ARCOIDS AND MYTILOIDS (BIVALVIA) FROM THE UPPER CRETACEOUS OF TRICHINOPOLY DISTRICT, SOUTH INDIA

G. W CHIPLONKAR and P. M. TAPASWI
Maharashtra Association for the Cultivation of Science, Poona 4

ABSTRACT

Of the 26 species representing the bivalve orders Arcoida and Mytiloida in our collection from the South Indian Cretaceous strata, 10 species, are described here. Of these eight are new and two indeterminate, in case of which, however, better preserved material would probably enable us to determine them also as new species. The species are shared by the genera *Nemodon, Cucullaea, Trigonarca, Mytilus, Brachidontes, Semimodiola, Modiolus* and *Atrina.* These species bear affinities mainly towards those from the Turonian and Senonian strata of South African regions.

Introduction

The orders Arcoida and Mytiloida, two of the groups are represented in our bivalve collection from the Upper Cretaceous strata of South India by 26 species. Of the 10 species described here, 8 are new and two are reported here as indeterminate species, because of the unsatisfactory state of preservation; but more material becoming available, may help us to describe these also as new species. The species described here are shared by the genera *Nemodon, Cucullaea, Trigonarca, Mytilus, Brachidontes, Semimodiola, Modiolus* and *Atrina.* It is interesting to note that except *Mytilus* and *Brachidontes* the remaining genera (described by Stoliczka and also collected by us) make their first appearance after Utatur times, in this area.

For systematic part we have followed *Treatise on Invertebrate Paleontology*, Part N (Bivalvia) edited by R. C. Moore.

Systematic Description

Order	:	Arcoida Stoliczka, 1871
Superfamily	:	Arcaces Lamarck, 1809,
Family	:	Parallelodontidae Dall, 1898
Subfamily	:	Grammatodontinae Branson, 1942

Group : Cucullaria
Genus : *Nemodon* Conrad, 1869
Subgenus : *Nemodon* Conrad, 1869

Nemodon (*Nemodon*) *garudamangalensis* sp. nov.
(Fig. I, Nos. 6, 7)

Material : Single LV, *Holotype* No. Gr 179/70.

Description. It is elongate, inequilateral, moderately tumid and subtrapezoidal in outline with moderate incurved umbo. The beak has a clearly developed groove. The area is elliptical. The posterior teeth are sub-horizontal. The anterior end of the hinge being slightly broken, nature of teeth in that region is not clear, though transverse teeth are definitely absent in the middle region. The anterior margin is narrowly convex and merges in the ventral margin which is almost straight to feebly convex. The posterior margin is somewhat wavy and meets the slightly curved dorsal margin in a more or less straight course. A ridge runs from the umbo to the postero-ventral portion.

The concentric growth lines are fine and close. The radial lines are close-set and more prominent than the growth lines. These radial lines are in doublets on the anterior portion but this nature is not seen persistant over the rest of the surface.

Remarks. As compared with *Nemodon eufaulensis* (Gabb) as described and figured by Wade from Upper Cretaceous of Eufauls, Ala (Ripley group), Coon Creek, etc., our specimen is more tall, its anterior more narrowly convex, and the radial lines are in doublets in the anterior region.

The present species differs from *Nemodon adkinsi* Stephenson from Navarro group of Texas, having its posterior margin somewhat wavy, longer shell and smaller number of radial ribs.

Occurrence. Brownish earthy rock from Trichinopoly group at about 1.5 km SE of Garduamangalam.

Etymology. The species is named after the locality of its occurrence.

Family : Cucullaeidae Stewart, 1930
Genus : *Cucullaea* Lamarck, 1801
Subgenus : *Idonearca* Conrad, 1862

Cucullaea (*Idonearca*) *pusilla* sp. nov.
(Fig. I, No. 3, 4)

Material. Single LV, *Holotype* No. Kn 28/70

Dimensions. Height/length ratio—0.74
Thickness/length ratio—0.64

Description. The shell is small, moderately tumid, sub-trapezoidal in outline with moderate incurved umbo. The anterior and the posterior teeth are more or less horizontal while the middle ones are transverse. The anterior margin is more convex in the antero-ventral region where it merges into the broadly convex ventral margin. The posterior side is obliquely truncated and ascends to meet the straight dorsal margin in a more or less straight course. A ridge runs from the umbo to the postero-ventral margin setting off the posterior declivity.

The concentric growth lines are fine. The radial lines are more prominent and somewhat wavy and are more or less equally spaced, their doublet nature is more clearly seen on the anterior part of the shell surface.

Remarks. As compared with *Cucullaea* (*Idonearca*) *vulgaris* (Morton) as described and figured by Wade from Upper Cretaceous of Ripley Formation, Coon Creek, Sand Hill, etc., the present species differs by being much smaller, its anterior side more narrowly convex and more or less straight nature of the posterior which is also more oblique.

The present species agrees with *Cucullaea zealandica* of Woods from Upper Senonian of Amuri group (New Zealand) in general outline but differs from it in having the presence of posterior carina distinct throughout its course, umbones less high and less incurved, and radial ribs in doublets and without secondary ribs.

Of the two species referred to above, the present one is nearer to *C. zealandica* Woods.

Occurrence. Shelly limestone from Trichinopoly group at about 1.5 km SW of Kunnam.

Etymology. *Pusillus*-small, tiny.

Superfamily	:	Limopsacea Dall, 1895
Family	:	Glycymerididae Newton, 1922
Subfamily	:	Arcullaeinae Newell, 1969
Genus	:	*Trigonarca* Conrad, 1862
Subgenus	:	*Costelliarca* Chiplonkar and Tapaswi, 1973

Trigonarca (*Costelliarca*) *duplex* sp. nov.
(Fig. I, No. 5)

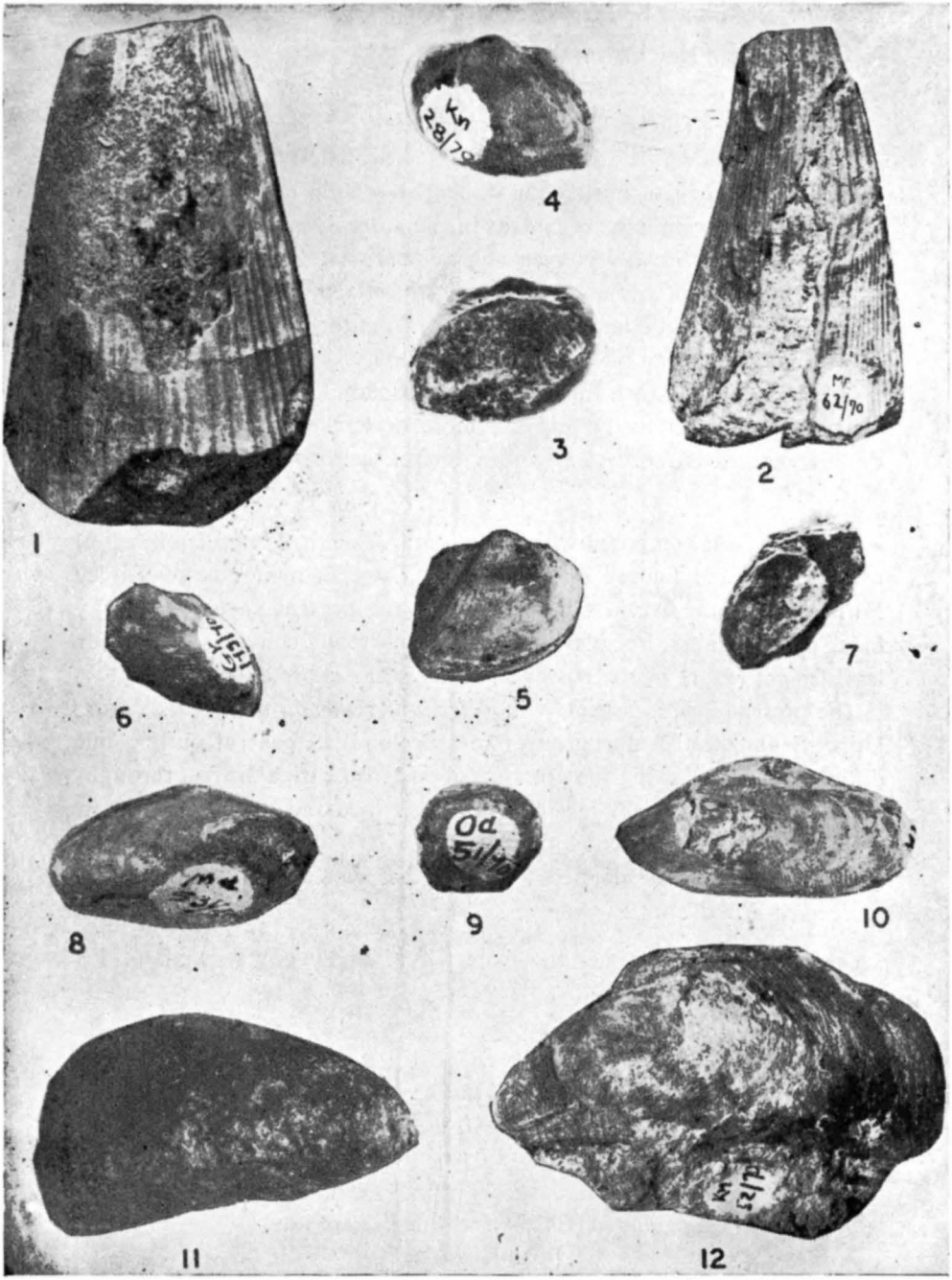

Plate I

Material. Two specimens, *Holotype* No. Kn 27/70

Dimensions. Height/Length ratio—0.75
Thickness/length ratio—0.58

Description. The shell is equivalve moderately tumid with prominent incurved umbones and sub-trapezoidal outline. The anterior margin is narrowly convex and merges into the broadly convex ventral margin. The posterior margin is slightly wavy and ascends to meet the dorsal margin in a more or less straight course. A ridge runs from the umbo to the postero-ventral portion setting off the posterior declivity. Another small ridge situated between the previous one and the posterior margin of the shell runs from the umbones to the middle of posterior margin. The portion between these two ridges is slightly concave.

The concentric growth lines are fine and distinct. The radial ornament consisting of fine ribs is more distinct in the right valve and on the left very faint, being just visible on the declivity between the carina and the posterior margin. The radial ribs are equally spaced and have a fine intercalary line between every two of them.

Remarks. As compared with *Trigonarca* (*Costelliarca*) *trichinopolitensis* (Forbes) from Trichinopoly group, the present material, at first sight, agrees with it in general outline and fits in its range of the dimensions, but differs from it in its nature of radial ornament, that is, in having an intercalary line between every two of the ribs, none of which are in doublets or triplets.

Plate I. **1.** *Atrina latjcostata angusta* sybsp. nov. *Holotype* No. Me 61/70 . . . × 0.66, **2.** *Atrina striatocostata* sp. nov. *Holotype* No. Me 62/70 . . . × 0.66, **3.** *Cucullaea* (*Idonearca*) *pusilla* sp. nov. Internal view, *Holotype* No. Kn 28/70 . . . × 1, **4.** Same as above external view, . . . × 1, **5.** *Trigonarca* (*Costelliarca*) *duplex* sp. nov. Lateral view, *Holotype* No. Kn. 27/70 . . . × 1, **6.** *Nemodon* (*Nemodon*) *garudamangalensis* sp. nov. External view, *Holotype* No. Gr 179/70 . . . × 1, **7.** Same as above internal view . . . × 1, **8.** *Modiolus* (*Modiolus*) *mallurensis* sp. nov. lateral view, *Holotype* No. Ma 531/70 . . . × 1, **9.** *Brachidontes* (*Brachidontes*) sp. *indet*. Lateral view, Figured specimen No. Od 51/70 . . . × 1, **10.** *Semimodiola crenulata* sp. nov. Lateral view, *Holotype* No. Klk 99/70 . . . × 1, **11.** *Mytilus* (*Mytilus*) *galliennei kunnamensis* subsp. nov. Lateral view, *Holotype* No. Kn 56/70 . . . × 0.66, **12.** *Mytilus* (*Mytilus*) sp. *indet*. Lateral view, Figured specimen No. Kn 52/70 . . . × 0.66.

TABLE 1—SHOWING THE VERTICAL DISTRIBUTION AND AFFINITY RELATIONS OF THE BIVALVE ORDERS ARCOIDA AND MYTILOIDA FROM CRETACEOUS OF S. INDIA

Sr. No.	*Species from Trichinopoly Cretaceous*	*Related species with geological horizon*	*Utatur group*	*Trichinopoly group*	*Ariyalur group*			
					Silakkudi formation	*Kallankurichchi formation*	*Ottakovil formation*	*Kallamedu formation*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1.	*Grammatodon (Nanonavis) japeticum (Forbes)*	*G. (N.) japeticum* (Forb.) Senon. of Angola; Up. Senon. of Malagasy; Up. Creta. of Sakhalin	—	—	x	x	x	—
2.	*Nemodon (Nemodon) garudamangalensis* sp. nov	*N. adkinsi* Steph. Navarro group (Maestr.) of Texas	—	x	—	—	—	—
3.	*Cucullaea (Idonearca) pusilla* sp. nov	*C. zealandica* Woods, Up. Senon. of Amuri group (New Zealand)	—	x	—	—	—	—
4.	*Trigonarca (Costelliarca) trichinopolitensis* (Forbes)	*T. curvatodonta* Riedel, Senon. of Cameroon, Angola, Malagasy; Campanian of Gold Coast	—	x	—	—	—	—
5.	*T. (C.) galdrina* (d'Orb.)	*T. (C.) galdrina* (d'Orb.), Senon. of Angola; Up. Senon. of Malagasy	—	x	—	—	—	—
6.	*T. (C.) gamana* (Forbes)	*T. (C.) gamana* (Forbes), Senon. of Angola	—	x	—	—	—	—
7.	*T. (C.) abrupta* (Forbes)	Affinities not clear	—	x	—	—	—	—

8. *T.* (*C.*) *brahminica* (Forbes)	*T.* (*C.*) *brahminica* (Forbes), Senon. of Malagasy; M. Maestr. of Yugoslavia	—	—	x	—	—	—
9. *T.* (*C.*) *duplex* sp. nov	*T.* (*C.*) *eapensis* (Griesbach), Up. Creta. of Pondoland and Natal	—	x	—	—	—	—
10. *Mytilus* (*Mytilus*) *arrialo-orensis* Stol.	Affinities not clear	—	—	—	—	x	—
11. *M.* (*M.*) *galliennei* d'Orb. *kunnamensis* subsp. nov	*M. galliennei* d'Orb. L. Turon. of Sarthe	—	x	—	—	x	—
12. *M.* (*M.*) sp. *indet.*	*M. galliennei* d'Orb. L. Turon. of Sarthe	x	—	—	—	—	—
13. *Brachidontes* (*Brachidontes*) sp. *indet.*	*B. striatocostata* (d'Orb.), Greensand of Blackdown (England)	—	x	—	—	—	—
14. *Semimodiola radiatula* (Stol.)	Affinities not clear	—	—	—	—	x	—
15. *S. crenulata* sp. nov.	*S. radiatula* (Stol.) Ottacovil Formation, Ariyalur group of South India	—	—	—	x	—	—
16. *Septifer annectans* (Stol.)	*S. linneatus* (Sow.), L. Greensand-Up. Chalk of England, Switz; Cenoman. of France; Acher Greensand of Germany; Cenoman.-Turon., Bagh Beds (India)	—	—	x	—	—	—

Table 1 (*contd. on page* 222)

Table 1 (*contd. from page* 221)

1	2	3	4	5	6	7	8	9
17.	*Inoperna flagellifera* (Forbes)	*I. flagellifera* (Forbes), Cenoman.-L. Senon. of Bas-Congo, England, Europe, Somaliland; Coniac. and Campan. of Cameroon; Up. Campan. of New Zealand, etc.	—	x	—	—	—	—
18.	*Modiolus* (*Modiolus*) *typicus* (Forbes)	*M. typicus* (Forbes), Cenoman.-Turon, Bagh Beds, and Wadhwan Formation (India); L. Turon.-L-Senon. of several countries in Europe, Malagasy, Somaliland; Up. Campan of New Zealand, etc	—	x	x	—	—	—
19.	*M.* (*M.*) *mallurensis* sp. nov	*M. archiaci* (d'Orb.) Neocomian of Haute-Marne	—	—	x	—	—	—
20.	*M.* (*M.*) *nitens* (Forbes)	*M. oppeli* Zittel, Up. Creta. of Gossau Formation	—	—	—	—	x	—
21.	*Pinna decussata* Goldf.	*P. decussata* Goldf., Up. Creta. of England, Germany, Pondoland, Somaliland, Turkey; Cenoman.-Turon. of N. Africa, Bas-Congo, etc.	—	x	—	—	—	—
22.	*P. complanata* Stol.	*P. complanata* Stol., Turon. of Malagasy	—	x	—	—	—	—

23. *P. intumescens* Stol.	*P. cottai* Geinitz Up. Creta. of Sachsen (Germany)	—	x	—	—	—	—
24. *Atrina laticostata* (Stol.)	*A. laticostata* (Stol.), L. Turon.-Maestr. of Cameroon; Senon. of Gabon and Yugoslavia	—	x	x	—	—	—
25. *A. laticostata angusta* subsp. nov.	*A. laticostata* (Stol.), -do-	—	—	x	—	—	—
26. *A. striatocostata* sp. nov.	-do-	-do-	—	—	x	—	—	—

As compared with *Arca capensis* Griesbach from Upper Greensand of Izinbluzabalungu deposits (Natal) and *Trigonarca capensis* (Griesbach) as shown by Woods from Upper Cretaceous of Pondoland, the present species differs in having longer shell, more narrowly convex anterior margin and presence of an intercalary between every two of the radial ribs and also the presence of a small ridge between the carina and the posterior margin.

The present species agrees with *Arca valdensis* of Pictet and Campiche from Upper Gault of St. Croix, in general outline and thickness but differs from it in having its anterior margin more narrowly convex, a shorter postero-dorsal margin and presence of an intercalary between every two primary ribs. Besides, the Swiss species has 3 prominent radial ribs on anterior portion and concentric lines intermittently prominent.

Trigonoarca semisulcata Matheron as described and figured by Roman and Mazeran from Turonian of Uchaux basin appears close to the present species as regards general outline and ornament but has more broadly convex anterior margin, a longer shell and absence of intercalaries and probably also absence of radial lines on the median portion of the shell as this feature is visible in the figures only on anterior and posterior portion of the shell.

Of the species referred to above, *Trigonarca* (*Costelliarca*) *capensis* (Griesbach) is closest to the present species.

Occurrence. Shelly limestone from Trichinopoly group at about 1.5 km SW of Kunnam.

Etymology. duplex=two-fold, two-faced; named after different ornament of the two valves.

Order	:	Mytiloida Férussac, 1822
Superfamily	:	Mytilacea Rafinesque, 1815
Family	:	Mytilidae Rafinesque, 1815
Subfamily	:	Mytilinae Rafinesque, 1815
Genus	:	*Mytilus* Linné, 1758
Subgenus	:	*Mytilus* Linné, 1758

Mytilus (*Mytilus*) *gallienni kunnamensis* subsp. nov.
(Fig. I, No. 11)

Material. One specimen; *Holotype* No. Kn 56/70.

Description. The shell is typically mytiliform, fairly convex and with

terminal umbones. The escutcheon is elongate. The ventral margin is feebly concave till it meets the posterior margin in a subangular to narrowly rounded manner at the postero-ventral region. The dorsal margin posterior to the umbones gradually rises to meet the postero-dorsal margin so that the maximum height of the shell is at about 1/3rd length from the posterior end. The maximum convexity of the shell gives the appearance of a ridge running obliquely from the umbones to postero-ventral portion, but in fact there is no ridge as such. The shell surface ventrally to the ridge is appreciably less convex than that on the dorsal side.

Remarks. The only species found comparable with the present one is *Mytilus galliennei* d'Orbigny from Lower Turonian of Sarthe from which, however, it differs in having posterior margin more narrowly rounded.

Occurrence. Brownish earthy rock from Utatur group at about 2.5 km SW of Kunnam.

Etymology. This subspecies is named after the locality of its occurrence.

Mytilus (*Mytilus*) *sp. indet.*
(Fig. I, No. 12)

Material. Two specimens; figured specimen No. Kn 52/70.

Description. The shell is mytiliform, moderately convex and long with almost terminal umbones. The posterior margin is broadly convex. The dorsal margin posterior to the umbones rises gradually to meet the postero-dorsal margin which along with the posterior margin follows a broad convex course and then meets rather abruptly the more or less straight ventral margin. The maximum tumidity of the shell is a little ahead of half the length and its maximum height at about 1/4th length from the posterior end.

The ornamentation is poorly preserved. The concentric growth ridges are only feebly seen.

Remarks. As compared with *Mytilus galliennei kunnamensis* (*vide supra*), the present species is less tumid, has its maximum tumidity more anteriorly situated being at nearly half the length and is also somewhat longer; for similar reasons this species differs from *M. galliennei* d'Orbigny from the Lower Turonian of Sarthe. More precise information about

the ornament may enable us to decide the distinctness of this species from others.

Occurrence. Brownish earthy rock from Utatur group at about 2.5 km SW of Kunnam.

Genus : *Brachidontes* Swainson, 1840
Brachidontes (*Brachidontes*) *sp. indet.*
(Fig. I, No. 9)

Material. Two specimens; figured specimen No. Od 51/70.

Description. Only two fragments of posterior part of the shell represent the present species in our collection. The course of growth lines as seen on the available fragments agrees much with that in *Septifer annectans* (Stoliczka) from Sillakkudi Formation of Ariyalur group. The radial ornament, however, is of a different pattern in the sense that it is absent on one third of the surface on the dorsal and ventral sides, being thus confined to the middle as a band extending antero-posteriorly; also these ribs are distinctly stronger, more distant and there is a fine intercalary between every two of them.

Remarks. As compared with *Modiola* (*Brachidontes*) *striato-costata* (d'Orbigny) as described and figured by Woods from Greensand of Blackdown, our species differs from it for the same reasons as it does from *Septifer annectans.*

By its characteristically restricted radial arrangement, this species probably differs from all the known species of this genus and better preserved material may enable us to establish it as a new species.

Occurrence. Brownish earthy rock from Utatur group at about 2.5 km NE of Odiyam.

Genus : *Semimodiola* Cossmann, 1887
Semimodiola crenulata sp. nov.
(Fig. I, No. 10)

Material. Single LV, *Holotype* No. Klk 99/70.

Description. The shell is strongly inequilateral, rather tapering anteriorly, with length of the shell nearly twice its height, moderately tumid and with the umbones prominent, incurved and almost terminal. The anterior margin is very narrowly rounded and smaller than the posterior convex

margin. A ridge acutely crested in the umbonal region tends to broaden out postero-ventrally. The dorsal margin is feebly convex to straight and after about half the length of the shell descends posteriorly. The part of the shell dorsally to the ridge tends to be concave so that the two valves meet to give to this part of the shell the appearance of a hollow-blade-razor. The ventral side is feebly concave.

Concentric growth striae are fine and distinct. Fine radial ribs cover the valve; they split and turn very quickly from the oblique mesial fold so as to meet the margins of the valve almost at right angle, the pattern of ribbing thus being more divaricate than radial. The margins show externally finely crenulate nature due to the ribbing.

Remarks. As compared with *S. radiatula* (Stoliczka) from Ariyalur group, the present species differs from it in having longer shell, the posterior side more narrowly convex and has less inconspicuous mesial fold.

To place the present material (and what is represented in our collection and described by Stoliczka as *Modiola* (*Brachidontes*) *radiatula*) under the genus *Semimodiola* presents some difficulties. Their radial ornament is strongly divaricate as is characteristic of *Semimodiola* (Soot-Ryen). Though not a distinct ridge the region of maximum convexity of the shell can be seen disposed obliquely from the umbo to the posterior side; the radial ornament is not of striae as in *Semimodiola* but in the form of ribs as in *Brachidontes*; these ribs do not become obsolete on the oblique antero-posterior ridge-like feature, but are certainly weaker on it than elsewhere; they show splitting posteriorly along the ventral margin and make it crenulate; also the shell outline is elongate like that of *Brachidontes*. Thus these species show a mixture of characters of *Semimodiola* and *Brachidontes*. These two species come from Kallankurichchi and Ottacovil Formations (Ariyalur group) which are considered Lower and Middle Maestrichtian (Sastry *et al.*). To place them under *Brachidontes* would need amending its definition to include divaricate nature and splitting of the radial ornament, and to place them under *Semimodiola* would need extension of time range of this genus down into the Maestrichtian.

Occurrence. Pinkish gritty limestone from Kallankurichchi Formation of Ariyalur group at about a km SW of Kallankurichchi.

Etymology. This species is named after its crenulated margin.

Subfamily : Modiolinae Keen, 1958
Genus : *Modiolus* Lamarck, 1799
Subgenus : *Modiolus* Lamarck, 1799

Modiolus (*Modiolus*) *mallurensis* sp. nov.
(Fig. I, No. 8)

Material. Single RV; *Holotype* No. Ma 531/70.

Description. The shell is inequilateral, modioliform, moderately tumid and with slightly incurved umbo. The dorsal margin is much shorter than the ventral and ascends to meet postero-dorsal margin which it does at about half the length of the shell. The ventral margin is very feebly concave to straight. A distinct ridge runs obliquely from the umbo in a postero-ventral direction and is the region of maximum convexity of the shell. The concentric growth striae are distinct.

Remarks. As compared with *Modiola nitens* Forbes from Ariyalur group, the present species does not have its growth lines so broadly rounded and thus does not give its posterior side as broad and convex an appearance as in *M. nitens*; also its shell does not flatten out posteriorly to produce wedge-like thinning towards the edge.

Modiola kaffraria Woods as shown by him from Upper Cretaceous of Pondoland, resembles the present species in general outline but differs from it in having longer shell, its posterior margin more arcuate and ventral margin slightly concave.

Occurrence. Pinkish calcareous grit from Sillakkudi Formation of Ariyalur group at about a km South of Mallur.

Etymology. This species is named after the locality of its occurrence.

Superfamily : Pinnacea Leach, 1819
Family : Pinnidae Leach, 1819
Genus : *Atrina* Gray, 1842

Atrina laticostata angusta subsp. nov.
(Fig. I, No. 1)

Material. Single specimen; *Holotype* No. Me 61/70.

Description. The shell is anteriorly broken, it is sub-trigonal in outline and the lateral median ridge gives it a rhomboidal cross-section. Umbonal

angle is about 20°. Undulating concentric growth striae are seen covering the surface being rugose along the ventral margin. The radial ribs, 18 in number, are almost equally prominent and spaced equidistant over the surface, except that near the dorsal margin 3 or 4 of them are closely spaced and corresponding region along the ventral margin is without radial ribs. The rest of the surface ventrally to them is covered by rugosities along the growth striae.

Remarks. As compared with *A. laticostata* (Stoliczka) from Ariyalur group, the present material agrees mostly with it except that it has an umbonal angle of 20° and has 18 radial ribs.

Occurrence. Calcareous gritty sandstone from Sillakkudi Formation of Ariyalur group at about 2.5 km SW of Mettal, i.e. about 1/2 km away from where *A. laticostata* is collected.

Etymology. Angustus=narrow; so named after its narrow nature.

Atrina striato-costata sp. nov.
(Fig. I, No. 2)

Material. Single specimen; *Holotype* No. Me 62/70.

Description. The shell is long, moderately tumid, with the median ridge almost absent and thus giving an elliptical to sub-elliptical cross-section. It is broken at the anterior end. The umbonal angle is approximately 27°. The dorsal margin is feebly convex to straight and ventral margin is slightly concave in the middle. The growth ridges do not show flexuous nature. The radial ribs are 12-13 in number. They are prominent, more or less equidistant, bear fine striae on them and follow a feebly convex course near about middle of the shell. Between the second and the third ribs from the dorsal side, there are 6 intercalaries appearing rather suddenly into prominence and the presence of them between the third and fourth is rather doubtful but otherwise they are absent between the remaining ribs. All the major radial ribs together cover nearly 3/4ths of the valve, the ventral 1/3rd of it being covered by close set growth ridges in a decussate manner towards the radial ribs.

Remarks. As compared with *Pinna arata* Forbes as shown by Stoliczka, the present species has a similar umbonal angle but it has 5 or 6 intercalaries appearing suddenly into prominance between the dorsal second

and third radial ribs (and perhaps also between 3rd and 4th ribs). These intercalaries give to the dorsal region of this species a very characteristic appearance not found in any of the South Indian species nor in any of those described in available literature.

The total number of radial ribs in this species is similar to that in *Atrina laticostata* (Stoliczka) from Ariyalur group, but the sudden appearance of 5 or 6 intercalaries between dorsal second and third ribs gives this species so characteristic an appearance that it cannot be confused with the former. Also the crowding of the 4 or 5 ribs seen in *A. laticostata* is not seen in the present species. But it is in that very region that the present species shows sudden appearance of several intercalaries. While these intercalaries give to the shell of this species a very distinct appearance, it may be a freak development or may be a modification of the crowding of the dorsal 4 or 5 ribs of *A. laticostata*; but in the latter case the total number of radial ribs would be much larger than that in *A. laticostata.*

Since only one specimen represents this species, it is considered safe to describe it as a species distinct from others, in order that the peculiar feature of it is not lost sight of.

Occurrence. Calcareous gritty sandstone from Sillakkudi Formation of Ariyalur group at about 2.5 km SW of Mettal, i.e. only 1/2 km away from where *A. laticostata angusta* is collected.

Etymology. The name is based on the fine striae on major costae.

General Remarks

Out of the ten species described here, 8 are new to science and two are indeterminate. The distribution of these new and known species as seen from the accompanying table reveals that they occur as being more or less restricted to certain horizons in this series of rock formations.

Upper portion of Utatur group has yielded—*Mytilus* (*Mytilus*) *galliennei kunnamensis* subsp. nov., *Mytilus* (*Mytilus*) sp. indet. and *Brachidontes* (*Brachidontes*) sp. indet.

Trichinopoly group contains—*Nemodon* (*Nemodon*) *garudamangalensis* sp. nov., *Cucullaea* (*Idonearca*) *pusilla* sp. nov., *Trigonarca* (*Costalliarca*) *duplex* sp. nov. Ariyalur group—Sillakkudi Formation—has yielded—*Modiolus* (*Modiolus*) *mallurensis* sp. nov., *Atrina laticostata angusta* subsp. nov. and *Atrina striatocostata* sp. nov.

The Kallankurichchi Formation of Ariyalur group has yielded only one new species of the present group i.e. *Semimodiola crenulata* sp. nov.

Thus it is seen that the youngest formation of the Ariyalur group i.e. Kallamedu Formation is devoid of the bivalves representing arcoids and mytiloids.

A full discussion of the age and provincial relations of the bivalve fauna, as a whole, from these rock formations will be taken up at a later stage. But in the meanwhile the accompanying table giving the affinities and distribution of all the Arcoid and Mytiloid species in our collection from these strata shows that they have more or less restricted distribution among the different horizons. They, however, do not show much of bearing on precise age of these beds, beyond that their affinities broadly range over Turonian and Senonian towards species from South African region.

Repository

The types described here are preserved in the Museum of Department of Geology and Palaeontology, Maharashtra Association for the Cultivation of Science, Poona 4.

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G. W. Chiplonkar and P. M. Tapaswi