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# **Records of the Zoological Survey of India**

Contributions to the Knowledge of Indian marine  
molluscs 2. Family Donacidae

by

N. V. SUBBA RAO

A. DEY

Issued by the Director  
Zoological Survey of India, Calcutta

RECORDS  
OF THE  
**ZOOLOGICAL SURVEY OF INDIA**

**CONTRIBUTIONS TO THE KNOWLEDGE  
OF  
INDIAN MARINE MOLLUSCS**

2. Family—DONACIDAE

BY

**N. V. SUBBA RAO & A. DEY**

*Zoological Survey of India*

8, Lindsay Street,  
Calcutta.



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# RECORDS OF THE ZOOLOGICAL SURVEY OF INDIA

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# CONTRIBUTIONS TO THE KNOWLEDGE OF INDIAN MARINE MOLLUSCS

## 2. Family—DONACIDAE

*By*

N. V. SUBBA RAO AND A. DEY

*Zoological Survey of India*

8, Lindsay Street, Calcutta-87

### INTRODUCTION

The family Donacidae is closely related to the family Psammobiidae, and together with another two families, the Tellinidae and Semelidae, it is included in the superfamily Tellinacea. The donacid shell is characterised by the absence of a gape. It is equivalve, trigonal with an external ligament. The hinge teeth include two cardinals in each valve, and laterals, which are well developed in the left valve. Siphons are short, and the aperture is bordered by six lobes. Inhalent siphon is longer than the exhalent siphon. Foot is very large, rounded, pointed anteriorly and is useful for active burrowing into the beach sand.

Donacids are common and constitute an ecologically significant group on the sandy east and west coasts of India. Considerable interest has been shown on the biology of donacids occurring on the Indian coasts. The present work is taken up with the idea of providing an up-to-date account of the family.

Donacids were reported in a casual way by some Indian workers as part of their general reports on the molluscs of India. Six species were reported from Madras coast (Gravelly, 1941); one species from Coromandel coast (Ray, 1949); four species from Bombay and its neighbourhood (Hornell and Tomlin, 1950); seven species from Krusadai Island (Satyamurti, 1956); and one species from Pirotan Island (Gideon *et al*, 1957).

The three common species, namely *Donax incarnatus*, *Donax cuneatus* and *Donax faba* were studied by different authors. The growth, reproduction and physiology were studied by Nayar (1955), Rao and Kutty (1969) and Nagabhusanam and Talikhedkar (1978, 1978a). Population structure and growth rate in *Donax incarnatus* were studied by Ansell *et al* (1972) and Nair *et al* (1978). Reproduction and physiology were investigated by Alagarswami (1966).

## SYSTEMATIC ACCOUNT

The family Donacidae includes four extant and three extinct genera. Of the four living genera, viz. *Donax*, *Galatea*, *Hemidonax* and *Iphigenia* the first mentioned is only reported so far from Indian coasts

### Genus *Donax* Linnaeus, 1758

(Type species: *Donax rugosa* Linnaeus, 1758; subsequent designation Schumacher, 1817).

1758. *Donax* Linnaeus, *Syst Nat.* ed 10 : 682.

1799. *Donax*: Lamarck, *Mem. Soc. Hist. nat. Paris* : 85.

1817. *Donax*: Schumacher, *Essai Nouv. Syst.*, : 144.

1853. *Serrula*: Moerich, *Cat. Yoldi.*, 2 : 18.

1870. *Donax*: Roemer, in Martini-Chemnitz, *Syst. Conch. Cab.*, 10 : 4.

1932. *Donax*: Prashad, *Siboga Exped.*, 53C : 202.

1969. *Donax*: Keen, *Treatise on Invertebrate Palaeontology*, 2 (3) : N 628.

Linnaeus (1758) initially proposed *Donax* to include eight species and later, in his twelfth edition he added two more species which were earlier described under the genus *Venus*. Scopoli (1777) made first attempt to sort out the species and Schumacher (1817) delineated the genus *Dcnax* as it is understood to-day.

Lamarck (1799) first designated *Donax trunculus* as the type species. But his choice of the type species of the genus was not recognised as a valid type under the Opinion 79 of the International Zoological Nomenclature. Children (1823) designated *Donax scortum* Linnaeus as the type species but it was not accepted since it was not on the original list of Linnaeus. Schumacher's (1817) designation of *D. rugosa* Linnaeus as the type species has been accepted.

The genus *Donax* was catalogued and monographed by Dillwyn (1817), Reeve (1854-55), Roemer (1870), Lucas (1967), Morrison (1971), Coan (1973, 1983), Keen (1969). Roemer (op. cit.) recognised seven sections in this genus, viz. *Hecuba*, *Chion*, *Serrula*, *Machaerodonax*, *Latona*, *Capsella* and *Heterodonax*.

The genus *Donax* is characterised by small to medium sized shell, solid, trigonal, inequilateral, the posterior side broader than the anterior. Sculpture with radial and concentric striae, radial striae present in most, at least as marginal crenulations. Concentric striae sometimes absent but when present, smooth or rugose-like on the anterior part. Hinge teeth with cardinal and lateral dentitions. Cardinal teeth two, lateral one or two in each valve; ligament short, external, muscle impressions rounded or oblong; pallial sinus wide and deep, periostracum absent. Shells white to highly coloured

Although the subgeneric divisions of *Donax* is not satisfactory (Coan, 1973, 1983) we have followed Keen (1969) in dividing the genus into various subgenera. Based on the sculpture, shape, cardinal teeth, lateral teeth, pallial sinus *Donax* can be grouped into five subgenera, namely *Donax*, *Hecuba*, *Latona*, *Paradonax* and *Plebidonax*.

#### *Key to the Subgenera*

1. Sculpture smooth or fine except the posterior slope, dorsal margin without groove, posterior carination not conspicuous .....2  
     Sculpture prominent, dorsal margin with sharp groove, posterior carination conspicuous ..... *Hecuba* Schumacher
2. Interior ventral margin smooth or with minute radials, shell surface nearly smooth, shell relatively large .....3  
     Interior ventral margin strongly denticulate, sculpture with prominent radials specially on the posterior part, relatively smaller in size .....4
3. Concentric striae rugose on posterior part .....*Latona* Schumacher  
     Concentric striae smooth throughout the body ..... *Plebidonax* Iredale
4. Radial sculpture on concentric slope only, posterior end not so broad ..... *Paradonax* Cossman & Peyrot  
     Radial sculpture sturdy, posterior end broad ..... *Donax* s. st.

Subgenus *Donax* s. st.

Shell medium to small, sturdy with radial sculpture, posterior area concentrically wrinkled; internal margin strongly denticulate.

It is represented by a single species from India. Cosmopolitan and Recent.

1. *Donax* (*Donax*) *pulchella* Hanley.

(Figs. 1-3, 14-19)

1843. *Donax pulchella* Hanley, *Proc. Zool. Soc. Lond.*, p.6, (type locality, W. Indies; types, British Museum Natural History 1900.2.B.44 ).

1854. *Donax pulchella* : Reeve. *Conch. Icon.*, 8 : sp.no.67, fig. 35.

1855. *Donax spiculum* Reeve, *Conch. Icon.*, 8 : sp. no.67. pl.9, fig.67, (type locality, Unknown; types, British Museum Natural History, 1958.1.15 2.4).

1870. *Donax* (*Serrula*) *pulchella* : Roemer, in Martini-Chemnitz, *Syst. Conch. Cab.*, 10 : 50, t.9, figs. 1-6.

1870. *Donax spiculum* : Roemer, in Martini-Chemnitz, *Syst. Conch. Cab.*, 10 : 51.

**Material examined** : 8127 exs., 8 valves from (Nizampatnam) Andhra Pradesh; several localities of Karnataka, Kerala, Orissa and Tamil Nadu.

**Description :**

Shell elongately oblong, a little compressed in the middle. Ash white or greyish white, rayed and banded with blackish grey. Anterior margin rounded; ventral margin slightly convex or almost straight; anterior-dorsal margin straight and gradually sloped : posterior-dorsal margin steeply sloped; posterior margin short and convex. Sculpture with very fine or almost obsolete concentric and radial striae, striae more prominent at the posterior end. Internal margin strongly denticulate. Umbos posterior, ligament short, sunken; lunule more on the right valve.

In the left valve the cardinal complex consist of a thin lamellate anterior tooth and slightly thick posterior tooth; anterior lateral absent; posterior lateral distinct and proximal to the cardinal complex. In the right valve the cardinal teeth consist of thick triangular bifid teeth; laterals very prominent; anterior-lateral distal and postero-lateral proximal to the cardinal complex.

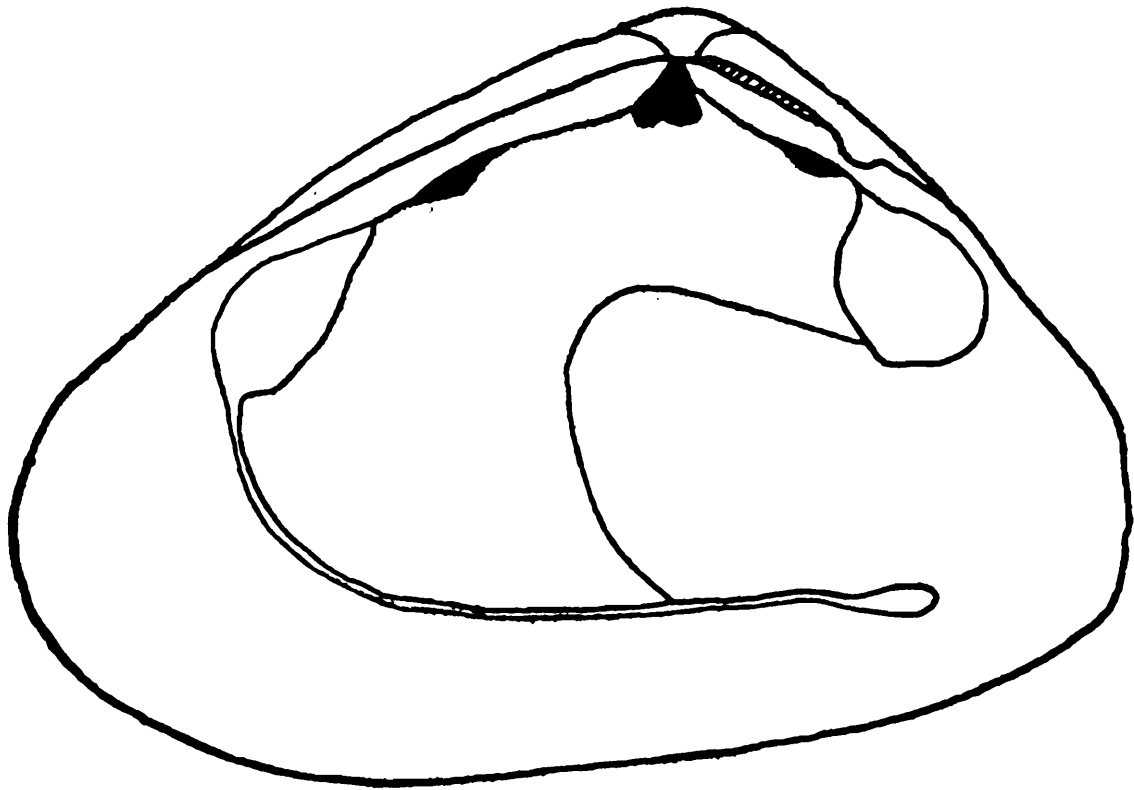


Fig. 1 Ventral view of right valve of *Donax (Donax) pulchella* Hanley, showing cardinal complex, adductor muscle scar, pallial line and pallial sinus.

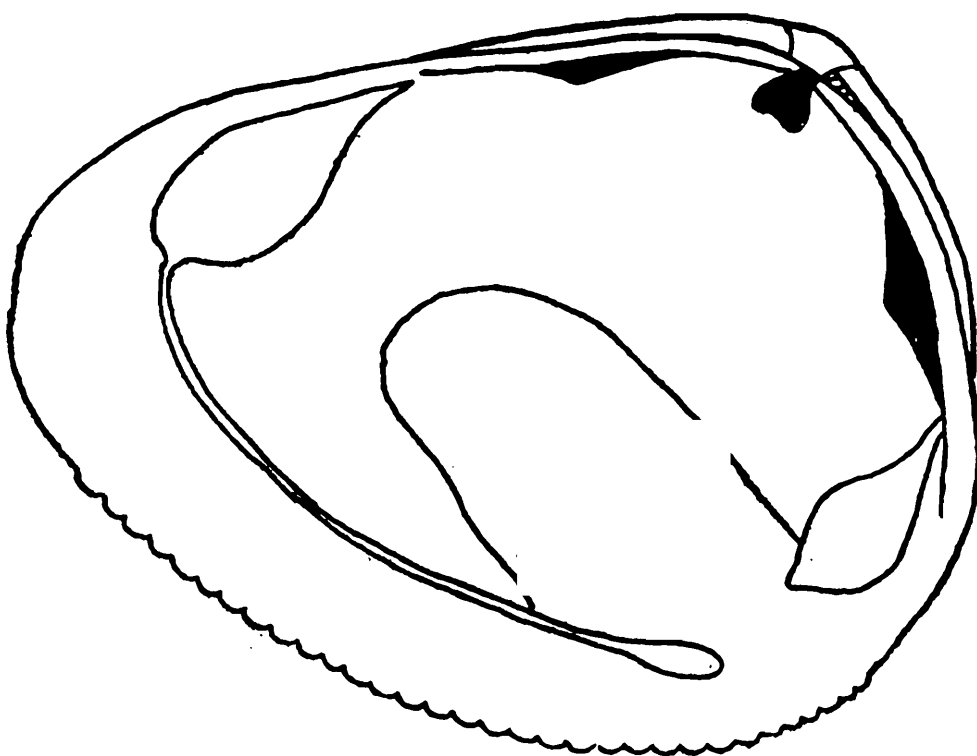


Fig. 2 Ventral view of right valve of *Donax (Donax) pulchella* Hanley (type), showing cardinal complex, adductor muscle scars, pallial line and pallial sinus.

Adductor muscle scars well developed. The anterior adductor muscle scar oblong shaped and posterior adductor muscle scars almost rounded in shape. Sinus equal in both the valves, developed less than half of the length of the shell, sinus rises from the posterior adductor scar and almost in a circular fashion and confluent with pallial line only at the end.

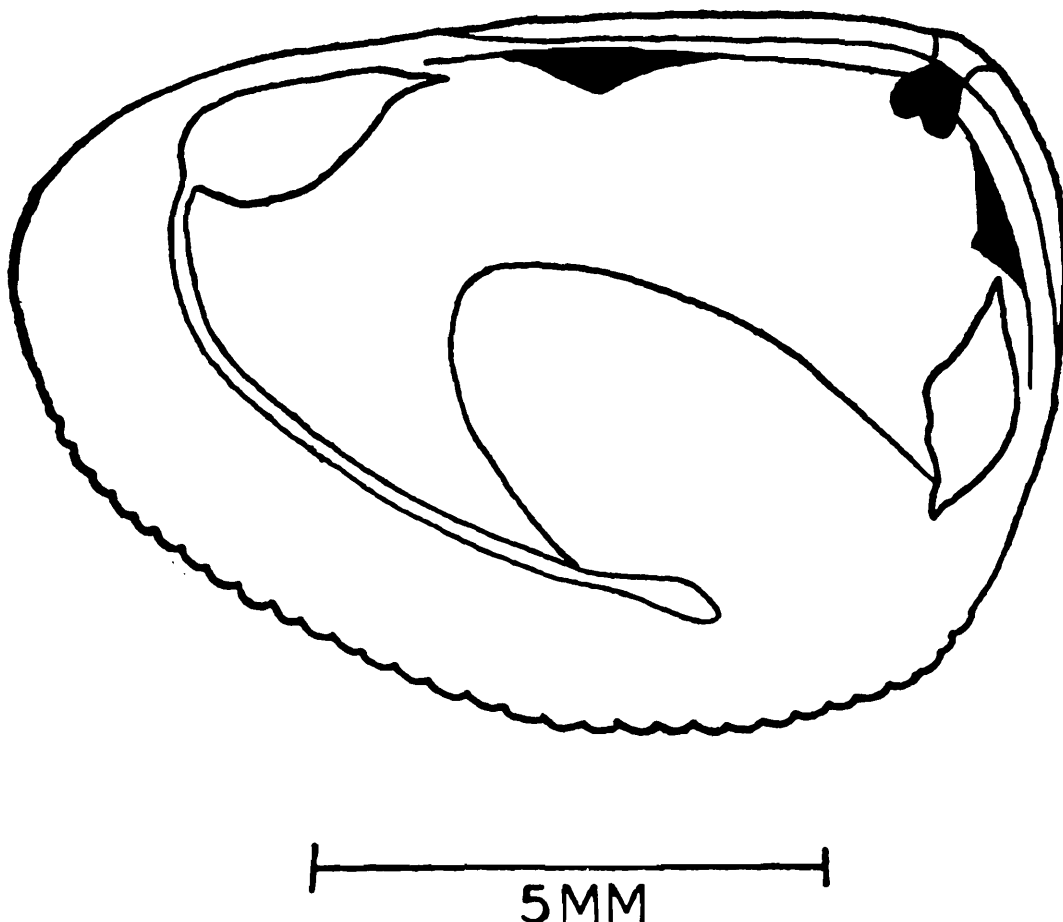


Fig. 3 Ventral view of *Donax spiculum* Reeve (type) showing cardinal complex, adductor muscle scars, pallial line and pallial sinus.

**Remarks :**

This species can be easily distinguished by its narrow oblong shape, a little compressed in the middle and its colour.

We have examined the type specimens of *D. spiculum* Reeve and it is synonymised under *D. pulchella* Hanley. The type locality "W. Indies" quoted by Hanley (1843) is doubtful.

Ansell (1972) made observations on the abundance and growth of this species at Cochin and Shertallai. It occurred at Cochin mainly during the pre monsoon, and at Shertallai during the post monsoon.

**Range :** From Pakistan to Burma.

*Distribution* : India Andhra Pradesh, Goa, Karnataka, Kerala, Tamil Nadu.

*Elsewhere* : Pakistan and Burma.

*Measurements* ( in mm ) :

Length	Height	Width
13.35	7.21	4.80
11 16	5.63	4.24
5.02	3.20	1.70

Subgenus *Hecuba* Schumacher, 1817

1817. *Hecuba* Schumacher, *Essai. Nouv. Syst.*, p. 157, ( type species, *Venus scortum* Linnaeus ; subsequent designation Herrmannsen, 1847 ).
1870. *Hecuba* : Roemer in Martinii-Chemnitz, *Syst. Conch. Cab.*, 10 : 6.
1969. *Hecuba* : Keen, *Treatise in Invertebrate Palaeontology* ( Moore ed. ), 2 (3) : N 628.

*Description* :

Shell large, triangularly oblong, sculpture with prominent concentric striae which form strong lamellae like structure at the anterior end and spine like at the posterior end, radial striae also prominent. Cardinal complex consists of two cardinal teeth in the left valve and one in the right valve ; laterals two in each valve. Sinus equal on both the valves ; adductor muscle scars poorly developed. Sharp groove in the dorsal margin of the right valve.

Not known in fossil condition.

*Remarks* :

The shape of the shell is very distinct. Its posterior carina, conspicuous concentric striae laminated at the anterior end, and a sharp groove in the dorsal margin of the right valve, can easily distinguish it from other subgenera.

It is common in Indo-pacific.

2. *Donax (Hecuba) scortum* Linnaeus, 1758

( Figs. 4, 20-21 )

1758. *Venus scortum* Linnaeus, *Syst. Nat.* ( ed 10 ), p. 686, no 103, ( type locality, "America" ).

1758. *Donax pubescens* Linnaeus, *Syst. Nat.* (ed 10), p. 682, no 83, (type locality, Indian Ocean).
1782. *Donax scortum* : Chemnitz, *Syst. Conch. Cab.*, 8 : 246, t. 25, figs. 242-247.
1854. *Donax scortum* : Reeve, *Conch. Icon*, 8 : sp. no. 1, pl. 1, figs. 1-3.
1869. *Donax (Hecuba) scortum* : Roemer in Martinii-Chemnitz, *Syst. Conch. Cab.*, 10 : 6, t. 1, figs. 1-6.
1942. *Donax scortum* : Gravely, *Bull. Mad. Govt. Mus.*, (Nat. Hist.), 5 (1) : 56.
1952. *Donax scortum* : Hornell, *Indian Molluscs*, p. 92.
1956. *Donax scortum* : Satyamurti, *Bull. Mad. Govt. Mus.* (Nat. Hist.) (1) 2, pt. 7 : 146, pl. 22, figs. 3a, 3b.

#### **Material examined :**

50 exs., 183 valves, from ( Kumta ) Gujarat ; ( Ratnagiri ) Maharastra ; Pondicherry and several localities from Goa, Karnataka and Tamil Nadu.

#### **Description :**

Shell triangularly oblong ; gibbous, dirty white, violet in the posterior. Umbos posterior, elevated and pointed. Anterior margin convex ; posterior margin convex with a depressed notch ; anterior-dorsal margin straight and gradually sloped with a sharp canal at the side ; posterior-dorsal margin slightly concave ; posterior margin short and pointed. Sculpture with prominent concentric striae, lamellae—like on the anterior end, thinner on the posterior, more or less squamately spinose on the angle ; radial striae prominent and originated from umbos in divergent manner ; ligament short, dark brown colour ; lunule very prominent, wide and equal on both the valves.

In the left valve the cardinal complex consists of a thick anterior tooth and a thin laminated posterior tooth ; lateral well developed ; posterior lateral stronger than anterior and more prominent than the cardinal complex. In the right valve the cardinal complex consists of a nob-like bifid cardinal tooth ; laterals poorly developed and form a groove to accommodate the lateral teeth of the left valve to form ball and socket joint.

Adductor muscle scars poorly developed. Anterior adductor scar elongated, semilunar shaped and posterior adductor almost rectangular shaped. Sinus equal on both valves, sinus rises from base of a posterior adductor scar straight and extends upto the

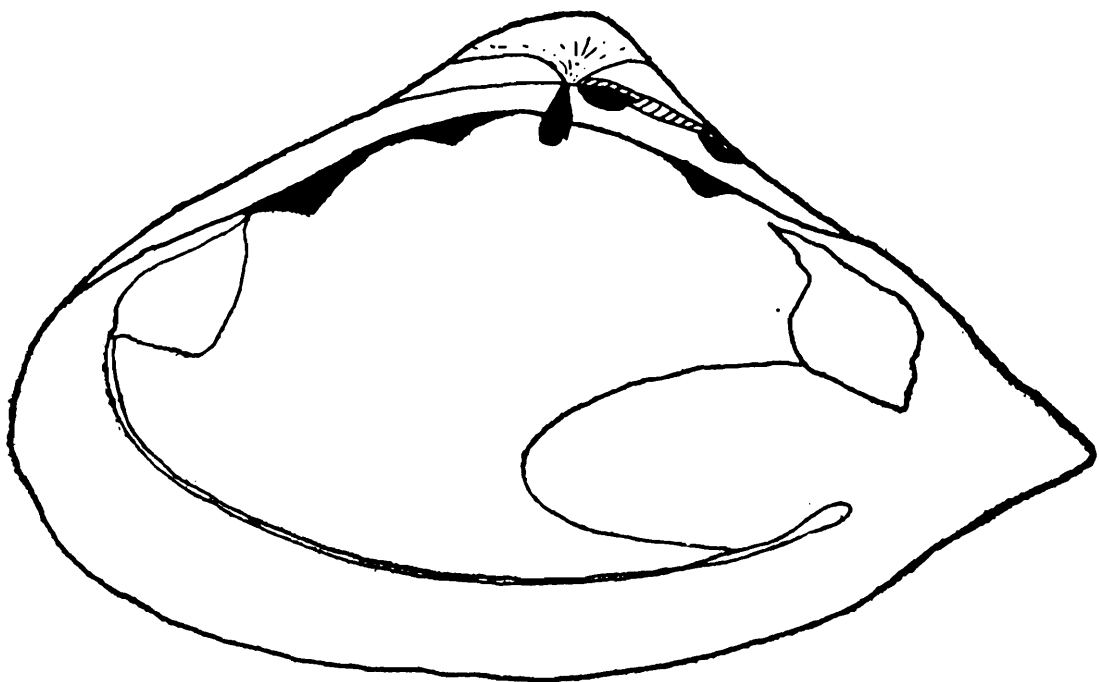
half of the shell, with rounded anterior end and falls obliquely to the pallial line and in confluence with it.

**Remarks**

This species can easily be distinguished from other donacids by its shape, sculpture, sharp groove on the dorsal margin, lateral teeth and pallial sinus. It is the largest Indian donacid.

**Remarks :**

Linnaeus (1758) first described this species under genus *Venus* with the type locality America. Later he corrected it in 1767, in his 12th edition and placed it under the genus *Donax*. In 10th edition he also described *D. pubescens* with the type locality Indian Ocean which are young ones of *D. scortum*. The type specimens of *D. scortum* Linnaeus is not present in the Linnaean collections, even the name of *D. scortum* is not on the list of species that he owned (Dodge, 1952). *D. pubescens* Linnaeus is conspecific with *D. scortum* Linnaeus and the type locality of *D. pubescens* is now taken as the type locality of *D. scortum* Linnaeus as the latter is not recorded from America.



— 10MM —

Fig. 4 Ventral view of right valve of *Donax (Hecuba) scortum* Linnaeus showing cardinal complex, adductor muscle scars, pallial line and pallial sinus.

**Range :** South Africa to Philippines and north to China.

**Distribution :** *India :* Andhra Pradesh, Goa, Gujarat, Karnatak, Kerala, Orissa, Pondicherry, Tamil Nadu, West Bengal.

**Elsewhere :** Republic of South Africa, Sri Lanka, Burma, China.

**Measurements** (In mm) :

Length	Height	Width
79.40	46.34	34.15
23.24	15.94	11.05

**Subgenus Latona Schumacher, 1817**

1817. *Latona* Schumacher, *Essai. Nouv. Syst.*, p. 156, (type species, *Donax cuneatus* Linnaeus, 1758; original designation).
1969. *Latona* : Keen, *Treatise on Invertebrate Palaeontology* (Moore ed.) 2(3) : N 628.

Shell medium, subtriangularly oblong and variously coloured. Umbos posterior. Sculpture with concentric striae which are rugose on the posterior part and radials reduced to thread like striae except on the posterior part. Interior margin smooth or with minute radial wrinkles. Cardinal complex consists of two cardinal teeth in the left valve and one in the right valve, laterals two and present on both the valves.

**Geological Range :** Recent.

**Remarks :**

This group can easily be distinguished by its shape, sculpture and the interior margin. Its resembles *Plebidonax* on one hand and *Chion* on the other hand. It differs from first by its size, shape, cardinal teeth and with the later by its sculpture.

This group is very common in Indo-pacific.

**Key to the Species**

- |    |  |                                   |
|----|--|-----------------------------------|
| 1  | Interior margin smooth   | .....2                            |
|    | Interior margin serrated   | ..... 3                           |
| 2. | Concentric striae very fine, rugose at the posterior end, adductor muscle scars and pallial sinus poorly developed, sinus developed half or more of the shell length | ..... <i>D. cuneatus</i> Linnaeus |

Concentric striae not so fine, not rugose at the posterior end, adductor muscles scars and pallial sinus well developed, sinus less than half of the length of the shell .....*D. faba* Gmelin

3. Shell with strong, sharply defined keel extending obliquely down from umbos near the posterior margin .....*D. spinosus* Gmelin

Shell without any strong, sharply defined keel .....4

4. Shell broader than long, posterior end of dorsal margin with strong concentric and radial striae, posterior lateral close to the cardinal complex ..... *D. incarnatus* Gmelin

Shell not so broad, posterior end of dorsal margin with rugose concentric striae, posterior lateral not so close to the cardinal complex .....*D. lubricus* Hanley

### 3. *Donax (Latona) cuneatus* Linnaeus

( Figs. 5-6, 22, 23, 27, 36 )

1758. *Donax cuneatus* Linnaeus, *Syst. Nat.* (ed. 10), p. 683, ( type locality, Tranquebar ).
1782. *Donax cuneatus* : Chemnitz, *Syst. Conch. Cab.*, 6 : 266, pl. 26, fig. 260. ( non binomial ).
1797. *Donax radiatus* Humphrey, *Mus. Calon.*, p. 47.
1817. *Latona variabilis* Schumacher, *Essai. Nouv. Syst.*, p. 156.
1818. *Donax cuneatus*, *D. granosa*, *D. australis* and *D. bicolor* : Lamarck, *Hist. nat. Anim. Sans. Vert.*, 5 : 546-548.
1854. *Donax cuneatus* : Reeve, *Conch. Icon.*, 8 : sp. no. 15, pl. III, figs. 15 a and b.
1870. *Donax (Latona) cuneatus*, *D. (L) australis* and *D. Deshayesii* : Roemer in Martini-Chemnitz, *Syst. Conch., Cab.*, 10 : 82, pl. 2, fig. 10, pl. 14, figs. 9, 10; p. 95, pl. 17, figs 4-6 and p. 98, pl. 17, figs. 13-15.
1898. *Donax (Latona) cuneatus* : Melvill and Standen, *J. Conch.*, 9 : 84.
1898. *Donax ( Latona ) cuneatus* : Melvill and Sykes, *Proc. Malac. Soc. Lond.*, 3 : 47.
1908. *Donax tiesenhauseni* Preston, *Rec. Indian Mus.*, 2 : 208, fig. 56, ( type locality, Andaman Islands; types, National Zoological Collection, Zoological Survey of India ).
1921. *Donax cuneatus* : Hornell, *Madras Fish. Bull.* 14 : 181, fig. 47.
1941. *Donax cuneatus* : Gravely, *Bull. Madras Govt. Mus.*, ( nat. Hist. ), 5 (1) : 56.
1956. *Donax cuneatus* Satyamurti, *Bull. Madras Govt. Mus. (nat. Hist.)*, 1, 2, pt. 7, p. 145, pl. 12, figs. 2a and 2b.

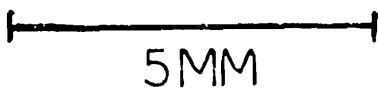
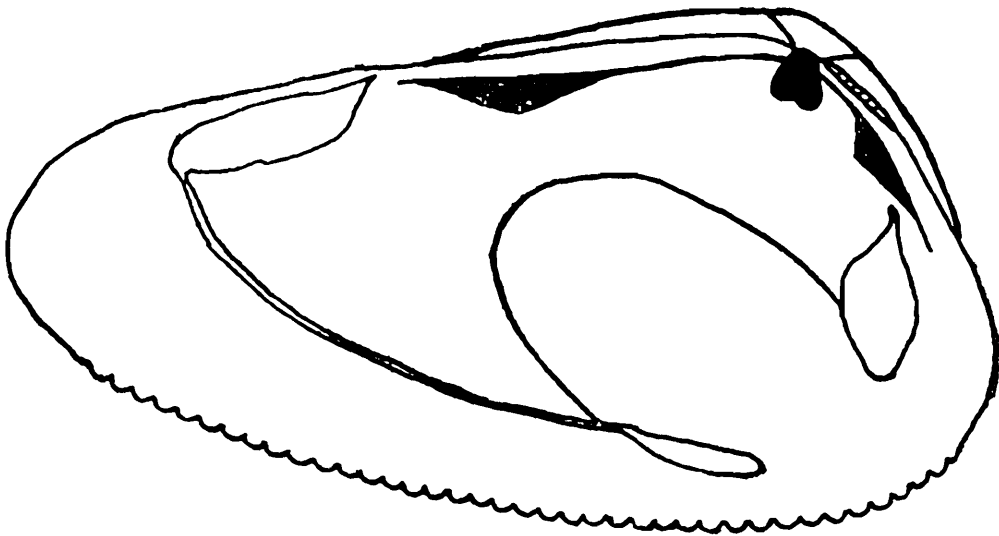


Fig. 5 Ventral view of right valve of *Donax (Latona) cuneatus* Linnaeus showing the cardinal complex, adductor muscle scars, pallial line and pallial sinus.

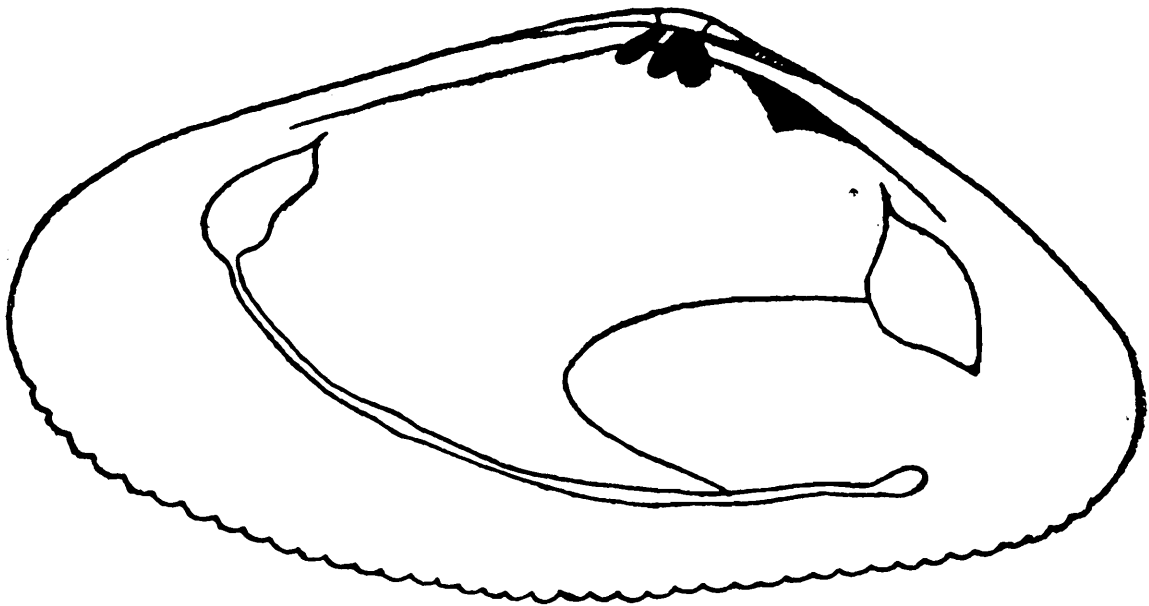


Fig. 6 Ventral view of *Donax tiesenhauseni* Preston showing cardinal complex, adductor muscle scars, pallial line and pallial sinus.

*Material examined* : 318 exs. and 218 valves from Andaman and Nicobar Islands ; ( Bimlipatnam ) Andhra Pradesh ; ( Madhapur ) Gujarat ; ( Hejmadi-Codi ) Karnataka ; Pondicherry and several localities of Tamil Nadu.

*Description* :

Shell medium sized, subtriangularly oblong, compressed, shining purple, white banded, sometimes lead colour. Umbos posterior, elevated and pointed. Anterior margin rounded ; ventral margin slightly convex or almost straight ; anterior-dorsal margin straight and gradually sloping ; posterior-dorsal margin short and steeply sloped ; posterior margin truncated. Sculpture with fine concentric striae, rugose on the posterior end, radial striae fine, thread like except on the posterior lobe. Ligament short and dark brown colour, lunule present on both the valves.

In the left valve the cardinal complex consists of a triangular, large anterior tooth and a small posterior tooth ; anterior lateral distal and posterior proximal to the cardinal complex, consist of a nob like bifid and a strong lateral teeth, with anterior lateral distal and posterior lateral proximal to the cardinal complex.

Adductor muscle scars well developed. Anterior adductor scar oval shaped, posterior adductor scar almost rounded. Sinus equal in both the valves. Sinus rises from the posterior adductor scar with rounded anterior end and convex ventral and falls obliquely to the pallial line and in confluence with it.

*Remarks* :

This speices can easily be distinguished by its subtraingularly oblong shape, sculpture, and cardinal complex, *D. granosa* Blainville, *D. australis* Deshayes and *D. bicolor* Deshayes are synonymised. Preston (1908) described *Donax tiesenhauseni* from Andaman islands. After examination of holotype this species is also synonymised with *D. cuneatus* Linnaeus.

This species is distributed throughout east and west coast of India but abundant on the Coromondel coast.

The life span of *D. cuneatus* is about two years at Palk Bay and two and half years at Miriya Bay (West coast). It grows to 22-23 mm by the end of two years and six months after which it generally perishes. High salinity is found to be favourable

to its growth. It attains sexual maturity when the shell attains 12 to 13 mm in length (Talikhedkar *et al.*, 1976).

**Range :** Throughout the Indo-pacific.

**Distribution :** *India :* Andaman and Nicobar islands, Gujarat, Karanataka, Maharastra, Pondichery, Tamil Nadu.

**Elsewhere :** Sri Lanka, New Caledonia.

**Measurements (in mm) :**

Length	Height	width
46.78	30.85	13.85
17.82	11.91	7.05

#### 4. *Donax (Latona) faba* Schroeter

( Figs. 7, 32 & 33 )

1782. *Donax faba* Chemnitz, *Syst. Conch. Cab.*, 6 : 245, 270, pl.26, figs 266, 267, (type locality, not given) (non binomial).

1786. *Donax radiata* Schroeter, *Einleit. Conch.*, 3 : 104, pl. 8, fig. 3.

1788. *Donax faba* : Schroeter, *Conch. Cab. Nomen. Reg.*, p.30.

1853. *Donax deshayesii* Dunker, *Moll. Guinea in Novitet Conch. Suppl.* 2 : 50, pl.9, figs. 25-27.

1870. *Donax (Latona) faba* : Roemer, in Martini-Chemnitz, *Syst. Conch. Cab.*, 10 (3) : 83, pl.2, figs. 12, 13.

1956. *Donax faba* : Satyamurti, *Bull. Madras Govt. Mus.*, (Nat. Hist.) 1,2 pt. 7 : 147, pl. 22, figs. 4 a-c.

**Material examined :** 282 exs. and 60 valves from Havelock, Andaman and Nicobar Islands; (Bombay) Maharastra; and several localities of Tamil Nadu.

**Description :**

**Shell** triangularly ovate, compressed, variously coloured, lead or freckled white or yellowish white, with red rays, inequilateral. Umbos posterior, pointed. Anterior margin rounded; ventral margin convex; anterior-dorsal margin straight and gradually sloped on the sides; posterior-dorsal margin straight and gradually sloped, convexed, short and abruptly sloped; posterior margin short and truncated. Ligament short and brown coloured; lunule almost absent.

In the left valve the cardinal complex consists of triangular anterior tooth and a small laminate posterior tooth with a groove between the two teeth, laterals present, anterior lateral poorly developed and distal, whereas the posterior lateral distinct and proximal to the cardinal complex. In the right valve cardinal complex consists of a knob like bifid tooth, laterals very distinct, provided with upper space to accommodate the laterals of the left valve.

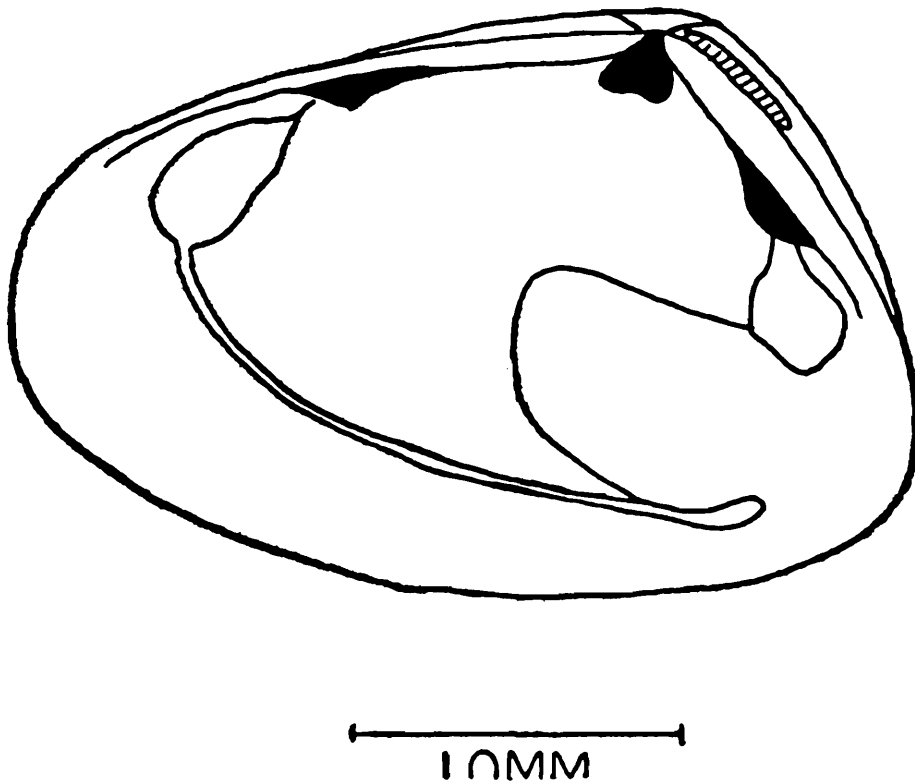


Fig. 7 Ventral view of right valve of *Donax (Latona) faba* Schroeter showing cardinal complex, adductor muscle scars, pallial line and pallial sinus.

Adductor muscle scars well developed, Anterior adductor scar more or less triangular, posterior adductor scar rounded with elongated anterior ends. Sinus equal on both the valves. Sinus rises from posterior adductor scar and extends upward with rounded anterior end and convex ventral end, falls obliquely to the pallial line and in confluence with it.

**Remarks :**

This species can easily be distinguished by its triangular-ovate shape, sculpture and cardinal complex.

It is common on the sandy beaches of Tamil Nadu coast and occurs along with *Donax cuneatus* Linnaeus, another common species.

**Range :** Throughout Indo-Pacific.

**Distribution :** India : Andaman and Nicobar Islands, Kerala, Maharashtra, Tamil Nadu.

**Elsewhere :** Java, Saigon, Hong Chako, Lombok.

**Measurements (in mm) :**

Length	Height	Width
25.10	18.21	9.66
17.35	11.35	5.80

### 5. *Donax (Latona) incarnatus* Gmelin

(Figs. 8, 9, 34, 35)

1182. *Donax incarnatus* Chemnitz, *Syst. Conch. Cab.*, 6 : 265, tab. 26, fig. 259, 266, 267, (type locality, Tranquebar). [ non-binomial ]
1791. *Donax incarnatus* Gmelin, *Syst. Nat.* (ed 13), p. 3265.
1854. *Donax dysoni* Deshayes, *Proc. Zool. Soc., Lond.*, 22 : 353 (non *Dysoni* Lischke, *D. semigranosus* Dunker).
1854. *Donax incarnatus* : Reeve, *Conch. Icon.*, 8, sp. no. 53, pl 8, fig. 53.
1908. *Donax trigonalis* Preston, *Rec. Indian Mus.*, 2 : 208, pl.16, fig. 57, (type locality, Andaman Island; types, National Zoological Collection, Zoological Survey of India).
1951. *Donax incarnatus* : Hornell, *Indian Molluscs*, p. 92.
1956. *Donax incarnatus* : Satyamurti, *Bull. Madras Govt. Mus.*, (Nat. Hist.), 1,2, pt. 7, p. 148, pl.22, figs. 6a-d.

**Material examined :** 1153 exs., from (Masulipatnam) Andhra Pradesh; (Bhavnagar) Gujarat; (Bombay) Maharashtra; (Chandipur) Orissa; several localities Tamil Nadu; (Digha) West Bengal.

#### **Description :**

Shell medium in size, triangular, compressed, variously coloured. Umbos posterior. Anterior margin rounded; ventral margin convex, serrated; anterior-dorsal margin long, straight and sloping gradually; posterior-dorsal margin slightly convex and serrated; posterior margin short and serrated. Sculptured with fine thread like concentric and radial striae, the posterior portion where the concentric striae rugose like and crossed by prominent radial striae giving punctate appearance. Ligament short, brown, lunule small and present on both the valves.

In the left valve the cardinal complex consists of a thin anterior tooth and a triangular thick posterior tooth; laterals present; anterior lateral formed by the thickening on the hinge line and distal, whereas the posterior lateral deltoid, strong and proximal to the cardinal complex. In the right valve the cardinal complex consists of a triangular, bilobed cardinal tooth; laterals very strong and with space to accommodate the laterals of left valve.

Adductor muscles scars moderately developed. Anterior adductor scar semilunar, whereas the posterior adductor scar circular shape with elongated anterior end. Sinus poorly developed and equal on both the valves. Sinus rises from posterior adductor scar in almost oval shape, with rounded anterior and convex ventral end and falls obliquely to the pallial line and in confluence with it.

#### Remarks

This species was first described by Chemnitz (1782) without any type locality, but the work is non-binomial and hence Gmelin is treated as the author of the species.

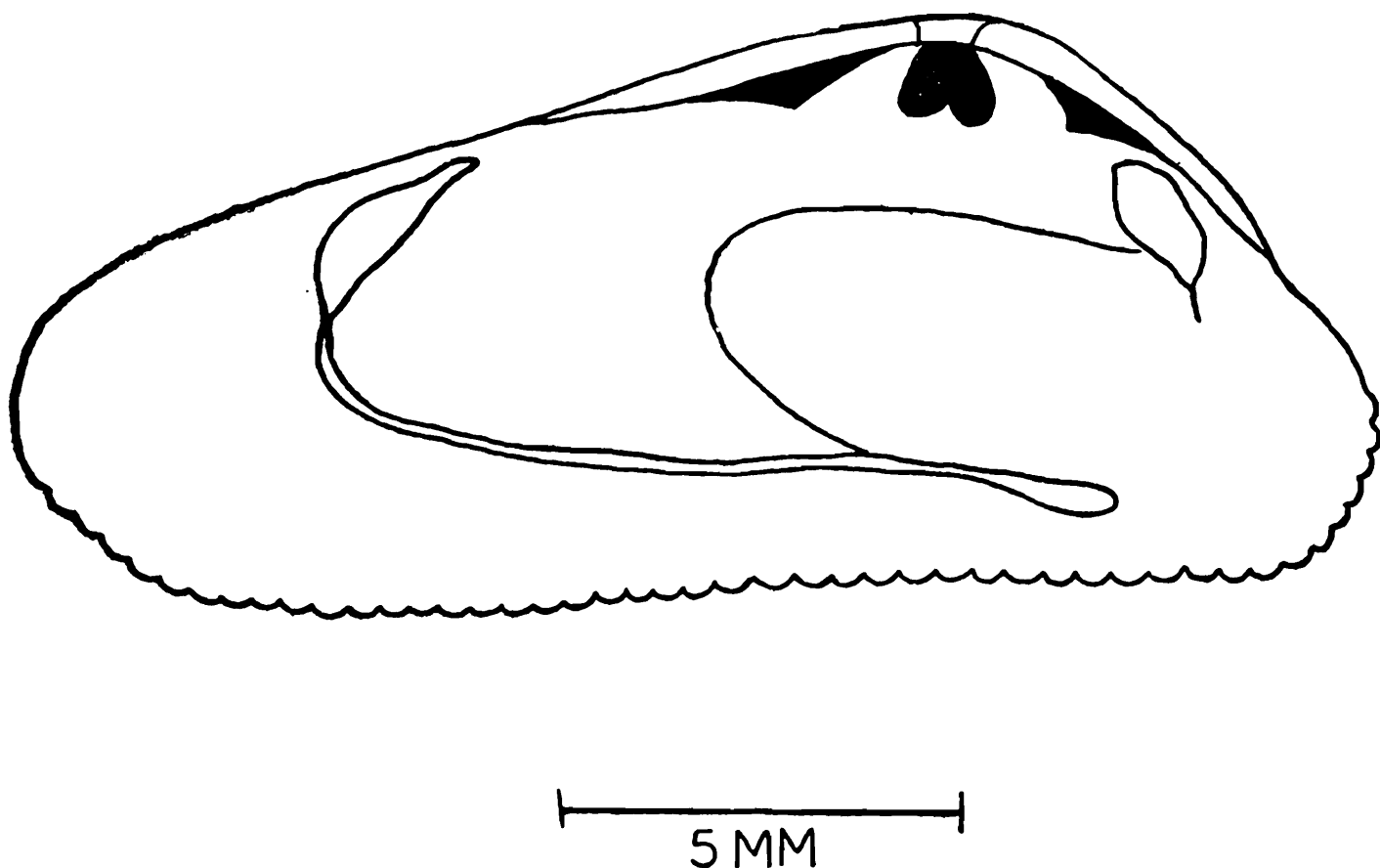


Fig. 8 Ventral view of right valve of *Donax (Latona) incarnatus* Gmelin showing the cardinal complex, adductor muscle scars, pallial line and pallial sinus.

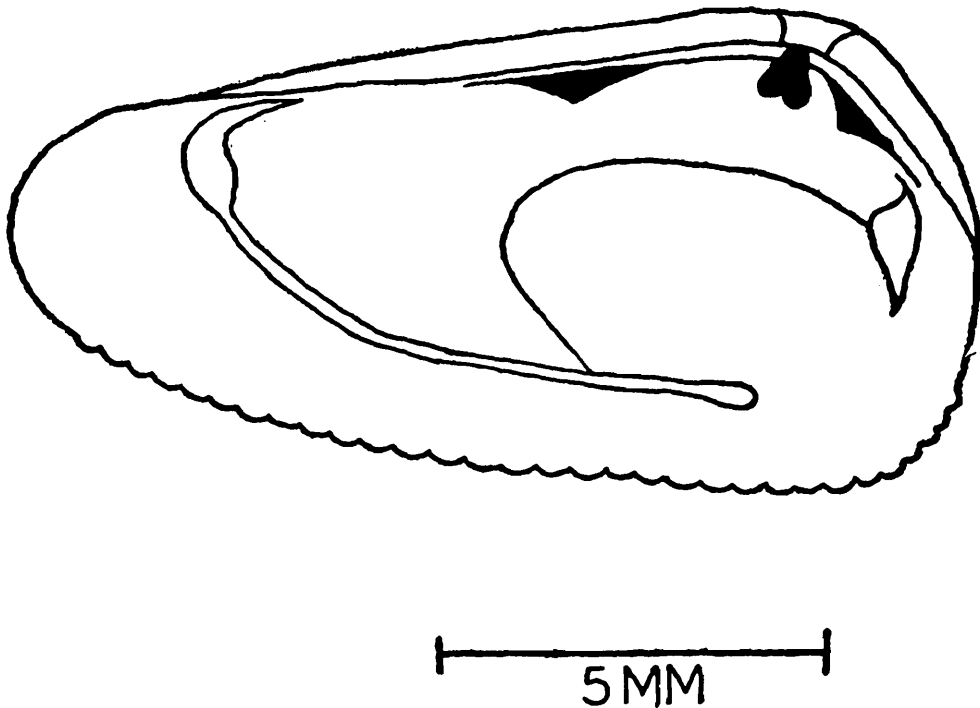


Fig. 9 Ventral view of right valve of *Donax trigonalis* Preston showing cardinal complex, adductor muscle scars, pallial line and pallial sinus.

This species can be easily distinguished by its shape, sculpture, adductor scars, pallial line, pallial sinus, and its colour.

Ansell *et al* (1972) made observations on the growth and the productivity of this species on the beaches at Cochin and at Shertallai. Ansell and Trueman (1973) estimated the energy cost involved in the tidal migration of this species. Our observations on the biology of *Donax incarnatus* Gmelin on the Digha beach, West Bengal show that the population density is more on the beach when compared with those made by Ansell *et al*. The breeding period and growth rate also differ from those obtained on the west coast (Subba Rao and Dey, unpublished).

*Measurements* (in mm) :

Length	Width	Height
18.31	14.43	9.12
7.26	5.52	2.60

*Range* : India, Burma and Singapore.

*Distribution* : *India* : Andaman and Nicobar Islands, Andhra Pradesh, Gujarat, Maharashtra, Orissa, Tamil Nadu, West Bengal.

*Elsewhere* : Malacca, Burma, Singapore.

6. *Donax (Latona) lubricus* Hanley  
(Figs. 10, 36-39)

1845. *Donax lubricus* Hanley, *Proc. Zool. Soc., Lond.*, p. 17, (type locality, unknown; types, British Museum (Nat. Hist.) ACC 1829)
1854. *Donax lubricus* : Reeve, *Conch. Icon.*, 8; sp. no. 46, pl. 7, fig. 46.
1869. *Donax lubricus* : Roemer, in Martini-Chemnitz, *Syst. Conch. Cab.*, 10(3) : 69.
1956. *Donax lubricus* : Satyamurti, *Bull. Madras Govt. Mus.*, 1, (2), pt. 7, p. 148, pl. 22, fig. 5.

*Material examined* : 674 exs., 115 valves from several localities of Goa, Karnataka, Kerala; (Ratnagiri) Maharashtra; (Chandipore) Orissa; Several localities of Tamil Nadu.

*Description* :

Shell triangular, compressed, variously coloured. Umbos posterior, pointed. Anterior margin rounded; ventral margin slightly convex; anterior-dorsal margin straight and gradually sloping; posterior-dorsal margin convex, short and steeply sloping; posterior margin short and convex; interior margin of ventral and posterior-dorsal

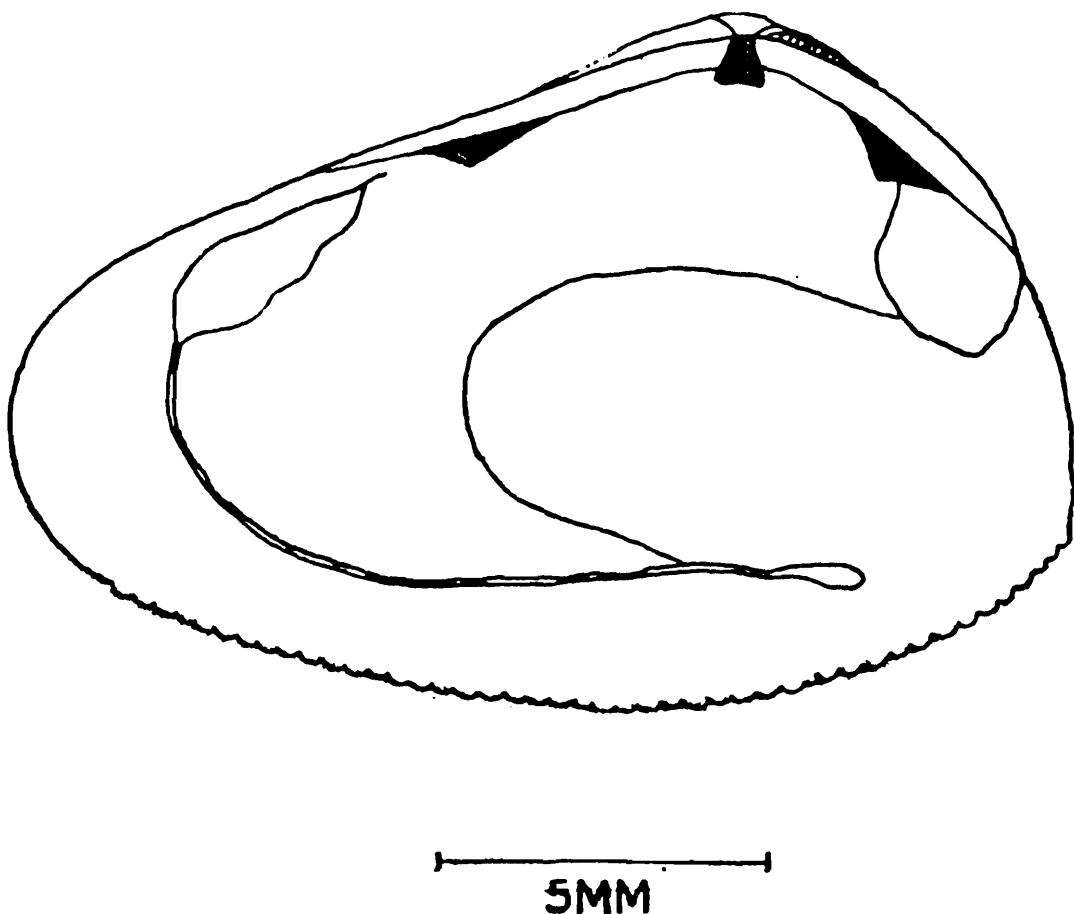


Fig. 10 Ventral view of the right valve of *Donax Latona lubricus* Hanley showing cardinal complex, adductor muscle scars, pallial line and pallial sinus.

side serrated. Sculpture of very fine concentric striae but rugose at the posterior end; radial striae on the ventral margin and on posterior end with punctated appearance. Ligament short, dark brown; lunule more on the right valve.

In the left valve the cardinal complex consists of a thin anterior tooth, a strong posterior tooth; laterals present; anterior lateral formed by thickening on the hinge line and distal, whereas the posterior lateral strong, socketed above and proximal. In the right valve the cardinal complex consists of a triangular, bifid cardinal tooth and strong, socketed laterals. with anterior lateral slightly distal than the posterior.

Adductor muscle scars poorly developed. The anterior adductor muscle scar elongated; posterior adductor muscle scar almost circular shaped. Sinus equal on both the valves, sinus rises from posterior adductor muscle scar, rounded anterior end and falls obliquely to the pallial line and in confluence with it.

**Remarks :**

This species can easily be distinguished by its triangular shape, sculpture, shape of the pallial line and pallial sinus.

It closely resembles *D. incarnatus* but can be differentiated from it in the shell being longer than high.

**Range :** India, Sri Lanka and Burma,

**Distribution :** India : Goa, Karnataka, Kerala, Maharashtra, Orissa, Tamil Nadu, West Bengal.

**Elsewhere :** Sri Lanka, Burma.

**Measurements (in mm) :**

Length	Width	Height
19.03	13.69	7.44
8.88	6.23	3.16

**7. *Donax (Latona) spinosus* Gmelin**

1791 *Donax spinosus* Gmelin, *Syst. Nat.* (ed. 13), p. 3265, no. 13.

1941. *Donax spinosus* : Gravely, *Bull. Madras Mus. (nat. Hist.)*, 5 (1) : 56, no. 1.

1956. *Donax spinosus* : Satyamurti, *Bull. Madras Govt. Mus., (nat. Hist.)*, 1(2) pt. 6 : 149, pl. 12, figs. 7a and 7b.

**Material examined :** i) 4 valves, Sri Lanka (Madras Govt. Mus.).

**Description :**

The shell is relatively more elongate than in *D. lubricus* Hanley, but resembles with it in the general shape, of its outline, and the inner margin of the inner surface being finely toothed. The shell is inequilateral, the posterior side being very short. A sharply defined keel present, extending from the umbos to the posteroventral angle. Keel and the area immediately in front of it are strongly and concentrically ridged, while the area behind the keel is closely decussated with radial and tranverse ridges. The lower margin is finely crenulated in correspondance with the fine teeth on the margin.

In the left valve the cardinal complex consists of a thin anterior tooth and a triangular thick posterior tooth; laterals present; anterior lateral formed by the thickening on the hinge line and distal, posterior lateral deltoid, strong and proximal to the cardinal complex which consists of a triangular, bilobed cardinal tooth; laterals very strong.

Adductor muscle scars moderately developed. Anterior adductor scar semilunar, posterior adductor scar circular with elongated anterior end. Sinus rises from posterior adductor, almost oval shaped, with rounded anterior end convex, ventral end and falls obliquely to the pallial line and in confluence with it.

**Range :** India and Sri Lanka.

**Distribution :** India : Tamil Nadu, (Satyamurti, 1956)

**Elsewhere :** Sri Lanka.

**Subgenus-*Paradonax* Cossmann and Peyrot, 1911**

1911. *Paradonax* Cossmann and Peyrot, *Soc. Linn. Bordeaux Actes.*, 64.  
(type species, *D. transversus* Deshayes, 1830; Original designation).

1969. *Paradonax* : Keen, *Treatise on Invertebrate Palaeontology*, 2  
(3) : N 628.

1983. *Paradonax* : Coan, *The Veliger*, 25 (4) : 289.

Shell smaller than *Donax*, thin, transversly elongated. Sculptured with very fine concentric and radial striae, very prominent on the posterior part. Cardinal complex with cardinal and lateral teeth. In the left valve the cardinal complex consists of an anterior and a

posterior tooth and weak laterals. In the right valve the cardinal complex consists of a cardinal, and a weak anterior lateral and a strong posterior lateral tooth. Muscles scars well developed, sinus equal on both the valves, interior margin of ventral side serrated.

*Geological Range* : Oligocene to Recent.

*Remarks* :

This group can be easily distinguished by its size, shape, sculpture and interior margin. It bears resemblance to the subgenus *Donax* but it can be easily distinguished by its shape and sculpture.

*Key to the Species*

Shell elongately oblong; radial striae either absent or when present only on outer margin; broader; umbo slightly posterior in position ...*D. nuxfagus* Preston

Shell transversely elongate; radial striae fine, more prominent on the outer margin; narrow; umbo extremely posterior in position ...*D. aperittus* Melvill

8. *Donax (Paradonax) aperittus* Melvill  
(Figs. 11, 28-31)

1897. *Donax aperittus* Melvill, *Mem. Proc. Manch. Lit. and Phil. Soc.*, 41(7) : 24, pl. 7, fig. 33, (type locality, Karachi; Syntypes, British Museum (nat. Hist.) 1897.7.30.126).

1941. *Donax aperittus* : Gravelly, *Bull. Madras Govt. Mus. (nat. Hist.)*, 5(1) : 57.

1956. *Donax aperittus* : Satyamurti, *Bull. Madras Govt. Mus. (nat. Hist.)*, 1(2) pt. 7, p. 150, pl. 22, fig. 8.

1968. *Donax (Serrula) aperittus* : Ray, *Bull. Indian Mus.* 3(1 & 2) : 31.

*Material examined* : 5 exs., from (Puri) Orissa, (Pamban) Tamil Nadu. Karachi (type).

*Description* :

Shell small, transversely elongated. Umbos posterior, pointed. Shell white or ash coloured. Anterior margin rounded; ventral margin slightly convex; anterior-dorsal margin straight and gradually sloped; posterior-dorsal margin straight and gradually sloped; posterior margin short; interior margin of the ventral side serrated. Sculptured with very fine concentric striae; radial striae also fine but posteriorly ridged like. Ligament small, lunule almost absent.

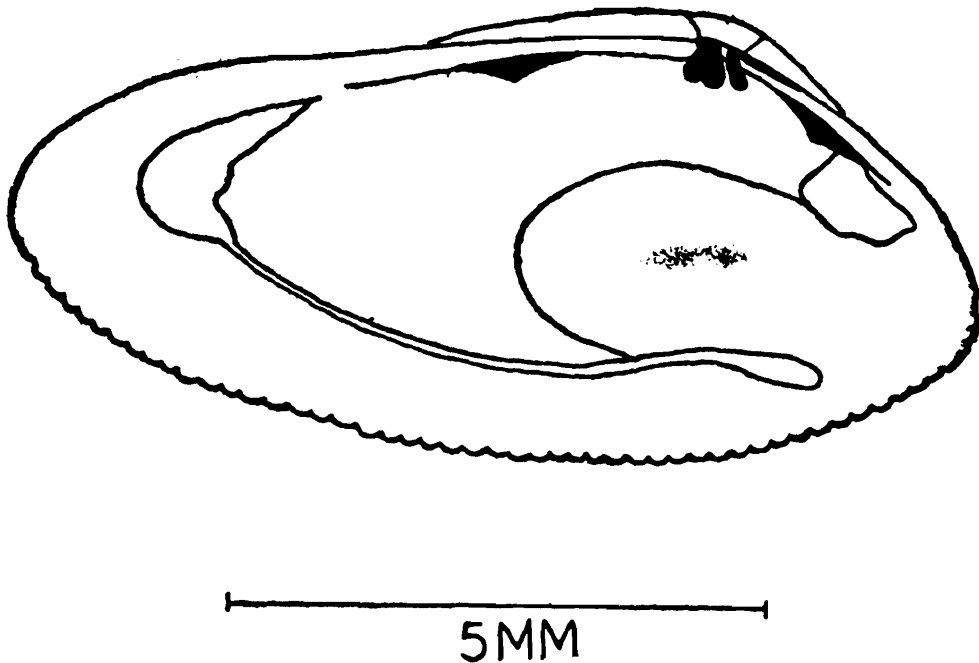


Fig. 11 Ventral view of right valve of *Donax (Paradonax) aperittus* Melvill showing cardinal complex, adductor muscle scars, pallial line and pallial sinus.

In the left valve the cardinal complex consists of a thin lamellated anterior and posterior tooth, anterior laterals absent, posterior lateral weakly developed. In the right valve the cardinal complex consists of a knob-like ridged cardinal tooth and a well developed posterior lateral tooth.

Adductor muscle scars well developed. Anterior adductor scar oval shaped, posterior adductor scar circular at the base but elongated anteriorly. Sinus equal on both the valves, developed less than half of the length of shell, rises from posterior adductor scar almost in parallel fashion with rounded anterior end, and convex ventral end, falls obliquely to the pallial line and in confluence with it.

**Remarks :**

This species can easily be distinguished from the other species by its shape, sculpture and the cardinal complex. It has some resemblance with *D. pulchella* (Hanley) but differs from it in being elongated in shape.

It is a rare species occurring along with more dominant *D. incarnatus* Gmelin at Digha and *D. cuneatus* Linnaeus at Mandapam. It is the smallest Indian donacid known so far.

**Range :** India and Pakistan.

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

**Elsewhere :** Pakistan.

**Measurements (in mm) :**

Length	Height	Width
9.84	4.70	3.58

**9. *Donax (Paradonax) nuxfagus* Preston.**  
(Figs. 12, 40, 41)

1908. *Donax nuxfagus* Preston, *Rec. Indian Mus.*, 2 : 207, pl. 16, fig. 55, (type locality, Andaman Islands; types, National Zoological Collection, Zoological Survey of India).

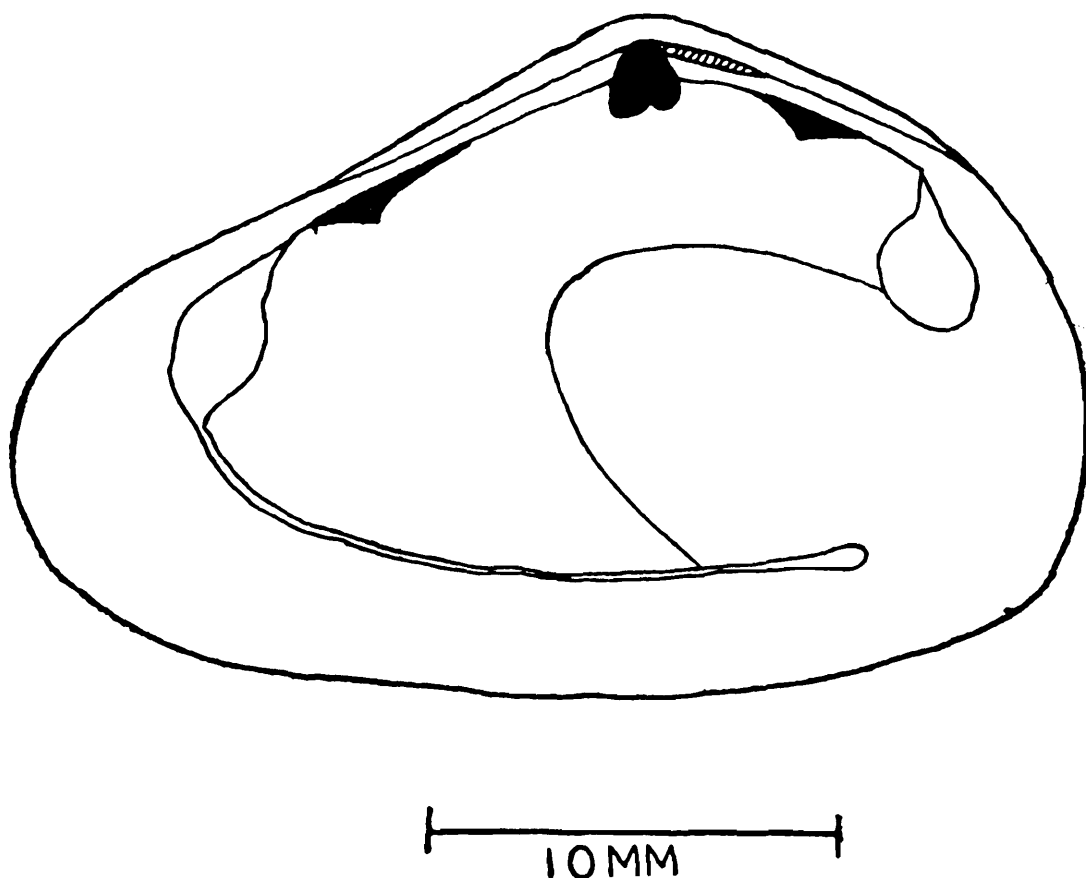


Fig. 12 Ventral view of right valve of *Donax (Paradonax) nuxfagus* Preston, showing cardinal complex, adductor muscle scars, pallial line and pallial sinus.

**Material examined :** 1 ex., Andaman (Holotype) 4056/1

**Description :**

Shell elongately oblong, yellowish colour. Anterior margin rounded; ventral margin slightly convex; anterior-dorsal margin steeply sloped; posterior margin short and convex. Sculptured with fine concentric striae more prominent on posterior side; internal margin strongly denticulate. Umbos posterior, ligament short, sunken, lunule on both the valves.

In the left valve the cardinal complex consists of a thin laminate anterior tooth and triangular, thick, bifid posterior tooth; anterior

lateral absent; posterior lateral distinct and proximal to the cardinal complex. In the right valve the cardinal complex consists of a strong, bifid anterior tooth and a lamellate posterior tooth; lateral teeth absent.

Adductor muscle scars well developed. Anterior adductor scar oblong; posterior adductor scar rounded Sinus equal in both the valves. Sinus rises from the posterior adductor scar and almost in a circular fashion and in confluence with pallial line only at the end.

*Remarks* : This species is known only by 1 ex., (Holotype) from Andaman Islands. After that no collection has been made so far. Judging from the known habits of *Donax* it is strange that only one specimen had been collected. When more collections are made it may turn out to be only a variant of already known species.

*Range* : India.

*Measurements* (in mm) :

Length	Height	Width
13.50	8.55	4.32

#### Subgenus-Plebidonax Iredale

(Type species, *D. deltoides* Lamarck, 1818; original designation)

1930. *Plebidonax* Iredale, *Rec. Aust. Mus. Sydney*, 17(9) : 398.

1969. *Plebidonax* : Keen, *Treatise on Invertebrate Palaeontology*, 2(3) : N 628.

Shell relatively large, triangular, wedge-shaped. Umbos posterior. Sculpture very fine or smooth except the posterior end where both the concentric and radial striae are prominent. Cardinal complex with well developed cardinal teeth which are two in the left valve and one in the right valve. Lateral present, anterior laterals absent in the left valve. Adductor muscle scars well developed, sinus equal on both the valves and occupies half of the length of the shell.

*Geological Range* : Recent

*Remarks :*

Keen (1969) mentioned that this group is represented from S. Pacific. But from India it is represented by *D. compressa* Lamarck. Therefore its range should be Indo-Pacific.

### 10. *Donax* (*Plebidonax*) *compressa* Lamarck

(Figs. 13, 24, 25)

1835. *Donax compressa* Lamarck, *Hist. Nat. Anim. Sans. Vert.*, 6 : 240, (type locality, unknown).

1854. *Donax compressa* : Reeve, *Conch. Icon.*, 8, sp. no. 8, pl. 2, fig. 8.

1869. *Donax* (*Latona*) *compressa* : Roemer in Martini-Chemnitz, *Syst. Conch. Cab.*, 10(3) : 87, t. 15, fig. 4-7.

*Material examined* : 52 exs. from Andaman & Nicobar Islands.

*Description :*

Shell triangular, wedge shaped, very much compressed with broad posterior end. Greyish ash, with obscure lines, three violet rays at the umbo. Umbos posterior, pointed and elevated. Anterior margin rounded; ventral margin convex, anterior-dorsal margin straight and gradually sloped; posterior-dorsal margin short and abruptly sloped; posterior margin truncated; interior margin smooth. Sculptured with fine concentric and radial striae but the posterior part with rugose concentric striae, Ligament short, dark brown colour, lunule on both the valves.

In the left valve the cardinal complex consists of deltoid, elongated anterior tooth and a posterior; anterior lateral absent; posterior lateral present and proximal to the cardinal complex. In the right valve the cardinal complex consists of a knob-like bifid cardinal tooth and socketed strong lateral teeth with anterior lateral distal and posterior lateral proximal to the cardinal complex.

Adductor muscle scars well developed. Anterior adductor scar oval, posterior adductor scar triangular at the base and elongated at the posterior side. Sinus equal on both the valves and developed half of the length, sinus rises from posterior adductor scar with convex shaped rounded anterior end and again convex ventral end; falls obliquely to the palial line and confluent with it.

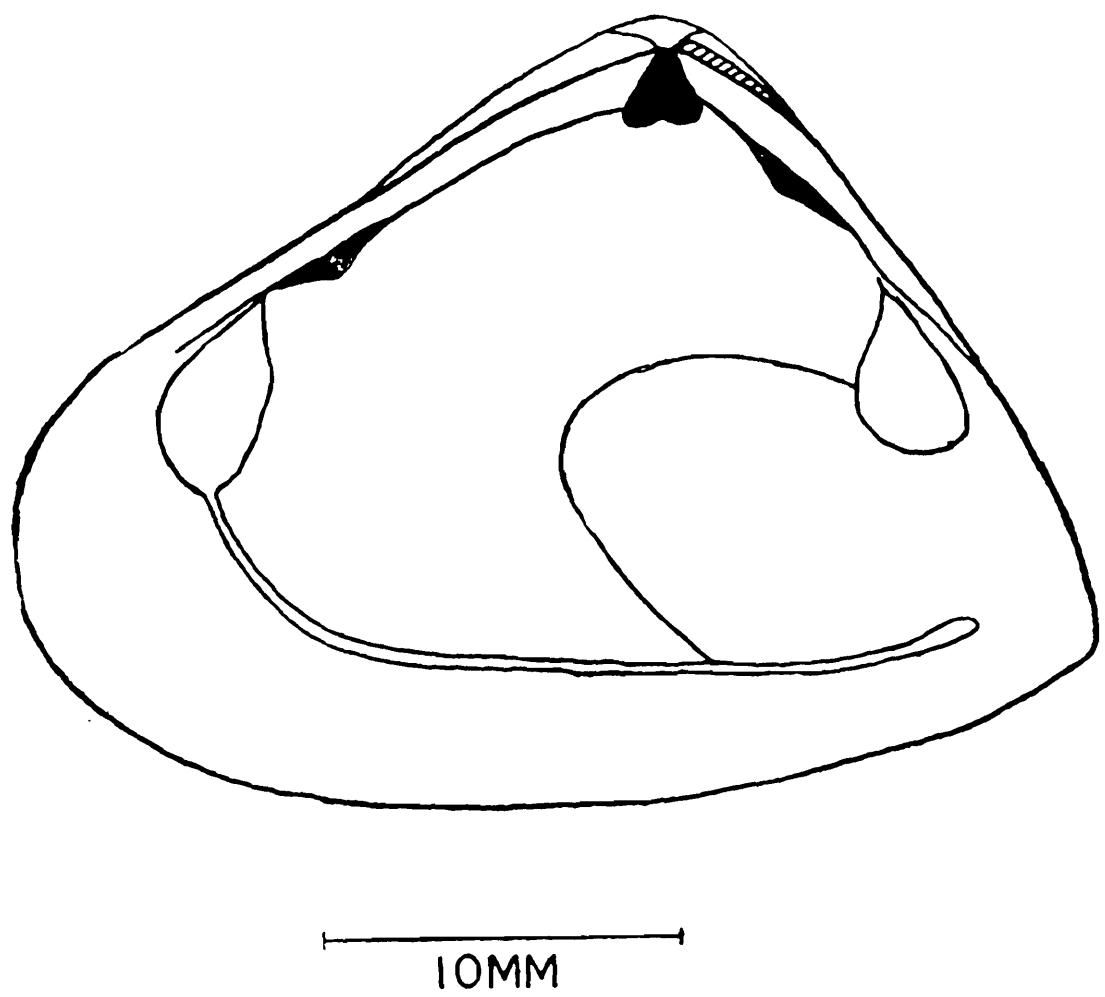


Fig. 13 Ventral view of right valve of *Donax Plebidonax compressa* Lamarck, showing cardinal complex, adductor muscle scars, pallial line and pallial sinus.

**Remarks :**

This species can easily be distinguished by its peculiarly compressed form, broad and obtusely angled posterior side.

This species is endemic to Andaman and Nicobar Islands.

**Range :** India, Burma and Sumatra only.

**Distribution :** India : Andaman and Nicobar Islands.

**Elsewhere :** Sumatra, Burma.

**Measurements (in mm) :**

Length	Height	Width
45.75	33.78	15.00
21.58	15.90	7.80

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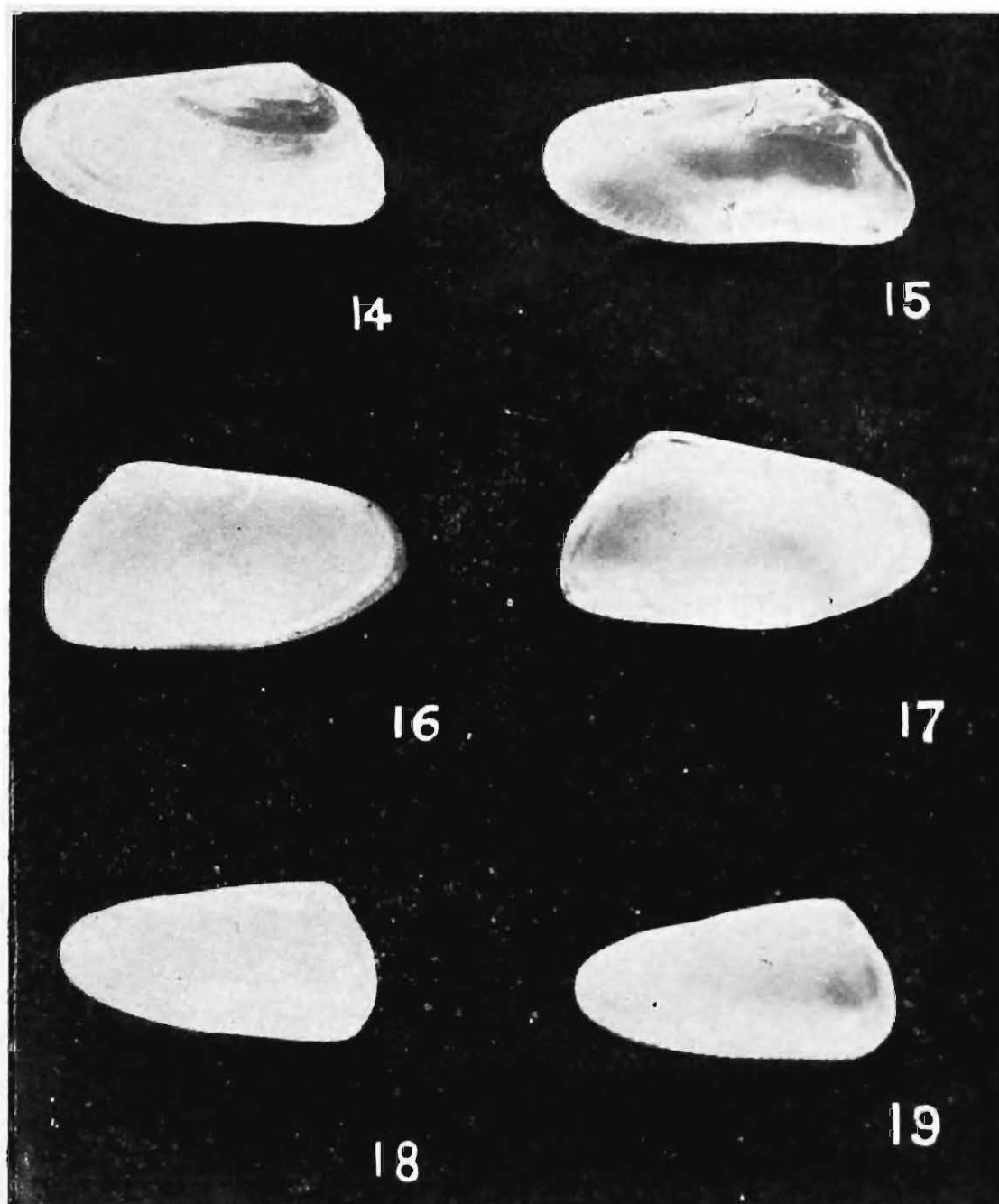
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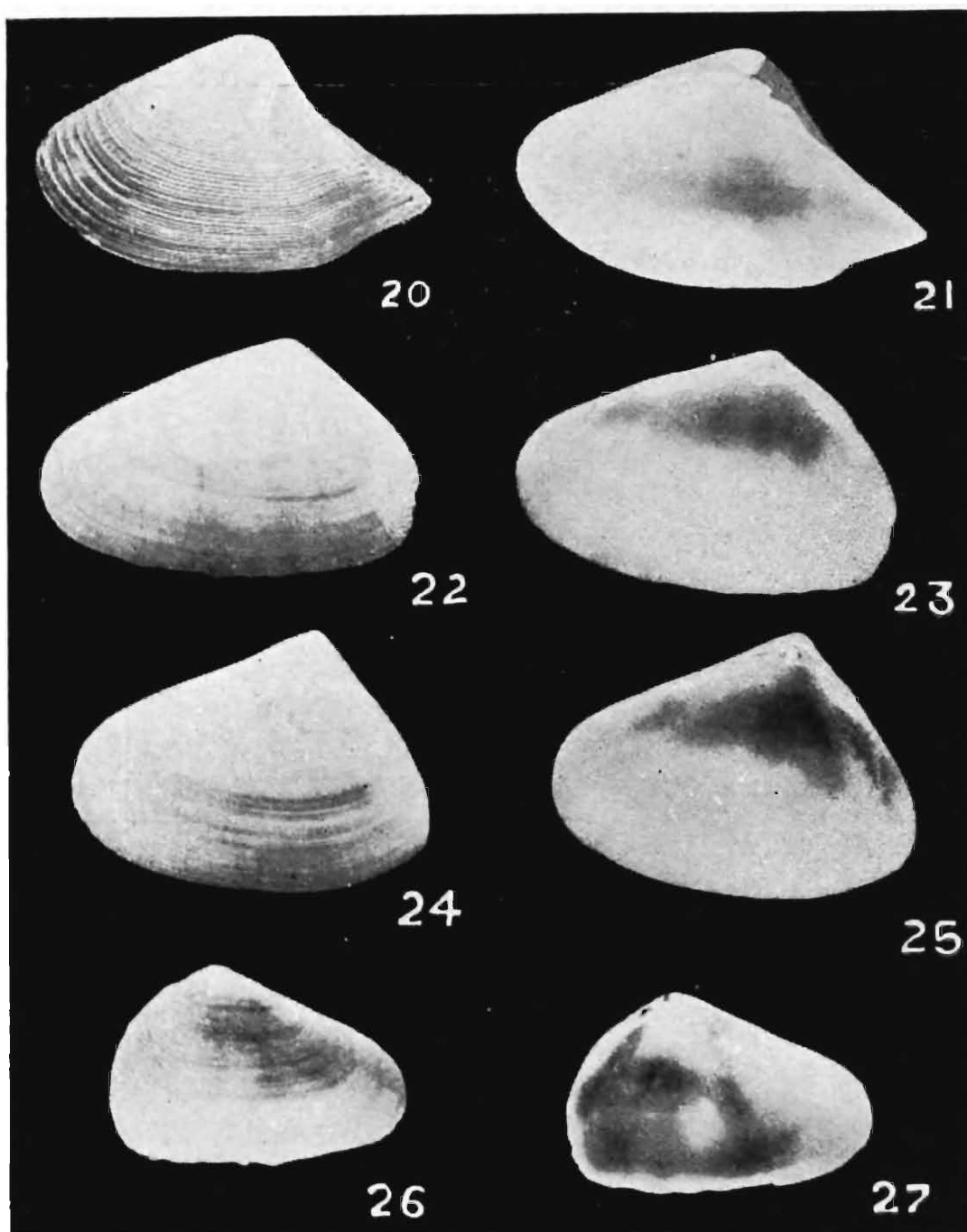
# PLATES

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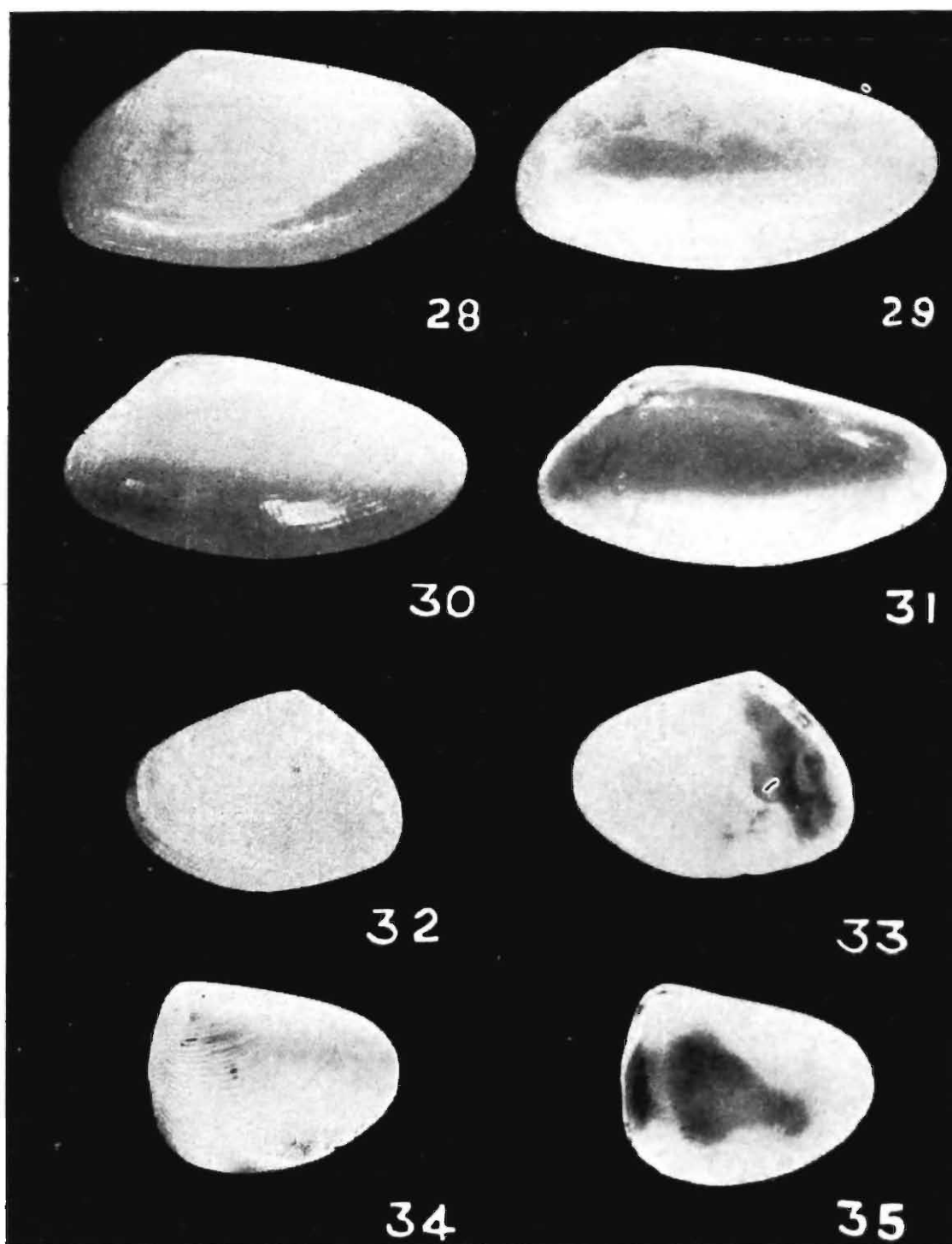




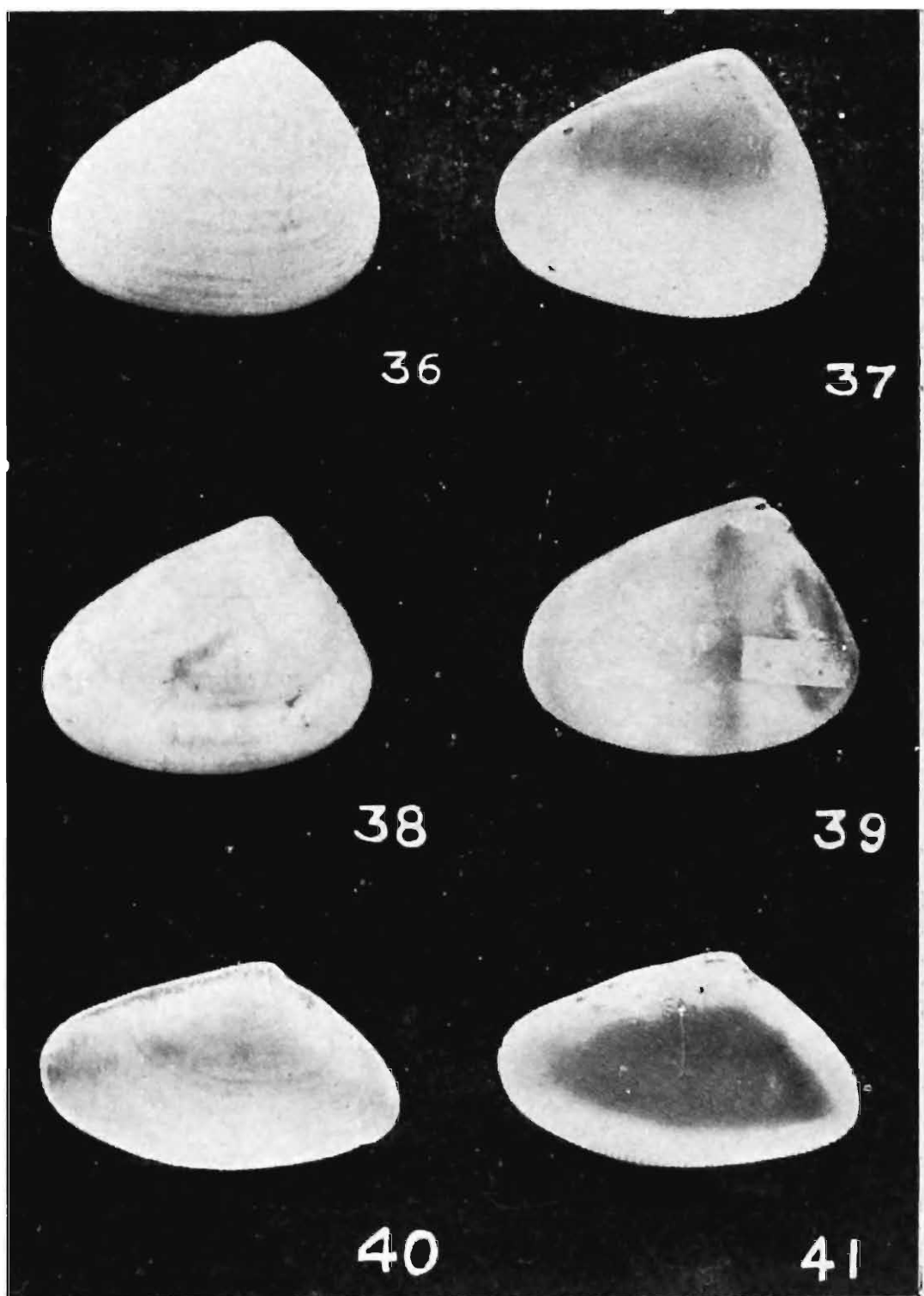
14. Dorsal view of left valve of *Donax (Donax) pulchella* Hanley (type).  
15. Ventral view of right valve of *Donax (Donax) pulchella* Hanley (type).  
16. Dorsal view of right valve of *Donax (Donax) pulchella* Hanley.  
17. Ventral view of left valve of *Donax (Donax) pulchella* Hanley.  
18. Dorsal view of left valve of *Donax spiculum* Reeve (type).  
19. Ventral view of right valve of *Donax spiculum* Reeve (type).



20. Dorsal view of left valve of *Donax (Hecuba) scortum* Linnaeus.  
21. Ventral view of right valve of *Donax (Hecuba) scortum* Linnaeus.  
22. Dorsal view of left valve of *Donax (Latona) cuneatus* Linnaeus.  
23. Ventral view of right valve of *Donax (Latona) cuneatus* Linnaeus.  
24. Dorsal view of left valve of *Donax (Plebidonax) compressa* Lamarck.  
25. Ventral view of right valve of *Donax (Plebidonax) compressa* Lamarck.  
26. Dorsal view of right valve of *Donax tiesenhauseni* Preston (type).  
27. Ventral view of left valve of *Donax tiesenhauseni* Preston (type).



28. Dorsal view of right valve of *Donax (Paradonax) aperittus* Melvill.
29. Ventral view of left valve of *Donax aperittus* Melvill.
30. Dorsal view of right valve of *Donax aperittus* Melvill (type).
31. Ventral view left valve of *Donax aperittus* Melvill (type).
32. Dorsal view of left valve of *Donax (Latona) faba* Schroeter.
33. Ventral view of right valve of *Donax (Latona) faba* Schroeter.
34. Dorsal view of right valve of *Donax (Latona) incarnatus* Gmelin.
35. Ventral view of left valve of *Donax (Latona) incarnatus* Gmelin.



36. Dorsal view of left valve of *Donax (Latona) lubricus* Hanley.  
37. Ventral view of right valve of *Donax (Latona) lubricus* Hanley.  
38. Dorsal view of left valve of *Donax (Latona) lubricus* Hanley (type).  
39. Ventral view of right valve of *Donax (Latona) lubricus* Hanley (type).  
40. Dorsal view of left valve of *Donax nuxfagus* Preston (type).  
41. Ventral view of right valve of *Donax nuxfagus* Preston (type).