathoms. Most often it is encountered in calcareous sandy bottoms with a relatively coarse texture. Maes (1967) found it commonly in the lagoons at Cocos-Keeling.

Range. Macoma (*Scissulina*) *dispar* is found throughout the central Indo-Pacific area, from the coast of southeast Africa to as far east as the Society Islands and the Hawaiian Islands. Although Turton (1932) recorded this species from Port Alfred, the southernmost area in which the species has been collected alive in South Africa is in the vicinity of Durban.

Specimens examined. REPUBLIC OF SOUTH AFRICA: (BMNH); Durban (SAM; NM); Durban Bluff (NM). MOZAMBIQUE: Santa Carolina Id., Bazaruto Bay (MCZ). MADAGASCAR: Nosy Satrana; Ilampy and near Ankobahahoba, NE of Ambodifototra, Ile Ste. Marie (all MCZ). SEYCHELLES IDS.: (MCZ; USNM). MAURITIUS: (BMNH). MALDIVE IDS.: (BMNH); NW of Gadifurils, South Nilandu Atoll; off Imma Id., SE side North Male Atoll (both ANSP). COCOS-KEELING IDS.: W of Pulo Bras and Pulo Gangsa, SW end of Direction Id., N. Lagoon, West Id., and off Home Id. (all ANSP). THAILAND: Goh Sindarar Nua (USNM). INDONESIA: E of Mios Woendi, Madaido Ids., New Guinea (MCZ). PHILIPPINE IDS.: Calapan, Mindoro (MCZ); S of Bohol (BMNH). AUSTRALIA: Percy Ids. (BMNH) and Heron Id. (MCZ), Queensland. PALAU IDS.: Schonian Harbor, N of Peleu Id. (ANSP). CAROLINE IDS.: (ANSP). MARSHALL IDS.: Kwajelein Atoll (MCZ). GILBERT IDS.: Apiang, Kingsmill Ids. (MCZ). LOYALTY IDS.: Mare (MCZ). NEW CALEDONIA: (MCZ). FIJI IDS.: Viti Levu (ANSP). SAMOA IDS.: off Manono Id., Upolu Id., and off Amouli, Tutuila Id. (both MCZ). COOK IDS.: Akitua, NW of Maina Id., near Nikaupara Village, S of Rapota Id., all Aitutaki (all ANSP). SOCIETY IDS.: Tahiti (MCZ); N of Motuorini Point, Tahiti (ANSP). LINE IDS.: Palmyra (MCZ). HAWAIIAN IDS.: Hilo, Hawaii (ANSP; MCZ; USNM); Mala Bay, Maui; Kawaikapu, Molokai; Ford's Id., Pearl Harbor; Honolulu (all USNM); Waikiki Beach (ANSP); Kahana

Bay (ANSP; MCZ); Mokuloelue Id. and Coconut Id., Kaneohe Bay (both ANSP); near Heeia Pond (fossil); Kaaawa (both USNM); Aiea; Kauai (both ANSP).

Heterodonax ludwigii (Krauss)

Plate 19, figure 4; Plate 20, figure 4; Plate 21.

Tellina ludwigii Krauss 1848, Die südafrikanischen Mollusken, p. 3, pl. 1, fig. 2 (type-locality, In litore natalensi; holotype, ? Stuttgart).

Tellina ludwigi Krauss. Sowerby 1892, Marine shells of South Africa, p. 57, error for *ludwigii* Krauss.

Tellina queketti Sowerby 1897, Appendix to Marine shells of South Africa, p. 22, pl. 8, fig. 16 (type-locality, Durban; types, not in BMNH type-collection).

Tellina queketti var. *radiata* Sowerby 1897, Appendix to Marine shells of South Africa, p. 22, pl. 8, fig. 17 (type-locality, Durban; types, not in BMNH type-collection), *non* Linnaeus 1758.

Tellina quecketti Sowerby. Schwarz 1910, Trans. Geol. Soc. South Africa, 12: 115, error for *queketti* Sowerby.

Description. Shell extending to 23 mm in length and 17 mm in height, irregularly subrectangular to subelliptical, equilateral to slightly inequilateral, equivalve, rather solid, inflated, with valves of more or less equal convexity, and without posterior flexure. Umbos subcentral, somewhat behind middle, slightly elevated, inflated, and blunt. Anterior margin smoothly and narrowly rounded; ventral margin convex, rising posteriorly, sometimes bowed midventrally; anterior dorsal margin long, more or less straight, and gently descending; posterior dorsal margin short, more or less straight, and more steeply descending; posterior margin weakly convex and forming blunt oblique truncation. Sculpture consisting of extremely weak and fine striations; irregular round growth lines evident; no radial sculpture developed.

Ligament black-brown, protuberant, set upon raised nymphal callosities; no true escutcheon; lunule weakly developed, elongate, lanceolate, striate. Hinge line moderately developed. In left valve, cardinal complex consisting of single, thickened, irregularly subdeltoid, bifid tooth (posterior cardinal element usually not evident); no lateral teeth. In right valve, cardinal complex consisting of posterior, irregularly subdeltoid, thickened, bifid tooth, and of anterior strong, thickened tooth; no true lateral teeth, but often hinge margin anteriorly and posteriorly socketed distally, forming weak, shelf-like, elongate grooves.

Muscle scars variously impressed; adductors set relatively high in valves; anterior semilunate, posterior irregularly rounded to subquadrate. Pallial sinus equal in opposite valves, extending straight out from base of posterior adductor muscle scar, rounded anteriorly, irregularly and arcuately falling to pallial line; confluence short. Cruciform muscle scars large, rounded, and not easily discerned. Color, white, purple, cream or pinkish, frequently with irregular radial rays of purple or violet evident externally and internally.

Length mm	Height mm	Width mm	
22.8	16.8	09.6	Delagoa Bay
21.6	16.2	08.3	Isipingo, Natal
19.4	15.6	08.7	Durban
17.6	12.7	06.3	Durban
15.8	11.5	06.2	Delagoa Bay
06.1	04.6	01.9	Morrumbene Estuary

Remarks. This species has long been incorrectly considered a *Tellina* (see Barnard, 1964b: 542, for citations). However, both its shell morphology (Pl. 19, fig. 4) and its anatomy (Pl. 21) indicate that it has affinities with other Tellinacean bivalves. It is separated from the genus *Tellina* and, indeed, the family Tellinidae, by (1) the development of distinctly raised nymphal callosities and the breadth of the hinge plate; (2) the presence of an unusual coloration, particularly the violaceous suffusions and radial rays; (3) the obsolescence and loss of the left posterior cardinal tooth and the generalized stoutness of the remaining cardinal teeth; (4) the lack of definitive lateral teeth; (5) the lack of a developed escutcheon; (6) the presence of plicate gills; and (7) the smallness of the palps. The composite features of this

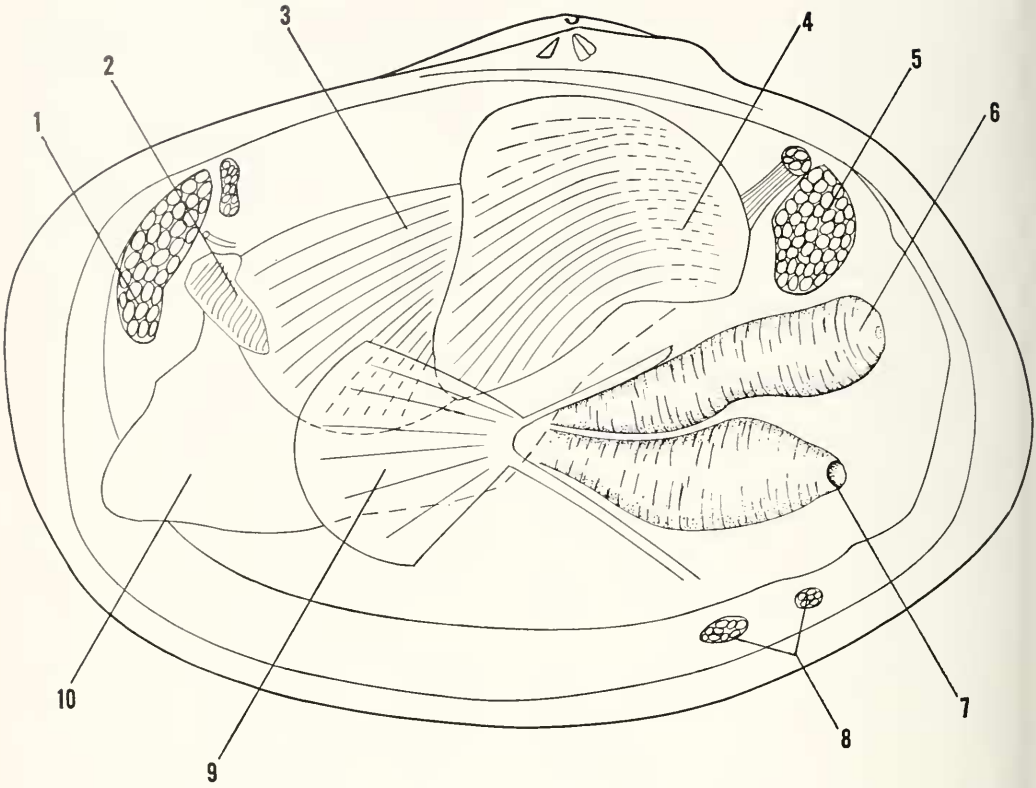


Plate 21. Diagrammatic illustration of the anatomy of *Heterodonax ludwigii* (Krauss): 1, anterior adductor muscle; 2, labial palp; 3, inner demibranch; 4, outer demibranch; 5, posterior adductor muscle; 6, excurrent siphon; 7, incurrent siphon; 8, cruciform muscle; 9, siphonal retractor muscles; 10, foot.

species agree in detail with the diagnosis of the genus *Heterodonax* Mörch 1853 (type-species, by monotypy, *Tellina bimaculata* Linnaeus 1758) as given by Dall (1900: 973), Thiele (1935: 908) and Olsson (1961: 354).

The genus *Heterodonax* belongs to the family Psammobiidae. Anatomically, it is characterized by plicate gills and small palps. The ligament is set upon a raised nymph, and the hinge plate is broad. There are really no lateral teeth present, and an escutcheon is not developed. The general features of the Psammobiidae, namely the nature of the gills and palps, are illustrated in *Gari tellinella* (Yonge 1949: 37, fig. 6). Further, the purple shell coloration, with its tendency to ray formation, is often encountered in the Psammobiidae and particularly in *Heterodonax*. For these reasons the species named *Tellina ludwigii* by Krauss is here removed from *Tellina* and placed in *Heterodonax*.

Heterodonax ludwigii exhibits a considerable amount of variation, especially in regard to shape and coloration. Further, the outline of the valves changes during ontogeny. In smaller, immature specimens there is a tendency to be proportionately more elongate or rather subelliptical in outline, whereas in adults the shell is somewhat more rounded to subrectangular. Some individuals may have a tendency to pointedness posteriorly, and frequently the

ventral margin is bowed out in an irregular convexity, giving the outline of the valves a ventral bulge.

Basically the shell is white, but not infrequently specimens may be predominantly purple, cream, or pink. Rayless white specimens do occur, but more often individuals rayed in purple are encountered. The rays are irregular in number, may be interrupted by concentric white bands, and usually widen peripherally.

The fossil history of *H. ludwigii* has been reviewed by Barnard (1962b: 194), who documented the occurrence of the species from the Algoa Bay area, in the Pleistocene, from the following localities: Shark River, The Creek (Ferreira's River), Zwartkops River, Redhouse, Koege River, Coerney, and Bushman's River.

This species appears to inhabit relatively shallow water in sandy substrates. As recorded by Broekhuysen and Taylor (1959: 292), it was taken in a sand bar in the estuary at Kosi Bay, where the pH was decidedly alkaline (8.5–8.7) and there was a considerable range in salinity (21.2–32.9 ppt). Specimens have also been taken in the Morrumbene Estuary. Therefore, this species is not unlike some of the donacids and certain psammobiids in having a preference for estuarine conditions, probably because of the considerable amounts of suspended matter released into the environment by the outflow of the rivers.

Contrary to Barnard (1964b: 543), the specimen named by Tomlin (1926: 301) as *Tellina yemenensis* Melvill is preserved in the Natal Museum (no. 3987) and is not *H. ludwigii;* it is treated in the previous section of this paper separately.

A species closely related to *H. ludwigii* is *H. seychellarum* Bertin (Bertin, 1881: 118, pl. 3, fig. 6a, b). However, this species from the Seychelles is differently shaped, being more nearly rounded and without the ventral bulge often found in *H. lugwigii.* Further, it appears to be completely purple and less frequently, if ever, rayed.

Range. H. ludwigii is found along the east coast of Africa, from at least northern Mozambique to Durban. In the Pleistocene it lived as far south as Algoa Bay but does not live there presently, a situation noted by Schwarz (1910).

Specimens examined. REPUBLIC OF SOUTH AFRICA: Durban (SAM; NM); Durban Bluff (DM; NM); Isipingo, Natal (NM). MOZAMBIQUE: Delagoa Bay (SAM); Kosi Bay; Morrumbene Estuary, near Inhambane (both UCT).

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Nominal genera and species cited in the text are indexed. Regular typeface indicates mention of the name; boldface, the primary discussion of that taxon; italics, an illustration.