

**OCCASIONAL PAPER No. 249**

**Records of the  
Zoological Survey of India**

**Contribution to the knowledge of  
Indian Marine Molluscs (Part - IV)  
Family TELLINIDAE**

**A. DEY**

**ZOOLOGICAL SURVEY OF INDIA**

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**Zoological Survey of India  
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## INTRODUCTION

India has a vast coastal line, with diversified ecosystems offering suitable habitats for divergent faunal groups. Mollusca are an important group and there are only a few important studies dealing exclusively with marine molluscs. There were only a few attempts to revise individual families. It is more particularly true with reference to bivalve molluscs of India. Out of total 117 bivalve families, about 101 families are having their representation from Indian waters. Except for one work on Donacidae (Subba Rao and Dey, 1986) all other work on Indian bivalves is anecdotal in nature and scattered in several old and recent publications in general molluscan fauna. The concept of species has also changed after the description of new species in the last century.

The objective of this paper is to update our knowledge on tellinids of India. The present account deals with the species inhabiting the Indian sea and estuaries. It includes their upto date nomenclature, synonymy, distinctive features, affinity, type locality and range of distribution.

Tellinides constitute one of the most distinctive groups of the shallow water marine molluscan fauna. Represented in all oceans and seas from Polar to tropical regions and these are found from "the level of high water neap tides" (Yonge, 1949) to depths in excess of 600 fathoms (Dall, 1889). The family Tellinidae comprising two subfamilies Tellininae and Macominae, includes mostly marine species with a few extending into estuaries. The Tellininae has tropical and subtropical distribution whereas the Macominae has more representation in the temperate and colder region.

The family 442 species out of which 66 are Indo-Pacific forms. Sixty two species are known from India and 13 known from literature only. The remaining forty nine species have been described here with illustrations. Keys are provided for the genera and species. Ecology of some of the common species is also given.

The systematic arrangement of genera and species is mainly based on Vaught's classification (1989).

Indian Tellinids have been inadequately treated so far. Melvill and Abrcrombie (1893) reported four species from Mumbai. Smith (1899, 1906) described three species from Andaman and Lakshadweep Islands. Preston (1908, 1914, 1915, and 1916) described eighteen new species from Andaman Islands, Chilka Lake and Ennur backwater, Chennai, out of which 13 have been synonymised with the already known species, 2 valid, 2 of them belongs to other families and one type untraced. Gravely (1941) recorded twenty two species of *Tellina* from Chennai coast. Hornell and Tomlin (1951) recorded fifteen species from Mumbai, belonging to the genera *Arcopagia*, *Apolymetis*, *Gastrana*, *Macoma*, *Angulus* and *Tellina*. Patil (1954) listed four genera from Karwar coast. Satyamurti (1956) included five species

from Gulf of Mannar. Kundu (1965) reported six species from Gulf of Kutchch and Cheriyan (1968) reported two species from Cochin harbour. Ray (1968) reported two species from Puri; both of them are synonymies. Surya Rao and Subba Rao (1991) reported five species of tellinids from Lakshadweep, four under genus *Tellina* and one under *Macoma*. Subba Rao *et. al* (1991) recorded thirteen species of tellinids from Orissa coast. Subba Rao *et. al* (1992) recorded seven species of tellinids from West Bengal coast. Subba Rao and Dey (2000) in their catalogue of marine molluscs of Andaman and Nicobar Islands catalogued thirty seven species of tellinids, twenty seven under genus *Tellina*, four under *Macoma*, two under *Psammotreta* and one each under genus *Strigilla*, *Gastrana* and *Macalia*.

Recent studies on Tellinids are those by Afshar (1969) and Boss (1966, 1968 and 1969). The former revised the superspecific groups of the Cretaceous and Cenozoic Tellinidae and the latter studied subfamily Tellininae of Western Atlantic genera and the South African forms. Boss (1968) also studied the morphology of mantle, foot, musculature, siphon and parasiphonal organs, ctenidia, alimentary canal, renopericardial structures, nervous and reproductive systems in two Atlantic representatives of *Eurytellina* viz. *T. (Eurytellina) alternata* Say and *T. (E.) punices* Gmelin.

## MATERIAL AND METHODS

The present work is based mainly on the large number of collections of Tellinids in the National Zoological collections of the Zoological Survey of India obtained mainly from the following sources :

- i. Shore collections from Indian mainland and its adjoining Islands by the Surgeon-Naturalist of the Indian Marine Survey, aboard RIMS 'Investigator' between 1887-1926.
- ii. Collections brought by faunistic survey parties of Zoological Survey of India from coastal areas.
- iii. Specimens received from other institutions for identification.
- iv. The collections were specially made from Gujarat coast, Goa coast, Kakinada Bay (Andhra Pradesh), Kakdwip, Namkhana, Digha (West Bengal) and Andaman and Nicobar Islands.

### Procedural technique

Morphological examination of the shells was carried out with the help of magnifying glass (10x) or under a binocular microscope.

All the measurements are given in millimeters (mm). For each species, largest and smallest were selected for measurement. Shell measurements are given in terms of maximum dimension along the longitudinal axis (Length) maximum dimension along ventral axis i.e.

dorsal to ventral margin (Height) and maximum inflation of the valve when joined (Depth). All these measurements were taken with the help of a dial caliper.

In the descriptive account the usual procedure employed by malacologists is followed for the sake of uniformity.

The habits of *Tellina (Pharaonella) iridescens* (Benson) and *Strigilla (Aeretica) splendida* (Anton) were studied by keeping the living specimens in a galvanised tray containing three inches thick of sand immersed in two inches of sea water from the same locality. Burrowing time was recorded with the help of a stop watch.

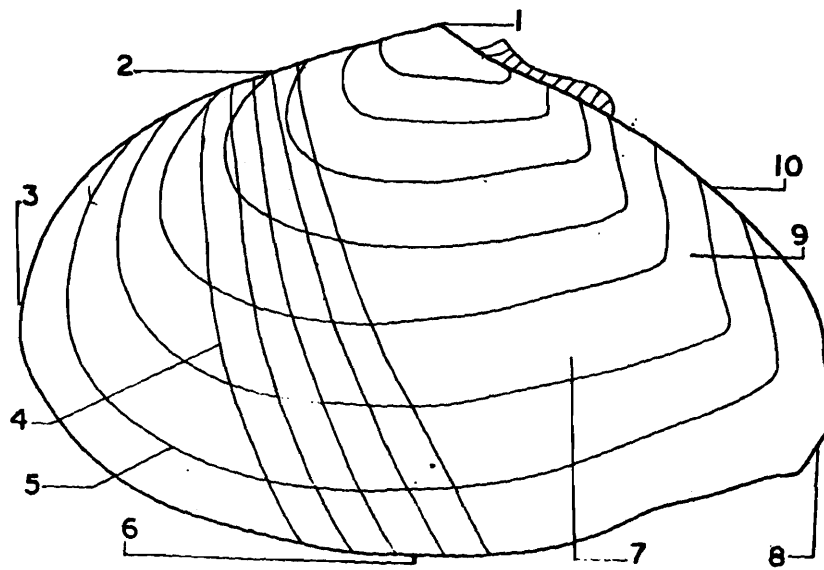
The following abbreviations are been used in the text :

ANSP	Academy of Natural Sciences of Philadelphia, Pennsylvania.
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.
MHNG	Museum d'Histoire Naturelle, Geneva.
MNHNP	Museum National d'Histoire Naturelle, Paris.
NHM	The Natural History Museum, London.
NM	Natal Museum, Pietermaritzburg.
SAM	South African Museum, Cape Town.
UZM	Universitetes Zoologiske Museum, Kobenhavn.
ZSI	Zoological Survey of India, Kolkata.

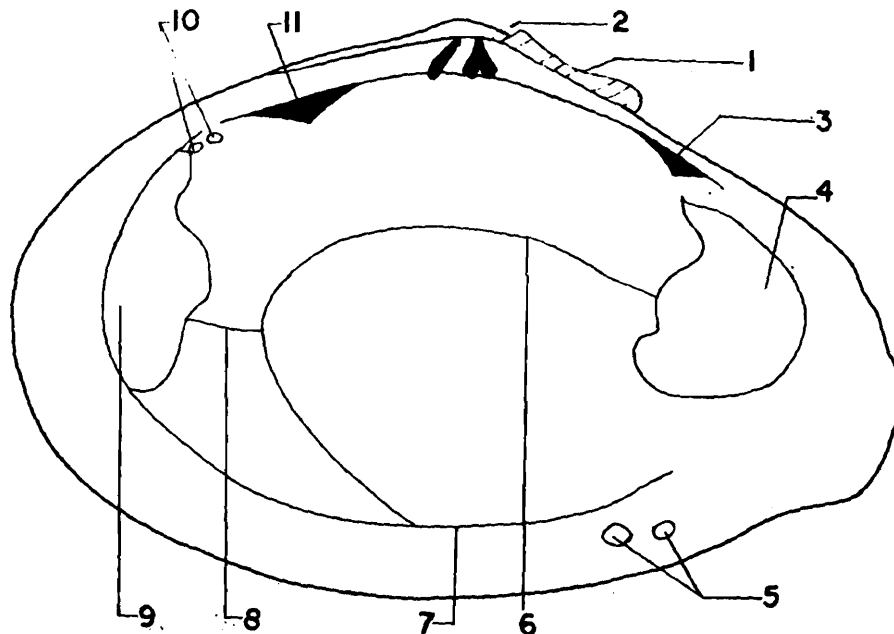
### CHARACTERS OF TAXONOMIC IMPORTANCE

The shells in the family Tellinidae are normally characterised by ovate, orbicular, suborbicular, elongate, inflated or compressed, with more or less pointed or rostrate posterior ends. Shells shows a wide range of variation in form, shape and structure, ranging from very thin (*Macoma*) to thick heavy shells (*Arcopagia*), more elongated (*Dallitellina*), rough and peculiar shape (*Quidnipagus*) or often with spinous outgrowth on the dorsal margin (*Serratina*, *Dallitellina*) or with heavy scales (*Scutarcopagia*) or with oblique scissulation (*Strigilla*). Some of the common characters are the cardinal complex, external ligament, pallial sinus and pallial line, adductor muscle scars, cruciform muscle scars etc.

The important shell characters such as the cardinal teeth, lateral teeth, ligament, sculpture, the impressions of pallial line and pallial sinus, adductor muscle, the cruciform and pedal retractor muscles are useful taxonomic characters (Plate I, figs. A and B).



A



B

Diagrammatic representation of the shell morphology of a generalised *Tellina* (after Boss, 1969).

**Fig. A.** External view of left valve : 1. Umbo. 2. Anterior dorsal margin 3. Anterior margin 4. Oblique sulcus or scissulation 5. Concentric sculpture 6. Ventral margin 7. Disc 8. Posterior margin 9. Posterior slope 10. Posterior dorsal margin

**Fig. B.** Internal view of right valve : 1. Ligament 2. Cardinal complex with single anterior, laminate cardinal tooth and the bifid, posterior cardinal tooth 3. Posterior lateral tooth 4. Posterior adductor muscle scar 5. Cruciform muscle scars 6. Pallial sinus 7. Pallial line 8. Interlinear scar 9. Anterior adductor muscle scar 10. Pedal retractor scars 11. Anterior lateral tooth

**Cardinal teeth** : There are two cardinal teeth in each valve which form the cardinal complex. At least one of these cardinal teeth is bifid and the other is entire, thin and laminate. The anterior tooth of the left valve and the posterior tooth of the right valve are always bifid and the posterior of the left valve and anterior of the right valve are entire, laminate. Interlocking the valves the cardinal complex is supported by a hinge plate and is present in the family Tellinidae and the related families (Semelidae, Donacidae, Asaphidae) under the superfamily Tellinacea. This character is useful in the diagnosis of the family and it is seldom used as diagnostic key character below the family level. Only in the genus *Macalia* this character has been successfully used and found most reliable for differentiating species.

**Lateral teeth** : On the presence and absence of lateral teeth the family Tellinidae is divided into two subfamilies i. Tellinae (with lateral teeth) and ii. Macominae (without lateral teeth). They are beyond the hinge line which serve for interlocking and stabilisation of the two valves. Usually they are two in each valve, one anterior and one posterior. Generally the anterior lateral tooth of right valve is stronger and well developed than the posterior one. The position of the lateral teeth in relation to cardinal complex is very important and distinctive characters in certain groups e.g. *Tellina*, *Tellinella*. The right anterior lateral, distal in the *Tellinides* and *Homalina* anterior lateral incorporated with the cardinal complex, whereas in *Angulus* the teeth proximal to the cardinal complex.

**Ligament** : Ligament is situated behind the umbo i.e. opisthodetic in nature. Usually it consists of an outer sheath which is horny, and a white internal calcareous element supported by the nymphal callosity, which becomes thickened on the hinge line. It is usually short and external but in a few species it is elongate and thin as in the case of *T. (Phylloda) foliacea* Linnaeus, or has a tendency to become internal as in *Tellidora cristata* Recluz.

**Sculpture or external surface** : The sculpture is also very important in taxonomic evaluation. Usually the shell is smooth or with fine concentric striations. In some cases sculpture is separated with oblique scissulation as in the genus *Strigilla*, and subgenera namely *Scissulina* and *Fabulina*. The scale like sculpture in the subgenus *Scutarcopagia* is peculiar. Dorsal spines are determining characters of some of the groups e.g. *Dallitellina*, *Serratina*, *Quadrans* and *Tellidora*. The pattern of sculpture and the thickness of the valves are considered to be adaptive in nature. The heavy shelled species (e.g. *Arcopagia remies* Linnaeus) are found in sand and shelly gravel, whereas fine concentric striae are seen in members inhabiting the muddy sands. This pattern of sculpture may also be acquired from the habit and natural position of the members e.g. *Tellina* (which are sculptured) lies vertically, whereas the *Macoma* (rarely sculptured) lies laterally. Unfortunately there is no quantitative evaluation regarding the relationship of sculpture, the habit and position is lacking.

**Internal surface of shell** : The internal surface of the shell shows impressions of many anatomical traits which have importance in the taxonomic studies. These are the size and position of the adductor muscles, pedal retractor muscles and the cruciform muscles. The shapes of all these muscles are characteristic in allied species. The anterior adductor muscle scar is usually long, narrow and semilunate, whereas the posterior adductor muscle has

unusual ventral extension. The cruciform muscles are paired and usually rounded but the right anterior one sometimes tends to be rectangular.

The pallial sinus formed by the impressions of siphonal retractors and the pallial line by the muscles of the edge of the mantle are important characters. Frequently the pallial sinus is connected with the anterior adductor scar by an interlinear scar. The ventral side of pallial sinus may be partly or fully coalescent with the pallial line.

## GENERAL MORPHOLOGY

Work on the internal morphology of Tellinids is still very inadequate and fragmentary, except for the contributions of Pelseneer (1911), Atkin (1937), Yonge (1949), Graham (1955) and Boss (1966). The following discussion is mainly based on dissections of *T. (Dallitellina) rostrata* Linnaeus *Tellina (Pharaonella) iridescens* (Benson), *Strigilla (Aeretica) splendida* (Anton) *Macoma (Psammacoma) birmanica* (Phillippi) and *M. (Psammotreta) ala* (Hanley) Many of the statements concerning the specific morphological traits are based on the literature.

**Mantle** The mantle is a thin and transparent structure covering the whole visceral mass. It is united dorsally and fused posteriorly, ventrally in the region of the cruciform muscle it is thickened at the edge. The pedal gape is large and extends ventrally from the anterior adductor muscle to the cruciform muscle. Posteriorly the mantle is modified into siphonal apparatus and musculature.

**Foot** The foot is large and laterally compressed extending from anterior adductor muscle to the base of inhalant siphon. The great mobility and usefulness of the foot in burrowing have been described by Yonge (1949). Some species are reported to develop a plantar surface on the foot (Pelseneer, 1911). The vestigial pedal gland and remnants of the byssiferous apparatus have been studied by Carriere (1879) and Barrois (1885). A functional byssus is absent in the adult.

**Musculature** The morphology of the musculature was discussed by Graham (1934). He made a comparative study of the myology of some selected members of the family. The anterior and posterior adductor muscles are large and well developed. The pedal musculature consists of anterior and posterior pedal retractors which are inserted into the foot. The anterior pedal retractor which is separated from the posterior protractor pedis by a small division of the anterior adductor muscle forms a trigonal attachment along the anterior dorsal margin. The anterior retractor inserts deeply into the foot, lies under the protractor pedis fibers and portions of the posterior retractor although some of its fibers lie over those of the posterior retractor.

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

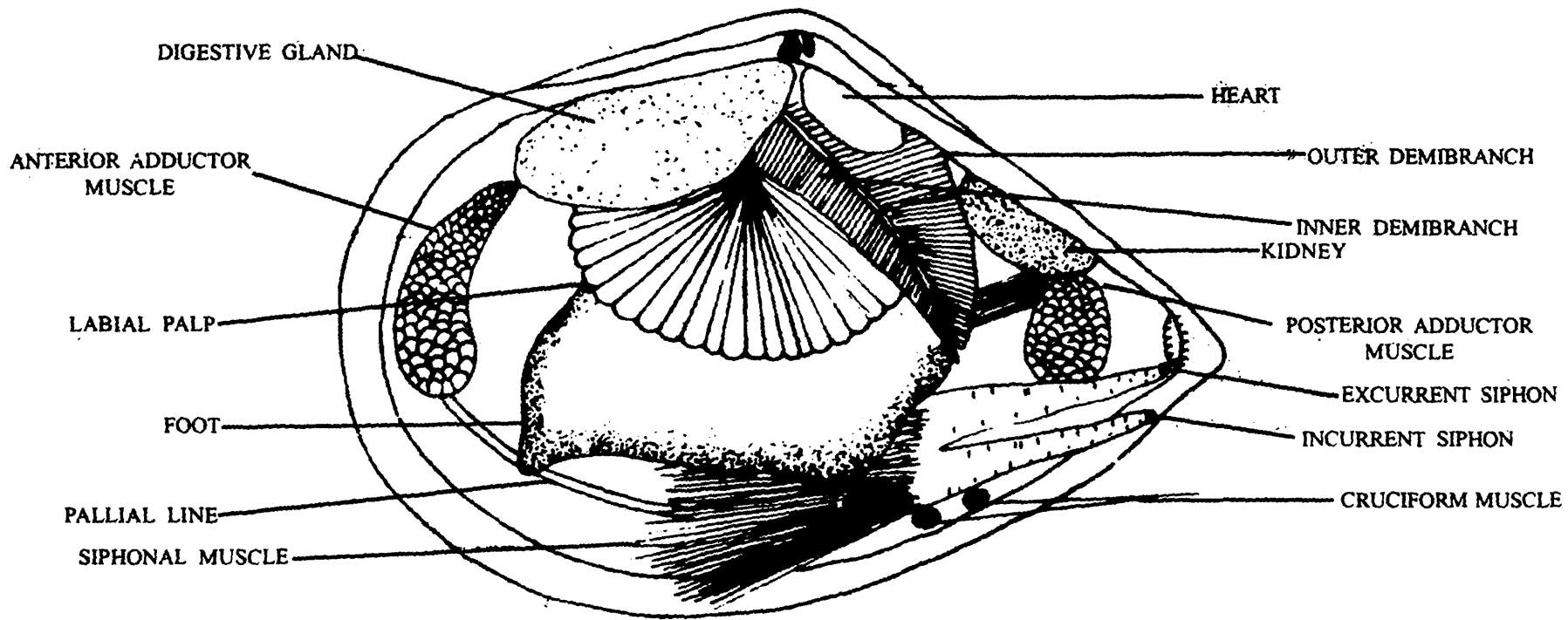


Fig. : Semidiagrammatic illustration of the anatomy of *Macoma (Psammoneca) eda* (Hanley)

The foot and viscera possess many intrinsic muscle fibers while special siphonal muscles and cruciform muscles are developed posteriorly. The size of the pallial muscle is distinctly different in different species and situated out of the pallial sinus or cavity and co-extensive with the muscular lobes of the mantle ventrally.

**Cruciform muscles** : These muscles are present only in the group Tellinacea and it seems reasonable to associate their presence with the formation of long, free siphon together with pedal gapes of maximum size. These muscles consist of two compact bundles of transversely running fibers which stretch diagonally between the shell valves, running through one another in the middle of their length. They lie at the anterior extremity of the posterior fusion of the inner mantle lobes and so immediately ventral to the base of siphons.

There are different opinions regarding the function of these muscles. Von Ihering (1901) proposed that these muscles act as an additional adductor. Graham (1955) showed that these muscles and their associate sensory structures are useful in water testing. The same workers pointed that the *Tellina* and *Macoma* can be differentiated by the nature of sensory pit associated with the cruciform muscle. In *Macoma* the pit is connected to outside by means of a short narrow tube whereas in *Tellina* it is directly in contact with the external medium. Yonge (1949) stated that it acts as a supporting structure for siphons and the sensory pit keeps the animal apprised of the relative position of the siphons.

**Ctenidia and Palps** : These are paired structures situated in the mantle cavity. The labial palps are trigonal, smaller than the ctenidia in the case of *T. (Dallitellina) rostrata* Linnaeus, *T. (Pharaonella) iridescens* (Benson) but in *Macoma (Psammotreta) ala* (Hanley) the labial palps are larger than the ctenidia. The ctenidium consists of a very large inner and a smaller, upturned outer demibranch. The labial palps are folded somewhat in the mantle cavity to form a groove, which leads to the mouth and generally contiguous with the anterior boundary of inner demibranch along a line, known as the distal oral groove (Kellogg, 1915; Graham, 1955).

The gill is unique. The anterior portion lacks the outer demibranch and the inner demibranch extends dorsally and superficially over part of the pericardium. Centrally and along most of the ctenidial length the outer demibranch is present and consists of single dorsally upturned direct lamella. Posteriorly and distally the lamella of the outer demibranch in folds to form a downwardly-directed portion. Both the lamellae are flat and homorhabdic (Ridewood, 1903).

The gill ciliation has been described by Kellogg (1915) for *Macoma secta*, Graham (1934) for *T. crassa* and Atkin (1937) for *T. crassa*, *T. donacina*, *T. fabula*, *T. tenuis*, and *M. balthica*.

**Siphons** : The siphons are two separate, elongated and well developed structures, made up from the posterior portion of the mantle. The tip of the inhalant siphon is bordered by six blunt lobes but in the exhalant siphon it is somewhat constricted.

**Alimentary canal** The structure of the alimentary canal was figured by Deshayes

(1848) for *T. nitida*. The functional adaptive significance of the morphology of the digestive system has been illuminated by the works of Graham (1949), Yonge (1949), Owea (1955) and Purchon (1960).

The oesophagus is straight, relatively long and enters the stomach anteriorly. The stomach consists of a medial globular portion and posterior ventral extension, the style sac. The style sac unites with the midgut. The midgut is long and more coiled in the *Macoma (Psammotreta) ala* (Hanley) than in *T. (Dallitellina) rostrata* Linnaeus, which terminates at the beginning of the rectum and its entrance into the pericardium. The rectum traverses the ventricle, passes out the pericardium, and continues around the dorsal ectad surface of the posterior adductor muscles to terminate in an anus near the opening of the excurrent siphon.

**Reno-pericardial structures** : The reno-pericardial structures in *Macoma balthica* are described by Odhner (1912). The kidney lies between the heart and the posterior adductor muscle and is traversed by portions of the posterior pedal retractor. The heart is simple; the pericardium is located dorsally between the kidney and digestive diverticula and may be superficially covered by the dorsal extension of the inner demibranch. The heart consists of two large, laterally paired, thin walled auricles connected with muscular ventricle which is traversed by the rectum (Boss, 1969).

**Nervous system** : The nervous system of tellinids is similar in pattern to that of the other lamellibranchs and is more alike in its general aspect to that of *Psammobia vespertinalis* (Duvernoy, 1853) and *Gari tellinella* (Graham, 1934). Boss (1966) mentioned that the paired cerebro-pleural ganglia situated anterior to the fusion of the labial palps on the entad surface of the anterior adductor muscles, united by a thin dorsal commissure, give rise to the anterior pallial nerves, which coarse cover the external surface of the anterior adductor muscles and innervate the pallial muscles of the mantle and short ramus which enters the anterior adductor muscle. On the postero-ventral side of the cerebro-pleural ganglia and the cerebro-pleurai connectives arise which lead to pedal ganglion in the foot. Pedal ganglion sends branches to the intrinsic muscles of the foot, certain portion of the alimentary canal, the digestive diverticula and pedal retractors. The cerebro-pleural ganglia which are partially united as visceral ganglion that gives rise to branchial nerves to ctenidia, a small anterior nerve to kidney and distinct ramus innervate the posterior adductor muscle and forms the dorsal pallial nerve. The ramus divided for siphonal retractor muscles, another branch to cruciform muscles and another to siphonal organs.

**Reproductive organs** : *Tellina* spp. are dioecious. Gonad is embedded in the foot and surrounds much of style sac and mid gut (Odhner, 1912). The time of spawning varies from species to species and with different ecological conditions prevailing in various geographical localities. Odhner (1914) recorded the fifteen days pelagic stage of tellinid larvae in middle of May. Boss (1968) obtained different stages of larvae of *T. agilis* from Prince Edward Island from July to August. It seems that the temperature plays a very important role on the time of spawning. The settling spat appears to be brightly coloured, particularly the purple umbonal region. The pelagic larval stage and its length permit the distribution of species by

currents. These species with a greater range probably have longer larval periods whereas those with shorter pelagic stages many tend to have a restricted distribution (Boss, 1966). The substrate specificity for settling larva has never been investigated. Studies of complete life history in tellinids are also lacking.

### HABITS AND HABITAT

Our knowledge on habits and habitat of tellinids is far from satisfactory. The reason may be due to their burrowing habit in the mud or sand extending to depth upto about eighty fathoms making it difficult to study these in situ.

A review was done to give an outline on the habits and habitat of tellinids based mainly on the available literature and author's own observations is given below :

Fraser (1932) observed that the *Macoma balthica* is abundant wherever there is thick mud in Dingle beach but becomes less in sand or thin mud. The mud between the stones may be quite as good as a medium for this species, as the thick mud. The number increases in the low water level. It is less abundant in the sandy area perhaps due to absence of scent food material.

Stephen (1932) studied the biology of two species, *Tellina tenuis* and *T. fabula* in Kames bay. He observed that *T. tenuis* breeds in summer. The growth rate in shallow water was less at low water mark and it extends upto two and half fathoms. *T. fabula* lives upto ten fathoms in the sandy area of shallow water.

Spooner and Moore (1940) observes that the tellinids are uniformly distributed in the Tamar estuary uniformly through the tidal zone. Yonge (1949) observes *Tellina* inhabit different grades of sandy substratum at varying depths. He observed that *T. tenuis* were intertidal extending to a depth of few fathoms. They may inhabit of fine or coarse sand contains organic debris. Stephenson (1932, 1933) found that *T. fabula* overlapped with the region immediately below water level and extended to depths of thirty fathoms, whereas *T. balustinn* lives in fine sand at depth of a eighteen to thirty fathoms (Jeffreys, 1863). *T. crassa* and *T. pygmaea* (= *T. pusilla*) lived in coarse sand gravel and extend upto a depth of fifty to eighty fathoms (Ford, 1923). *T. donacina* inhabited coarse and gravel from shallow depths to about twenty five fathoms.

Homle (1961) observed the mode of life of *Tellina crassa*, *T. fabula*, *T. domacina*, *T. pygmaea*, *T. squalida* and *T. tenuis*. These species lives burrows into sand, mud or gravel and maintaining connection with overlying water by their long extensive siphons. They are found to occupy more or less vertical position when burried but a few lie beneath the surface and majority of them excavated at low tide by their sides.

The influence of oxygen concentration on the behaviour of tellinids is variable. *M. balthica* overcomes the oxygen deficiency in the beach during the tidal exposure by moving

upwards and fully exposing itself to the surface of the sand where the entire mantle edge is brought into contact with better oxygenated surface water lying between the sand ripples (Brefield, 1963).

The burrowing habit of the tellinids along with some other bivalves was studied by Trueman *et al.* (1966). They remarked that the penetration was most easily done in the sand with the largest particle size by a margin of 20% over the fine sands. The burrowing rate of *Donax* in the same sand showed the greatest speed in the finer more resistant substrates, indicating that besides simple physical penetration other factors are involved.

Stephen (1929) has shown that *Macoma* spp. are inhabitants of inter-tidal water where clean sand is replaced by mud, often in black and foul smelling sand. Beanland (1940) suggest that the abundance of *Macoma* in estuaries possibly depends on two factors a) quality of available food supply, correlated with the type of soil, b) available feeding time, correlated with distance below high water mark. Peterson (1915) observes that *M. calcarea* lives at greater depths but also on a mud bottom in association with *Abra alba*. The genus *Macoma* is said to include species adapted to live on muddy substratum.

Yonge (1949) made some observations on *M. balthica* collected from area of thick muddy sand in Ballock bay, Isle of Cumbrae. The animals are large, with more rounded shell than in *T. tenuis*. Burrowing takes place in the same manner but slower, the process usually taking about 2½ minutes depending on the shape of the shell. In Indian tellinids, Subramanyam *et al.* (1949) attempted to study the behavior of some species on Mumbai coast. They observed that the tellinids preferred mud and sand more than the cockles, but the waves prohibited them to come up to the surface. Living specimens were found sometime in mudflats lying on other side and prefer to live in water containing green volvocales and diatoms. In this exposed position birds, like gull and crow pick them up for food. Sometimes the sudden waves dash them against the shore, but majority of them manage to slip down into the mud and save themselves.

The ecology of a few species occurring in Beyt Island (Gujarat), Kakinada Bay (Andhra Pradesh), Kakdwip, Namkhana, Bakkhali and Digha (West Bengal) were studied.

Kakinada bay is situated on the east coast of India between 81° 15' and 81° 22' E longitude 160° 51' and 17° N latitudes. The bay is shallow and occupies a total area of a little over 132 sq. kms, the widest part being about 15.2 kms in the centre of the bay. It is bounded by the main land on the western side, by the marshy mangroves on the southern side and a sand bar on the eastern side. It opens through a wide mouth into the Bay of Bengal on the north. A number of interconnecting creeks and a few narrow river branches open into the bay. Three irrigation canals on the southern side of Kakinada town join together into Kakinada canal which opens into the bay. There are extensive mudflats on the western and southern sides. The mudflats on the south-western side are exposed to the extent of 0.5 to 0.8 km. during the low tide. The western mud flats are largely made up of clays and contain a considerable amount of organic carbon. There is a faint smell of hydrogen sulphide owing

to the decaying materials. The southern flat area somewhat different in nature consisting of patches of silty clays, clayey sand, sand-silt-clay and sand; the percentage of organic carbon is less than that in the western mudflats. *Tellina* spp., are very common in these mudflats. The species density was also very high. The density of animals is more in the north western and western part. The living and dead animals are frequently found in the sandy area i.e. towards the northern part of the bay. The other species *Tellina (Pharaonella) iridescens*, *Macoma (Psammacoma) birmanica* (Philippi) prefer lower salinity and are estuarine in nature.

The Beyt Island is situated about 2 kms east of Okha in the Gulf of Kutchch at a longitude of 69° 05' E and a latitude of 22° 28' N. The nature of the beach differs from region to region. The northern side is known as the Hanuman-dandi which is constituted mainly of limestone rock, with secondary coral formation. The other side is known as Balapur which is a mudflat, having gravel mixed sand mud with upper hard mud and lower loose sand areas.

The salinity ranges from 35.46 to 36.73%, oxygen concentration 5.3-6.7 ppm; phosphate 0.1-1.05g atom/l and nitrate content 2.0-11.5 g atom/l. The water temperature ranges from 20° to 30°C, the lowest being in Jan.-Feb. and maximum in June-July

The low water spring tides occur along Balapur during March to August in the morning hour and in the remaining months in the evening hours. The maximum height is 4.28 m while low tide 0.34 m (Indian tide table). The Beyt-Balapur beach is exposed about ½ to 1 ½ Kms during low tide. The outer zone is mainly sandy in nature. The middle region consists of loose mud about two meters depth. *Cerithidea cingulata* are very common on the outer region of beach at about 50 nos./sq. meter but their number gradually reduces in and almost absent in the low water region. In the middle region *Macoma (Psammotreta) ala* (Hanley) is very common at depths from 5 to 15 cm at the average density of 10.2 nos./Sq. meter area.

These animals are locally known as *Kadila*, a term which is used for all types of clams. They are found in mid littoral zone, especially where the organic debris is very common. Observations made on specimen collected from areas of muddy sand of Beyt-Balapur bay. The animals are 26.10-17.60 mm. long and 19.16-12.45mm. width. The foot protrudes, extends forward and anterior end enters into the sand, the posterior end remains pointed upwards. When the animal is completely buried it lies in vertical position and siphons are extruded. The siphons extend upto 4-5 cms above the substratum level. The time taken for the entire process of burrowing from the first extrusion of the foot to final disappearance under the sand is 90 to 120 seconds. When the animals are placed upside down with the umbonal side downwards they lie inactive for sometime. They also attempt to tilt the body downwards with the help of foot, if they succeed then they burrow in the same process, otherwise they remain completely inactive.

Some observations are also made in the Narayan Sarovar and Mandvi (Kutchch) district of Gujarat. The backwater at Narayan Sarovar (Kutchch) is stretched over about 15 Kms. width. It is connected with the Kori Creek at a point about 2 Kms from the Koteswar temple

with 40-50 cm depth of water. The top layer of the muddy bottom is yellowish but below the surface level (2.5 cm depth) it is blackish. The organic content is very high in some places and the hydrogen sulphide.

The Rukmavoti Creek, Mandvi (Kutchch) is sandy with a few muddy patches here and there. About a kilometer of the canal is exposed during the low tide. During high tide the canal is full with water and appears like a river. The mud upto 2-3 cms depth appears yellowish and below that is black in colour probably due to high organic content. The smell of hydrogen sulphide is very common on the muddy area. Frequent patches of green algae are found in the muddy area buried in the mud at a depth of 2 to 5 cm with a population density of about 3-5 nos./sq. meter area in both the places is noticed. The burrowing process is same as in *Macoma (Psammotreta) ala* (Hanley) but the time required for the entire process is 70 to 90 seconds.

Observations are also made at Kakdwip and Namkhana areas of Muriganga estuary, a part of Hughli estuary on West Bengal coast. Muriganga is a branch of river Hughli and flows into Bay of Bengal near Frasersganj. This river separates Kakdwip from Sagar Island and has a number of small Islands near its mouth like Ghoramara, Lohachara, Kankramarichara, Mousumi ect. At Kakdwip a small branch known as Ghiapata is given off from main river Muriganga. The Ghiapata branch receives a few canals from Kakdwip side and meets the main river about 3 Kms south-west of Kakdwip town. A small Island called Majnachara has come up between the main river and its branch known as Hathania-Duyania, which connects to Saptamukhi river.

Temperature varies from 19°C to 32.5°C, salinity varies from 1.5% to 32.77% with only one peak during the pre-monsoon period, March-June (Jhingran, 1978). Three species are common in this region. *T. (Pharaonella) iridescens* (Benson) common in the Kakdwip and Namkhana areas, *M. (Psammacoma) birmanica* (Phillippi) in the muddy bed of the river Muriganga at Chemaguri, Sagar Island and *Strigilla (Aeretica) splendida* (Anton) found in the muddy areas of Kakdwip and Namkhana. The present study reveals that *T. (Pharaonella) iridescens* (Benson) and *M. (Psammacoma) birmanica* (Phillippi) occurs in less saline areas of Muriganga estuary, but *S. (Aeretica) splendida* (Anton) can tolerate even higher saline waters. The population varies from 1.6 to 22.8 nos./sq. meters on an average. The maximum population is observed during June/July and minimum during Feb./March. It breeds in the river from March to May when the salinity content is higher.

## CLASSIFICATION

The credit of putting an order into classification of Tellinidae goes to H. and A. Adams (1858) who proposed order Veneracea include ten families. Order Veneracea was corrected by Newell as Veneroida, which included the super family Tellinacea. Adams and Adams (1858) recognised four subfamilies Tellininae, Donacinae, Scrobiculariinae, Paphiinae under the family Tellinidae. Stoliczka (1870) included Garinae, Tellininae, and Capsinae under the

family Tellinidae of the super family Tellinacea. Thiele (1935) treated Tellinacea as "Stripe" of the order Eulamellibranchiata and included the families Donacidae, Psammobidae, Semelidae and Tellinidae. Cotton and Godfrey (1938) treated Tellinacea as a super family of the order Teleodermacea and supported the classification of Thiele. Abbott (1953) followed the same classification but he used the same Sanquinolaridae for the Psammobiidae. Myra Keen (1969) accepted the super family Tellinacea and followed the same classification but divided the family Psammobidae into Garidae and Solecurtidae.

Newell (1965) included the superfamily Tellinacea under the Veneroidea which included ten families including the family Tellinidae.

The most recent classification is given by Vaught (1989). He divided this family into two subfamilies, included 14 genera and 63 subgenera. The classification proposed by Vaught has been followed with some changes at the sub generic level.

#### Superfamily TELLINACEA

Animal with two elongate siphons that are not fused, inequilateral valves with external ligament or if sunken, in pit on hinge plate. Cardinal teeth two in each valve, tending to bifid, lateral teeth well developed, adductor muscle scars connected by pallial line with distinct sinus.

#### Family TELLINIDAE

Gill sub lamellibranchiate, non plicate, posterior, small, outer demibranch directed to dorsal side, labial palps very large and united on the posterior side. Foot compressed and short, Mantle margin papillose with a pedal gap, Siphon long, extensive, separated into two at the base, capable of retraction into extensive pallial sinus. Ligament external, opisthodontic and subtended by nymphal callosities, Cruciform muscles posterior, byssal apparatus obsolete. Animal dioecious, marine.

**Shell** : Small to large, usually ovate sometimes orbicular or suborbicular, elongated, more or less pointed or rostrated posteriorly, inflated or compressed. Thin to heavy, usually white, often maculated or rayed with yellow or red or suffused with some colours. Valves unequal, left slightly larger than the right. Sculpture varied. Umbo inflated, medium, more or less pointed. Hinge with two cardinal teeth in each valve, the anterior in left and posterior in right valves are bifid. Lateral dentition present or absent, when present dentition of right valve stronger than the left. Adductor muscle scars varies; anterior usually larger and elongate. Pallial sinus large, ventral edge of which partly confluent with the pallial line. Geologically the family dates back to Cretaceous period. Based on the character of lateral teeth the family is divided into two subfamilies i) Tellininae, ii) Macominae.

## SYSTEMATIC ACCOUNT

### List of Indian Species

- |      |  |   |
|------|--|---|
|      | Subfamily                                | TELLININAE                              |
|      | Genus                                    | <i>Tellina</i> Linnaeus                 |
|      | Subgenus                                 | <i>Tellina</i> s.st.                    |
| *1   | <i>Tellina costata</i>                   | Deshayes                                |
| *2.  | <i>Tellina rubella</i>                   | Deshayes                                |
| *3.  | <i>Tellina scapellum</i>                 | Hanley                                  |
| 4.   | <i>Tellina unguis</i>                    | Preston                                 |
| *5.  | <i>Tellina vestalis</i>                  | Hanley                                  |
| *6.  | <i>Tellina viator</i>                    | Preston                                 |
|      | Subgenus                                 | <i>Angulus</i> Mergerle von Muehlfeld   |
| *7.  | <i>Tellina (Angulus) colarata</i>        | Dall                                    |
| 8.   | <i>Tellina (Angulus) corbuloides</i>     | Hanley                                  |
| 9.   | <i>Tellina (Angulus) incisa</i>          | Preston                                 |
| 10.  | <i>Tellina (Angulus) lanceolata</i>      | Wood                                    |
| *11. | <i>Tellina (Angulus) rhodon</i>          | Hanley                                  |
| 12.  | <i>Tellina (Angulus) rhomboides</i>      | Quoy and Gaimard                        |
|      | Subgenus                                 | <i>Cadella</i> Dall, Bartsch and Rehder |
| *13. | <i>Tellina (Cadella) lechriogramma</i>   | Melvill                                 |
| 14.  | <i>Tellina (Cadella) semen</i>           | Hanley                                  |
|      | Subgenus                                 | <i>Dallitellina</i> Afshar              |
| 15.  | <i>Tellina (Dallitellina) rostrata</i>   | Linnaeus                                |
|      | Subgenus                                 | <i>Eurytellina</i> Fischer              |
| *16. | <i>Tellina (Eurytellina) alfredensis</i> | Bartsch                                 |
|      | Subgenus                                 | <i>Hemimetis</i> Theile                 |
| 17.  | <i>Tellina (Hemimetis) angulata</i>      | Linnaeus                                |
|      | Subgenus                                 | <i>Homalina</i> Stoliczka               |
| 18.  | <i>Tellina (Homalina) myaeformis</i>     | Sowerby                                 |
|      | Subgenus                                 | <i>Moerella</i> Fischer                 |
| 19.  | <i>Tellina (Moerella) ostracea</i>       | Lamarck                                 |
| 20.  | <i>Tellina (Moerella) philippinarum</i>  | Hanley                                  |





### Key to the subfamilies

- Sculpture various, lateral teeth present at least in one of the valves ..... TELLININAE
- Sculpture generally more subdued, lateral teeth are absent in both the valves ..... MACOMINAE

#### Subfamily **TELLININAE** de Blainville

#### Key to the genera

- 1 Sculpture concentric or with fine radial striae ..... (2)
  - Sculpture with flexous scissulation in both the valves ..... *Strigilla* Turton
2. Shell orbicular shape, solid; Pallial sinus not close to anterior adductor scar .....
  - Shell ovate, elliptical or subrectangular, not solid, Pallial sinus close to or touching anterior adductor scar ..... *Tellina* Linnaeus

#### Genus *Tellina* Linnaeus

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

Shell large to small, ovate or elliptical, unequal and the left being generally more convex than the right valve. Shells are fragile to solid. Sculpture generally concentric. Hinge with cardinal and lateral dentitions. Cardinal teeth are two in each valve; the left anterior and right posterior bifid, whereas the left posterior and right anterior thin, laminated. Lateral dentition variously formed. Shell white to highly coloured.

Based on the position and number of lateral teeth, pallial sinus and sculpture, thirteen subgenera have been recognised under the genus *Tellina* from Indian waters. They are *Angulus*, *Dallitellina*, *Hemimetis*, *Homalina*, *Moerella*, *Pinguitellina*, *Pharaonella*, *Phylloda*, *Quidnipagus*, *Scutarcopagia*, *Serratina*, *Tellinella* and *Tellinides*.

#### Key to the Subgenera

- 1 Lateral teeth two in the right valve ..... (2)
  - Lateral teeth one in the right valve ..... (3)
2. Pallial sinus close or touching anterior adductor scar ..... (9)
  - Pallial sinus not close or touching anterior adductor scar ..... (5)

3. Lower margin of pallial sinus entirely coalescent with pallial line .....(4)
  - Only half of the ventral margin of pallial sinus coalescent with pallial line .....  
..... *Phylloda* Schumacher
4. Pallial sinus not close to anterior adductor scar ..... *Tellinides* Lamarck
  - Pallial sinus close to anterior adductor scar ..... *Angulus* Muehlfeld
5. Only half of ventral margin coalescent with pallial line .....(6)
  - More than half of ventral margin coalescent with pallial line .... *Pharaonella* Lamy
6. Sculpture of concentric striae .....(7)
  - Sculpture consisting of scales on the body ..... *Scutarcopagia* Pilsbry
7. Shell with spinous rows along the dorsal margin ..... *Dallitellina* Afshar
  - Shell without spinous rows along the dorsal margin .....(8)
8. Sculpture of concentric lamellae only ..... *Hemimetis* Thiele
  - Sculpture of fine concentric striae or ridges ..... *Pinguitellina* Iredale
9. Umbone anterior .....(10)
  - Umbone central or posterior to the mid line ..... (11)
10. Sculpture with lamellate undulations ..... *Quidnipagus* Iredale
  - Sculpture with concentric striae ..... *Homalina* Stoliczka
11. Umbone central .....(12)
  - Umbone posterior to mid line .....(13)
12. Sculpture of fine concentric striae only ..... *Tellinella* Moerch
  - Sculpture with predominate concentric striae, more or less regularly spaced, incised sulcation ..... *Serratina* Pallary
13. Shell heavy, strong, and with strong lateral teeth *Cadella* Dall, Bartsch and Rehder
  - Shell not heavy and with weak lateral teeth ..... *Moerella* Fischer

Subgenus *Tellina* s. st.

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

Shell large to medium, moderately thick, elongate-subelliptical and flexed to the right posteriorly. Sculpture smooth, with fine concentric striae; radial sculpture rare. Hinge with

cardinal and lateral dentitions. Cardinal teeth are two in each valve, left anterior and right posterior are bifid. Lateral teeth in the right valve distal and strongly developed, whereas in the left valve more or less poorly developed and equidistant from the cardinal complex. Pallial sinus large, extending near to anterior adductor scar and descending arcuately to the pallial line. Pallial sinus posteriorly confluent with the pallial line about half of its ventral length. Adductor muscle scars well impressed.

This group is very common in Western Atlantic and Indo-pacific.

*Geological range* : Tertiary to Recent.

1. *Tellina unguis* Preston  
( Pl. I, fig. 1 )

1916. *Tellina unguis* Preston, *Rec. Indian Mus.*, **12** : 98, fig. 16, (type locality, Bamboo flat, Port Blair, Andamans).

*Material examined* Andamans : i) 1 ex., Bamboo flat, Andamans, Holotype.

*Measurements (mm)* :

Length	Height	Depth
7.25	4.75	—

*Description* : Shell elongately ovate, thin, transparent, light yellowish. Umbo small, pointed and posterior; anterior margin rounded, ventral margin convex; anterior dorsal margin straight and gradually sloping; posterior dorsal margin short, straight and sloped; posterior margin obtusely rostrated. Sculpture almost smooth, only very fine concentric striae present near the umbonal region.

In the left valve the cardinal complex consist of an equal bifid anterior tooth; and a small posterior tooth, laterals are absent. In the right valve the cardinal complex consist of strong deltoid anterior tooth and equally bifid posterior tooth, anterior one stronger than posterior; laterals absent.

*Remarks* : This species is described from Andamans and the only record so far.

*Range* : India.

*Distribution* : India : Andaman Islands.

Subgenus *Angulus* Megerle von Muehlfeld

1811. *Angulus* Megerle von Muehlfeld, *Gesellschaft Naturforschen der Freunde Berlin. Magazin*, **5** : 57: (type-species, *Tellina lanceolata* Gmelin 1791, subsequent designation Gray, 1847).

Shell large to small, elongately ovate, generally compressed. Sculpture of fine concentric striae. Hinge with cardinal and lateral dentitions. Cardinals two in each valve, the left anterior

and right posterior bifid. Lateral teeth absent in the left valve; but in right valve the laterals present and adjacent to cardinal complex. In some species they may be obsolete, left anterior lateral corresponding to the one on the right valve. Pallial sinus of various sizes, extensive and confluent with the pallial line at the ventral margin. Adductor muscle scars well impressed.

*Geological range* : Recent.

Six species were reported from India but material is available for only the following four species.

**Key to the species**

- 1. Sculpture with prominent concentric striae ..... *T.(A.) rhomboides* Quoy & Gaimard
  - Sculpture smooth or with very fine concentric striae .....(2)
- 2. Shell lanceolate with pointed posterior end, anterior lateral teeth not prominent, pallial sinus at a distance from the anterior adductor scar ..... *T.(A.) lanceolata* Gmelin
  - Shell corbular or oval, anterior lateral teeth prominent, pallial sinus close or near to the anterior adductor scar .....(3)
- 3. Shell corbular, thick, pallial sinus touching anterior adductor scar, posterior end beak like ..... *T.(A.) corbuloides* Hanley
  - Shell oval, not so thick, pallial sinus not touching anterior adductor scar, posterior end not beaked ..... *T.(A.) incisa* Preston

**2. *Tellina (Angulus) corbuloides* Hanley**  
( Pl. I, figs. 2 & 3, Pl. IV, fig. 1 )

1844. *Tellina corbuloides* Hanley, *Proc. zool. Soc. Lond.*, p. 70, (type locality, Catbalenga. Isle of Samar: Syntypes NHM 1976130).

*Material examined* : Andaman and Nicobar Islands : i) 4 ex., Andaman.

*Measurements (mm)* :

Length	Height	Depth
15.23-12.10	10.10-8.08	6.00-4.00

*Description* : Shell corbuloid, solid, inequivalve, more or less ventricose; white and rosy colour especially on the umbonal region and on the interior. Umbo pointed, elevated and almost middle. Anterior margin rounded; ventral margin convex and descending posterior; anterior dorsal margin and posterior dorsal margin straight, gradually sloping; posterior margin short, pointed and forms a beak like structure; sculpture of very fine close concentric striae; radial striae absent; ligament small, sunken, dark brown colour; lunule narrow and short.

In the left valve the cardinal complex consist of an equally bilobed anterior tooth and a small thin posterior tooth; lateral teeth absent. In the right valve the cardinal complex consists of a small anterior tooth and a bilobed posterior tooth; lateral teeth are present with more prominent anterior lateral.

Muscle scars well developed. Anterior adductor scar elongate, semilunar, posterior adductor scar almost oval with elongated anterior end. Cruciform scars two rounded, posterior one larger than the anterior. Pallial sinus equal in both the valves, sinus ascending posterior and descending anteriorly with arcuated anterior end touching the anterior adductor scar and falling obliquely to the pallial line and confluent with it.

*Remarks* : *T. corbuloides* Hanley can be distinguished from the other species by its corbuloid shape, pallial sinus, pallial line and adductor muscle impression.

*Range* : India to Philippines.

*Distribution* : India : Andaman and Nicobar Islands; *Elsewhere* : Philippines.

### 3. *Tellina (Angulus) incisa* Preston ( Pl. II, fig. 2 )

1908. *Tellina incisa* Preston. *Rec. Indian Mus.*, 2 : 209. pl.17, fig.59. (type locality. Andaman Islands. Holotype. ZSI).

*Material examined* : Andaman and Nicobar Islands : i) 1ex., Andaman Islands.

*Measurements (mm)* :

Length	Height	Depth
21.00 11.90	3.85	—

*Description* : Shell medium, thin, elongately ovate, compressed, inequivalve; white and rosy colour mainly on the posterior side; Umbo posterior, pointed and elevated. Anterior margin rounded; ventral margin convex; anterior dorsal margin straight and gradually sloping; posterior dorsal margin short and slightly sloping; posterior margin short, arcuated; sculpture smooth with fine close concentric striae; radial striae absent. Ligament short and narrow; lunule almost absent.

In the left valve the cardinal complex consists of bilobed anterior tooth and a lamellar posterior tooth; lateral teeth absent. In the right valve the cardinal complex consists of a thin lamellate anterior tooth and an equal bilobed posterior tooth; anterior lateral small and adjacent to the cardinal complex; posterior lateral absent.

Muscle scars well impressed. Anterior adductor scar elongate, and larger than the posterior adductor scar. Cruciform scars two closely placed, oval. Pallial sinus equal in both the valves, sinus ascending anteriorly for a short distance and then descending with a rounded anterior and close to anterior adductor scar; ventral margin confluent with pallial line.

**Remarks** : This species is not recorded after its original discovery. It is distinguished by its elongately ovate shape and its sculpture.

**Range** : India only.

**Distribution** : India : Andaman Islands, endemic.

**4. *Tellina (Angulus) lanceolata* Gmelin**  
( Pl. II, fig. 1, Pl. IV, fig. 2 )

1772. *Tellina lanceolata* Chemnitz, *Conch. Cab.*, 6 : 111.t.11, fig. 103, (type locality. East Indian Sea).

1791. *Tellina lanceolata* Gmelin, *Syst. Nat.*, ed. 13 : 3236.

1818. *Psammotaea pellucida* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 5 : 517.

**Material examined** : Andaman and Nicobar Islands : i) 1 ex., 2 valves, Andamans; Orissa ii) 1ex., Puri.

**Measurements (mm)** :

Length	Height	Depth
37.85-28.71	16.91-13.14	5.20-4.50

**Description** : Shell medium, elongate, oblong, thin, sublateral, more compressed, inequivalve, with the right one more concave, slightly gaping at the ends; white with suffused rose colour valves. Umbo central, pointed and slightly elevated; anterior margin rounded; ventral margin slightly convex and a little emergent posteriorly; anterior dorsal margin gently sloping; posterior dorsal margin steeply inclined, slightly concave; posterior margin lanceolate; sculpture of closed concentric striae; radial striae almost absent. Ligament small, dark-brown, situated at ligamental groove; lunule almost absent. Posterior umbonal fold moderately developed but obsolete in the left valve.

In the left valve the cardinal complex consists of a bifid anterior tooth and a lamellar posterior tooth; laterals absent. In the right valve the cardinal complex consists of a thin, lamellate anterior tooth and a bifid equal lobed posterior tooth; only small anterior lateral present, adjacent to the cardinal complex.

Muscle scars moderately impressed. Anterior adductor scar elongate and larger, posterior adductor scar orbicular, smaller. Cruciform scars closely placed and oval in shape. Pallial sinus equal in both the valves; sinus rises anteriorly after a short distance it descends with a rounded anterior end and falls on the pallial line, the ventral margin entirely coalescent with the pallial line.

**Remarks** : This species can be distinguished by its elongate, lanceolate shape, fine concentric sculpture and pallial sinus. The posterior region is elongated and contains the ridges which is a prominent character. This species appears to be rare. Only five valves recorded so far from India. Boss (1969) pointed out some similarities between *T. lanceolata* and *T. canonica* Salisbury.

*Range* : India to Philippines.

*Distribution* : India : Orissa and Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

5. *Tellina (Angulus) rhomboides* Quoy and Gaimard  
( Pl. II, fig. 3 )

1835. *Tellina rhomboides* Quoy and Gaimard, *Voy. Astrolabe*, 3 : 502, pl.81, figs.4-7. (type locality, not mentioned).
1835. *Tellina clathrata* Deshayes in Lamarck. *Hist. Nat. Anim. Sans. Vert.*, 6 : 208.
1846. *Tellina lauta* Gould, *Expt Shells*, p.79.
1846. *Tellina compta* Gould, *Expt Shells*, p.79.
1855. *Tellina silicula* Deshayes, *Proc. zool. Soc. Lond.*, 1854 : 363.
1867. *Tellina texturata* Sowerby in Reeve, *Conch. Icon.*, 17, *Tellina*-sp.no 233, pl.41, fig.233, pl45. fig.233b,(type locality, not mentioned).
1914. *Tellina confusa* Preston, *Rec. Indian Mus.*, 10 : 309, figs.18a, 18b, (type locality, Lake Chilka, Orissa).

*Material examined* : Orissa i) 2 valves, Lake Chilka.

*Measurements (mm)* :

Length	Height	Depth
9.41-7.94	5.55-5.20	—

*Description* : Shell elongate, narrow, more or less triangular; pale yellow or white. Umbo pointed and posterior; anterior margin rounded; ventral margin more or less straight; anterior dorsal margin straight but with abrupt slope; posterior dorsal short and slightly concave; posterior margin short angular and beaked and with a posterior umbonal ridge. Sculpture with prominent concentric striae; radial striae absent; ligament short.

In the left valve the cardinal complex consists of an equal bilobed anterior tooth and a lamellar posterior tooth; lateral teeth absent. In the right valve a single deltoid anterior cardinal tooth and unequal bilobed posterior cardinal; lateral two, the anterior distal than posterior.

Muscle scars well developed. Anterior adductor scar elongate, semilunar, posterior adductor scar rounded with elongated anterior end. Cruciform scars two, rounded. Pallial sinus equal in both valves, sinus rises slightly posterior, gently descending, arcuated anterior end sharply falling to pallial line, not reaching anterior adductor scar, and coalescent with pallial line for more than three quarters along its ventral length

*Range* : India to Indonesia.

*Distribution* : India : Orissa; *Elsewhere* : Indo-west Pacific.

Subgenus *Cadella* Dall, Bartsch and Rehder

1939. *Cadella* Dall, Bartsch and Rehder, *Bull. Bishop. Mus.*, 153 : 196; (type species, *Tellina lechriogramma* Melvill. 1893. original designation).

Shell small, ovate, donaciformis, solid and more or less equivalve. Sculpture with fine closely spaced liration; radial striae not so prominent. Umbo obtuse and behind the mid length. Hinge with cardinal and lateral dentitions. Cardinal are two, the left anterior and right posterior are bifid. Lateral teeth obsolete in left valve and well developed in right valve. Pallial sinus close to anterior adductor muscle scar, extending anterior and descending sharply forming short confluent with the pallial line. Ligament short, strong and shunken. Adductor muscle scars well impressed.

*Geological Range* : Recent. Common in Indo-Pacific region.

Two species were reported from India, but material is available for following one species.

**6. *Tellina (Cadella) semen* Hanley**  
( Pl. III, fig. 1, Pl. VIII, fig. 1 )

1844. *Tellina semen* Hanley, *Proc. zool. Soc., Lond.*, p. 164, pt. 12, no. 141, (type locality, Corregidor [Philippines Islands]; types, not known, not in the type collection in NHM).

1854. *Tellina fabagella* Deshayes, *Proc. zool. Soc., Lond.*, p. 3554, pt. 22, (type locality, Albay, Islands of Luzon, Philippines; Syntypes, NHM).

*Material examined* : Andaman and Nicobar Island : i) 12 valves, Andaman Islands.

*Measurements (mm)* :

Length	Height	Depth
11.25-8.74	8.06-6.08	4.84-3.83

*Description* : Shell small, subelliptical, solid, equivalve, inflated with large anterior end; externally dirty white with yellowish touches; internally very polished. Umbo elevated, inflated and posterior; anterior margin narrow and rounded ventral margin convex; anterior dorsal margin long, descending and more or less straight; posterior dorsal margin short and ends abruptly; posterior margin convex and forms bluntly rounded truncation. Sculpture of fine closely placed concentric striae; radial striae absent. Ligament short, shunken and yellowish brown; lunule small and narrow.

In the left valve the cardinal complex consists of a bifid equal anterior tooth and elongate, sublaminar posterior tooth; lateral teeth narrow, pointed with distal anterior and proximal posterior. In the right valve the anterior cardinal tooth sublaminar and posterior one unequal, bifid; lateral teeth strong, pointed and socketed above with anterior lateral distal and posterior lateral sub proximal to the cardinal complex.

Muscle scars poorly impressed. Anterior adductor scar elongate, rounded whereas the posterior adductor scar sub quadrate, rounded. Cruciform scars more or less rounded. Pallial sinus equal in both the valves extending very close to the anterior adductor scar and rounded anteriorly, confluent with pallial line posteriorly.

*Remarks* : *T. semen* Hanley although variable in shape can be distinguished by its concentric sculpture, position of lateral teeth and pallial sinus.

*Range* : South African Coast to Philippines Islands east to Fiji Islands.

*Distribution* : India : Tamil Nadu, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

Subgenus *Dallitellina* Afshar

1969. *Dallitellina* Afshar, *Mem. Geol. Soc. Am.*, **119** : 38, (type species, *Tellina rostrata* Linnaeus 1758: original designation).

Shell large to small, elongate, narrow, inequivalve with slightly elongated posterior. Sculpture of fine concentric striae and rows of spines along the dorsal margin. Hinge with cardinal and lateral dentitions. Cardinal teeth two in each valve; the left anterior and right posterior bifid. Lateral teeth well developed and distant in the right valve; but obsolete in the left valve. Pallial sinus small and extends only half distance of the shell. Adductor muscle scars well impressed.

*Geological Range* : Recent.

Only one species is known from India.

7. *Tellina (Dallitellina) rostrata* Linnaeus  
( Pl. III, fig. 2, Pl. IV, fig. 3 )

1758. *Tellina rostrata* Linnaeus, *Syst. Nat.* ed. **10** : 675, (type locality, 'O' Indico et India; type, Linnacan Society, London).

*Material examined* : Tamil Nadu : i) 1 valve, Tuticorin, ii) 3 exs. and 5 valves, Chennai.

*Measurements (mm)* :

Length	Height	Depth
68.68-64.76	22.80-20.00	13.21-11.

*Description* : Shell medium, long, elongate inequivalve, arched laterally, posterior end rostrate, bent to right and obliquely truncate with acuminate extremity; white with some pink mark on the anterior side of umbonal region. Umbo slightly anterior, trigonal and elevated; anterior margin acuminate; ventral margin broadly arcuate; anterior dorsal margin moderately sloped; posterior dorsal straight and steeply sloped; posterior margin short and depressed, posterior end with two folds from umbo to the outer margin. Sculpture with sharp concentric ridges, a few of which terminate at an angle on the posterior part of the ventral margin, the dorsal margin contain a row of spines; ligament short, lanceolate and yellowish brown; lunule narrow and elevated.

In the left valve the cardinal complex consists of a trigonal, bifid anterior tooth and a lamellar posterior cardinal tooth; lateral teeth obsolete. In the right valve the cardinal complex consists of lamellar anterior and trigonal, bifid posterior; lateral teeth well developed, the posterior one situated below the distal end of the ligamental groove.

Muscle scars moderately developed. Anterior adductor scar elongate and slightly larger than posterior adductor scar. Cruciform scars close, rounded and posterior ones larger than

the anterior. Pallial sinus equal in both the valves, sinus developed upto half of the shell; it dorsal margin nearly straight, anterior end arcuated, falls obliquely to the pallial line and joint it in ventral part.

*Range* : India to Philippines Island.

*Distribution* : India : Tamil Nadu, Orissa, Andaman and Nicobar Islands; *Elsewhere* Indo-Pacific.

#### Subgenus *Hemimetis* Thiele

1934. *Hemimetis* Thiele, *Hand. Syst. Weich.*, pt. 3, 915, (type species, *Tellina plicata* Valenciennes (= *angulata* Linnaeus), monotypy.

Shell large to medium, thin, somewhat lenticular, inequivalve with slightly elongated posterior. Sculpture of concentric lamellae. Hinge with cardinal and lateral dentitions. Cardinal teeth are two in each valves; the left anterior and right posterior bifid. Lateral teeth are well developed and distant in the right valve; but absent in the left valve. Pallial sinus small and extends only half of the length of the shell, not confluent. Adductor muscle scars poorly impressed.

*Geological Range* : Recent. Common in Indo-pacific region.

Only one species is known from India.

#### 8. *Tellina (Hemimetis) angulata* Linnaeus ( Pl. V, figs. 1 & 2, Pl. XIX, fig. 4 )

1767. *Tellina angulata* Linnaeus, *Syst. Nat.*, ed.12 : 1116, no 47, (type locality, Java; types. Linnaean Society. London).

1827. *Tellina plicata* Valenciennes, *Encyl. Meth.*, t. 287. fig. 3.

*Material examined* : Andaman and Nicobar Islands : i) 1 valve, Andamans.

*Measurements (mm)* :

Length	Height	Depth
51.50	37.41	—

*Description* : Shell subventricose, thin, elevated, subovate with short posterior side, with two prominent ridges; yellowish white externally and shiny internally. Umbo elevated and pointed and more or less at the center; anterior margin rounded; ventral margin convex with an upward slope; anterior dorsal margin elevated and rounded; posterior dorsal margin elevated but short and convex; posterior margin short laterally flexuous. Sculpture of minute and widely spaced concentric raised striae. Ligament elongated and prominent, dark brown colour; lunule is small and mostly on the right valve.

In the left valve the cardinal complex consists of a strong unequal bilobed anterior tooth and a small laminated posterior tooth; lateral teeth absent. In the right valve the cardinal

complex consist of a thin lamellar anterior tooth and a large, trigonal bifid posterior tooth, lateral well developed, the posterior one situated below the distal end of the ligamental groove.

Muscle scars poorly developed. Anterior adductor scar semilunar, elongated, posterior adductor scar irregular. Cruciform scars two and oval shaped. Pallial sinus raised abruptly on the anterior, descending posterior with rounded anterior end falling obliquely to the pallial line and confluent with it only in the posterior region.

*Remark* : *T. angulata* Linnaeus can be distinguished by its shape, sculpture, cardinal complex and the lateral teeth.

There is a lot of confusion regarding the nomenclature of *T. angulata*. Linnaeus (1767) described *T. angulata*. Chemnitz (1782) described *T. angulata* based on some other specimen distinct from *T. angulata* Linnaeus, but cited Linnaeus *T. angulata* as first reference. The same was followed by a number of subsequent workers. But the species of Linnaeus is actually entirely different from the *T. angulata* Chemnitz.

*Range* : Andaman and Nicobar Islands to Philippines and Fiji.

*Distribution* : India : Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

#### Subgenus *Homalina* Stoliczka

1870. *Homalina* Stoliczka, *Mem. Geol. Surv. India Palaeo. India*, 3 : 118, (type species. *Tellina triangularis* (Chemnitz) Roeding, *Tellina trilatera* Gmelin 1791, original designation).

Shell medium, subtrigonal, compressed, inequilateral. Sculpture of fine concentric striae. Umbo anterior, slightly elevated. Hinge with cardinal and lateral dentition. Cardinal teeth two in each valve, the left anterior and the right posterior laminate and bifurcated. Laterals teeth absent except the right anterior lateral lying close to the cardinal complex. Pallial sinus extensive, sometimes coalescent with anterior adductor muscle scar.

*Geological Range* : Recent.

Only one species is known from India.

#### 9. *Tellina (Homalina) myaeformis* Sowerby ( Pl. VI, fig. 1, Pl. XXII, fig. 6 )

1867. *Tellina myaeformis* Sowerby in Reeve, *Conch. Icon.* 17 : *Tellina* sp. No. 268, pl. 45, fig. 268. (type locality, Pulicat Lake, Coromandel coast).

*Material examined* : Orissa : i) 4 valves, Puri; West Bengal : ii) 9 valves, Chingrighata, outskirts of Kolkata.

*Measurements (mm)* :

Length	Height	Depth
24.72-15.50	17.84-11.85	10.78-9.36

*Description* : Shell medium to small, oblong, semioval, inequivalve, left valve more convex than the right; white. Umbo pointed, elevated and nearly at two third distance from anterior end; anterior margin rounded; ventral margin gently convex; anterior dorsal margin straight and gradually sloping; posterior dorsal margin short and sharply descending; posterior margin short and acuminate. Sculpture of closely spaced very fine concentric striae; radial striae almost absent or poorly developed. Ligament moderate, shunken; lunule moderate and mostly on the right valve.

In the left valve the cardinal complex consists of an unequal, bilobed anterior tooth and a thin small laminate posterior tooth; laterals absent. In the right valve the cardinal complex consists of an anterior tooth and a deltoid, unequally bilobed posterior tooth, anterior lateral very close to the cardinal complex, posterior lateral absent.

Muscle scars moderately developed. Anterior adductor scar semilunate, more elongated, posterior adductor scar subrectangular, irregular. Cruciform scars two, oval shaped. Pallial sinus unequal; sinus rises posterior only for a short distance, descending anteriorly and close to anterior adductor scar, with arcuated anterior margin and confluent with pallial line.

*Remarks* : *T. myaeformis* Sowerby is easily be distinguished by its semioval equivalve shape, cardinal teeth, presence of deltoid lateral teeth in the right valve, pallial sinus, and pallial line.

*Range* : India.

*Distribution* : India : Tamil Nadu, Orissa, West Bengal.

#### Subgenus *Moerella* Fischer

1887. *Moerella* Fischer, *Man. De Conch.*, p. 1147, (type species, *Tellina donacina* Linnaeus 1758, monotypy).

Shell small, elongate-ovate, subelliptical, inequilateral more or less equal, posterior end obscurely rostrate. Sculpture of more or less regularly spaced concentric striae. Umbo behind the middle. Hinge with cardinal and lateral dentition; cardinal with two teeth in each valve, the left anterior and right posterior bifid; laterals well developed; right anterior and posterior lateral teeth strong and socketed above; anterior tooth sub proximal to cardinal complex. Pallial sinus extends near to the anterior adductor muscle scar and extensively confluent with pallial line posteriorly. Colour often reddish with bands and rays; adductor muscle scars moderately impressed.

*Geological Range* : Lower Eocene to Recent period.

Three species is reported from India.

#### Key to the species

1. Shell dull coloured with or without yellowish suffusion with prominent ridge on the posterior end, sculpture of widely spaced, strong concentric striae .....(2)

- Shell rosy or white, without prominent ridge on the posterior end, sculpture of close concentric striae ..... *T.(M.) philippinarum* Hanley
- 2. Posterior end more elongated, shell less thick, radial striae absent.....  
*T.(M.) ostracea* Lamarck
- Posterior end less elongated, shell very thick, radial striae present.....  
*T.(M.) subtruncata* Hanley

10. *Tellina (Moerella) ostracea* Lamarck  
( Pl. VI, fig. 2, Pl. VIII, fig. 6 )

1791. *Tellina ostracea* Lamarck, *Encyl. Meth.*, t. 290, fig. 13. (type locality, Indian Sea).

*Material examined* : Andaman and Nicobar Islands : i) 1 valve, Andamans, ii) 1 ex., Camorta, iii) 1 ex., Chidyatapu, iv) 1 ex., Nancowry Island.

*Measurements (mm) :*

Length	Height	Depth
30.51-23.64	23.44-16.65	8.25-7.45

*Description* : Shell ovate, more or less subtrigonal, compressed with posterior unequal ridges at the sides; dull white externally and more shiny internally. Umbo elevately pointed and posterior. Anterior margin rounded; ventral margin concave contracted at the angle of the rib (posterior side); anterior dorsal margin straight and gradually sloping; posterior dorsal margin straight and abruptly sloped; posterior margin short, straight and forming an oblique truncation. Sculpture of raised concentric ridges more prominent at the posterior end; radial striae absent. Ligament short and brown colour; lunule absent.

In the left valve the cardinal complex consist of an unequal bilobed anterior tooth and a thin laminated posterior tooth; laterals less prominent and forms by the thickening on the hinge line. In the right valve the cardinal complex with a thin, laminated anterior tooth and a bifid posterior tooth; laterals strong, socketed above and anterior one closer to cardinal complex.

Muscle scars moderately impressed. Anterior adductor scar elongate; posterior adductor scar rectangular. Cruciform scars two, oval shaped. Pallial sinus equal in both the valves, sinus extensive, rising posteriorly; descending anteriorly with arcuated anterior end but not touching the anterior adductor scar, falls obliquely to the pallial line and ventral margin confluent with it.

*Remarks* : *T. ostracea* Lamarck is easily be distinguished by its subtrigonal shape, sculpture, posterior margin, pallial line and pallial sinus.

This species shows variation in the regularity of the laminated striae. It resembles *T. longirostrata* Sowerby, but *T. longirostrata* differs, being more transverse with a produced beak and double flexure.

*Range* : Malagasy to Mergui Archipelago.

*Distribution* : India : Andaman and Nicobar Islands; *Elsewhere* : Indian Ocean.

11 *Tellina (Moerella) philippinarum* Hanley  
( Pl. VI, fig. 3, Pl. VII, fig. 1, Pl. VIII, figs. 2 & 3 )

1844. *Tellina philippinarum* Hanley, *Proc. zool. Soc., Lond.* P. 69. (type locality, Philippines: Syntypes, NHM 1976129 part)

*Material examined* : Andaman and Nicobar Islands : i) 3 valves, Port Blair, ii) 3 valves, Nancowry Islands.

*Measurements (mm)* :

Length	Height	Depth
20.66-11.42	14.70-8.00	6.95-3.75

*Description* : Shell ovate, thin, subequilateral, rather compressed; rosy colour; umbo middle, elevated and pointed; anterior margin rounded; ventral margin convex; anterior dorsal margin straight gradually sloping; posterior dorsal margin flatly depressed and terminally with a slight sinus; posterior margin wedge-shaped, attenuated, compressed, flexuous, angular. Sculpture of fine closely spaced concentric striae; radial striae very fine or almost absent; ligament small, sunken and yellowish brown in colour; lunule elongate, well developed and mostly on the right valve.

In the left valve the cardinal complex consist of a subequal bilobed anterior tooth and a small laminate posterior tooth; lateral teeth absent. In the right valve the cardinal complex consist of a laminate anterior tooth and a unequally bilobed posterior tooth; lateral teeth present, socketed above, anterior lateral well developed, proximal to the cardinal complex, posterior lateral weak and distal to cardinal complex.

Muscle scars well impressed. Anterior adductor scar elongate, semilunar posterior adductor scar elongately rectangular. Cruciform scars two, with elongated anterior and rounded posterior. Pallial sinus equal in both the valves, sinus extensive ascending anteriorly and descending posteriorly and with broad arcuated anterior end, touching the anterior adductor scar and confluent with pallial line.

*Remarks* : *T. philippinarum* Hanley is distinguished by its shape, cardinal complex and the arrangement of pallial sinus.

*Range* : India to Philippines.

*Distribution* : India : Tamil Nadu, Andhra Pradesh, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

12. *Tellina (Moerella) subtruncata* Hanley  
( Pl. VII, figs. 2 & 3, Pl. VIII, figs. 4 & 5 )

1844. *Tellina subtruncata* Hanley, *Proc. zool. Soc., Lond.*, p. 149. (type locality, Philippines. Syntypes. NHM, 1976121).  
1893. *Tellina kolabana* Melvill, *Mem. Proc. Manches. Lit. Phil. Soc.*, (4)7 : 13, pl.1, fig.23, (type locality, Bombay; Types, NHM, 1893.2.16.4).

*Material examined* : Andaman and Nicobar Islands : i) 3 valves, Andamans.

*Measurements (mm)* :

Length	Height	Depth
17.35-14.45	12.41-11.00	—

*Description* : Shell medium, subelliptical, sub-ovate, inequilateral or more or less equivalve; white. Umbo elevated, slightly pointed and posterior. Anterior margin rounded; ventral margin convex and sinuous posteriorly; anterior dorsal margin straight and gradually sloping; posterior dorsal short and abruptly sloping; posterior margin bluntly rounded. Sculpture of fine closely spaced concentric striae; radial striae almost absent. Posterior margin of the left valve with a groove, radiating from umbonal region to ventral margin, correspondingly a ridge in the right valve. Ligament short and dark brown; lunule moderate and mostly on the left valve.

In the left valve the cardinal complex consists of equally bilobed anterior tooth and a small thin posterior tooth attached with nymph; lateral teeth small, formed by the thickening on the marginal line. In the right valve the cardinal complex consists of a thin, small anterior tooth and an unequally bilobed posterior tooth, lateral teeth well developed, socketed above, with anterior slightly closer to cardinal complex.

Muscle scars moderately developed. Anterior adductor scar elongate semilunar, posterior adductor scar sub rectangular. Cruciform scars two rounded. Pallial sinus equal in both the valves; sinus rises sharply on the posterior; descending anteriorly with a arcuated anterior margin and closer to anterior adductor scar but separated from it, and ventral margin confluent with pallial line.

*Range* : Gulf of Aden to Philippines.

*Distribution* India : Maharashtra : Mumbai and further south, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

Subgenus *Pharaonella* Lamy

1918. *Pharaonella* Lamy, *Bull. Mus. Natl. Hist. Nat. Paris*, 24 :31, (type species, *Tellina pharaonis* Hanley 1844, subsequent designation, Salisbury, 1934).

Shell large to medium thin, elongate, posterior end strongly rostrate. Sculpture smooth or with fine concentric striations. Umbo small pointed slightly posterior. Hinge with weak

cardinal and lateral dentitions. Cardinal teeth two in each valve, the left anterior and right posterior bifid. Laterals well developed in right valve, thin shelf like and pointed. Pallial sinus moderate, pointed anteriorly, descending dorsally confluent with posterior quarter of pallial line. Adductor muscle scars well impressed. Colour white, sometimes with deep red, rayed variously arranged.

*Geological Range* : Recent.

Four species is known from India.

### Key to the species

- 1 Shell large, pallial sinus developed only half of the shell length .....(2)
  - Shell small, pallial sinus developed almost whole of the shell length .....(3)
2. Shell large, wide and posterior end less rostrated, sculpture with concentric striae radial striae more prominent, umbo pink colour ..... *T.(P) perna* Spengler
  - Shell large, elongated and posterior end more rostrate, sculpture with concentric striae, radial striae less prominent, umbo white, shell pink colour .....  
..... *T.(P.) vulsella* Gmelin
3. Shell rosy pink colour, thin, comparatively smaller in size .....  
.....*T.(P.) cuneolus* Sowerby
  - Shell white with pink colour externally, internally more pink, thick and comparatively larger than the previous ..... *T.(P.) iridescens* (Benson)

### 13. *Tellina (Pharaonella) cuneolus* Sowerby ( Pl. IX, fig. 3, Pl. XI, fig. 4 )

1844. *Tellina cuneolus* Sowerby, *Zeitschr. F. Malak.*, p. 162.

*Material examined* : Andhra Pradesh : i) 5 valves, Visakhapatnam; Orissa : ii) 2 exs., Puri.

*Measurements (mm)* :

Length	Height	Depth
14.40-10.80	8.50-7.55	5.15-4.00

*Description* : Shell small, oval, oblong, equivalve and glossy. Umbo pointed, elevated and slightly posterior; white with pink anterior end, glossy internally, rather light; anterior margin rounded; ventral margin convex; anterior dorsal margin slightly convex; posterior dorsal margin straight and sloping gradually; posterior margin short, attenuated, acuminate obliquely and truncated at the end. Sculpture of fine concentric striae which are more prominent on the outer margin and almost smooth on the umbonal region; radial striation absent; ligament small and dark brown colour; lunule moderate and almost on the left valve.

In the left valve the cardinal complex consists of a subequal bilobed anterior tooth and a thin laminate posterior tooth; laterals present, anterior lateral strong and proximal to cardinal complex and posterior lateral formed by the thickening on the hinge line and distal to cardinal complex. In the right valve the cardinal complex consists of large deltoid, globular anterior tooth and a smaller laminate bifid posterior tooth laterals two not so prominent and formed by thickenings on hinge line.

Muscle scars moderately developed. Adductor scars semilunate; anterior scar more elongated than the posterior scar. Cruciform scars two and oval. Pallial sinus equal in both the valves, sinus rises abruptly on the posterior and descends anteriorly close to anterior adductor scar, touches and forms arcuation, confluent with the pallial line.

*Remarks* : *T. cuneolus* Sowerby can be easily recognised by its shape, colour cardinal teeth and muscle scars.

*Range* : India to Philippines.

*Distribution* : India : Andhra Pradesh, Orissa; *Elsewhere* : Indo-Pacific.

14. *Tellina (Pharaonella) iridescens* (Benson)  
( Pl. IX, figs. 1 & 2, Pl. XI, figs. 3 & 5 )

1842. *Sanguinolaria iridescens* Benson, *Ann. Mag. Nat. Hist.*, (1) 9 : 490, (type locality, said to inhabit canals Tschu Sam, China).

1844. *Tellina carnea* Philippi in Menke, *Zeitschr. F. Malak.*, p. 162.

1915. *Tellina chilkaensis* Preston, *Rec. Indian Mus.*, 11 : 306, figs. 20, 20a-b, ( type-locality, Channel of Berhampur, Chilka Lake, Holotype, ZSI).

*Material examined* : Andhra Pradesh : i) 5 ex., Vishakhapatnam, ii) 10 ex., Bhimlipatnam, iii) 15 ex., Kakinada Bay; Orissa : iv) 6 ex., Puri, v) 1 ex., Chilka Lake; West Bengal : vi) 258 ex., Kakdwip, 24 Paraganas (South).

*Measurements (mm)* :

Length	Height	Depth
11.50-6.46	7.31-4.00	3.76-2.20

*Description* : Shell small, oval, oblong, equivalve and glossy. Umbo pointed, elevated and slightly posterior; white or pink, glossy internally, rather light; anterior margin rounded; ventral margin convex, a little sloping upward, then straight; anterior dorsal margin straight and gradually sloped; posterior dorsal margin short and abruptly sloped; posterior margin short, attenuated, acuminate obliquely truncated at the end. Sculptured with fine concentric striae which are more prominent on the outer margin and almost smooth in the umbonal region; radial striation absent; ligament small and dark brown colour; lunule moderate and almost on the left valve.

In the left valve the cardinal complex consists of a subequal bilobed anterior tooth and a thin laminate posterior tooth; lateral present and formed by the thickening on the hinge line. In the right valve the cardinal complex consists of large deltoid, globular anterior tooth and a smaller laminate bifid posterior tooth; laterals two, anterior strong and closer to the cardinal complex; posterior lateral very much thickened and socketed above.

Muscle scars moderately developed. Adductor scars semilunate; posterior scar more elongate than the anterior scar. Cruciform scars two and oval. Pallial sinus equal in both the valves, sinus rises abruptly posterior and descends anteriorly, close to anterior adductor scar, touches and form arcuation, confluent with the pallial line.

*Remarks* : *T. iridescens* (Benson) can be easily recognised by its oval, oblong, shape, rose coloured umbonal region, minute cardinal teeth and anterior lateral.

*Range* : Indian Ocean Islands to Philippines, north to China and Japan.

*Distribution* : India : Gujarat, Andhra Pradesh, Orissa, West Bengal; *Elsewhere* : Indo-Pacific.

### 15. *Tellina (Pharaonella) perna* Spengler ( Pl. X, fig. 2, Pl. XI, fig. 6 )

1798. *Tellina perna* Spengler, *Skri. Nat. hist. Sels. Kob.*, 4(2) : 79, (type locality, Fra Ostindien; Holotype, Zoological Museum, Copenhagen?).
1817. *Tellina pallescens* Dillwyn, *Des. Cat. Rec. Shells*, 1 : 84, (type locality, East Indian Seas).
1818. *Tellina sulphurea* Lamarck, *Hist. Nat. Anim. Sans. Vert.*, 5 : 523, (type locality, habite l'Ocean Indien....; Syntypes, MHNG).
1818. *Tellina latirostra* Lamarck, *Hist. Nat. Anim. Sans. Vert.*, 5 : 523, (type locality, habite l'Ocean Indien....; Holotype, MHNG).
1844. *Tellina pharaonis* Hanley, *Proc. zool. Soc. Lond.*, p. 148, pt. 12, (type locality, Red Sea; Museum Metcalfe).
1854. *Tellina venusta* Deshayes, *Proc. zool. Soc. Lond.*, p. 368, pt. 22, (type locality, Sandwich Island; Holotype, NHM).
1865. *Tellina semilaevis* von Martens, *Ann. Mag. Nat. Hist.*, (3)16 : 429, (type locality, Qurimba Islands, near Mocambique).
1869. *Tellina tenuisulcata*, Sowerby in Reeve, *Conch. Icon.*, 17 : *Tellina* index p. 4. new name for *tenuilirata* Sowerby.

*Material examined* : Andaman and Nicobar Islands : i) 1 ex., Andaman.

*Measurements (mm)* :

Length	Height	Depth
78.56	45.95	20.62

*Description* : Shell large to small, subelliptical, rather thin, inequilateral, equivalve, thin in immature stage; white with pink umbonal region. Umbo more or less pointed, elevated and

posterior; anterior margin rounded; ventral margin gently convex; anterior dorsal margin elongate, straight and gently descending; posterior dorsal margin slightly concave and gently sloping; posterior margin short and forming blunt oblique posterior truncation. Posterior outline of the shell slightly rostrated; ligament strong, shunken and dark brown in colour; lunule small, narrow, present only in the left valve.

In the left valve the cardinal complex consists of an anterior tooth with bifid subequal lobes and a thin laminate posterior tooth; lateral teeth moderate, formed by thickening on the hinge line, the anterior lateral close to the cardinal complex. In the right valve the cardinal complex consists of thickened; laminate anterior tooth and a small subequally bifid posterior tooth; lateral well developed; anterior lateral concave, socketed above; posterior lateral socketed, pointed and distal to the cardinal complex.

Muscle scars moderately impressed. Adductor muscle scars irregular, semilunar, posterior adductor scar slightly more elongate. Cruciform muscle scars two, rounded. Pallial sinus equal in both valves; sinus rises posterior and after a short distance descends anteriorly, extends nearly two third length of the shell and fall obliquely to the pallial line and confluent with it.

*Remarks* : *T. perna* Spengler exhibits considerable variation not only in shape and size but also in the geographical range. This species is very much similar to *T. vulsella* Hanley. It differs from it in colouration, shape, size and also in having a short posterior end.

*Range* : South Africa to Philippines, north to Japan, south to Australia southeast Samoan Island and north to Hawaii.

*Distribution* : India : Andaman and Nicobar Islands; *Elsewhere* : Widely distributed in Indo-Pacific.

16. *Tellina (Pharaonella) vulsella* Hanley  
( Pl. X, fig. 1, Pl. XXII, fig. 3 )

1782. *Tellina rostrata* var. *vulsella* Chemnitz, *Conch. Cab.*, 6 : 113, t.11, fig. 105, (type locality, East Indies).

1845. *Tellina vulsella* Hanley in Sowerby, *Thes. Conch.*, 1(6) : 235-236, pl.16, figs. 162, 163.

1878. *Tellina perrieri* Bertin, *Nouv. Arch. Mus. Hist. nat. Paris*, 1(2) : 255, pl.8, figs.8a-b, (type locality, Japan).

1903. *Tellina consanguinea* Sowerby, *Ann. Mus. Nat. Hist.*, (7)12 : 500, (type locality, Hirad Hijan, Japan).

*Material examined* : Andaman and Nicobar Islands : i) 33 ex., 2 valves, Andamans.

*Measurement (mm)* :

Length	Height	Depth
66.02-31.23	22.56-11.20	8.06-4.06

*Description* : Shell elongate, attenuate, compressed, thin, gaping at both ends, posterior end narrow and forms an acuminate beak; pink or yellowish, more deep in unbonal region.

Umbo elevated, pointed and slightly posterior; anterior margin rounded; ventral margin gently convex, rising behind in a post basal arcuation; anterior dorsal margin nearly straight, gently descending; posterior dorsal margin slightly concave and gently descending; posterior margin short, angular and forming blunt oblique posterior sulcus; posterior outline rostrate. Sculpture of fine closely spaced concentric striae, strong on the ventral margin; radial striae fine; ligament small, shunken, dark brown; lunule almost absent.

In the left valve the cardinal complex consists of subdeltoid, bifid, unequal anterior tooth, and a laminated posterior tooth; anterior lateral not prominent; posterior lateral prominent, formed by the thickening of the hinge line. In the right valve the cardinal complex consists of a laminate anterior tooth and a strong unequal bifid posterior tooth; laterals prominent, upcurled, pointed and socketed above, with anterior slightly distant than the posterior.

Muscle scars moderately developed. Anterior adductor scar irregular, semilunate whereas the posterior adductor scar rectangular. Cruciform scars two, rounded. Pallial sinus equal in both the valves; sinus rises posterior and after short distance descends anteriorly with a rounded anterior end, extends to about two third length of the shell, falls obliquely to the pallial line and confluent with it.

*Remarks* : This species very much resembles *T. perna* Spengler but differs by its thin, typical reddish or flesh coloured smaller shell, more narrowly elongate, with produced and rostrated posterior end.

*Range* : East Coast of Africa to Philippines north to Japan.

*Distribution* : India : Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

#### Subgenus *Phylloda* Schumacher

1817. *Phylloda* Schumacher, *Essai. Nouv. Syst.*, : 148, 149, (type species, *P. aurea* Schumacher = *Tellina foliacea* Linnaeus, original designation, monotypy).

Shell large to medium, elongately-ovate and compressed, subequilateral. Sculpture consists of fine concentric and radial ridges and small scales on the posterior area. Hinge with cardinal and lateral dentitions. Cardinals two in each valve, the left anterior and right posterior bifid; lateral one in each valve. Pallial sinus rather small and more than half of the ventral margin is free, confluent with the pallial line only in posterior part, sometimes connected with the anterior adductor scar by a thin linear scar. Adductor muscle scar well impressed.

*Geological Range* : Upper Oligocene to Recent.

Only one species is reported from India.

#### 17. *Tellina (Phylloda) foliacea* Linnaeus

( Pl. XII, fig. 2, Pl. XVI, fig. 5 )

1758. *Tellina foliacea* Linnaeus, *Syst. Nat.*, ed. 10 : 675, no 39, (type locality : O Indico: type, Linnaean Society, London (missing)).

1784. *Tellina cinnamar* Martyn, *Univ. Conch.*, 4 : pl. 156. 1817. *Phylloda aurea* Schumacher. *Essai. Nouv. Syst.*, p. 149, pl. 16, figs. 1 a and b.

*Material examined* : Andaman and Nicobar Islands : i) 5 valves, Andamans.

*Measurements (mm)* :

Length	Height	Depth
85.20-62.14	45.50-34.28	12.02-8.05

*Description* : Shell large, oblong, compressed, thin, flattened, elongate, ovate, left valve more concave than the right; orange and glossy. Umbo greatly subdued. Anterior margin rounded; ventral margin nearly straight; anterior dorsal margin sloping gradually; posterior dorsal margin convex and spinous; posterior margin obtusely biangulate. Sculpture with fine concentric striae and with very fine radial striations; posterior region of both the valves with numerous scales radiating from umbos to outer margin. Ligament lanceolate, elongated and occupying almost entire length of posterior dorsal, dark brown; lunule almost absent.

In left valve the cardinal complex consists of a small bifid anterior cardinal tooth and a long slender posterior cardinal tooth; anterior lateral tooth obsolete and posterior; lateral absent. In the right valve the cardinal complex consists of small anterior and a trigonal, bifid posterior cardinal tooth; anterior lateral small and adjacent to the cardinal complex; posterior lateral absent.

Muscle scars moderately developed. Anterior adductor scar elongate and posterior adductor scar suborbicular. Cruciform scars moderate, posterior small, oval, anterior large and elongate ovate, Pallial sinus equal in both the valves, small, ascending anteriorly, extending upto the midlength of the shell, fall obliquely to pallial line but the ventral margin is free, a thin linear scar joining the pallial sinus with anterior adductor scar.

*Remarks* : *T. foliacea* Linnaeus can be distinguished from the other by its sculpture of fine concentric and radial striae, broad posterior end with spines on the posterior dorsal margin and numerous scales on posterior region radiating from umbo to outer margin.

*Range* : Red Sea to Philippines.

*Distribution* : India : Tamil Nadu, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

#### Subgenus *Pinguitellina* Iredale

1927. *Pinguitellina* Iredale, *Rec. Austr. Mus.*, (5)16 : 76, (type species, *Tellina robusta* Hanley 1844, original designation).

Shell small, thin, sub-equivalve, left more convex; posterior slope set off by an angle. Sculpture smooth or with very fine concentric striae. Hinge with cardinal and lateral dentitions. Cardinal teeth two in each valve; the left anterior and right posterior bifid. Lateral teeth well developed in the right valve; but obsolete in the left valve. Pallial sinus large with descending dorsal margin. Adductor muscle scars well impressed.

*Geological Range* : Recent.

Only one species is reported from India.

18. *Tellina (Pinguitellina) robusta* Hanley  
( Pl. XIII, figs. 1 & 2, Pl. XVI, fig. 2, Pl. XXVII, fig. 4 )

1845. *Tellina robusta* Hanley, *Proc. zool. Soc., Lond.*, 1844 : 63, (type locality, Philippines, low water; type, not in the NHM).

1916. *Tellina bertiniana* Preston, *Rec. Indian Mus.*, 12 : 95, figs. 10 and 10a, (type locality, Bamboo flat bay, Andamans; type, ZSI).

*Material examined* : i) 5 Valves, Sri Lanka, Singapore, Andamans (as per recorded localities in the collection), ii) 1 ex., Bamboo flat, Andamans, Holotype of *T. bertiniana*.

*Measurements (mm)* :

Length	Height	Depth
14.39-12.50	11.52-9.65	7.14-5.32

*Description* : Shell small, thin, orbicular, sub-equivalve, the left more convex than the right; white or yellowish white. Umbo inflated, elevated and slightly posterior; anterior margin rounded; ventral margin convex; anterior dorsal margin concave; posterior dorsal margin straightly sloping; posterior margin truncated; Sculpture with fine concentrically spaced low ridges; ligament small, yellowish brown and situated in a depressed ligamental groove; lunule small and mostly on the right valve.

In the left valve the cardinal complex consists of bifid more or less equal lobed cardinal tooth and a thin small posterior tooth; laterals equidistant and formed by thickening on the hinge line. In the right valve a small strong, laminate anterior tooth and a bilobed posterior tooth; laterals more prominent, socketed above and the anterior slightly nearer to cardinal complex than the posterior.

Muscle scars prominent. Adductor scars subequal and orbicular in both the valves. Cruciform scars small and not so distinct. Pallial sinus large with descending dorsal margin, anterior end rounded and falls obliquely to the pallial line and half of the ventral a margin confluent with pallial line.

*Remarks* : *T. robusta* Hanley can easily be distinguished by its shape texture, ligamental position and the pallial sinus. This species is very much allied to *T. nux* Hanley, *T. pinguis* Hanley and *T. casta* Hanley. It is distinguished from all the above three species by its stouter texture, even in the young individuals. In the case of *T. pinguis* the ligament is decidedly convex.

*Range* : South Africa to Philippines, Australia and South Pacific.

*Distribution* : India : Lakshadweep, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

Subgenus *Quidnipagus* Iredale

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

Small to medium, inequivalve, solid, ovate with right valve more convex, somewhat attenuated. Sculpture with irregular wrinkles and radial furrows. Umbo subcentral, well developed. Hinge with cardinal and lateral dentitions. Cardinal complex consists of two teeth in each valve, the left anterior and right posterior bifid and the left posterior and right anterior single, laminate. Lateral teeth two in each valve, but strong in the right valve, with anterior lateral subproximal to the cardinal complex. Pallial sinus extends upto the anterior adductor scar but does not touch it, broadly rounded and confluent with half of the posterior part of the pallial line. Adductor muscle scars well impressed.

*Geological Range* : Pleistocene to Recent.

Two species are reported from India.

## Key to the species

- Shell large, sculpture with wavy concentric striae throughout, posterior dorsal spines absent ..... *T.(Q.) palatam* Iredale
- Shell medium, sculpture with wavy concentric striae more prominent in the posterior part, posterior dorsal spines present ..... *T.(Q.) gargadia* Linnaeus

19. *Tellina (Quidnipagus) gargadia* Linnaeus  
( Pl. XIV, fig. 1, Pl. XVI, fig. 6 )

1705. *Remies gargadia* Rumphius. *Amboin Rarit.*, p. 140, pl. 42, fig. N.

1758. *Tellina Gargadia* Linnaeus, *Syst. Nat.*, ed. 10 : 674, no33, (type locality, O Asiatico; type, Linnaean Society, London (missing)).

1844. *Tellina inequalis* Hanley, *Proc. zool. Soc. Lond.*, p. 71, (type locality, Ceylon).

*Material examined* : Andaman and Nicobar Islands : i) 2 exs., Kankana, Camorta.

*Measurements (mm)* :

Length	Height	Depth
28.66-27.08	23.42-21.75	8.34-8.14

*Description* : Shell medium, subovate, elongate with slight flexure to the right, more or less equivalve; yellowish externally, white and glossy internally. Umbo acuminate, elevated and posterior; anterior margin rounded; ventral margin convex very much sloping upwards; anterior dorsal margin straight and gradually sloped; posterior dorsal margin short and steeply sloped; posterior margin acutely angular, posterior dorsal margin with a row of spines; Sculpture very rough and consist of irregular, undulated, raised striae and the posterior and anterior ends with concentric striae; radial striae very fine or almost absent; ligament short,

engrooved and yellowish brown; lunule moderate, elongate and equally distributed in both the valves.

In the left valve the cardinal complex consists of subequal bilobed anterior tooth and a thin lamellate posterior tooth close to nymph; lateral teeth two, distal to the cardinal complex. In the right valve the cardinal complex consists of a thin anterior tooth attached with the nymph and an unequally lobed posterior tooth; lateral teeth more prominent, strong and socketed above, the anterior one proximal to the cardinal complex.

Muscle scars moderately developed. Anterior adductor scar semilunar, elongate whereas the posterior more or less oval. Cruciform scars two more or less oval, with elongated anterior. Pallial sinus equal in both the valves; sinus slightly ascending in its dorsal margin more or less straight and touches the anterior adductor scar; anterior margin rounded and ventral margin confluent with the pallial line.

*Remarks* : *T. gargadia* Linnaeus can be distinguished by its shape, sculpture, and spinous posterior dorsal margin. The description of *T. gargadia* given by Linnaeus is insufficient and the missing of type-specimen from the Linnaeus collection has created some problem for the taxonomist.

*Range* : South Africa to Philippines north to Japan and Australia.

*Distribution* : India : Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

**20. *Tellina (Quidnipagus) palatam* Iredale**  
( Pl. XIV, fig. 2, Pl. XI, fig. 1 )

1778. *Tellina rugosa* Born, *Index rerum naturalium Musei Caesarei Vindobonensis*, pt. 1, *Testacea*, p. 18, (type locality, not given; Holotype, Vienna).  
 1784. *Cochlea palatam* Martyn, *Univ. Conch.*, 4, pl.138, (type locality, China; type, not known).  
 1929. *Quidnipagus palatam* Iredale, *Mem. Qd. Mus.*, 9 : 266, (refer to *Cochlea palatam* Martyn. *Univ. Conch.*, 4, pl.138).

*Material examined* : Andaman and Nicobar Islands : i) 2 ex., 16 valves, Andamans, ii) 3 ex., 16 valves, Camorta, iii) 1 ex., 3 valves, Carbyn's Scove, iv) 15 ex., 25 valves, Car Nicobar, v) 2 ex., 2 valves, Chidyatapu, vi) 1 ex., 3 valves, Havelock Island, vii) 2 valves, Katchal Island, viii) 7 valves, Nancowry Island, ix) 5 ex., Neil Island, x) 3 ex., Port Blair, xi) 6 valves, Trinket; Lakshadweep : xii) 12 exs., Minicoy; Maharashtra : xiii) 1 valve, Mumbai.

*Measurements (mm) :*

Length	Height	Depth
53.62-29.82	44.58-23.61	18.81-11.73

*Description* : Shell large to medium subovate, thick, solid, inequivalve with the right valve more convex; white, sometimes with yellowish tinge in the umbonal region and internal side

of the shell. Umbo subcentral, pointed and elevated; anterior margin rounded; ventral margin gently convex. Anterior dorsal margin convex, rounded and gently sloped; posterior dorsal margin sloping, rather straight, obliquely subtruncate at the end; posterior margin irregular, short, due to the acuminate posterior side which is plaited with a large oblique rib. Sculpture consists of lamellar concentric wavy-ridges which become coarse as they approach the margins; ligament large, brown, partly embedded; lumule narrow, depressed and mainly on the left valve.

In the left valve the cardinal complex consists of an equal, bilobed anterior tooth and a very thin laminated posterior tooth; lateral teeth not prominent and are at unequal distance. In the right valve the cardinal complex consists of a very thin, triangular anterior tooth and a bilobed posterior; lateral teeth strong; the anterior subdeltoid and posterior upcurled, pointed and socketed above.

Muscle scars moderately impressed. Anterior adductor scar elongated, posterior adductor scar rounded to subquadrate. Cruciform scars oval and posterior one larger than the anterior. Pallial sinus equal in both the valves, sinus large, its dorsal margin ascending to a short distance; descending posteriorly, anterior end rounded and extend near the anterior scars, falls obliquely to the pallial line, confluent short on the posterior half.

*Remarks* : *T. palatam* (Iredale) is characterised by its peculiar sculpture which distinguishes it from any other groups.

*Range* : It is widely distributed in the Indo-pacific region; East African coast to Hawaii Island.

*Distribution* : India : Maharashtra : Mumbai, Lakshadweep, Tamil Nadu, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific, widely distributed.

#### Subgenus *Scutarcopagia* Pilsbry

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

Shell large to small, usually solid, ovate or elongately ovate, more or less equivalve. Sculpture with scales on the radial ridges decussating with concentric ones. Hinge with cardinal and lateral dentitions. Cardinal teeth two in each valve, left anterior and right posterior bifid. Lateral teeth well developed, two in each valve but more prominent in case of the right valve. Pallial sinus with various configurations, sometimes the linear scar is connected with anterior adductor scar and pallial sinus. Adductor muscle scars well impressed.

This group is well represented in the Indo-Pacific region.

*Geological Range* : Pleistocene to Recent Period.

Two species were reported from India.

*Remarks* : Boss (1969) placed *Scutarcopagia* under *Arcopagia* and remarked "one might be inclined to treat *Scutarcopagia* separately, if a genuine radiation of the species existed" He reported two species *T. scobinata* Linnaeus and *T. elizabethae* Pilsbry. Afshar (1969) created a subgenus *Smitharcopagia* under *Arcopagia* with the type-species *T. lingua-felis* Linnaeus. He differentiated *Scutarcopagia* from *Smitharcopagia* by the shape of the shell which is orbicular in previous and elongately ovate in the latter. This character is insufficient to distinguish the two subgenera and therefore *Smitharcopagia* Afshar is placed under *Scutarcopagia* Pilsbry.

**Key to the species**

- Shell elongately ovate, unbonal region rosy ..... *T.(S.) lingua-felis* Linnaeus
- Shell orbicular, unbonal region white ..... *T.(S.) scobinata* Linnaeus

**21. *Tellina (Scutarcopagia) lingua-felis* Linnaeus  
( Pl. XV, fig. 2, Pl. XVI, fig. 3 )**

1758. *Tellina Lingua-felis* Linnaeus, *Syst. Nat.*, ed.10 : 674, no 34, (type locality, O Asiatico; type, Linnaean Society, London)

*Material examined* : 3 ex., Indian Ocean.

*Measurements (mm)* :

Length	Height	Depth
48.90-43.51	40.06-33.64	21.41-15.14

*Description* : Shell medium, elongately ovate, somewhat produced anteriorly with left valve more concave than the right; white with rosy umbonal region. Umbo pointed, elevated and posterior; anterior margin rounded; ventral margin convex; anterior dorsal margin gently sloping; posterior dorsal margin short; posterior margin bluntly truncated. Sculpture with sharp, three cornered obliquely disposed spines stronger on the outer margin; in the posterior region of the left valve a radial sinus radiates from umbo to the outer margin whereas a ridge radiates correspondingly from the umbo to outer margin in the right valve; ligament moderate, yellowish brown; lunule moderate, equal in both valves.

In the left valve the cardinal complex consists of one anterior trigonal, bifid cardinal tooth and small laminated posterior; lateral teeth obsolete, formed by thickening on the hinge line and anterior one slightly nearer to cardinal complex than the posterior. In the right valve the cardinal complex consists of thin anterior tooth and an unequal lobed, bifid posterior tooth, which is posterior in direction. Lateral teeth well developed, socketed above and the anterior nearer to cardinal complex than the posterior.

Muscle scars well developed. Anterior adductor scar slightly larger whereas the posterior adductor scar suborbicular. Cruciform scars two and oval shaped. Pallial sinus equal, moderately large in both the valves; its dorsal margin descending anteriorly and rounded at anterior end,

falls obliquely to the pallial line and most of the ventral part confluent with it; it is connected with anterior adductor muscle scar by a thin linear scar.

*Remarks* : *T. lingua-felis* Linnaeus can easily be distinguished by its elongated shape, and its unique sharp, three cornered, obliquely disposed spines. This species is very much allied to *T. scobinata* Linnaeus by its sculpture, but it differs from it by its elongated-oval shape and pink colour umbonal region.

*Range* : From South African Coast to Philippines

*Distribution* : India : Indian Seas, Nicobar Islands; *Elsewhere* : Indo-Pacific.

**22. *Tellina (Scutarcopagia) scobinata* Linnaeus**  
( Pl. XV, fig. 1, Pl. XVI, fig. 4 )

1758. *Tellina scobinata* Linnaeus, *Syst. Nat.*, ed. 10 : 676, no 49, (type locality, O Asiatico; type. Linnacan Society, London).

*Material examined* : Andaman and Nicobar Islands : i) 4 ex., Andamans, ii) 11 ex., 2 valves, Car Nicobar, iii) 2 ex., Chidyatapu, iv) 1 valve, Galathea, v) 1 valve, Nancowry Island, vi) 3 ex., Neil Island, vii) 1 ex., 1 valve, Port Blair; Lakshadweep : viii) 2 valves, Kavartti, Kalperu.

*Measurements (mm)* :

Length	Height	Depth
53.17-31.74	48.46-27.58	25.38-11.75

*Description* : Shell thick, small to large, solid, right valve more concave; white with some brown discontinuous rays; Umbo subcentral, inconspicuous and slightly elevated; anterior margin broadly rounded; ventral margin convex; anterior dorsal and posterior dorsal margin straight and gently sloping; posterior margin truncated and elevated. Sculpture with raised, trigonal, elevated, obliquely arranged scales being more strong on the outer margin. In the posterior region of the left valve a radial sinus radiates from umbo to outer margin whereas in the right valve a radial ridge radiates from umbo to outer margin; ligament stout, depressed, brown in colour; lunule moderate and mostly only the left valve.

In the left valve the cardinal complex consists of anterior trigonal, bilobed cardinal tooth and a laminate posterior cardinal tooth; laterals obsolete formed by thickening on hinge line, anterior slightly nearer than the posterior to cardinal complex. In the right valve cardinal complex with small laminate anterior tooth and one unequal, bifid posterior tooth; laterals well developed, socketed above, sub equidistance, the anterior slightly nearer than posterior.

Muscle scars well developed. Anterior adductor scars larger than posterior, and more or less oval, posterior adductor scars suborbicular. Cruciform scars two and rounded in shape. Pallial sinus equal in both the valves; sinus ascending anteriorly, descending posteriorly with

arcuated anterior end, falls obliquely to the pallial line and confluent with it and connected with anterior adductor scar by a thin linear scar.

*Remarks* : *T. scobinata* Linnaeus can be distinguished by its rounded shape and raised, trigonal, elevated, obliquely arranged scaly sculpture. This species resembles *T. lingua-felis* Linnaeus by sculpture but is easily distinguished in its rounded shape contrast to *T. lingua-felis* Linnaeus which is elongate ovate.

*Range* : From Red Sea to Hawaii Island.

*Distribution* : India : Maharashtra : Mumbai, Lakshadweep, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

### Subgenus *Serratina* Pallary

1918. *Pristis* Lamy, *Bull. Mus. Hist. Nat. Paris*, **24** : 29, non Link 1790, Latham 1794, Mueller and Henlo 1837 (Pisces), nec Brulle' 1846 (Insecta); (type species, *Tellina pristis* Lamarck, 1818, original designation).

1922. *Serratina* Pallary, *Exp. Scien. Mer. Malac.*, p. 95; (type species, *Tellina serrata* (Roemer MS) Brocchi, 1814, original designation).

Shell medium to small, ovate, compressed and more or less equivalve. Sculpture with regularly spaced, concentric striae and radial striae very fine or absent. Umbo centrally situated. Hinge with cardinal and lateral dentitions. Cardinal teeth two in each valve, the left anterior and right posterior bifid. Lateral dentition well developed; with anterior and posterior lateral equidistant from cardinal complex. Pallial sinus large, extensive and reaches near the anterior adductor scar but does not touch it and confluent with the pallial line posteriorly. White or dull grey. Adductor muscle scars well impressed.

*Geological Range* : Miocene to Recent period.

*Remarks* : This subgenus shows some similarities to *Quadrans* Bertin but it differs in having rough shell surface and peculiarly spinose on posterior lamellations.

### 23. *Tellina (Serratina) capsoides* Lamarck ( Pl. XII, fig. 1, Pl. XI, fig. 2 )

1818. *Tellina capsoides* Lamarck, *Hist. Nat. Anim. Sans. Vert.* **5** : 531, (type locality, a l'île St. Pierre – St. Francois; types, MNHNP).

1818. *Tellina pristis* Lamarck, *Hist. Nat. Anim. Sans. Vert.* **5** : 531, (type locality, l'Océan Indyen; types, MNHNP).

1847. *Tellina lima* Philippi, *Zeit. Malak.*, **4** : 74, (type locality, China, insula Basilen).

1850. *Tellina (Arcopagia) concentrica* Gould, *Proc. Boston Soc. Nat. Hist.*, **3** : 253, (type-locality, Feejee (Fiji) Islands).

1854. *Tellina denticulata* Deshayes, *Proc. zool. Soc. Lond.*, p. 365, (type locality, not given; Syntypes, MNHNP).

1854. *Tellina diaphana* Deshayes, *Proc. zool. Soc. Lond.*, p. 364, (type locality, Japan; Syntypes, MNHNP).

1860. *Tellina*(*Arcopagia*) *siamensia* von Martens, *Proc. zool. Soc. Lond.*, p.18. (type locality. Siam: Syntypes. NHM 59.5.23.5).
1878. *Tellina negrosiensis* Bertin, *Nouv.Arch. Mus. Hist. nat. Paris*, 1(2) : 250, pl. 8, figs. 6 a and b. (type locality, iles Negros, Philippines Islands; Syntypes. MNHNP).
1896. *Tellina* (*Tellinella*) *thymares* Melvill, *Proc. malac. Soc. Lond.*, 2 : 116, pl. 8, figs. 9. (type locality. Bombay, Holotype; NHM 96.10.162).
1901. *Tellina* (*Merisca*) *pristiformis* Pilsbry, *Proc. Acad. Nat. Sci. Philad.*, 53 : 400, pl. 19, figs. 8. (type locality, Inland sea, Japan, Syntypes; ANSP 71029).

*Material examined* : Andaman and Nicobar Islands : i) 1 ex., Camorta, ii) 2 ex., Car Nicobar; Andhra Pradesh : iii) 2 ex., Vishakhapatnam; Gujarat; iv) 11 valves, Pirotan Island, v) 1 ex., Kathiawar, vi) 2 valves, Bhadrashwar, vii) 1 valve, New Kandla, viii) 15 valves, Jamnagar, ix) 4 valves, Sika beach; Maharashtra : x) 1 valve, Ratnagiri, xi) 2 ex., 1 valve, Mumbai; Tamil Nadu : xii) 3 valves, Rameswaram.

*Measurements (mm) :*

Length	Height	Depth
49.41-26.66	35.82-21.93	15.08-9.97

*Description* : Shell of medium size, trigonal-ovate, solid, heavy, nearly equivalve with a very weak flexure to the right posterior; white or chalky white and sometimes greyish. Umbo posterior to the middle, somewhat elevated and pointed. Anterior margin rounded; ventral margin convex and gently rising posteriorly; anterior dorsal margin long, straight and sloping gradually; posterior dorsal margin short and steeply descending; posterior margin short, biangulated and forming truncation. Sculpture with weak concentric and fine radial striae. Anterior and posterior dorsal margin subspinose. Ligament shunken and large, dark brown; lunule lanceolate, more extensive in right valve.

In the left valve the cardinal complex consists of a subequal bilobed anterior tooth and a laminated posterior tooth, lateral teeth not so prominent and forms by the thickening on the hinge line, in equidistant, the anterior proximal and posterior distal to the cardinal complex. In the right valve the cardinal complex consists of a laminate anterior tooth and an unequal, elongated, bilobed posterior tooth; lateral teeth well developed, bluntly pointed, socketed above and posterior lateral distally placed from the cardinal complex.

Muscle scars well developed. Anterior adductor scar large, semi lunated whereas posterior adductor scar small and rounded. Cruciform scars close, anterior one flattened and larger than the posterior. Pallial sinus equal in both the valves, rise sharply from posterior adductor scar; descending anteriorly and rounded, arcuated or slightly pointed end falls obliquely to the pallial line without touching anterior adductor scar, confluent with it in short distance only.

*Remarks* : *T. capsoides* Lamarck can be distinguished by its trigonal, ovate shape; sculpture of weak concentric striae crisscrossed by fine radial striae; subspinose on the dorsal margin.

This species is extremely variable due to which a large number of species synonymised under this species.

There are some differences in the placement and configuration of the pallial sinus of young and adult individuals. In the young individuals pallial sinus is regularly rounded in the anterior margin and distinctly separated from the anterior adductor scar. In case of the adults anterior adductor scar is larger, and pallial sinus more extensive, close to the anterior adductor scar and regularly convex arcuation becomes irregular and slightly displaced.

*Range* : East African coast to Philippines, north to Japan and South to Queensland, Australia.

*Distribution* : India : Gujarat, Maharashtra, Tamil Nadu, Andhra Pradesh, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

#### Subgenus *Tellinella* Moerch

1853. *Tellinella* Moerch, *Catalogus Conchyliorum Comes di Yoldi*, 2 : 13, (typespecies, *Tellina virgata* Linnaeus 1758, subsequent designation, Stoliczka 1870)

Shell large to medium, elongate, ovate or elliptical, equivalve, solid to subsolid, more or less flexed to right posteriorly. Sculpture of strong concentric striae often squamose posteriorly; radial sculpture rare. Hinge with cardinal and lateral dentitions. Cardinal teeth two in each valve, left anterior and right posterior bifid. Lateral teeth in the right valve distal and strongly developed, whereas in the left valve distal but less developed. Pallial sinus linguiform, and removed from anterior adductor scar, confluent with pallial line only in posterior half of the shell. Adductor muscle scars well impressed.

This group is very common in Western Atlantic, Eastern Pacific, and Indo-Pacific.

*Geological Range* : Upper Cretaceous to Recent.

*Remarks* : Afshar (1969) created a subgenus *Liotribella* with *T. staurella* Lamarck as type-species. His description is very similar to that of *Tellinella* Moerch, only difference is in the unbonal region, which is posterior to mid length in the case of *Liotribella*. It is considered as a synonym of *Tellinella* Moerch.

The Indo-Pacific region is the richest area in the world map for the species of *Tellinella*. Most of them are tropical, in shallow water habits and often associated with the sandy areas and also in the reefs. A few were also recorded from western Atlantic and Eastern Pacific.

Stoliczka (1870) documented the occurrence of this group from Cretaceous of India. It also appears to be well established in the Eocene of Europe and North America.

It is known by four species from India but the following three are physically examined.

### Key to the species

1. Umbo pointed and more or less middle in position .....(2)
  - Umbo pointed and posterior in position ..... *T. staurella* Lamarck
2. Posterior end more rostrate, sculpture with concentric striae and radial bands present ..... *T. virgata* Linnaeus
  - Posterior end less rostrate, sculpture with concentric striae and radial bands absent ..... *T. travancorica* Smith

#### 24. *Tellina (Tellinella) staurella* Lamarck ( Pl. XVIII, fig. 1, Pl. XIX, fig. 1 )

1798. *Tellina cruciata* Spengler, *Skrivter of naturhistorie Selskabet Kebenhavn*, 4(2) : 83. ( t y p e locality, Era Niquebar; types, UZM), nomen dubium.
1818. *Tellina staurella* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 5 : 522. (type locality, Nouvelle Holland; Syntypes, MNHNP).
1818. *Tellina scalaris* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 5 : 527, (type locality, Unknown; Holotype, MNHNP).
1854. *Tellina incerta* Deshayes, *Proc. zool. Soc. Lond.*, 1854 : 367, pt.22. (type locality, Philippines Islands; Syntypes, NHM).
1854. *Tellina petalina* Deshayes, *Proc. zool. Soc. Lond.*, 1854 : 367,(type locality, Unknown: Holotype, NHM).
1854. *Tellina rufa* Deshayes, *Proc. zool. Soc. Lond.*, 1854 : 367, (type locality, Unknown: Holotype, NHM).

*Material examined* : Andaman and Nicobar Islands : i) 87 valves, Andamans, ii) 5 ex., Car Nicobar, iii) 3 valves, Havelock Island, iv) 1 ex., Nancowry Island, v) 2 ex., Neil Island,vi) 3 ex., Nicobar Islands, vii) 6 ex., Port Blair, Andamans.

#### *Measurements (mm) :*

Length	Height	Depth
52.25-26.89	31.00-16.00	12.52-7.26

*Description* : Shell subelliptical, solid, somewhat inflated, equivalve with a sharp posterior flexure on the right valve, left valve slightly more convex; yellowish or white, sometimes with rosy radiating rays from the umbonal region. Umbo slightly elevated, pointed and a little posterior to middle; anterior margin rounded, ventral margin slightly convex; anterior dorsal margin gently sloping; posterior dorsal margin slightly convex; posterior margin irregular, divided into two short portions more or less oblique to the dorso ventral axis. Sculpture of prominent concentric ridges with incised sulci, the concentric ridges more prominent on the posterior side. Posterior ridge biangulate and rather well developed in the right valve. Radial striae very fine or almost absent. Ligament broad, elongate, strong and dark brown colour, lunule obsolete.

In the left valve the cardinal complex consists of a strong bifid anterior tooth of irregular lobes and a thin laminate posterior tooth; lateral teeth are well developed and distal; recognised by thickening on the hinge line. In the right valve the cardinal complex consists of posterior strong bifid tooth with subequal lobes, lateral teeth well developed, up curved and socketed above, the anterior tooth nearer to cardinal complex more prominent than the posterior tooth, the later distal to the cardinal complex.

Muscles scars well developed. Anterior adductor scar elongate and posterior adductor scar sub orbicular. Pallial sinus subequal in both the valves, rising gently from lateral surface of the posterior adductor scar, rounded anteriorly and falls obliquely to the pallial line and confluent in short extends upto the anterior adductor scar but well separated and connected with a small linear scar.

*Remarks* : Lamarck (1818) distinguished three varieties mainly based on the colour pattern a) white with crimson cross on the umbones and crimson interrupted rays, b) with crimson cross on the umbones but without interrupted rays, c) without umbonal cross and with only faint rays.

This species is generally confused with *T. virgata* and *T. crucigera* of Indo-pacific region. *T. staurella* can be distinguished from *T. virgata* as the former is less elongate, with very much short posterior end, posterior dorsal margin has very steep slope, hinge plate thin, right anterior lateral strong, dorsal margin of the pallial sinus nearly straight and umbones marked with crimson cross and the sculpture lacks the fine radial striae, whereas the latter is more elongated, subequilateral, posterior end rostrate, posterior dorsal margin less slope, dorsal margin of pallial sinus convex, the sculpture has very fine radial striae, umbones never marked by crimson cross, pallial sinus connected with anterior adductor scar in the case of *T. staurella* whereas it is not connected by linear scar in the case of *T. virgata*. Boss (1969) remarks under *T. virgata*, "the young of *T. staurella* are not distinctly cancellate and have closely set concentric lirations"

*Range* : East Africa to Philippines, Polynesia.

*Distribution* : India : Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

**25. *Tellina (Tellinella) travancorica* Smith**  
( Pl. XVII, fig. 1, Pl. XIX, fig. 2 )

1897. *Tellina travancorica* Smith, *Ann. Mag. Nat. Hist.*, 7(4) : 249. (type locality, Laccadive Sea, Syntypes. ZSI).

*Material examined* : Lakshadweep : i) 11 valves, Lakshadweep , Reg. No. M 948/1

*Measurements (mm)* :

Length	Height	Depth
43.65-38.11	25.82-22.06	10.22-9.85

*Description* Shell elongate, subovate, somewhat inflated, the left one more concave than the right; white. Umbo more or less central, pointed and slightly elevated; anterior margin rounded, ventral margin slightly convex or more or less straight; anterior dorsal and posterior dorsal margin straight and gradually sloping; posterior margin truncated. Sculpture of fine concentric striae; radial striae almost absent. Ligament short, yellowish brown, lunule narrow, elongate and equal in both the valves

In the left valve the cardinal complex consists of a subequal bilobed anterior tooth and a thin laminate posterior tooth; lateral teeth thickenings on the hinge line or almost absent. In the right valve the cardinal complex consists of a thick anterior tooth and an unequal bilobed posterior tooth; lateral teeth strong, socketed above, the anterior one slightly closer than the posterior tooth.

Muscle scars moderately developed. Anterior adductor scar elongate, semi lunar whereas posterior adductor scar more or less rounded, with elongated anterior end. Cruciform scars two, oval. Pallial sinus equal in both the valves, sinus rises sharply on the posterior but after a short distance it descended anteriorly with rounded anterior end and the ventral margin parallel to the pallial line confluent with posterior end only.

*Remarks* : This species can be distinguished from the others by its shape and sculpture.

*Range* : Endemic to West coast of India.

*Distribution* : India : Lakshadweep, Kerala.

**26. *Tellina (Tellinella) virgata* Linnaeus**  
(Pl. XVIII, fig. 2, Pl. XIX, fig. 3 )

1741. *Tellina virgata* Rumph, *Amboin. Rarit.*, p. 147, pl. 45, fig. H.

1758. *Tellina virgata* Linnaeus, *Syst. Nat.* ed. 10 : 674, no 35, (type locality, in *O. indicum*; types, Linnaean Society, London).

1843. *Tellina Marginalis* Hanley, *Rec. Biv. Shells*, p. 61.

1844. *Tellina jubar* Hanley, *Proc. zool. Soc. Lond.*, p. 60, pt.12, (type locality : Unknown, Syntypes, NMH).

*Material examined* : Andaman and Nicobar Islands : i) 169 valves, Andamans, ii) 2 valves, Port Blair; Maharashtra : iii) 1 valve, Mumbai.

*Measurements (mm)* :

Length	Height	Depth
80.45-27.80	48.10-15.75	20.05-11.12

*Description* : Shell subovate, solid, and somewhat inflated, inequivalve, with a sharp posterior flexure to the right, with the left valve of greater convexity; white or yellowish and banded with concentric orange or pink close spaced radiating rays, umbonal region red or pinkish. Umbo central, more or less pointed and slightly elevated; anterior margin rounded;

ventral margin obliquely inflated; anterior dorsal margin and posterior dorsal margin gently sloping; posterior margin irregular, attenuated, biangulate, forming irregular truncation in posterior. Sculpture of strong concentric, irregularly spaced, lirations particularly on the posterior slope, radial striations very fine and prominent only in the dorsal half of the shell. Ligament strong, yellowish brown; lunule poorly developed.

In the left valve the cardinal complex consists of subequal, bifid anterior tooth and an elongate, laminate shelf like, posterior tooth; anterior lateral consist of thickened denticle on hinge margin and distal but nearer to cardinal complex than the posterior lateral. In the right valve the cardinal complex consists of thickened anterior laminate tooth and unequal bifid posterior; anterior lateral strong, shelf like and socketed above closer to the cardinal complex; posterior lateral also strong, socketed, pointed and distal to the cardinal complex.

Muscle scars well developed. Anterior adductor scars irregularly, semilunate; posterior adductor scar subovate. Cruciform scars moderately developed, anterior most subrectangular. Pallial sinus subequal in both valves, rising gradually to the posterior side, broadly convex on the upper side, extending towards the anterior adductor scar, rounded anteriorly and falls obliquely to the pallial line confluent posterior and irregular; a small linear scar unites the pallial sinus with the anterior adductor scar.

*Remarks* : It is a common Indo-pacific species. It is very much allied and similar to *T. staurella* Lamarck. *T. virgata* Linnaeus may be distinguished by the row of accessory pallial attachment on scars parallel with the pallial line and the internal surface of the valve, concentric sculpture stronger, sharper; cardinal and hinge plates are also thicker and the shell also larger than *T. staurella* Lamarck.

*Range* : East African coast to Society Island and south to Shark's Bay in Western Australia to north Ryu Ryu Island.

*Distribution* India : Maharastra : Mumbai, Andaman and Nicobar Islands; *Elsewhere* Indo-Pacific.

#### Subgenus *Tellinides* Lamarck

1818. *Tellinides* Lamarck, *Hist. Nat. Anim. Sans. Vert.*, 5 : 535, (type species, *Tellina timorensis* Lamarck 1818, original designation, monotypy).

Shell medium to large, elongate, and rectangular in shape. Sculpture more or less smooth or with fine concentric striae. Umbo rather small, usually medium, posterior in position. Hinge with weak cardinal and lateral dentitions. Cardinal teeth two in each valve; lateral teeth obsolete or absent except the right anterior that lies close to the cardinal complex. Pallial sinus rising sharply behind and descending, oblique anteriorly, united with pallial line after some distance from anterior adductor scar. Cruciform muscles scar often marked by whitish ray posteriorly. Adductor scars well impressed. Colour generally white, sometimes purple red.

*Geological Range* Recent.

Three species were reported from India.

### Key to the species

1. Shell subrectangular to subacuminate, white or pink colour, anterior adductor scar semi lunar but the inner edge zigzag.....(2)
  - Shell oval, pink colour with radiating white bands from the umbonal region to the outer margin, anterior adductor scar elongate with more or less straight inner edge ..... *T. (T.) ovalis* Sowerby
2. Shell with subquadrangle outline, less angulated posterior end, concentric striae very strong and widely spaced ..... *T. (T.) sinuata* Spengler
  - Shell without subquadrangle out line, with angulated posterior end, concentric striae not so strong and spaced ..... *T. (T.) opalina* Gmelin

### 27. *Tellina (Tellinides) opalina* Gmelin ( Pl. XX, fig. 2, Pl. XXII, fig. 2 )

1782. *Tellina opalina* Chemnitz, *Conch. Cab.*, 6 : 118, t. 2, figs. 107 and 108, (type locality, in sinu Nicobarico. types. UZM (broken).

*Tellina apelina* Gmelin, *Syst. Nat.*, ed. 13 : 3236, error for *opalina*.

1827. *Tellinides rosea* Crouch Lamarck's *Conch.*, pp 11, 44, pl.4, figs. 1 a and b, (type locality, not given).

1839. *Tellina planissima* Anton, *Vérz.*, p.4, (type locality, not given).

*Material examined* : Andaman and Nicobar Islands : i) 4 valves, Casuarina Bay; ii) 2 valves, Rulo Kumb, Great Nicobar.

#### *Measurements (mm) :*

Length	Height	Depth
40.18-32.22	26.20-20.55	–

*Description* : Shell medium, more or less oval, subrectangular to subacuminate, thin, with compressed posterior side; pinkish red and white at periphery, with white rays specially on the posterior part of the left valve. Umbo subcentral, prominent, sharp and anteriorly placed. Anterior margin rounded; ventral margin convex, rising in gently convex arcuation posteriorly; anterior dorsal margin descending and slightly convex; posterior dorsal very sharply descending; posterior margin short, rounded forming somewhat oblique truncation. Sculpture of very fine closely placed concentric striae; radial striae more evident on the central disc; ligament moderate, protuberant and dark brown in colour; lunule absent.

In the left valve the cardinal complex consists of narrow, bifid subequal, anterior tooth and an elongate, laminated posterior tooth; true laterals teeth absent; but sub proximal fold

represent the anterior lateral tooth. In the right valve the cardinal complex consists of short laminate anterior tooth and a large, skewed, posterior bifid posterior tooth; lateral only one, the anterior lateral peg like, protrudent and closely to the cardinal complex; posterior lateral absent.

Muscle scars well impressed. Anterior adductor scar subsemilunate and posterior adductor scar subrectangular. Cruciform scars large, rounded, placed at distance in the left valve but slightly closer in the right valve. Pallial sinus more or less equal in both the valves; rising sharply from posterior adductor scars, irregularly descending in arcuation anteriorly, coalesced with and separated from anterior adductor scar, and joining pallial line ventrally in convex arcuation, distance separating anterior most extension of pallial sinus and anterior adductor scar variable.

*Remarks* : *T. opalina* Gmelin can be distinguished by its fine incised sulcated sculpture, obsolete radial striae and anterior lateral tooth in right valve which is small, rounded, blunt and peg-like.

*Range* : S. African coast to Philippines and Fiji Islands.

*Distribution* : India : Nicobar Islands; *Elsewhere* : Indo-Pacific.

**28. *Tellina (Tellinides) ovalis* Sowerby**  
( Pl. XX, fig. 1, Pl. XXII, fig. 1 )

1825. *Tellina ovalis* Sowerby in Budgin MS, *Tank. Cat.App.*, 3 : no 198, ( type locality, not mentioned).

1870-73. *Tellina gratiosa* Roemer in Martini-Chemnitz, *Conch. Cab.*, 10(4) :170, t.34, figs.10-12. ( type locality, Der Indische Ocean).

*Material examined* : Andaman and Nicobar Islands : i) 3 ex., Andamans.

*Measurements (mm)* :

Length	Height	Depth
30.64-21.93	19.65-13.10	6.68-4.36

*Description* : Shell oval, thin, compressed gaping at both ends, subequilateral, left valve more concave; rosy with white rays radiating from the umbo to the outer margin externally, internally glossy and lighter. Umbo posterior and pointed. Anterior margin rounded; ventral margin slightly convex; anterior dorsal margin straight rather sloping; posterior dorsal margin sloping; posterior margin obtusely rounded and rather broader than the rounded termination of the more elongated anterior side. Sculpture of close concentric striae; closely placed anteriorly and widely spaced posteriorly, radial striae almost absent. Ligament conspicuous, dark brown colour; lunule narrow and mostly on the right valve.

In the left valve the cardinal complex consists of a bilobed anterior tooth and a small posterior tooth; lateral teeth absent. In the right valve the cardinal complex consist of a thin elongate anterior tooth and a laminate bilobed posterior tooth; anterior lateral present which is near to the cardinal complex; posterior lateral absent.

Muscle scars poorly developed. Anterior adductor scar elongated, posterior adductor scar semilunate, short. Cruciform scars two and rounded. Pallial sinus equal in both the valves, sinus rises; anteriorly, descends posteriorly with arcuated anterior end and falls obliquely to the pallial line and confluent with it.

*Remarks* : This species can be distinguished by its oval shape, sculpture and the arrangement of pallial sinus.

*Range* : Persian Gulf to Philippines.

*Distribution* : India : Goa, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

29. *Tellina (Tellinides) sinuata* Spengler  
( Pl. XXI, fig. 1 & 2, Pl. XXII, fig. 4 & 5 )

1798. *Tellina sinuata* Spengler, *Nat. Selsk. Skrivt.* 4 : 109, (type locality, unknown, type, Holotype, UZM).  
1815. *Tellina nivea* Wood, *Gen. Conch.*, 1 : 144, no.62, t.46, (type locality, American Ocean).  
1819. *Tellina Timorensis* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 5 : 536, (type locality, Timor).

*Material examined* : Andaman and Nicobar Islands : i) 17 ex., 6 valves, Andamans, ii) 3 valves, Katchal Island; Goa : iii) 3 valves, Cavellosum beach, iv) 1 valve, Betul Bay, v) 1 valve, Sridon beach, vi) 3 valves, Terakol; Gujarat : vii) 1 valve, Kandla; Maharashtra : viii) 9 valves, Mumbai, ix) 3 valves, Ratnagiri; Orissa : x) 1 ex., Chandipur; Tamil Nadu : xi) 4 valves, Porto Novo, xii) 8 valves, Palk strait, xiii) 1 valve, Tranquebar, xiv) 3 valves, Tuticorin; West Bengal : xv) 5 valves, Digha.

*Measurements (mm)* :

Length	Height	Depth
63.43-26.92	40.08-15.20	6.96-5.08

*Description* : Shell oblong subquadrate, broad, tolerably strong, compressed, gaping on both the ends; white with yellowish suffused region. Umbo anterior to mid length, elevated and pointed. Anterior margin rounded; ventral margin straight and after the mid length with a strong posterior sinus; anterior dorsal margin elongately sloping; posterior dorsal margin truncated; its extremity obtusely angulated in front of the angle sinuously depressed. Sculpture of fine closely spaced concentric striae which are decussated in front by raised oblique rather distant, radial striae fine or almost absent; ligament moderate, prominent and dark brown in colour, lunule almost absent.

In the left valve the cardinal complex consists of strong, unequal bifid anterior tooth and posterior one slightly prominent which forms by the thickening on the hinge line. In the right valve the cardinal complex has a laminate anterior tooth and a bifid posterior tooth; anterior lateral prominent and closely situated to the cardinal complex.

Muscle scars moderately impressed. Adductor scars elongated, semi-lunar. Cruciform scars well impressed, anterior oval and posterior rounded, posterior larger than anterior in

left valve. Pallial sinus equal in both the valves; sinus rises posteriorly and after a short distance it descends anteriorly with a rounded anterior margin far from anterior adductor scar and ventral margin confluent with pallial sinus.

*Remarks* : *T. sinuata* Spengler can be easily distinguished from the other species by its shape, cardinal complex, pallial sinus and pallial line.

*Range* : Indian Ocean Islands to Philippines.

*Distribution* : India : Gujarat, Maharashtra, Goa, Tamil Nadu, Orissa, West Bengal Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

### Genus *Arcopagia* Brown

1827. *Arcopagia* (Leach MS) Brown, *Illustrations Conch. Great Britain and Ireland*, pl. 16, figs., 8-10, (type species, *Tellina crassa* Pennant, 1777, subsequent designation Herrmannsen, 1846).

Shell large to small, usually rounded or ovate, solid, moderately inflated. Sculpture of strong concentric striae and weak radial striae. Hinge with cardinal and lateral dentitions; cardinal teeth two in each valve, left anterior and right posterior bifid; lateral teeth two strong in the right valve and weak in the left valve. Pallial sinus with various configurations, sometimes linear scar connecting anterior adductor scar and pallial sinus, but it may be discrepant in two valves. Adductor muscle scars well impressed.

This group is very common in Western Atlantic and Indo-Pacific region.

*Geological Range* : Eocene to Recent.

*Remarks* : *Arcopagia* is considered here as a genus, which includes many subgenera. The general thickness and orbicular shape of the shell are typical characters of this group.

Many of the so called genera synonymised under *Arcopagia*. *Pseudoarcopagia* and *Zearcopagia* very closely related as it is difficult to justify any generic differences. Boss (1969) included *Scutarcopagia* under *Arcopagia* as it is characterised by unique rasp like sculpture with the remarks "one might be inclined to treat *Scutarcopagia* separately, if a genuine radiation of species existed" He named two species *T. scobinata* and *T. elizabethae* which possesses that type of sculpture. In India one more species *T. lingua-felis* represented and so *Scutarcopagia* kept as subgenus of *Arcopagia*.

*Arcopagia* was found in the Cretaceous period (Stolickza, 1870). It is well represented in the Eocene of Paris Basin. Recent forms are mainly recorded from the tropical Indo-pacific and few of them also known to have from cool temperate and even boreal distribution.

This genus represented by six species from India.

### Key to the species

- 1 Shell medium to large size .....(2)
  - Shell small to medium size .....(3)
2. Sculpture with strong concentric ridges separated by inter lamellar space .....  
..... *A. remies* Linnaeus
  - Sculpture with very fine concentric ridges and radial ridges, inter lamellar space very close ..... *A. inflata* Gmelin
3. Sculpture with very fine concentric striae .....(4)
  - Sculpture with decussate appearance ..... *A. carnicolor* Hanley
4. Shell with subovate, anterior lateral tooth closer to the cardinal complex .....(5)
  - Shell with oval subcuneate with acuminate posterior end, anterior lateral tooth strong and closer to cardinal complex ..... *A. pudica* Hanley
5. Shell thin, white all over including umbonal region, outline less orbicular .....  
..... *A. casta* Hanley
  - Shell thick, white with rosy umbonal region, outline more orbicular .....  
..... *A. pinguis* Hanley

### 30. *Arcopogia carnicolor* (Hanley)

( Pl. XXIII, figs. 1-3, Pl. XIX, figs. 5 & 6 )

1844. *Tellina incarnata* Hanley (non Linnaeus), *Proc. zool. Soc., Lond.*, p. 68, (type locality, San Nicolas, Zebu, Philippines, Sandy and Low water; types, NHM, 1874, 12.11.338).
1846. *Tellina carnicolor* Hanley in Sowerby, *Thes. Conch.*, 1(6) : 263, pl. 56, fig. 15.
1854. *Tellina Strangei* Deshayes, *Proc. zool. Soc., Lond.*, p.362, (type locality, New Zealand; types, unknown)
1867. *Tellina corbis* Sowerby in Reeve, *Conch. Icon.*, 17 : *Tellina* sp. no. 126, pl.24, fig.126, (type locality, unknown).
1908. *Tellina cancellata* Preston, *Rec. Indian Mus.*, 2 : 219, pl.17, figs.58,58A, (type locality, Andaman Islands; type, ZSI).

*Material examined* : Andamans : i) 48 valves, Andamans; ii) 1 ex., Zebu, Philippines, NHM, 1874.12.11.338, (type of *T. carnicolor* Hanley).

*Measurements (mm)* :

Length	Height	Depth
27.95-9.86	15.00-7.80	8.25-6.17

**Description** : Shell small, oval, solid and ventricose, white. Umbo elevated, pointed, and slightly posterior. Anterior margin rounded; ventral margin convex and ascending posteriorly; anterior dorsal margin long gradually sloping; posterior dorsal margin short slightly convex, sloping; posterior margin angular and subtruncated. Sculpture of prominent concentrically spaced lamellae crossed by close set radial striae giving it a decussated appearance; ligament small, narrow, sunken and yellowish brown; lunule moderate and equally developed in both the valves.

In the left valve the cardinal complex consists of a bilobed anterior tooth and a small thin laminate posterior tooth; lateral teeth at equidistant from the cardinal complex, formed by thickening on hinge line. In the right valve the cardinal complex consists of a laminate anterior tooth and a strong unequal bilobed posterior tooth; lateral teeth strong, well developed, equidistant and socketed above.

Muscle scars moderately developed. Adductor scars poorly developed with elongate anterior scar and more or less oval posterior scar. Cruciform scars well impressed, the posterior smaller than the anterior. Pallial sinus equal in both the valves; sinus descending gradually anteriorly and after half of the distance it falls obliquely to the pallial line and confluent on posterior part.

**Remarks** : *T. carnicolor* Hanley is distinguished from other Indian forms by its distinct sculpture of concentrically spaced lamellae crossed by close radial striae which giving it a decussated appearance.

**Range** : Maldives to Philippines and east of Australia.

**Distribution** : India : Lakshadweep, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

### 31. *Arcopagia casta* (Hanley)

( Pl. XVII, fig. 2, Pl. XXIV, figs. 1-3, Pl. XXVII, figs. 5 & 6 )

1845. *Tellina casta* Hanley, *Proc. zool. Soc., Lond.*, 1844 : 63, (type locality, Singapore from sandy mud; Syntypes, NHM, 1976123).

1916. *Tellina persimplex* Preston, *Rec. Indian Mus.*, 12 : 96, fig. 12, (type locality, Port Blair, Andaman; Holotype, ZSI).

1916. *Tellina vadorum* Preston, *Rec. Indian Mus.*, 12 : 98, fig. 17 and 17a, (type locality, Bamboo flat bay, Andaman; Holotype, ZSI).

**Material examined** : Andaman and Nicobar Islands : i) 7 valves, Andamans; Singapore : ii) 7 valves, Singapore, NHM 1976123 (Syntypes).

#### *Measurements (mm)* :

Length	Height	Depth
12.54-10.65	9.95-8.27	5.44-4.12

*Description* : Shell medium to small, subovate, thin, slightly inequivalve; white and glossy. Umbo wide and posterior; anterior margin broadly rounded; ventral margin convex; anterior dorsal margin straight and gradually sloping; posterior dorsal margin short and straightly sloping; posterior margin short arcuated; sculpture smooth and with very fine close concentric striae; radial striae absent; ligament short and narrow.

In the left valve the cardinal complex consists of a bilobed anterior tooth and a lamellar posterior tooth; lateral teeth small and formed by the thickening on the hinge marginal line. In the right valve the cardinal complex consists of a small lamellar anterior tooth and unequal bilobed posterior tooth, lateral teeth prominent, socketed above; the anterior lateral more stronger than the posterior lateral.

Muscle scars well developed. Anterior adductor scar elongated and semilunar; posterior adductor scar subrectangular. Cruciform scars two and more or less rounded. Pallial sinus equal in both the valves; sinus rises posteriorly descending anteriorly with arcuated anterior end, far from anterior adductor scar, fall obliquely to the pallial line and confluent with it.

*Remarks* : *T. casta* Hanley can be recognised by its thin, subovate shape, umbo, cardinal complex, pallial sinus and pallial line. It resemble *T. nux* Hanley but can be differenciated from it in broad shape, decidedly arcuated ventral edge, dorsal edges less convex and shorter, umbonal region colourless. It also resembles *T. pinguis* Hanley and *T. robusta* Hanley but the former differs by its more orbicular outline and the later distinguished by its texture even in the case of young individuals.

*Range* : Mauritius to Indonesia.

*Distribution* : India : Orissa, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

### 32. *Arcopagia inflata* (Gmelin) ( Pl. XXV, fig. 1, Pl. XXVII, fig. 1 )

1782. *Tellina inflata* Chemnitz, *Conch. Cab.*, 6 : 91, pl.9, fig.76, (type locality, unknown; type, not in NHM).

1791. *Tellina inflata* Gmelin, *Syst. Nat.*, ed., 13 : 3230.

1818. *Tellina striatula* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 5 : 529, (type locality, I' Ocean, Europe).

1843. *Tellina hippoidea* Jonas in Philippi, *Abbild. Beschr. Conch.*, 1 : 72, *Tellina* pl. 1, fig.3. (type locality, Unknown.).

1870. *Tellina (Peronaeoderma) simplex* H. Adams, *Proc. zool. Soc. Lond.*, 1870 : 789, pl.48, fig.5. (type locality, not mentioned).

*Material examined* : Andaman and Nicobar Islands : i) 29 ex., Andamans; ii) 1 ex., Camorta.

*Measurements (mm)* :

Length	Height	Depth
41.22-24.11	34.36-19.55	14.54-7.70

**Description** : Shell subovate, solid, more or less equivalve, moderately inflated with larger anterior end; white, internally more glossy. Umbo pointed posterior, and slightly elevated; anterior margin broad, rounded; ventral margin convex; anterior dorsal margin gradually sloping; posterior dorsal margin abruptly sloping; posterior margin obtusely angulated. Sculpture of very fine concentric ridges obscurely decussated with fine radial striae; ligament short, shunken and yellowish brown, lunule very small.

In the left valve the cardinal complex consists of an anterior tooth with unequal lobes and a laminated posterior tooth; lateral tooth small obsolete and anterior lateral closer to the cardinal complex, the posterior lateral situated below the distal end of ligamental groove. In the right valve the cardinal complex consists of a small laminate anterior tooth and an unequal bilobed posterior tooth; lateral tooth well developed, strong, socketed above with anterior proximal to cardinal complex and posterior distal to cardinal complex.

Muscle scars well developed. Anterior adductor scar elongated, semilunar whereas the posterior adductor scar is oval. Cruciform scars closer to the periphery; anterior smaller, oval, posteriorly elongated. Pallial sinus equal in two valves, posteriorly ascending and anteriorly descending; its anterior end acutely rounded, falls obliquely to the pallial line, confluent only in small posterior part.

**Remarks** : *T. inflata* Gmelin can be distinguished by its general shape, sculpture of fine concentric striae obscurely decussated with fine radial striae.

**Range** : East African coast to Philippines.

**Distribution** : India : Maharastra, Goa, Lakshadweep, Andaman and Nicobar Islands; **Elsewhere** : Indo-Pacific.

### 33. *Arcopagia pinguis* (Hanley) ( Pl. XXV, fig. 2, Pl. XXVII, fig. 2 )

1844. *Tellina pinguis* Hanley, *Proc. zool. Soc., Lond.*, p. 63, (type locality, St. Nicholas Zebu, Philippines; type, not known).

**Material examined** : i) 7 valves, Sri Lanka, Port Said, Andaman, (as per recorded localities in the collections).

**Measurements (mm)** :

Length	Height	Depth
9.80-8.97	8.52-7.30	5.20-4.25

**Description** : Shell small, subovate, thick, slightly inequivalve; white, with rosy tinge in the unbonal region. Umbo pointed, slightly posterior. Anterior margin rounded; ventral margin convex; anterior dorsal margin and posterior dorsal margin are straight and sloped; posterior margin short and arcuated. Sculpture of very fine concentric striae, appearing almost smooth and without radial striae; ligament short and extremely narrow; lunule short and narrow.

In the left valve the cardinal complex consists of a unequally bilobed anterior teeth and laminate posterior tooth; lateral teeth formed by thickening on the hinge marginal line, anterior lateral nearer to cardinal complex, In the right valve the cardinal complex consists of an anterior tooth and a unequal bilobed posterior tooth; lateral teeth prominent, socketed above, anterior one stronger and nearer to the cardinal complex than the posterior.

Muscle scars well impressed. Adductor scar semilunar with elongated anterior end. Cruciform scars two and rounded. Pallial sinus equal in both the valves, sinus ascending anteriorly and descending posteriorly with arcuated anterior end looks like an arc, falls obliquely to pallial line and confluent with it.

*Remarks* : This species can easily be recognised by its orbicular outline, ligament, pallial sinus, pallial line, and pallial complex. It is very much allied to *T. casta* Hanley but differs from it in its more orbicular outline.

*Range* : India to Philippines.

*Distribution* : India : Andaman and Nicobar Islands, Kerala, Maharastra, Tamil Nadu; *Elsewhere* : Indo-Pacific.

#### 34. *Arcopagia pudica* (Hanley) ( Pl. XXV, fig. 3 )

1845. *Tellina pudica* Hanley, *Proc. zool. Soc., Lond.*, 1845 : 62, (type locality, Cathalonga, Isle of Samar, Philippines).  
1916. *Tellina innocens* Preston, *Rec. Indian Mus.*, 12 : 96, fig. 11, (type locality, Phoenix bay, Andaman: type, ZSI).

*Material examined* : Andaman and Nicobar Islands : i) 1 ex., Phoenix bay, Andaman.

*Measurements (mm)* :

Length	Height	Depth
5.00	4.00	2.50

*Description* Shell small, smooth, oval, subtruncate with acuminate posterior side; white. Umbo pointed, slightly anterior. Anterior margin rounded; ventral margin convex; anterior dorsal margin straight and gradually sloped; posterior dorsal margin also straight with a gradual slope; posterior margin short and acuminate. Sculpture of very fine close concentric striae and radial striae absent; ligament short and situated in ligament groove.

In the left valve the cardinal complex consists of a bilobed anterior tooth and a laminate posterior tooth; lateral teeth small. In the right valve the cardinal complex, consists of an anterior tooth and a bilobed posterior tooth; lateral teeth are prominent, socketed above, the anterior lateral strong and nearer than the posterior lateral.

Muscle scars well impressed. Adductor scars subequal and orbicular. Cruciform scars two and not so distinct. Pallial sinus not so distinct, sinus ascending posteriorly and descending

anteriorly with rounded anterior end and falls obliquely to pallial line and confluent with it.

**Remarks** : This species can easily be recognised by its shape, sculpture, cardinal complex and lateral teeth.

**Range** : India to Philippines, north to Japan..

**Distribution** : India : Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

### 35. *Arcopagia remies* (Linnaeus)

(Pl. XXVI, figs. 1 & 2, Pl. XVI, fig. 1, Pl. XXVII, fig. 3)

1758. *Tellina Remies* Linnaeus, *Syst. Nat. ed.*, 10, p.676, no 48. (type locality, 0 Europaeo et Indico: type, Linnaean Society, London).

1818. *Tellina sulcata* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 5 : 528, (type locality, Nouvelle Hollande).

1825. *Tellina convexa* Wood, *Ind. Test. Supp.*, t.1, fig. 2.

1908. *Tellina jousseaumei* Preston, *Rec. Indian Mus.*, 2 : 209, pl.17, fig.60, (type locality, Andaman Islands; type, ZSI ).

**Material examined** : Andaman and Nicobar Islands : i) 7 ex., 9 valves Andamans, ii) 9 ex., Camorta, iii) 2 valves, Carbyn's Cove, iv) 3 ex., 1 valve, Car Nicobar, v) 1 valve, Chidyatapu, vi) 3 valves, Havelock Island, vii) 1 ex., 5 valves, Katchal Island, viii) 1 ex., 5 valves, Nancowry Island, ix) 11 ex., Neil Island, x) 6 ex., 16 valves, Port Blair, Andamans, xi) 3 exs., Rangat, Andamans.

**Measurements (mm)** :

Length	Height	Depth
78.18-28.11	73.89-23.81	31.46-10.35

**Description** : Shell suborbicular, solid, rather inequivalve; white. Umbo subcentral and somewhat inconspicuous. Anterior margin semi-circular; ventral margin broadly rounded anterior; anterior dorsal margin gradually sloping; posterior dorsal margin somewhat steep; posterior margin truncated, left valve sinuously depressed and the right sinuously elevated posteriorly. Sculpture with irregularly spaced lamellae of stronger in the anterior region and posterior slope; radial striae very fine; ligament strong, yellowish brown; lunule small.

In the left valve the cardinal complex consists of a strong, skewed, bifid anterior tooth with unequal lobes, deflected posteriorly and a thin laminated posterior tooth; lateral teeth prominent, bluntly thickening on hinge line; anterior one more prominent and proximal to the cardinal complex; the posterior less prominent and distal to the cardinal complex. In the right valve the cardinal complex consists of an anterior elongated, laminated tooth and a posterior skewed, strong, bifid tooth; anterior lateral tooth strong, proximal and protuberant and the posterior lateral distal and stronger than anterior, socketed above.

Muscle scars well impressed. Anterior adductor scar large and elongated and posterior adductor scar irregularly oval. Cruciform scars small, the anterior slightly elongated, large;

posterior one oval. Pallial sinus unequal, longer in the left valve and closer to the anterior adductor scar. Sinus rises sharply posterior but after a short distance descends gently anteriorly and falls obliquely to the pallial line; confluent short; a small linear scar connects the sinus with anterior adductor scar.

*Remarks* : Sowerby (1866) in his monograph treated *T. discus* Hanley and *T. remies* Linnaeus as two different species. He mentioned *T. discus* differs from *T. remies* by having wrinkles on the shell surface which are more and less continuous, and the posterior end acuminate and broadly truncated. But these differences are not strong enough for separating the two species. Both the species are very common to Indo-pacific. It may be *T. discus* Hanley is the same species described by Linnaeus as *T. remies*.

*Range* : India to Philippines, East of Australia.

*Distribution* : India : Tamil Nadu, Lakshadweep, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

### Genus *Strigilla* Turton

*Strigilla* Turton, *Conch. Insu. Brit. Dithyra*, p. 117, pl. 7, fig. 15, (type species, *Tellina carnaria* Linnaeus; subsequent designation, Gray 1847).

Shell medium to small, orbicular, trigonal. Sculpture of oblique incised rugae in the middle but divaricated on the anterior and posterior ends. Umbo anterior. Hinge with cardinal and lateral dentitions. Cardinal two in each valve, the left anterior and right posterior bifid. Lateral two, strong in the case of right valve but obsolete in the left valve. Pallial sinus variously developed, it may or may not touch the anterior adductor muscle scar. Adductor muscle scars well impressed. Colour white with fusion of red, yellow, green or brown.

This group shows a discontinuous distribution and occurs in Eastern Atlantic, Western Atlantic, Eastern Pacific and Indo-pacific.

This group first appeared in the late Oligocene period in region of North American Tertiary.

### Subgenus *Aeretica* Dall

1900. *Aeretica* Dall, *Trans. Wagner Free Inst. Sci. Philad.*, 3 : 1038; (type species, *Tellina senegalensis* Hanley, 1844; original designation).

Shell medium to small, orbicular. Sculpture of oblique scissulation on anterior part and smooth posterior slope; hinge with cardinal and lateral dentitions. Cardinals two in each valve, the left anterior and right posterior bifid, laterals two, strong in the case of right valve but obsolete in the left valve. Pallial sinus discrepant in two valves; pallial line connecting adductor scar in one valve, falling short in the other.

*Geological Range* : Oligocene to Recent.

**Remarks :** This subgenus can easily be separated from other subgenera by the pallial sinus which is discrepant in two valves. Common in Indo-pacific region.

**36. *Strigilla (Aeretica) splendida* (Anton)**  
( Pl. XXVIII, figs. 1-3, Pl. IV, figs. 4-6 )

1839. *Tellina splendida* Anton, *Verz. Conch.*, p.5, (type locality, Isle of Samar, Philippines).

1908. *Strigilla denestriata* Preston, *Rec. Indian Mus.*, 2 : 210, pl.14, figs. 20, 20A, (type locality, Andaman Islands; type, ZSI ).

**Material examined :** Andaman and Nicobar Islands : i) 1 ex., 1 valve, Andamans; Andhra Pradesh : ii) 4 valves, Kakinada Bay; West Bengal : iii) 55 ex., Bakkhali, iv) 20 valves, Digha, v) 108 ex., Kakdwip.

**Measurements (mm) :**

Length	Height	Depth
20.24-10.34	17.81-8.28	8.05-3.88

**Description :** Shell medium, orbicular, tolerably strong or very thin, delicate, inequivalve valve, the right valve more convex than the left; white with yellow or rosy suffused. Umbo acuminate, elevated and anterior in position; anterior margin rounded; ventral margin convex; anterior dorsal margin straight and abruptly sloping; posterior dorsal margin rounded. Sculpture of oblique scissulations on the posterior part of both the valves but the anterior end with fine, closely spaced concentric striae. Ligament shunken and small, flexure not conspicuous; lunule moderate and partly situated on the left valve, umbonal ridge obsolete.

In the left valve the cardinal complex consists of a narrow, elongate, laminate, bifid anterior tooth and a thin laminate posterior tooth, closely depressed to the calcareous element of the ligament; laterals pointed and anterior one proximal to the cardinal complex. In the right valve the cardinal complex consists of a small thin anterior tooth and a strong, skewed bifid posterior tooth with the posterior lobe larger; laterals strong, socketed above with anterior one proximal and posterior one distal to the cardinal complex.

Muscle scars moderately impressed. Adductor scars elongated and narrow. Cruciform scars close to the ventral boundary and rounded. Pallial sinus discrepant in two valves. Sinus rising abruptly and forms convex shaped and falls obliquely to the pallial line without touching the anterior adductor scar, but more close to the anterior adductor scar in the case of right valve.

**Remarks :** *Strigilla splendida* (Anton) can be distinguished by its sculpture which has oblique scissulation on the posterior part but fine closely spaced concentric striae on the anterior end. The colour of the shell is highly variable. The specimens from Andamans are rosy suffused and thick; shells from Digha coast are very thin and almost white, while the collections from Kakdwip are thin, yellowish, rosy and white coloured shells.

*Range* : India to Philippines.

*Distribution* : India : Andhra Pradesh, Orissa, West Bengal, Andaman and Nicobar Islands;  
*Elsewhere* : Indo-Pacific.

### Subfamily MACOMINAE Olsson

#### Key to the genera

- 1 Cardinal teeth very large ..... *Macalia* H. Adams
- Cardinal teeth not large ..... (2)
2. Pallial sinus discrepant in two valves ..... *Macoma* Leach
- Pallial sinus not discrepant in two valves ..... (3)
3. Shell large and orbicular in shape ..... *Apolymetis* Salisbury
- Shell large or small but trigonal in shape ..... *Gastrana* Schumacher

#### Genus *Macoma* Leach

1819. *Macoma* Leach, *Ross voy.*, ed. 2 : 175. (type-species, *Macoma tenera* Leach = *Tellina calcarea* Gmelin, 1791; monotypy).

Shell subtrigonal mostly thin and usually colourless, or even if coloured without any particular pattern. Sculpture is of concentric or sometimes oblique striae. Hinge without lateral teeth, right valve with convergent cardinal teeth, with the larger posterior. The left valve with unequal bifid anterior tooth. Pallial sinus coalescent with the pallial line, below and often discrepant in the two valves.

Most of the earlier workers who considered the shape of the shell for grouping the genera and species. Salisbury (1934) for the first time pointed out the importance of the cardinal and lateral dentition for grouping the genera and the same was followed by later workers.

*Macoma* occurs in all seas but typical forms inhabit mostly the cooler seas and especially boreal water, in the laminarian and coralline zone.

Based on the cardinal complex, pallial sinus and sculpture, four subgenera have been recognised under the genus *Macoma* from Indian waters. They are *Pinguimacoma*, *Psammacoma*, *Psammotreta* and *Scissulina*.

#### Key to the subgenera

- 1 Anterior end considerably larger than the posterior end ..... (2)
- Anterior end only slightly larger than the posterior end ..... (3)

- 2. Shell larger than 12 mm; anterior end considerably larger than posterior end .....  
..... *Psammacoma* Dall
- Shell smaller than 12 mm; anterior end not larger than posterior end .....  
..... *Pinguimacoma* Iredale
- 3. Sculpture of concentric striae on both the valves ..... *Psammotreta* Dall
- Sculpture of concentric striae in the left valve and oblique scissulations in the right valve ..... *Scissulina* Dall

Subgenus *Pinguimacoma* Iredale

1936. *Pinguimacoma* Iredale, *Rec. Australian Mus.*, 19(5) : 292, (type species, *Pinguimacoma hemicilla* Iredale; by original designation).

Shell small inflated, thin, smooth with shorter posterior end. Sculpture of concentric striae only. Hinge with only cardinal teeth which are two in each valve, the left anterior and right posterior are bifid. Pallial sinus extended upto half of the shell and is confluent with pallial line only for a small part. Adductor muscle scars not well impressed and subequal in both the valves.

*Geological Range* : Recent.

Only one species recorded from Indian water.

37. *Macoma (Pinguimacoma) albissima* (Smith)  
( Pl. XXIX, fig. 1 )

1906. *Tellina albissima* Smith, *Ann. Mag. Nat. Hist.*, (7)18 : 259. (type-locality, Port Blair, Andamans, 100 fathoms).

*Material examined* : Andaman and Nicobar Islands : i) 2 valves, Off Port Blair, Andamans.

*Measurements (mm)* :

Length	Height	Width
16.00	10.00	–

*Description* : Shell medium, orbicular and tolerably strong; white with brownish touch. Umbo inflated, pointed and middle. Anterior margin rounded, ventral margin convex; anterior dorsal margin rounded; posterior dorsal margin straight and abruptly sloped; posterior margin truncated. Sculpture of fine concentric striae; radial striae absent. Ligament small, situated in ligamental groove.

In the left valve the cardinal complex consists of a bifid anterior tooth, and a small posterior tooth; laterals absent. In the right valve the cardinal complex consists of an anterior and an equally bifid posterior cardinal tooth; laterals absent.

Muscle scars moderately well developed. Anterior adductor scar elongate, posterior adductor scar almost rectangular shaped with elongated anterior end. Cruciform scars not so distinct. Pallial sinus rises posteriorly and after a short distance descends anteriorly, with rounded anterior end and confluent with the pallial line in the mid length.

*Remarks* : *M. albissima* (Smith) can be recognised by its shape, sculpture, cardinal complex, adductor muscle impression, pallial line and pallial sinus.

*Range* : India.

*Distribution* : India : Andaman Islands.

#### Subgenus *Psammacoma* Dall

1900. *Psammacoma* Dall, *Proc. U.S. nat. Mus.*, 23 : 292, (type-species, *Psammotaea candida* Lamarck, 1818; original designation).

Shell large to medium, elongate, thin, smooth with shorter posterior end. Sculpture of concentric striae only. Hinge with only two cardinal teeth in each valve, the left anterior and right posterior bifid. Pallial sinus extended upto half of the shell length and confluent with pallial line only for a small part. Adductor muscle scars not well impressed and subequal in both valves.

*Geological Range* : Miocene to Recent.

Three species were recorded from India.

#### Key to the species

- 1 Shell elongate, pallial sinus developed almost whole length of the shell .....  
*M.(P.) birmanica* (Philippi)
- Shell elongate, pallial sinus developed slightly more than the half length of the shell  
(2)
2. Shell more elongate, with prominent radial striae, anterior cardinal tooth not large as in the other ..... *M.(P.) candida* (Lamarck)
- Shell wider than the length, with less prominent radial striae, anterior cardinal tooth large ..... *M.(P.) truncata* (Jonas)

#### 38. *Macoma (Psammacoma) birmanica* (Philippi) ( Pl. XXIX, fig. 2, Pl. XXXV, fig. 1 )

1849. *Tellina birmanica* Philippi, *Abbil. Besch.*, 3 : 27, 55 No. 1, (type-locality, Mergue Archipelago, Birmah).

*Material examined* : Andhra Pradesh : i) 3 ex., Kakinada Bay; W. Bengal : ii) 2 ex., Digha, iii) 8 ex., Port Canning, iv) 108 ex., Chemaguri, Sagar Island.

*Measurements (mm) :*

Length	Height	Depth
60.10-22.54	37.34-12.51	16.75-5.81

*Description* : Shell oblong-subovate, solid, subcompressed, inequivalve, the left valve more heavy and convex than the right; chalky white with an epidermal layer externally. Umbo elevated, pointed and posterior. Anterior margin rounded, ventral margin convex, sloping upwards; anterior dorsal margin straight and abruptly sloping; posterior dorsal margin subtrigonal, rather short with arched flexure. Sculpture of spaced growth lines and with minute concentric striae in between which become more strong on the posterior region; radial striae very fine or almost absent; ligament elevated, anteriorly with arcuated anterior end; ventral margin confluent with the pallial line. prominent; lunule short and mostly on the left valve; hinge with only cardinal teeth.

Cardinal teeth two in each valve; a strong, subequally bifid anterior tooth, and a laminate posterior tooth in the left and of a small stout anterior tooth and a strong prominent posterior tooth in the right valve.

Muscle scars moderately well developed. Anterior adductor scar narrowly elongate more or less semilunar while posterior adductor scar irregular subrectangular. Cruciform scars two with elongated oval anterior and an oral posterior closely placed in the case of left valve. Pallial sinus equal in both the valves; sinus rises abruptly posterior, descending anteriorly with arcuated anterior end; ventral margin confluent with the pallial line.

*Remarks* : *M. birmanica* (Philippi) can be recognised by its general shape, cardinal complex, adductor muscle impression and shape of the pallial line and pallial sinus.

*Range* : India to Myanmar.

*Distribution* : India : Andhra Pradesh, Orissa, West Bengal; *Elsewhere* Myanmar.

39. *Macoma (Psammacoma) candida* (Lamarck)  
( Pl. XXIX, fig. 3, Pl. XXXV, fig. 2 )

1818. *Psammotaea candida* Lamarck, *Hist. Nat. Anim. Sans. Vert.*, 5 : 517, no. 6, (type-locality, Nouvelle Hollande).

*Material examined* : Andaman and Nicobar Islands i) 1 ex., Andamans.

*Measurements (mm) :*

Length	Height	Depth
53.21	32.81	15.92

*Description* : Shell elongately oblong, thin, subequivalve, rather compressed with slight gape on the posterior side. Shell greyish yellow externally, white internally. Umbo acuminate and posterior. Anterior margin rounded; ventral margin more or less straight; anterior dorsal

margin straight and gently sloping; posterior dorsal margin straight and abruptly sloping; posterior margin very short, truncate, slightly angular. Sculpture of very fine concentric striae towards the ventral margin and without radial striae. Ligament short and situated in a slightly depressed ligamental groove; lunule almost absent.

Hinge with two cardinal in each valve; an unequal bilobed anterior tooth and a thin laminate posterior tooth in the left valve and of an unequal bilobed anterior tooth and a rib like posterior tooth in the right valve.

Muscle scars moderately impressed. Anterior adductor scars elongate and semilunar; posterior adductor scar suborbicular and smaller than the anterior. Cruciform scars two, oval shaped. Pallial sinus equal in both the valves, developed upto half of the length of the shell; rises sharply on the posterior; descending anteriorly with arcuated anterior end, falls obliquely to the pallial line, confluent with pallial line only in the posterior half.

*Range* : India to Philippines north to Japan and China.

*Distribution* : India : Andaman Islands; *Elsewhere* : Indo-Pacific.

40. *Macoma (Psammacoma) truncata* (Jonas)  
( Pl. XXX, figs. 1 & 2, Pl. XXXV, fig. 3 )

1844. *Tellina truncata* Jonas in Philippi, *Abbil Beschr.*, 1(3), t.1, fig.2, (type locality, Manila).

1844. *Tellina gubernaculum* Hanley, *Proc. zool. Soc. Lond.*, p.142, (type locality, West C. America; Syntypes, NHM 1976.2.6).

*Material examined* : Andaman and Nicobar Islands : i) 1 valve, Andamans; Goa : ii) 1 valve, Betul bay, iii) 2 valves, Cavellosum, iv) 1 valve, Dona Paula, v) 20 valves, Sridon beach; Gujarat : vi) 1 valve, Candla; Maharashtra : vii) 1 ex., Bombay; Orissa : viii) 2 valves, Mahanadi; Tamil Nadu : ix) 2 valves, Karaikel.

*Measurements (mm)* :

Length	Height	Depth
58.30-32.18	43.00-23.50	14.00 -9.23

*Description* : Shell medium, subovate, trigonal, donaciform, rather compressed moderately solid, more or less equivalve; white. Umbo elevated, acuminate and posterior in position. Anterior margin rounded; ventral margin convex sloping upward; anterior dorsal margin straight; gently sloping; posterior dorsal margin abruptly sloping; posterior margin short truncate and cuneiform. Sculpture of widely spaced growth lines with fine concentric striae in between radial striae, finely striated. Ligament shrunken, fold and flexure, obsolete; lunule moderate.

Hinge with two cardinal in each valve; a subequal, bifid anterior and a thin laminate posterior mostly fused with nymph in the left valve and a strong laminate upward anterior and an unequal, bifid posterior in the right valve.

Muscle scars poorly impressed. Anterior adductor scar irregularly elongate and semilunar; posterior adductor scar short and semioval. Cruciform scars two, with oval anterior and rounded posterior. Pallial sinus equal in both the valves, developed upto half of the length of the shell; sinus rises sharply on the posterior; descends anteriorly with arcuated anterior end, falls obliquely to the pallial line confluent with pallial line only in the posterior half.

*Remarks* : *M. truncata* (Jonas) can be recognised by its trigonal, donaciform shell and shape of pallial sinus, pallial line and adductor muscle scars.

*Range* : East African coast to Philippines north to Japan.

*Distribution* : India : Andaman and Nicobar Islands, Goa, Gujarat, Maharashtra, Orissa; Tamil Nadu; *Elsewhere* : Indo-Pacific.

#### Subgenus *Psammotreta* Dall

1900. *Psammotreta* Dall, *Trans. Wagner. Free Inst. Sci. Philad.*, 3 : 1045, pt.5; (type species, *Tellina aurora* Hanley, 1844; original designation).

Shell large to small, elongate-ovate. Sculpture concentric, posterior end bluntly truncate. Hinge with only two cardinal teeth in each valve. Ligament shunken, with the resilium, internal and partly separated from ligament. Pallial sinus partly confluent. Adductor muscle scars unequal.

*Geological Range* : Miocene to Recent.

*Remarks* : Dall (1900) treated *Psammotreta* as a section under the subgenus *Psammacoma*. This group resembles *Psammacoma*, but it differs from *Psammacoma* in having larger shell with the anterior end slightly longer than the posterior end.

Three species are reported from India.

#### Key to the species

- 1 Shell orbicular, thick, anterior adductor scar semilunar, sculpture of fine concentric striae ..... *M. (P.) ala* (Hanley)
- Shell rectangular, not so thick, posterior end elongate, anterior adductor scar elongate at both the end ..... (2)
2. Shell medium, posterior end rostrate and beak like ..... *M. (P) micans* (Hanley)
- Shell large, posterior end not rostrate and beak like .....  
*M. (P) alba* (Quoy and Gaimard)

41. *Macoma (Psammotreta) ala* (Hanley)  
( Pl. XXXII, fig. 1, Pl. XXXV, fig. 6 )

1844. *Tellina ala* Hanley, *Proc. zool. Soc., Lond.*, p. 165, (type locality, Ceylon).

*Material examined* : Andaman and Nicobar Islands : i) 5 valves, Andamans, ii) 1 ex., Carbyn's Scove; Andhra Pradesh : iii) 16 ex., Kakinada; Gujarat : iv) 12 ex., Bhadreswar, v) 15 valves, Balapur, v) 105 exs., Beyt Island, vi) 1 valve, Kandla; Maharashtra : vii) 2 exs., Mumbai; Orissa : viii) 3 ex., Puri; Tamil Nadu : ix) 7 ex., Tuticorin.

*Measurements (mm) :*

Length	Height	Depth
27.35-18.63	29.23-13.46	12.38-5.17

*Description* : Shell ovate, solid, subtrigonal, compressed, left valve slightly thinner and less convex than the right. Shell white with a slight yellowish suffused. Umbo acuminate, elevated and slightly posterior in position. Anterior margin rounded; ventral margin convex sinuated at the posterior end; anterior dorsal margin convex and gently sloping; posterior dorsal margin straight and gently sloping; posterior margin angulated and subrostrate its dorsal edge retuse near the beak. Sculpture of minute close concentric striae; radial striae almost absent. Left valve with a prominent posterior sinus and the right valve with a prominent fold radiating from umbo to the outer margin. Ligament partly embedded, shunken, dark brown colour; lunule small or almost absent.

Hinge with two cardinal teeth in each valve; a sub equal, bilobed anterior and a thin laminate posterior in the left valve and a laminate anterior and a sub equal, bilobed posterior in the right valve.

Muscle scars well impressed. Anterior adductor scar elongated, irregular and semilunar; posterior adductor scar subrectangular. Cruciform scars two, oval. Pallial sinus equal in both valves; sinus extensive, rising abruptly behind extending to a broad arcuation anteriorly but not touching the anterior adductor scar; sinus falls obliquely to the pallial line and confluent immediately.

*Remarks* : *M (P.) ala* (Hanley) can be distinguished by its subtrigonal shape, sculpture of close concentric striae, shape of the pallial sinus and adductor muscle impression. A number of workers treated this species under genus *Tellina* but absence at lateral teeth, this species is placed under genus *Macoma*.

*Range* : Pakistan to Philippines, north to Japan.

*Distribution* : India : Gujarat, Maharastra, Goa, Tamil Nadu, Andhra Pradesh, Orissa, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

42. *Macoma (Psammotreta) alba* (Quoy and Gaimard)  
( Pl. XXXII, figs. 2 & 3, Pl. XXXVIII, fig. 1 )

1835. *Tellina alba* Quoy and Gaimard, *Voy. Astrol. Zool.*, 3 : 500, t. 81, figs. 1-3. (type locality, New Ireland; type, MHNG).

*Material examined* : i) 1 ex., South India.

*Measurements (mm) :*

Length	Height	Depth
58.16	39.32	9.00

*Description* : Shell subovate, flat, tolerably strong, inequivalve the right one less convex than the left; white with suffused yellow at the outer margin externally and glossy white internally. Umbo acuminate slightly elevated and anterior in position. Anterior margin rounded; ventral margin slightly convex; anterior dorsal margin and posterior dorsal margin slightly convex and sloping gently, posterior margin obtusely cuneiform. Sculpture of fine closely concentric striae; radial striae absent. The posterior side of the left valve with a sinus and right valve with a ridge radiating from umbo to the outer margin. Ligament embedded, shunken, dark brown colour; lunule almost absent.

Hinge with two cardinal teeth in each valve; an unequal, bifid anterior and a thin laminate posterior closed to the nymph in the left valve and a strong laminate anterior and a unequal, bilobed posterior in the right valve.

Muscle scars well impressed. Anterior adductor scar elongate, irregular; posterior adductor scar irregular and subrectangular. Cruciform scars large and more or less oval in shape. Pallial sinus equal in both the valves; sinus extensive, rising abruptly posterior, descending anteriorly with a broad arcuation anteriorly but not touching anterior adductor scar; ventral margin fully confluent with the pallial line.

*Remarks* : *M. alba* (Quoy and Gaimard) can be distinguished by its flat, subovate shell, sculpture with fine concentric striae, cardinal complex, and the shape of the pallial sinus and pallial line.

*Range* : India to New Zealand

*Distribution* : India : South India, Andaman and Nicobar Islands; *Elsewhere* : New Ireland and New Zealand.

43. *Macoma (Psammotreta) micans* (Hanley)  
( Pl. XXXIII, figs. 1 & 2, Pl. XXXVIII, fig. 2 )

1844. *Tellina micans* Hanley, *Proc. zool. Soc., Lond.*, p.72, (type locality, Catbalonga, Isle of Samar and Bias, Isle of Negros, Philippines; Syntypes, NHM, 1976132).
1865. *Tellina depauperata* von Martens, *Ann. Mag. Nat. Hist.*, (3)16 :429, (type locality, Cavite, Bay of Manila, Philippines).
1916. *Tellina pervitrea* Preston, *Rec. Indian Mus.*, 12 : 96, fig.13. (type locality, Semiramis bay, Andamans. types, ZSI).
1916. *Tellina ennurensis* Preston, *Rec. Indian Mus.*, 12 : 38, figs.14, 14A, (type locality, Ennur backwater, Madras: type. ZSI ).
1916. *Tellina soror* Preston, *Rec. Indian Mus.*, 12 : 97, figs.15 a-b, (type locality, Port Blair, Andamans. types. ZSI).

*Material examined* : Andaman and Nicobar Islands : i) 17 ex., 7 valves, Andamans, ii) 1 ex., Port Blair; Gujarat : iii) 1 ex., Katiawar.

*Measurements (mm) :*

Length	Height	Depth
27.80-8.00	15.44-4.62	5.06-3.32

*Description* : Shell ovate-oblong, thin, compressed, inequilateral, gaping at both the ends, left valve more concave than the right, Shell white. Umbo pointed and slightly posterior. Anterior margin rounded; ventral margin convex, scarcely flexuous, very obliquely sloping upwards; anterior dorsal margin straight gently sloping; posterior dorsal margin steeply sloping; posterior margin wedge shaped. Sculpture of very fine close spaced concentric striae, more spacious on the outer margin of the shell; radial striations very fine or almost absent. Ligament small, protuberance, dark brown colour; lunule almost absent.

Hinge with two cardinal teeth in each valve; an equal, bilobed anterior and a poorly developed laminated posterior in the left valve and a poorly developed, laminate anterior and subequal, bifid posterior in the right valve.

Muscle scars moderately developed. Anterior adductor scar irregularly elongate, posterior adductor scar subrectangular. Cruciform scars two and oval shaped. Pallial sinus equal in both valves; sinus rises posteriorly; descending anteriorly with arcuated anterior end and falls obliquely to pallial line near the anterior adductor scar; ventral margin entirely confluent with pallial line.

*Remarks* : *M. (Psammotreta) micans* (Hanley) can be distinguished from the other species by its ovate, oblong shape, sculpture of fine concentric striae, cardinal complex, pallial sinus and pallial line.

*Range* : Gulf of Aden to Philippines.

*Distribution* : India : Gujarat, Andaman and Nicobar Islands; *Elsewhere* Indo-Pacific.

#### Subgenus *Scissulina* Dall

1924. *Scissulina* Dall. *Proc. Biol. Soc. Wash.*, 37 : 88. (type species, *Tellina dispar* Conard. 1837: by original designation)

Shell medium to small, anterior end slightly larger than posterior end which is bluntly truncate. Sculpture of concentric striae on the left valve but with fine oblique scissulation on the right valve. Hinge with two cardinal teeth in each valve. Pallial sinus equal in both the valves, extended upto the anterior adductor scar, without touching it. Adductor scars well impressed and unequal.

*Geological Range* : Recent.

Two species were reported from India.

**Key to the species**

- Shell rectangular; sculpture scissulate on the right valve, concentric and radial striae on left valve ..... *M.(S.) dispar* (Conard)
- Shell elongate; sculpture scissulate on both the valves .....  
..... *M.(S.) reticulata* (Sowerby)

**44. *Macoma (Scissulina) dispar* (Conard)  
( Pl. XXXIV, fig. 1, Pl. XXXV, fig. 4 )**

1837. *Tellina dispar* Conard, *J. Acad. Nat. Sci. Philad.*, 7 : 259, (type-locality, Sandwich Islands. Hawaiian Islands; type, not found in ANSP, not listed in Moore 1962).

*Material examined* : Andaman and Nicobar Islands : i) 12 valve Andamans; South India : ii) 2 ex., South India.

*Measurements (mm) :*

Length	Height	Depth
29.81-17.95	20.15-11.34	8.40-5.14

*Description* : Shell medium to small, elongate-ovate thin or tolerably strong, inequivalve, left valve more convex than the right; white with suffused yellow in the umbonal region, sometimes with pinkish or pale orange colour. Umbo acuminate, blunt, not elevated and posterior. Anterior margin rounded; ventral margin slightly convex rising in arcuation posteriorly; anterior dorsal margin long, straight with a gently slope; posterior dorsal margin short, straight, with steeply slope; posterior margin slightly arched and elevated in front. Sculpture differs in both the valves; left valve with fine close concentric striae; radial striae almost absent; right valve with concentric striation and over crowded, oblique scissulations. Ligament strong, protuberant, dark brown to black colour; lunule indefinite.

Hinge with two cardinal teeth; left valve with an anterior narrow bifid tooth, and a posterior thin, elongated tooth; right valve with an anterior, sub deltoid, protuberant tooth and a thin narrow bifid posterior tooth.

Muscle scars well impressed. Anterior adductor scar irregularly elongate; posterior adductor scar irregularly rounded. Cruciform scars difficult to discern, rounded sometimes slightly flattened close to ventral margin of the shell. Pallial sinus equal in both the valves; rises posteriorly descending gently to the anterior region, arcuated anteriorly and confluent with the pallial line.

*Remarks* : *M. dispar* (Conard) has been for a long time incorrectly placed under genus *Tellina*. This species actually belongs to genus *Macoma* due to absence of lateral dentition.

*M. dispar* can easily be distinguished from *T. fabula* as the latter has a right anterior tooth. In addition to that the *T. fabula* is rather pointed or attenuate behind, whereas *M.*

*dispar* is rather bluntly truncate. Both the species have similarity in their over crowded, oblique scissulations on the right valve and is the result of convergence (Boss, 1969).

*Range* : South Africa to Society Island and Hawaiian Island.

*Distribution* : India : South India, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

45. *Macoma (Scissulina) reticulata* (Sowerby)

( Pl. XXXIV, fig. 2, Pl. XXXV, fig. 5 )

1867. *Tellina reticulata* Sowerby in Reeve, *Conch. Icon.*, 17; *Tellina* sp. No. 252, pl. 43, fig. 252, (type locality, Unknown; type, not in NHM).

*Material examined* : Andaman and Nicobar Islands : i) 15 valves Andamans.

*Measurements (mm)* :

Length	Height	Depth
19.78-13.72	10.05-8.45	4.00

*Description* : Shell subcuneate, oblong, equivalve and medium. Shell white or rosy colour. Umbo acuminate, slightly elevated and posterior. Anterior margin rounded; ventral margin convex; anterior dorsal margin convex, gradually sloping; posterior dorsal margin short angulated; posterior margin acuminate. Sculpture of very minutely reticulated oblique striae. Ligament short, shunken, dark brown colour; lunule elongate and equally developed in both the valves.

Hinge with two cardinals in each valve; an unequally bilobed anterior and a thin laminate posterior in the left valve and a prominent anterior and a small bilobed posterior in the right valve.

Muscle scars well impressed. Anterior adductor scar more or less rounded with elongated upper edge; posterior adductor scar elongately semilunar. Cruciform scars rounded but slightly elongate posteriorly in the left valve. Pallial sinus equal in both the valves; rising posteriorly; falling in smoothly rounded convex arcuation anteriorly; central end confluent with the pallial line.

This species is very much similar to *T. rhomboides* Quoy and Gaimard in general form but it can be distinguished by its minutely reticulated sculpture.

*Range* : Mauritius to India.

*Distribution* : India : Lakshadweep, Andaman and Nicobar Islands; *Elsewhere* : Mauritius.

Genus *Apolymetis* Salisbury

1929. *Apolymetis* Salisbury, *Proc. malac. Soc. Lond.*, 18 : 255, (type species, *Tellina meyeri* Philippi, 1846. Dunker MS; by original designation, monotypy).

Shell medium to large, inequivalve, inflated, suborbicular with large rounded anterior end and bluntly truncated posterior end. Sculpture of concentric striae; radial striae absent. Ligament short. Hinge with only cardinal teeth; two in each valve. Pallial sinus large and its ventral margin mostly or entirely coalescent with pallial line.

*Geological Range* : Miocene to Recent.

This group is similar to *Gastrana* but they differ from each other in shape and size. *Apolymetis* has peculiar shape, large, more or less orbicular and discrepant pallial sinus in both the valves.

### Key to the species

- Shell irregular, pallial sinus extends posterior to the mid length, anterior adductor scar semilunar with rough inner margin.....*A. papyracea* (Gmelin)
- Shell somewhat oval, pallial sinus on the extreme posterior end, anterior adductor scar semilunar but without rough inner margin.....*A. edentula* (Spengler)

#### 46. *Apolymetis edentula* (Spengler) ( Pl. XXXVI, fig. 1, Pl. XXXVIII, fig. 4 )

1782. *Tellina angulata* Linnaeus : Chemnitz, *Conch. Cab.*, 6 : 89, Pl.9, figs. 74-75, non Linnaeus, (type locality, refers to type locality of *angulata* Linnaeus, Java)

1798. *Tellina edentula* Spengler, *Nat. Selsk. Skriv.*, 4(2) :96, (non Broderip and Sowerby, 1829).

*Material examined* : Goa : i) 2 valves, Colva beach, ii) 2 valves, Sankval beach, iii) 1 valve, Terakal beach; Gujarat : iv) 6 valves, Bhadreswar, v) 1 ex., Katiawar, vi) 2 valves, Kutch; Karnataka :vii) 1 valve, Karwar; Kerala : viii) 1 valve, Trivandam; Maharashtra : ix) 4 valves, Mumbai, x) 1 valve, Ratnagiri; Orissa : xi) 20 valves, Chandipur, xii) 3 valves, Paradip; Pondicherry : xiii) 3 valves, Pondicherry; Tamil Nadu : xiv) 7 ex., Porto Novo, xv) 3 valves, Palk Strait; West Bengal : xvi) 30 valves, Digha.

#### *Measurements (mm)* :

Length	Height	Depth
72.64-43.93	52.18-34.08	24.18

*Description* : Shell medium to large, somewhat oval, strongly inequivalve, right valve large and more convex; white tinged with yellow externally, internally more white. Umbo leaning backward, pointed and posterior. Anterior margin rounded; ventral margin convex; anterior dorsal margin straight, much sloping; posterior dorsal margin short, straight and very much sloping; posterior margin obtusely biangulated or attenuated and obtuse. Sculpture of concentric striae more stout and prominent on the outer margin and on the posterior side. Ligament small, narrow, and shunken, lunule narrow and elongate.

Hinge with two cardinals in each valve; a bilobed anterior separated at outer end and an inflated posterior in the left valve and a laminate anterior and a bilobed, inflated posterior in the right valve.

Muscle scars moderately impressed. Adductor scars semilunar, anterior adductor scar more elongated than the posterior. Cruciform scars two, rounded. Pallial sinus equal in both the valves; sinus rises sharply on the posterior; and descending anteriorly, with rounded anterior end, falls to the pallial line near the anterior adductor scar and ventral margin confluent with the pallial line.

*Remarks* : *A. edentula* (Spengler) can be identified by its shape, sculpture and the cardinal complex. This species has some similarities to *M. truncata* (Jonas) but it differs from it in its shape, cardinal teeth, pallial sinus and pallial line.

*Range* : Red Sea to Philippines, Fiji Island.

*Distribution* : India : Gujarat, Maharastra, Goa, Karnataka, Kerala, Tamil Nadu, Orissa, West Bengal; *Elsewhere* : Indo-Pacific.

**47. *Apolymetis papyracea* (Gmelin)**  
( Pl. XXXVI, fig. 2, Pl. XXXVIII, fig. 5 )

1782. *Tellina lacunosa* Chemnitz, *Conch. Cab.*, 6 : 92. t.9, fig. 78, (type locality, Guines; type, NHM).

1791. *Tellina papyracea* Gmelin, *Syst., Nat.*, ed. 13 : 3231.

*Material examined* : Andaman and Nicobar Islands : i) 1 ex., Andaman; Gujarat : ii) 3 valves, Jamnagar.

*Measurements (mm)* :

Length	Height	Width
66.78-52.20	50.65-39.64	—

*Description* : Shell large, subquadrate, elevated, inequivalve wrinkle, shaped with large anterior end and a short posterior end; white. Umbo angular, prominent, elevated and slightly posterior. Anterior margin rounded; ventral margin convex and forms an arcuation in the middle region; anterior dorsal margin obliquely sloping; posterior dorsal margin short and convex; posterior margin short, much inflated, bluntly truncated. Sculpture of wide spaced growth lines and close fine concentric ridges. Ligament short, stout, dark brown; lunule indefinite.

Cardinal teeth two in each valve; an equally bifid, slightly upturned anterior and a thin posterior fused with nymph, in the left valve and a strong, elevated anterior and a small unequally bifid posterior, with posterior lobe partly fused with the nymph, in the right valve.

Muscle scars moderately impressed. Anterior adductor scar elongate but smaller than the rectangular posterior adductor scar. Cruciform scars oval and on the ventral margin of the

shell. Pallial sinus more or less equal in both the valves; sinus small, dorsal margin more or less straight, anterior margin also straight forming a characteristic rectangular shape; ventral margin entirely confluent with the pallial line.

*Remarks* : *A. papyracea* (Gmelin) can easily be distinguished by its irregular shape, sculpture with wide spaced growth lines and with close fine concentric ridges.

*Range* : South Africa to Philippines.

*Distribution* : India : Andaman and Nicobar Islands, Goa, Gujarat, Maharashtra, *Elsewhere* : Indo-Pacific.

### Genus *Gastrana* Schumacher

1816. *Gastrana* Schumacher, *Essai. Nouv. Syst.*, pp. 44, 132; (type species, *Tellina fragilis* Linnaeus: subsequent designation, Stoliczka, 1870).

Shell large to small, solid, equivalve, inequilateral, subtrigonally ovate, anterior end short and rounded, posterior end elongated and narrow. Sculpture consists of fine concentric ridges and radial striae. Hinge with cardinal teeth only; two in each valve, the right posterior and left anterior are bifid and larger than the other. Pallial sinus rounded, deep, not confluent. Anterior adductor scar smaller than the posterior. Shell white or dull coloured.

*Geological Range* : Eocene to Recent period.

The member of this genus have very strong shells and show many similarities with the genus *Apolymetis* but the later can be distinguished by its shape, size and sculpture.

#### 48. *Gastrana polygona* (Gmelin)

( Pl. XXXVII, fig. 1, Pl. XXXVIII, fig. 6 )

1782. *Tellina polygona* Chemnitz, *Conch. Cab.*, 6 : 91, pl. 9, fig. 77, (type locality, Indian Ocean).

1791. *Tellina polygona* Gmelin, *Syst. Nat.*, ed. 13 : 3244, no 91.

1818. *Tellina multiangula* Wood, *Gen. Conch.*, 1 : 150.

*Material examined* : Andaman and Nicobar Islands : i) 1 valve, Camorta; Kerala : ii) 2 valves, Cannanore, iii) 2 valves, Calicut; Maharashtra : iv) 1 valve, Ratnagiri; Tamil Nadu v) 1 valve, Tuticorin, vi) 1 valve, Mandapam, vii) 1 valve Palk Strait, viii) 1 valve, Chennai.

*Measurements (mm)* :

Length	Height	Depth
82.20-25.80	55.68-18.58	24.68

*Description* : Shell large to medium, thick, solid, inequilateral and irregularly shaped with extended posterior side with two prominent ridges on both valves; greyish externally, white internally. Umbo elevated, pointed and anterior. Anterior margin rounded; ventral margin straight in the posterior part and forms an angle, than flexuous; anterior dorsal margin short

sloped with a little swelling; posterior dorsal margin straight with a little swelling in the middle; posterior margin cuneiform rather long. Sculpture of strong concentric striae with close elevated lines; radial striae fine. Ligament moderate, strong and dark brown in colour; lunule small and mostly on the left valve.

Cardinal teeth two in each valve; an elevated, unequal, bifid, anterior and a small posterior in the left valve and both the cardinal deltoid, anterior more strong and bifid posterior in the right valve.

Muscle scars well developed. Anterior adductor scar elongated, semilunar, with irregular posterior margin, posterior more or less rectangular. Cruciform muscle scars oval and closely placed. Pallial sinus equal in both the valves; sinus rises posteriorly to a short distance, descends anteriorly and falls obliquely to the pallial line and confluent with it, sinus developed a little more than half the length of the shell.

*Remarks* : *G. polygona* (Gmelin) can be identified by its strong irregular shells, sculpture and the cardinal teeth.

*Range* : India and Pakistan only.

*Distribution* : India : Gujarat, Maharashtra, Kerala, Tamil Nadu, Andaman and Nicobar Islands; *Elsewhere* : Pakistan Coast.

#### Genus *Macalia* H. Adams

1860. *Macalia* H. Adams, *Proc. zool. Soc., Lond.*, p. 369, (type species, *Tellina bruguieri* Hanley 1844, by original designation).

Shell medium, solid, somewhat thick, compressed, sub orbicular, inequilateral, and subequivalve. Anterior end rounded, broad, posterior end short and bluntly truncated. Sculpture consists of fine concentric ridges and fine radial striae. Hinge with two cardinals in each valves, anterior cardinals of both valves strikingly large; laterals absent. Pallial sinus discrepant in both the valves, right one becomes smaller, and half of its ventral margin of the pallial sinus coalescent with pallial line. Anterior adductor scar smaller than the posterior adductor scar.

*Geological Range* : Recent.

*Remarks* : *Macalia* has been treated as a subgenus by many workers. Afshar (1969) placed it under separate genus due to its large cardinal teeth. It is found that the *Macalia* resembles with *Macoma* by sculpture, pallial sinus and adductor muscle impressions, but has very large cardinal teeth which not found in any other group. So, *Macalia* kept as separate genus.

**49. *Macalia bruguieri* (Hanley)**  
( Pl. XXXVII, figs. 2 & 3, Pl. XXXVIII, fig. 3 )

1844. *Tellina bruguieri* Hanley, *Proc. zool. Soc., Lond.*, p. 142, (type-locality, Ilo – Ilo, Isle of Panhey, Hard Sand, Philippines; Syntypes, NHM).

*Material examined* : Andaman and Nicobar Islands : i) 2 ex., Andamans, ii) 2 valves, Katchal; Gujarat : iii) 13 valves, Jamnagar, iv) 2 valves, Sikka; Maharashtra : v) 1 ex., Mumbai; Tamil Nadu : vi) 2 valves, Tranqubar.

*Measurements (mm)* :

Length	Height	Depth
37.30-18.64	30.39-14.87	13.25-10.08

*Description* : Shell medium, subtriangular, solid nearly equivalve with broadly rounded long anterior end and a short bluntly truncated posterior end. Shell white in colour. Umbo elevated, acuminate and posterior in position. Anterior margin broadly rounded; ventral margin convex, sloping upwards; anterior dorsal margin slightly convex, and moderately sloping; posterior dorsal margin slightly convex, adjacent to beak, abruptly sloping; posterior margin short, angle, obsolete. Sculpture of fine concentric striae; radial striae very finely striated. Ligament shunken, imbedded; lunule small and narrow.

Hinge with two cardinal teeth; a very strong, large, subequal, bifid anterior and a small, thin posterior mostly fused with nymph in the left valve and of a very prominent rib like elevated anterior and a small unequal, bilobed posterior in the right valve.

Muscle scars moderately well developed. Anterior adductor scar elongated, semilunar, posterior adductor scar subrectangular. Cruciform scars difficult to discern, rounded and close to the ventral margin. Pallial sinus equal in both the valves; sinus rises short posterior; descends anterior, anterior end with rounded arcuation and confluent with pallial line only in the posterior part of the ventral margin.

*Remarks* : *M. bruguieri* (Hanley) can be distinguished from the other species by its strong elevated cardinal teeth which are not found in many other species.

The shells present in the National Zoological collections ZSI, differs from the type material NHM 1976155 in general shape. The shells from Andaman's are less broad than length which is not in the case of type specimens.

*Range* : Persian Gulf to Philippines north to China and Japan.

*Distribution* : India : Gujarat, Maharashtra, Goa, Tamil Nadu, Andaman and Nicobar Islands; *Elsewhere* : Indo-Pacific.

## DISCUSSION

The family Tellinidae is a widely distributed marine eulamellibranch group of bivalves having 442 species under two subfamilies the Tellininae and the Macominae. However, in India only 62 species (47 belongs to Tellininae under 3 genera and 15 belongs to Macominae under 4 genera) have been recorded so far. Out of these sixtytwo species, ten species reported for the first time from India. While classifying the members of the group the first hurdle, the workers like Deshayes (1838), Hanley (1842-56), Sowerby (1866-69), Jay (1850), Adams and Adams (1858), Stoliczka (1870), Bertin (1870), Dall (1901), Newell (1965) had to cross, was to chalk out distinguishing characters. The most ancient practice, as adopted by all taxonomists, is grouping of animals based on the morphological characters. In Tellinids and also in other shelled molluscs the shell serves as the basis for the systematic. However, certain of the more noticeable anatomical features of the animals are reflected in the structure (pallial line, pallial sinus) of the shell a fact which at least in part justifies the reliance of the system on shell morphology (Boss, 1969). But for taxonomy, characters from a single source are not enough for any conclusion and therefore search for new and more decisive characters is always in progress. However, in Tellinidae the nature and modifications of cardinal and lateral teeth were employed in classifying the animals below the family by Salisbury (1934). In the present study the author has considered all these characteristic features for identifying the Indian tellinids.

But the workers are unanimous with the fact that only morphological characters would not solve the problem in closely related species. And, this is a growing tendency among the workers to study the anatomy, biology and ecology of the species concerned. In the present study an attempt has been made to consider the ctenidia., labial palps, foot, mantle, siphon, cruciform muscles for classification of few species (three only) of this group. But more anatomical work is needed and for this purpose living specimens are essential in large numbers.

Tellinids are essentially marine animals. No members of the class can respire, feed or remain active except in an aqueous medium. The period for which any species can survive, inactive, when removed from such an environment depends largely on its capacity to close its two valves, so that loss of moisture is reduced to a minimum. The tellinids are intertidal burrowing bivalves which remain active only during high tide and go deep into the soil when the habitat is exposed to air. This indicates that the tellinids require a habitat characterised by sand, mud or sandy muddy soil. It is interesting that the thick shelled species are inhabiting in the sand and while the smooth shelled are restricted to muddy bed. This is most probably related with the mechanical process essential for burrowing. The choice for particular species is dependent not only on the soil factors but also temperature, rainfall and salinity. A decline in species number with the variation in temperature has been discussed by Stephenson (1944), Sowerby (1866-69), and Boss (1969). From the present study it is evident that the number of species is gradually increasing towards east coast. This is most probably associated with the temperature of the water. As mentioned earlier by Boss (1969) the cold water stands as barrier for the distribution of tellinids for which they are not occurring in the colder water.

From the study of the distribution of Indian tellinids it is clear that water temperature is the main factors that regulate the movement of the species. As Tamil Nadu, Andaman and Nicobar Islands characterised by high temperature and tellinids species are occurring there in large numbers. While the numbers of species is considerably less in the west coast as observed in Goa, Gujarat. The reason for the assemblage of forty one species, of which fifteen are restricted to the Andaman and Nicobar Islands, is still not clear but it seems that these islands are nearer to Indonesia and the peculiar habitat of these islands has got the possibility of having more species. It appears that a particular type of environment specially the temperature is essential for the dispersal of the tellinid molluscs and it is, most probably specific for a particular species as is known from the occurrence of *T. (Angulus) lanceolata* Wood, *Tellina (Angulus) rhomboides* Hanley, *T. (Homalina) myaeformis* Sowerby, *Strigilla (Aeretica) splendida* (Anton), *Macoma (Psammacoma) birmanica* (Phillippi) species in east coast of India. The most interesting aspect associated with tellinids is the increase of individuals of a species with the related number of other species. This suggests that there is a sharp competition among the species and this behavior in time to come help either in dispersal of some species to the other parts or total extinction of the species.

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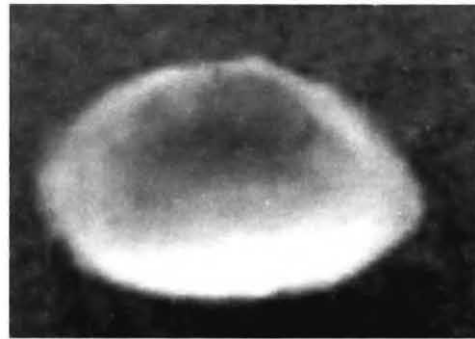
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# PLATES

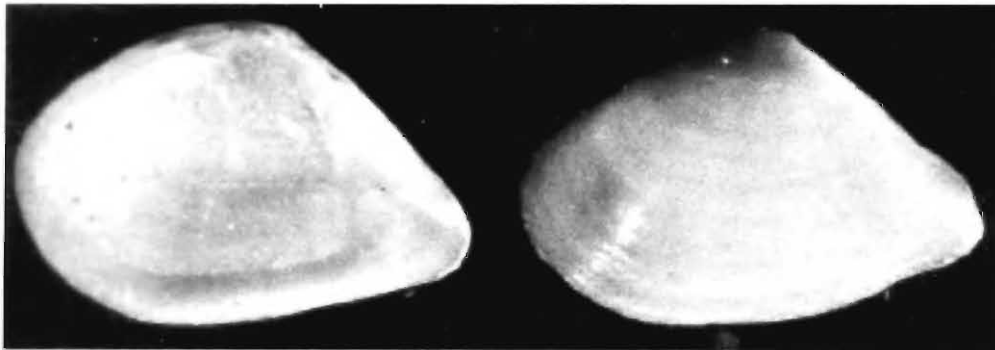
PLATE - I



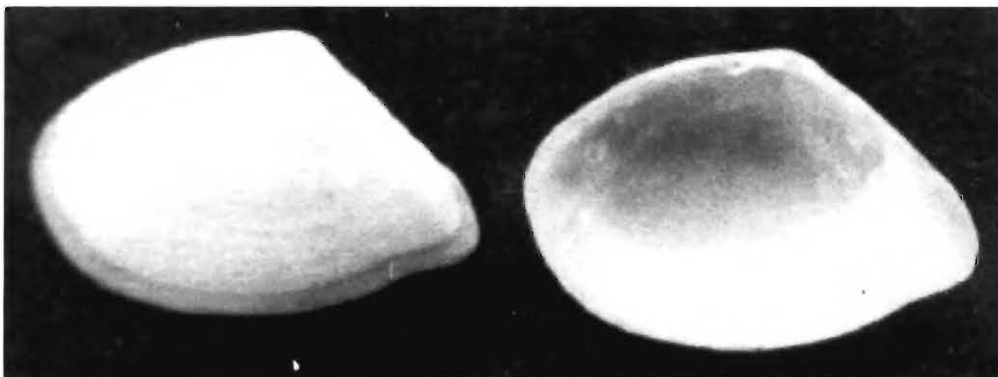
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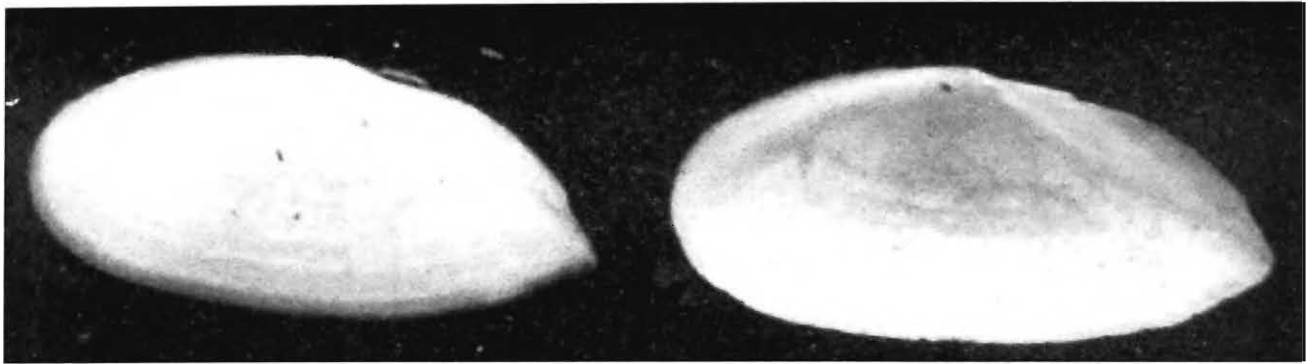
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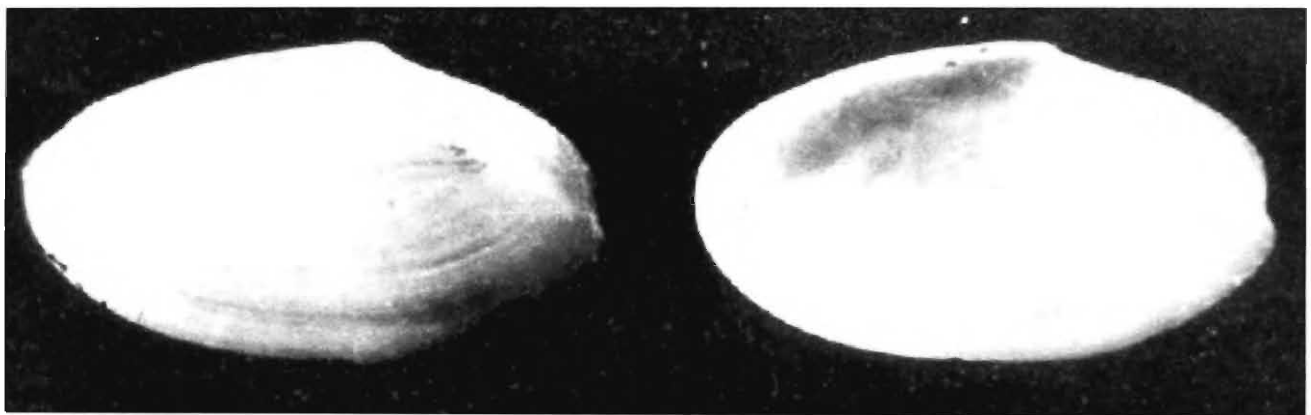
4

- Fig. 1&2.** External view of left valve (left) and internal view of right valve (right) of *Tellina unguis* Preston. (length = 7.25 mm)
- Fig. 3.** External view of left valve (right) and Internal view of right valve (left) of *Tellina (Angulus) corbuloides* Hanley. (length = 30.20 mm)
- Fig. 4.** External view of left valve (left) and Internal view of right valve (right) *Tellina corbuloides* Hanley (type). (length = 15.00 mm)

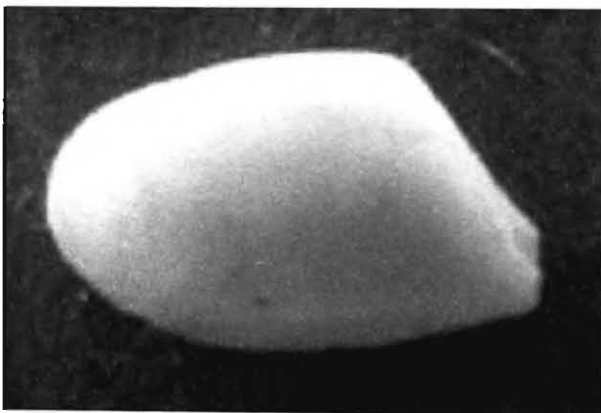
## PLATE – II



1



2



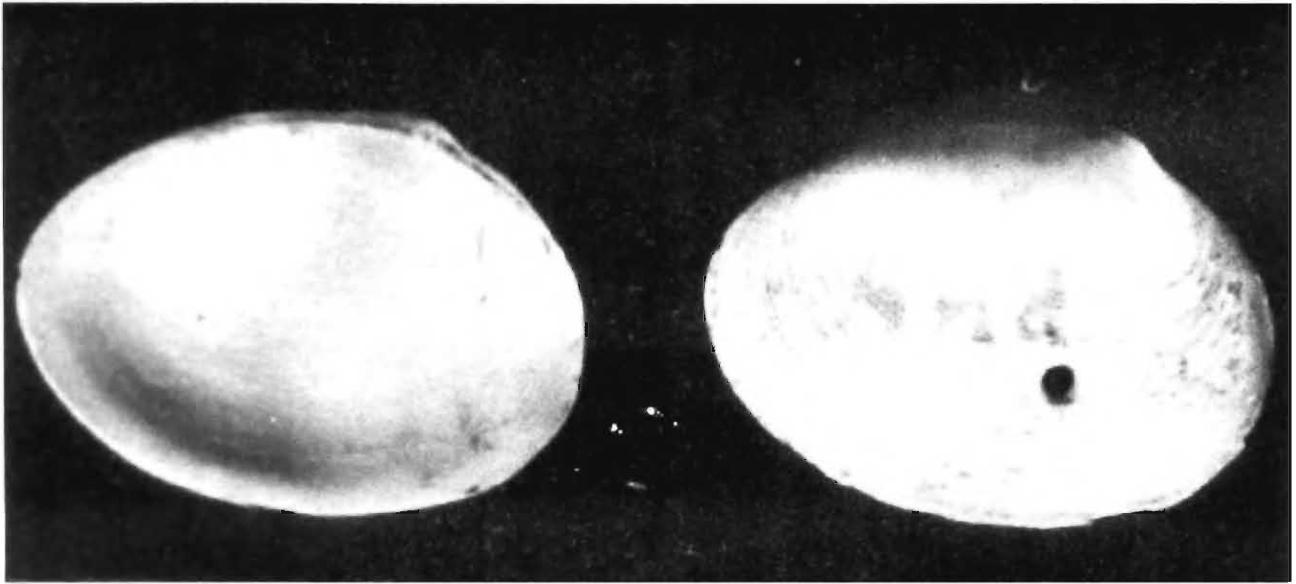
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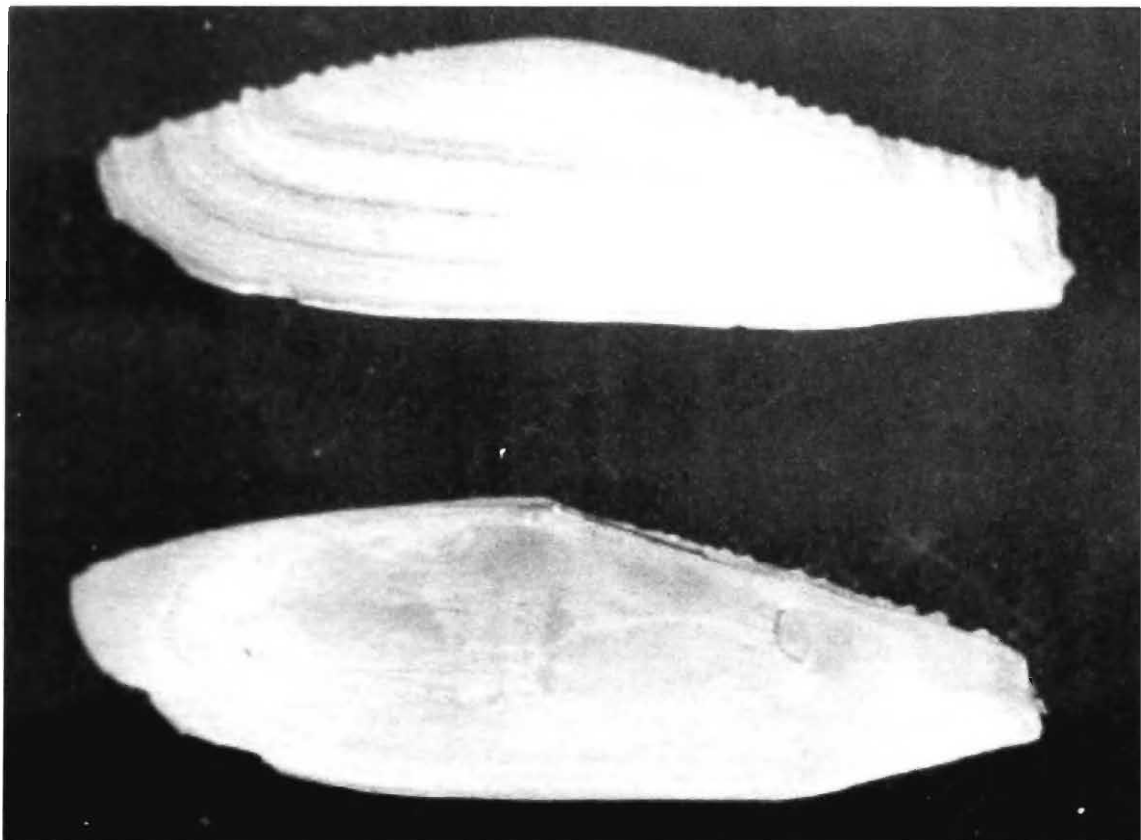
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- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) (*Angulus lanceolata* Gmelin. (length = 37.13 mm)
- Fig. 2.** External view of left valve (left) and Internal view of right valve (right) of *Tellina (Angulus) incisa* Preston. (length = 21.00 mm)
- Fig. 3&4.** External view of left valve (left) and Internal view of left valve (right) of *Tellina (Angulus) rhomboides* Quoy and Gaimard (length = 9.41 mm)

PLATE – III



1

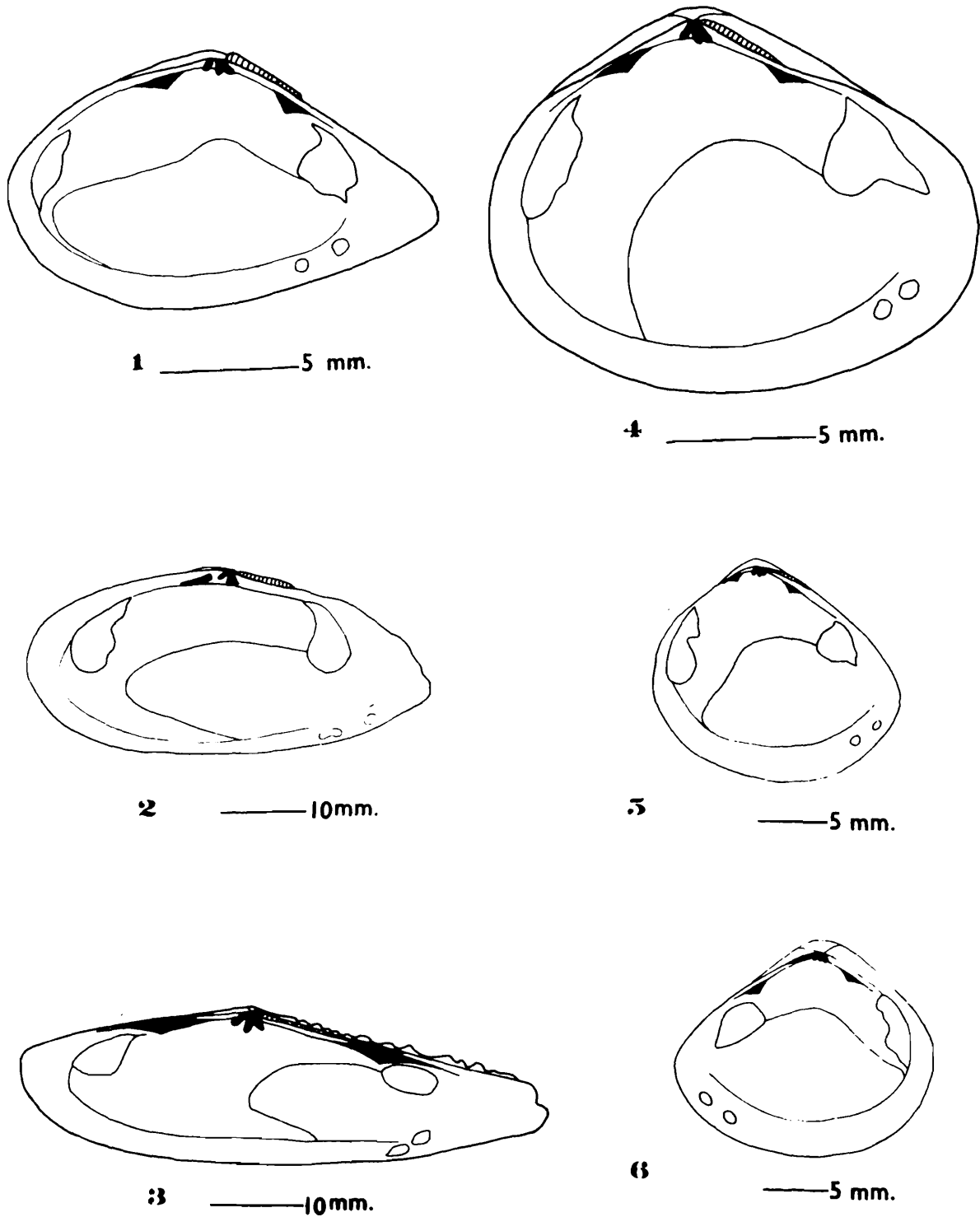


2

**Fig. 1.** External view of left valve (right) and Internal view of right valve (left) of *Tellina (Cadella) semen* Hanley. (length = 11.15 mm)

**Fig. 2.** External view of left valve (upper) and Internal view of right valve (lower) of *Tellina (Dallitellina) rostrata* Linnaeus. (length = 64.48 mm)

## PLATE - IV



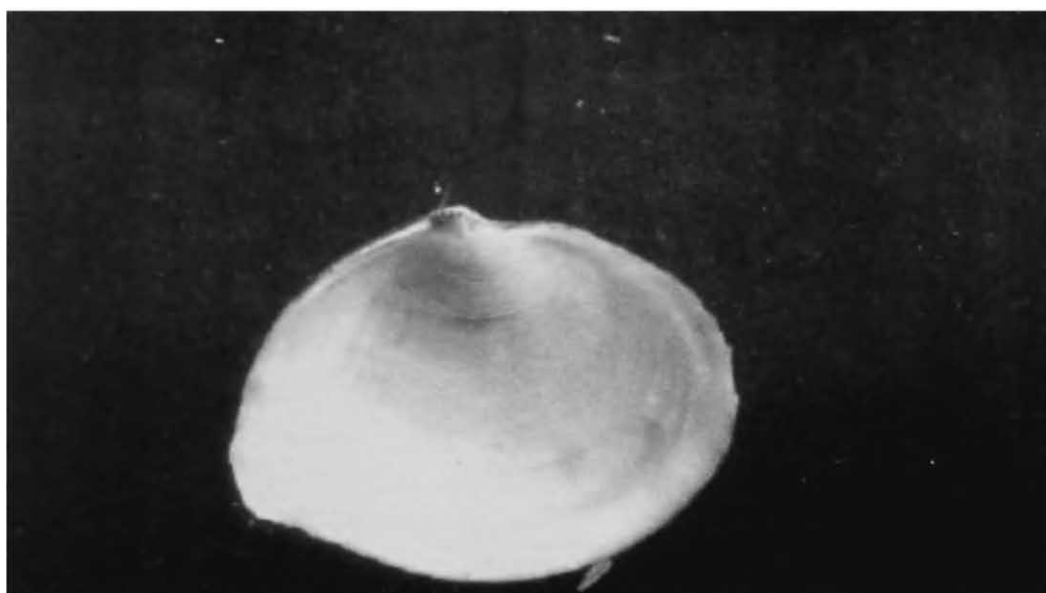
Diagrammatic illustrations of the internal surface of the valves showing the cardinal teeth, adductor muscles impressions, cruciform muscles impressions, pallial line and pallial sinus

1. *Tellina (Angulus) corbuloides* Hanley (right valve)
2. *Tellina (Angulus) lanceolata* Gmelin (right valve)
3. *Tellina (Dallitellina) rostrata* Linnaeus (right valve)
4. *Strigilla denestriata* Preston (right valve, type)
5. *Strigilla (Aeretica) splendida* (Anton) (right valve)
6. *Strigilla (Aeretica) splendida* (Anton) (right valve)

PLATE - V



1

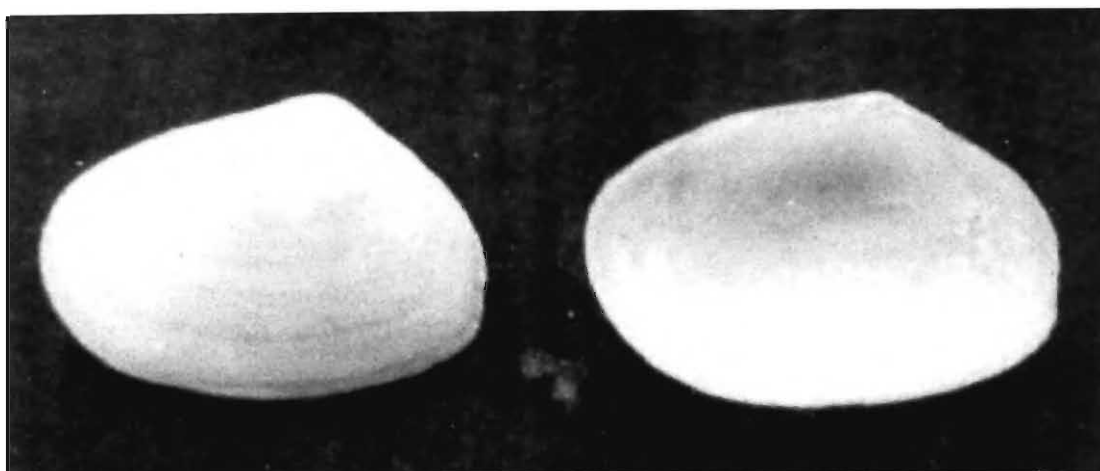


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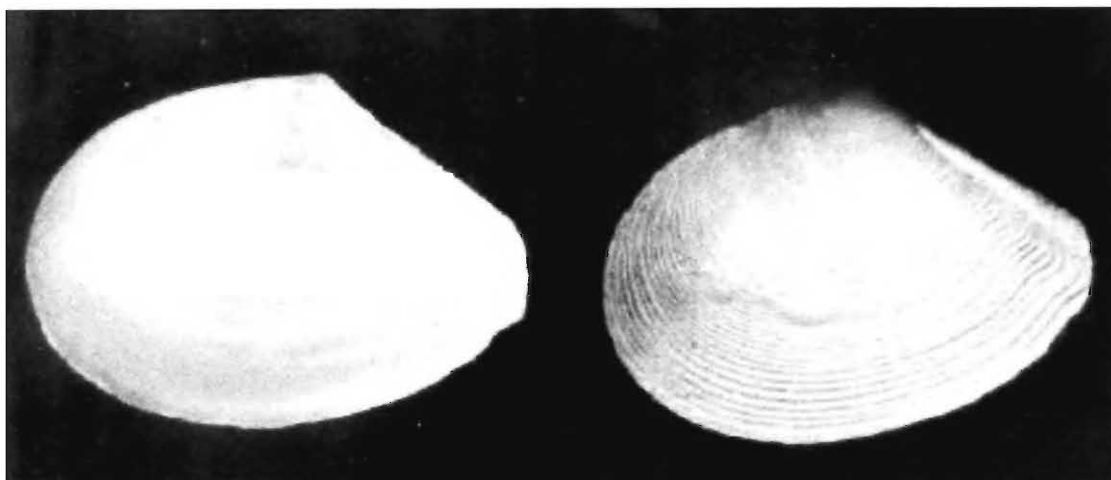
**Fig. 1.** External view of left valve of *Tellina (Hemimetis) angulata* Linnaeus. (length = 51.50 mm)

**Fig. 2.** Internal view of right valve of *Tellina (Hemimetis) angulata* Linnaeus. (length = 51.50 mm)

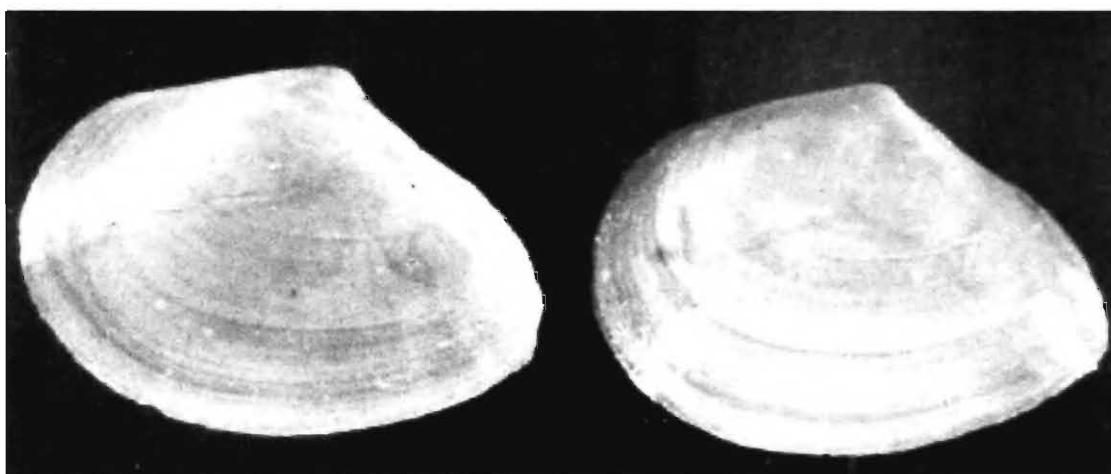
## PLATE – VI



1



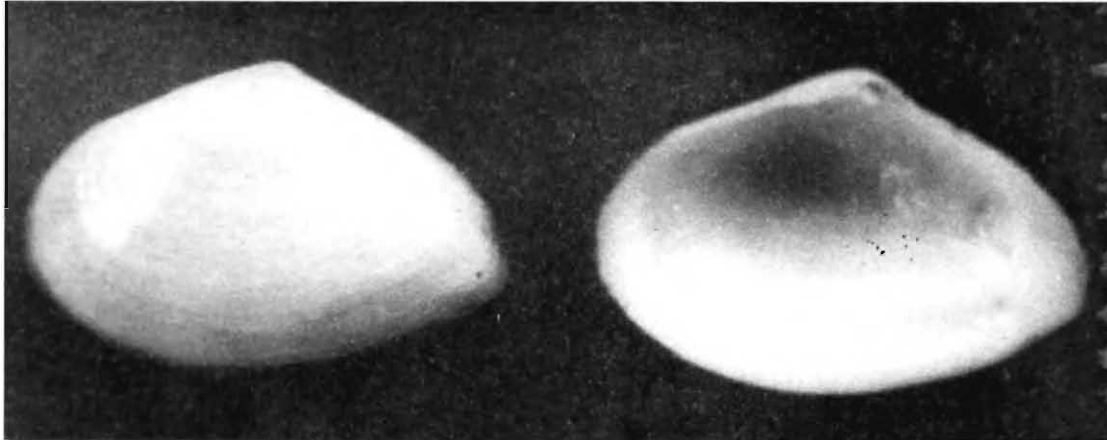
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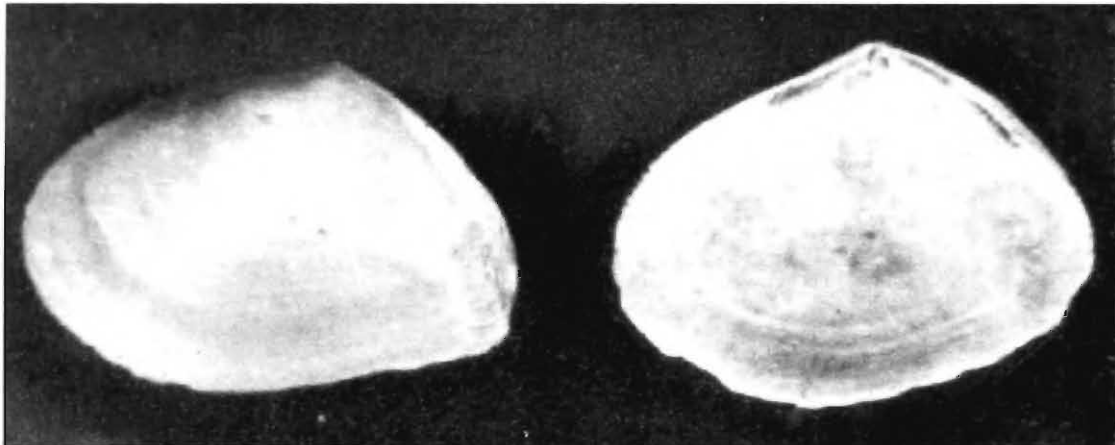
3

- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Tellina (Homalina) myaeformis* Sowreby. (length = 23.08 mm)
- Fig. 2.** External view of left valve (right) and Internal view of right valve (left) of *Tellina (Moerella) ostracea* Lamarck. (length = 21.27 mm)
- Fig. 3.** External view of left valve (right) and Internal view of right valve (left) of *Tellina philippinarum* Hanley (type). (length = 26.47 mm)

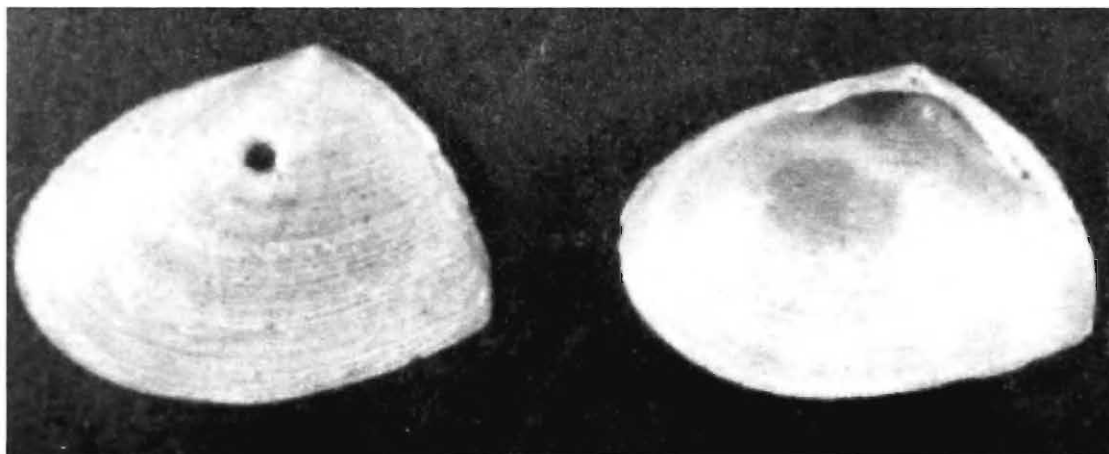
PLATE – VII



1



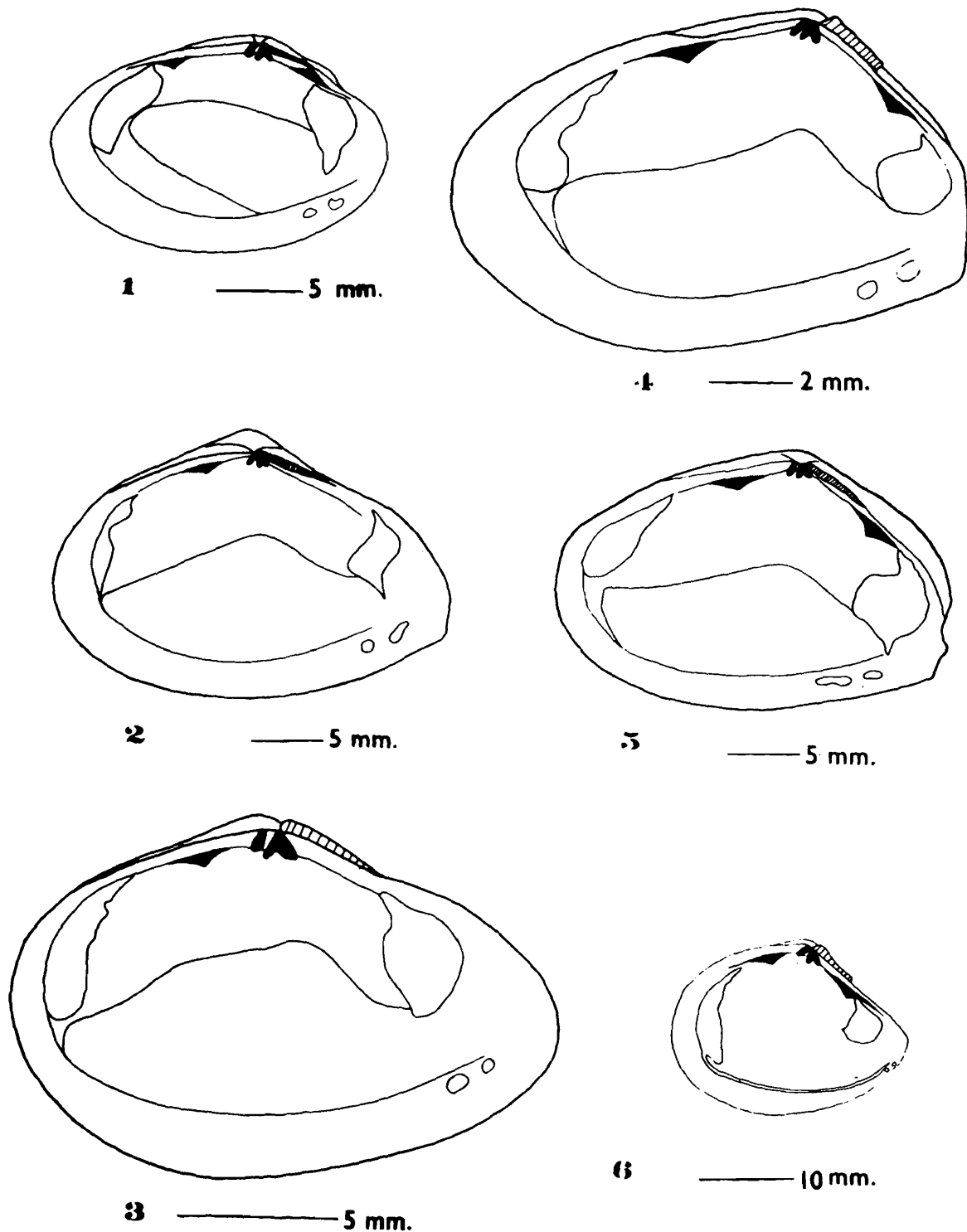
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3

- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) *Tellina (Moerella) philippinarum* Hanley. (length = 18.50 mm)
- Fig. 2.** External view of left valve (left) and Internal view of right valve (right) *Tellina (Moerella) subtruncata* Hanley. (length = 17.30 mm)
- Fig. 3.** External view of left valve (left) and Internal view of right valve (right) *Tellina subtruncata* Hanley (type). (length = 18.49 mm)

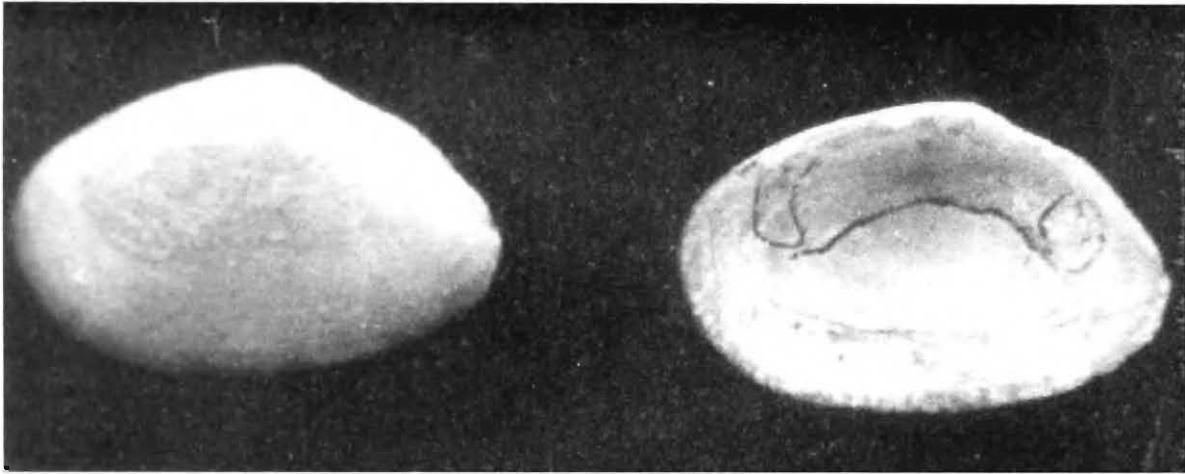
## PLATE - VIII



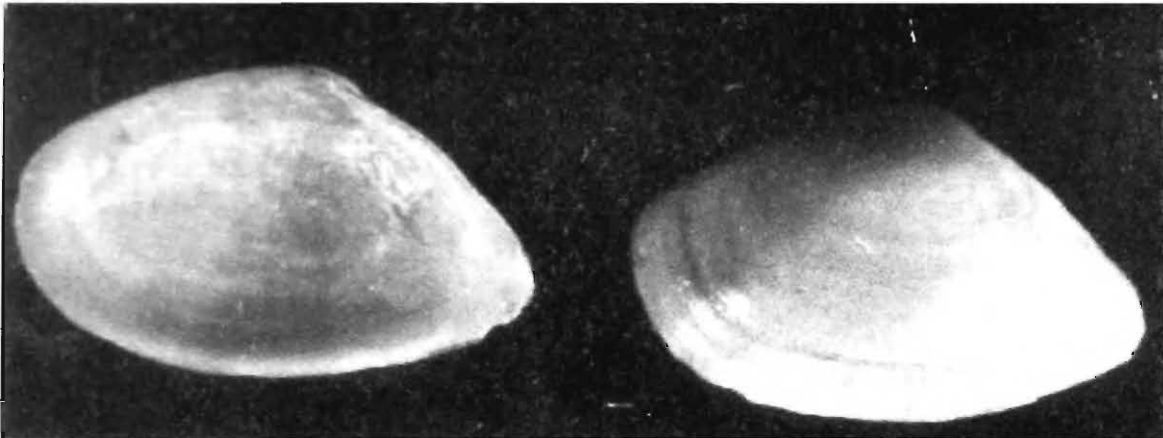
Diagrammatic illustrations of the internal surface of the valves showing the cardinal teeth, adductor muscles impressions, cruciform muscles impressions, pallial line and pallial sinus

1. *Tellina (Cadella) semen* Hanley (right valve) 2. *Tellina philippinarum* Hanley (right valve, type)  
 3. *Tellina (Moerella) philippinarum* Hanley (right valve) 4. *Tellina (Moerella) subtruncata* Hanley (right valve)  
 5. *Tellina kolabana* Melvill (right valve) 6. *Tellina (Moerella) ostracea* Lamarck (right valve)

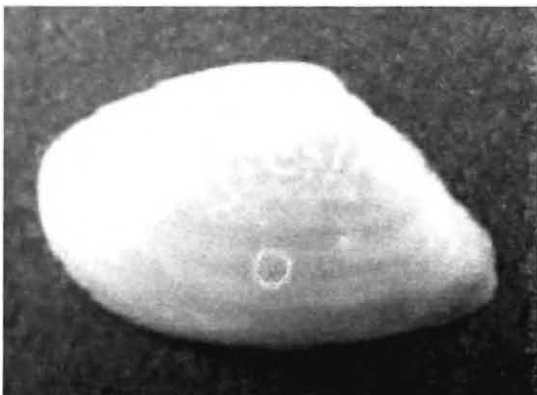
PLATE - IX



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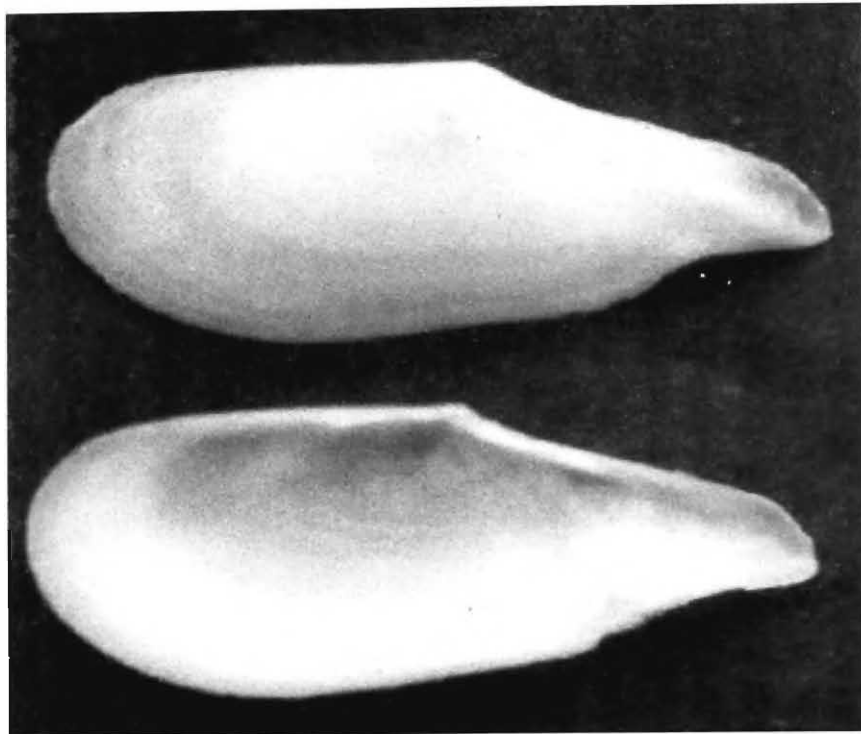
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**Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Tellina chilkaensis* Preston type. (length = 9.75 mm)

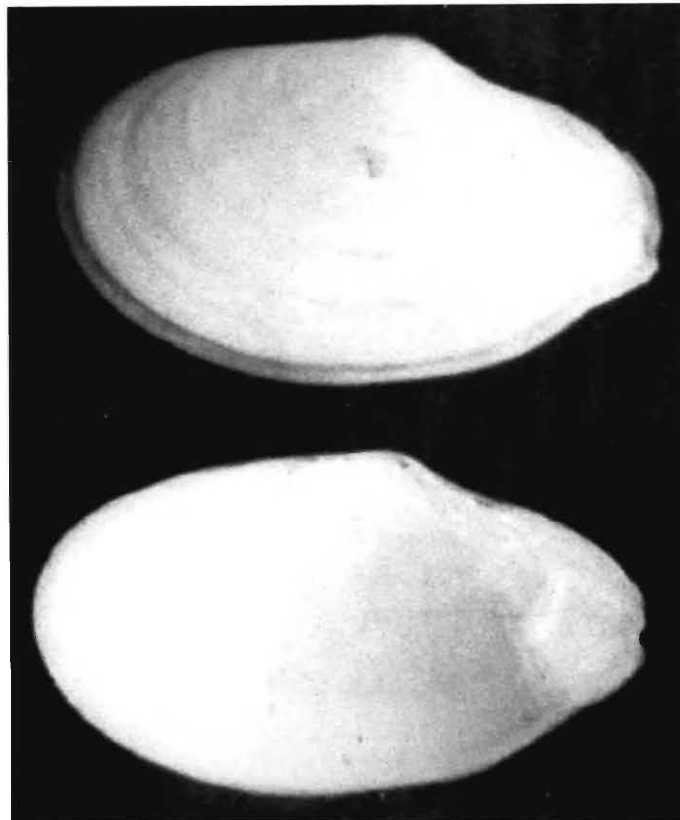
**Fig. 2.** External view of left valve (right) and Internal view of right valve (left) of *Tellina (Pharaonella) iridescens* (Benson). (length = 11.50 mm)

**Fig. 3&4.** External view of left valve (right) and Internal view of right valve (left) of *Tellina (Pharaonella) cuneolus* Sowerby (length = 14.40 mm)

## PLATE - X



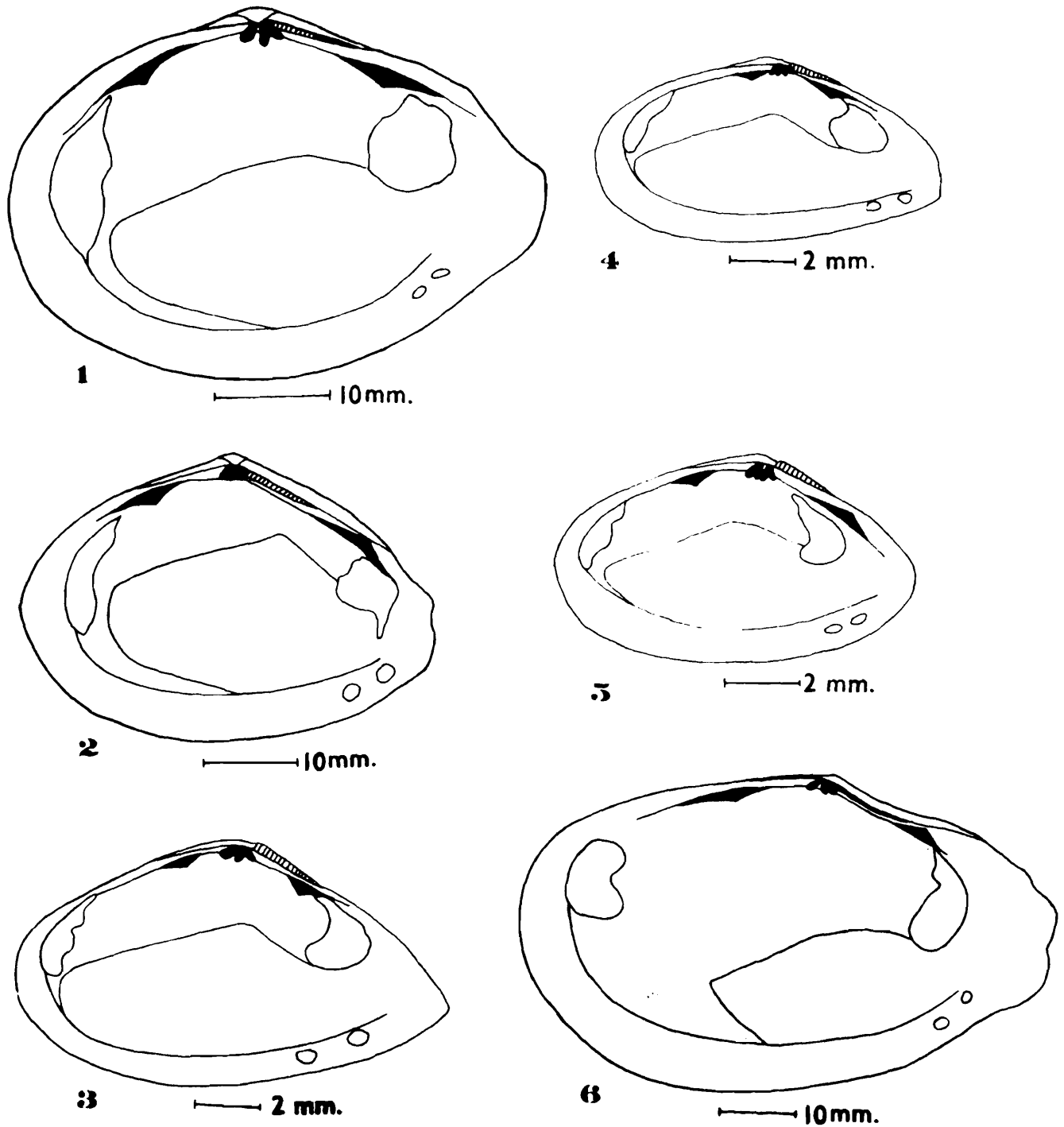
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- Fig. 1.** External view of left valve (upper) and Internal view of right valve (lower) of *Tellina (Pharaonella) vulsella* Gmelin. (length = 60.20 mm)
- Fig. 2.** External view of left valve (upper) and Internal view of right valve (lower) of *Tellina (Pharaonella) perna* Spengler. (length = 78.48 mm)

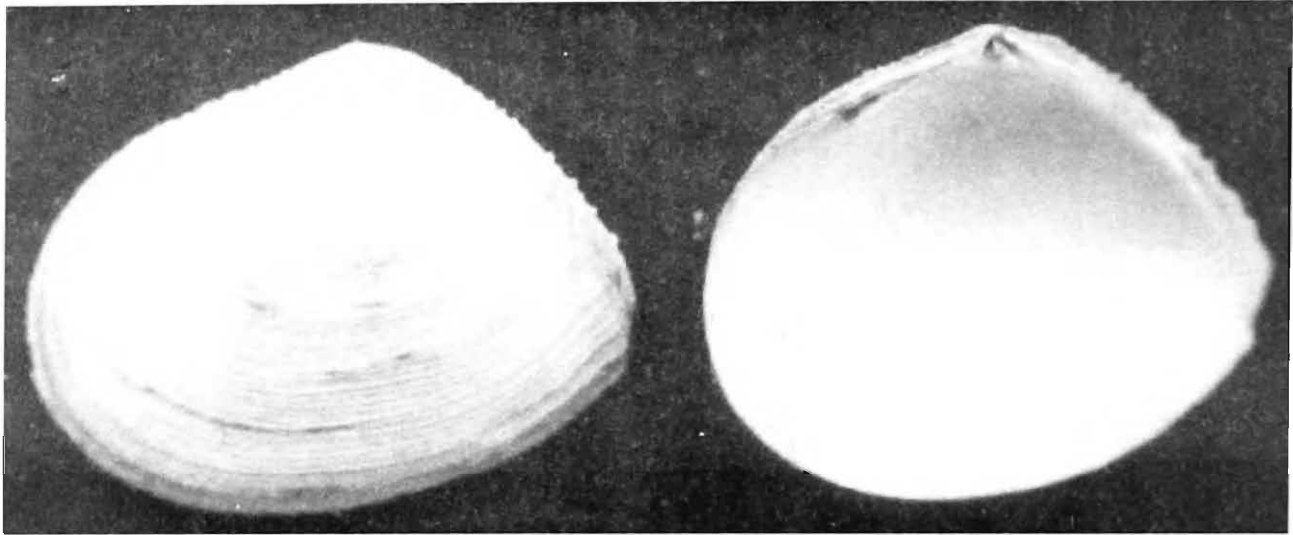
PLATE - XI



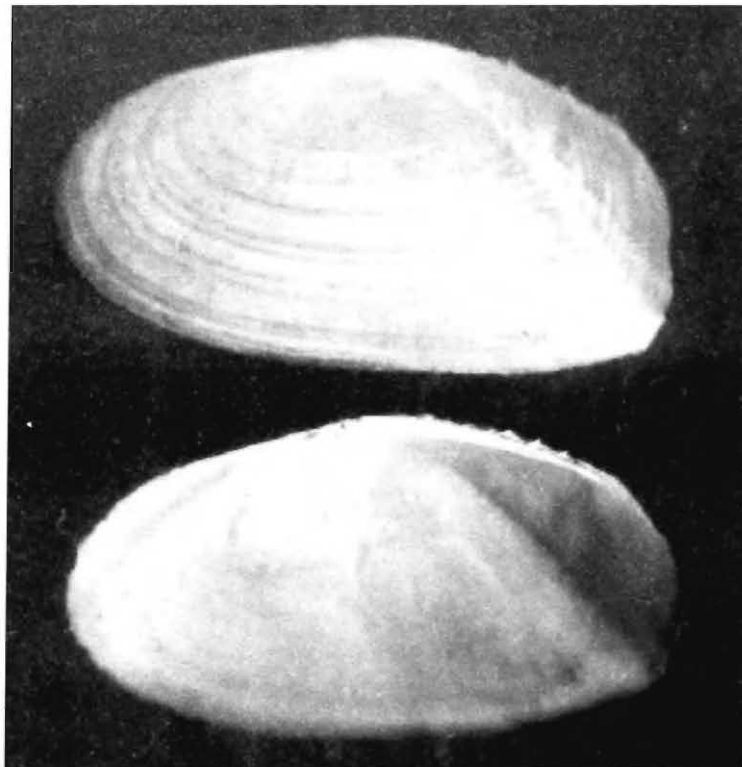
Diagrammatic illustrations of the internal surface of the valves showing the cardinal teeth, adductor muscles impressions, cruciform muscles impressions, pallial line and pallial sinus.

1. *Tellina (Quidnipagus) palatam* Iredale (right valve) 2. *Tellina (Serratina) capsoides* Lemarck (right valve)  
 3. *Tellina (Pharaonella) iridescens* (Benson) (right valve) 4. *Tellina (Pharaonella) cuneolus* Sowerby (right valve)  
 5. *Tellina chilkaensis* Preston (right valve, type) 6. *Tellina (Pharaonella) perna* Spengler (right valve)

## PLATE – XII



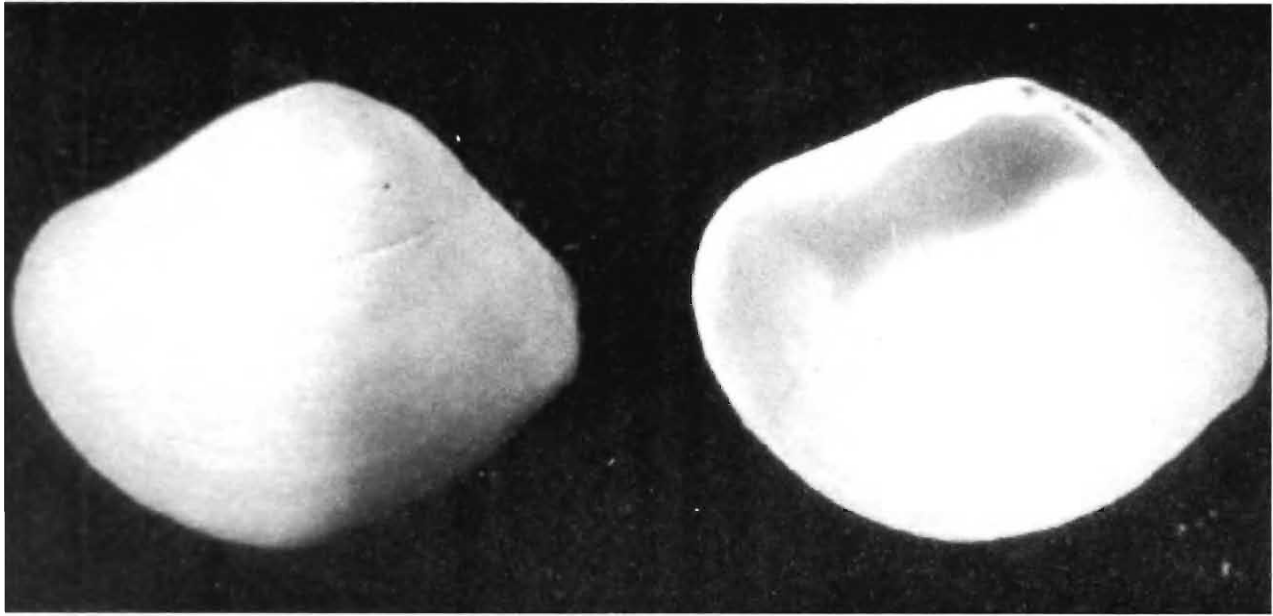
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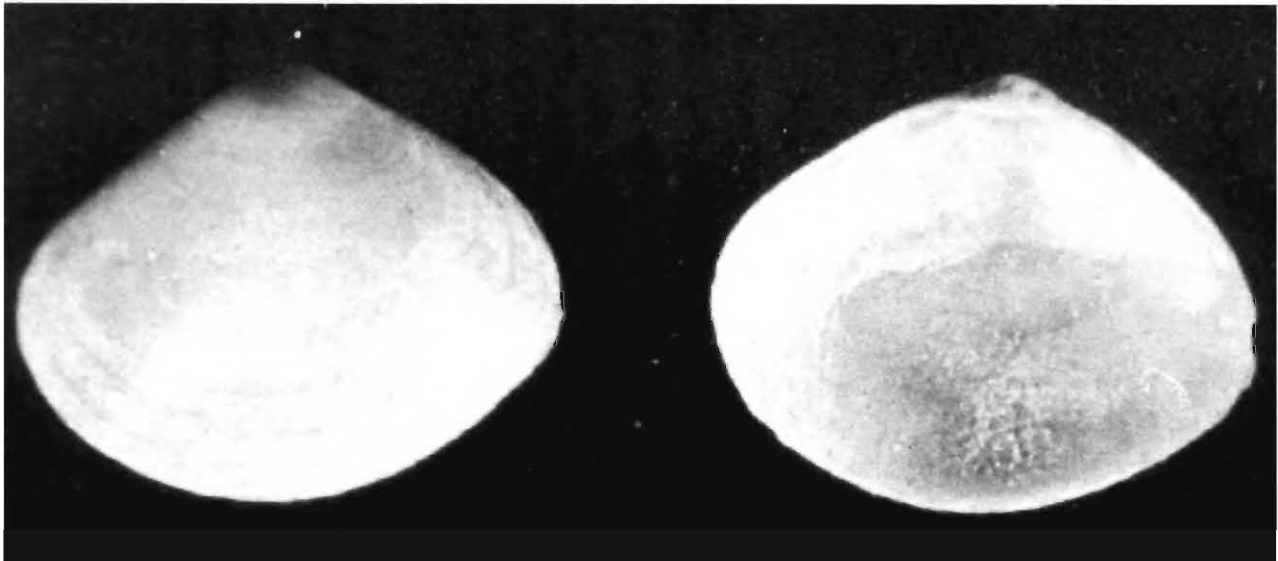
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- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Tellina (Serratina) capsoides* Lamarck. (length = 47.95 mm)
- Fig. 2.** External view of left valve (upper) and Internal view of right valve (lower) of *Tellina (Phylloda) foliacea* Linnaeus. (length = 85.15 mm)

PLATE – XIII



1

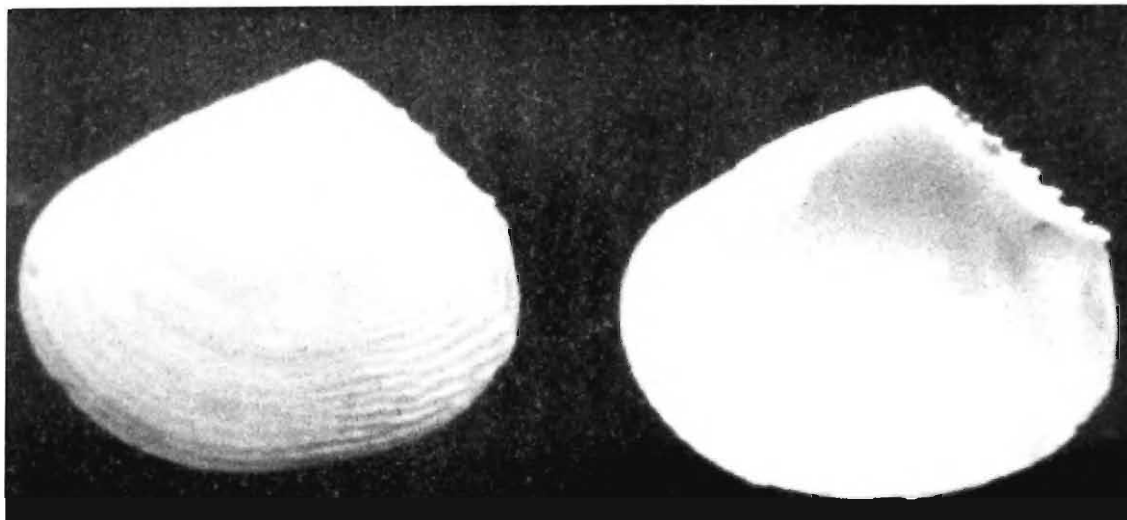


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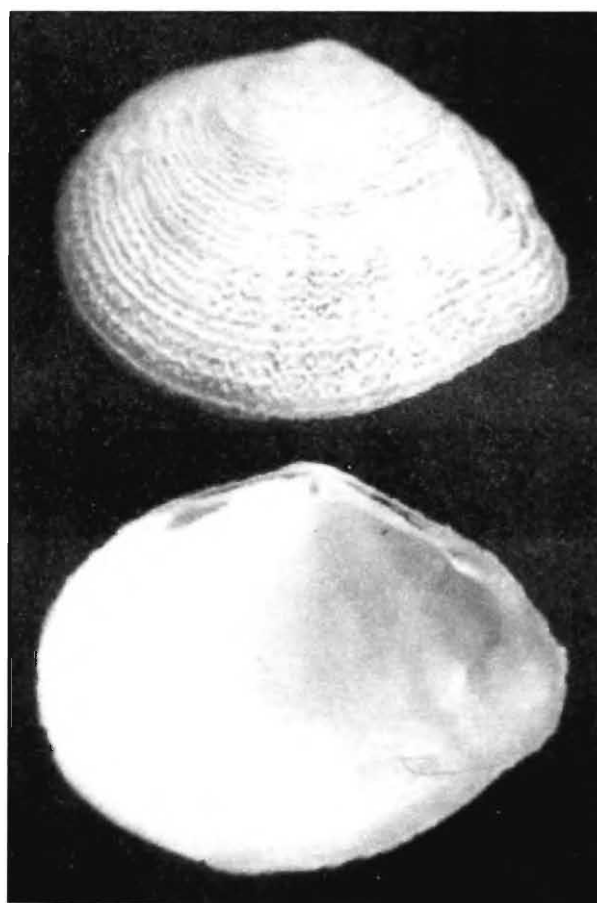
**Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Tellina (Pinguitellina) robusta* Hanley. (length = 14.26 mm)

**Fig. 2.** External view of left valve (left) and Internal view of right valve (right) of *Tellina bertianiana* Preston (type). (length = 9.25 mm)

## PLATE – XIV



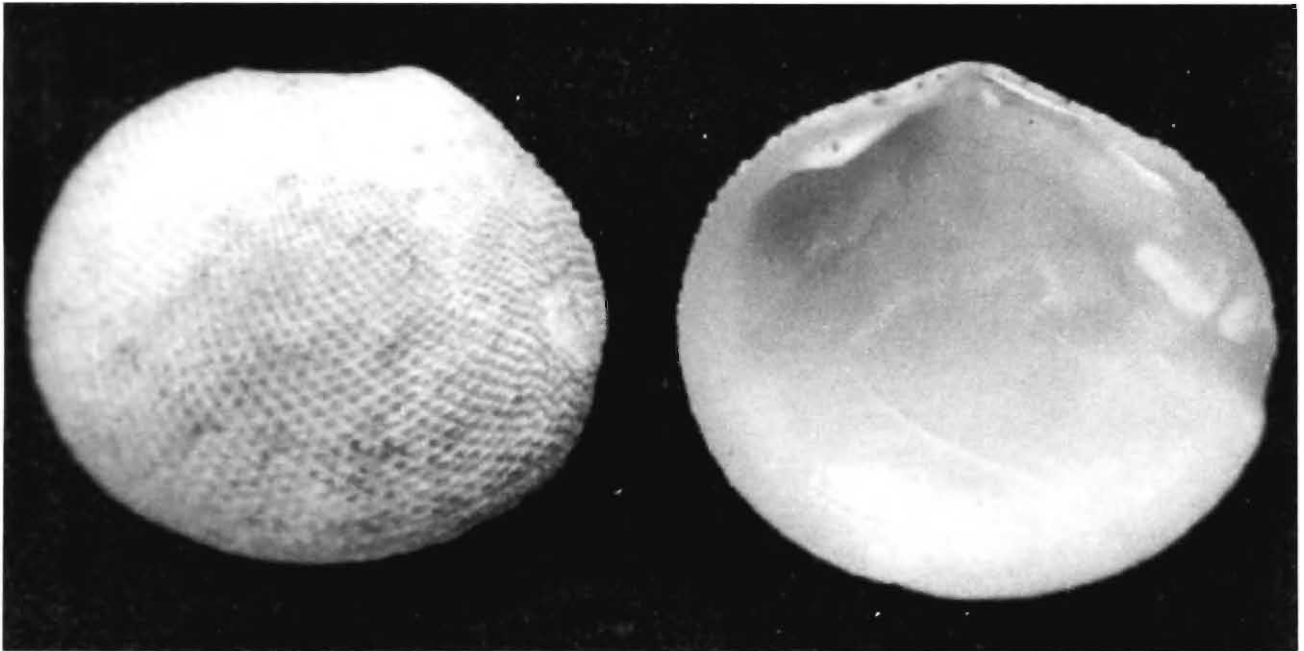
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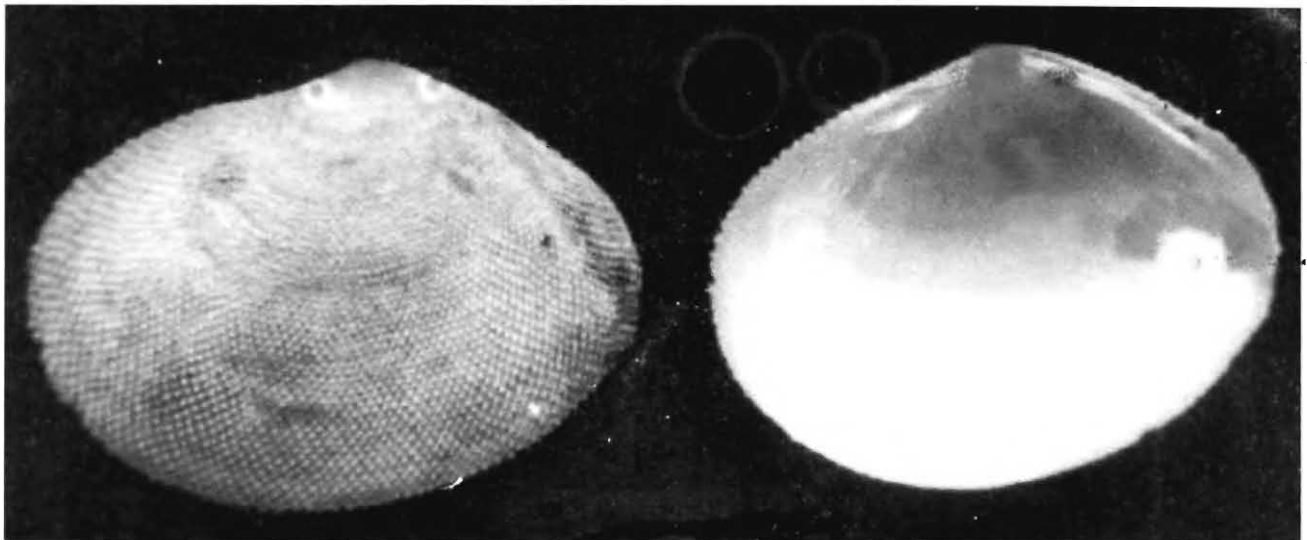
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- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Tellina (Quidnipagus) gargadia* Linnaeus. (length = 28.45 mm)
- Fig. 2.** External view of left valve (upper) and Internal view of right valve (lower) of *Tellina (Quidnipagus) palatam* Iredale. (length = 56.04 mm)

PLATE – XV



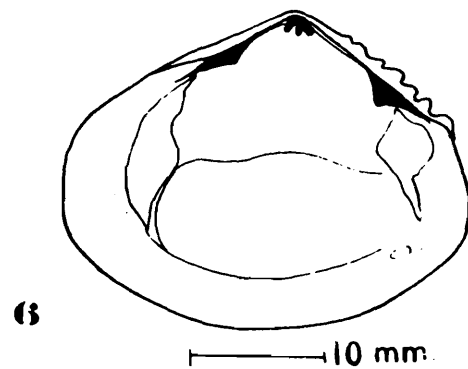
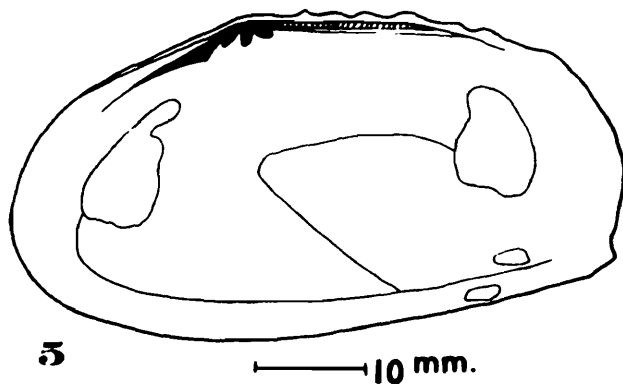
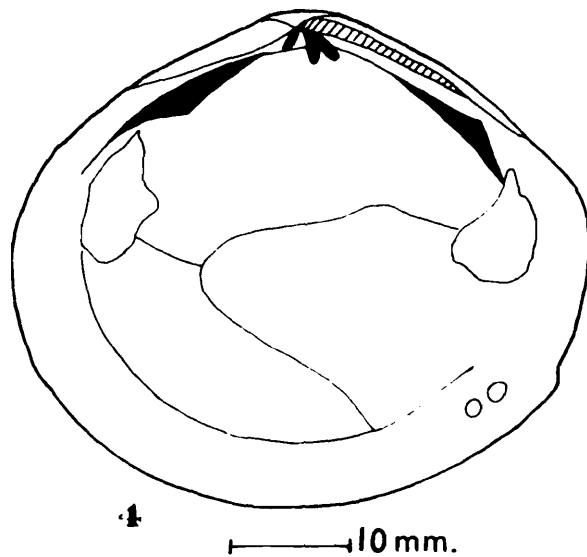
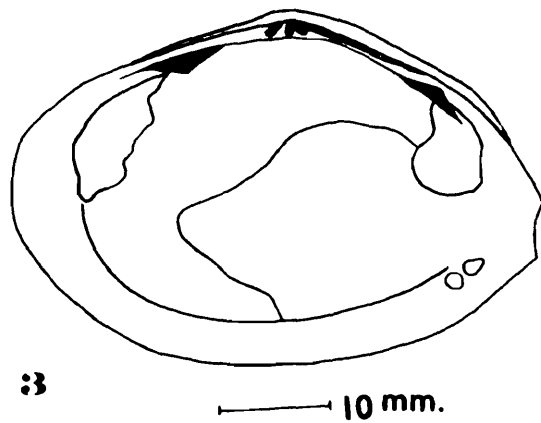
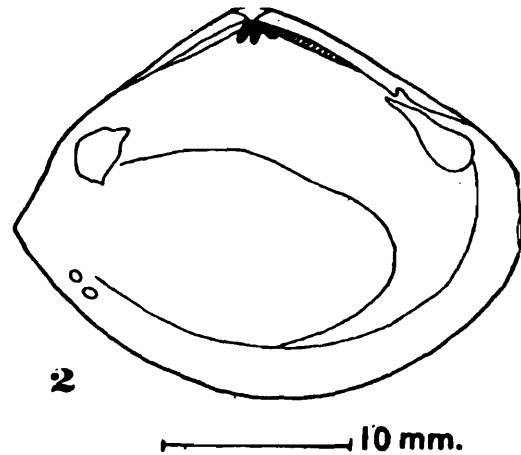
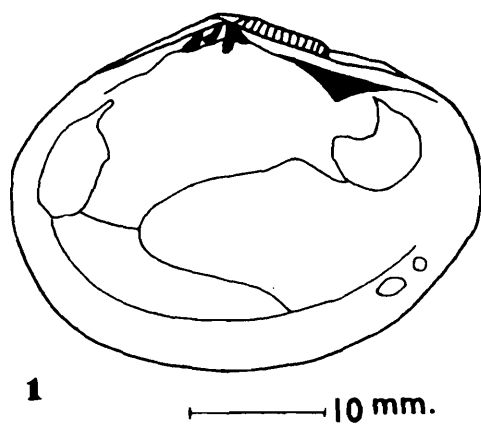
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2

- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Tellina (Scutarcopagia) scobinata* Linnaeus. (length = 59.58 mm)
- Fig. 2.** External view of left valve (left) and Internal view of right valve (right) of *Tellina (Scutarcopagia) lingua-felis* Linnaeus. (length = 46.25 mm)

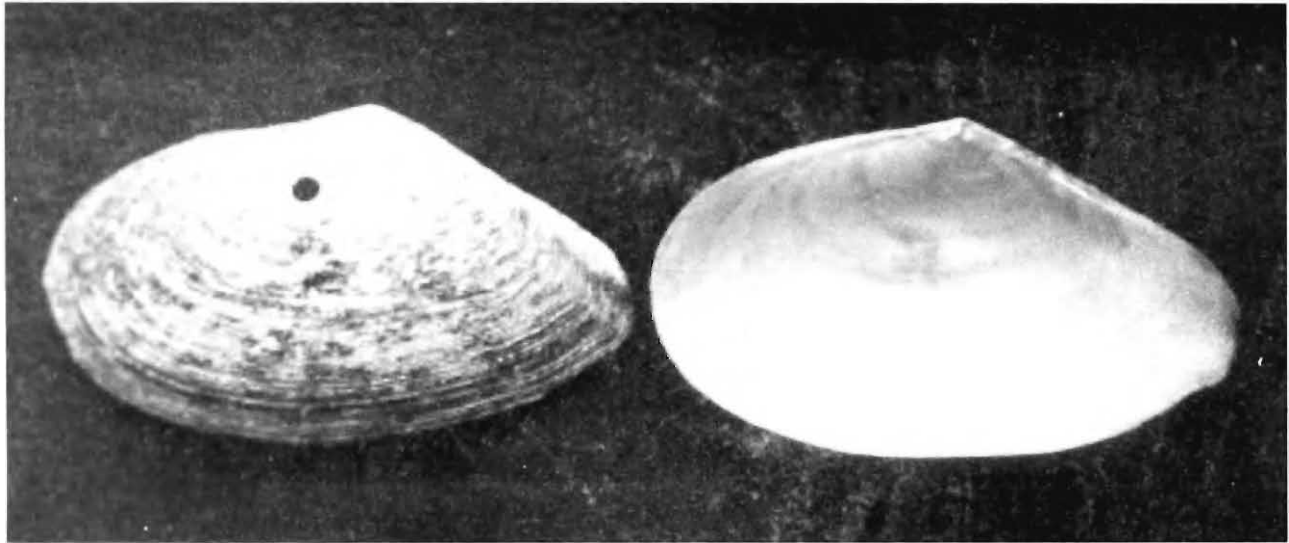
## PLATE - XVI



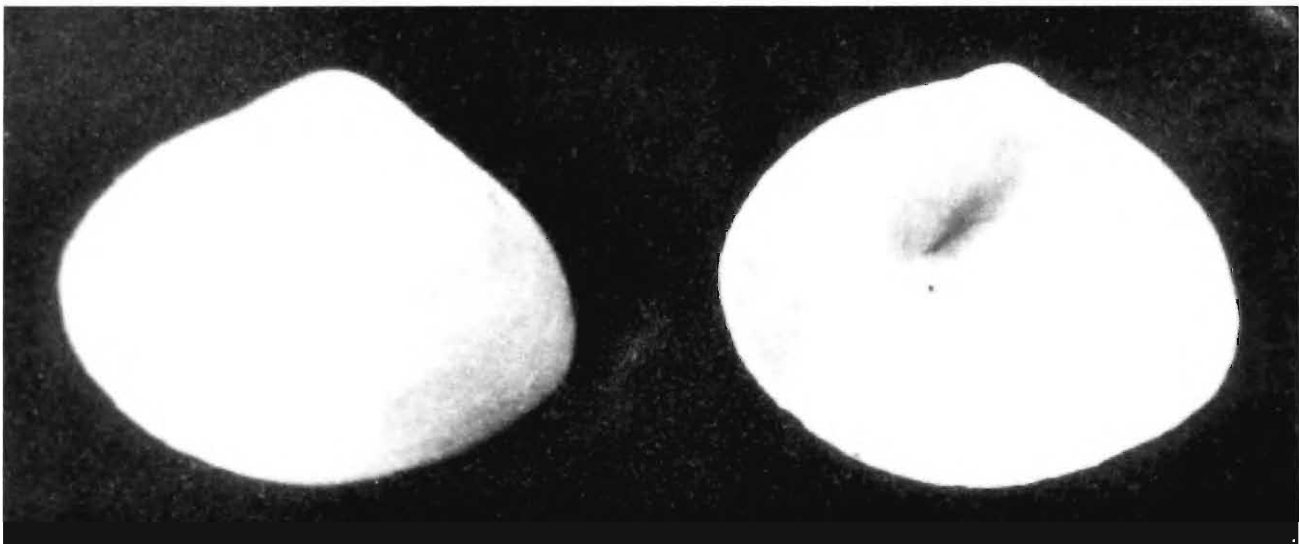
Diagrammatic illustrations of the internal surface of the valves, showing the cardinal teeth, adductor muscles impressions, cruciform muscles impressions, pallial line and pallial sinus.

1. *Tellina jaussaeumei* Preston (right valve, type) 2. *Tellina (Pinguitellina) robusta* Hanley (left valve)  
 3. *Tellina (Scutarcopagia) lingua-felis* Linnaeus (right valve) 4. *Tellina (Scutarcopagia) scobinata* Linnaeus  
 (right valve) 5. *Tellina (Phylloda) foliacea* Linnaeus (right valve) 6. *Tellina (Quidnipagus) gargadia*  
 Linnaeus (right valve).

PLATE – XVII



1

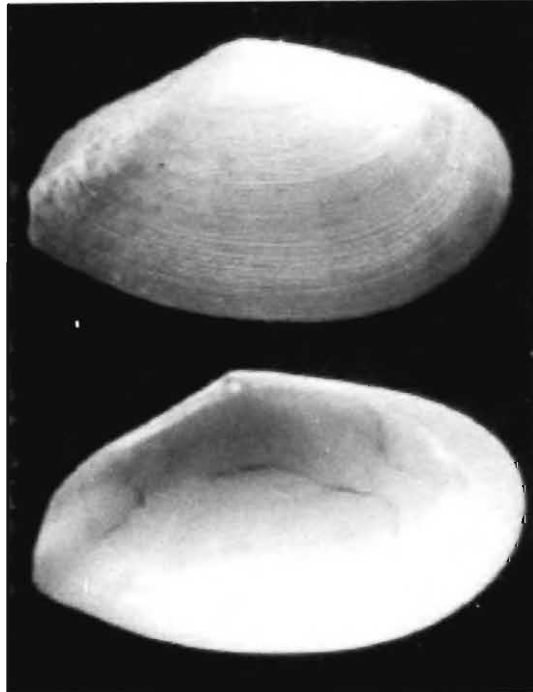


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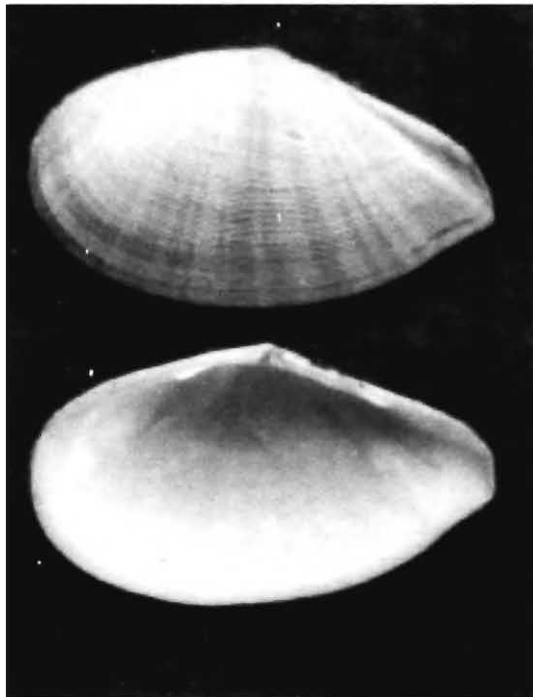
**Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Tellina (Tellinella) travancorica* Smith. (length = 38.11 mm)

**Fig. 2.** External view of left valve (left) and Internal view of right valve (right) of *Tellina vadorum* Preston (type). (length = 7.76 mm)

## PLATE – XVIII



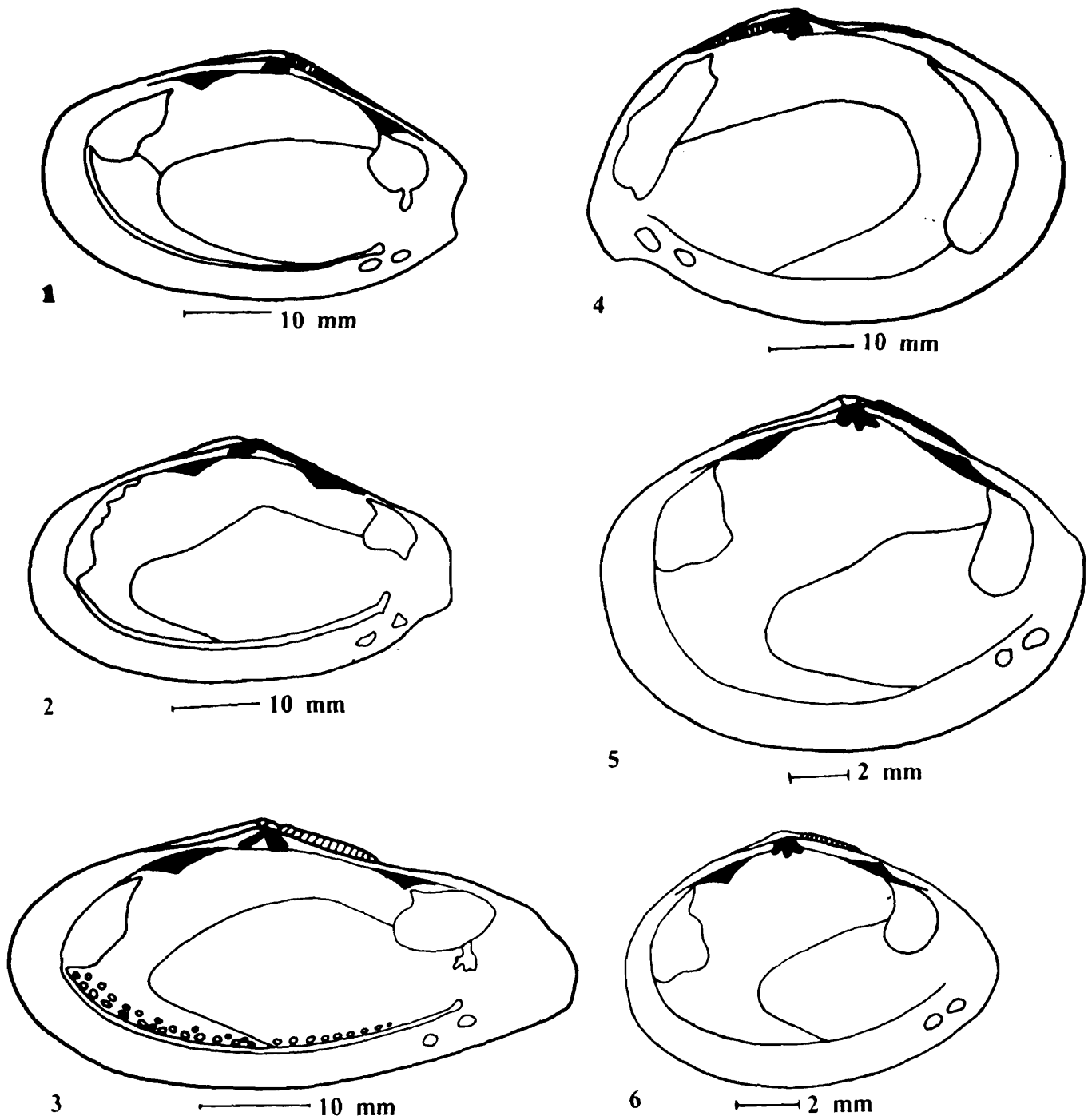
1



2

- Fig. 1.** External view of right valve (upper) and internal view of left valve (lower) of *Tellina (Tellinella) staurella* Lamarck. (length = 52.25 mm)
- Fig. 2.** External view of left valve (upper) and internal view of right valve (lower) of *Tellina (Tellinella) virgata* Linnaeus. (length = 80.45 mm)

PLATE - XIX



Diagrammatic illustrations of the internal surface of the valves showing the cardinal teeth, adductor muscles impressions, pallial line and pallial sinus

1. *Tellina (Tellinella) staurella* Lamarck (right valve) 2. *Tellina (Tellinella) travancorica* Smith (right valve, type) 3. *Tellina (Tellinella) virgata* Linnaeus (right valve) 4. *Tellina (Hemimetis) angulata* Linnaeus (left valve) 5. *Arcopagia carnicolor* (Hanley) (right valve) 6. *Tellina cancellata* Preston (right valve, type)

## PLATE - XX



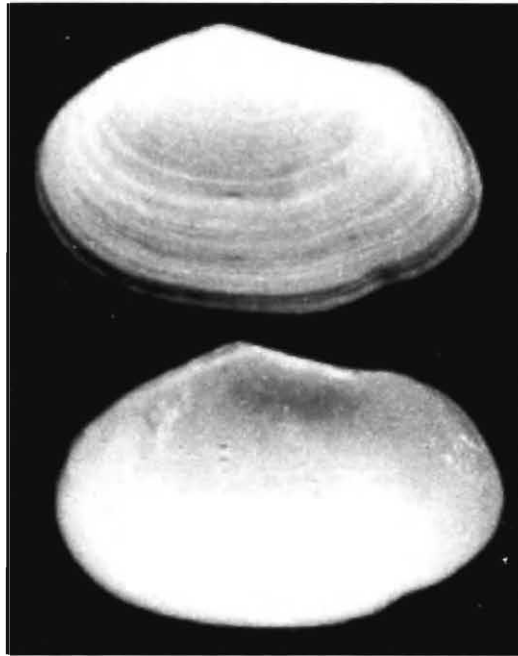
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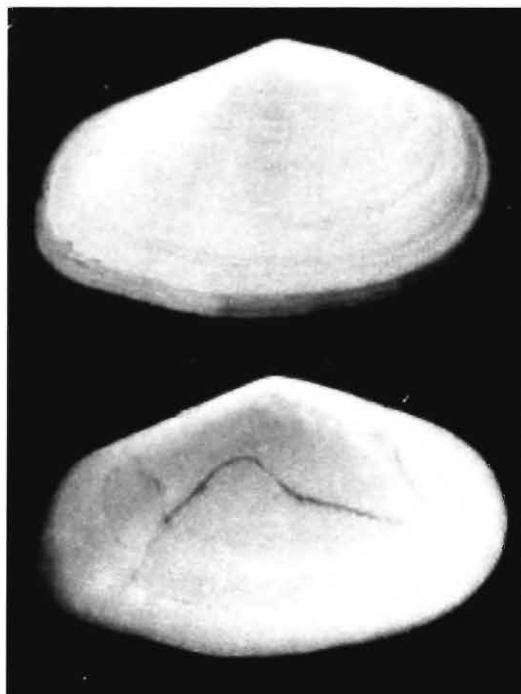
2

- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Tellina (Tellinides) ovalis* Sowreby. (length = 30.62 mm)
- Fig. 2.** External view of left valve (left) and Internal view of right valve (right) of *Tellina (Tellinides) opalina* Gmelin. (length = 38.52 mm)

PLATE – XXI



1

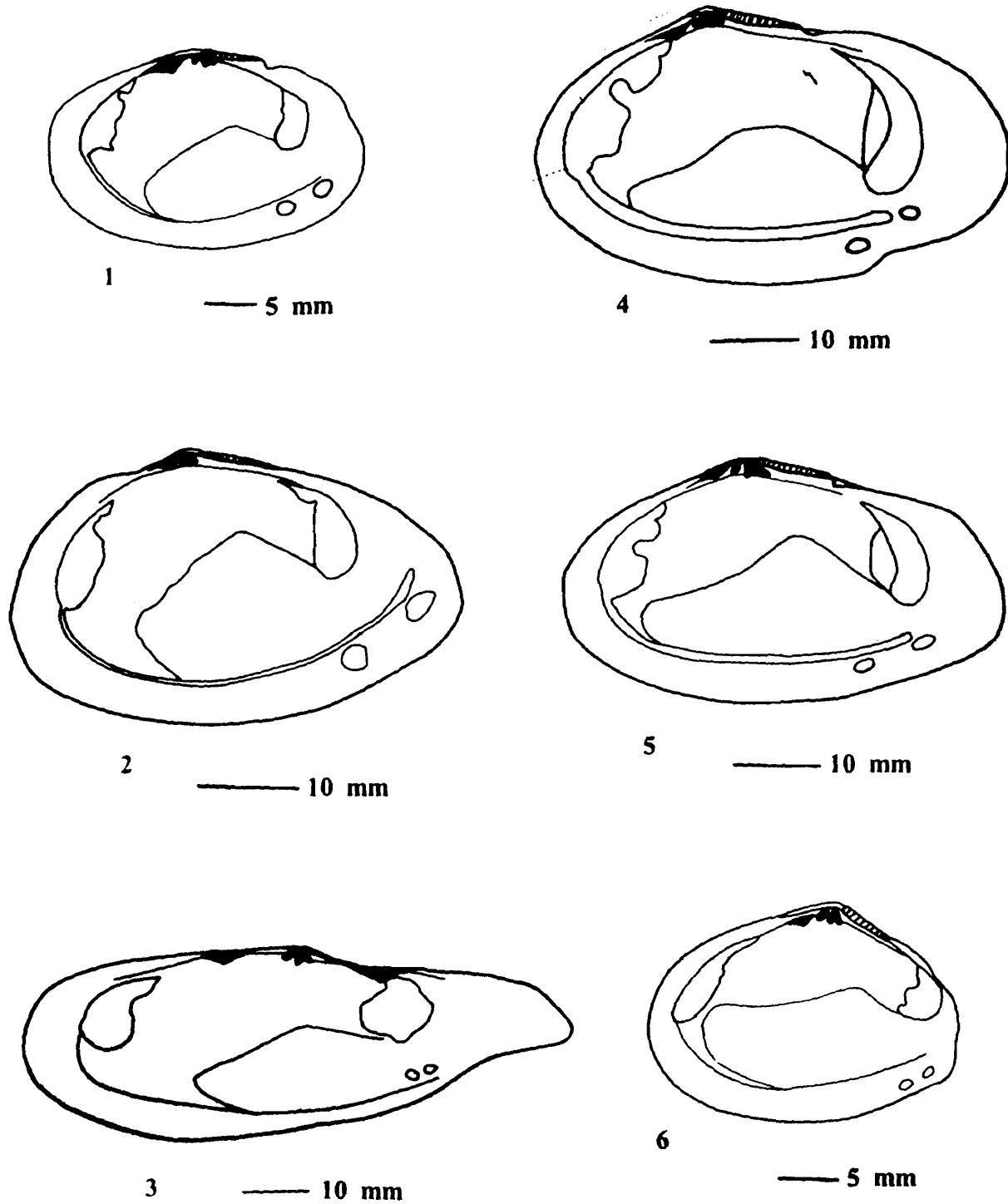


2

**Fig. 1.** External view of left valve (upper) and Internal view of right valve (lower) of *Tellina (Tellinides) sinuata* Spengler. (length = 53.00 mm)

**Fig. 2.** External view of right valve (upper) and Internal view of left valve (lower) of *Tellina (Tellinides) sinuata* Spengler. (length = 49.70 mm)

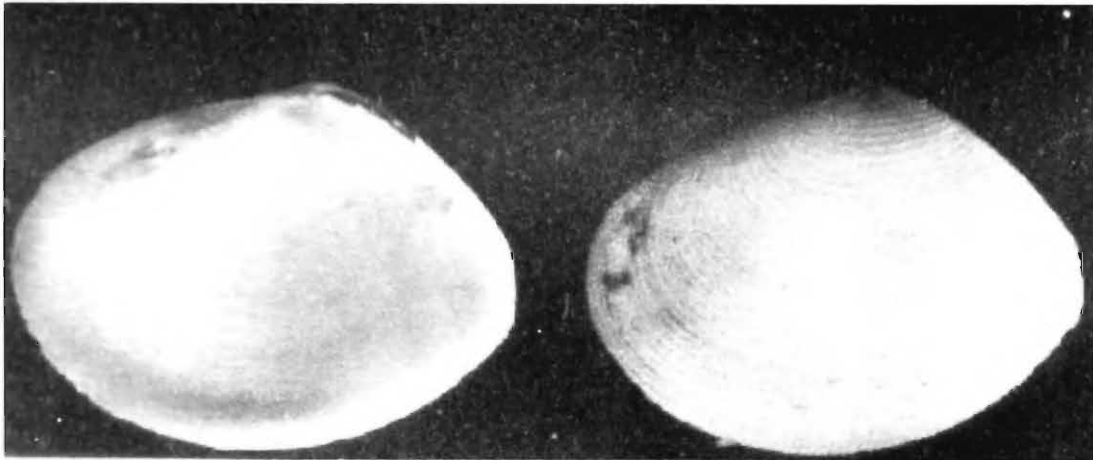
## PLATE - XXII



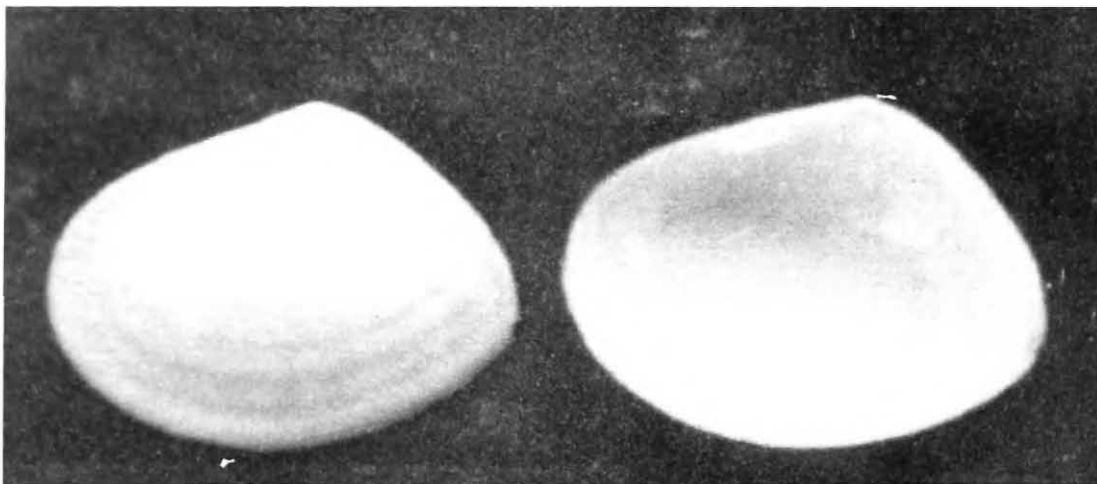
Diagrammatic illustrations of the internal surface of the valves showing the cardinal teeth, adductor muscles impressions, cruciform muscles impressions, pallial line and pallial sinus

1. *Tellina (Tellinides) ovalis* Sowerby (right valve)
2. *Tellina (Tellinides) opalina* Gmelin (right valve)
3. *Tellina (Pharaonella) vulsella* Gmelin (right valve)
4. *Tellina (Tellinides) sinuata* Spengler (right valve)
5. *Tellina (Tellinides) sinuata* Spengler (right valve immature)
6. *Tellina (Homalina) myaeformis* Sowerby (right valve)

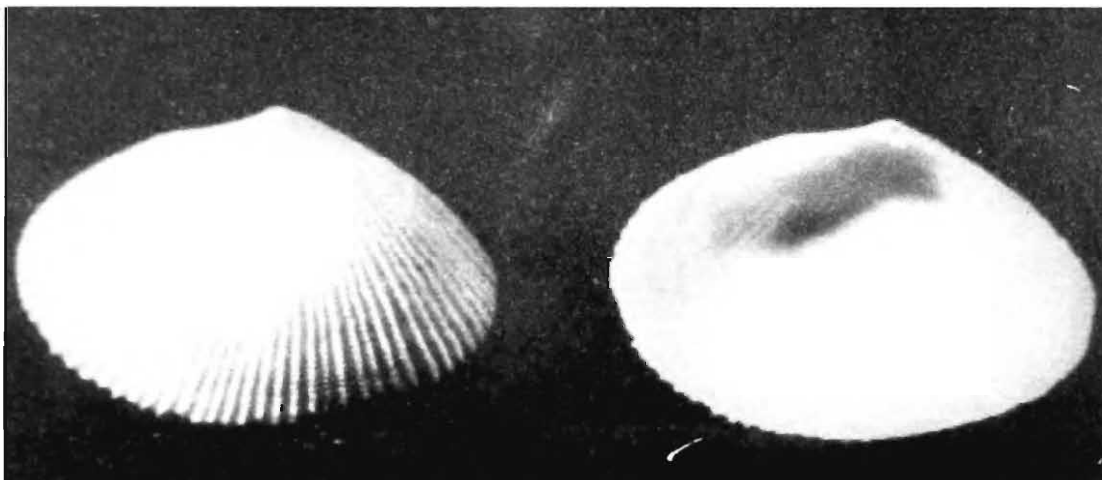
PLATE – XXIII



1



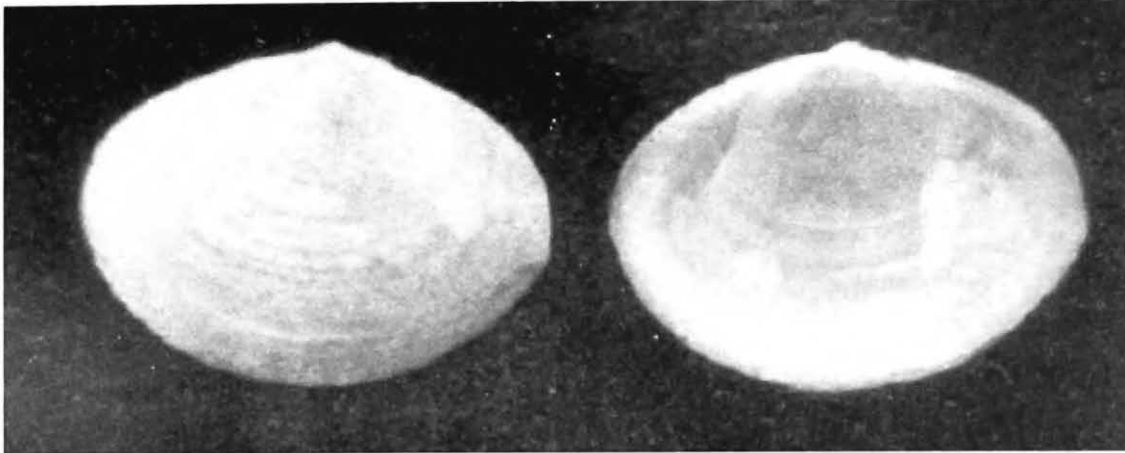
2



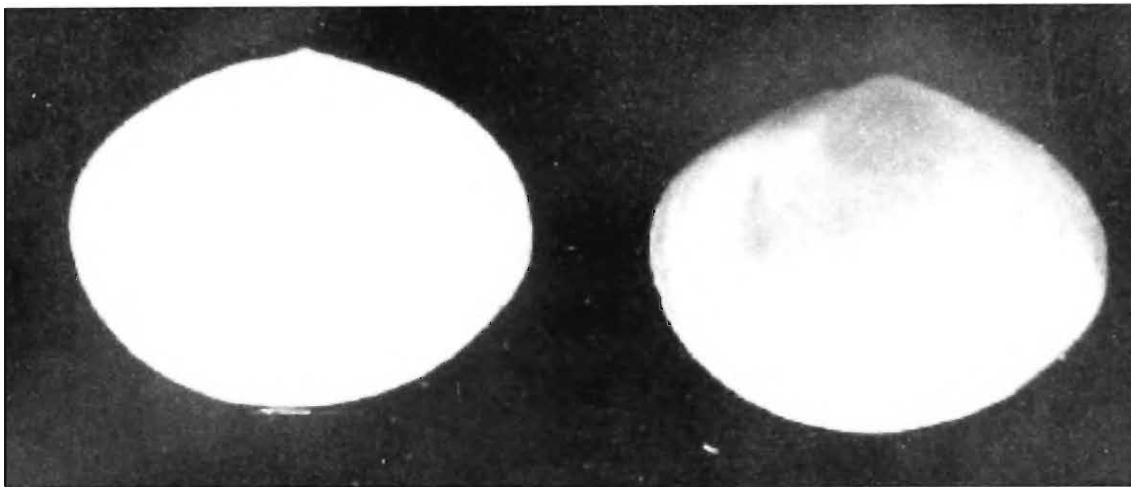
3

- Fig. 1.** External view of left valve (right) and Internal view of right valve (left) of *Tellina carnicolor* Hanley (type). (length = 19.39 mm)
- Fig. 2.** External view of left valve (left) and Internal view of right valve (right) of *Arcopagia carnicolor* (Hanley). (length = 16.85 mm)
- Fig. 3.** External view of left valve (left) and Internal view of right valve (right) of *Tellina cancellata* Preston (type). (length = 12.20 mm)

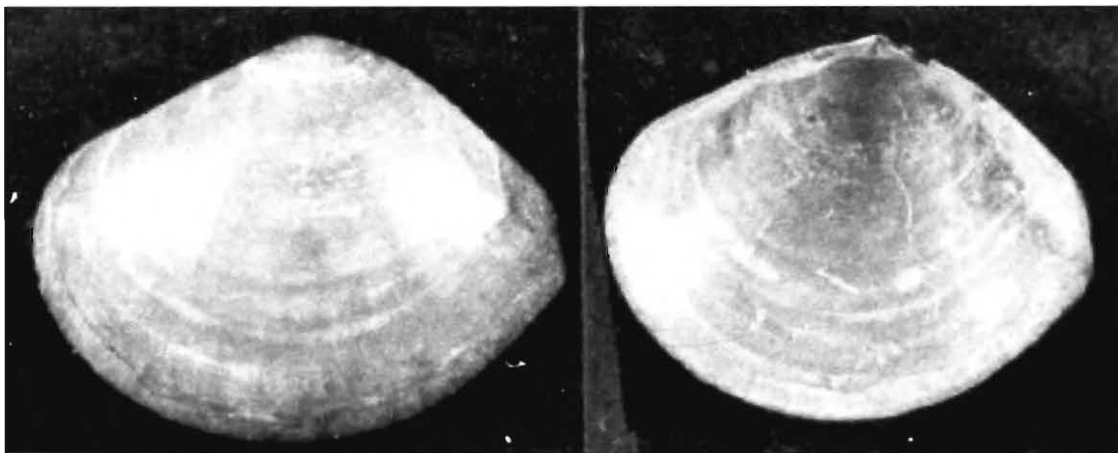
## PLATE – XXIV



1



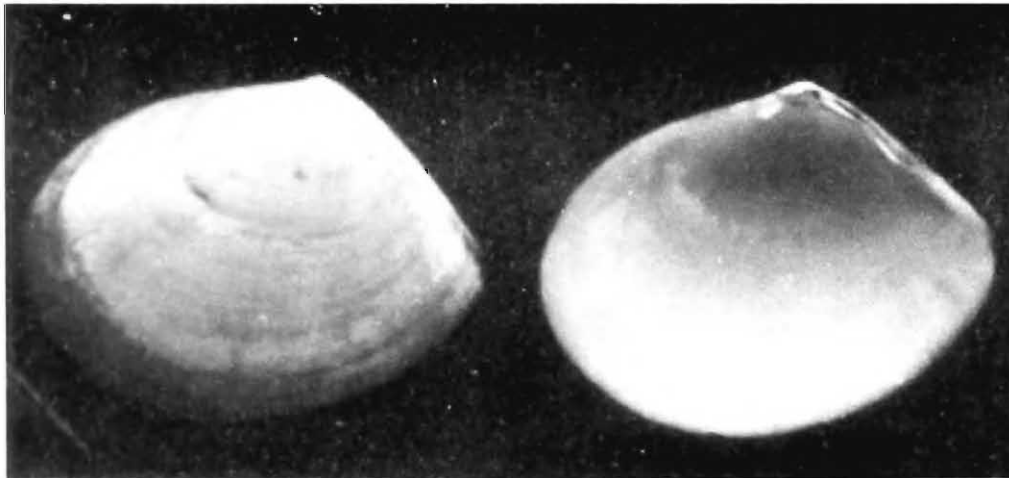
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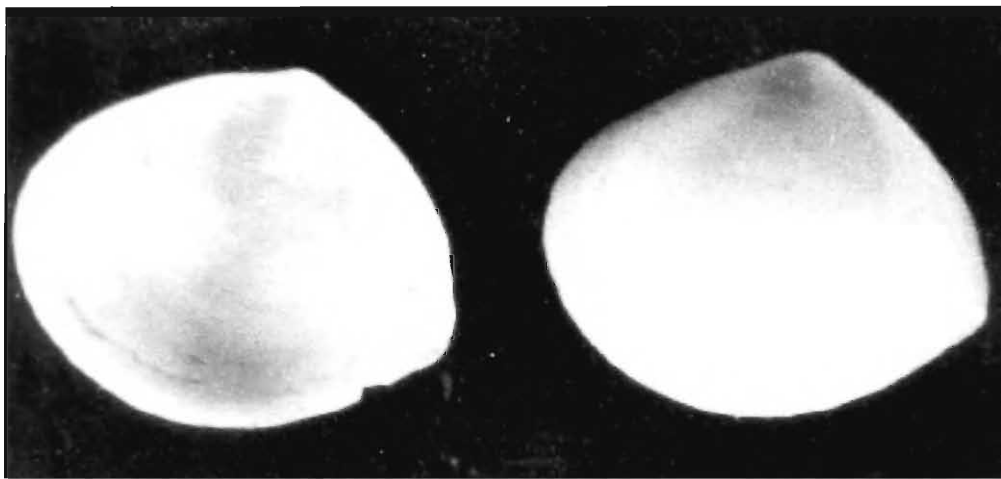
3

- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Tellina persimplex* Preston (type). (length = 8.00 mm)
- Fig. 2.** External view of left valve (right) and Internal view of right valve (left) of *Arcopagia casta* (Hanley). (length = 10.61 mm)
- Fig. 3.** External view of left valve (left) and Internal view of right valve (right) of *Tellina casta* Hanley (type). (length = 12.06 mm)

PLATE – XXV



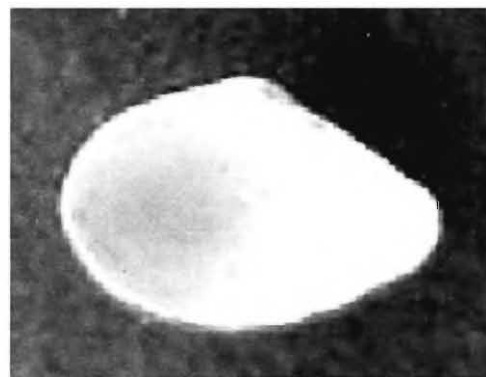
1



2



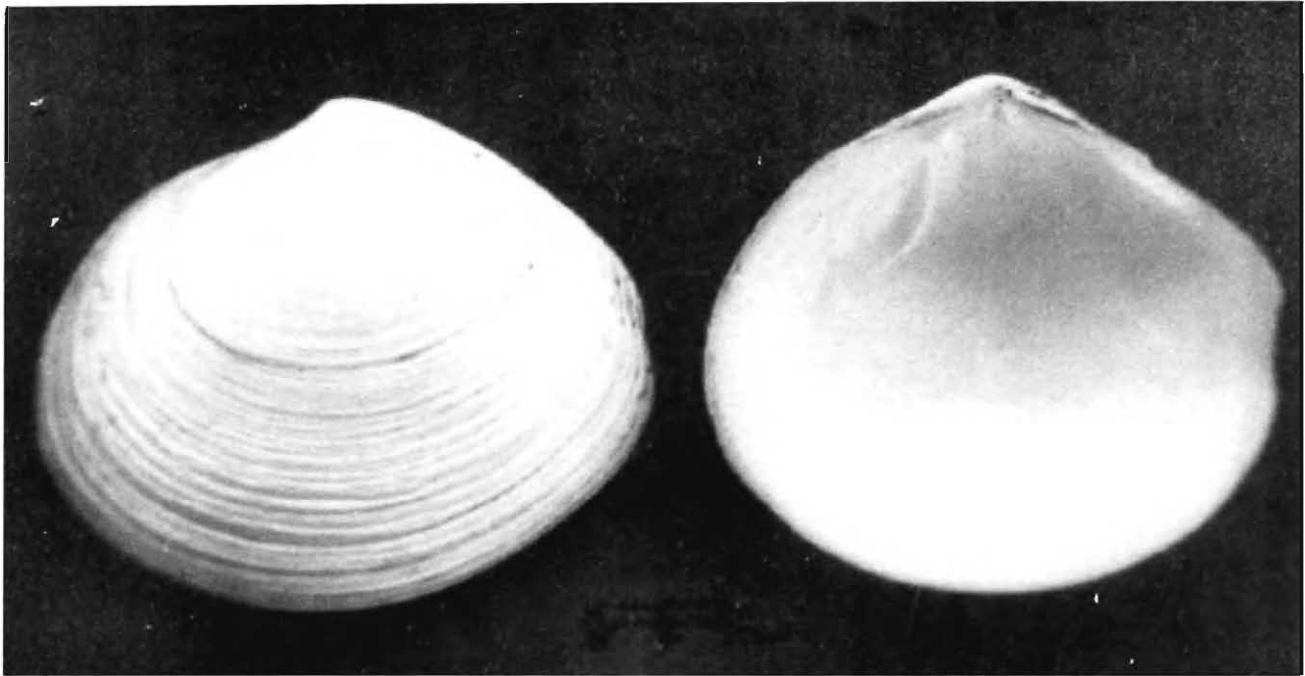
3



4

- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Arcopagia inflata* (Gmelin). (length = 41.26 mm)
- Fig. 2.** External view of left valve (right) and Internal view of right valve (left) of *Arcopagia pinguis* (Hanley). (length = 9.70 mm)
- Fig. 3&4.** External view of left valve (left) and Internal view of right valve (right) of *Arcopagia pudica* (Hanley). (length = 5.00 mm)

## PLATE – XXVI



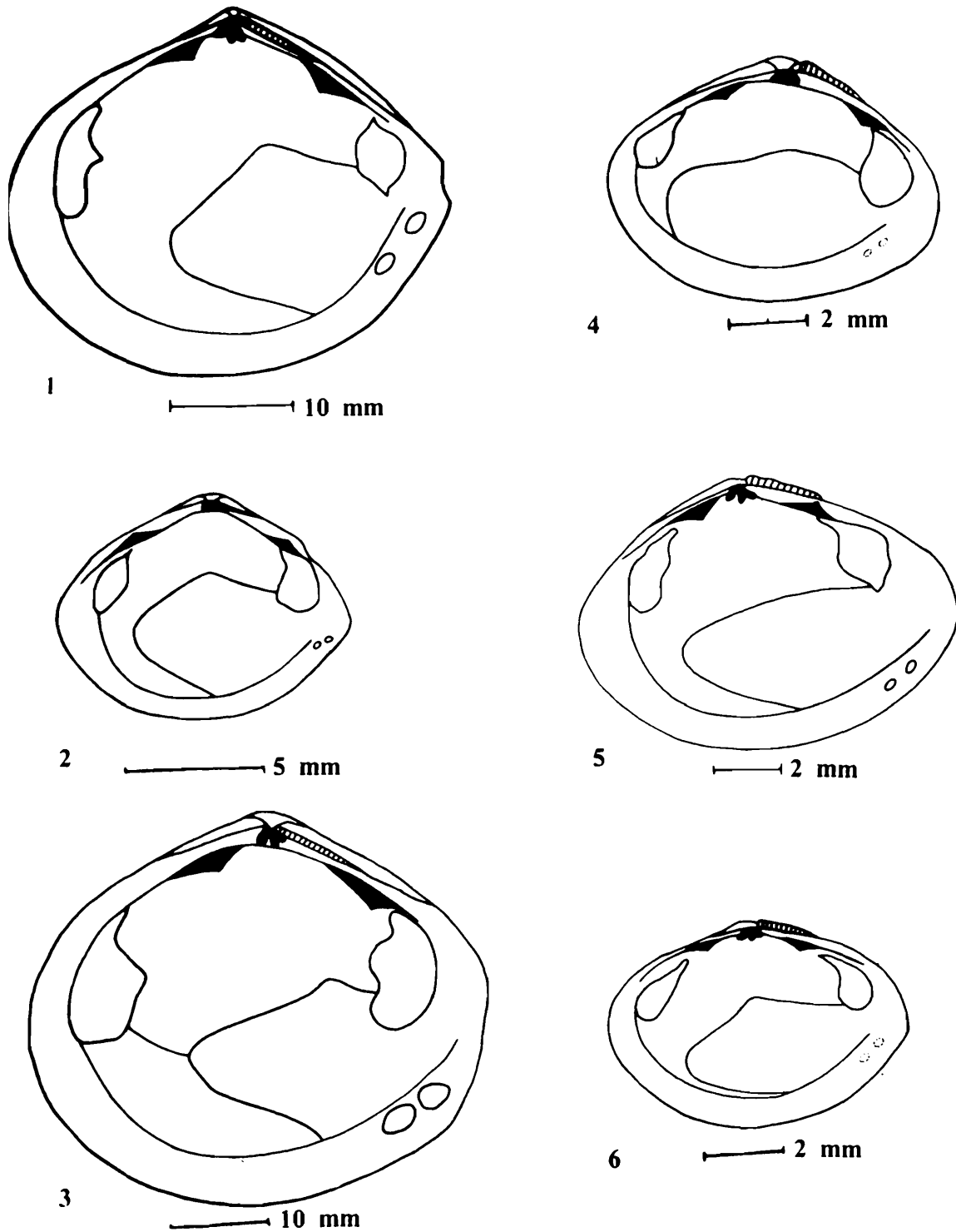
1



2

- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Arcopagia remies* (Linnaeus). (length = 79.70 mm)
- Fig. 2.** External view of left valve (left) and Internal view of right valve (right) of *Tellina jaussaeumei* Preston (type). (length = 38.70 mm)

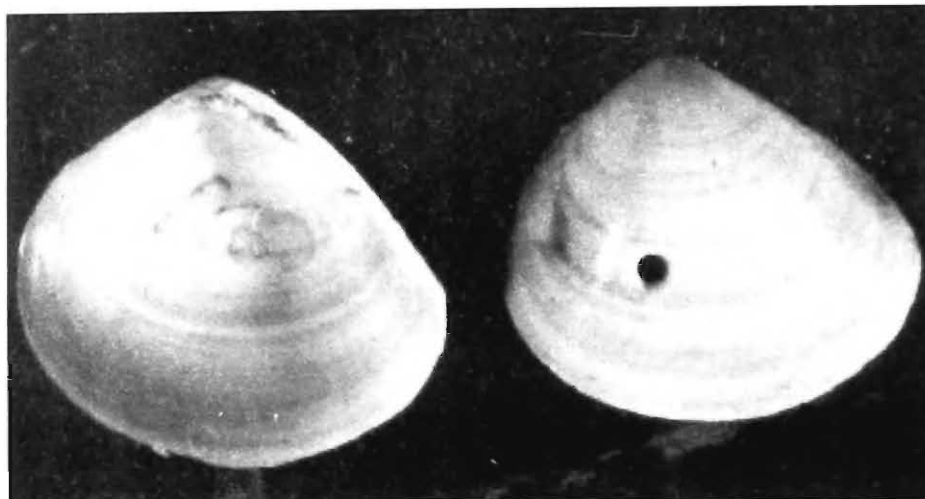
PLATE – XXVII



Diagrammatic illustrations of the internal surface of the valves showing the cardinal teeth, adductor muscles impressions, cruciform muscles impressions, pallial line and pallial sinus

1. *Arcopagia inflata* (Gmelin) (right valve) 2. *Arcopagia pinguis* (Hanley) (right valve)  
 3. *Arcopagia remies* (Linnaeus) (right valve) 4. *Tellina bertianana* Preston (right valve, type)  
 5. *Arcopagia casta* (Hanley) (right valve) 6. *Tellina persimplex* Preston (right valve, type)

## PLATE – XXVIII



1



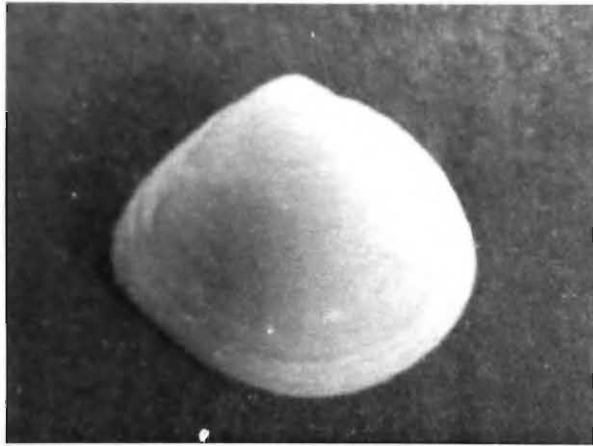
2



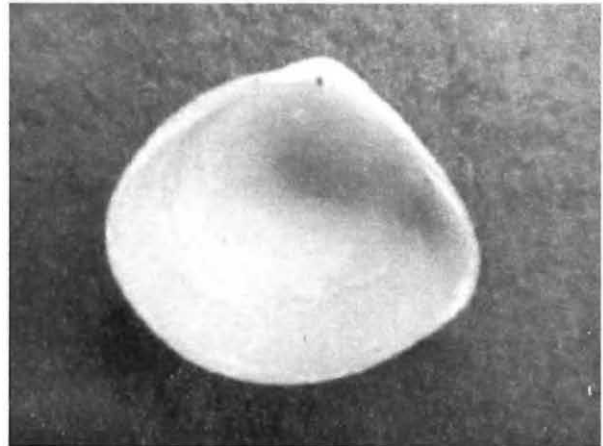
3

- Fig. 1.** External view of left valve (right) and Internal view of right valve (left) of *Strigilla (Aeretica) splendida* (Anton). (length = 17.75 mm)
- Fig. 2.** External view of right valve of *Strigilla denestriata* Preston. (length = 17.00 mm)
- Fig. 3.** Internal view of right valve of *Strigilla denestriata* Preston. (length = 17.00 mm)

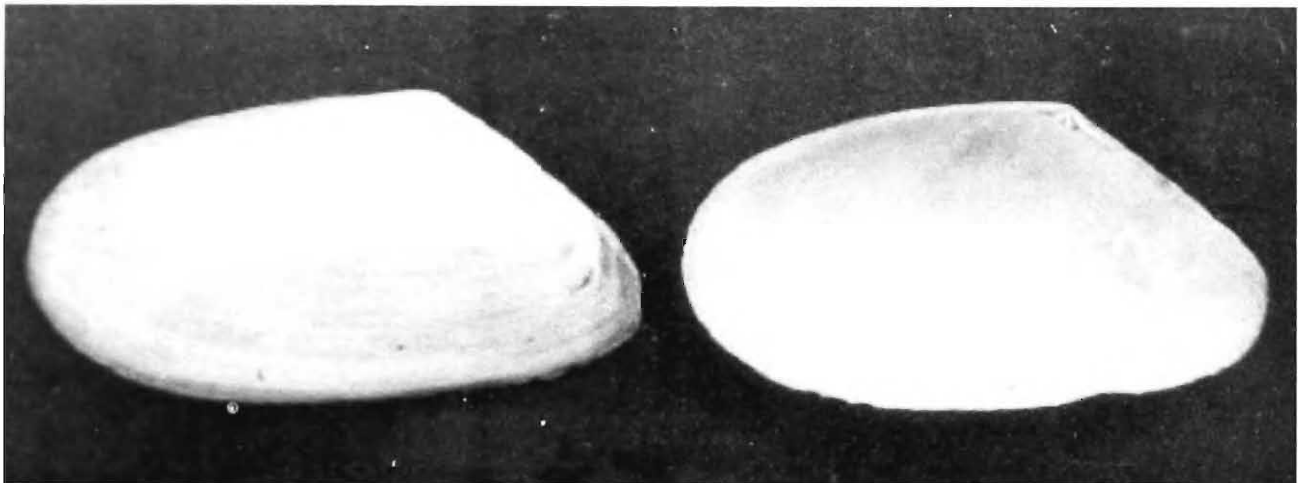
PLATE – XXIX



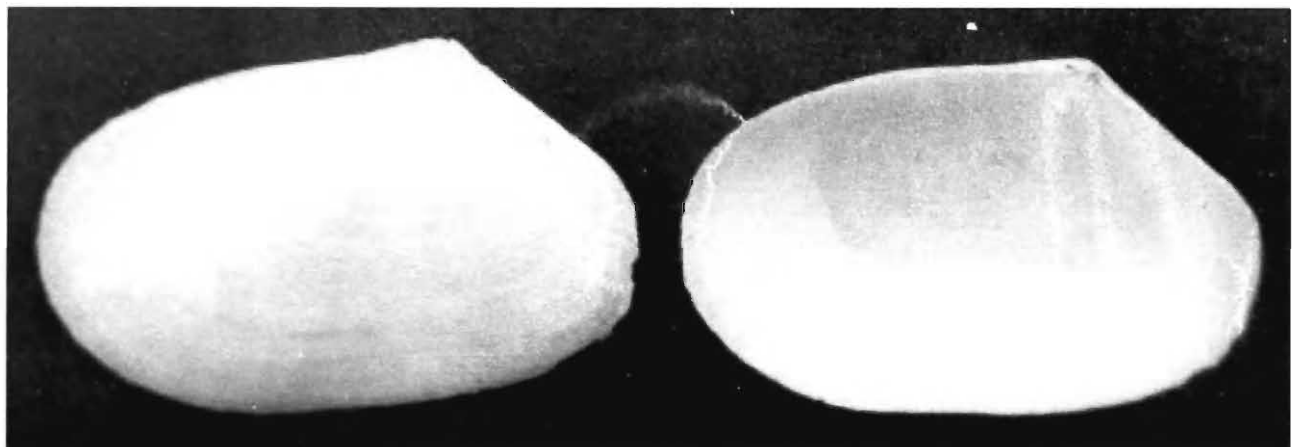
1



2



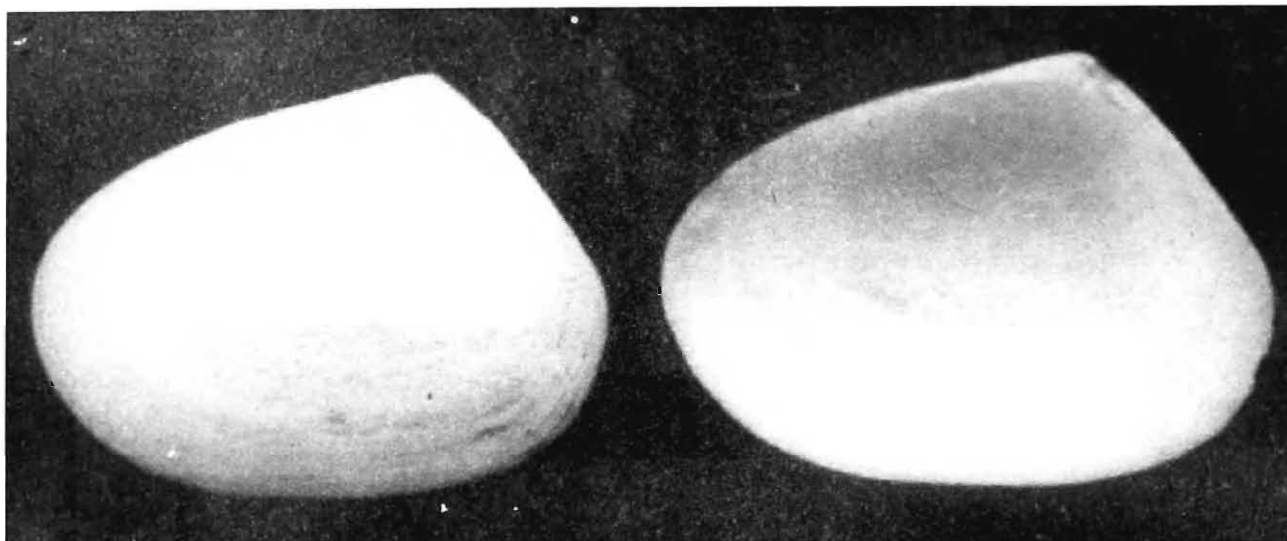
3



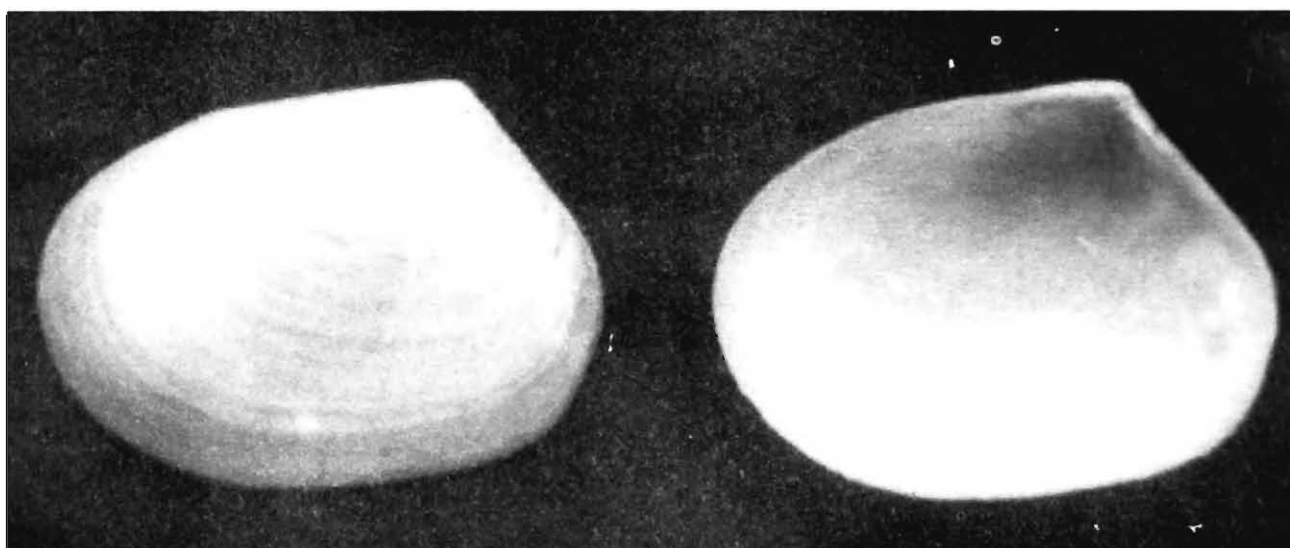
4

- Fig. 1&2.** External view of right valve (left) and Internal view of right valve (right) of *Macoma (Pinguimacoma) albissima* Smith. Type (length = 16.00 mm)
- Fig.3.** External view of left valve (left) and Internal view of right valve (right) of *Macoma (Psammacoma) birmanica* (Philippi). (length = 59.84 mm)
- Fig.4.** External view of left valve (left) and Internal view of right valve (right) of *Macoma (Psammacoma) candida* (Lamarck). (length = 53.87 mm)

## PLATE – XXX



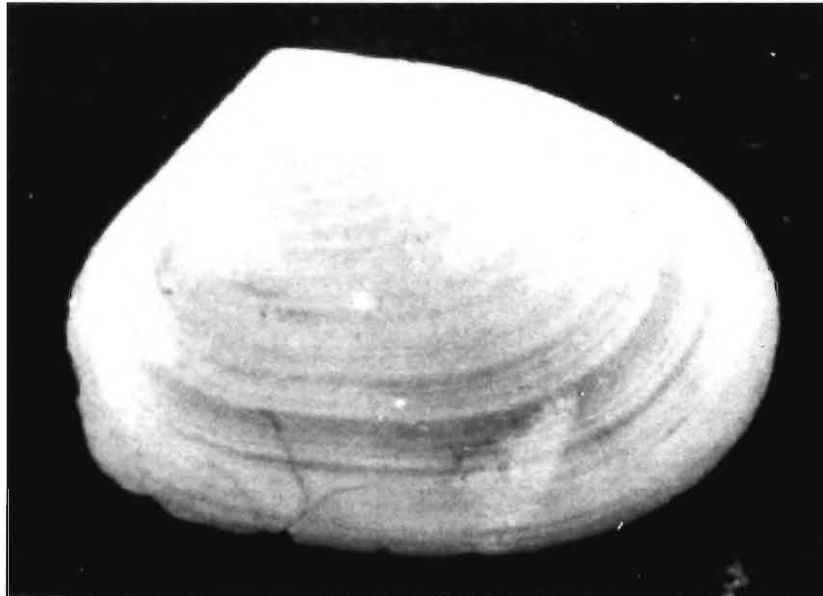
1



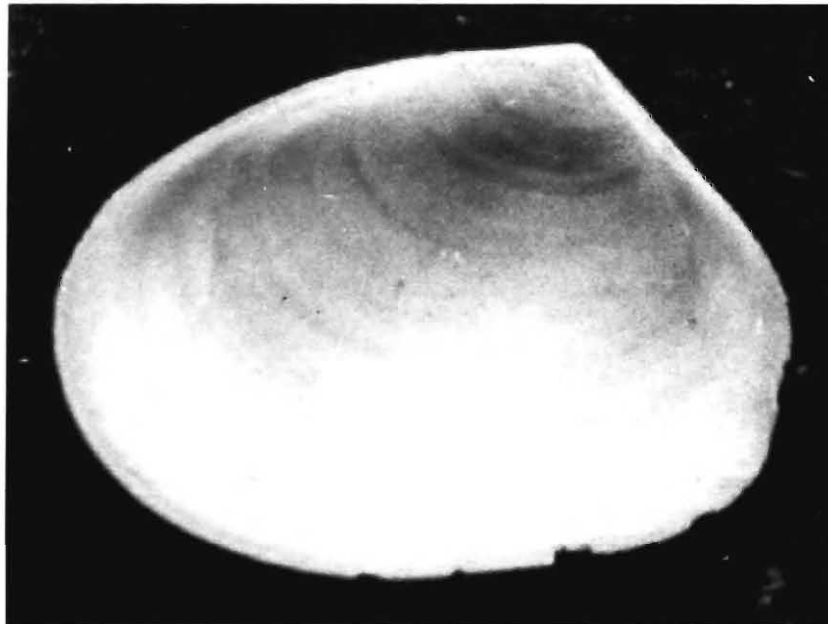
2

- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Macoma (Psammacoma) truncata* (Jonas). (length = 40.80 mm)
- Fig. 2.** External view of left valve (left) and Internal view of right valve (right) of *Tellina gubernaculum* Hanley (type). (length = 36.41 mm)

PLATE - XXXI



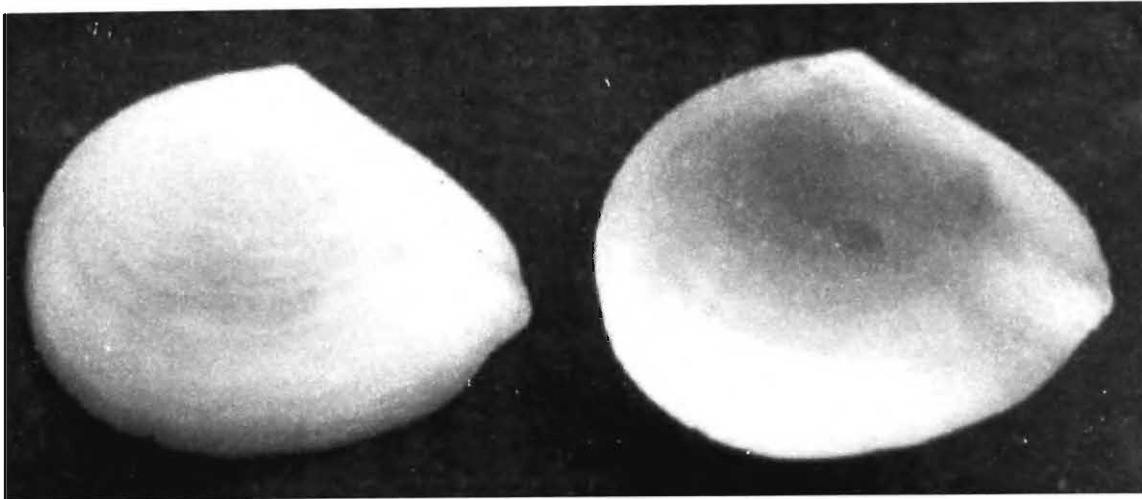
1



2

**Fig. 1.** External view of right valve of *Tellina blairensis* Smith (type). (length = 43.95 mm)  
**Fig. 2.** External view of right valve of *Tellina blairensis* Smith (type). (length = 43.95 mm)

## PLATE – XXXII



1



2



3

- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Macoma (Psammotreta) ala* (Hanley). (length = 34.95 mm)
- Fig. 2.** External view of left valve of *Macoma (Psammotreta) alba* (Quoy and Gaimard). (length = 58.10 mm)
- Fig. 3.** Internal view of left valve of *Macoma (Psammotreta) alba* (Quoy and Gaimard). (length = 58.10 mm)

PLATE – XXXIII



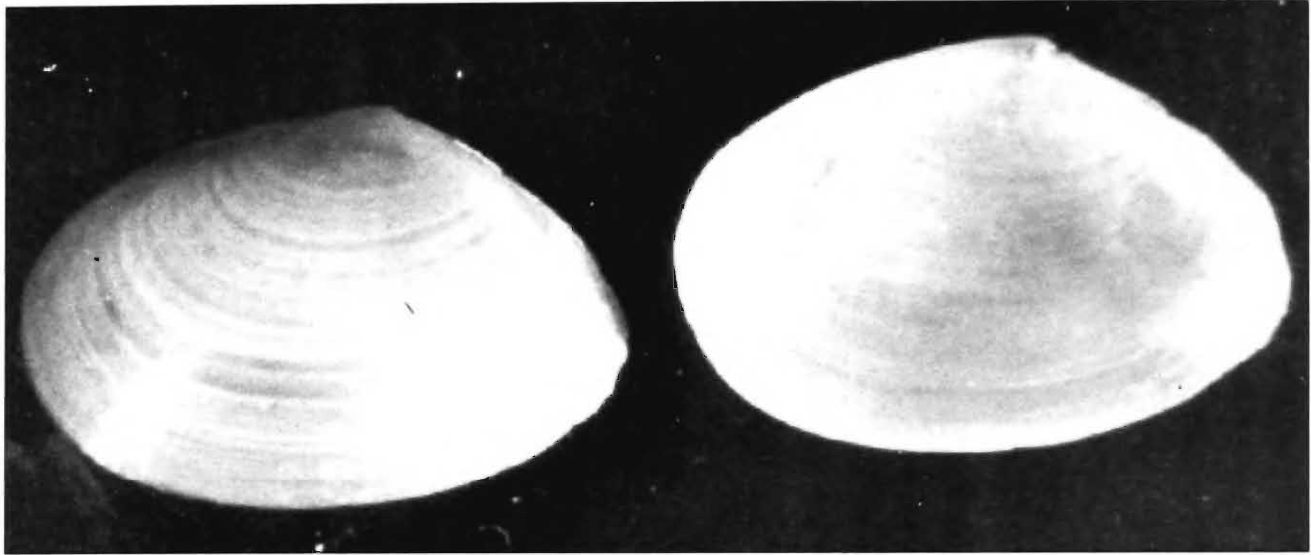
1



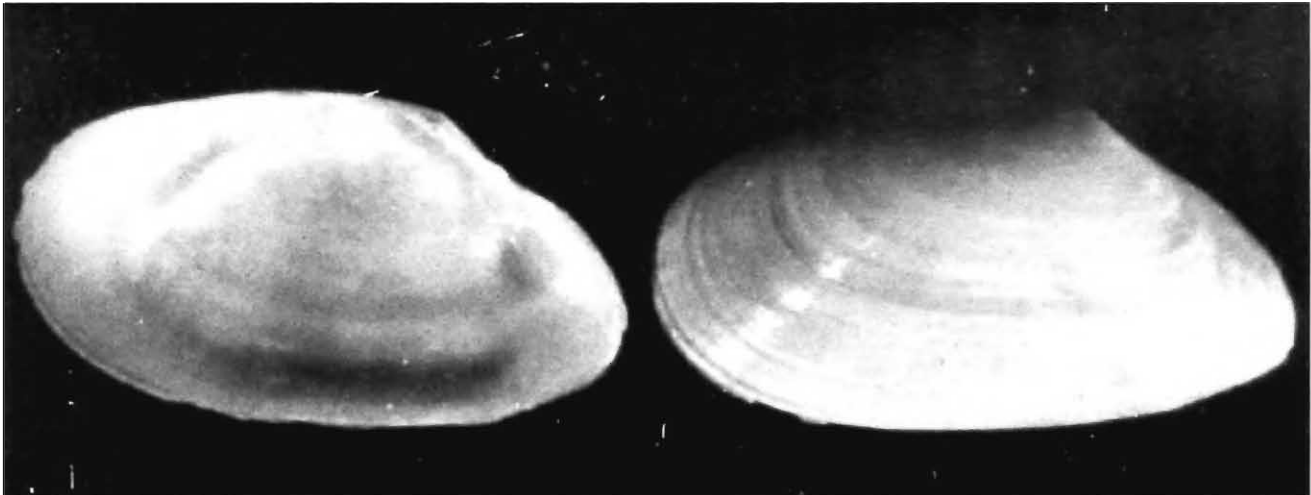
2

- Fig. 1.** External view of right valve (lower) and Internal view of left valve (upper) of *Macoma (Psammotreta) micans* (Hanley). (length = 20.40 mm)
- Fig. 2.** External view of left valve (upper) and Internal view of right valve (lower) of *Tellina micans* Hanley (type). (length = 26.45 mm)

## PLATE – XXXIV



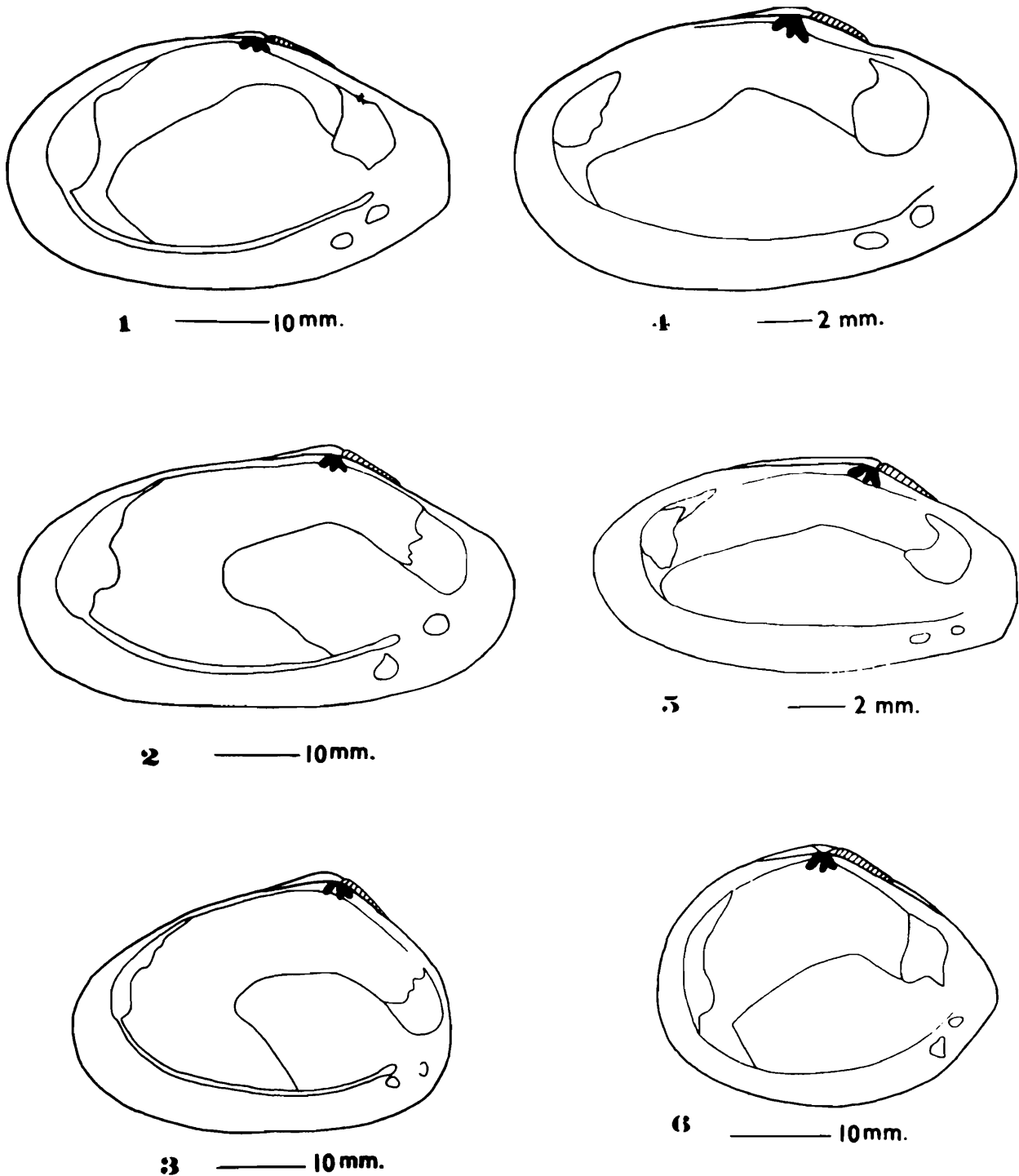
1



2

- Fig. 1.** External view of left valve (left) and Internal view of right valve (right) of *Macoma (Scissulina) dispar* (Conard). (length = 22.95 mm)
- Fig. 2.** External view of left valve (right) and Internal view of right valve (left) of *Macoma (Scissulina) reticulata* (Sowerby). (length = 19.76 mm)

PLATE - XXXV



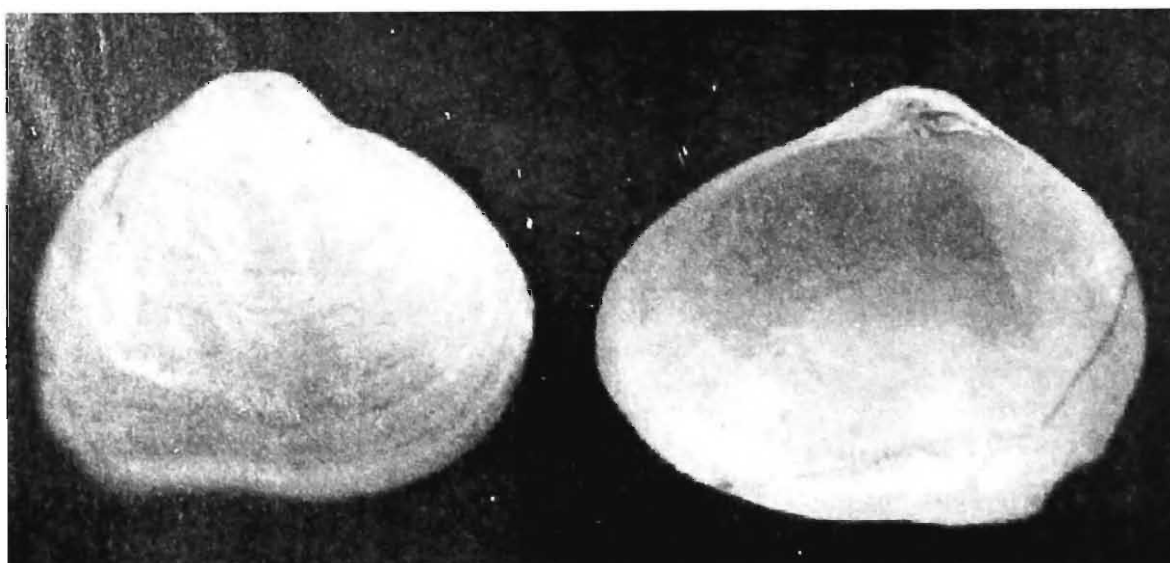
Diagrammatic illustrations of the internal surface of the valves showing the cardinal teeth, adductor muscles impressions, cruciform muscles impressions, pallial line and pallial sinus

1. *Macoma (Psammacoma) birmanica* (Philippi) (right valve) 2. *Macoma (Psammacoma) candida* (Lamarck) (right valve) 3. *Macoma (Psammacoma) truncata* (Jonas) (right valve) 4. *Macoma (Scissulina) dispar* (Conard) (right valve) 5. *Macoma (Scissulina) reticulata* (Sowerby) (right valve) 6. *Macoma (Psammolreta) ala* (Hanley) (right valve)

## PLATE - XXXVI



1



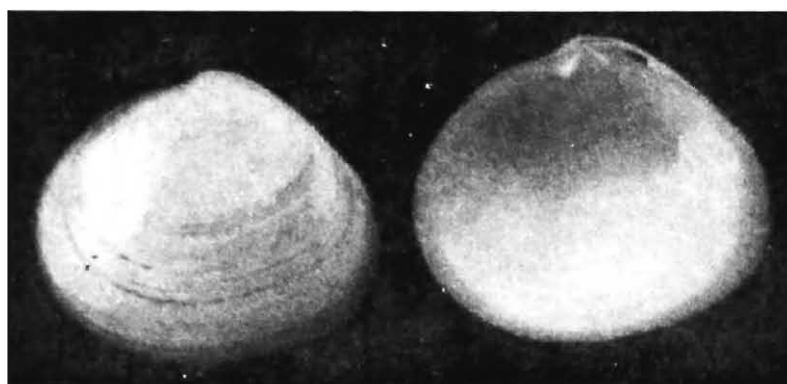
2

- Fig. 1.** External view of left valve (upper) and Internal view of right valve (lower) of *Apolymetis edentula* (Spengler). (length = 71.25 mm)
- Fig. 2.** External view of right valve (left) and Internal view of right valve (right) of *Apolymetis papyracea* (Gmelin). (length = 50.45 mm)

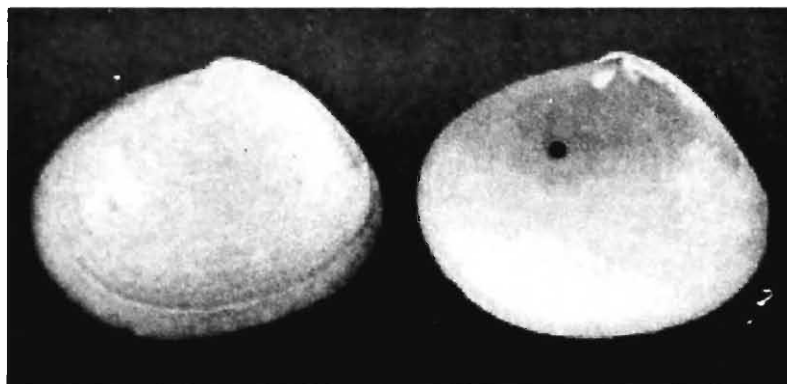
PLATE - XXXVII



1



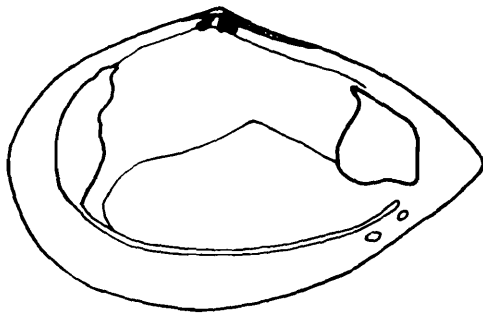
2



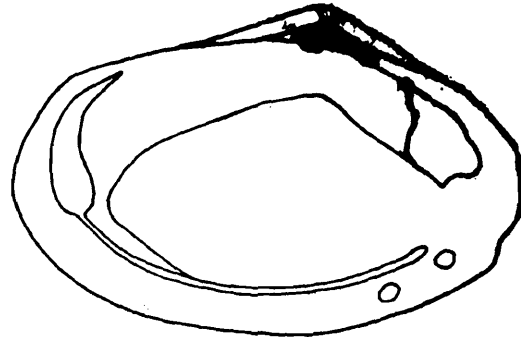
3

- Fig. 1. External view of left valve (upper) and Internal view of right valve (lower) of *Gastrana polygona* (Gmelin). (length = 58.45 mm)
- Fig. 2. External view of left valve (left) and Internal view of right valve (right) of *Tellina bruguieri* Hanley (type). (length = 43.15 mm)
- Fig. 3. External view of left valve (left) and Internal view of right valve (right) of *Macalia bruguieri* (Hanley). (length = 37.48 mm)

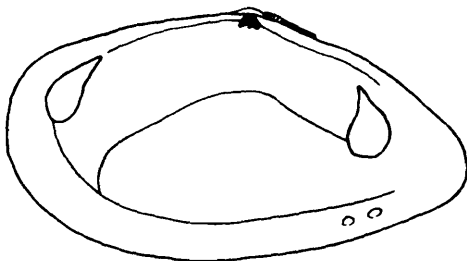
## PLATE - XXXVIII



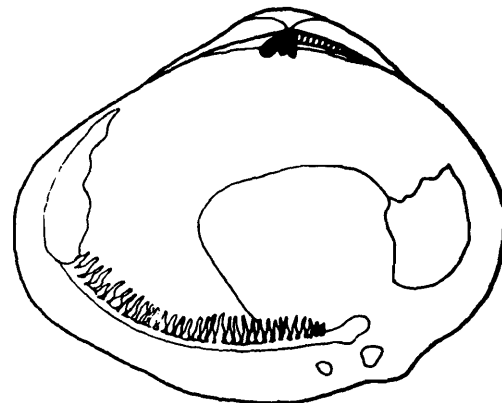
1 — 10 mm



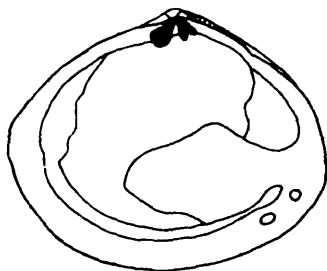
4 — 10 mm



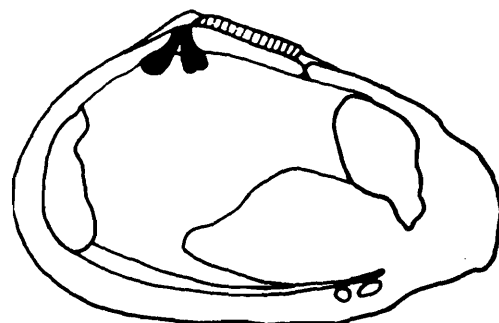
2 — 5 mm



5 — 10 mm



3 — 10 mm



6 — 10 mm

Diagrammatic illustrations of the internal surface of the valves showing the cardinal teeth, adductor muscles impressions, cruciform muscles impressions, pallial line and pallial sinus

1. *Macoma (Psammolrea) alba* (Quoy and Gaimard) (right valve) 2. *Macoma (Psammolrea) micans* (Hanley) (right valve) 3. *Macalia bruguieri* (Hanley) (right valve) 4. *Apolymetis edentula* (Spengler) (right valve) 5. *Apolymetis papyracea* (Gmelin) (right valve) 6. *Gastrana polygona* (Hanley) (right valve)