Taxonomic review of the elongated cockles: genera *Trachycardium*, *Vasticardium* and *Acrosterigma* (Mollusca, Cardiidae)

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ABSTRACT
The cardiids of the subfamily Trachycardiinae Stewart, 1930 (*sensu* Keen, 1969, genus *Papyridea* excluded), are reviewed, with special attention given to the genera *Trachycardium*, *Acrosterigma*, and *Vasticardium*. No change is proposed here to the relatively well-defined taxonomy of *Trachycardium*, considered to be exclusively American, with six subgenera, nor to the American *Acrosterigma*. In contrast, the generic taxonomy of the Indo-Pacific Trachycardiinae, quasi-randomly distributed by authors among the three genera cited above, was not clear and is reevaluated. All of the species are regrouped here into two genera *Vasticardium* and *Acrosterigma* which receive clear and usable definitions. The American genus *Trachycardium* differs widely from them in both hinge and rib morphology. The two genera *Vasticardium* and *Acrosterigma* are distinguished mainly by rib morphology. These three genera are now grouped in the subfamily Cardiinae. In several previous articles, I have analyzed in detail the genus *Vasticardium*, including fifteen Recent species. The results are summarized here. The genus *Acrosterigma* is represented in America by several fossil species and two Recent species; in the Indo-Pacific, where no general study has previously been undertaken, it is represented by several fossil species (one new) and twenty-five Recent species, of which nine are new; these species are divided into six species-groups. Neotypes are proposed for *Cardium magnum* Linné, 1758 and *Cardium biradiatum* Bruguière, 1789 and lectotypes for *Cardium laevigatum* Linné, 1758, *Cardium serratum* Linné, 1758, and *Cardium marmoreum* Lamarck, 1819.

KEY WORDS
Mollusca,
Bivalvia,
Trachycardium,
Vasticardium,
Acrosterigma.

RÉSUMÉ

Revue taxonomique des « coques allongées » : genres Trachycardium, Vasticardium, Acrosterigma *(Mollusca, Cardiidae).*

Cette étude est une révision de la sous-famille des Trachycardiinae Stewart, 1930 (au sens de Keen, 1969, à l'exclusion du genre *Papyridea*). Une attention spéciale est donnée aux genres *Trachycardium*, *Vasticardium* et *Acrosterigma*. Aucun changement ne sera proposé à la taxonomie de *Trachycardium*, considéré comme exclusivement américain et qui comprend six sous-genres, ni aux *Acrosterigma* américains. Par contre, la taxonomie générique des Trachycardiinae de l'Indo-Pacifique, répartis à peu près au hasard par les auteurs dans les trois genres cités ci-dessus, a été reconsidérée. Toutes ces espèces sont regroupées ici dans les deux genres *Vasticardium* et *Acrosterigma* qui reçoivent des définitions claires et facilement utilisables. Le genre américain *Trachycardium* diffère nettement d'eux par la charnière et par la morphologie des côtes. Les deux genres *Vasticardium* et *Acrosterigma* sont séparés essentiellement par la morphologie des côtes. Les trois genres sont placés maintenant dans la sous-famille des Cardiinae. Dans plusieurs articles, j'ai analysé en détail le genre *Vasticardium* qui comprend quinze espèces vivantes ; les résultats de ces études sont sommairement indiqués. Le genre *Acrosterigma* est représenté en Amérique par plusieurs espèces fossiles et deux espèces actuelles ; dans l'Indo-Pacifique, où aucune étude générale détaillée n'a encore été entreprise, le genre est représenté par plusieurs espèces fossiles (dont une nouvelle) et vingt-cinq espèces actuelles, dont neuf sont nouvelles, et qui sont réparties dans six groupes-espèces. Cette revue propose des néotypes pour *Cardium magnum* Linné, 1758 et *Cardium biradiatum* Bruguière, 1789 ainsi que des lectotypes pour *Cardium laevigatum* Linné, 1758, *Cardium serratum* Linné, 1758 et *Cardium marmoreum* Lamarck, 1819.

MOTS CLÉS
Mollusca,
Bivalvia,
Trachycardium,
Vasticardium,
Acrosterigma.

CONTENTS

INTRODUCTION

The species discussed here can be grouped under the vernacular name "elongated cockles", because most of them have height appreciably greater than length with an ovoid more or less oblique shape, characters that are exceptionally present together in other Cardiidae, Recent or fossil, except for several species in the subfamily Laevicardiinae (Keen, 1951), which still await revision and cannot be treated in this paper. For many authors, *Trachycardium*, *Vasticardium* and *Acrosterigma* constitute the basis of the subfamily Trachycardiinae. It will be shown here that this subfamily should no longer be utilized, as already done by some authors (Popov 1977; Kafanov & Popov 1977; Schneider 1992, 1995).

When Stewart (1930: 271) defined the Trachycardiinae, the given criteria of separation from the other subfamilies were limited to the size of the cardinal teeth: "Cardinals very unequal, the right anterior and left posterior being obscure". If the two genera *Dinocardia* and *Cerastoderma* (which Stewart considered as "probably close to the Cardiinae") are excluded, the original composition of the subfamily is reduced to two genera: *Trachycardium* and *Acrosterigma*.

The genus *Trachycardium*, represented by numerous well-studied American fossil and Recent species, was divided by Stewart into five subgenera, taxa still valid and in current use. On the other hand, Stewart hesitated to give generic status to *Acrosterigma* (comprising, at that time, some fossils and two living species, all American), because he could not see any difference in the hinges, comparative to *Trachycardium*. As far as Indo-Pacific species are concerned, Stewart admitted being unable to place them in any genus, and left this question open. It must be recognized that, at that time, Indo-Pacific species were far less well known than the American species.

Iredale (1927: 75) had already created the genus *Vasticardium* for the Indo-Pacific species, based mainly on geographical considerations; this action did not bring anything new to the problem, nor did the new genus *Regozara* introduced by him in 1936 (p. 275).

Keen (1969) at first grouped the Indo-Pacific Trachycardiinae in the genus *Acrosterigma* (subgenera *Regozara* and *Vasticardium*), then (1980) in two genera *Acrosterigma* and *Vasticardium*. However, her criteria taken into account for the definition of these taxa were unclear and unconvincing, and few authors followed these proposals. The majority of subsequent authors grouped

the Indo-Pacific species, sometimes seemingly more or less randomly, in the genus-groups *Trachycardium*, *Acrosterigma*, *Vasticardium* and *Regozara*, without accurate criteria of definition. This situation has recently been summarized by Olivet & Chesney (1997: 65), who stated: "The generic subdivisions of the Trachycatdiinae have always been debated and there is little consistency in their use". Several other authors have also admitted that the generic taxonomy for this group is unsatisfactory, for example Maxwell (1978: 20) who wrote "Interrelationships of the various genus-group taxa that have been proposed in the Trachycardiinae are far from clear".

Wilson & Stevenson (1977: 74) noted that "the shell characters on which the current classification of the subfamily Trachycardiinae is based, are unsatisfactory". They, however, made a fundamental observation: that Indo-Pacific Trachycardiinae as well as the American *Acrosterigma* have cardinal teeth separated in the right valve (Fig. 1D, F), while these teeth are fused together in the American *Trachycardium* species (Fig. 1A). They, therefore, recognize two genera in the Trachycardiinae: *Trachycardium* s.s. (same as Stewart) and *Acrosterigma* including the original American species and all the Indo-Pacific Trachycardiinae. Wilson & Stevenson treated the genus *Vasticardium* as a synonym of *Acrosterigma*, although they make another interesting observation (1977: 77): "We have observed one sculptural character of possible generic significance: in the smaller Australian species [six species cited], the South-East Asian species *arenicolum* and the Japanese species *burchardi*, the posterior ribs are divided down their centres [...while...] in other species the ribs are simple". Thus, these authors demonstrated one of the main criteria for separating *Acrosterigma* from *Vasticardium* in the Indo-Pacific.

The former group is also distinguishable by other characters, as already noted by Powell (1958: 76): "These shells [*arenicola-cygnorum* group], plus several other Indo-Pacific species, differ from the massive *Trachycardium* and *Vasticardium* in their lighter build, smaller size and acute flattened beaks, but they are here retained in *Vasticardium*, pending a better understanding of the tropical Pacific species".

This "better undetstanding" required a general study as detailed as possible of the Trachycardiinae *sensu* Keen, particularly of these from the Indo-Pacific. I have undertaken, in several previous papers and in this article, to present this study, confirming that the Recent Indo-Pacific Trachycardiinae can be distributed between two genetic groups: (1) the group already separated by Powell, and Wilson & Stevenson, which has numerous affinities with the American *Acrosterigma*; (2) the generic group *Vasticardium*, having different characters.

MATERIAL AND METHODS

The material comes from the following museums:

AMS	Australian Museum, Sydney;
ANSP	Academy of Natural Sciences, Philadelphia;
AIM	Auckland Institute and Museum, Auckland;
BPBM	Bernice P. Bishop Museum, Honolulu;
BMNH	The Natural History Museum, London;
IRSNB	Institut royal des Sciences naturelles de Belgique, Bruxelles;
LACM	Los Angeles County Museum of Natural History, Los Angeles;
Natal Museum	Pietermaritzburg;
MHNG	Muséum d'Histoire naturelle de Genève, Geneva;
MNHN	Muséum national d'Histoire naturelle, Paris;
MNZ	Museum of New Zealand Te Papa Tongarewa, Wellington;
NHMW	Naturhistorisches Museum, Vienna;
QM	Queensland Museum, Brisbane;
RMNH	Nationaal Natuurhistorisch Museum, Leiden;
UGML	University of Guam Marine Laboratory, Mangilao, Guam;
UMZ	University Museum of Zoology, Cambridge;
USNM	National Museum of Natural History, Washington D.C;

UUZM	University Zoological Museum, Uppsala;
WAM	Western Australian Museum, Perth;
ZMA	Zoologisch Museum, Amsterdam;
ZMUC	Zoologisk Museum, Copenhagen;

American fossil material has been examined in ANSP and USNM (about sixty specimens of twenty-four nominal species and subspecies, including nineteen holotypes). Data on the Australian and New Zealand fossils were mainly derived from the literature. Unfortunately investigation of the other Indo-Pacific fossils was more difficult, because of the poorer quality of material and descriptions, and the difficulty or impossibility of examining specimens. Accordingly, only a few hypothetical suggestions have been made about this field for the present.

As far as methods of identification of taxa, specific and even generic, are concerned, detailed rib morphology plays a prominent part in the analysis of the concerned genera. I have already explained the elaborate character and the importance of this rib morphology in several articles (notably Vidal 1997a).

Measurements of shells concern:

H	height, measured along the median rib;
L	length, measured parallel to the hinge;
W	width [when only one valve is available, the indicated width is extrapollated, and placed in brackets ( )];
Ratio D	measures the asymmetry of the hinge; it is determined by dividing the length of the line from the tip of the umbo to the tip of the posterior lateral by the corresponding distance from the umbo to the tip of the anterior lateral;
Angle A	is formed by two lines joining the laterals to the main cardinal in the right valve, measured by taking a print of the hinge on modelling clay.

In the measurements tables, ≈ means *circa*:

For description of rib morphology and its variations, shells are divided into four "quarters":

PQ	posterior quarter;
MPQ	medio-posterior quarter;
MAQ	medio-anterior quarter;
AQ	anterior quarter;

Longitudinally, shells are divided schematically into two parts, a "juvenile" (or umbonal) part and an "adult" (or marginal) part.

To avoid excessively long descriptions of rib ornamentation some prefixes are used:

retro-	concerning posterior flank or top margin (e.g. retro-tuberculated or retro-crenulated);
pro-	concerning anterior flank or top margin (e.g. pro-ridged or pro-festooned);
bi-	concerning both flanks or top margins, but not the top zone itself (e.g. bi-crenulated);
top-	concerning the top zone of ribs (e.g. top-ridged);
peri-	concerning all the rib, top and flanks (e.g. peri-ridged);

Some terms are used with particular meanings:

crenulated or festooned are applied to the edges, the margins of the top zone of the ribs, while ridged or tuberculated describe the flanks or the top zone of the ribs;

interstices notched means that they are characterized by successive, regularly disposed small holes, grooves, or notches, while striated means sculptured with very fine parallel concentric striae.

To simplify descriptions, "neologisms" are utilized also for some often-used descriptive elements:

Crestal fold	a longitudinal rib, more or less individualized, at the apex of some triangular ribs;
Pseudo-interstice	the posterior scaled part of PQ ribs can disappear on some *Acrosterigma* species, merging into the interstice which becomes enlarged; the rib becomes reduced to the scaleless anterior part;
Sterigma	"support", internal medial rib in the umbonal cavity, more or less high and developed (Fig. 2C);
Sublunule	smooth first part of AQ beside

the lunule, without internal marginal "ribbing".

SYSTEMATICS

Family CARDIIDAE Lamarck, 1809
Subfamily CARDIINAE Lamarck, 1809
Genus *Trachycardium* Mörch, 1853

Trachycardium Mörch, 1853: 34
(introduced as a subgenus of *Cardium*).

TYPE SPECIES. — *Cardium isocardia* Linné, 1758, by subsequent designation (Von Martens, 1870: 586).

DISTRIBUTION. — East and west coasts of tropical America, from Eocene to Recent.

INCLUDED SUBGENERA. — Six subgenera, based on rib morphology:
1) Subgenus *Trachycardium* Mörch, 1853, with four living species [in the Pacific: *T. consors* (Sowerby *in* Broderip & Sowerby, 1833) ; in the Atlantic: *T. isocardia* (Linné, 1758), *T. egmontianum* (Shuttleworth, 1856) and *T. manueli* Prado, 1993], and at least four fossil nominal species.
2) Subgenus *Agnocardia* Stewart, 1930, with at least six fossil nominal species.
3) Subgenus *Phlogocardia* Stewart, 1930, with one living species [*T. belcheri* (Broderip & Sowerby, 1829) in the Pacific, Fig. 1H], and at least four fossil nominal species.
4) Subgenus *Mexicardia* Stewart, 1930, with two (probably synonym) Pacific living species [*T. procerum* (Sowerby *in* Broderip & Sowerby, 1833) and *T. panamense* (Sowerby *in* Broderip & Sowerby, 1833)], and at least two fossil nominal species.
5) Subgenus *Conilocardium* Vokes, 1977, with one fossil species.
6) Subgenus *Dallocardia* Stewart, 1930, with three living species [in the Pacific: *T. senticosum* (Sowerby *in* Broderip & Sowerby, 1833) and *T. quadragenarium* (Conrad, 1837) ; in the Atlantic: *T. muricatum* (Linné, 1758), Fig. 1I], and at least nine fossil nominal species.

REMARKS

Some authors have treated some of the above subgenera as genera.

Most of *Trachycardium* species have an elongated ovoid shape. However, some individuals in certain species, particularly in the subgenus *Dallocardia*, lose this characteristic, acquiring a length equivalent to or even slightly greater than the height (for example, *Trachycardium quadragenarium* can have L/H up to 1.10).

The genus *Trachycardium*, as defined above, is considered here as exclusively American. As far as fossils are concerned, I think that this genus was erroneously utilized for groups of species from outside America, for example in the Upper Cretaceous of India, the Paleocene and Lower Eocene of Europe, the Neogene of the Pacific.

On the other hand some species from outside America, placed or not in the genus *Trachycardium*, share numerous characters with some species of this genus, particularly of the subgenus *Dallocardia*:
1) That is the case of the West African species *Cardium serrulatum* Deshayes, 1855 and *Cardium caparti* Nicklès, 1955.
2) The European Neogene *Cardium multicostatum* Brocchi, 1843 is quasi identical to the Miocene subspecies *Trachycardium* (*Dallocardia*) *dominicense hadriaticum* Woodring, 1982 (type series USNM 647469 and 647470). Brocchi (1843: 313) wrote: "*Tanta è la conformità che ha questo cardio* [C. multicostatum] *col* muricatum *di Linneo, che io fui da principio tentato di risguardarlo come una simplice varietà di esso*". Some authors have placed Brocchi's species and several related taxa in *Trachycardium*, e.g. Sacco (1899: 41) who cited *Trachycardium multicostatum* (Brocchi); Cossmann & Peyrot (1912: 473) who cited *Cardium* (*Trachycardium*) *multicostatum* (Brocchi); Rossi Ronchetti (1952: 70) who cited *Laevicardium* (*Trachycardium*) *multicostatum* (Brocchi). Popov (1977) placed *C. multicostatum*, together with three others, in a new subgenus *Europicardium* Popov, 1977. Von Cosel (pers. comm.) considers that this taxon is worthy of genus status, placing in it the two above West African species, *Europicardium serrulatum* and *E. caparti*.
3) The Indo-Pacific *Vepricardium* species also share several characteristics of some *Dallocardia* (and *Europicardium*) species, including shape, lunula, hinge, rib ornamentation, presence of pustules, etc. Conrad (1837: 230) described *C. quadragenarium* as being "allied to *C. asiaticum*", a common Indo-Pacific *Vepricardium* species, and Sacco (1899: 41) stated that *T. multicostatum* has affinities with *T. muricatum*

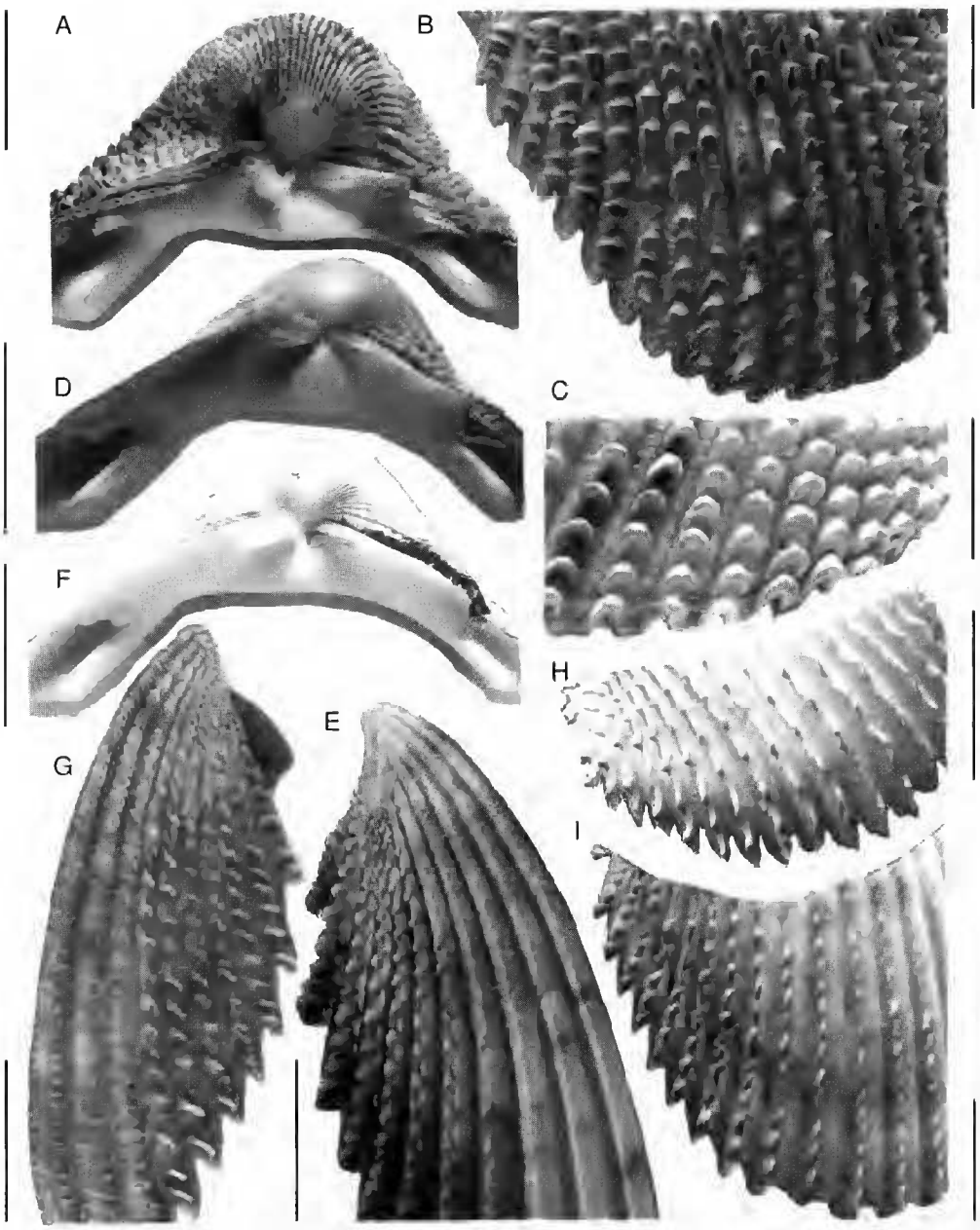

FIG. 1. — **A-C**, *Trachycardium isocardia*, right valve from Martinique, MNHN; **A**, right hinge; **B**, partial view of PQ and MPQ; **C**, detail of AQ ornamentation: "horseshoe" scales; **D**, **E**, *Acrosterigma magnum*, right valve from Martinique, MNHN; **D**, right hinge; **E**, View of PQ and three ribs of MPQ (on right); **F**, *Vasticardium elongatum*, hinge of a right valve from Phuket, MNHN; **G**, *Vasticardium assimile*, a left valve from Al Fintas, Kuwait, Persian Gulf, MNHN; view of PQ and three ribs of MPQ (on left); **H**, *Trachycardium belcheri*, a right valve from Coiba Island, Panama, MNHN; partial view of PQ and MPQ; **I**, *Trachycardium muricatum*, a right valve from Antilles, MNHN; partial view of PQ and MPQ. Scale bars: 10 mm.

TABLE 1. — Comparative diagnosis of the genus *Trachycardium* with both genera *Vasticardium* and *Acrosterigma*.

Genus *Trachycardium*	Genera *Vasticardium, Acrosterigma*
Shell higher than long, subovate to elliptical, attenuate towards umbones; often asymmetrical with anterior part dorsally raised and posterior receding but obliquely more expanded and with more or less marked truncation. Ribs often curved backwards in projection, with weak or absent posterior angulation.	Same diagnosis
Hinge short, usually less than half the length of the shell.	Hinge generally short.
Cardinal area wide and moderately curved (Angle A between 140° and 160°).	Cardinal area of variable width curved (Angle A between 85° and 140°).
Teeth strong, although cardinals are very unequal, right anterior and left posterior being obscure. Cardinals in right valve connected by a high dorsal saddle (Fig. 1A).	Teeth often strong; cardinals unequal, right anterior and left posterior being smaller. Cardinals in right valve separa parated or merely touching at their base, no dorsal saddle (Fig. 1D, F)
Ribs always high and strong, essentially ornated on posterior flank.	Ribs variable, sometimes low and weakly marked, mainly ornated on top or top margins.
PQ not or weakly contrasting with rest of shell (Fig. 1B, H, I).	PQ contrasting with rest (Figs 1E, G, 5F, M), with tubercular (Figs 1E, 5F, 10E) or elongated top scales (Figs 1G, 2J).
On median part of shell, ribs ornated with coma-like scales to laminae, pinned against posterior flank (Fig. 1B, H, I); rib rarely ornamented on anterior part (Fig. 1B); top margins never serrated. On anterior part, ribs often ornated with "horseshoe-like" scales (Fig. 1C), never with transverse ridges.	On median part of shell, ribs ornated with top scales or tubercles, top margins serrations (Fig. 14L) and flank ridges or tubercles, never with posterior laminae. On anterior part, ribs almost always finely transversally ridged, never with "horseshoe-like" scales.

TABLE 2. — Comparative diagnoses of *Vasticardium* and *Acrosterigma*.

Vasticardium	*Acrosterigma*
1. Shell large to medium, rarely small (small = H below 25 mm); one exception.	**1.** Shell medium to small, rarely large (large = H over 80 mm); one exception.
2. Shell not dorsally tapered: angle A always above 125° (one exception), up to 140°	**2.** Shell often dorsally tapered: angle A often below 125°, down to 85° (rarely reaching 135°).
3. No internal umbonal ridge (stengma); two exceptions.	**3.** Several species with an umbonal ridge (sterigma).
4. No internal umbonal V-shaped coloured rays (three exceptions); ventral margin often coloured.	**4.** Umbonal V-shaped coloured rays always present; ventral margin exceptionally coloured.
5. Mean rib number low to medium (28.4-43.5).	**5.** Mean rib number sometimes medium (36.2-40.0), but more often high (44.2-62.8).
6. Ribs generally high and well ornamented.	**6.** Ribs generally low and weakly ornamented.
7. On PQ ribs high, squared, not longitudinally divided, interstices relatively wide (Figs 1G, 2J). Interstices relatively wide with respect to the ribs.	**7.** On PQ ribs low, divided so that each has a smooth anterior part and a scale or nodule bearing posterior part, sepa rated by a furrow wich can encroach into the posterior part between the ornaments (Figs 1E; 2K; 10E). Interstices thin, sometimes confused with above furrows.
8. On juvenile median and anterior parts, ribs enlarge quickly following small smooth very early shell, becoming high, well ornamented and overhanging, interstices in umbonal area. Ribs rather more ornamented on juvenile than on adult parts.	**8.** On juvenile median and anterior parts, ribs appear very gradually following small, smooth very early shell, remaining low, simple and smooth in umbonal area of adults. Ribs much less ornamented on juvenile than on adult parts.
9. Interstices sometimes striated, never hollowed or notched on median and anterior parts.	**9.** Interstices sometimes hollowed or notched, never striated, on median and anterior parts.

TABLE 3. — Statistical data (mean values).

Species	L/H	W/L	D	A	Ribs
Genus *Vasticardium*					
elongatum	0.79	0.77	1.18	125°	37.9
fidele	0.77	0.84	0.95	125°	30.7
papuanum	0.84	0.74	≈1.0	130°	36.9
gortanii (Fos.)	0.78	0.83	1.15	135°	29.8
orbita	0.82	0.82	1.31	130°	42.2
luteomarginatum	0.82	0.80	1.21	135°	32.5
assimile	0.77	0.87	1.20	130°	33.4
rubicundum	0.81	0.84	1.10	135°	36.0
rhegminum	0.83	0.84	0.95	110°	42.2
thomassini	0.82	0.84	≈1.0	135°	43.5
flavum	0.90	0.75	≈1.0	135°	29.0
pectiniforme	0.92	0.71	1.14	130°	30.6
vertebratum	0.83	0.84	1.19	130°	28.4
ornatum	0.88	0.76	1.28	135°	29.0
angulatum	0.86	0.66	≈1.0	125°	32.1
sewelli	0.89	0.78	≈1.0	135°	38.2
Genus *Acrosterigma*					
dalli (Fos.)	0.75	0.68	1.14	105°	35.0
pristipleura	0.77	0.76	1.08	119°	35.0
magnum	0.79	0.76	1.16	123°	33.8
burchardi	0.81	0.67	0.86	106°	42.2
cygnorum	0.90	0.65	1.03	125°	42.6
sorenseni	0.94	0.56	0.91	121°	51.2
kerslakae	0.91	0.69	1.02	124°	40.9
marielae	0.90	0.62	1.13	128°	62.6
abrolhense n. sp.	0.99	0.56	1.00	130°	44.5
variegatum	0.91	0.67	0.84	128°	40.2
oxygonum	0.85	0.70	0.85	117°	38.9
selene n. sp.	0.94	0.66	0.66	122°	36.6
discus n. sp.	0.93	0.60	0.90	120°	56.3
mauritianum	0.89	0.71	0.95	118°	44.1
uniornatum n. sp.	0.83	0.82	1.00	128°	38.2
profundum n. sp.	0.82	0.79	1.03	122°	56.9
amirante n. sp.	0.84	0.82	0.87	130°	53.5
suluanum n. sp.	0.83	0.80	0.95	130°	43.8
paulayi n. sp. (Fos.)	0.86	0.77	1.27	130°	48.7
maculosum	0.84	0.71	1.02	115°	51.7
impolitum	0.85	0.70	1.04	118°	39.5
transcendens	0.87	0.73	0.98	123°	64.4
seurati n. sp.	0.89	0.72	1.03	127°	62.8
dianthinum	0.89	0.69	1.00	125°	46.1
punctolineatum	0.86	0.73	1.04	122°	48.9
hobbsae n. sp.	0.88	0.72	0.86	128°	61.9
simplex	0.85	0.80	1.07	119°	47.6
biradiatum	0.80	0.67	0.98	110°	50.9
attenuatum	0.66	0.68	1.03	88°	56.9

and *T. fimbriatum* (Wood, 1815), another common Indo-Pacific Recent *Vepricardium* species.

4) The Atlantic South American species *Cardium delicatulum* Smith, 1915, with length markedly superior to height (L/H = 1.12 in the holotype), is also to be compared to *Dallocardia*

and *Vepricardium*. Powell (1960: 182) and Castellanos (1970: 231) placed it in the genus *Trachycardium*.
The conclusion of all these remarks is that a progressive variation exists from *Trachycardium* to *Vepricardium*, with intermediate forms represented by *Europicardium* species. Consequently a subfamily break cannot be placed between *Trachycardium* and *Vepricardium*, as in Keen's classification. Accordingly Trachycardiinae is interpreted as a synonym of Cardiinae, a conclusion reached by Kafanov & Popov who placed *Trachycardium* in the Cardiinae (1977: 311). This paper will show that there is a more significant break, without any intermediate form, between *Trachycardium* on the one hand, and *Vasticardium* and *Acrosterigma* on the other. These two latter genera will, however, also be placed in the Cardiinae.

Genus *Vasticardium* Iredale, 1927

Vasticardium Iredale, 1927: 75.

TYPE SPECIES. — *Cardium elongatum* Bruguière, 1789 (by original designarion).

DIAGNOSIS. — See Table 2.

SUBDIVISIONS. — The genus *Vasticardium* is divided here into six species-groups. Further research, including fossil species, might justify treating these species-groups as formal subgenera.

Most species of this genus have already been revised (Vidal, 1991, 1992, 1993, 1996, 1997a, 1997b, 1998). Only a summary is given here, with a short diagnosis of the different species-groups. The important additional lots and localities, observed after the issue of the above papers, are mentioned.

Group of *Vasticardium elongatum*

INCLUDED RECENT SPECIES. — (see Vidal 1992, 1993, 1996 for details):
1) *Vasticardium elongatum* (Bruguière, 1789) [Synonyms: *Cardium enode* Sowerby, 1841a; *Cardium serricostatum* Melvill & Standen, 1899; *Trachycardium okinawaense* Kuroda, 1960; *Trachycardium wilsoni* Voskuil & Onverwagt, 1991].
Six subspecies: *elongatum*; *enode*; *wilsoni*; *indioceanum* (Vidal, 1993); *cipangense* (Vidal, 1993); *coralense* (Vidal, 1993).
2) *Vasticardium fidele* (Vidal, 1992).
3) *Vasticardium papuanum* Vidal, 1996.

FOSSIL SPECIES. — *Vasticardium gortanii* (Nardini, 1937), Pleistocene, Red Sea.

ADDITIONAL DISTRIBUTION DATA. — *V. elongatum* on a beach of E Kmodn, Indonesia (MNHN Vidal 1998). — *V. fidele* in Tuticorin, India (MNHN), in Sri Lanka (AMS C147163), in Phuket (Roussy private coll., MNHN Vidal), in far north of Zululand, South Africa (Natal Museum), in Singapore (MNHN Vidal), in the Philippines (LACM 90013, USNM 230318) and in Wallis and Futuna Territory area (MNHN, MUSORSTOM 7 campaign 1992). — *V. papuanum* in Sibuko Bay, Borneo (USNM 239129).

DIAGNOSIS. — Shells large to very large, markedly elongated, sometimes asymmetrical and expanded backwards; lunule small. Foundation of anterior teeth receding (not "hooked"). On PQ, ribs top-scaled with straight to slightly twisted main scales, and with secondary serrations or scales on both edges of top; elsewhere, ribs high and square-sided, overhanging interstices, tops smooth and bi-crenulated, except on AQ where ribs are top-ridged; interstices smooth (one exceptinn).

Group of *Vasticardium orbita*

INCLUDED RECENT SPECIES. — (see Vidal, 1997a for details):
1) *Vasticardium orbita* (Broderip & Sowerby, 1833) [Synonyms: *Cardium mendanaense* Sowerby, 1897; *Cardium philippinense* Hedley, 1899; *Cardium pseudoangulatum* Bülow, 1905; *Trachycardium hawaiensis* Dall, Bartsch & Rehder, 1938]. Four subspecies: *orbita*; *mendanaense*; *philippinense*; *hawaiensis*.
2) *Vasticardium luteomarginatum* (Voskuil & Onverwagt, 1991) [Synonym: *Trachycardium mareruhrum* Voskuil & Onverwagt, 1991]. Three subspecies: *luteomarginatum*; *mareruhrum*; *insulare* (Vidal, 1997a).

ADDITIONAL DISTRIBUTION DATA. — *V. orbita philippinense* on beaches of NW Lombok, N Sumbawa, E Komodn, Indonesia (MNHN Vidal 1998). — *V. luteomarginatum insulare* in southern Mozambique and northern Zululand (Natal Museum). — *V. papuanum* in Palau (UGML).

DIAGNOSIS. — Shells large to very large, moderately elongated, often posteriorly expanded and "winged"; lunule rather large, with a raised margin. Foundation

of anterior lateral teeth "hooked". On PQ ribs squared, with twisted to conical main scales and possibly secondary lamellar thin scales at their anterior margin. Elsewhere, ribs squared to slightly rounded and bicrenulated, with or without the equivalent of PQ top main scales, ridged and sometimes "herringboned" on anterior part of shell. Interstices strongly striated.

Group of *Vasticardium assimile*

INCLUDED RECENT SPECIES. — (see Vidal 1998 for details):
1) *Vasticardium assimile* (Reeve, 1844) [Synonym: *Cardium lacunosum* Reeve, 1844]. Two subspecies: *assimile* and *lacunosum*.
2) *Vasticardium rubicundum* (Reeve, 1844) [Synonyms: *Cardium mindanense* Reeve, 1844; *Vasticardium compunctum* Kira, 1959; *Acrosterigma kengaluorum* Voskuil & Onverwagt, 1992].
3) *Vasticardium rhegminum* (Olivet & Chesney, 1997).
4) *Vasticardium thomassini* Vidal, 1998.

ADDITIONAL DISTRIBUTION DATA. — *V. rubicundum* on beaches of NW Lombok, Indonesia (MNHN Vidal 1989). — *V. thomassini* abondant off far north coast of Zululand, South Africa, 45-78 m (Natal Museum).

DIAGNOSIS. — Shells medium, rarely large, aboot equilateral and variably elongated. Foondation of lateral teeth almost "hooked". On PQ, ribs low, with sharp anterior edges: there are top tubercles or scales but no secondary lateral scales or serrations. Elsewhere, ribs high and square-sided, slightly top-scaled or ridged, sometimes herringboned, with serrated edges and often beaded or ridged flanks. Shells tend to be brightly coloured, but lusterless.

REMARKS

This species-group is the closest to *Acrosterigma*, in characters such as: possible sterigma, double umbonal coloured ray, curved hinge, flattish and rarely divided ribs on PQ, with no secondary marginal ornamentation.

Group of *Vasticardium flavum*

Regozara Iredale, 1936

INCLUDED RECENT SPECIES. — (see Vidal 1997b for details):
1) *Vasticardium flavum* (Linné, 1758) [Synonyms: *Cardium fucatum* Spengler, 1799; *Cardium subrugosum* Sowerby, 1838; *Cardium dupuchense* Reeve, 1845; *Cardium gratiosum* Deshayes, 1855; *Cardium tumidum* Deshayes, 1855]. Three subspecies: *flavum*; *subrugosum*; *dupuchense*.
2) *Vasticardium pecitiniforme* (Born, 1780) [Synonyms: *Cardium regulare* Brugoière, 1789; *Cardium rugosum* Lamarck, 1819; *Trachycardium peregrinum* Jousseaume, 1888; *Vasticardium nigropunctatum* Habe & Kosuge, 1966].
3) *Vasticardium vertebratum* (Jonas, 1844) [Synonyms: *Cardium reeveanum* Dunker, 1852; *Regozara olivifer* Iredale, 1936].
4) *Vasticardium ornatum* (Sowerby, 1877) [Synonyms: *Cardium fultoni* Sowerby, 1916; *Acrosterigma sowerbyorum* Voskuil & Onverwagt, 1992].

ADDITIONAL DISTRIBUTION DATA. — *V. vertebratum in* Java: 5°41,5'S, 105°37'E (ZMUC).

DIAGNOSIS. — Shells medium-sized, often symmetrical, sometimes slightly expanded posteriorly, but little elongated; lunule variable in width and depth. On PQ, ribs squared with major slightly oblique top scales and secondary small scales or serrations on both edges (see Fig. 2J). Elsewhere, ribs rounded to trapezoidal; they may be peri-ridged, with top ridges that may have a crushed appearance, or ridges may be limited to sides of ribs. Interstices striated.

Group of *Vasticardium angulatum*

INCLUDED RECENT SPECIES. — (see Vidal 1991 for details):
1) *Vasticardium angulatum* (Lamarck, 1819) [Synonym: *Cardium alternatum* Sowerby, 1840]. This species is distinguishable from all other Recent *Vasticardium* and *Acrosterigma* species by its gaping valves; triangular ribs are also rather uncommon in *Vasticardium* species.

DIAGNOSIS. — Shells large, obliquely ovoid, very asymmetrical, and gaping anteriorly and posteriorly; lunule very small. On PQ, ribs triangular; top-scales a little twisted and almost radially disposed, with no secondary scales. On MPQ, ribs triangular and retro-ridged, becoming rounded and top-ridged on anterior part of shell. Interstices smooth with a rounded regular riblet.

Group of *Vasticardium sewelli*

INCLUDED RECENT SPECIES. — (see Ter Poorten 1997 for details).
1) *Vasticardium sewelli* (Prashad, 1932) [Synonym: *Cardium laddi* Abrard, 1946, an Upper Miocene fossil from Epi Island (Vanuatu)]. The single species of this group has a very distinctive rib morphology: the top curved scales resemble those of *Trachycardium isocardia* (but not forming laminae pinned against posterior flank of ribs), and the top and latetal ornaments of the

TABLE 4. — Comparative diagnoses of the species-groups of *Acrosterigma dalli*, *A. cygnorum* and *A. variegatum*.

	***A. dalli* species-group**	***A. cygnorum* species-group**	***A. variegatum* species-group**
Dimensions shape	Medium to large. Somewhat elongated, pointed, ovoid and equilateral (one exception).	Small to medium. Little elongated; moderately pointed, slightly inequilateral (often bi-straightened posteriorly).	Medium; slightly elongated and pointed; symmetry variable.
Lunule	Little marked.	Well-marked, slightly depressed on both sides.	Well marked, often depressed in one or both sides.
Hinge and interior	Hinge variably asymmetrical; markedly angled (A 105°-123°). A sterigma in one species in addition to genotype.	Hinge symmetrical; moderately angled (A 121-130). A sterigma present in two species	Hinge asymmetrical (D 0.66-0.95); moderately angled (A 117°-128°). A sterigma in one species.
PQ rib morphology	Anterior part of ribs wide, posterior very reduced; scales small, irregular to nearly triangular, almost longitudinally disposed, somewhat connected.	Both parts of ribs of equivalent width; scales elongated to "herringboned", slightly irregular, slightly connected together.	Both parts of ribs of variable width; oblique scales with regular elongated ovoid shape, not connected together.
Last ribs of MPQ	Flatly rounded, smooth to slightly retro-tuberculated.	Rounded to subtriangular, retro-ridged.	Triangular with a crestal fold, smooth to retro-ridged.
Median part of shell	Ribs low, flat, bicrenulated, overhanging thin interstices.	Ribs variable: flat-rounded to squared, bi-tuberculated, becoming top-ridged.	Ribs variably triangular to rounded, often finely retro-ridged (one exception).
AQ rib morphology	Same flat ribs as above, may or may not become top-ridged.	Same ribs as above, becoming top-ridged.	Same ribs as above, becoming top-ridged.
First ribs of AQ near lunule	First one or two ribs widen, swell, loosing ornaments.	No change of ribs; clearly defined limit with lunule.	No change of ribs (one exception).

ribs are typical of *Vasticardium* (Fig. 14L), as is the hinge.

ADDITIONAL DISTRIBUTION DATA. — Phuket (coll. Roussy). — Guam, Hapra Harbour (USNM 849694), Oca Point (USNM 851281). — Santo, Vanuatu (USNM 769249).

DIAGNOSIS. — Shells medium-sized, little elongated, and almost equilateral. Foundation of lateral teeth receding. Ribs high, rounded to square-sided, and regularly ornamented over entire shell on top of ribs with thin, slightly oblique, curved to U-shaped scales longer on the posterior side of ribs, becoming spatuliform on anterior part of shell. In addition to these top ornaments, ribs in juvenile shells serrated or finely ridged on both sides. Interstices finely striated.

Other fossil species (not assigned to species-groups)

According to literature data, several fossil forms from West-Indonesia and Burma seem to be close to *Vasticardium*, for example:

Cardium subalternatum Jenkins, 1864: 60, pl. 7, fig. 7A, B. Miocene of Java. Compared by its author with *C. alternatum*.

Cardium protosubrugosum Noetling, 1901: 179, pl. 10, figs 10-11. Miocene of Burma. Compared by Pannekoek (1936: 71) with *spolongense* and *sedanense*.

Cardium (*Trachycardium*) *spolongense* Martin,

TABLE 5. — Comparative diagnoses of the secies-groups of *Acrosterigma uniornatum*, *A. maculosum* and *A. biradiatum*.

	***A. uniornatum* species-group**	***A. maculosum* species-group**	***A. biradiatum* species-group**
Dimensions Shape	Small to medium; little elongated, moderately pointed; ovoid and equilateral; rather tumid.	Medium, rather elongated and pointed, variably inequilateral (often bi- or tri-straightened posteriorly)	Medium; variably elongated and pointed; often inequilateral (bi- rarely tri-straightened).
Lunule	Well marked and delineated, slightly hollowed.	Generally small and not depressed; poorly delineated.	Small to hardly marked; confused with sublunule.
Hinge and interior	Rather symmetrical, moderately angled (A 122°-130°); cardinals slightly connected in right valve. No sterigma.	Hinge symmetrical, angled (A 115°-128°). A sterigma in type species.	Nearly symmetrical; markedly angled (A 88°-110°). A sterigma in both species.
PQ rib morphology	Anterior smooth part variable; long, thin scales regularly obliquely placed, not connected, encroaching upon anterior part.	Both parts of ribs more or less equivalent; scales variable, rather tubercular and irregular, separated.	Bipartition of ribs with scales only on juveniles; in adults ribs smoothed but distinct, with wide pseudo-interstices; two last ribs remain prominent.
Last ribs of MPQ	Ribs low, flatly triangular; same scales as on PQ, disappearing or not.	Flatly rounded to subtriangular, retro-ridged	Very low but always marked, wider than those more anterior.
Median part of shell	Ribs variable, becoming retro-ridged, and finely pro-ridged (two species).	Same as above, but somewhat retrocrenulated.	Ribs very low, close-set, marked and retro-ridged, or only visible by colours.
AQ rib morphology	Same ribs becoming peri-ridged, sometimes herring-boned.	Same ribs as above, becoming top-ridged. Concentric alignments or ridges.	one third as above, one third with few distinct ribs and striae; first third as below. Concentric ridges.
First ribs of AQ near lunule	Become slightly tubercular; clear limit with lunule.	First ribs degenerate; top ridges become tubercular; concentric features appear.	Smooth sublunule in about third of AQ: no ribs, no marginal internal crenulations

1916: 266, pl. 4, figs 107-109. Lower Miocene of Java. Shape and ribbing seem typical of *Vasticardium*.

Cardium (*Eucardium*) *talahabense* Martin, 1922: 484, pl. 61, fig. 105, A. Lower Miocene of Java. Shape and ribbing seem typical of *Vasticardium*.

Cardium (*Trachycardium*) *sedanense* Pannekoek, 1936: 72, pl. 4, fig. 51, A. Lower Miocene of Java. Elongated shape, strong rib sculpture; compared with *spolongense* by its author.

Cardium (*Acanthocardia*) *denticostulatum* Beets, 1941: 163, pl. 8, figs 319-326. Upper Miocene of Borneo. Compared with *lacunosum*, *flavum*, *elongatum*, *fultoni* by its author.

In addition to these exclusively fossil species, some living species are also cited from the Neogene, for example, by Martin, *C. elongatum* and *C. rugosum* (1883: 245-246) and *C. dupuchnesse* [*sic*] (1879: 106), in the "Tertiary Schists of Java".

Genus *Acrosterigma* Dall, 1900

Acrosterigma Dall, 1900b: 1073, 1090, introduced as a section of subgenus *Trachycardium*, genus *Cardium*; only one species is cited by this author.

TYPE SPECIES. — *Cardium dalli* Heilprin, 1887 (by original designation: 131, fig. 70).

FOSSIL RECORDS. — There are no records of fossils of *Acrosterigma* species before the Miocene. The genus *Trachycardium* is geologically older, already represented in the Oligocene and possibly Eocene of America. Several fossil American *Acrosterigma* species have been described (see below). Some Australian fossil species undoubtedly belong here (see below). Less certainly, some Japanese fossil species may also belong here, for example:
Cardium tokyoensis Tokunaga, 1906: 51, pl. 3, fig. 12A, A'. Pliocene of Tokyo. Compared to *Acrosterigma burchardi* by its author, but said to be closer to *Acrosterigma unicolor*.
Vasticardium otukai Hatai & Nisiyama, 1952: 35. Previously described as *Cardium burchardi* Yokoyama, 1925: 120, pl. 14, fig. 9, from the Oligocene Ogano Formation and cited by Yokoyama (1926: 134, pl.19, figs 3; 4) from the Miocene Kanomatazarawa Formation.
Vasticardium kantoense Kanno, 1958: 176, pl. 2, fig. 4A, B. From Nagura Formation (Lower Miocene). Described as closely related to *V. arenicola*.
Vasticardium arenicoloides Akutsu, 1964: 284, pl. 59, figs 6; 7. Miocene of south and central Japan. Compared to *arenicola* and *burchardi* by its author.
Trachycardium burchardi and *T. unicolor* are also cited as Neogene fossils from Taiwan (Gu Zhi-wei *et al.* 1976: 70).
In Europe, *Cardium* (*Trachyrardium*) *fraternum* Mayer, 1864: 356, from the Lower Miocene of southwest France, probably belongs to the genus *Acrosterigma*, according to the description and figures of Cosmann & Peyrot (1912: 502, pl. 22, figs 34 and 38-42); it is the same for *C. proecedens* Mayer, 1858, Oligocene, same area.

DIAGNOSIS. — See Table 2.

SUBDIVISIONS. — The genus *Acrosterigma* is subdivided here into six species-groups. Further research, including fossil species, might justify treating these species-groups as formal subgenera.

Species-group of *Acrosterigma dalli* (Heilprin, 1877)

INCLUDED SPECIES. — 1) Living species: *A. pristipleura* (American Pacific); *A. magnum* (American Atlantic); *A. burchardi* (Japan).
2) American fossil species: No synthetic study has ever been done on this group of shells. Having examined almost all the American type material in ANSP and USNM, I will limit myself to mentioning the published nominal species:
A. dalli (Heilprin, 1887), from Caloosahatchie Formation, Florida. Pliocene.
A. hoerleinum Vokes, 1977, from Chipola Formation, Florida. Miocene.
A. incanspicuum (Guppy, 1866), from Bowden, Jamaica. Miocene (see Woodring, 1925).
A. watlandi (Woodring, 1925), from Bowden, Jamaica. Miocene.
A. linguatigris (Maury, 1917), from Cercado and Gurabo Formations, Dominican Republic. Neogene (see Vokes, 1989).
A. declive (Gabb, 1881), from Costa Rica. Pliocene.

DIAGNOSIS. — See Table 4.

REMARKS
Cardium dalli is by far the largest of all the *Acrosterigma* species, reaching a height of 137 mm. Many specimens have an internal elevated medial rib, radiating from the umbonal cavity (Fig. 2C), from which the name *Acrosterigma* [= umbonal support] stems. But this "sterigma" is rather inconstant in the present species and has never been found in any specimen of the other American fossil species of the genus, nor in the two living American species. For this reason it has been considered as of no systematic value by several authors. Nevertheless it is present, in rather attenuated form, in several living Indo-West Pacific *Acrosterigma* species.
Acrosterigma dalli (Fig. 2A-C) is very close to *A. pristipleura* (Fig. 2D, E)) from which it differs by its larger size, more flattened posterior part, wider first ribs beside the lunule, more rounded ribs, and wider interstices.

Acrosterigma pristipleura (Dall, 1900) (Fig. 2D, E; Table 6)

Cardium (Trachycardium) pristipleura Dall, 1900a: 389.
Cardium maculosum Sowerby *in* Broderip & Sowerby, 1833: 85; Sowerby, 1834, fig. 18. Not *C. maculosum* Wood, 1815.
Cardium maculatum Sowerby, 1841b: 4. Not *C. maculatum* Gmelin, 1791: 3255 [= *Cardium robustum* Solander, 1786]. *Nomen novum* for *C. maculosum* Sowerby.
Cardium bornelli Tomlin, 1928: 194. *Nomen novum* for *C. maculatum* Sowerby.

TYPES. — *Cardium pristipleura*: types not traced.
Cardium maculosum Sowerby: three shells in BMNH, Cuming collection, from Tres Marias Islands, Mexico. The smallest two fit the figure and the dimensions given by Sowerby, and Reeve's figure (1844: fig. 58). The largest was selected as lectotype of *Cardium maculosum* Sowerby by Vaskuil & Onverwagt (1991: 68, pl. 3, fig. 5) and registered BMNH 1991.043/1.

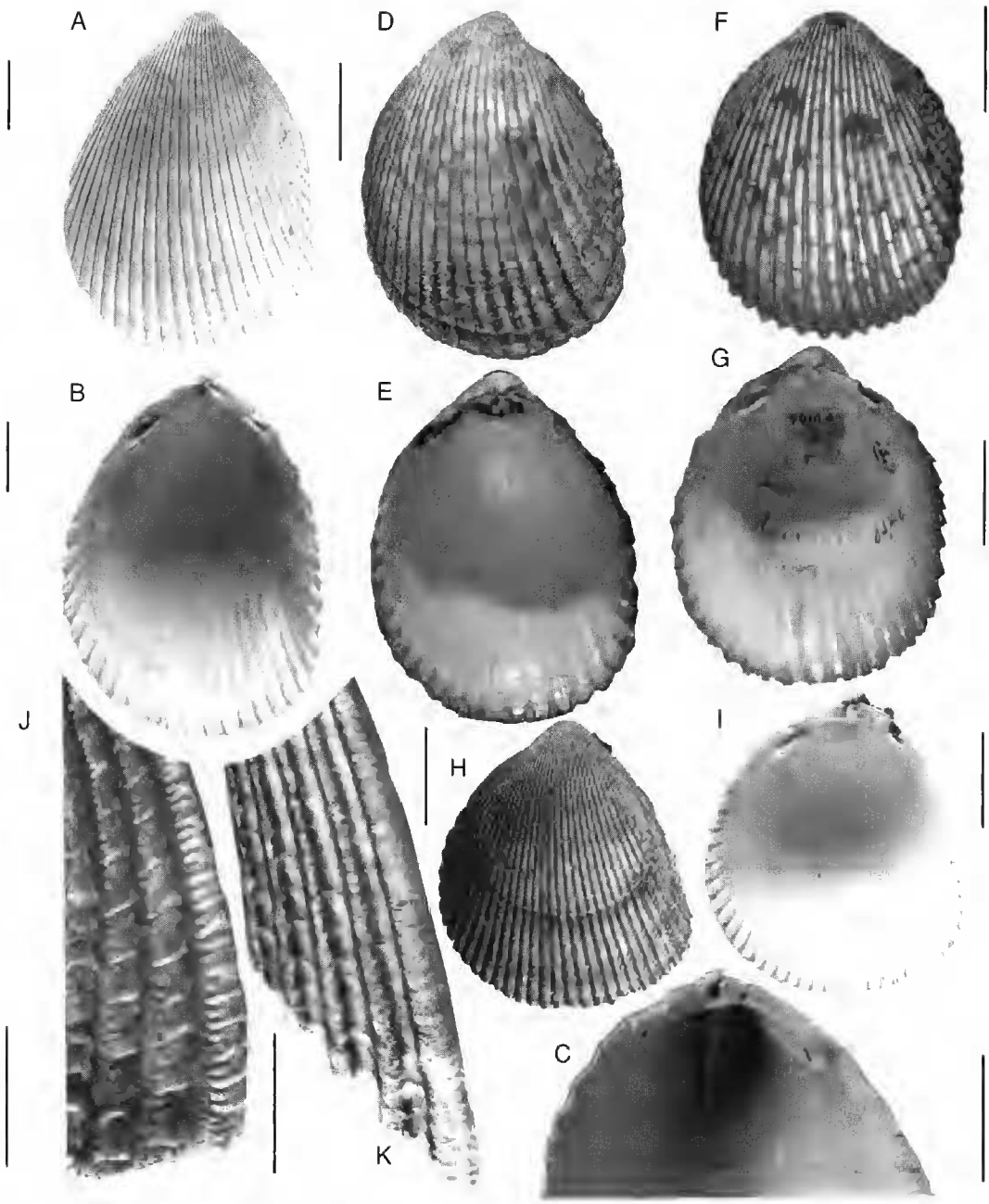

FIG. 2. — **A-C**, *Acrosterigma dalli*, specimen from La Belle, Hendry Cty, Florida, MNHN, H. E. Vokes gift; dimensions: 109.1 × 71.7 × 55.6 mm, with 34 ribs; **C**, umbonal cavity with a sterigma; **D**, **E**, *Acrosterigma pristipleura*, lectotype of *Cardium maculosum* Sowerby; **F**, **G**, *Acrosterigma leucostoma*; lectotype, neotype of *Cardium magnum* Linné; **H**, **I**, *Acrosterigma burchardi*, specimen from Kyushu, Japan, MNHN; **J**, *Vasticardium pectiniforme*, specimen from Noumea, New-Caledonia, MNHN, detail of PQ and first rib of MPQ; **K**, *Acrosterigma cygnorum*, specimen from Revesly Island, South Australia; detail of PQ and first rib of MPQ. Scale bars: A, B, D-I, 20 mm; C, 25 mm; J, K, 5 mm.

TABLE 6. — Measurements (in mm) and rib count of *Acrosterigma pristipleura* (Dall, 1900).

	H	L	W	L/H	W/L	D	A°	Ribs
Lectotype *maculosum* Sow.	70.3	53.6	44.0	0.76	0.82	1.06	120	31
Syntype *idem*	64.0	48.7	36.8	0.76	0.76			36
Syntype *idem*	63.3	51.0	39.0	0.81	0.76			33
MNHN, Monterey?	50.5	41.0	31.1	0.81	0.76	?	125	34
MNHN, off Coiba	52.0	41.1	33.4	0.79	0.81	0.98	120	36
LACM 129-34	73.0	57.0	(40.0)	0.78	0.70		120	38
LACM 86-29	59.0	44.2	(36.4)	0.75	0.82	1.14		34
LACM 50904	84.6	64.7	(46.0)	0.76	0.71		115	34
LACM 50904	87.3	66.3	(47.4)	0.76	0.71	≈1.0		35
Total adult shells measured and rib counts				17	12	6	11	23
General mean values				0.77	0.76	1.08	119	35.0
Standard deviation				0.03	0.04	0.08	3.7	2.1
Largest specimen observed, LACM 50904 (see above).								

MATERIAL EXAMINED. — The following lots in addition to the above cited type material:
Mexico. Gulf of California (USNM 152227). — Bahia Magdalena, 18 m (LACM 129-34). — Tres Marias Islands (LACM 38-4). — Barra de Navidad (LACM 68-41). — Socorro Island, 26-33 m (LACM 129-34).. — Clarion Island (LACM 38-10). — Acapulco (MNHN Dutailly 1850).
Costa Rica. Golfo de Papaguayo (LACM 86-29, 1986). — Cano Island (LACM 72-63, 1972).
Panama. Afuera Island (MNHN Vidal). — Coiba Island (MNHN Vidal).
Ecuador. Playas de Atacames (Esmeraldas) (MNHN Hoffstetter 1956). — Manta (MNHN Hoffstetter 1956).
Dubious and wrong localities. Monterey, California (MNHN du Petit Thouars 1839). — Philippines (LACM 50904 Burch).

DISTRIBUTION. — Southern portion of Gulf of California to Ecuador; approximately from northern tropics to equator, extending along about 3800 km of coasts.

DESCRIPTION

Shells medium to (rarely) large, ovoid to "pear-shaped", rarely elliptical, and equilateral with possible weak truncation on posterior margin. Always elongated in adult stage: mean L/H = 0.77 (range 0.70-0.84); width rather variable, mean W/L = 0.76 (range 0,70-0.82). Ribs straight or slightly curved in projection. Lunular area rather large.
Exterior well-coloured, with orange, pink, brown and/or purple; interior white, with posterior margin generally orange and ventral and anterior margins purple. Hinge line moderately arched in adults, mean < A = 119° (range 115°-125°) and symmetrical (ratio D close to 1). No sterigma observed.
Mean rib number 35,0 (range 31-41).
Rib morphology: on PQ anterior part of ribs wide, posterior reduced with very small scales. On median part of shell, ribs low, flat, overhanging thin interstices; bottom of interstices on juvenile shells regularly notched by elongated or crescent-shaped notches, which continue on lower sides of ribs; contact between interstices and ribs marked, on both sides, by a very thin longitudinal depressed line. As in *A. magnum* (see below), the last rib of MPQ, mainly on right valve, can bear a longitudinal gash on its anterior part.

REMARKS

Acrosterigma pristipleura conforms with the species-group diagnosis as far as rib morphology is concerned, and is very close to the genotype *A. dulli*, in that its ribs are "flattened and peculiarly approximated, interstices, deep narrow cuts" (Reeve 1844, Sp. 58). *Acrosterigma pristipleura*, when adult, is easily distinguishable from *A. magnum*, the other living representative of the species-group in the Americas, mainly by its flat low ribs and very thin interstices. It is a rather uncommon species, little cited in the literature.

TABLE 7. — Measurements (in mm) and rib count of *Acrosterigma magnum* (Linné, 1758).

	H	L	W	L/H	W/L	D	A°	Ribs
Lectotype *leucostoma*	64.2	51.8	38.6	0.81	0.75	1.18	120	33
Lectotype *marmoreum*	57.6	47.0	38.0	0.82	0.81	1.29	125	34
Possible syntype *subelongatum*	73.0	55.0	44.0	0.75	0.80	1.12	125	33
MNHN, Lamarck coll.	73.0	61.2	47.1	0.84	0.77	1.18	125	33
MNHN, Calypso stn 28	62.6	48.0	34.5	0.77	0.72	1.06	120	32
MNHN, Guadeloupe	66.3	50.0	39.5	0.75	0.79	1.13	130	31
MNHN, Salvador, Brazil	61.6	46.2	35.0	0.75	0.76	1.26	120	33
MNHN, Panama	44.2	35.7	28.8	0.81	0.81	1.28	130	37
MNHN, Antilles	45.0	36.8	27.2	0.82	0.74	1.16	130	35
MNHN, Les Saintes	64.0	49.3	40.0	0.84	0.77	1.27	125	32
Total adult shells measured and rib counts				30	29	25	21	35
General mean values				0.79	0.76	1.16	123	33.8
Standard deviation				0.03	0.03	0.08	4.5	1.9
Largest specimen in literature, Clench & Smith (1944: 6), 87 × 67 × 46								

Acrosterigma magnum (Linné, 1758)
(Figs 1D, E; 2F, G; Table 7)

Cardium magnum Linné, 1758: 680.
Cardium leucostoma Born, 1780: 46, pl. 3, figs 6-7.
Cardium marmoreum Lamarck, 1819: 9 [var [2] excluded].
Cardium subelongatum Sowerby, 1841a: 108.
Selected references: *Cardium magnum* Linné – Gmelin 1791: 3250 [reference Beta only].
Wood 1815, 1: 221, pl. 53, fig. 3.
Trachycardium (*Acrosterigma*) *magnum* (Linné) – Clench & Smith 1944: 5, pl. 4, figs 1-2.
Not *Cardium magnum* Linné – Born 1780 : 46, pl. 2, fig.5. [= *C. robustum* Solander, 1786] – Chemnitz 1782 : 196, pl. 19, fig. 191 [= *C. angulatum* Lamarck, 1819] – Bruguière 1789 : 229 [= *C. elongatum* Bruguière, 1789].
Not *Cardium leucostoma* Born – Reeve 1845, Sp. 47, pl. 13, fig. 47 [= *Vasticardium luteomarginatum* (Voskuil & Onverwagt, 1991)].
Not *Cardium marmoreum* var. [2] Lamarck, 1819: 9 [= *Vasticardium luteomarginatum* (Voskuil & Onverwagt, 1991)].

TYPES. — *Cardium leucostoma* Born, 1780 is the oldest well-identified and unquestionable name of the species in question here, stabilized by two syntypes:
1) The shell figured by Lister (1685, pl. 331, fig. 168), from Jamaica, which is not traced;
2) a shell from Queen Maria Theresia's collection, figured by Born 1780, pl. 3, figs 6; 7, now in NHMV, Reg. No. 857a (Fig. 2F, G). Born stated only that this species "lives in America, according Lister"; figured as lectotype of *Cardium leucostoma* Born by Voskuil & Onverwagt (1991, pl. 3, fig. 2). As noted below, this will also be the neotype of *C. magnum* Linné.

Cardium magnum: remains an enigmatic name. It is probable that the species so named belongs to the group of the elongated cockles [qualified as "oblong" by Linné], but I do not share the confidence of Clench & Smith (1944: 7) as to its true identity, based only on the given locality "Jamaica", which could be erroneous. Linné left no reference and no type specimen has yet been traced. There are only short descriptions, from which I will retain three passages:
1) "*magnitudine manus*" (1764: 489) [= magnitude of a hand]. *C. leucostoma* never reaches half of this size; I know of only two species with oblong shells that conform to this criterion: *Vasticardium elongatum* (Bruguière) and *V. orbita* (Broderip & Sowerby). Of these, I think the less improbable is the former because the latter was probably very rare in collections in the middle of the eighteenth century;
2) and 3) "*sulcis angulatis latere serratis*" (1758: 680) [= angular ribs laterally serrated] and "*sulcis retrorsum crenatis*" (1764: 489) [= ribs anteriorly ridged]. That description does not seem appropriate to *C. leucostoma*, which has a rather smooth macroscopic aspect, but it could fit *V. elongatum* and, even better, *V. angulatum* [Chemnitz 1782 interpretation of *C. magnum*, figured shell pl. 19, fig. 191, still stored in ZMUC] which can also be large (height more than 100 mm).
In my opinion, Clench & Smith chose the less probable possibility in selecting a figure of *C. leucostoma* Born (Lister 1685, pl. 331, fig. 168) as type figure of *C. magnum* Linné. However, in consideration of the existing doubt, their selection, which stabilizes the name, cannot be disregarded; therefore I adopt it, especially since the tendency in the American literature has been to use it exclusively. Nevertheless the shell figured by Lister is not traced, and a neotype can be selected; so, I here select the lectotype of *C. leucostoma* as neotype of *C. magnum* Linné (Fig. 2F, G).

Cardium marmoreum: Lamarck designated four figure references: Lister 1685 (pl. 331, fig. 168), Born 1780 (pl. 3, figs 6-7), Chemnitz 1782 (pl. 17, fig. 179), Lamarck 1816 (pl. 297, fig. 3). Of these, only Born's specimen can be traced today (see above).
In addition, Lamarck had three shells, labelled in his own hand as *marmoreum*: one in MNHN, with no locality data; two others in MHNG, from his personal collection.
All the figures and shells refered to by Lamarck are *A. magnum*, except one in MNHG (Reg. 1085-53) from Ceylon (Maclay coll.), described and labelled as "*var.* [2] *testa majore*" [which is not a syntype (art. 72b of ICZN)]. This shell is actually *Vasticardium luteomarginatum* (Voskuil & Onverwagt 1991). In order to avoid confusion, I here select the other specimen of Lamarck's collection in MNHN (Reg. 1085-52) as lectotype of *Cardium marmoreum* Lamarck.
Cardium subelongatum: the types of Sowerby's taxon are not identified in BMNH. Nevertheless, there are two uncatalogued specimens from Cuming collection from the type locality (St Thomas Island, West Indies) which could be considered as syntypes. The largest specimen (73 × 55 × 44 mm) is probably the one figured by Reeve (1844: fig. 57).

MATERIAL EXAMINED. —The following lots in addition to the type material discussed above:.
Cuba. (MNHN de Boury).
Lesser Antilles. (MHNG). — (NHMV), (MNHN Vidal). — Saint Croix (USNM). — Cap Salomon, Martinique (MNHN Lamy 1984). — Les Saintes (MNHN Vidal 1998). — Vieux Bourg, Guadeloupe (MNHN). — Grand Cul-De-Sac, Guadeloupe (MNHN). — Guadeloupe (MNHN Cabanis 1973). — Guadeloupe (MNHN Douarinou 1973). — Guadeloupe (MNHN Pointier 1973). — Marie Galante (MNHN Letellier 1949).
Panama. Porto Bello Bay (MNHN Vidal). — Farallon Islands (MNHN Vidal).
Brazil. Salvador (MNHN Vidal).
Calypso 1961-62 MNHN: stn 19, 03°50'S, 32°26'W, Fernando de Norona Island. — Stn 7, 03°50'S, 32°26W, Atol da Rocas, 47-54 m. — Stn 1, 07°29'S, 34°30'W, off Paraiba, 45 m. — Stn 22, 08°15'S, 34°42'W, 33 m. — Stn 27, 08°25'S, 34°48'W, 33 m. — Stn 28, 08°27'S, 34°55'W, 27 m. — Stn 29, 08°28'S, 34°55'W, 22-30 m, off Pernambuco. — Stn 33, 09°45'S, 35°35'W, 32 m, off Algoas. — Stn 45, 11°22'S, 37°10'W, 31 m, off Sergipe. — Stn 85, 17°50'S, 39°07'W, 2-5 m, Siriba, Abrolhos Archipelago.
Wrong and Unknown localities. Zanzibar (MNHN). — Singapore (MNHN Denis 1945). — (MNHN Staadt 1949). — (MNHN Jousseaume 1921). — (BMNH), (MHNV).

DISTRIBUTION. — South Florida and Bahamas, south through the West Indies and Gulf of Mexico to Brazil (Abrolhos Archipelago), i.e. for about 6000 km along the eastern coast of the Americas.

DESCRIPTION
Shells medium (very rarely large), almost perfectly ellipsoidal and equilateral, with exceptionally truncation of the posterior part. Ribs show pronounced backwards curvature, but posterior part very rarely expanded. Adult shells always elongated (mean L/H = 0.79; range 0.74-0.84); width also relatively constant (mean L/W = 0.76; range 0.70-0.82). Lunular area very small.
Glossy exterior surface brightly coloured with orange, white, yellow, pink and purple. Interior often colored only in umbonal area and on ventral margin. Hinge typical of genus, (mean < A = 123°, range 115°-130°; mean ratio D = 1.16, range 1.04-1.29). No sterigma.
Mean rib number 33.8 (range 31-40).
Rib morphology conforms to species-group diagnosis (Table 4), but ribs in median and anterior parts are higher than usual and interstices wider; a gash very frequently occurs along posterior 8th or 9th rib of MPQ in right valve. Interstices regularly notched by transverse, elongated, sometimes crescent-shaped notches.

REMARKS
Acrosterigma magnum has often been confused with *Vasticardium luteomarginatum* (Voskuil & Onverwagt, 1991), and has also been described as "exceedingly close" (Clench & Smith 1944: 7) to *Vasticardium elongatum* (Bruguière, 1789). While it is true that some smooth forms of the latter two can have a superficial resemblance, they differ, without any ambiguity, by all the characters separating the two genera (see Table 2). In addition, *A. magnum* is distinguished by its bright colours and glossy surface, and above all by the typical notching of interstices and lower part of flanks of ribs, while *A. luteomarginatum* has finely striated interstices and *elongatum* smooth interstices.

Acrosterigma burchardi (Dunker, 1877)
(Fig. 2H, I; Table 8)

Cardium burchardti [*sic*] Dunker, 1877: 67 [dedicated to G. Burchard].

TABLE 8. — Measurements (in mm) and rib count *Acrosterigma burchardi* (Dunker, 1877).

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *burchardi*	71.0	58.2	37.6	0.82	0.65		105	41
USNM 304262, Awaji	76.7	60.2	41.0	0.78	0.68	0.92	110	41
USNM 605943, Tosa Bay	62 8	49.4	34.1	0.79	0.69	0.73	105	41
MNHN, Nikawa	84.0	65.0	45.0	0.77	0.69	≈1.0	105	40
Idem	79.0	61.3	42.7	0.78	0.70	?	105	44
MNHN, Kyushu	62,5	52.7	34.2	0.84	0.65	0.79	105	42
MNHN, Kyushu	60.8	50.5	33.6	0.83	0.67	0.87	110	40
LACM 23134, Kyushu	75.2	63.5	40.5	0.84	0.64		45	
BPBM 11060, Matsuka Ki	84.2	71.0	45.3	0.84	0.64		42	
Total measured adult shells and rib counts				12	12	6	10	18
General mean values				0.81	0.67	0.86	106	42.2
Standard deviation				0.03	0.02	0.09	2.3	1.7
Largest specimen observed, BPBM 11060 (see above).								

Cardium burchardi Dunker, 1882: 210, pl. 15, figs 4-6.

HOLOTYPE. — The shell described and figured by Dunker, 71 mm high, with 40-42 ribs; not traced.

MATERIAL EXAMINED. — The following lots:
Japan. (LACM 52862). — (BPBM 11060). — Nikawa, Aichi pref. (MNHN Vidal). — Kyushu (MNHN Petit 1972); (MNHN Vidal); (LACM 48715); 48 m (LACM 50911, 23134, 13434). — Boshi (NMW Melvill). — Kii (LACM 13444); 18 m (LACM 13452). — Matsuka Ki (BPBM 10233). — Sagami Bay (BPBM 204080, 204081). — Fukura, Awaji (USNM 304262). — Tosa Bay (USNM 605943).

DISTRIBUTION. — The living species occurs exclusively in Japan, Honshu (Boso Peninsula, east of Tokyo, as northern limit), Shikoku and Kyushu, Japan.

DESCRIPTION
Shells medium to large, very asymmetrical; anterior margin raised and rounded; posterior margin receding and almost straight due to flattening of PQ, which forms a rounded angle with rest of shell. MPQ margin may also be somewhat straightened. Shell moderately elongated (L/H range: 0.77-0.86) and appreciably depressed (W/L range: 0.64-0.70).
Lunule narrow, more developed on right valve, a little hollowed and bounded by a wide, high, longitudinal fold, which bears fine oblique ridges, corresponding to the AQ first rib. External colour yellowish, sometimes with pinkish shades; PQ often purplish. Interior white. Hinge line asymmetrical (ratio D range 0.73-1.00), and strongly angled (< A range 105°-110°). Umbonal cavity filled with a brown callosity that often terminates ventrally in a short sterigma.
Mean rib number 42.2 (range 40-45).
Rib morphology conforms to species-group diagnosis (Table 4); on PQ, posterior thin tubercles of ribs can be joined together by a thin ridge; on other parts of shell ribs flat-topped, slightly overhanging interstices, retro-crenulated on MPQ, progressively bi-crenulated, and then very sightly top-ridged. On most of the adult zone of large specimens, ribs become rounded and interstices wider on MPQ.

Species-group of *Acrosterigma cygnorum* (Deshayes, 1855)

INCLUDED SPECIES. — 1) Recent: *A. cygnorum* (Deshayes, 1855); *A. sorenseni* (Powell, 1958); *A. marielae* Wilson & Stevenson, 1977; *A. kerslakae* Healy & Lamprell, 1992; *A. abrolhensis* n. sp.
2) Fossil: According to the literature data, the following species very probably belong to this group:
Vasticardium (*Regozara*) *praecygnorum* Ludbrook, 1955, from Dry Creek Sands (Pliocene), Adelaide, South Australia. This shell, with 48 ribs, was compared by Ludbrook (1955: 61) with *Acrosterigma kerslakae* Healy & Lamprell, 1992 (see below).
Trachycardium (*Regozara*) *delectabile* Maxwell, 1978,

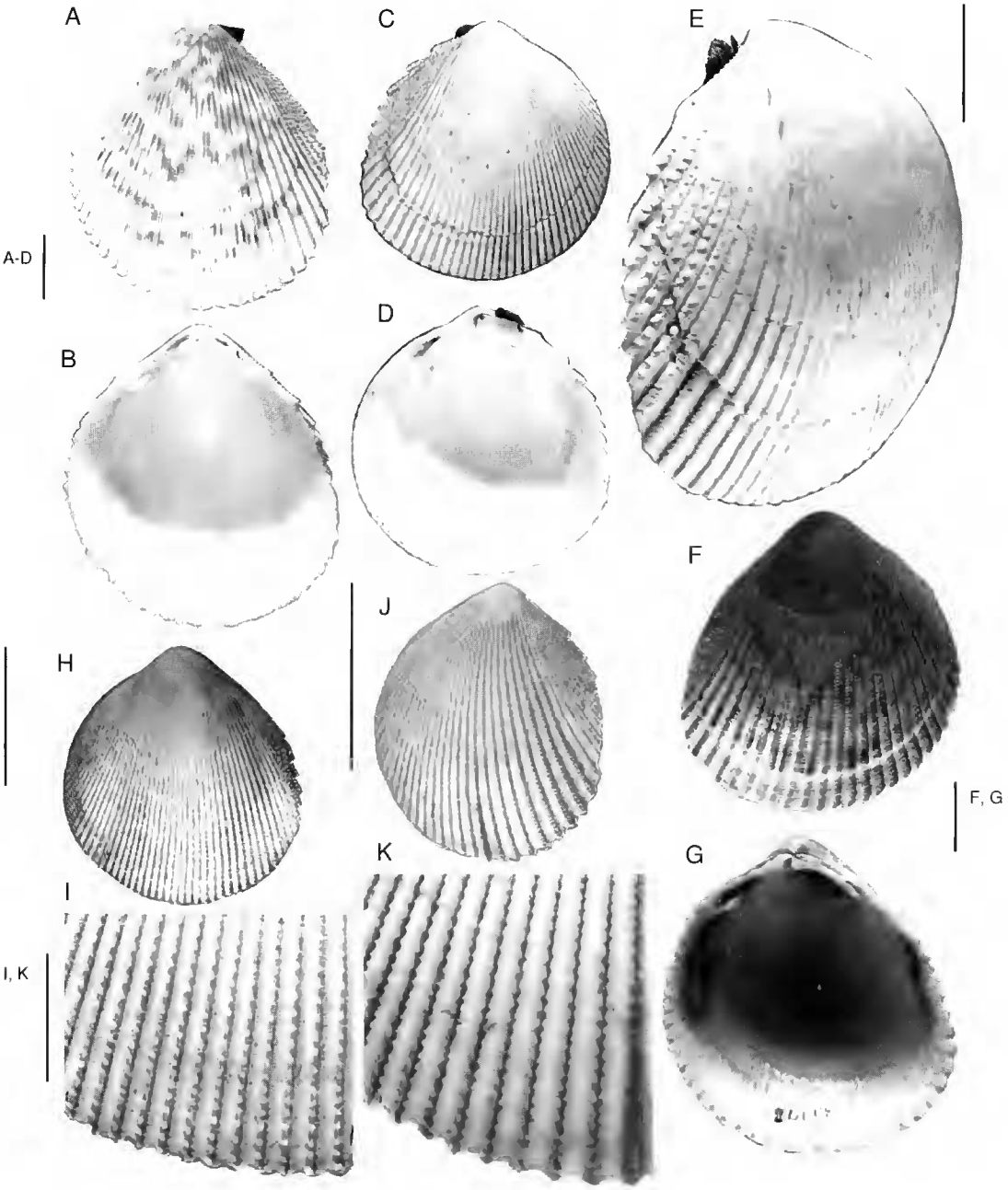

FIG. 3. — **A**, **B**, *Acrosterigma cygnorum*, specimen from Adelaide, South Australia; **C**, **D**, **E**, *Acrosterigma sorenseni*, holotype; **E**, view of PQ and MPQ; **F**, **G**, *Acrosterigma kerslakae*, paratype AMS 80144, from Collaroy Beach, Sydney; **H**, *Acrosterigma marielae*, a left valve from Cheyne Bay, Western Australia, AMS 310554; **I**, *Acrosterigma marielae*, same specimen, detail of the median zone; **J**, *Acrosterigma abrolhensis*, holotype; **K**, *Acrosterigma abrolhensis*, holotype; detail of the median zone. Scale bars: A-E, H, J, 10 mm; F, G, 20 mm; I, K, 2 mm.

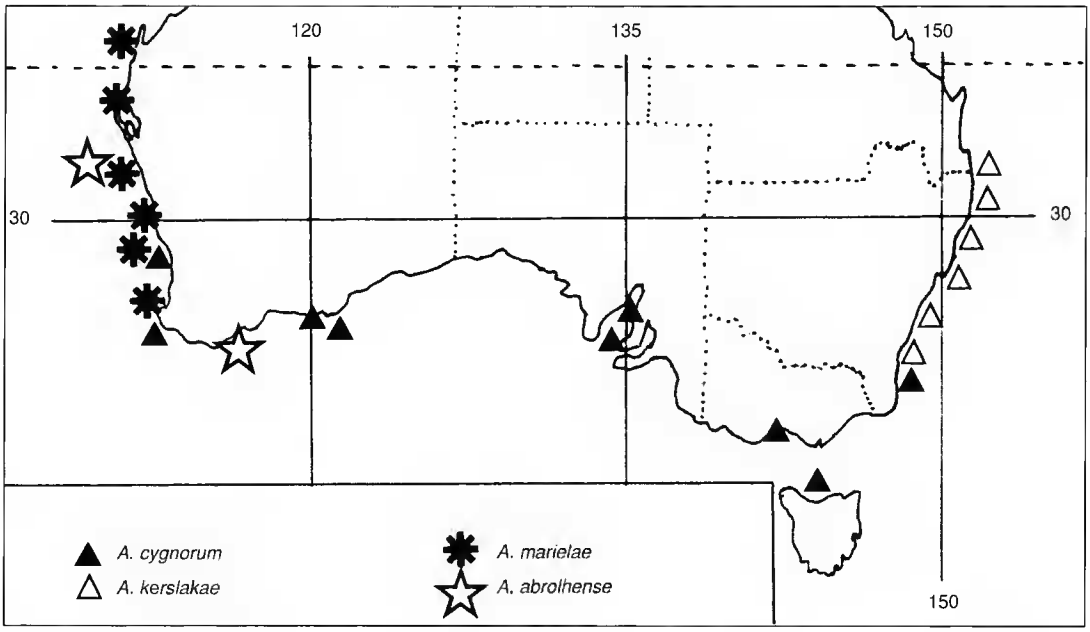

FIG. 4. — Distribution of the species of the species-group of *Acrosterigma cygnorum* (*A. sorenseni* excluded: see Fig. 11).

from Clifdenian (Middle Miocene), Waiau River, South Island, New Zealand. This shell, with 57 ribs, was compared by Maxwell (1978: 22) with *Acrosterigma sorenseni* (Powell, 1958) and *A. cygnorum* (Deshayes, 1855) (see below).

DISTRIBUTION. — (Figs 4; 11) All the species, living and fossil, are restricted to southern part of Australia and/or to New Zealand.

DIAGNOSIS. — See Table 4.

Acrosterigma cygnorum (Deshayes, 1855)
(Figs 2K; 3A, B; Table 9)

Cardium cygnorum Deshayes, 1855: 331.
? *Cardium foveolatum* Sowerby, 1841a: 111.

TABLE 9. — Measurements (in mm) and rib count of *Acrosterigma cygnorum* (Deshayes, 1855).

	H	L	W	L/H	W/L	D	A°	Ribs
Syntype *cygnorum* No. 1	52.5	45.0	30.0	0.86	0.67			44
Idem No. 2	44.2	40.5	25.6	0.91	0.63			42
Idem No. 3	32.7	30.5	21.4	0.93	0.71			42
USNM 253444	50.5	47.0	28.8	0.93	0.61	1.10	125	45
USNM 160215	42.6	36.6	26.6	0.86	0.73	1.12	125	41
MNHN, Western Australia	55.4	50.2	29.1	0.91	0.58	≈1.0	125	43
Idem	46.0	42.3	26.4	0.92	0.62	1.05	125	40
MNHN, Adelaide	51.7	47.5	29.5	0.92	0.62	0.95	125	36
MNHN, Brighton	51.1	46.5	29.4	0.91	0.63	≈1.0	125	42
LACM 23132	55.7	46.8	32.2	0.84	0.69			42
Total adult shells measured and rib counts				25	24	11	11	26
General mean values				0.90	0.65	1.03	125	42.6
Standard deviation				0.03	0.04	0.05	0	2.2
Largest specimen observed, LACM 23132 (see above)								

Laevicardium (*Trachycardium*) *gaillardi* Fischer-Piette, 1977: 58, pl. 6, figs 1-2.

TYPES. — *Cardium cygnorum*: three syntypes in BMNH, reg. 1971-23, Cuming collection, from Swan River, Western Australia. *Cardium foveolatum*: from Swan River also, not traced; Wilson & Stevenson (19??: 91) were convinced of the synonymy with *C. cygnorum* and suspected that a type specimen could be one of the syntypes of *C. cygnorum*. *Laevicardium* (*Trachycardium*) *gaillardi*: holotype in MNHN, collected by Quoy & Gaymard during the voyage of *L'Astrolabe* (1826-1829), labelled as coming from New-Zealand. However, *C. cygnorum* has never been recorded from this country, and the specimen probably originates from Australia where the *Astrolabe* called at several times during the same voyage.

MATERIAL EXAMINED. — The following lots in addition to the type material:
Australia. (LACM 13356), (MNHN Vidal).
Western Australia. Geographe Bay (Hobbs). — Freemantle (ANSP 263242).
South Australia. (USNM 253444, 160215). — (ANSP 72345). — Adelaide (MNHN Vidal). — Revesly Island, Banks group (MNHN Vidal, 2 lots). — Brighton, Adelaide (MNHN Vidal). — Normanville (LACM23132). — Hardwicke Bay (LACM 13342). — Hardwicke Bay (USNM 321673). — Port Granville (LACM 28314). — St Vincent Gulf (LACM 13369, 50874). — Wallaroo (LACM 50890, 50858). — Semaphore Bay (ANSP 186763).
Victoria. (USNM 203909). — Port Bay (LACM 28212). — Melbourne (ANSP 98954).
Tasmania. (MNHN Stanley).

DISTRIBUTION. — (Fig. 4) According to Wilson & Stevenson (1977: 92) "Southern Australia, the most northern records being Fremantle in the west coast, and Montagu Island on the east coast". It is also "fairly common along the north coast" of Tasmania (May 1958: 13).

DESCRIPTION

Shell medium-sized, generally symmetrical with anterior margin rounded and raised, and posterior slightly receding, with a small oblique truncation. PQ a little flattened, forming a rounded obtuse angle with rest of shell. Not elongated (mean L/H = 0.90; range 0.84-0.95) and moderately compressed (mean W/L = 0.65; range 0.58-0.73).

Lunule narrow, identical on both valves, and slightly hollowed, with posterior margin well-delimited. External colour cream to yellowish, with more or less developed brownish splashes; interior white. Hinge approximately symmetric-al, and moderately angled (< A about 125°). A low sterigma occurs in some shells about 40% of lots.

Mean rib number 42.6 (range 36-47).

Rib morphology: on PQ (Fig. 2K), posterior rib scales sometimes prolonged above the anterior smooth part, forming herringbones. On MPQ, ribs rather high, variably rounded to subtriangular in section, sometimes with a thin top-crest; always retro-ridged on adult part, becoming bi-tuberculated. Interstices thin on juvenile shell, one third to half the width of ribs in adult. On adult part, anterior half of ribs becomes progressively more square-sided, bi-tuberculated or bi-ridged, then top-ridged. Ridges always thin and free (not imbricated throughout), sometimes herringboned. Interstices similar to those on MPQ, smooth and slightly overhung by ribs.

Acrosterigma sorenseni (Powell, 1958)
(Fig. 3C-E; Table 10)

Trachycardium (*Vasticardium*) *sorenseni* Powell, 1958: 76, pl. 11, figs 6; 7.

TYPES. — Holotype: a right valve in Auckland Museum AK 701236 from Denham Bay, Raoul Island, Kermadec Islands, 29°16'S, 178°03'E, 0 m. Two other smaller valves in Auckland Museum from *Galathea* 1952, stn 674 off Raoul Island, 29°15'S, 177°57'E, 75-85m, were cited but not qualified paratypes by the author.

MATERIAL EXAMINED. — The holotype and the following lots:
New Zealand. Raoul Island, Kermadec Islands, in MNZ (M.202885 Bollons). — (M.213883 Oliver 1908). — (M.202889).
Acheron 1975: stn 75443, off Meyer Islet, 29°14.7'S, 177°52.7'W, 22-27 m (M.225794). — Stn 75436, SE of d'Arcy Point, 29°18.5'S, 177°54.5'W, 44 m (M.225784).
Acheron 1976: stn 76573, between Dayrel and Chanter Islets, 29°15.00'S, 177°50.90'W, 31-45 m (M.226972). — Stn 76567, East Anchorage, 29°16.00'S, 177°51.58'W, 42-47 m (M.226611).

DISTRIBUTION. — (Fig. 11) Raoul Island, Kermadec Islands, New Zealand.

DESCRIPTION

Shell of medium size, almost symmetrical and

TABLE 10. — Measurements (in mm) and rib count of *Acrosterigma sorenseni* (Powell, 1958).

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *sorenseni*	42.3	40.0	(24.0)	0.95	0.60		120	54
Galathea 674	26.5	25.0	(15.0)	0.94	0.60			
Galathea 674	20.5	20.0	(10.0)	0.98	0.50			
MNZ M.202885	44.5	39.7	(23.0)	0.89	0.58	≈1.0		50
MNZ M 213883	40.6	34.2	(21.6)	0.84	0.63	≈1.0		48
MNZ M.225794	29.1	28.0	15.5	0.96	0.55	0.82	115	51
MNZ M.202889	29.4	27.5	(15.2)	0.94	0.55		120	52
MNZ *idem*	19.3	20.0	(10.7)	1.04	0.53			53
MNZ M.225784	28.0	27.0	(15.0)	0.96	0.56		130	50
Total adult shells measured and rib counts				10	10	4	4	15
General mean values				0.94	0.56	0.91	121	51.2
Standard deviation				0.05	0.03	0.08	5.4	1.4
Largest specimens observed, the holotype and NMZ.M202885 (see above)								

rounded in outline (mean L/H = 0.94, range 0.84-0.97, but only two fully adult shells have this ratio less than 0.93, see measurements table), rather compressed (mean extrapolated W/L = 0.56, range 0.53-0.63). PQ area very slightly flattened.

Lunule non-existent, ribs practically reaching margins. Colour of fresh shells whitish heavily blotched with orange-pink; interior with external colour pattern showing through; holotype, a faded beach shell, shows a sparsely speckled pattern on a pale ground. Hinge variably asymmetrical and rather moderately angled (< A range 115-130). No sterigma.

Mean rib number 51.2, range 48-54.

Rib morphology: PQ (Fig. 3E) conforms to species-group, with irregular, somewhat elongated oblique tubercles on posterior half of ribs. On MPQ (Fig. 3E), ribs retro-ridged, almost square-sided, but with rounded tops, and a slight forward bending; interstices about one third of ribs width, and loosely striated. On anterior part of shell, ribs become higher, square-sided, flat-topped and top-ridged with wide touching ridges which are sometimes imbricated. Interstices become progressively narrower.

REMARKS

Acrosterigma sorenseni is close to *A. cygnorum*. The former mainly differs in: (1) higher rib number (48-54 against 35-47 in *cygnorum*); (2) presence on PQ of a discontinuous axial furrow, formed by successive holes between the scales; (3) different rib morphology on AQ, i.e. thinner interstices, higher ribs which are square-sided rather than rounded and, on the ribs, wider, more imbricated ridges which almost touch (instead of the thin, free ridges of *A. cygnorum*).

The two valves in New Zealand Oceanographic Institute cited by Powell (1958: 76) from E of Philip Island, Norfolk Island "similar to the Kermadec species in sculpture but of oblique-ovate outline [...] and with a rib count 48-50" are very probably *A. maculosum bowense* (see in this subspecies, abundant in Norfolk Island).

Acrosterigma kerslakae
Healy & Lamprell, 1992
(Fig. 3F, G; Table 11)

Acrosterigma kerslakae Healy & Lamprell, 1992: 84, pl. 3, figs a-d.
Cardium oxygonum Sowerby, 1833 – Hedley, 1923: 304.

TYPES. — Holotype: a paired specimen AMS C31559, from Burpengary, Queensland, 27°10'S, 152°57'E. Paratypes: one lot in AMS from Collaroy Beach, Sydney (AMS C80164), and two lots in QM from Caloundra (MO33056) and Southport (MO32904).

MATERIAL EXAMINED. — The following lots in addition to the three paratype lots:
Queensland. Shelly Beach, Caloundra (MNHN Vidal). — Caloundra (WAM 4796-68). — 26°40'S, 153°07'E, Alexandra Head (AMS C315813). —

TABLE 11. — Measurements (in mm) and rib count of *Acrosterigma kerslakae* Healy & Lamprell, 1992.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *kerslakae*	28.0	27.9	16.5	#1.0	0.59		120	38
AMS C80164, paratype	39.7	35.2	(25.6)	0.90	0.73		125	42
Idem, paratype	36.4	34.0	(23.0)	0 93	0.68	1.05		39
AMS C145036	34.4	30.7	(22.8)	0.89	0.74		125	36
AMS C105746	38.0	35.5	(26.0)	0.93	0.73	≈1.0		40
AMS C62419	35.0	31.0	(22.0)	0.89	0.71		125	42
AMS C145034	32.3	28.6	(18.2)	0.89	0.64		125	37
AMS C145088	34.2	31.0	(22.0)	0 91	0.71		120	40
AMS C145037	37.2	34.6	(24.0)	0 93	0.69		125	43
AMS C14442	40.2	34.0	(27.2)	0.85	0.80	≈1.0		40
Total adult shells measured and rib counts				16	16	5	8	51
General mean values				0.91	0.69	1.02	124	40.9
Standard deviation				0.03	0.05	0.02	2.1	2.4
Largest specimen observed, AMS C14442 (see above)								

26°49'S, 153°10'E, Caloundra (AMS C315819, C315820, C315821, C054640, C047785, C012772). — 27°15'S, 153°15'E, Moreton Bay 3.5-11 m (AMS C315829). — 27°26'S, 153°32'E, Point Lookout, Stradbroke Island, Moreton Bay (AMS C145026, C315832). — 27°31'S, 153°40'E, off Moreton Bay, 75-80 m (AMS 315826). — 28°05'S, 153°27'E, Great Burleigh Head (AMS C145027). — 28°06'S, 153°28'E, Tallebudgera Creek, Big Burleigh (AMS C145028). — 28°10'S, 153°32', Coolangatta (AMS C315827, C315824).

New South Wales. 28°38'S, 153°37'S, Byron Bay (AMS C005215). — 28°52'S, 153°34'E, Ballina (AMS C005088). — 29°29'S, 153°22'E, Angourie Point (AMS C315935, C315853). — 29°32'S, 153°22'E, Shelly Beach, 8 km south of Yamba (AMS C315851). — 29°46'S, 153°18'E, Minnie Waters (AMS C315959). — 30°06'S, 153°12'E, Woolgoolga (AMS C145029). — 30°12'S, 153°16'E, South Solitary Island, off Coffs Harbour (AMS C108804). — 30°53'S, 153°04'E, Trial Bay (AMS C028435). — 32°04'S, 152°33'E, Point Halliday, near Forster (AMS C092814). — 32°42'S, 152°05'E, Port Stephens (AMS C084363, C145031). — 32°45'S, 152°11'E, Fingal Bay, Port Stephens (AMS C315960). — 33°04'S, 151°36'E, Lake Maquarie (AMS C014442). — 33°05'S, 151°39'E, Blacksmiths Beach, Swansea (AMS C315961). — 33°31'S, 151°19'E, Ocean Beach, Broken Bay (AMS C145030). — 33°35'S, 151°19'E, Palm Beach, Sydney (AMS C315831). — 33°36'S, 151°17'E, Inner Basin, Pittwater, Sydney (AMS C145032). — 33°42'S, 151°18'E, Narrabeen Beach, Sydney (AMS C145033). — 33°44'S, 151°18'E, Collaroy Beach, N of Sydney (AMS C315937, C062419). — 33°45'S, 151°19'E, Long Reef, Collaroy, Sydney (AMS C145034, C145035). — 33°48'S, 151°16'E, North Harbour, Port Jackson, Sydney (AMS C145036). — 33°48'S, 151°17'E, Manly Beach, Sydney (AMS C088850, C105746, C315962). — 33°48'-33°50'S, 151°14'-151°16'E, Middle Harbour, Sydney (AMS C017776). — 33°49'S, 151°15'E, Balmoral Beach, Sydney (AMS C001882). — 33°50'S, 151°16'E, off Sow and Pigs Reef, Port Jackson, Sydney (AMS C055349). — 33°50'-33°52'S, 151°12'-151°16'E, Port Jackson, Sydney (AMS C145037). — 33°51'S, 151°14'E, Port Jackson, Sydney (AMS C145038). — 33°50'-33°52'S, 151°12'-151°16'E, Sydney Harbour (AMS C145092). — 33°58.76'S, 151°13'69E, Yarra Bay, Botany Bay (AMS C315938). — 33°59'S, 151°12'E, Botany Bay (AMS C315963). — 34°0.58'S, 151°12'38E, Kurnell, Botany Bay (AMS C145040). — 34°03'S, 151°09'4E, Cronulla Beach (AMS C145034). — 34°32'S, 150°52'E, Windang (AMS C066189). — 34°35'S, 150°52'E, Shell Harbour (AMS C315965, C108306). — 34°49'S, 150°46'E, Seven Miles Beach, near Gerringong (AMS C145089). — 35°24'S, 150°27'E, Burril Lake, S of Ulladulla (AMS C315966, 145090). — 36°13'S, 150°08'4E, Narooma (AMS C145091).

DISTRIBUTION. — (Fig. 4) Eastern coast of Australia along more than 1000 km of coastline, from Caloundra, Queensland (26°49'S) south to Naruma, New South Wales (36°13'S).

DESCRIPTION

Shell medium-sized, almost symmetrical with a very small truncation on PQ, only slightly elongated (mean L/H = 0.91; range 0.88-1.00) and

rather compressed (mean W/L = 0.69; range 0.59-0.80).
Lunule small, a little hollowed, almost equivalent in both valves, well-delimited posteriorly, and always colored pink-purple. Exterior colour cream-yellow, with prominent pink-brown blotches, which are fused near umbones; interior white, except for occasional pale V-shaped umbonal rays. Hinge symmetrical (ratio D about 1.0) and moderately angled (< A range 120-125°). A low sterigma present on some shells in 13% of lots.
Mean rib number 40.9 (range 35-45).
Rib morphology: PQ excepted, ribs variable in profile, generally low and slightly rounded, but sometimes almost triangular or trapezoidal, flat-topped and overhanging interstices. Rib ornaments also variable in number and size, generally retro-ridged on posterior MPQ, smooth to retro- or bi-tuberculated on central part, and top-ridged with thin ridges on AQ, sometimes herringboned. Interstices always narrow.

REMARKS

Acrosterigma kerslakae is very close to *A. cygnorum*; the former is generally smaller, with lower, smoother ribs and narrower interstices, and has a lower mean rib number (40.2 compared to 42.7 in *cygnorum*). However, these two forms are perfectly parapatric, and the weakness of their differences cannot exclude the possibility of the existence of two subspecies. Nevertheless, they have been treated as distinct species by the majority of authors, for example Hedley (see above), and Ludbrook (1955: 61) who stated: "Iredale (1936: 276) has pointed out that NSW shells referred to *Cardium cygnorum* (typically from western Australia) are not referable to *cygnorum* [...] and the writer is inclined to agree with this opinion".

Acrosterigma marielae
Wilson & Stevenson, 1977
(Fig. 3H, I; Table 12)

Acrosterigma marielae Wilson & Stevenson, 1977: 103, pl. 6, figs 11-15.

TYPES. — Holotype: a specimen from CSIRO 1963, stn 216, 31°18'S, 115°03'E, W of Cape Leschenault, Western Australia, 91 m (WAM 215-67). Paratypes: 28 (no details in Wilson & Stevenson).

MATERIAL EXAMINED. — The following lots:
Western Australia. *Gascoyne* 1962: 33°43'S, 125°04'E, East of Rocky Point, Great Australian Bight, 77-80 m (AMS C310551). — 34°21'S, 121°16'E, E of Hood Point, Great Australian Bight, 82 m (AMS C310553). — 34°25'S, 121°20'E, same, 158 m (AMS C310552). — 34°55'S, 119°00'E, E of Cheyne Bay, 71-76 m (AMS C310554).
Diamantina 1972: 28°18'S,113°58'E, W of North Island, Hautman Abrolhos, 108 m (WAM 233-90). — 28°43'S, 113°51'E, Suomi Island, Eastern Group, Abrolhos, 43 m (WAM 785-91). — 28°45'S, 113°50'E, Little North Island, Eastern Group, Abrolhos, 45 m (WAM 784-91). — 30°34'S, 114°44'E, NW of Green Island, 128 m (WAM 27-94). — 30°34'S, 114°56', 115°06'E, W of Guilderton, 146 m (WAM 29-94, 30-94). — 30°35'S, 114°35'E, SW of Cervantes, 110 m (WAM 37-94). — 31°00'S, 114°52'E, W of Lancelin, 150 m (WAM 37-94). — 32°02'S, 115°22'E, W of Rottnest Island, 110 m (WAM 232-90).
Sprightly 1976: 29°06'7S, 113°58'5E, *c.* 32 km W of Dongara, 91 m (AMS C310604).
Moresby 1980: 31°40'6S, 115°09'6E, 100 m (AMS C310603).

DISTRIBUTION. — (Fig. 4) According to Wilson & Stevenson (1977: 104), "between 33 and 152 fathoms [60.3-274.3 m] off the mid-west coast of Western Australia".

DESCRIPTION

Shell small, thin, slightly obliquely ovate, inequilateral with anterior dorsal margin rounded and posterior margin rather straight and not truncated on PQ. Not very elongated (according to Wilson & Stevenson 1977, mean L/H = 0.91; range 0.84-0.96) and moderately compressed (mean W/L = 0.62; range 0.57-0.70).
Lunule well-defined, wider and projecting from the margin in right valve, and somewhat hollowed. Exterior glossy, cream in colour, with small splashes of orange; interior white except for pink V-shaped umbonal rays; lunule and hinge below it orange-pink, mainly in right valve. Hinge nearly symmetrical (ratio D close to 1.0) and moderately angled (< A range 120°-130°).
Mean rib number 62.6, range 56-68.
Rib morphology: on PQ, scales on posterior parts of ribs variable: prismatic, roundly tubercular, or

TABLE 12. — Measurements (in mm) and rib count of *Acrosterigma marielae* Wilson & Stevenson, 1977.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *marielae*	22.6	20.0	12.8	0.88	0.64	1.25	120	63
WAM 232-90	22.8	20.8	(12.8)	0.91	0.62	1.21		65
Idem 20.7	18.6	(11.8)	0.90	0.63			125	67
WAM 27-94	19.2	17.1	(11.4)	0.89	0.67		130	64
AMS C310553	18.8	17.0	(10.0)	0.90	0.59		130	61
AMS C310554	18.4	16.8	(10.0)	0.91	0.60	1.10		61
WAM 30-94	23.1	20.0	(13.6)	0.87	0.68	≈1.0		62
Total adult shells measured and rib counts				24	24	6	7	24
General mean values				0.90	0.62	1.13	128	62.6
Standard deviation				0.03	0.04	0.08	3.6	3.0
Largest specimen observed, WAM 30-94 (see above)								

sometimes elongated. On rest of shell (Fig. 3I), ribs generally rounded to roundly triangular, retro-ridged to retro-tuberculated; ridges or tubercles variable in shape, prismatic and pointed to elongated and acute, placed on upper part of sides of ribs. Ribs become progressively more top-ridged on AQ, but on adult part of some specimens, bi-tuberculated ribs appear as early as on the anterior part of MPQ and develop further, changing into herringbone sculpture on AQ.

REMARKS

A. marielae is close to *A. cygnorum* and *A. kerslakae* as far as shape and colour are concerned, but differs by its smaller size, much larger rib number, and rib ornamentation (stronger and more acute lateral ridges or tubercles).

Acrosterigma abrolhense n. sp.
(Fig. 3J, K; Table 13)

TYPES. — Holotype: a paired specimen, *Flinders* 1977, stn 8, 28°37.5'S, 113°51.5'E, off Little North Island, Easter Group, Abrolhos Islands, Western Australia, 42 m (WAM 775-91). Paratype 1: a left valve, *Gascoyne* 1962, 34°55'S, 119°00'E, east of Cheyne Bay, Western Australia, 71-76 m (AMS C310554). Paratype 2: a right valve, *Rumphius* 1 1973, stn Li 2, 03°13'S, 128°14'E, east of Piru Bay, Ceram, Indonesia (WAM 43-94).

ETYMOLOGY. — From the Abrolhos Islands, Western Australia.

MATERIAL EXAMINED. — Additionally to the type material, a right valve, Western Australia, *Sprightly* 1976, 29°10.0'S, 114°43'E, 24 km NW of Dongara, 40 m (WAM 777-91).

DISTRIBUTION. — (Fig. 4) Western Australia, in the vicinity of the Abrolhos Islands and in Cheyne Bay near Albany. I think its presence in Ceram, represented by a single valve (paratype 2), needs confirmation.

DESCRIPTION

A small shell, obliquely ovate, and slightly inequilateral, with posterior margin slightly truncated on PQ which forms a vague obtuse angle with MPQ; not elongated (L/H close to 1.0) and somewhat compressed.

Lunule small, equally developed in both valves, not shifted from margin, and slightly hollowed. Colour white, both externally and internally, except for lunule, slightly pinkish. Hinge symmetrical and moderately angled (*c.* 130°).

Rib number 43-46.

Rib morphology: on PQ, regular elongated oblique scales occur on posterior part of ribs; on MPQ, ribs low, slightly rounded, and retro-ridged or retro-tuberculated on their lower sides, near interstices; in MAQ (Fig. 3K) ribs become progressively flat-topped, slightly squared, and bi-tuberculated, side tubercles being roughly pyramidal to slightly elongated and acute and almost touching across interstice. More anteriorly, side tubercles lengthen and become sharp lateral oblique ridges which tend to join on top, forming herringbone sculpture; on AQ, ribs become at once laterally tuberculated and

TABLE 13. — Measurements (in mm) and rib count of *Acrosterigma abrolhense* n. sp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *abrolhense*	13.2	12.3	7.3	0.93	0.54	≈1.0	130	46
Paratype No. 1	12.6	13.0	(7.0)	1.03	0.54	≈1.0		43
Paratype No. 2	10.0	10.0	(5.6)	1.00	0.56		130	45
WAM 777-91	10.0	10.3	(6.0)	1.03	0.58			44

top-ridged with thin free ridges. Interstices always very narrow. Tops of ribs covered by a multitude of very thin holes, sometimes concentrically aligned on juvenile part, probably corresponding to lost pustules.

REMARKS

The rib ornamentation of *A. abrolhense* is comparable to that of *A. marielae*, but the rib morphology is different (compare Fig. 3I and K), as is the lunule, the number of ribs and the colour. *A. abrolhense* differs from *A. cygnorum* and *A. kerslakae* by its smaller size, colours and rib ornamentation. This species is further characterized by the very numerous pustular holes on the ribs, present but never as abundant in several other *Acrosterigma* species.

Species-group of *Acrosterigma variegatum* (Sowerby, 1840)

INCLUDED SPECIES. — Recent: *A. variegatum* (Sowerby, 1840); *A. oxygonum* (Sowerby, 1834); *A. selene* n. sp.; *A. discus* n. sp.; *A. mauritianum* (Deshayes, 1855).

DESCRIPTION

See Table 4.

REMARKS

This species-group is the closest to the genus *Vasticardium*.

Acrosterigma variegatum (Sowerby, 1841) (Fig. 5A-C; Table 14)

Cardium variegatum Sowerby, 1841a: 107.

TYPES. — Three shells considered as syntypes in BMNH, not catalogued, Cuming collection, labelled from Ticao (Philippines) and another location (label illegible). The dimensions given by Sowerby for his figured specimen could fit the smallest specimen, but the colour pattern, the rib number (48 given), and the locality (Leyte given) do not match. The specimen figured here (Fig. 5A-C), better fits the figure, description and locality given by Reeve (1845: Sp 75).

MATERIAL EXAMINED. — The following lots in addition to the syntypes:
Philippines. (MNHN). — (MNHN Vidal). — Magellan Bay (MNHN Vidal). — Burias Island (USNM 237011). — Zamboanga, Mindanao (LACM 50834, USNM 248371). — Mindanao (USNM 237217). — Sa Cruz Island, Mindanao (USNM 248371). — Davao, Mindanao (USNM 248301). — *Pele* 1964: Doc Can Island, Sulu Archipelago, 1-3 m (WAM 656-66). — Jolo Island, Sulu Archipelago (USNM 235598, LACM 90046). — Siasi Island, Sulu Archipelago (USNM 612432, BPBM 203569, MNHN Vidal). — Sulu Archipelago (MNHN Vidal).
Indonesia. Moluccas (ZMA de Serriere). — Flores (ZMA Winckelsweep).
Papua New Guinea. Weleluku, Kivero (AMS C3164). — Samarai (QM MO20733).
Queensland. Murray Island, Torres Strait (AMS C30279). — Port Douglas (MNHN Vidal).
Wallis and Futuna. MUSORSTOM 7 1992 (MNHN): stn DW 529, 12°31'S, 176°40'W, Waterwitch Bank, 500 m. — Stn DW 538, 12°31'S, 176°40'W, Waterwitch Bank, 275-295 m. — Stn DW 588 12°17'S, 174°45'W, Field Bank, 490-500 m.

DISTRIBUTION. — (Fig. 6) Tropical western Pacific as far east as Wallis and Futuna; very abundant in the Philippines.

DESCRIPTION

Shell medium-sized, ovoid, almost equilateral (anterior dorsal margin slightly angled,), not posteriorly truncated, nor elongated (mean L/H = 0.91; range 0.87-0.95) and moderately compressed (mean W/L = 0.67; range 0.58-0.78).

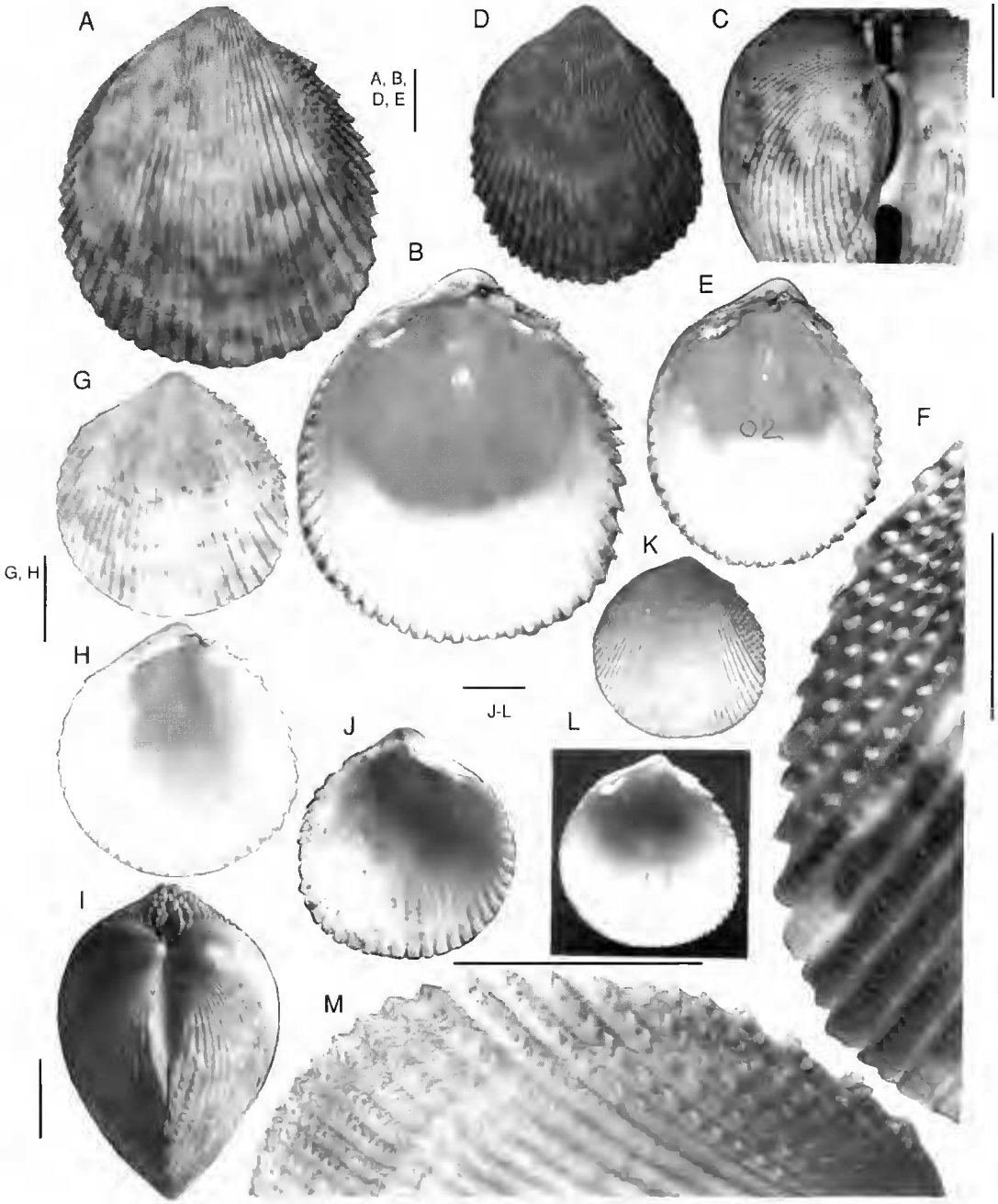

Fig. 5. — **A**, **B**, *Acrosterigma variegatum*, syntype; **C**, *Acrosterigma variegatum*, specimen from Magellan Bay, Philippines, MNHN; detail of the particular lunule; **D**, **E**, *Acrosterigma oxygonum*, syntype; **F**, *Acrosterigma oxygonum*, specimen from Rameswaran, India, MNHN; detail of PQ and MPQ; **G**, **H**, *Acrosterigma selene*, holotype; **I**, *Acrosterigma selene*, holotype; view of the deep lunule; **J**, *Acrosterigma selene*, paratype 1; **K**, **L**, *Acrosterigma discus*, holotype; **M**, *Acrosterigma discus*, holotype; detail of PQ and MPQ. Scale bars: 10 mm.

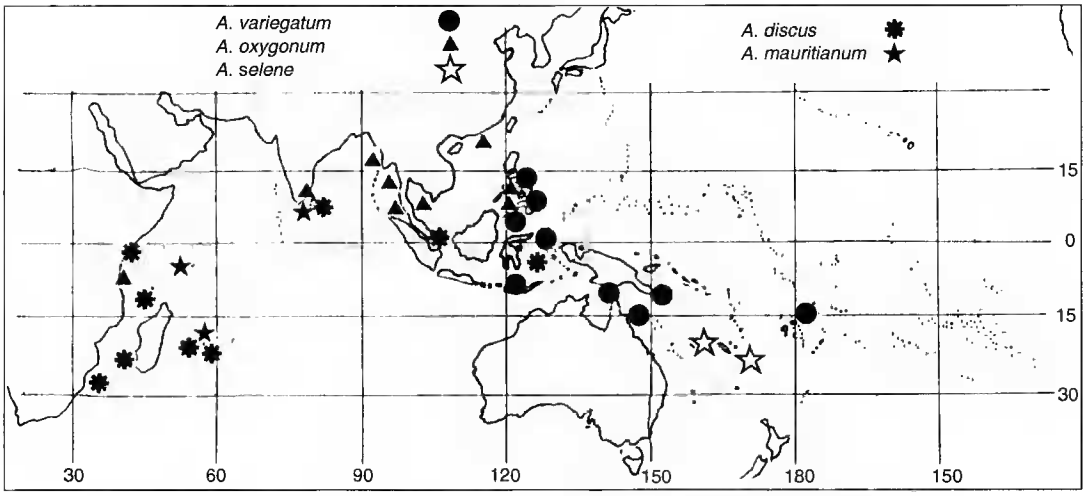

FIG. 6. — Distribution of the species of the species-group of *Acrosterigma variegatum*.

Lunule wide on right valve, projecting from the margin against left valve, and composed of two parts: a strongly hollowed part near margin, forming an elongated socket, and an elevated part behind that, forming a large rib-like ridge, both parts being concentrically finely ridged (Fig. 5C); practically no lunule on left valve (Fig. 5C). Exterior beige variegated with large irregular patches of orange, brown, and purple, which are visible interiorly. Hinge markedly asymmetrical (average ratio D = 0.84; range 0.78-0.88) and moderately angled (average < A = 128°; range 125°-130°).

Mean rib number 40.2, range 36-43 (never as many as 48, as indicated by Sowerby).

Rib morphology: on PQ, anterior part of ribs

TABLE 14. — Measurements (in mm) and rib count of *Acrosterigma variegatum* (Sowerby, 1840).

	H	L	W	L/H	W/L	D	A°	Ribs
Syntype *Variegatum* No. 1	55.6	48.6	33.4	0.87	0.69	0.83	120	36
Idem No. 2	53.0	50.6	29.6	0.95	0.58	0.80	125	42
Idem No. 3	47.7	43.1	34.0	0.90	0.78			37
MNHN, Sulu	43.7	40.0	27.3	0.92	0.68	0.87	130	41
MNHN, Philippines	34.0	32.0	21.0	0.94	0.66	0.88	125	37
MNHN, Philippines	46.3	40.4	28.0	0.87	0.69	0.80	125	39
MNHN	40.8	37.3	24.7	0.91	0.66	0.82	130	40
QM MO20733	48.3	42.3	29.7	0.88	0.70	0.88	130	43
AMS C30279	58.1	52.6	(37.0)	0.91	0.70			43
Total adult shells measured and rib counts				18	17	14	14	22
General mean values				0.91	0.67	0.84	128	40.2
Standard deviation				0.03	0.04	0.04	3.0	2.2
Largest specimen observed, AMS C30279 (see above)								

TABLE 15. — Measurements (in mm) and rib count of *Acrosterigma oxygonum* (Sowerby, 1833).

	H	L	W	L/H	W/L	D	A°	Ribs
Syntype *oxygonum* No. 1	41.2	34.0	25.0	0.81	0.74	0.82	115	36
Idem No. 2	37.5	32.7	23.0	0.87	0.70	0.81	110	37
MNHN, China	36.8	31.8	23.0	0.86	0.72	0.95	120	41
MNHN, India	37.5	32.3	22.2	0.86	0.69	0.86	120	37
Idem	36.0	30.7	20.3	0.85	0.66	0.83	115	38
MNHN, Phuket	36.9	31.6	23.0	0.86	0.73	0.82	120	38
MNHN	42 8	37.0	26.0	0.86	0.70	0.80	110	38
Total adult shells measured and rib counts				11	11	9	9	19
General main values				0.85	0.70	0.85	117	38.9
Standard deviation				0.02	0.02	0.05	4.1	1.4
Largest specimen observed, MNHN (see above)								

much wider, with oblique scales straddling a very thin intermediate furrow. Ribs of MPQ triangular with a slightly concave posterior side, and a small, entirely smooth crestal fold. Anteriorly ribs become progressively rounded, first a little retro-ridged then top-ridged on anterior half. Interstices always rounded (PQ excepted), and slightly narrower than ribs.

REMARKS

A. variegatum is very constant in characters. It cannot be confused with any other species, particularly because of its unique lunule.

Acrosterigma oxygonum (Sowerby, 1833)
(Fig. 5D-F; Table 15)

Cardium oxygonum Sowerby, 1833: fig. 9; 1841a: 107.

TYPES. — Two shells considered as syntypes in BMNH, Cuming collection, labelled "Philippines". The dimensions and rib number given by Sowerby could fit the specimen figured here (Fig. 5D, E); but the locality given by Sowerby (China Sea) does not agree.

MATERIAL EXAMINED. — The following lots in addition to syntypes:
Zanzibar. (IRSNB Dautzenberg).
India. Gulf of Manaar (BMNH Winckworth). — Tuticorin (BMNH Winckworth). — Rameswaram (MNHN Vidal). — Vishakhapatman (USNM 622130).
Sri Lanka. (MNHN Staadt). — (IRSNB Dautzenberg). — (NHMW 859). — (AMS C03408 – (BMNH 1875-4-8-2 Holdworth – (USNM 149929).
Burma. S of Akyab, Gulf of Bengal (ANSP 239957, 293956). — 10°37'N, 97°34'E, Twin Island, Andaman Sea (ANSP 291908).
Thailand. Hai Nan Beach, Phuket (MNHN Vidal). — Nai Yang Reef, Phuket (MNHN Vidal). — Kata Beach (ZMUC). — Southern Thailand (LACM 13488). — 9°11'N, 98°13'E, Gulf of Thailand (ZMUC).
Malaysia. Langkawi Island, Andaman Sea (ZMUC). — 6°27'N, 99°50'E, Langkawi Island (AMS Loch).
Philippines. (NHMW). — (AMS). — Ticao Island (MHMW).
China. (MNHN Denis 1945). — (LACM 50836). — (MHMW).
Unidentified and unknown localities. Toujong Rhu (AMS C142747). — Three lots (MNHN).

DISTRIBUTION. — (Fig. 6) Except for a lot said to be from Zanzibar (to be confirmed), exclusively in northern hemisphere: Gulf of Mannar, Andaman Sea and Malacca Strait, Gulf of Thailand, (South?) China, Philippines. Published records from Australia (South Queensland and New South Wales) are erroneous and refer to *A. kerslakae*.

DESCRIPTION

Shell medium-sized; ovoid, and almost equilateral, sometimes with posterior dorsal margin a little straightened; hardly elongated (mean L/H = 0.85; range 0.81-0.89) and not appreciably compressed (mean W/L = 0.70; range 0.66-0.74). Ribs straight in projection.

Lunule about equivalent on both valves, well-delineated, and appreciably hollowed on both sides. External colour beige, variegated with rather dark brown to purple in large irregular

TABLE 16. — Measurements (in mm) and rib count of *Acrosterigma selene* n. sp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *selene*	27.3	26.4	17.7	0.97	0.67	0.68	120	37
Paratype No. 1	35.3	32.9	(23.6)	0.93	0.72	0.67		35
Idem No. 2	30.2	27.8	(20.0)	0.92	0.72	0.69		36
Idem No. 3	23.2	22.6	(16.0)	0.97	0.71		125	38
Idem No. 4	25.1	23.8	(16.0)	0.95	0.67	0.63		37
Idem No. 5	20.0	18.5	12.3	0.93	0.66	0.65	120	37
Total adult shells measured and rib counts				6	5	5	3	8
General mean values				0.94	0.66	0.66	122	36.6
Standard deviation				0.02	0.02	0.02	2.4	0.8
Largest specimen observed, paratype No. 1 (see above)								

patches; interior white, except for umbonal rays. Hinge appreciably asymmetrical (average ratio D = 0.85; range 0.80-0.95) and angled (average < A = 117°; range 110°-120°). A long, thin, weak umbonal sterigma on some shells in about 20% of lots.

Mean rib number 38.9, range 36-41.

Rib morphology: on PQ (Fig. 5F), both parts of equivalent width, with a weakly marked median furrow and scales that are somerimes irregular; interstices well-marked. Elsewhere, ribs always triangular, except for first ones of AQ, which become rounded; on MPQ (Fig. 5F), ribs first retro-ridged, becoming retro-tuberculated anteriorly, with numerous small tubercules situated on lower part of flank; anterior flank smooth, and a significant smooth crestal fold present. On anterior half, anterior flanks of ribs become at first pro-tuberculated at base, then pro-ridged, with ridges terminating in crestal tubercles, but not reaching interstice; in contrast, posterior flanks of ribs become and remain smooth throughout. Interstices triangular and smooth.

REMARKS

A. oxygonum has very constant characters, particularly an elaborate and distinctive rib morphology. One lot of this species in BMNH (reg. 1910-12-13-15), from Sri Lanka, is labelled as a type series of *"Cardium sanguineotincta"* Preston; another lot AMS C034080, from Sri Lanka, is labelled as a cotype lot of the same taxon. I could not find any verification of this name in the literature, even in Adam (1971).

Acrosterigma selene n. sp.
(Fig. 5G-J; Table 16)

TYPES. — All shells from several dredging campaigns in the vicinity of New Caledonia, MNHN, Richer de Forges ORSTOM collection. Holotype: a bivalved shell (Fig. 5G-I), LAGON 1985, stn 416, 22°38'S, 167°14'E, S zone of Lagoon, 40-50 m. Paratype 1: a left valve (Fig. 5J), CORAIL 2 1988, stn CP25, 20°25'S, 161°05'E, Lansdowne-Fairway Plateau, 67-70 m. Paratype 2: a left valve, CHALCAL 2 1986, stn DW 83, 23°20'S, 168°06'E, SE of New Caledonia ridge, 200 m. Paratype 3: a right valve, CHALCAL 1984, stn D39, 20°29'S, 158°41'E, Chesterfield-Bellona Plateau, 40 m. Paratype 4: a left valve, CORAIL 2 1988, stn DW 18, 20°44'S, 161°00'E, Lansdowne-Fairway Plateau, 69 m. Paratype 5: a bivalved shell, LAGON 1985, stn 379, 22°31'S, 167°11'E, Grand Récif Sud, 70 m. Paratypes 6 to 10: six smaller valves or bivalved shells, from Chesterfield and Landsdowne-Fairway areas.

ETYMOLOGY. — *Selene*, greek name of the moon; an allusion to the unique lunule of this shell (*lunula*: small moon in Latin).

MATERIAL EXAMINED. — The type series (eleven individuals).

DISTRIBUTION. — (Fig. 6) SE of New Caledonia, Chesterfield-Bellona Plateau and Landsdowne-Fairway bancs.

DESCRIPTION

Shell medium-sized, almost equilateral, neither elongated (L/H range 0.93-0.97) nor inflated (W/L of holotype = 0.67) and very slightly truncated on posterior margin.

Lunule well-delineated and extremely hollowed

TABLE 17. — Measurements (in mm) and rib count of *Acrosterigma discus* n. sp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *discus*	29.2	27.5	15.6	0.94	0.57	0.78	125	57
Paratype No. 1	26.9	25.0	15.6	0.93	0 62	0.79	120	54
Idem No. 2	25.3	23.6	14.7	0.93	0.62	0.82	120	61
Idem No. 3	24.4	22 5	13.0	0.92	0.58	0.85	120	53
Idem No. 4	24.3	23.0	12.8	0.95	0.56	0.95	120	56
Natal, Natal Mus. S4039	29.2	26.0	(15.8)	0.89	0.61	≈1.0	120	63
MNHN, Kenya	23.6	22.0	13.9	0.93	0.63	≈1.0	120	59
MNHN, Comores	24.1	22.1	13.6	0.92	0.62	0.86	115	62
MNHN, Madagascar	23.9	22.3	(14.0)	0.93	0.63		115	53
ZMA, Moluccas	25.5	23.8	14.2	0.93	0.60	0.76	115	55
USNM 321695	31.5	28.0	17.8	0.89	0.64			
Total adult shells measured and rib counts				36	36	16	6	46
General mean values				0.93	0.60	0.90	120	56.3
Standard deviation				0.02	0.03	0.08	2.9	3.2
Largest specimen observed, USNM 321695 (see above)								

on both sides, the right being wider (Fig. 5I, J). External colour yellowish-beige, with irregular darker zones and pink to orange spots. Interior whitish with traces of external spots, and two pink umbonal rays which are also visible exteriorly. Hinge moderately angled (< A about 120°), and strongly asymmetrical (ratio D range 0.63-0.69), in contrast to the shell itself, which is almost perfectly equilateral, as previously mentioned.

Mean rib number 36.6 (range 35-38).

Rib morphology: on PQ, anterior smooth part of ribs much wider than posterior part; intermediate furrow very thin and not always visible in adult region. Scales elongated, sometimes prismatic, straddling the longitudinal furrow, and often almost longitudinally disposed rather than oblique. On MPQ, ribs triangular and slightly asymmetrical with posterior flank flat, shorter, and more abrupt, and anterior flank slightly convex. Ribs themselves practically smooth (rarely slightly retro-ridged), with a crestal fold marked by regular, short undulations derived from PQ scales. On anterior half, ribs become progressively less triangular, then rounded, first retro-ridged or crenulated, then top-ridged. Interstices rounded, smooth, as wide as ribs.

REMARKS

Acrosterigma selene superficially resembles *A. mauritianum* in shape and colour, but has fewer ribs and its rib morphology is different (ribs more triangular). It differs from all *Acrosterigma* species by its unique lunule.

Acrosterigma discus n. sp.
(Fig. 5K-M; Table 17)

Trachycardium cf. *mauritianum* (Deshayes). – Drivas & Jay 1988a: 17, fig. 14.

TYPES. — All from Mauritius, in MNHN, H. Fischer coll.: holotype and four paratypes.

ETYMOLOGY. — Shape close to a disc.

MATERIAL EXAMINED. — The following lots in addition to the type material:

South Africa. N Zululand (in Natal Museum): Between Bhanga Neck and Kosi Bay, 34 m (D9816 Herbert). — Leadsman Shoal, 25 m (E2453 Herbert). *Meiring Naudé* 1987, SE of Kosi River Mouth: stn ZA1, 26°56.9'S, 32°54.5'E, 50 m (D9219). — Stn ZA2, 26°56.0'S, 32°54.7'E, 50 m (D7304). — Stn ZA9, 26°54.6'S, 32°55.3'E, 50 m (D6246). — Stn ZA12, 26°55.0'S, 32°55.8'E, 65 m (D8065). — Stn ZA29, 26°54.3'S, 32°54.8'E, 48 m (D8703). — Stn ZA30, 26°54.3'S, 32°55.5'E, 50 m (D7932); NMDP 1990, off Kosi Bay: stn ZA37, 26°54.0S, 32°55.5E, 50 m (S3973). — Stn ZA41, 26°52.9'S, 32°55.3'E, 49 m (S5641). — Stn ZA48, 26°53.5'S, 32°55.6'E, 51 m (S4039). — ZB12 27°00.4'S, 32°55.3'E, 67 m (S6335).

Mauritius. (MNHN). — (BMNH). — (NHMW). —

(AMS C147231). — (USNM 149930, 321695). — (ANSP 315581). — 21°21'S, 65°52'E, SE Rodriguez Island, 60 m (USNM Brunn).
Madagascar. THOMASSIN'S Survey 1962-72, Tulear area (MNHN): stn D16, 23°29'36"S, 43°41'35"W, 13-17 m. — Stn D21, 23°20'35"S, 43°41'35"W, 50 m. — Stn D50, 23°29'06", 43°22'24"W, 29 m. — Stn D51 23°29'00"S, 43°52'51"W, 10 m. — Stn 230, S of Grand Récif, 21 m. — Stn 240, Grand Récif, 36 m. — Stn 261, Grand Récif, 26 m. — Stn 615, 616, Beach N of Fiharenana, 8 m. — Stn 619, 621, Tulear Lagoon, South Pass. — Stn 738, Tulear Lagoon, South Pass, 12 m.
Comores. 43 m (MNHN Plaute 1975).
Kenya. Wasin Channel (off Michangani), Shimoni, 10 m (MNHN).
Sri Lanka. (BMNH 1937-7-9-31-33).
Singapore. Sentosa Island reclamation (AMS C310566).
Moluccas. (ZMA).

DISTRIBUTION. — (Fig. 6) Mainly Indian Ocean, very abundant in Mauritius, where it is sympatric with *A. mauritianum* and similarly collected *ex pisce*; recorded in La Réunion only by Drivas & Jay (1988a: 17); Known, but rare, as far east as the Moluccas.

DESCRIPTION

Shell medium-sized to small, almost circular (L/H range 0.87-0.97), almost perfectly equilateral, sometimes very slightly truncated on PQ, and very rarely slightly expanded backwards. Shell also strongly flattened (W/L range 0.53-0.65), giving it a "disk-like" appearance.
Lunule extremely narrow to non-existent on both valves, and may be absent altogether, with reduced ribbing practically reaching margin. On right valve this margin appreciably raised near umbo. Periostracum thin and homogeneous. External colour light beige, more or less mottled with brown-purple, and umbo sometimes with two radial purplish rays. Interior white with purplish stains corresponding to external markings. Hinge nearly symmetrical, but with ratio D always less than 1.00 (range 0.76-1.0). Angle A rather high, ranging from 115 to 125°.
Mean rib number 56.3 (range 53-63).
Rib morphology: on PQ (Fig. 5M), anterior smooth part of each rib unusually large, axial furrow very thin and often confused with posterior part of rib, which is also very thin, sometimes practically non-existent. Persistent scales inserted in the furrow are high, elongated, ellipsoidal in section and slightly twisted; they encroach slightly upon anterior part of rib. These scales placed at a narrow angle to axis of shell, almost longitudinally. On MPQ, ribs asymmetrically triangular with posterior flank steeper; they are generally smooth (rarely with ridges in continuity with scales of PQ as in Fig. 5M). The rib top (apex of triangle) bears a smooth, regular, longitudinal crestal fold (Fig. 5M: shining line). Interstices rounded and smooth. On anterior half of shell, ribs become progressively asymmetrically rounded, more or less retto-ridged or festooned, then top-ridged; on first ribs of AQ, top scales become tubercular and a little irregular, and tend to take on a vaguely concentric alignment.

REMARKS

Acrosterigma discus resembles *A. mauritianum* with which it has been confused. However, it differs in its discoid shape, higher rib number, and more triangular shape of the ribs on MPQ.

Acrosterigma mauritianum (Deshayes, 1855)
(Fig. 7A, B; Table 18)

Cardium mauritianum Deshayes, 1855: 331.
Trachycardium nebulosum (Reeve) – Drivas & Jay 1988a: 17, fig. 15; 1988b: 140, pl. 55 [Not *Cardium nebulosum* Reeve, 1845 = *Acrosterigma simplex* (Spengler 1799)].

TYPES. — Three syntypes in BMNH, Cuming collection, not catalogued, from Mauritius (stomach of a large fish). The largest is figured here (Fig. 7A, B).

MATERIAL EXAMINED. — The following lots in addition to the three syntypes:
Mauritius. (MNHN Jousseaume 1921). — (MNHN Carrié 1911). — (MNHN J. de Lh.). — (MNHN Vidal). — (AMS C147223, 147224, 147226, 147227, 038053). — (BMNH).
Seychelles. Amirante Island, stn E16 (BMNH 1910-8-31-701 Gardiner).
Reves 2 1880 MNHN: stn 4, 05°08'S, 56°35'E, 32 m. — Stn 18, 05°45'S, 56°35'E, 50 m. — Stn 20, 05°36'S, 56°19'E, 35 m.
Sri Lanka. (BMNH 1937-7-9-31-33)?
Philippines. Port Galera, Mindoro (BMNH 1914-6-12-52)?
Unknown locality. (MNHN).

DISTRIBUTION. — (Fig. 6) Mauritius and Seychelles, sometimes present well-preserved in the stomachs of

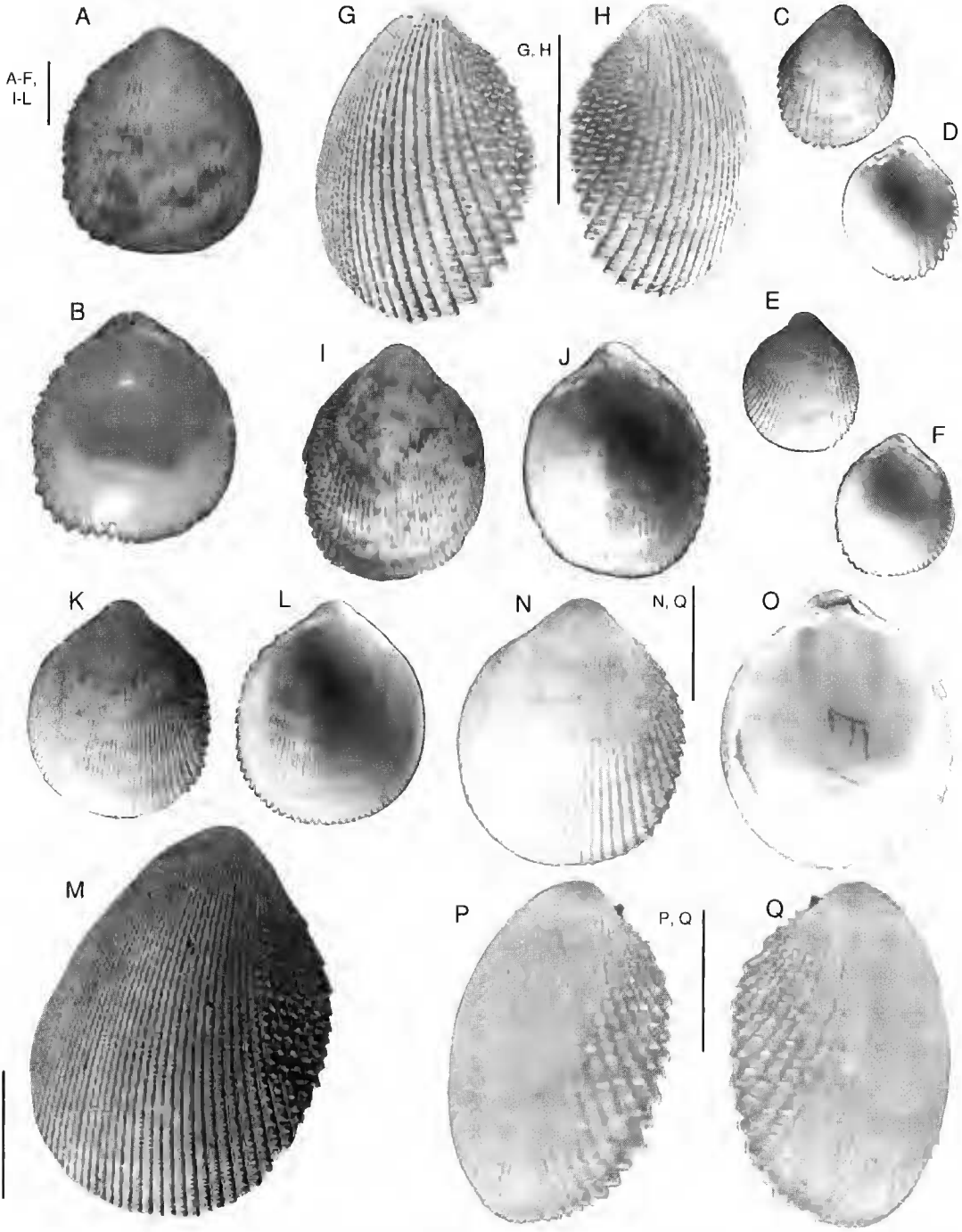

FIG. 7. — **A**, **B**, *Acrosterigma mauritianum*, syntype; **C**, **D**, *Acrosterigma uniornatum*, holotype; **E**, **F**, *Acrosterigma uniornatum*, paratypes 1 and 2; **G**, *Acrosterigma uniornatum*, paratype 28; **H**, *Acrosterigma uniornatum*, paratype 29; **I**, **J**, *Acrosterigma profundum*, holotype; **K**, **L**, *Acrosterigma profundum*, paratype 1; **M**, *Acrosterigma profundum*, paratype 2; **N**, **O**, *Acrosterigma amirante*, holotype; **P**, **Q**, *Acrosterigma amirante*, holotype; view of PQ and MPQ on both valves. Scale bars: 10 mm.

TABLE 18. — Measurements (in mm) and rib count of *Acrosterigma mauritianum* (Deshayes, 1855).

	H	L	W	L/H	W/L	D	A°	Ribs	
Synt. *mauritianum* No. 1	33.1	29.0	20.8	0.88	0.72	≈1.0	120	41
Idem No. 2	32.8	30.0	21.0	0.91	0.70	0.98	110	45
Idem No. 3	29.8	27.3	20.0	0.92	0.73	0.90	115	46
MNHN, Mauritius	37.0	31.6	23.3	0.85	0.74	0.89	115	44
MNHN, Mauritius	30.6	27.4	19.6	0.90	0.72	0.92	120	43
MNHN, Seychelles	26.2	21.5	17.0	0.82	0.79	0.96	120	43
MNHN, Mauritius	38.5	32.8	23.7	0.85	0.72	≈1.0	120	44
MNHN, Mauritius	39.0	33.7	24.0	0.86	0.71	0.95	120	42
Total adult shells measured and rib counts				19	19	10	9	26
General mean values				0.89	0.71	0.95	118	44.1
Largest specimen observed, MNHN Mauritius (see above)								

large fishes; old lots said to be from Sri Lanka or the Philippines are probably mislocalized.

DESCRIPTION

Shell medium-sized, ovoid and almost equilateral, sometimes with a slight truncation at MPQ margin and frequently a slight flattening of median ventral margin. Shell moderately elongated (mean L/H = 0.89; range 0.82-0.94) and inflated (mean W/L = 0.71; range 0.64-0.79).

Lunule narrow, elongated and slightly hollowed on right valve, very thin to nearly absent on left. External colours beige with variably developed pinkish patches, sometimes with two umbonal rays; interior white, except for pink umbonal rays. Hinge almost symmetrical (mean ratio D = 0.95; range 0.89-1.00) and moderately angled (mean < A = 118°; range 110°-125°).

Mean rib number 44.1, range 41-47.

Rib morphology: on PQ, anterior part of ribs wide, posterior part and intermediate furrow very narrow and poorly differentiated. Scales short and sometimes slightly tubercular; interstices narrow. On MPQ ribs generally roundly triangular to rounded and asymmetrical, rarely fully triangular. Posterior flank shorter and more abrupt, with a clean crestal fold; ribs retro-tuberculated, rarely entirely smooth. On anterior half, ribs become rounded, retro-tuberculated or crenulated, then more or less clearly top-ridged. On first ribs of AQ, top ridges widen and become tubercular and irregular, sometimes forming vaguely concentrical alignments.

REMARKS

A. mauritianum is well-characterized by its shape and colour, and distinctive rib characters on PQ and MPQ; it differs also from the other species of the species-group by its less triangular ribs and the characteristics of AQ, which may be transitional with those of the species-group of *A. maculosum*.

Species-group of *Acrosterigma uniornatum* n. sp.

DIAGNOSIS. — See Table 5.

INCLUDED SPECIES. — 1) Recent: four new species: *A. uniornatum*; *A. profundum*; *A. amirante*; *A. suluanum*. 2) Fossil: lack of sufficient information; a new species described here *A. paulayi* n. sp.

Acrosterigma uniornatum n. sp.
(Figs 7C-H; 8A; Table 19)

TYPES. — All type lots come from three relatively shallow banks on the Melanesian Border Plateau, within and in the vicinity of Wallis and Futuna Territory, MUSORSTOM 7 Campaign 1992 in the south-western Pacific, in MNHN, Bouchet, Métivier, Richer de Forges coll. Holotype: a right valve (Fig. 7C, D), stn DW 29, 12°31'S, 176°40'W, Waterwitch Bank, 500 m. Paratype 1: a left valve from the same locality (Fig. 7E). Paratype 2: a right valve from the same locality. Paratype 3: a right valve from the same locality (Fig. 7F). Paratypes 4 to 25: odd valves, same locality. Paratypes 26-27: two valves, stn DW 530, 12°33'S, 176°39'W, Waterwitch Bank, 580-600 m. Paratypes 28 to 36: odd valves, stn DW 538, 12°31'S, 176°40',

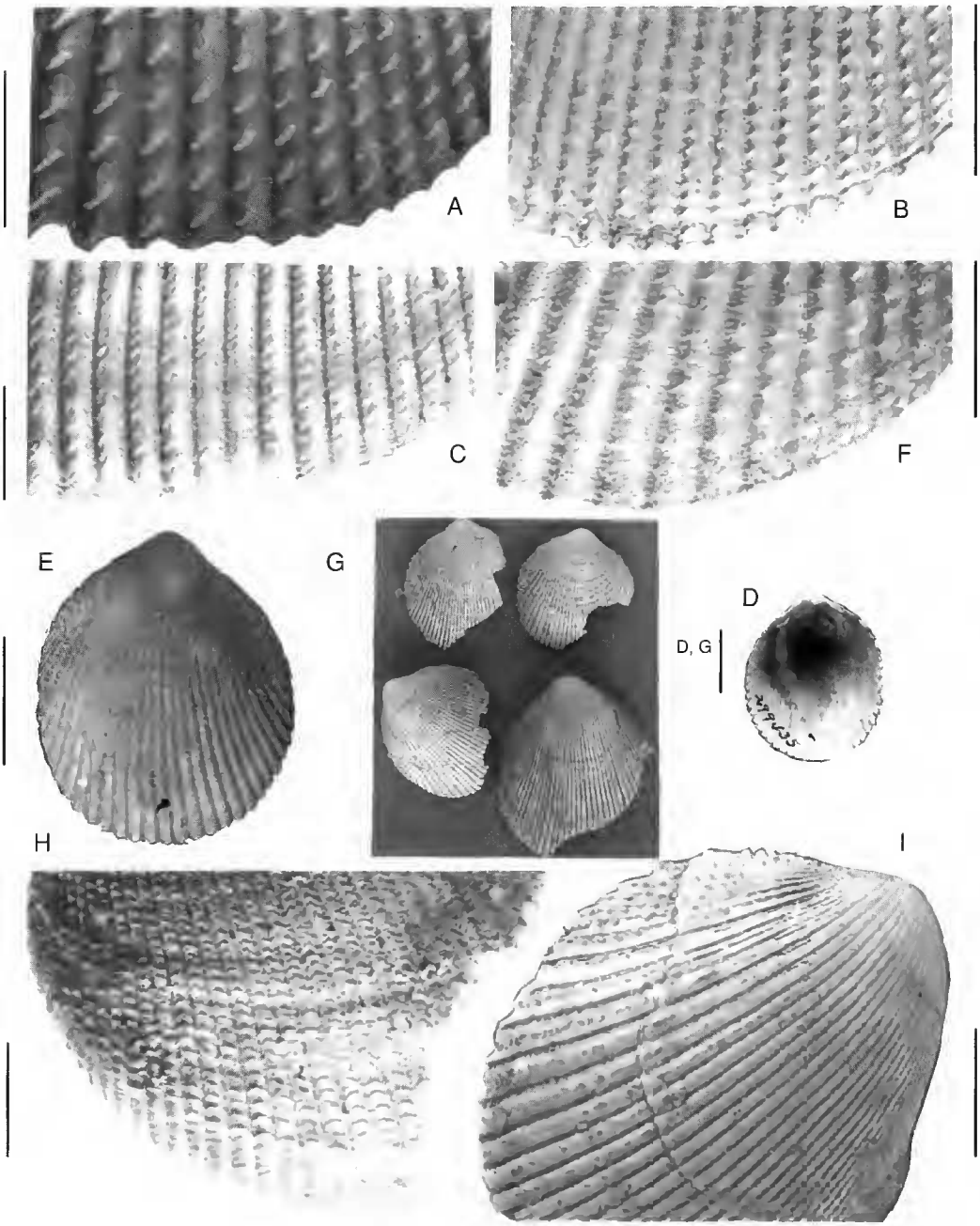

FIG. 8. — **A**, *Acrosterigma uniornatum*, holotype; view of median-anterior part; **B**, *Acrosterigma amirante*, holotype; view of median-anterior part; **C**, *Acrosterigma profundum*, holotype; view of median-anterior part; **D**, *Acrosterigma suluanum*, holotype; **E**, *Acrosterigma suluanum*, holotype; **F**, *Acrosterigma suluanum*, holotype; view of median-anterior part; **G**, *Acrosterigma paulayi*; type series, (P1, P2, P3 = paratypes; H = holotype); **H**, *Acrosterigma paulayi*, holotype, view of MAQ and part of AQ; **I**, *Acrosterigma paulayi*, paratype 1; detail of PQ and part of MPQ. Scale bars: A-C, F, 4 mm; D, E, G, 10 mm; H, I, 5 mm.

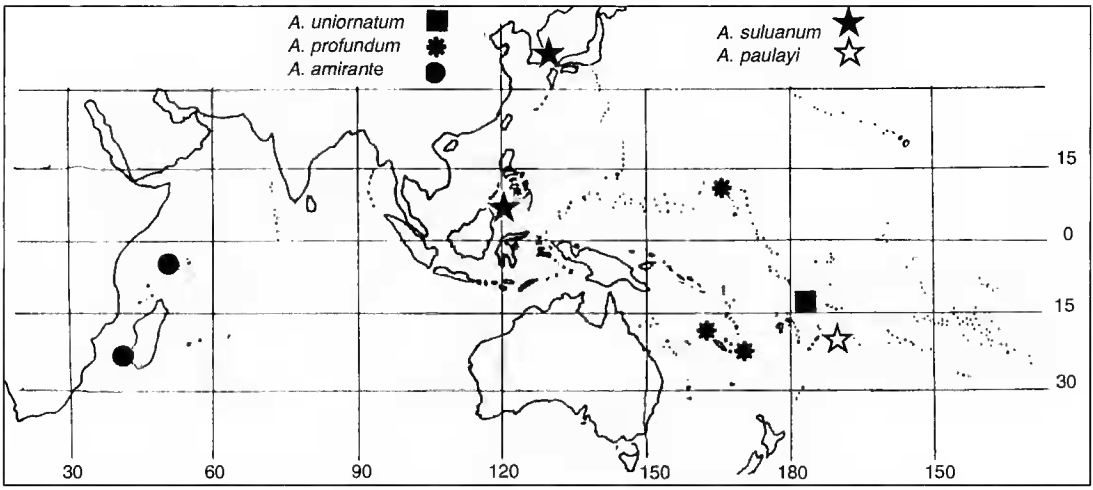

FIG. 9. — Distribution of the species of the species-group of *Acrosterigma uniornatum*.

Waterwitch Bank, 275-295 m. Paratype 37: one valve, stn DW 542, 12°26'S, 177°28'W, Combe Bank, 370 m. Paratypes 38-39: two odd valves, stn DW 546, 12°27'S, 177°29'W, Combe Bank, 550-552 m. Paratypes 40 to 44: odd valves, stn DW 588, 12°17'S, 174°45'W, Field Bank, 490-500 m.

ETYMOLOGY. — Ornamentation of the ribs uniform on all the parts of the shell.

MATERIAL EXAMINED. — The type series.

DISTRIBUTION. — (Fig. 9) Known only from the vicinity of Wallis and Futuna Islands. It is unclear whether this species lives at 500-600 m where the shells were dredged, or have rafted down from shallower depths. Anyhow, its depth range is probably greater than is usual for the genus. This occurs also for the other species of the species-group.

DESCRIPTION

Shell small, ovoid, practically equilateral, never truncated posteriorly, moderately elongated (L/H about 0.83) and rather globose (extrapolated W/L about 0.82).

Lunule well-delineated, nearly similar on both valves, small, and slightly hollowed. External

TABLE 19. — Measurements (in mm) and rib count of *Acrosterigma uniornatum* n. sp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *uniornatum*	22.4	18.1	(15.2)	0.81	0.84		130	36
Paratype No. 1	21.9	18.0	(15.4)	0.82	0.86	≈1.0		39
Idem No. 2	22.1	18.1	(15.4)	0.82	0.80		130	36
Idem No. 3	21.7	17.9	(14.4)	0.82	0.80		130	36
Idem No. 4	16.3	14.0	(12.0)	0.86	0.86	≈1.0		39
Total adult shells measured and rib counts				14	14	3	5	16
General mean values				0.83	0.82	100	128	38.2
Standard deviation				0.02	0.03	0	4.0	1.4
Largest specimen observed, the holotype								

TABLE 20. — Measurements (in mm) and rib count of *Acrosterigma profundum* n. sp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *profundum*	36.7	28.2	(23.6)	0.77	0.84		120	57
Paratype No. 1	34.4	28.8	(22.4)	0.84	0.78	≈1.0		61
Idem No. 2	30.0	24.4	(19.0)	0.81	0.78	≈1.0		63
Idem No. 5	32.3	26.3	(21.8)	0.81	0.83		125	57
Idem No. 6	21.1	18.0	(13.2)	0.85	0.73	0.95		57
Idem No. 7	19.5	16.6	(13.0)	0.85	0.78		120	55
Total adult shells measured and rib counts				6	6	3	3	8
General mean values				0.82	0.79	1.03	122	56.9
Standard deviation				0.03	0.04	0.06	2.3	3.1
Largest specimen observed, the holotype								

colour uniform: white on juvenile part, pale yellow on adult part. Interior white, very rarely with traces of pink; no umbonal rays visible. Hinge symmetrical (ratio D *c.* 1.0), and moderately angled (< A about 130°). On right valve cardinals show a greater degree of fusion at their base than is typical for the genus.

Mean rib number 38.2, range 36-41.

Rib morphology: on PQ (Fig. 7G, H), interstices thin, ribs flat with a central longitudinal furrow. Anterior smooth part narrower than posterior part, which bears elongated, thin, straight, oblique scales, often encroaching upon axial furrow and even anterior part. On MPQ (Fig. 7G, H), same features occur but posterior zone is slightly raised and ribs become slightly flattened triangles. Longitudinal furrow progressively becomes less distinct, and anterior smooth part of rib becomes its anterior flank. Scales remain about the same as on PQ. On anterior half (Fig. 8A), ribs become more rounded; scales become more numerous and change, first into posterior flank-ridges, then into moderately imbricated transverse top-ridges.

REMARKS

The discussions below indicate differences between *Acrosterigma uniornatum* and the other four species of the species-group.

Acrosterigma profundum n. sp.
(Figs 7J-M; 8C; Table 20)

TYPES. — Holotype: a right valve (Fig. 7I, J), BATHUS 4 1994, stn DW 894, 20°16'S, 163°52'E, N of New Caledonia, 245-268 m (MNHN, Bouchet, Métivier, Richer de Forges). Paratype 1: a left valve (Fig. 7K, L), New Caledonia LAGON 1987, stn 830, 20°49'S, 165°19'E, NE zone of Lagoon, 105-110 m (MNHN *idem*). Paratype 2: a left valve (Fig. 7M), BATHUS 4 1994, stn DW 896, 20°16'S, 163°52'E, N of New Caledonia, 315-350 m (MNHN *idem*). Paratype 3: a left valve, broken and incomplete, BATHUS 1 1993, stn DW 691, 20°35 S, 164°59'E, E coast of New Caledonia, 227-250 m (MNHN *idem*). Paratype 4: a very small left valve, from same locality as paratype 1. Paratype 5: a right valve, stn 14 of 1947 campaign seaward (N) of west end of Bikini Atoll, Marshall Islands. 177-244 m (USNM 598697, RW Russel coll.). Paratype 6: a left valve, same lot as paratype 5. Paratype 7: a left valve, same lot as paratypes 5 and 6.

ETYMOLOGY. — *Profundum*: deep in Latin; an allusion to the relative deep environment of this shell.

MATERIAL EXAMINED. — The type series.

DISTRIBUTION. — (Fig. 9) North and east of New Caledonia, at relatively great water depths for Cardiidae other than Protocardiinae; present also in Bikini Atoll, Marshall Islands (paratypes 5 to 7).

DESCRIPTION

Shell medium-sized, ovoid and nearly equilateral with no posterior truncation, moderately elongated (L/H range 0.77-0.85) and globose (extrapolated W/L range 0.73-0.84).

Lunule small, rather imperfectly delineated and nearly the same on both valves; umbonal margin raised, forming a double wall. External colour pattern is unique: on adult part, PQ entirely pink to orange, MPQ bears large, pink to orange, irregularly concentric splashes, and anterior half

TABLE 21. — Measurements (in mm) and rib count of *Acrosterigma amirante* n. sp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *amirante*	23.9	20.0	16.5	0.84	0.82	0.88	130	52
Paratype	24.2	?	?			0.86		55

of the shell beige, with widely scattered small splashes. Interior white with some exterior splashes showing through; no umbonal rays visible. Hinge symmetrical (ratio D *c.* 1.0) and moderately angled (< A about 120°). On right valve, cardinals show an unusual degree of fusion at their base, as in the preceding species.
Mean rib number 56.9 , range 55-63.
Rib morphology: on PQ (Fig. 7M), interstices thin; ribs flat with a central longitudinal furrow, anterior smooth part as wide as or narrower than posterior. Elongated, thin, straight, oblique scales develop on posterior part, straddling axial furrow and encroaching slightly upon anterior zone. On posterior half of MPQ (Fig. 7M), the same features appear, but posterior zone slightly raises and ribs become flatly triangular; longitudinal furrow progressively disappears and anterior smooth zone becomes anterior flank of the rib. On anterior half of MPQ (Fig. 8C), ribs become more rounded, scales become progressively shorter and more numerous and change into posterior ridges, rib tops becoming smooth; at the same time, numerous very thin oblique serrations appear on anterior flanks of ribs, changing anteriorly into small ridges or tubercles. On MAQ (Fig. 8C), this sculptural evolution leads to ribs which are slightly square-sided, serrated on both sides, and slightly overhanging interstices. In AQ, some lateral serrations join on top of ribs, forming thin, free top-ridges, which are not imbricated; the first ribs of this quarter slightly degenerate, their ornamentation becoming less regular.

REMARKS

Acrosterigma profundum has a very elaborate and specific rib morphology that cannot be confused with any other; it is separated from *A. uniornatum* by its larger size, higher rib number, and particular rib ornamentation on the median part of the shell, i.e. the small dense serrations on the anterior flanks of the ribs.

Acrosterigma amirante n. sp.
(Figs 7N, Q; 8B; Table 21)

TYPES. — Holotype: a bivalved shell (Figs 7P, Q; 8B), stn E16, Amirante Island, Seychelles, 71.3 m (BMNH Ref. 1910-8-31-702, J. S. Gardiner coll.). Paratype 1: a partially broken and incomplete left valve, Thomassin Survey, stn D36, 43°39'55"W, 23°29'08"S, Tulear, Madagascar, 280 m (MNHN).

ETYMOLOGY. — From Amirante Islands, Seychelles.

MATERIAL EXAMINED. — The type series.

DISTRIBUTION. — (Fig. 9) Indian Ocean: Amirante Islands and Madagascar.

DIAGNOSIS. — Shell small, ovoid, not truncated posteriorly, nearly equilateral, moderately elongated (L/H = 0.84) and rather globose (W/L = 0.83).
Lunule somewhat imperfectly delineated, small, almost equivalent on both valves, its margin raised near umbo. External colour a uniform pale yellow, except for a pink umbo. Interior white, with a pink concentric band in the middle and two pink umbonal rays. Hinge slightly asymmetrical (ratio D = 0.86 and 0.88) and moderately angled (< A = 130°). On right valve, cardinals more than usually fused at base once again.
Rib number 55.
Rib morphology: on PQ (Fig. 7P, Q), interstices very thin, ribs very flat with an axial longitudinal thin furrow separating two zones of similar width. Elongated, thin, straight, oblique scales occupy entire posterior zone and encroach upon anterior zone, straddling axial furrow. On MPQ, features are at first similar, but then (Fig. 8B) posterior zone becomes slightly raised and ribs become flatly triangular; axial furrow gradually disappears and anterior smooth zone becomes anrerior flank of the rib. Scales shorten, becoming only more numerous small flank-ridges; rib-tops become smooth. On anterior part of shell (Fig. 8B), flank-ridges extend again onto rib tops and eventually become transverse top-ridges, at first free and thin, then, on AQ, becoming wide, imbricated and even irregularly tubercular near lunule.

REMARKS

Acrosterigma amirante resembles *A. uniornatum* in dimensions, shape, and colour, but is distin-

TABLE 22. — Measurements (in mm) and rib count of *Acrosterigma suluanum* n. sp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *suluanum*	25.4	20.5	(15.0)	0.81	0.73		130	44
Paratype No. 1	43.6	34.0	(30.0)	0.78	0.88	0.95		44
Idem No. 2	33.3	28.6	(22.0)	0.86	0.77		130	45
Idem No. 3	?	27.0	(24.0)	?	0.89		130	44
Idem No. 4	30.3	25.7	(19.2)	0.86	0.75		130	45
Idem No. 5	28.5	23.8	(19.0)	0.84	0.80		130	41
Total adult shells measured and rib counts				5	6	1	5	6
General mean values				0.83	0.80	0.95	130	43.8
Standard deviation				0.03	0.06	0	0	1.3
Largest specimen observed, the paratype No. 1								

guished from that species by the lunule shape, rib number, and details of rib ornamentation. It is close to *A. profundum* in lunule shape and rib number, but differs in rib morphology having no high bi-crenulated ribs on the median part of the shell.

Acrosterigma suluanum n. sp.
(Fig. 8D-F; Table 22)

TYPE. — Holotype a right valve (Fig. 8D-F), stn 5577 of USBF, Tawitawi Island, Sulu Archipelago, Philippines, 439 m (USNM 299435). Paratypes 1, 2 and 3, a left valve and two right valves from Sunasaki, Japan, dredged 150-35 m (ZMUC coll. Mortensen). Paratypes 4 and 5, two right valves, 34°20'N, 130°10'E, Japan, 113 m, same repository and collection.

ETYMOLOGY. — From Sulu Archipelago, Philippines.

MATERIAL EXAMINED AND DISTRIBUTION. — (Fig. 9) The holotype, from north of Tawitawi Island, Philippines, at a great water depth for a Cardiidae and five paratypes from Japan.

DESCRIPTION

Shell small, ovoid, not truncated posteriorly and almost equilateral, moderately elongated (mean L/H = 0.83) and tumid (mean W/L = 0.80).

Lunule small, rather imperfectly delineated, its umbonal margin raised. Colour yellow with more orange splashes; interior partially pink. Hinge slightly asymmetrical (ratio D = 0.95) and moderately angled (angle A = 130°). On right valve, cardinals slightly more than usually fused at base.

Mean rib number 43.8, range 41-45.

Rib morphology: on PQ, interstices very thin, ribs very flat with an axial furrow separating two zones of similar width. Slightly elongated, tubercular, oblique scales on posterior part encroaching upon anterior zone, straddling axial furrow. On MPQ ribs become flatly triangular and asymmetrical, then rounded. Scales disappear and are replaced posteriorly with numerous very thin short ridges or tubercles, situated at base of rib, touching interstice. On MAQ (Fig. 8F), large scales reappear on posterior flanks, surimposed on the latter fine ornamentation; a similar fine beading but thinner and more tubercular appears also at base of anterior flank of ribs. On AQ (Fig. 8F), the fine beading of both sides disappears and posterior large scales proceed to top and anterior flank of ribs, forming free top-ridges which are not imbricated.

REMARKS

Acrosterigma suluanum shares with *A. profundum* the character of having fine ornaments on both sides of the ribs on MAQ (difference with *A. uniornatum* and *A. amirante* that have ornaments only on the posterior side). On *A. suluanum*, however, the ribs are rounded and the fine lateral ornaments are situated at the base of the ribs, touching the interstice, whilst on *A. profundum* the ribs are squared and the fine ornaments are separated from the interstice and slightly overhang it. In addition, the rib number of *profundum* is higher, with an average of 58.4, against 43.8 on *suluanum*.

TABLE 23. — Measurements (many extrapollated, in mm) and rib count of *Acrosterigma paulayi* n. sp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *paulayi*	29.5	25.5	20.0	0.86	0.78	1.27		50
Paratype No. 1	22.0	19.0	14.6	0.86	0.77		130	47
Idem No. 2	22.0	19.0	14.6	0.86	0.77	?		51
Idem No. 3	22.0	19.0	14.6	0.86	0.77		130	47
Total adult shells measured and rib counts				4	4	1	2	4
General mean values				0.86	0.77	1.27	130	48.7
Standard deviation				0.00	0.00	0.00	0.0	1.8
Largest specimen observed, the holotype								

Acrosterigma paulayi n. sp.
(Fig. 8G-I; Table 23)

TYPES. — All material (Fig. 8G-I) from Niue Island, Neogene fossil reef, will be stored in USNM, Paulay coll. Ref. FNIUE 28. Holotype: an incomplete left valve. Paratype 1: an incomplete right valve. Paratype 2: an incomplete right valve. Paratype 3: an incomplete right valve.

ETYMOLOGY. — In honour of Dr Gustav Paulay.

MATERIAL EXAMINED AND DISTRIBUTION. — (Fig. 9) The type material, plus five valves in poor state of preservation, all from Neogene fossil reef of Niue Island.

DESCRIPTION

Shell small to medium-sized, ovoid and nearly equilateral with no posterior truncation, moderately elongated (L/H = *c.* 0.86) and globose (extrapolated W/L = *c.* 0.77).

Lunule small and well-delineated, about equivalent on both valves, flat and slightly bending towards interior of shell. Colours not preserved. Hinge rather symmetrical and moderately angled (< A = 130°).

Mean rib number 48.7, range 47-51.

Rib morphology: on PQ (Fig. 8I), interstices narrow, ribs flat with central longitudinal furrow not or hardly marked, anterior smooth zone wider than posterior. Elongated, thin, straight, oblique scales develop on posterior part, not straddling axial furrow and not encroaching upon anterior zone. On MPQ (Fig. 8I), ribs become flatly rounded, then square-sided with rounded tops; posterior scales change into more numerous flank ridges or marginal serrations; possibly appearance of anterior marginal serrations (observation difficult, due to the imperfect state of preservation of the shells). On MAQ (Fig. 8H), lateral serrations proceed up to top and join, forming a herringbone structure. On AQ herringbone structure changes into straight concentrical ridging, not imbricated.

REMARKS

Acrosterigma paulayi is close to *A. profundum*; it differs in having a more depressed lunule, shorter oblique scales on PQ not encroaching upon the anterior smooth zone, no squared ribs elsewhere, no or less marked anterior serrations or scales on the ribs of the median part, more pronounced herringbone structure on the anterior part of MPQ and on MAQ. In addition, the rib number of *A. paulayi* is lower (48.7 *versus* 58.4 in *profundum*).

Species-group of *Acrosterigma maculosum* (Wood, 1815)

INCLUDED SPECIES. — 1) Recent: *A. maculosum* (Wood, 1815) with a new subspecies, *howense*; *A. impolitum* (Sowerby, 1833); *A. transcendens* (Melvill & Standen, 1899); *A. seurati* n. sp.; *A. dianthinum* (Melvill & Standen, 1899); *A. punctolineatum* Healy & Lamprell, 1992; *A. hobbsae* n. sp.; *A. simplex* (Spengler, 1799). 2) Fossil: see above for succint data.

DIAGNOSIS. — See Table 5.

Acrosterigma maculosum (Wood, 1815)
(Fig. 10A-H; Table 24)

Cardium maculosum Wood, 1815: 218, pl. 52, fig. 3.
Not *C. maculosum* Sowerby *in* Broderip & Sowerby, 1833: 85 [= *C. pristipleura* Dall, 1900)].
Not *C. maculosum*. – Sowerby, 1839: 18, fig. 123 [= *C. vertebratum* Jonas, 1844].

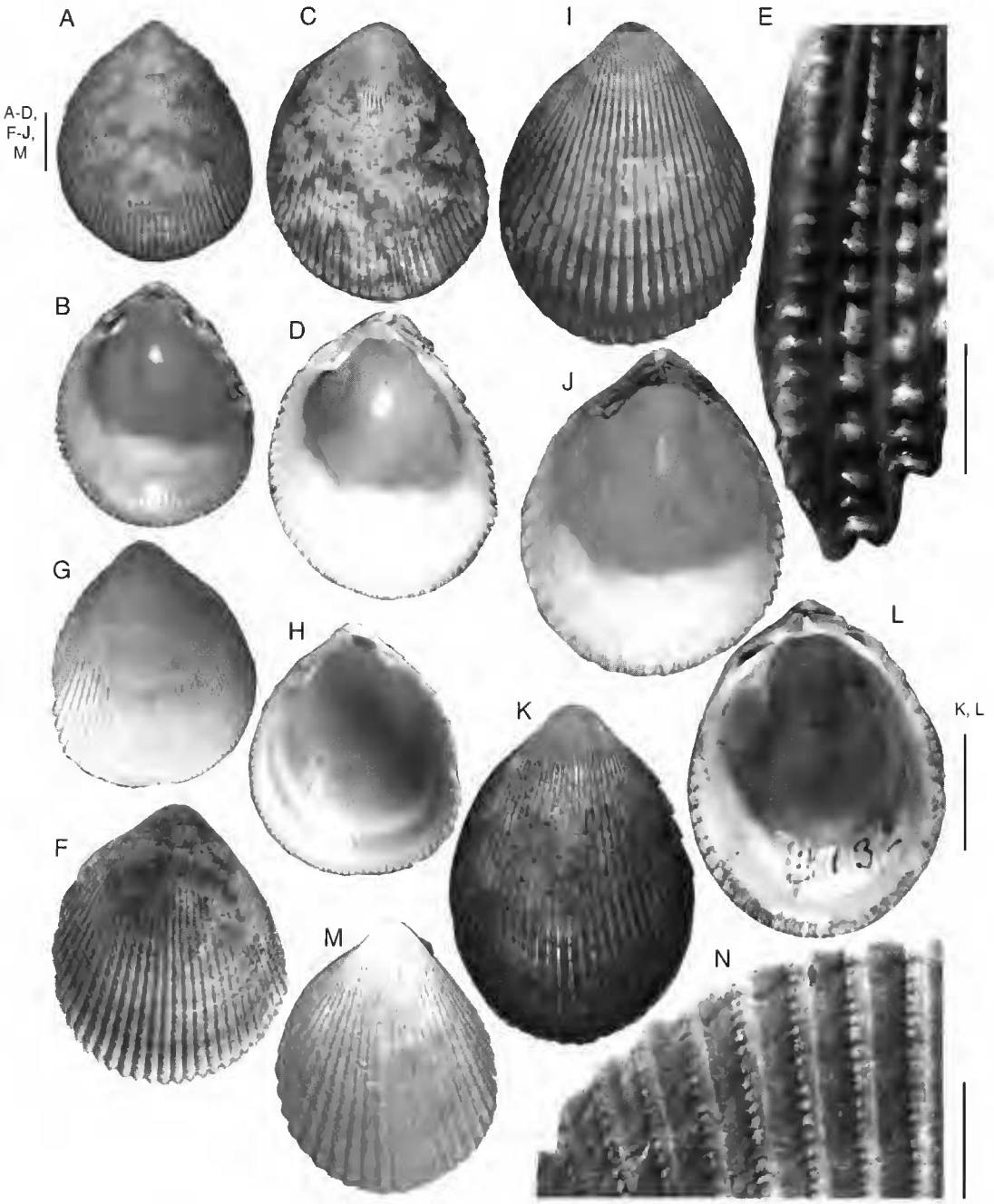

FIG. 10. — **A**, **B**, *Acrosterigma maculosum*, possible syntype of *C. multistriatum* Sowerby; **C**, **D**, *Acrosterigma maculosum*, syntype of *Cardium arenicola* Reeve; **E**, *Acrosterigma maculosum*, specimen from Shikoku, Japan, MNHN; detail of PQ and last rib of MPQ; **F**, *Acrosterigma maculosum*, specimen from Japan, MNHN: **G**, **H**, *Acrosterigma maculosum howense*, holotype: **I**, **J**, *Acrosterigma impolitum*, syntype; **K**, **L**, *Acrosterigma impolitum*, holotype of *Cardium beauforti* Prashad; **M**, *Acrosterigma impolitum*, specimen from Penang (Malaysia), MNHN; **N**, *Acrosterigma impolitum*, specimen from Queensland, MNHN; detail of median marginal part (an optical illusion can show the notched interstices as ribs). Scale bars: A-D, F-M, 10 mm; E, 2 mm; N, 4 mm.

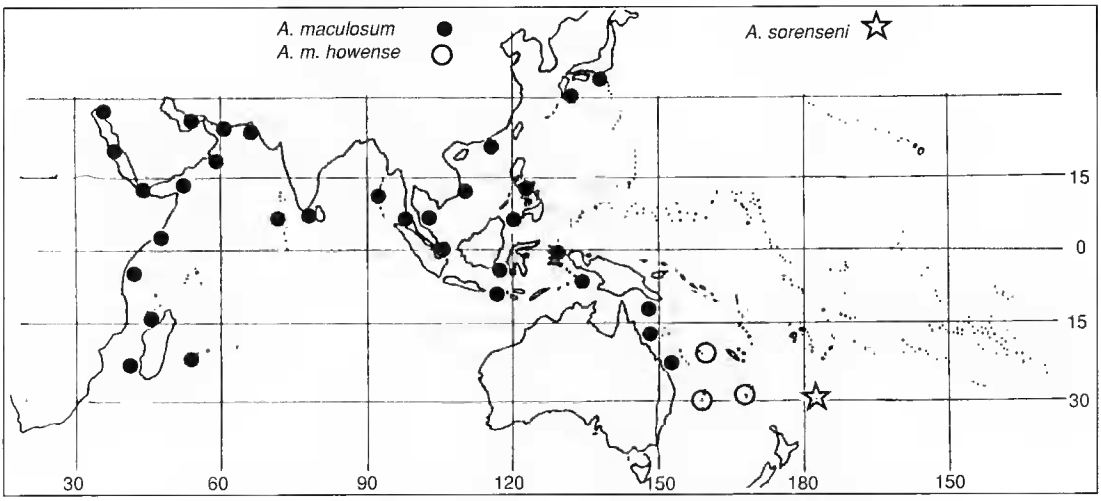

FIG. 11. — Distribution of *A. maculosum*, *A. maculosum howense* and *A. sorenseni*.

Cardium multistriatum Sowerby *in* Broderip & Sowerby, 1833: 85. – Sowerby 1841b: Sp. 47, fig. 59. *Cardium arenicolum* Reeve, 1845: Sp. 78.

TYPES. — *Cardium maculosum*: the shell figured by Wood not traced. *Cardium multistriatum*: the shell in Cuming collection from Santa Helena, cited and figured by Sowerby not traced. However, a lot labelled *C. multistriatum* from Santa Helena (West Columbia) is present in BMNH, Cuming collection (see also Reeve 1845: Sp. 76). These shells (Reg. 1995079/1-2-3) can be considered possible syntypes of *C. multistriatum*, the largest figured here (Fig. 10A, B). The locality is certainly erroneous, as no similar

TABLE 24. — Measurements (in mm) and rib count of *Acrosterigma maculosum* (Wood, 1815).

	H	L	W	L/H	W/L	D	A°	Ribs
Syntype(?) *multistriatum*	36.2	29.2	20.7	0.81	0.71	1.14	105	53
Syntype *arenicola*	42.0	32.6	23.0	0.78	0.71	≈1.0	100	48
MNHN, Zanzibar	23.2	20.0	15.2	0.86	0.76	≈1.0	120	50
MNHN, Red Sea	30.0	23.4	17.9	0.78	0.76	≈1.0	120	55
MNHN, Sri Lanka	44.7	34.7	26.5	0.78	0.76	≈1.0	105	48
ZMUC, Andaman Is	23.1	20.2	14.2	0.87	0.70	≈1.0	115	54
ZMUC, Philippines	41.6	35.1	25.8	0.84	0.74	≈1.0	105	50
MNHN, Hong Kong	20.2	19.0	12.2	0.94	0.64	≈1.0	120	44
MNHN, Japan	30.0	25.0	19.1	0.83	0.76	≈1.0	110	49
USNM 747210, Moluccas	30.0	23.4	(16.4)	0.78	0.70			60
AMS C077245, Queensland	36.1	29.1	21.8	0.81	0.75	≈1.0	120	56
MNHN, Japan	51.6	42.9	31.6	0.83	0.74	≈1.0	105	43
Total adult shells measured and rib counts				102	101	51	48	136
General mean values				0.84	0.71	1.02	115	51.7
Standard deviation				0.04	0.05	0.09	5.9	4.5
Largest specimen observed, MNHN, Japan (see above)								

cardiid has ever been found on the Pacific coast of the Americas. *Cardium arenicola*: three specimens considered as syntypes in BMNH Reg. 197 81 32, from Ticao, Philippines, the largest figured here (Fig. 10C, D).

MATERIAL EXAMINED. — The following lots in addition to the type material:
Mauritius. (BMNH Winckworth).
Madagascar. Stn 257 Tulear (MNHN Thomassin). — Nosi Be (MHNG). — (USNM 718849).
Zanzibar. (MNHN Rousseau 1841).
Somalia. Mogadischio (ANSP 289942).
Djibouti. Gulf of Tadjoura (MNHN Gravier 1904). — Tadjoura (MNHN Lavranos 1968). — W of Tadjoura (MNHN Lavranos 1974).
Red Sea. (MHNG). — Elath (MNHN Tel Aviv University). — Stn 27bis, 27ter, 28°14'N, 33°23'E, Gulf of Suez, 22 m (MNHN Mission Dolfuss 1928). — Tor Beach (MNHN Mission Dolfuss 1928). — Mersa Thlemel (MNHN Mission Dolfuss 1928). — Souakim (MNHN Jousseaume 1921). — S of Zeit, Egypt (fossil) (MNHN Plaziat). — Dahlak Archipelago (BMNH).
Arabian Sea. Aden (BMNH). — Socotra Island (MNHN Lavranos 1968). — 19°22'26"N, 57°53'00"E, off Masirah Island, 13.5 m (NMW). — 19°22'36"N, 57°53'00"E off Masirah Island (NMW). — Gulf of Oman (BMNH Melvill). — Makran Coast (BMNH Mac Andrew). — Karachi (BMNH Mac Andrew).
Persian Gulf. Dubay'ah (MNHN Pras 1981). — Trucial coast (BMNH). — *Calypso* 1954, stn 1, 2, E of Trucial Coast, 70 m (MNHN Charbonnier). — Lavan Island (MNHN Fischer-Piette 1973). — Abu Dhabi (BMNH).
Maldives. (ANSP 305455).
Sri Lanka. (MNHN Reynaud 1829). — (MNHN Denis 1945). — (MNHN Staadt 1969). — (BMNH Holdswork). — (USNM 17446). — (USNM 203974). — 08°47'N, 81°07'E Nilavel (LACM 84-8). — (AMS C04093).
India. Andaman Island (ZMUC Rocptorf 1875).
Thailand. Hai Nan Beach, Phuket (MNHN Vidal). — Surin Beach, Phuket (MNHN Vidal). — Phuket (ANSP 287283). — Songkhla, Gulf of Thailand (ANSP 287195).
Malaysia. Pulau Lembu, West Coast (WAM 33-94). — 04°14'N, 103°27'E, N of Kampong Kemaman, East Coast (AMS C310564 and ANSP 354005).
Singapore. Pulau Sudong reclamation (AMS C310550, C310565, C123696). — Sentosa Island reclamation (AMS C310549).
Philippines. (ZMUC, 2 lots). — Jolo (MNHN Vidal). — Panglao (MNHN Vidal). — Cebu (MNHN Vidal). — Jolo, 38 m (ZMUC Pacific Expedition Mortensen 1914). — Harbour of Zamboanga, Mindanao (Vidal). — *Pele* 1964, Sibutu, Sulu Archipelago, 23 m (WAM 878-66). — Corregidor Island (AMS C310567). — Manila Bay (ANSP 247060, 247055, 246714). — Siasi Island, Sulu Archipelago (BPBM 203570). — Marongas Island (USNM 484414).
Viet Nam. Qui Nhon (MNHN Saurin). — Poulo Cedar de Terre (MNHN Saurin).
China. (LACM 50836). — 21°07'N, 115°15'E, 116-128 m (AMS C143045). — Ping Chan Island, Hong Kong, 0-8 m (AMS C310599, C103243).
Japan. (LACM 13454,13507). — (NMW Melvill). — ANSP 228108). — (NHMW, 2 lots). — Shikoku (MNHN Staadt 1969). — Tosa (MNHN Staadt 1969). — Wakayama 10-20 m (MNHN Vidal). — Tosa (ANSP 209392). — Kii (ANSP 252677). — Hirado Hizen (ANSP 80471). — Kinuzaru, Awaji (ANSP 141828). — Awaji (USNM 273676). — Hirado Hizen (USNM 344805). — Tosa (LACM 13460). — 32°23'N, 130°07'E, Amakusa, Kuamoto Pref., Kyushu (LACM 82-25). — 32°31N,130°03'E, Tamioka Bay, Amasuka (LACM 82-23). — 34°11'N, 135°09'E, Bansho Zaki, Wakayama pref., Honshu (LACM 13460). — 32°49'N, 128°54'E, Nagasaki (BMNH).
Indonesia. Makassar, Sulawesi (ANSP). — Moluccas (BMNH Cuming). — 06°26'S, 133°57'E, Aru, 50 m (WAM 3294). — Lombok (MNHN Vidal).
MARIEL KING Expedition 1970: stn AW1, 05°30'S, 134°12'E, Wasir Island, Aru (USNM 747210, 747248, WAM 42-94).
Papua New Guinea. Lorula Island, SW of Port Moresby 12-18 m (AMS C210567).
Queensland. Dingo Beach, Cape Gloucester (AMS C077245). — 18°43'S, 146°37'E, Great Palm Island (AMS C147234). — Off S end of Frazer Island (AMS C310600). — Hayman Island (AMS C147235). — Bowen (AMS C089470). — Black Island, Langford Reef, Whitsunday (AMS C310576).
Norfolk Island and Lord Howe Rise (Australia). See in *A. maculosum howense*.
Chesterfield Plateau (New Caledonia). See in *A. maculosum howense*.

DESCRIPTION

Shell medium-sized to small, ovoid, ranging in shape from nearly perfectly symmetrical to asymmetrical with a raised anterior dorsal margin and a receding posterior one, sometimes also more or less bi-truncated (on PQ and MPQ). Despite this asymmetry, shells always look roughly equilateral, and are never expanded backwards, with ribs appearing straight in projection. Rather elongated (mean L/H = 0.84; range 0.73-0.95) and moderately inflated (mean W/L = 0.71; range 0.59-0.85). Lunule very narrow and flat on left valve, wider on right valve, and slightly hollowed behind

TABLE 25. — Measurements (in mm) and rib count of *Acrosterigma maculosum howense* n. ssp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *howense*	40.2	33.3	(22.0)	0.83	0.66		115	59
Paratype No. 1	36.8	30.5	(20.0)	0.83	0.66	0.93		59
Idem No. 2	36.6	29.0	(22.0)	0.79		0.81		56
Idem No. 3	38.0	30.2	21.1	0.79	0.70	≈1.0	115	46
Idem No. 4	34.5	27.3	18.8	0.79	0.69	≈1.0	120	
Idem No. 5	51.1	40.4	(28.8)	0.79	0.71	0.90		52
Total adult shells measured and rib counts				32	32	17	20	46
General mean values				0.83	0.64	0.85	113	54.1
Standard deviation				0.03	0.04	0.08	4.6	4.6
Largest specimen observed, paratype No. 5 (see above)								

exteriorly raised shell margin. Exterior almost always strongly stained with two sorts of shades of brown, purple or orange; large diffuse irregular ones and short darker more regular concentric ones (mainly in young shells). Interior white to almost entirely purple. Hinge symmetrical (mean D close to 1.0), and rather little angled (< A range 105°-125°).

Rib number rather high, but variable according to the particular form (see below), generally ranging 43-61. Strong internal ribbing along margin, very weak or not discernible on rest of shell.

Rib morphology: on PQ (Fig. 10E), smooth anterior part of ribs about as wide as axial furrow and posterior part, which are often confused in a depressed zone that usually bears irregular, mainly tubercular, scales, often slightly encroaching upon anterior part. Interstices narrow and very thin. On MPQ, ribs asymmetrically slightly rounded, with posterior flank steeper; this flank bears oblique, elongated wide tubercles which encroach upon top zone, and produce festooning of posterior margin. These ridges stronger on last ribs, in continuity with scales of PQ but more numerous (Fig. 10E); interstices U-shaped, generally smooth but occasionally and locally notched, independently from flank sculpture. On anterior half of shell ribs appear as on MPQ or become progressively top-ridged; first ribs, until the fourth or the fifth, progressively degenerate.

DISTRIBUTION AND REMARKS

(Fig. 11) Very schematically, all the characters described above are common to two morphologic groups, with a rough correspondence to two geographical distributions:

1) "*Multistriatum*" form: (Fig. 10A, B) shells rather small (30 mm in height), mainly symmetrical, with numerous ribs (50-61), umbo moderately acute (A range 115-125°), shell smoother: Red Sea, Persian Gulf, tropical east coast of Africa, islands of the Indian Ocean, Philippines, some localities in Indonesia. Shells from the Red Sea are generally smoother: scales on PQ are frequently absent; retro-ridges in MPQ, and top-ridges on the anterior half are rare.

2) "*Arenicola*" form: (Fig. 10C, D, F) shells larger (up to 51 mm), more often asymmetrical and truncated, ribs less numerous (43-50), umbo more acute (< A range 105°-115°): N Indian Ocean (Srilanka, Andaman Sea), NW Pacific (China, Japan), eastern Indonesia (Moluccas, Papua New Guinea), Australia (Central Queensland).

These two groups cannot constitute subspecies because many exceptions and intermediate forms exist, and a given individual is not necessarily identifiable as belonging to one of the two groups. The differences could be of eco-phenotypic origin: for example, large asymmetrical forms with a few ribs in littoral waters, smaller more symmetrical forms with more ribs in deeper water. However, a subspecies with peculiar characters, can be described in the south-east corner of the range of the species (see below).

Acrosterigma maculosum howense n. ssp.
(Fig. 10G, H; Table 25)

TYPES. — Holotype: a right valve (Fig. 10G, H), New

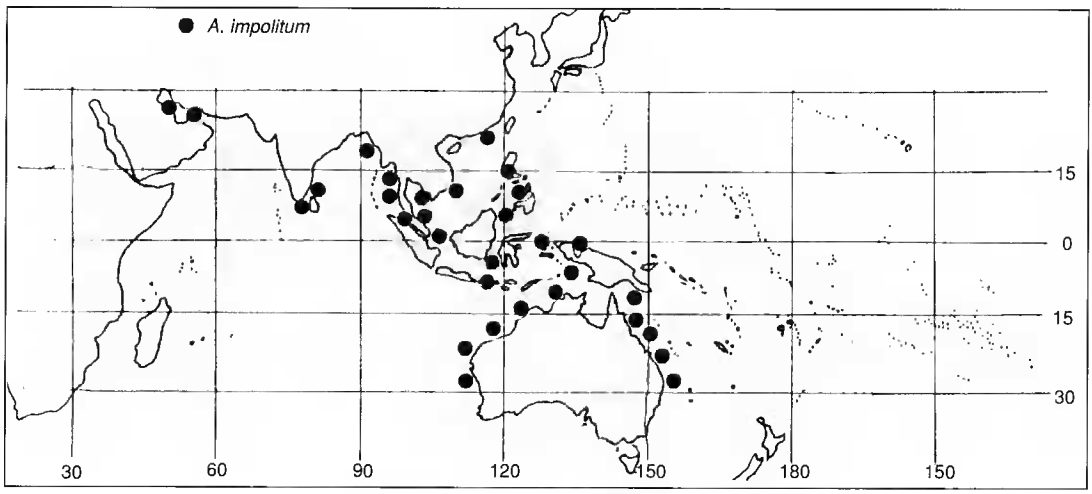

FIG. 12. — Distribution of *Acrosterigma impolitum*.

Caledonia CORAIL 2 Campaign 1988, stn DW 10, 20°52'S, 161°41'E, Lansdowne-Fairway Shelf, 60 m (MNHN Richer de Forges-ORSTOM). Paratype 1: a left valve, same data. Paratype 2: a left valve, same data. Paratype 3: a bivalved shell, 29°02'S, 167°57'E, Norfolk Island (AMS C059446 Bell & Iredale). Paratype 4: a bivalved shell, same data. Paratype 5: a left valve, 31°33'S, 159°05'E, Lord Howe Island (AMS C147228 Baxter).

ETYMOLOGY. — From Lord Howe Ridge, between Coral Sea and Tasman Sea, east of Australia.

MATERIAL EXAMINED. — The type specimens and the following lots:

TABLE 26. — Measurements (in mm) and rib count of *Acrosterigma impolitum* (Sowerby, 1833).

	H	L	W	L/H	W/L	D	A°	Ribs
Lectotype *impolitum*	48.3	38.1	30.2	0.79	0.79	≈1.0	120	38
Holotype *beauforti*	27.3	20.3	17.8	0.74	0.88	≈1.0	125	43
Paratype *beauforti*	23.3	17.8	14.1	0.76	0.79			
Holotype *dilmunense*	43.1	35.7	26.8	0.83	0.75	1.05	125	38
Holotype *couvrili*	46.6	36.6	27.5	0.79	0.75	1.10	110	32
Holotype *vlamingi*	27.4	24.2	(16.6)	0.88	0.69	0.96		41
Holotype *rosemariensis*	20.2	17.0	(11.8)	0.84	0.69			44
Holotype *dampierense*	39.3	32.4	(19.5)	0.82	0.60	≈1.0	105	29
Paratype *dampierense*	45.1	37.4	25.8	0.83	0.70	1.13	125	33
MNHN, Penang	43.8	35.0	25.7	0.80	0.73	0.95	105	35
MNHN, Singapore	32.5	27.4	19.0	0.84	0.69	1.10	120	37
MNHN, China	42.2	32.9	23.5	0.78	0.71	1.06	110	35
MNHN, NW Australia	21.5	18.4	13.0	0.86	0.71	1.10	125	44
MNHN, Queensland	16.0	15.3	9.6	0.96	0.63	0.96	125	48
QM 97-5707, Queensland	56.3	44.4	33.8	0.79	0.76			32
Total adult shells measured and rib counts				102	101	51	48	136
General mean values				0.85	0.70	1.04	118	39.5
Standard deviation				0.05	0.05	0.06	7.0	6.1
Largest specimen observed, QM 97-5707 (see above)								

Australia. Norfolk Island (AMS C059446 Bell and Iredale, AMS C147222 Mort & Woolacott).
Tui 1962, Norfolk Island: stn 62028, 28°54'S, 167°59'E, 33 m (MNZ M.224552). — Stn 62029, 28°56'S, 167°58'E, 38 m (MNZ M.224925). — Stn 62030, 28°59'S, 167°58'S, 38 m (MNZ M.225104); Lord Howe Island (AMS C029185, C147228).
Kimbla 1976, Lord Howe Rise: stn LH1, 31°35'S, 159°00'E, 73 m (AMS C123975). — Stn LH5, 30°25'S,159°06'E, 50 m (AMS C123719). — Stn LH2, 31°38'S, 159°04'E, 44 m (AMS C124463).
New Caledonia (MNHN). *Coriolis* MUSORSTOM 5 1986 Coral Sea: stn 264, 25°20'S, 159°44'E, Banc Capel, 56 m.
Chalcal 1984: stn D7, 20°51'S, 161°37'E, Banc Landsdowne-Fairway, 62 m.
Coriolis CORAIL 2 1988, Bancs Landsdowne-Fairway: stn DW 01, 20°56'S, 161°41'E, 59 m. — Stn DW 02, 20°50'S, 161°37'E, 62 m. — Stn DW 04, 20°52'S, 161°37'E, 64 m. — Stn DW 10, 20°52'S, 161°41'E, 60 m.

DISTRIBUTION. — (Fig. 11) In New Caledonia, only in Lansdowne-Fairway Bank and near Capel Bank, both situated on the Chesterfield Plateau. In Australia, Lord Howe Island and Norfolk Island.

DESCRIPTION
As for *Acrosterigma maculosum s.s.* except for three distinctive characters:
1. Colour: shell exteriorly white, sometimes with vague light pink stains; interior generally either entirely pink or pink-striped, but always white in umbonal cavity and on margins. Nymphal plate always characteristically pink. (The nominal subspecies is never pink, except for the interior of some specimens from Queensland close to the area of distribution of this subspecies).
2. In New Caledonia rib number higher than in nominal subspecies, ranging from 53 to 61.
3. Rib morphology: ribs lower and smoother than in nominal subspecies, practically without ornamentation (except on PQ and on first part of AQ); on some shells first ribs of AQ become indistinct, forming a smooth zone beside lunule.

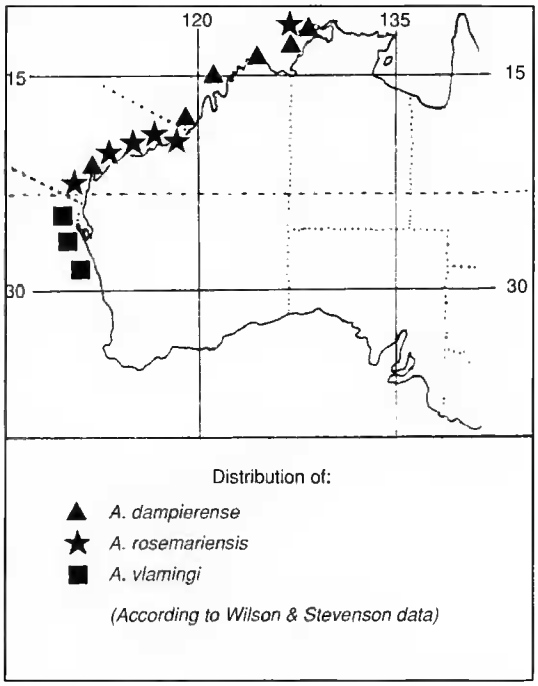

FIG. 13. — Distribution of *Acrosterigma dampierense*, *A. rosemariensis* and *A. vlamingi*.

Acrosterigma impolitum (Sowerby, 1833)
(Fig. 10I-N; Table 26)

Cardium impolitum Sowerby, 1833: fig. 6; 1841a: 107.
Cardium beauforti Prashad, 1932: 270, pl. 6, figs 27; 28.
Laevicardium (*Trachycardium*) *couvrili* Fischer-Piette, 1977: 57, pl. 5, fig. 2.
Acrosterigma vlamingi Wilson & Stevenson, 1977: 92, pl. 6, figs 21; 22.
Acrosterigma rosemariensis Wilson & Stevenson, 1977: 95, pl. 6, figs 23; 24.
Acrosterigma dampierense Wilson & Stevenson, 1977: 98, pl. 6, figs 1-5.
Acrosterigma n. sp.(a) Oliver, 1995: 246, fig. 1089.
Trachycardium impolitum dilmunensis Oliver & Chesney, 1997: 65, figs 25; 26; 29-36.

TYPES. — *Cardium impolitum*: three shells accessioned 1991.042 in BMNH, Cuming collection, China, are apparently syntypes. The largest (Fig. 10I, J), certainly the one figured by Reeve (1845: Sp. 80), is possibly that measured and figured by Sowerby (1840: fig. 66) and was selected as lectotype by Voskuil & Onverwagt (1991b: 119). *Cardium beauforti*: two shells in ZMA No. 314-4, from *Siboga* Expedition, stn 133, Salibabu Island (between Philippines and Moluccas), the holotype (Fig. 10K, L) selected and figured by Prashad. A paratype from the same area in NMW, Melvill-Tomlin collection, 55.158.1245. *Laevicardium* (*Trachycardium*) *couvrili*: holotype in

MNHN, the only reported specimen, said to be from off Gabon (West Africa). *Acrosterigma vlamingi*: holotype in WAM 1029-66, a single left valve from Shark Bay, Western Australia. Eight paratypes, all from the central west coast of Western Australia, from Abrolhos Islands to Shark Bay. *Acrosterigma rosemariensis*: holotype in WAM 650-66, a specimen from Rosemary Island, Western Australia. Ten paratypes, all from the northern coast of Western Australia, from Point Cloates to Dampier Archipelago. *Acrosterigma dampierense*: holotype in WAM 3334-68, a specimen from Port Hedland, Western Australia. Fifteen paratypes, all from the northernmost part of Western Australia, north from Dampier Archipelago (with one exception). Northern Territory, Queensland, and Aru Island (Indonesia). *Trachycardium impolitum dilmunensis*: holotype BMNH 1994.100 from Trucial Coast, Persian Gulf. Two paratypes, Biggs collection, from Persian Gulf, one in BMNH, one in NMW.

MATERIAL EXAMINED. — The types of *impolitum*, *beauforti*, *couvrili*, *impolitum dilmunense*; one paratype of *rosemariense*, *vlamingi*; two paratypes of *dampierense*. The following additional lots:

Persian Gulf. *Calypso* 1954, E of Trucial Coast (MNHN Charbonnier): stn 1, 54°00'N, 26°35'E, 35 m; stn 2, 70 m. — Bahrain (BMNH). — Abu Dhabi (BMNH 1944-100, 1944-101). — 26°N,51°E, Grand Mosque Beach, Jaffair, Bahrain (NMW). — 26°28'N, 50°05'E, Tarut Bay, Saudi Arabia (AMS C310598).

Sri Lanka. (MNHN Staadt 1969).

India. Mandapam, gulf of Manaar (ANSP 302324). — Karikal (IRSNB).

Burma. S of Akyab, Bay of Bengal (ANSP 239957). — Tavoy Island (ANSP 292951). — 13°06'N, 98°16'E, Tavoy Island (ANSP 292951).

Thailand. Phuket, Hai Nan Beach (MNHN Vidal). — Phuket (ANSP 286323). — Songka Beach, E coast S Thailand (AMS).

Malaysia. Penang (MNHN Vidal, IRSNB).

Singapore. (MNHN). — (BMNH Archer). — (BMNH Winckworth). — (NMW Melvill). — (USNM 128478). — (ANSP 54211). — Pulau Pawa (ANSP 319360). — Pulau Sudong reclamation (AMS 123696).

Cambodia. Ream (MNHN Fischer 1972).

Viet Nam. Qui Non (MNHN Saurin).

Philippines. (USNM 292297). — Manila Bay (ANSP 247226, 246659). — Corregidor Island (AMS). — Mindoro (USNM 617485). — Bentayan (USNM 293135). — Balabac (USNM 237977). — Jolo (USNM 235633, 235565, 235516, 236563). — Jawi Jawi (USNM 283380, 236190). — Bacataan (USNM 235971. — Panay (USNM 248405). — Iaraan (USNM 236300). — *Pele* 1964, N of Sulu Archipelago, 37-40 m (WAM 655-66). — *Pele* 1964, S Lagoon, Sibutu, Sulu Archipelago, 16-27 m (WAM 662-66).

China. (BMNH). — (MNHN Denis 1945). — (MNHN Jousseaume 1921). — (USNM 120168). — Hong Kong (AMS). — Hong Kong (ANSP 262933). — Hong Kong (ZMA von Heukelom). — Hong Kong (IRSNB Dautzenberg). — Dongshan, Fujian Province (MNHN Vidal). — 22°33'N, 114°24'E, near Hong Kong, 0-8 m (AMS C103 243). — *Taishun* 1943, 21°17'N, 114°52'E, off Hong Kong, 87-97 m (AMS C310540).

Indonesia. *Siboga* 1899-1900, stn 71, Macassar (ZMA). — *Siboga* 1899-1900, stn 311, Sumbawa (ZMA). — Halmaera, Moluccas (USNM 761777). — Saparoea Bay, Moluccas, 19 m (ZMUC). — 5°30'S, 143°12'E, Wasir Island, Aru, 30-40 m (USNM 747248). — 5°32'S, 132°41'E, N of Nuhu Rowa, Kai Island, 37 m (USNM 746926). — Japen Island, Irian Jaya (ANSP 206749).

Papua New Guinea. Manubada Island, Port Moresby (AMS C310597).

Western Australia. Off Rottnet Island (WAM 907-66). — Port Hedland (QM). — La Grange Bay (ANSP 325325).

Northern Territory. 12°09'S, 130°18'E, Charles Point, W of Darwin (WAM 4-95). — 32 km off Point Charles, Darwin (AMS C310512, C060742). — Gove Peninsula, NE of Arnhem (AMS C310568).

Queensland. AMS collections: Dingo Beach (C084369). — Mapoon, Gulf of Carpentaria (C014181). — Masthead Island, Capricorn Group (C018857). — Albany Passage, Cape York (CO36208). — Off Murray Island, Torres Strait (C036336). — Albany Passage (CO55693). — Lindeman Island (058782). — Off Burnet Heads (C66185). — Big Sandy Cay, Swain Reef (C066188) — Lady Musgrave Island (C066187). — 21°42'S, 152°26'E, 3 km NE of W side of Gillet Cay, Swain Reef, 64-73 m (C123512). — Magnetic Island, Townsville (C310541). — North West Island, Capricorn Group (C310543). — Low Isles (C310569). — N of Direction Island (C310570). — Bargara (C310571). — Townsville (C310572). — Witsunday Passage, 24 m (C310573). — Hook Island, Whitsunday Passage (C310574). — Hayman Island (C310575). — Black Island, Langford Reef, Whitsunday (C310576). — Seaford, N of Mackay (C310577). — Mackay (C310 578). — E of Mackay (C310 579). — E of Sarina (C310580). — Broad Sound (C310581, C310582). — Humpy Island, Keppel Bay (C310583). — Great Keppel Island, Keppel Bay (C310584). — North West Island, Capricorn Group (C310585). — Yeppon (C310586, C310587). — Hervey Bay (C310588, C310590). — Off Moreton Bay (C310589). — Pialba, Hervey Bay (C310591). — Keppel Bay (C310592). — Off Shaw Island, N of Mackay (C310593). — Quoin Island, Port Curtis (C310594). — Tamnun Sands (C310595).

Lamprell collection (MNHN 1996): Gulf of Carpen-

taria. — Shelbourne. — Kurrimine Beach. — Dingo Beach. — Burrum Heads. — Shoal Point. — Turkey Bay. — Woody Island;
Vidal Beach Survey 1994, (MNHN): Airly Beach. — Shoal Point, 15 km N of Mackay. — Tamnun Sands, Canoe Point, SE of Gladstone. — Hervey Bay. — Noosa Heads. — Caloundra. — Moreton Bay. — Southport.
Other museums: Pialba, Hervey Bay (QM 52-002). — Peel Island, Moreton Bay (QM 52-001, 97-5707). — Moreton Bay (BMNH Cuming). — Port Curtis (BMNH 1881-11-10-160-1). — Flinder's Entrance (BMNH 1881-11-10-162-3).

DISTRIBUTION. — (Figs 12; 13).

DESCRIPTION

Shell medium-sized to small, subovoid, with umbonal area more or less pointed. Young specimens almost perfectly symmetrical, then becoming slightly asymmetrical, with a receding posterior dorsal margin and a raised and inflated anterior one. Posterior half of PQ often flattened, in relation to a straightened margin, forming a rounded angle with anterior part of PQ, which can also be slightly truncated. Shells always elongated (mean L/H = 0.85; range 0.76-0.95), but extent varies with populations and individuals; a same variation is observed in amount of compression (mean W/L = 0.70; range 0.60-0.88).
Lunule narrow and flat on left valve, slightly wider on right valve. Under a typical opaque light yellow-brown periostracum, regular over entire shell, external colour generally light, white to yellow, sometimes with purple mottling. Interior white, sometimes slightly stained with purple. Hinge sometimes slightly asymmetrical (average ratio D = 1.04; range 0.92-1.24) and moderately angled (average < A = 118°; range 110°-130°), but these values seem to depend both on population and shell size, large and adult shells having a generally smaller umbonal angle and looking more pointed.
Mean rib number 39.5, range 29-52, possibly reflecting an environmental variation (see below).
Rib morphology: on PQ, interstices always developed and often confused with hollowed posterior part and axial furrow; smooth anterior part wider, with numerous small tubercular scales, sometimes fused and reduced to a thin scar, or occasionally absent. On median part of shell (MPQ and MAQ), ribs slightly rounded, triangular and asymmetrical with posterior flank steeper and shorter; posterior flank of ribs more or less retro-ridged on different individuals; interstices become notched with crescent-shaped hollows, proceeding up posterior flanks, and sometimes slightly up anterior flank as well, a condition apparently related to the retro-grooving of the ribs (Fig. 10N). Sometimes a longitudinal split cuts hollows in the bottom of interstice; this split can be double producing a riblet. Sometimes ribs become trapezoidal, with a flat top. In all populations of Australia, and rarely elsewhere (e.g. specimens of "*beauforti*" and others from the Gulf of Mannar), ribs of certain individuals bear small concentrically aligned granules, generally on flanks but sometimes on tops or in interstices. On anterior part of shell, lateral ridging progressively proceeds up to top of ribs, forming simple straight cross-bars. These cross-bars are never imbricated, and may be rare or absent. The three or four first ribs following lunule always degenerate anteriorly, becoming smooth, low and sometimes poorly marked.

REMARKS

Acrosterigma impolitum is unusually variable in rib number (29 to 52); it is also rather variable in size. Very schematically, two extreme forms can be observed: (1) large shells (30-45 mm high or more) with a few ribs (29-40), and (2) smaller shells (20-30 mm high) with more ribs (41-52). However, many transitional forms exist and I have been unable to find significant breaks. The hypothesis made concerning *A. maculosum* is probably appropriate here: large shells with fewer ribs occurring in shallower zones are probably ecotypes.
Acrosterigma impolitum can easily be separated from the related species of the group by several characters, the most important being:
1. The "pointed" look of the shell and the uniform thick light brown periostracum; these characters may not always be definitive.
2. The regular, crescent-shaped notching of the interstices (Fig. 10N).

3. The trapezoizal profile of the ribs in section.
4. The possible presence of local longitudinal splits in the interstices, sometimes creating small "riblets".
5. The rib-top cross-bars of the anterior part, often disappearing anteriorly, but never degenerating into tubercles.
6. In Australia and occasionally elsewhere, the presence of aligned small pustules on the ribs on the median part. Such pustules can be present on other species of the genus, but are smaller, generally less numerous and limited to the juvenile parts of the shells.

In spite of these numerous possible characters of identification, several different nominal species have been created, which I consider to be synonyms of *impolitum*:

A. beauforti (Fig. 10K, L), which differs only by a slightly more elongated shape and the presence of unusual reddish colours.

A. dampierense, *rosemariensis* and *vlamingi*, from Western Australia, have many characters of *impolitum*, and, in my opinion, no character allowing a specific separation from it, nor among themselves. According to Wilson & Stevensons's data, these species are distributed in three different areas (see above the distriburion of types and Fig. 13), and are practically parapatric, with two exceptions only. This suggests ecotypic influences, but the differences among these three taxa are not sufficiently constant to justify even a subspecific separation. In Queensland, a comparable diversity of forms is present, but without apparent geographic or ecologic segregation. Such ecophenotypic variations are admitted in Western Australia by Wilson & Stevenson (1977: 99), but for *A. dampierense* only; they separate: (1) "fresh paired valves collected in shallow water or on beach"; (2) "smaller specimens [taken by dredging in deeper water], more tumid with slighrly higher rib count than others (probably ecophenotypic variations...)". On the other hand, Oliver & Chesney (1997: 68), although they agree with the synonymy of *dampierense* with *impolitum*, think that "we could not accept the amalgamated [Australian] complex as a single population". These authors (1977: 65) separate also a subspecies *impolitum dilmunense* in the Persian Gulf, based on small differences on shape, rib count and morphology, but above all on geographical isolation.

A. conrili: the only specimen is a typical form of *A. impolitum*. It seems that the only reason for this new species is an erroneous label from West Africa.

Acrosterigma transcendens
(Melvill & Standen, 1899)
(Fig. 14A-D; Table 27)

Cardium (*Trachycardium*) *transcendens* Melvill & Standen, 1899: 191, pl. 11, fig. 21.
Cardium perstriatum Kuroda, 1928: 11 [*Fide* Habe, 1981: 111].
Laevicardium pulcherrimum Sakurai & Habe, 1966: 293.

TYPES. — *Cardium transcendens*: holotype, a left valve from Torres Strait, BMNH 1899.23.6. Pararype: a specimen from same locality, Melvill coll. NMW 55.158.696, *Cardium perstriatum*: no types data. *Laevicardium pulcherrimum*: holotype and two paratypes, from Kakeroma-Jima, Amami Island, in National Science Museum, Japan, ref. NSMT-MO 68405 and MO 70879.

MATERIAL EXAMINED. — The following lots in addition to the type material of *C. transcendens*:

South Africa. N Zululand from off Kosi Bay to off Sodwana Bay (in Natal Museum), *Meiring Naudé* 1987: stn ZA9, 26°54.6'S, 32°55.3'E, 50 m (S4874). — Stn ZB1, 27°01.4'S, 32°54.2'E, 50 m (D6836). — Stn ZB6, 27°01.1'S, 32°55.2E, 78 m (D7509). — Stn ZC3, 27°06.5'S, 32°52.9'E, 70 m (D6458). — Stn ZH3, 27°32.8'S, 32°42.6'E, 68 m (D6731). — Stn ZH4, 27°33.2'S, 32°42.8'E, 85 m D6772). — Stn ZH16, 27°35.0'S, 32°41.8'E, 70 m (D8493).

NMDP 1990: stn ZA37, 26°54.0S, 32°55.5E, 50 m (S3957). — Stn ZA48, 26°53.5'S, 32°55.6'E, 51 m (S4039). — Stn ZA50, 26°55.0'S, 32°55.2'E, 41 m (S7373). — Stn ZB19, 27°00.7'S, 32°55.2'E, 70 m (S4894). — Stn ZB22, 27°02.4'S, 32°54.9E, 75 m (S5369). — Stn ZC10, 27°06.0'S, 32°53.3'S, 74 m (S6483). — Stn ZC12, 27°07.6'S, 32°52.4'E, 76 m (S8965). — Stn ZD10, 27°11.5'S, 32°50.4'E, 78 m (S4635). — Stn ZH19, 27°32.8'S, 32°42.8E, 77 m (S4777). — Stn ZH24, 27°32.2'S, 32°42.2'E, 49-53 m (S4733).

Mozambique. *Galathea* 1951, stn 209, 20°08'S, 35°33'E, off Beira, 75 m (ZMUC). — Jomise, Beira (USNM 718568).

La Réunion. *Marion Dufresne* 1982 (MNHN): stn DC41, CP42 and CP43, 21°21'S, 55°27'E, 73-77 m. — Stn DR47, 21°23'S, 55°37'E, 205-215 m. — Stn CP55, 21°05'S, 55°13'E,

97-110 m. — Stn DC56, 21°05'S, 55°12'E, 170-225 m. — Stn CP57, 21°05'S, 55°11'E, 210-227 m. — Stn DC124, 20°52'S, 55°37'E, 40 m.
Mauritius. (MNHN Carrié 1911). — (MNHN Arnould 1927).
Madagascar. Thomassin Survey 1962-1973, Tulear area, MNHN: stn D30, 23°23'S, 43°36'E, 70-75 m. — Stn 240, Grand Récif, 36 m. — Stn 621, Tulear Lagoon, S Pass.
Seychelles. Stn E21, Amirante Island, 55 m, (BMNH 1910-8-31-704).
Sri Lanka. N of Trincomalee, 29 m (AMS C310547).
Singapore. Sister Island reclamation (AMS C310563). — Pulau Island reclamation (AMS 310550). — Sentosa Island reclamation (AMS C310548).
Philippines. Punta Engano, Mactan Island, Cebu, 80 m (Hobbs). — Bentayan Island (USNM 293135). — Bentayan Island, 20-40 m (Hobbs). — *Pele* 1964, off Mactan Island, Cebu (WAM 8-95). — Bohol (Lamprell). — *Pele* 1964, SE of Balaba Island, Palawan, 55 m (WAM 35-94). — *Siboga* 1899-1900, stn 98, 06°09'N, 120°21'E, Sulu Archipelago, 350 m (ZMA).
Japan. Amami Oshima, Kyushu, 9-18 m (Hobbs). — Onna Village, Okinawa (USNM 838584); 26°29'N, 127°50'E; (LACM 79-75); 26°29.6'N, 127°50.5'E, (LACM 78-101). — Off Homan, Okinawa (BPBM 4337d). — 26°30.00'N, 127°50.54'E (USNM 341664).
Indonesia. Bangka Island, Sumatra (Hobbs). — 8°48'S, 115°14'E, Nusa Dua, Bali (LACM 86-166). — Aru Island (USNM 755486). — Aoeri Island, Irian Jaya (ANSP 208924, 205663). — E Padaido Island, Irian Jaya, 45-90 m (ANSP 206104).
Siboga 1899-1900, (ZMA): stn 43, Pulu Sarassa, Postillon Island. — Stn 310, 8°30'S, 119°07.5'E, Sumbawa, 73 m. — Stn 315, Paternoster Island. — Stn 299, S of Rotti Island, Timor. — Stn 240, Banda Island.
Papua New Guinea. Hansa Bay, S of Madang, 45 m (IRSNB 26132, 25955).
Queensland. Murray Island, Torres Strait (AMS C029784, C030282, C310545). —Torres Strait (BMNH 1937-7-9-29-30). — Off St Crispin Reef, 40 m (AMS C044684). — Kurrimine Beach (ZMA Pini 1977). — Swain Reef (AMS C123512).
Kimbla 1981 stn C10, NE of Cairns, 55 m (AMS C310542).
Kimbla 1977, stn 19, E of North Reef, Capricorn Group (AMS C116523).
BRITISH EXPEDITION 1928: stn 17, N of Cooktown, 34.5 m (AMS C310561). — Low Isles (AMS C310557).
Western Australia. 129 km NNE of Port Hedland (AMS C310555).
New Caledonia. *Vauban* LAGON 1984, SW zone of Lagoon (MNHN): stn 119, 22°28.0'S, 166°46.1'E, 20 m. — Stn 130, 22°29.1'S, 166°48.3'E, 32 m. — Stn 267, 22°21.5'S, 166°15'E, 70 m; *Vauban* LAGON 1984-85, S zone of Lagoon (MNHN): stn 316, 22°35.3'S, 166°54.0'E, 68 m. — Stn 392, 22°48.2'S, 167°02.3'E, 80 m. — Stn 398, 22°37.0'S, 167°11.8'E, 71 m.
Vauban LAGON 1986, SE zone of Lagoon (MNHN): stn 600, 22°17.9'S, 167°04.4'E, 62-65 m. — Stn 624, 21°59.7'S, 166°52.0'E, 44-46 m. — Stn 626, 21°57.94'S, 166°52.5'E, 47-48 m. — Stn 632, 21°57.3'S, 166°49.6'E, 44-45 m. — Stn 633, 21°55.6'S, 166°48.2'E, 50 m. — Stn 658, 21°46.5'S, 166°35.2'E, 49-51 m. — Stn 667, 21°42.0'S, 166°27.7'E, 33-37 m. — Stn 688, 21°31.4'S, 166°15.2'E, 36-40 m. — Stn 713, 21°22.6'S, 166°00.7'E, 34-35 m. — Stn 716, 21°22.1'S, 165°58.9'E, 30 m. — Stn 726, 21°20.4'S, 165°55.0'E, 50-51 m.
Vauban LAGON 1987-88, NE zone of Lagoon (MNHN): stn 748, 21°16.9'S, 165°49.9'E, 35 m. — Stn 761, 21°13.15'S, 165°44.35'E, 41-44 m. — Stn 782, 21°06.1'S, 165°36.7'E, 30 m. — Stn 789, 21°03.25'S, 165°33.55'E, 29 m. — Stn 807, 20°59.1'S, 165°28.75'E, 55 m. — Stn 814, 21°55.5'S, 165°26.0'E, 38-50 m. — Stn 815, 21°54.1'S, 165°26.95'E, 32 m. — Stn 816, 21°52.6'S, 165°25.4'E, 31 m. — Stn 821, 20°51.9'S, 165°23.2'E, 32 m. — Stn 836, 20°46.4'S, 165°15.75'E, 57 m. — Stn 837, 20°45.5'S, 165°13.9'E, 28-36 m. — Stn 900, 20°14.6'S, 164°23.1'E, 40 m.
Coriolis CHALCAL 1984, Lansdowne-Fairway Banks (MNHN): stn D10, 20°36.09'S, 161°05.82'E, 87 m. — Chesterfield-Bellona Plateau (MNHN): stn D46, 20°52.26'S, 158°33.74'E, 65 m. — Stn D47, 20°50.85'S, 158°36.03'E, 70 m. — Stn D50, 21°04.40'S, 158°40.70'E, 70 m. — Stn D51, 21°13.21'S, 158°42.50'E, 55 m. — Stn D52, 21°13.40'S, 158°49.20'E, 69 m. — Stn D55, 21°23.90'S, 158°59.60'E, 55 m. — Stn D56, 21°24.40'S, 159°08.80'E, 60 m. — Stn D59, 21°40.36'S, 159°21.29'E, 56 m. — Stn D61, 21°42.40'S, 159°29.00'E, 50 m.
Coriolis CORAIL 2 1988, Landsdowne-Fairway Banks (MNHN): stn DW 04, 20°52'S, 161°37'E, 64 m. — Stn DW 08, 20°52'S, 161°38'E, 63 m. — Stn DW 21, 20°36'S, 161°02'E, 86 m. — Stn DW 40, 19°29'S, 158°35'E, 58 m; *Coriolis* CORAIL 2 1988, Chesterfield Plateau (MNHN): stn DW 83, 19°12'S, 158°54'E, 59 m. — Stn DW 137, 19°34'S, 158°15'S, 32 m.
MONTROUZIER EXPEDITION 1993, Touho area, (MNHN): stn 1261, 20°46'-20°47'S, 165°154-165°16'E, Chenal de Touho, 45-56 m.
Alis BATHUS 1 1993, east coast, (MNHN): stn DW 678, 20°49'S, 165°19'E, 94-100 m.
Vanuatu. (MNHN).
Wallis and Futuna. *Alis* MUSORSTOM 7 1992, (MNHN): stn DW 538, 12°31'S, 176°40'W, Waterwitch Banc, 275-295 m.

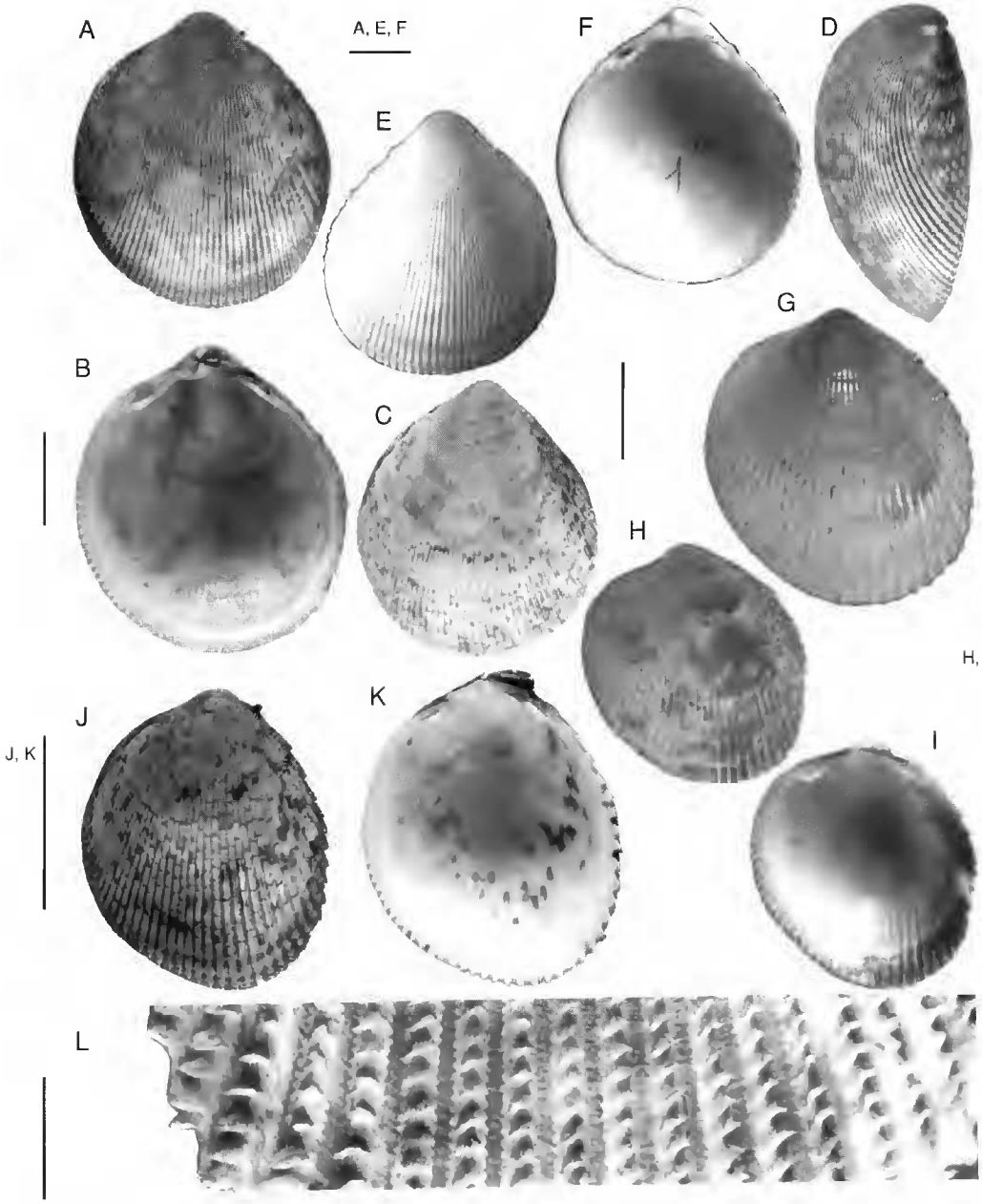

FIG. 14. — **A**, **B**, *Acrosterigma transcendens*, specimen from Mauritius, MNHN; **C**, *Acrosterigma transcendens*, a left valve from Chesterfield-Bellona Plateau, New-Caledonia, MNHN; **D**, *Acrosterigma transcendens*, a right valve from New-Caledonia Lagoon, MNHN; detail of anterior part showing concentrical features; **E**, **F**, *Acrosterigma seurati*, holotype; **G**, *Acrosterigma dianthinum*, syntype; **H**, **I**, *Acrosterigma dianthinum*, specimen from Passe de Koumac, New-Caledonia, MNHN; **J**, **K**, *Acrosterigma punctolineatum*, specimen from Touho, New-Caledonia, MNHN; **L**, *Vasticardium sewelli*, specimen from New Caledonia, right valve, MNHN; detail of rib morphology on the median part of shell. Scale bars: A-F, 10 mm; G-I, L, 5 mm; J, K, 20 mm.

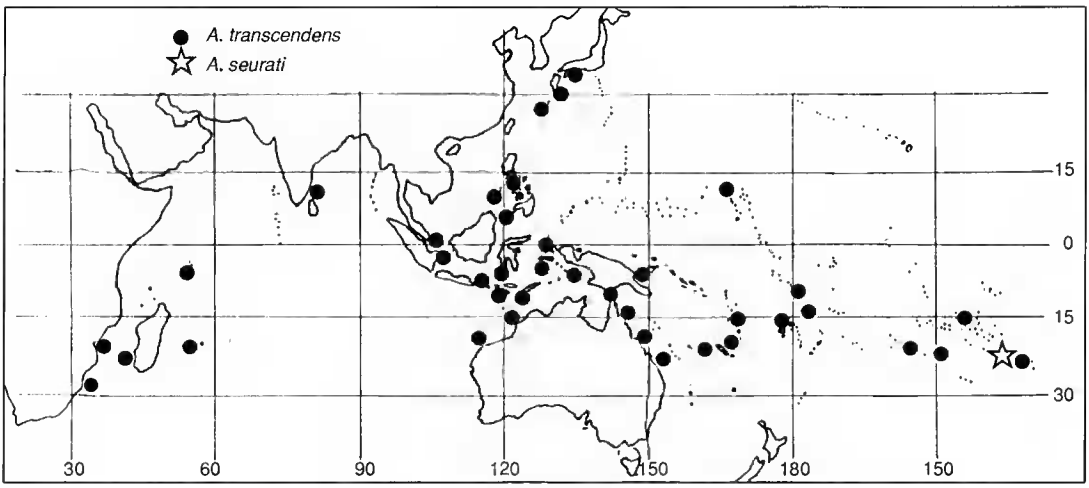

FIG. 15. — Distribution of *Acrosterigma transcendens* and *A. seurati*.

Society Islands. Moorea (ANSP 250482). — Opunohav Bay, Moorea (USNM 630645). — Bora Bora (USNM 630006). — 16°42.8'S, 151°02'W (LACM 74-37). — Raiatea (MNHN). — Tahiti (ANSP 250348). — Tahiti (USNM 879714). — Tahiti, Taone Reef (USNM 671626). — Afaahiti, Tahiti, 40-60 m (MNHN Boutet).
Tuamotu Archipelago. (ANSP 53998, 53999). — S Marutea (MNHN). — Rangiroa (USNM 789666). — Mataira (USNM 711626).
Tuvalu. 8°31'S, 179°13'E, Funafuti (AMS C006184).
Marshall Islands. Bikini, 46-55 m (USNM 583037).

DISTRIBUTION. — (Fig. 15) In addition to the locations listed above, *Acrosterigma transcendens* is recor-

TABLE 27. — Measurements (in mm) and rib count of *Acrosterigma transcendens* (Melvill & Standen, 1833).

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *transcendens*	25.0	21.0	15.0	0.84	0.71	0.92		66
Paratype *transcendens*	26.8	23.1	16.3	0.86	0.71			63
MNHN, Mauritius	30.2	27.1	18.9	0.90	0.70			68
MNHN, Madagascar	24.7	22.0	16.4	0.89	0.75	0.95	125	61
AMS C310547, Sri Lanka	24.6	20.0	(15.2)	0.81	0.76	≈1.0		60
AMS C310547, Singapore	22.7	19.2	(12.8)	0.85	0.67		120	59
Hobbs, Mactan Is	29.4	25.3	18.3	0.86	0.80	≈1.0		62
MNHN, Japan	24.6	21.2	14.7	0.86	0.69			70
MNHN, New Caledonia	24.0	20.7	15.0	0.86	0.72	0.95	120	67
AMS C006184, Tuvalu Is	27.5	19.2	(12.8)	0.85	0.67		120	63
MNHN, Tahiti	26.3	22.3	17.5	0.85	0.78	≈1.0	125	63
Total adult shells measured and rib counts				51	53	15	14	86
General mean values				0.87	0.73	0.98	123	64.4
Standard deviation				0.03	0.05	0.07	3.1	3.9
Largest specimen observed, MNHN, Mauritius (see above)								

TABLE 28. — Measurements (in mm) and rib count of *Acrosterigma seurati* n. sp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *seurati*	43.6	37.9	(30.0)	0.87	0.79		125	58
Paratype No. 1	37.5	32.2	(25.4)	0.86	0.79	≈1.0		66
Idem No. 2	40.9	35.5	(27.0)	0.87	0.76		130	65
Idem No. 3	37.6	33.0	(23.2)	0.88	0.70	≈1.0		61
Idem No. 4	34.2	30.2	(22.6)	0.88	0.75	≈1.0		62
Idem No. 5	32.2	28.5	(20.0)	0.89	0.70		130	68
Total adult shells measured and rib counts				19	19	8	11	19
General mean values				0.89	0.72	1.03	127	62.8
Standard deviation				0.02	0.04	0.03	4.9	3.6

Largest specimen observed, the holotype.

ded from southern Honshu, Japan (Kuroda & Habe 1981: 111); it does not live in littoral waters and is only recoverable by dredging or deep diving, which explains its relative rarity. It is probably present in the main part of the tropical Indian Ocean, and in many Central Pacific archipelagoes.

DESCRIPTION

Shell medium to small, almost perfectly ovoid and equilateral (anterior dorsal margin sometimes very slightly raised), and never truncated; also weakly elongated (mean L/H = 0.87; range 0.82-0.93) and rather globose (mean W/L = 0.73; range 0.66-0.86).

Lunule narrow, almost equal on both valves, and poorly differentiated, with its umbonal margins slightly raised. External colour variable, often vivid and bright, light beige-yellow variously spotted and splashed with darker pink, orange, or brown. Interior variable in colour, white to pink or orange, with two umbonal rays which are often wide and well-developed. Hinge nearly symmetrical (ratio D *c.* 1.0) and moderately angled (< A range 120°-125°).

Mean rib number 64.4, range 56-74.

Rib morphology: on PQ, interstices narrow and both parts of ribs about equivalent in width, with a variable axial furrow; scales irregular, mainly tubercular, sometimes becoming very small, or absent altogether. On posterior part of MPQ, ribs become more or less flatly triangular and asymmetrical (the anterior flank shorter and steeper), sometimes still bearing an axial furrow; wider posterior flank smooth or bearing elongated ridges which are analogous to the scales of PQ, but more numerous. On anterior part of MPQ, axial furrow and posterior long ridges eventually disappear and ribs become progressively more symmetrical and slightly rounded, ornamented only with posterior crenulations; interstices become wider and often very finely notched. On anterior half of shell, ribs at first remain rounded and retro-crenulated, and then become somewhat top-ridged; on first ribs of AQ, top ridges become tubercular and irregular, tending to be arranged in concentric alignments which can replace the longitudinal ribbing (Fig. 14D).

REMARKS

This species is very close to *A. maculosum*, particularly as far as rib morphology is concerned. *A. transcendens* can be separated from *maculosum* by a more vividly coloured, thinner and often smaller shell, less elongated (mean L/H = 0.87 compared to 0.84), more globular (mean W/L = 0.73 compared to 0.71) and with more ribs (range 56-74 as opposed to 43-61 in *maculosum*).

A. transcendens is generally rather consistent as far as size, colours and thickness of the shell are concerned.

Acrosterigma seurati n. sp.
(Fig. 14E, F; Table 28)

Cardium maculosum Wood, 1815 – Lamy 1906: 214.
Cardium unicolor Sowerby, 1834 – Ranson 1967: 125.

TYPES. — All the existing material, nineteen single valves, collected by L. G. Seurat, probably on beaches, in the Marutea du Sud Atoll, Tuamotu Archipelago (1902-1905), is selected as type series, stored in MNHN. Holotype: a right valve (Fig. 14E, F).

TABLE 29. — Measurements (in mm) and rib count of *Acrosterigma dianthinum* (Melvill & Standen, 1899).

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *dianthinum*	14.0	12.0	8.0	0.86	0.67	≈1.0	130	43
MNHN, New Caledonia	12.3	10.6	8.0	0.86	0.75	1.05	120	42
Idem	10.0	9.0	6.2	0.90	0.67	≈1.0	120	49
AMS C053697, Queensland		15.2	12.7	(8.6)	0.84	0.68	130	46
Idem	14.2	13.2	(8.4)	0.93	0.64	0.95		46
Idem	13.5	12.6	(9.0)	0.93	0.71		130	50
Total adult shells measured and rib counts				8	8	4	5	8
General mean values				0.89	0.69	1.00	126	46.1
Standard deviation				0.05	0.05	0.04	4.5	2.5
Largest specimen observed, AMS C053697 (see above)								

Paratypes 1 to 18: ten right valves and eight left valves (H = 40.9 to 25.2, L = 35.5 to 23.3, extrapolated W = 27.0 to 16.2 mm).

ETYMOLOGY. — In honour to Dr L. G. Seurat.

MATERIAL EXAMINED AND DISTRIBUTION. — The type material from Tuamotu archipelago, South Central Pacific (Fig. 15).

DESCRIPTION

Shell medium-sized almost perfectly ovoid and equilateral (anterior dorsal margin sometimes very slightly raised), rarely slightly truncated posteriorly, weakly elongated (mean L/H = 0.89; range 0.85-0.93) and rather globose (mean W/L = 0.72; range 0.64-0.79).

Lunule narrow, almost equal on both valves, and poorly differentiated, with its umbonal margins slightly raised. External colour almost entirely white, except for a few pink spots or small splashes and part of PQ sometimes yellow; interior white, sometimes with very pale yellow umbonal rays. Hinge nearly symmetrical (ratio D *c.* 1.0) and variably angled (< A range 115°-130°).

Mean rib number 62.8, range 56-68.

Rib morphology: on PQ, interstices very narrow and both parts of ribs about equivalent in width; scales irregular, tubercular. On posterior part of MPQ, ribs become more or less flatly rounded, sometimes still bearing an axial furrow; entire rib or wider posterior part can bear elongated ridges, analogous to the scales of PQ, but more numerous. On anterior part of MPQ ribs ornamented only with posterior crenulations; interstices become wider and often very finely notched. On anterior half of shell, ribs at first remain rounded and retro-crenulated, and then become finely top-ridged; on first ribs of AQ, top ridges become tubercular and irregular, tending to be arranged in concentric alignments which can replace the longitudinal ribbing.

REMARKS

A. seurati has several characters in common with *A. transcendens* [I treated it as a Tuamotu subspecies of *A. transcendens* until I discovered in this archipelago several perfectly typical lots of the latter], but has a much larger, thicker, heavier shell and slightly less elongated shell (mean L/H = 0.89, rather than 0.87 in *A. transcendens*). It is also noticeably less colorful and the hinge is a little less angled (mean < A = 127°, as compared to 123° in *A. transcendens*).

Acrosterigma dianthinum
(Melvill & Standen, 1899)
(Fig. 14G-I; Table 29)

Cardium (*Trachycardium*) *dianthinum* Melvill & Standen, 1899: 190, pl. 11, fig. 25A.

TYPES. — All type series from channel between Hammon Island and Wednesday Split, Torres Strait (Australia). Figured syntype: a bivalved specimen in BMNH, Reg. 1899.2.23.11 (Fig. 14G). Three syntypes: two bivalved shells and one right valve in NMW Reg. 1955.158.693. Five syntypes: three bivalved shells and two single valves in Manchester Museum (according to Trew 1987: 36).

MATERIAL EXAMINED AND DISTRIBUTION. — Five lots in addition to the syntypes in BMNH and NMW (Fig. 17).
Queensland. Eight small single valves, off Murray Island, Torres Strait (9°56'S, 144°4'E), 9-15 m (AMS C310544, Hedley *et al.* coll., 1907). — Nineteen single valves, Michaelmas Cay off Cairns, 16°36'S, 145°59'E (AMS C053697, Iredale *et al.* coll., 1926).
New Caledonia. MONTROUZIER EXPEDITION 1993, Koumac area, (MNHN): one bivalved specimen, stn 1319, 20°44'S, 164°15.5'E, Passe Deverd, 10-20 m; one bivalved specimen (Fig. 14H, I), stn 1310, 20°39.7'S, 164°14.9'E, Passe de Koumac, 15 m, Touho area, (MNHN), four bivalved specimens, stn 1271, 20°52.7'S, 165°19.5'E, Tié, 5-25 m.

DESCRIPTION
Shell small, transversally ovoid in shape and asymmetrical, but not posteriorly truncated, elongation variable, but moderate (L/H range 0.84-0.98), and moderately inflated (W/L range 0.61-0.76).
Lunule small, slightly wider and hollowed on right valve, and well-delineated. External colour uniformly beige, only MPQ being coloured brown-purple; interior slightly yellow in umbonal cavity and purple on MPQ (and sometimes part of PQ) by transparency; nymph yellow; no umbonal rays observed. Hinge slightly asymmetrical (ratio D a little higher than 1.0) and moderately angled (< A *c.* 125°).
Mean rib number 46.1, range 42-50.
Rib morphology: on PQ, ribs flat, interstices thin but well-marked; anterior smooth part of ribs slightly narrower, and posterior part bearing elongated, strong, regular and regularly disposed scales. On MPQ, ribs low, slightly rounded, rarely somewhat flatly triangular, and smooth except for presence on posterior third of top of regularly disposed small rounded tubercular pustules. On median part of shell (MPQ and MAQ), ribs become flatter and very low, are sometimes slightly retro-crenulated, still bearing pustules. Relatively wide interstices, often bearing regular fine grooves in adult part, sometimes with a very thin, fairly clear, riblet on bottom. On AQ, pustules lengthen, and become progressively wider and stronger top-ridges.

REMARKS
Acrosterigma dianthinum is easily separated from the other small species of the genus both by its characteristic shape and by the consistent rib-top pustules. The regular elongated scales of PQ and the well-delineated lunule are characters of the species-group of *A. variegatum*, but it is placed in the *A. maculosum* species-group because of its shape and low and poorly ornamented ribs.

Acrosterigma punctolineatum
Healy & Lamprell, 1992
(Figs 14J, K; 16A, B; Table 30)

Acrosterigma punctolineata Healy & Lamprell, 1992: 87, pl. 3, figs e-h.
Cardium foveolatum Sowerby – Reeve 1845: Sp 87 (Hete Fig. 16A, B).
Probably not *Cardium foveolatum* Sowerby, 1841a: 111 [which is unidentifiable].

TYPES. — *Acrosterigma punctolineata*: holotype: a paired specimen from Little Trunk Reef, N Queensland (18°20'S, 146°46'E), in QM ref. MO32905. Paratypes: four paired specimens from N Queensland, in AMS.

MATERIAL EXAMINED. — The following lots:
Philippines. 13°46'N, 120°44'E, Batangas Province, Luzon (WAM 661-66). — Tabango, Luzon (AMS C104739). — 13°45'N, 120°46'E, Luzon (WAM 663-66).
Indonesia. 1°28.4'N, 124°49.5'E, Menado, N of Sulawesi (LACM 88-58). — Moluccas (ZMA Hutchr). — N coast of Ambon Island (WAM 41-94). — 03°35'S, 128°02'E, Kg Said, N coast of Ambon Island (WAM 12-95).
Papua New Guinea. Madang (WAM 40-94). — Hansa Bay, S of Madang (IRSNB 26132). — Hansa Bay, 10 m (IRSNB 26253). — New Britain (AMS C45574).
Australia, Northern Territory. Orontes Reef, off Port Essington (WAM 42-95).
Queensland. Lizard Island, Mrs Watson's Beach (MNHN Vidal). — Ribbon Reef (AMS C138337).
Australia, Lord Howe Island. (AMS C13785).
New Caledonia. Poindimié, Monitel Hotel Beach (MNHN Vidal 1992). — Poindimié (AMS C87767). — Nchoué Bay, SE of Poum (MNHN Vidal 1992). — *Alis* LAGON 1989, N zone of Lagoon: stn DW 1195, 19°30'S, 163°19'E, 35-38 m (MNHN).
MONTROUZIER EXPEDITION 1993, Touho area, (MNHN): stn 1271, 20°52.7'S, 165°19.5'E, Haut Fond de Tié, 5-25 m. — Stn 1272, 20°49.5'S, 165°19.6'E, Passe de Touho, 10 m. — Stn 1255, 20°43.0'S, 165°08.0'E, Îlot Ouao, 11 m. — Stn 1246, 20°42.8'S, 165°08.7'E, Îlot Ouao, 0 m.

Vanuatu. Erakor Lagoon, Port Vila (MNHN Vidal 1989). — Efate Island (ANSP 787382). — Santos Island (ANSP 787442).
Solomon Island. 9°31'S, 160°48'E, Nuda Island (LACM 78-69-42).

DISTRIBUTION. — (Fig 17) Recorded only in the eastern part of the Western Pacific, in littoral, reef environment. The species has been cited and figured from Taiwan by Kuroda (1941: 161, pl. 5, fig. 74) and from Okinawa by Kubo & Kurozumi (1995: 181, fig. 3).

DESCRIPTION
Shell medium-sized, ovoid, equilaterally (only anterior dorsal margin slightly raised) to transversally (MPQ margin expanded) but not posteriorly truncated, moderately elongated (mean L/H = 0.86; range 0.80-0.93), and variably compressed (mean W/L = 0.73; range 0.66-0.85).
Lunule of medium size on right valve, with its umbonal margin raised and encroaching on left valve, where lunule is almost non-existent. External colour beige with small, slightly elongated brown spots, limited to smooth anterior part of ribs on PQ, and to rib tops on other parts of shell; on PQ these spots are longer and darker than elsewhere. Interior shows the same features by transparency. Hinge symmetrical (ratio D *c.* 1.0) and moderately angled (< A 120°- 125°).
Mean rib number 48.9, range 42-56.
Rib morphology: on PQ, ribs flat with thin interstices; anterior smooth part of ribs narrower than posterior part and terminating abruptly against interstice. Axial furrow relatively wide and readily visible; oblique scales slightly elongated, regular in shape and regularly disposed in axial furrow, encroaching upon posterior part of rib, but usually not upon anterior part. On median part of shell (MPQ and MAQ), ribs roundly triangular to rounded, slightly asymmetrical, and generally smooth, except for those closest to PQ, which sometimes bear numerous long ridges on posterior face; on some young shells, small rounded tubercular pustules randomly scattered on rib tops; interstices narrower than ribs, bearing a well-delineated small riblet in bottom, and finely notched in places on adult parts. On AQ, ribs become retro-crenulated, then top-ridged (wide ridges, somewhat imbricated, becoming even wider and irregular approaching lunule).

REMARKS
Acrosterigma punctolineatum has typical characters (coloured spots, riblets in interstices etc...) and cannot be confused; it is close to the next species *A. hobbsae*, but can easily be separated from it (see below).

Acrosterigma hobbsae n. sp.
(Fig. 16C-H; Tables 31; 32)

TYPES. — Holotype: a bivalved shell (Fig. 16C, D) from tangle nets at 110 m, Punta Engano, Mactan Island (Philippines), in MNHN, leg of Mrs Sue Hobbs. Paratype 1: a bivalved shell, same data. Paratype 2: a bivalved shell (Fig. 16E, F), same locality, in Mrs Sue Hobbs' private coll. Paratype 3: a bivalved shell from Moluccas, in BMNH, Cuming coll., Reg. 1996423. Paratype 4: a bivalved shell, slightly broken in both umbones, with soft parts, Apra Harbor, Western Shoals, Guam, 2 m (UGML, Paulay coll.). Paratype 5: a left valve (Fig. 16G, H), same locality and repository. Paratype 6: a bivalved shell slightly broken in ventral margin of right valve, 14°39'S, 145°29.5'E, Macgillivray Cay, Great Barrier Reef, Queensland, 9-15 m (AMS C138397, Ian Loch *et al.*). Paratype 7: a left valve, Montrouzier Expedition 1993, New Caledonia: stn 1256, 20°45.0'S, 165°09.8'E, Vieux Tonho Lagoon, 15-20 m. Paratype 8: a small bivalved specimen, from CORAIL 2 Campaign 1988 New Caledonia: stn DW 117, 19°12'S, 158°36'E, Chesterfield Plateau, 60 m.

ETYMOLOGY. — In honour to Mrs Sue Hobbs.

MATERIAL EXAMINED AND DISTRIBUTION. — (Fig. 17) The type series only; a rare species so far found exclusively in the eastern part of the Western Pacific, in relatively "deep" water (Philippines) as well as in littoral areas.

DESCRIPTION
Shell medium, generally ovoid and equilateral, rarely with a very slight oblique elongation and a small expansion of MPQ, but never posteriorly truncated; weakly elongated (mean L/H = 0.88; range 0.84-0.95), and moderately inflated (mean W/L = 0.72; range 0.68-0.82).
Lunule relatively wide and slightly hollowed on right valve, with umbonal margin raised very slightly or not at all, narrower on left valve; to some extent on both valves, but mainly on right, posterior limit of lunule well-delineated, although ribbing is degenerate near this limit (Fig. 16H). External colour beige with fairly numerous irregu-

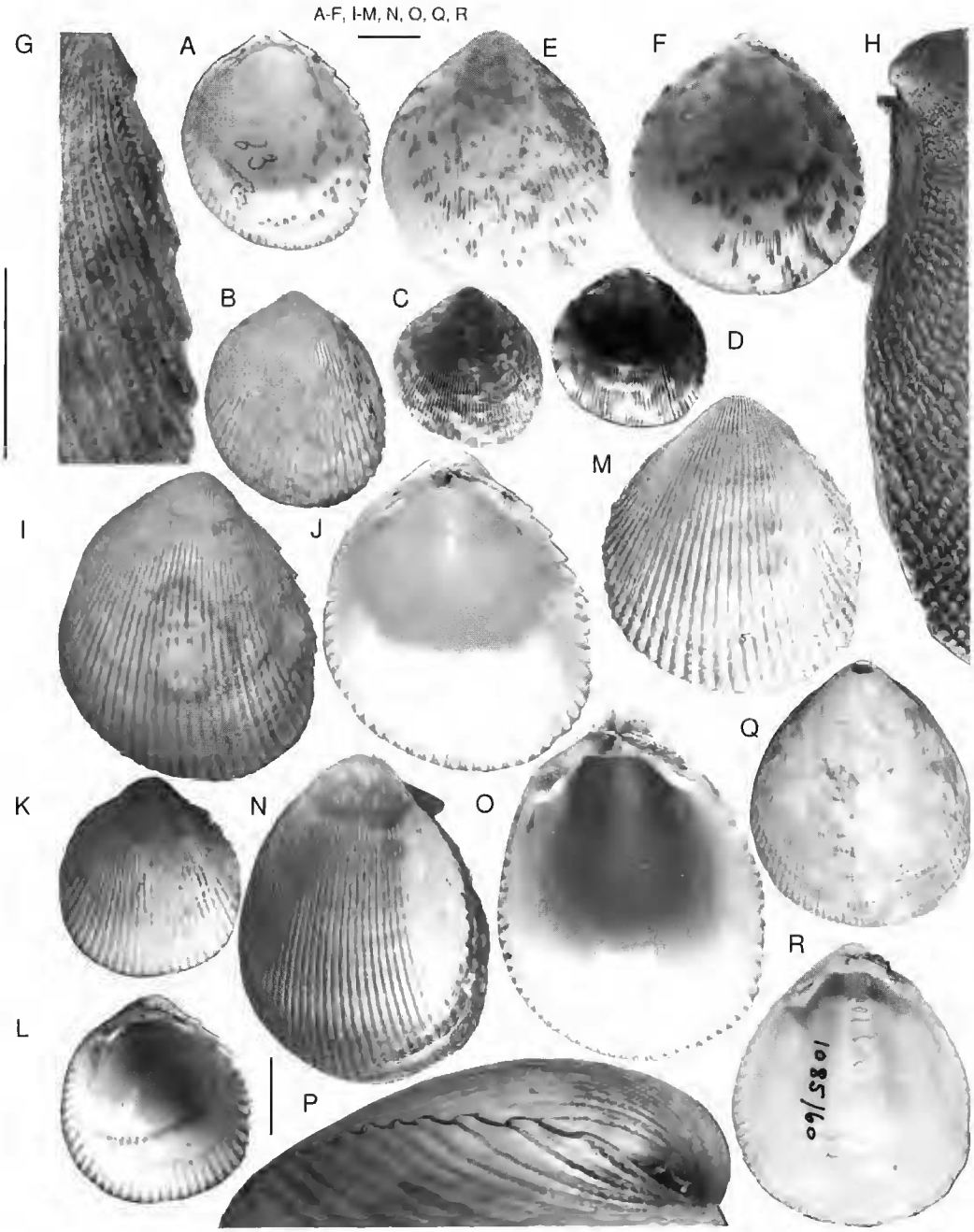

FIG. 16. — **A**, **B**, *Acrosterigma punctolineatum*, specimen labelled by Reeve *Cardium foveolatum* Sowerby, BMNH; **C**, **D**, *Acrosterigma hobbsae*, holotype; full scale. **E**, **F**, *Acrosterigma hobbsae*, paratype 2; **G**, **H**, *Acrosterigma hobbsae*, paratype 5; detail of PQ (**G**) and AQ (H); **I**, **J**, *Acrosterigma simplex*, lectotype of *Cardium unicolor*; **K**, **L**, *Acrosterigma simplex*, holotype; **M**, *Acrosterigma simplex*, a left valve from Zanzibar, MNHN; **N**, **O**, *Acrosterigma simplex*, a specimen from New-Caledonia, MNHN; **P**, *Acrosterigma simplex*, specimen from New Caledonia, MNHN; view showing ontogenic changes in rib morphology on PQ; **Q**, **R**, *Acrosterigma biradiatum*, neotype of *Cardium biradiatum* here selected. Scale bars: A-O, Q, R, 10 mm; P, 5 mm.

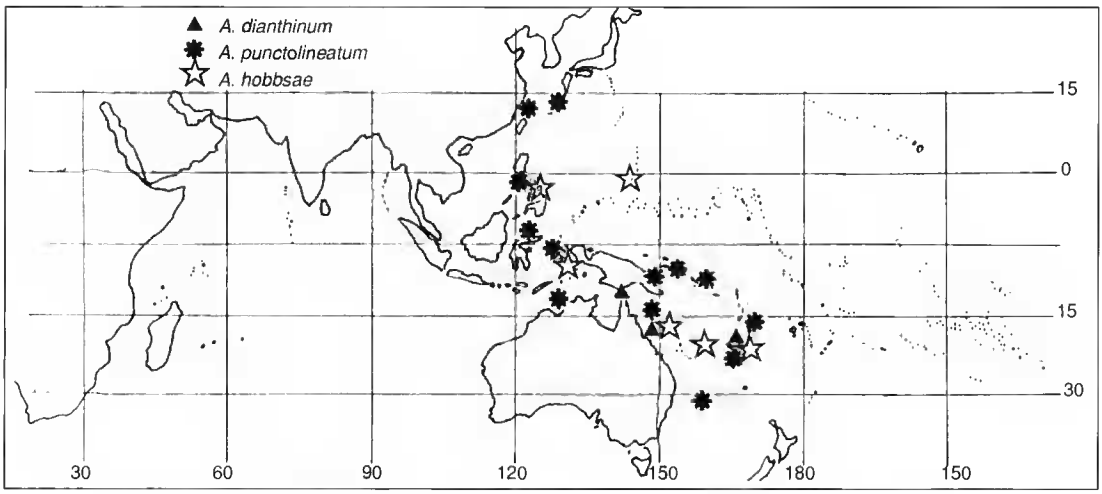

FIG. 17. — Distribution of *Acrosterigma dianthinum*, *A. punctolineatum* and *A. hobbsae*.

lar, brown to purple splashes, more frequent on posterior part and rarely darker on PQ; both ribs and interstices coloured. Interior shows same colours by transparency. Hinge asymmetrical (mean ratio D = 0.86; range 0.72-1.00), and moderately angled (< A range 125°-130°).

Mean rib number 61.9, range 58-65.

Rib morphology: on PQ (Fig. 16G), interstices very thin, but usually distinct. Ribs flat, not abrupt anteriorly, both parts rather irregular and variable in width, and axial furrow sometimes indistinct. Scales small, not elongated, but irregular in shape and size, vaguely spiniform or spatuliform, and often connected by a small thin ridge. On median part of shell (MPQ and MAQ), ribs low and flat, with a small, abrupt posterior flank, those on MPQ slightly more rounded; ribs smooth, except one to three ribs at posterior edge of MPQ, which can bear posteriorly a few fine ridges; anterior ribs of this zone, beside AQ, can

TABLE 30. — Measurements (in mm) and rib count of *Acrosterigma punctolineatum* Healy & Lamprell, 1992.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *punctolineatum*	35.7	29.9	24.0	0.84	0.80		120	46
Type Reeve's *foveolatum*	32.1	26.5	19.6	0.83	0.74	1.10	120	42
ZMA, Moluccas	35.0	30.8	21.4	0.88	0.69			54
IRSNB Hansa Bay, PNG	29.5	25.7	18.8	0.87	0.73			50
MNHN, Queensland	31.2	25.9	(19.0)	0.83	0.73		125	49
MNHN, New Caledonia	34.9	28.0	20.9	0.80	0.75	1.10		51
MNHN, New Caledonia	23.1	18.4	(15.6)	0.80	0.85	≈1.0		53
MNHN, Vanuatu	34.0	31.7	(21.0)	0.93	0.66	≈1.0		50
Total adult shells measured and rib counts				21	21	5	3	35
General mean values				0.86	0.73	1.04	122	48.9
Standard deviation				0.03	0.05	0.05	2.4	3.3
Largest specimen cited, the holotype (see above)								

TABLE 31. — Measurements (in mm) and rib count of *Acrosterigma hobbsae* n. sp.

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *hobbsae*	24.9	22.0	15.0	0.88	0.68	0.84	130	58
Paratype No. 1	25.0	23.7	15.5	0.95	0.65	0.86	130	65
Idem No. 2	40.2	36.0	24.4	0.90	0.68	0.72	130	60
Idem No. 3	32.3	29.0	20.1	0.90	0.69	0.81	130	64
Idem No. 4	45.4	38.0	31.0	0.84	0.82	0.88	125	58
Idem No. 5	39.4	33.0	(24.4)	0.84	0.74	≈1.0		64
Idem No. 6	35.5	31.0	22.0	0.87	0.71	0.85	125	62
Idem No. 7	32.2	28.5	(19.0)	0.89	0.67	0.83		65
Idem No. 8	16.6	11.5	6.9		non mature			63
Total adult shells measured and rib counts				10	10	9	8	11
General mean values				0.88	0.72	0.86	128	62.1
Standard deviation				0.03	0.05	0.07	2.4	2.6
Largest specimen observed, the paratype No. 4 (see above)								

become increasingly finely retro-crenulated. On AQ, these crenulations change into straight or curved, relatively thin, free top-ridges, first regularly disposed, then lengthening and tending to align concentrically (Fig. 16H).

REMARKS

Acrosterigma hobbsae resembles *A. punctolineatum* as far as general appearance, shape and colours are concerned, but differs by characters tabulated in Table 32. The two species are sympatric at Touho, New Caledonia (MNHN).

Acrosterigma simplex (Spengler, 1799)
(Fig. 16I-P; Table 33)

Cardium simplex Spengler, 1799: 17.
Cardium unicolor Sowerby, 1834: fig. 29; 1841a: 107.
Cardium nebulosum Reeve, 1845: Sp. 99.
Laevicardium soyeri Fischer-Piette, 1977: 19, pl. 1, figs 4-7.

TYPES. — *Cardium simplex:* holotype, a paired specimen in ZMUC without locality, Spengler coll. (Fig. 16K, L). *Cardium unicolor:* six paired syntypes from Ticao (Philippines), in BMNH, Cuming coll., the largest of which (Fig. 16I, J) fits the specimen cited and figured by Sowerby, and was selected as lectotype by Voskuil & Onverwagt (1991b: 116). *Cardium nebulosum:* holotype, a paired specimen from the Maldives in BMNH 1900-2-13-22, figured by Reeve. *Laevicardium soyeri:* holotype and three paratypes, all paired specimens, labelled (incorrectly) "Corsica", in MNHN.

MATERIAL EXAMINED. — The following lots in addition to the type series:
Mozambique. Conducia Bay, S of Choca (Natal Museum H4189 and G3042 legs Grosch).
Mauritius. (IRSNB Daurzenberg).
Madagascar. (MNHN Powis 1840). — (MNHN Texor de Ravisi 1853). — (MNHN Petit 1921). — Ambatoloaka (MNHN Petit 1921). — Nosi Be (MNHN Boivin 1853). — Stn 230, 255, Tulear (MNHN Thomassin 1969). - Ambatoloaka, SW

TABLE 32. — Character differences between *Acrosterigma punctolineatum* Healy & Lamprell, 1992 and *A. hobbsae* n. sp.

A. punctolineatum	***A. hobbsae***
Lunule small, flat, limit vague	Lunule larger, hollowed, clear limit
Colour spots only on top or anterior part of ribs (PQ)	Colour pattern not so confined
Rib number range 41-57	Rib number range 58-65
Anterior margin of ribs on PQ abrupt; scales large and regular	On PQ, anterior margin not abrupt; scales small, irregular
Ribs on median part high; rounded interstices notched, w/a intermediary riblet	Ribs on median part low, flat; interstices smooth, no intermediary riblet
Top-ridges on AQ thin and long	Top-ridges on AQ wide and tubercular

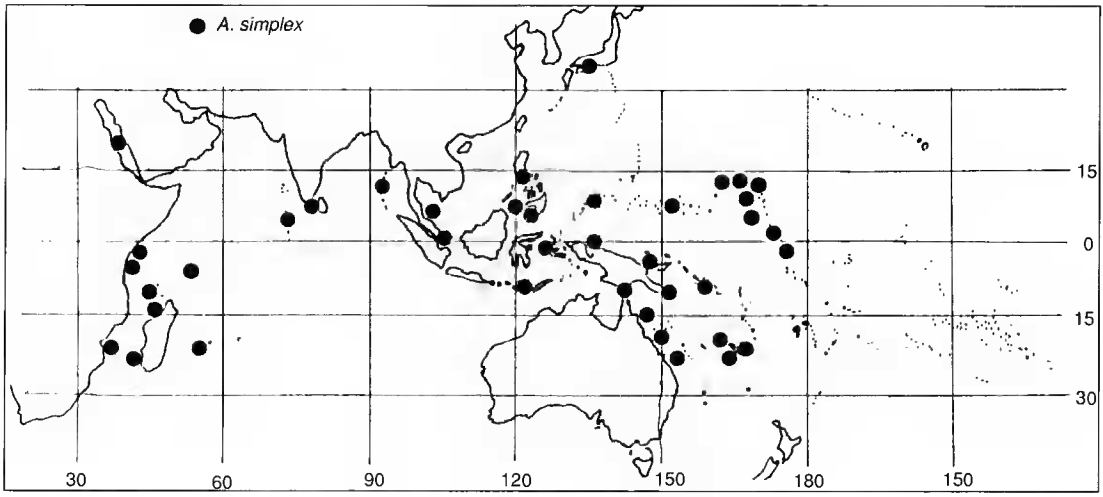

FIG. 18. — Distribution of *Acrosterigma simplex*.

Nosi Be (MNHN von Cosel 1986). — Ambariaonka, SW Nosi Be (MNHN von Cosel 1986).
Comores. (MNHN Jousseaume 1921). — Mayotte (MNHN Claret 1874). — Mayotte (Natal Museum K2273 Roscoe).
Zanzibar. (MNHN Rousseau 1841). — (MNHN Boivin 1853). — (ANSP 213976, 54225, 597142, 643452).
Kenya. Likoni, near Mombassa (MNHN Lavranos 1970). — Shimoni (MNHN Bentley-Buckle 1972).
Seychelles. (MNHN Boivin 1853). — (BMNH Taylor). — Aldabra Atoll (ANSP 837717). — Olhuveli Islet, near Mahé (LACM 84-1).
Red Sea. (BMNH 1844-6-3-11).
Sri Lanka. (MNHN Denis 1945).
India. Off Madras (Natal Museum K2029 Honker). — Port Blair, Andaman Island (BMNH Winckworth).

TABLE 33. — Measurements (in mm) and rib count of *Acrosterigma simplex* (Spengler, 1799).

	H	L	W	L/H	W/L	D	A°	Ribs
Holotype *simplex*	32.7	29.3	23.6	0.90	0.81	≈1.0	125	43
Lectotype *unicolor*	45.5	37.7	28.5	0.82	0.76	≈1.0	115	49
Holotype *nebulosum*	27.2	25.2	17.6	0.93	0.70	≈1.0	125	44
Holotype *soyeri*	42.3	35.7	27.9	0.84	0.78	≈1.0	?	45
MNHN, Madagascar	40.5	35.3	27.0	0.87	0.76	1.10	120	47
HNHN, Sri Lanka	32.8	27.9	(22.8)	0.85	0.82		120	47
Hobbs coll., Sumatra	20.8	18.8	14.2	0.90	0.76			49
Hobbs coll., Phillppines	22.0	19.6	15.7	0.89	0.80			51
MNHN, Queensland	34.1	29.2	22.9	0.86	0.78	1.10	125	48
MNHN, New Caledonia	42.5	35.4	31.7	0.78	0.89	1.05	115	42
Hobbs coll., Carolines	28.1	25.0	19.5	0.89	0.78			46
USNM 614342, Marshall	39.5	32.4	(27.6)	0.82	0.85		120	54
MNHN, New Caledonia	52.8	39.4	36.0	0.75	0.91	1.10	115	52
Total adult shells measured and rib counts				57	57	38	38	58
General mean values				0.85	0.80	1.07	119	47.6
Standard deviation				0.05	0.05	0.06	5.0	3.8
Largest specimen observed, MNHN, New Caledonia (see above)								

Thailand. Koh Tao (ANSP 419749).
Philippines. Caboloa, Polillo Group, Quezon Province (LACM 89960). — Off Buyong Beach, Mactan Island (AMS C143113). — Olongo Reef, Mactan Island (Hobbs). — Ticao (MNHN Letellier 1949). — Ticao (IRSNB). — Davao (LACM 13362). — Tabaco Bay, Albany Province (LACM 89222). — Bubuan Island (ANSP 248415). — Sa Cruz Island, Zamboanga (ANSP 248298). — Siasi Island, Sulu Archipelago (BPBM 203571).
Palau. (ANSP 202031). — Malakal Harbour (ANSP 202781). — Babelthuap Island, Palau (ANSP 203340). — Palau (USNM Paulay BPAL 14, BPAL 16, BPAL 17, BPAL 52).
Japan. Awaji (BMNH Mac Andrew).
Indonesia. Sumarra, Bengkalis Island (Hobbs). — Waiara Maumere, Flores (Hobbs). — Moluccas (ZMA, 2 lots). — Moluccas (BMNH). — Biak Island, Irian Jaya (ANSP 600635).
Papua New Guinea. Hansa Bay, S of Madang (IRSNB 25681, 26132). — Louisiades Archipelago (BMNH 1856-126-8-22). — Samarai Island (*Galatea* stn L396, ZMUC).
Solomon. Lyons Point, Florida Island (BPBM 198603).
Queensland. Darnley Island, Torres Strait (WAM); (BMNH 1846-8-31-203). — Stephen Island, Torres Strait (WAM). — 09°09'S, 143°53'E, Bramble Cay, Torres Strait (AMS C051330). — 16°15'S, 145°50'E, Opal Reef, N of Cairns (AMS C310558). — 16°46'S, 145°58'E, Green Island, off Cairns (AMS C310559). — Two Isles (MNHN Vidal 1994). — Four Miles Beach (MNHN Lamprell). — Lizard Island (MNHN Vidal 1994). — Mrs Watson's Beach, Lizard Island (Vidal 1994). — Lizard Island (ANSP 704706, 352683); (LACM 79-53, 79-55, 79-57). — 21°42'S, 152°26'E, Gillet Cay, Swain Reef, 64-73 m (AMS C123512). — 23°32'S, 151°45'E, Masthead Island, Capricorn Group, 31-37 m (AMS CO21200).
New Caledonia. MNHN various coll.: (Marie 1872). — (Lambert 1876). — (Crosse & Fischer 1974). — (ORSTOM). — (Laboute 1982). — Île aux Canards (Catala 1953). — Baie des Citrons, Nouméa (Berthault 1994). — Anse Vata, Noumea (WAM 3567-65). — Baie de Kuto, Île des Pins (MNHN Vidal 1989). — Nehoué Bay, near Poum (MNHN Vidal 1992). — Koumac Harbour (MNHN Vidal 1992). — Plarier du Ouen Toro (MNHN Vidal 1989). — Anse Vata, Noumea (MNHN Vidal 1992). — Grand Récif Sud (MNHN Laboute 1982).
Vauban LAGON 1984, SW zone of Lagoon, (MNHN): stn 4, 22°22.5'S, 166°20.7'E, 9 m. — Stn 5, 22°24.3'S, 166°22.0'E, 10 m. — Stn 7, 22°24.0'S, 166°19.7'E, 14 m. — Stn 10, 22°19.9'S, 166°20.4'E, 15 m. — Stn 21, 22°22.8'S, 166°23.4'E, 10 m. — Stn 49, 22°18.5'S, 166°13.8'E, 10 m. — Stn 50, 22°12.6'S, 166°12.2'E, 12 m. — Stn 51, 22°14.7'S, 166°11.1'E, 10 m. — Stn 63, 22°26.0'S, 166°26.3'E, 20 m. — Stn 66, 22°27.5'S, 166°27.4'E, 15 m. — Stn 95, 22°31.3'S, 166°32.8'E, 14 m. — Stn 99, 22°32.6'S, 166°34.6'E, 14 m. — Stn 127, 22°30.6'S, 166°45.9'E, 55 m. — Stn 128, 22°30.2'S, 166°44.0'E, 52 m. — Stn 150, 22°30.1'S, 166°50.4'E, 65 m. — Stn 161, 22°34.4'S, 166°38.4'E, 20 m. — Stn 163, 22°12.0'S, 166°07.5'E, 15 m. — Stn 185, 22°04.8'S, 166°02.2'E, 15 m. — Stn 251, 22°19.3'S, 166°25'E, 20 m. — Stn 253, 22°22.1'S, 166°23'E, 16 m. — Stn 281, 22°23.7'S, 166°24'E, 10 m. — Stn 284, 22°25.8'S, 166°25'E, 6 m.
Vauban LAGON 1984-85, S zone of Lagoon, (MNHN): stn 293, 22°41.5'S, 166°40.9'E, 20 m. — Stn 294, 22°43.7'S, 166°41.8'E, 21 m. — Stn 296, 22°40.6'S, 166°44.4'E, 26 m. — Stn 312, 22°41.9'S, 166°48.8'E, 26 m. — Stn 340, 22°47.7'S, 166°46.6'E, 27 m. — Stn 357, 22°29.8'S, 167°06.7'E, 77 m. — Stn 546, 22°53.3'S, 166°51.6'E, 33 m. — Stn 547 22°54.5'S, 166°53.0'E, 29 m. — Stn 554, 22°50.2'S, 166°53.5'E, 27 m. — Stn 564, 22°46.8'S, 166°56.0'E, 35 m. — Stn 592, 22°34.2'S, 167°22.0'E, 22 m. — Stn 593, 22°33.4'S, 167°20.0'E, 25 m.
Vauban LAGON 1985, (MNHN): Huon Atoll, stn 443, 18°00.0'S, 162°55.1'E, 40 m. — Surprise Atoll, stn 448, 18°21.5'S, 163°07.0'E, 30 m. — Stn 452, 18°27.4'S, 163°12.3'E, 27 m. — Stn 455, 18°29.5'S, 163°07.9E, 40 m. — Stn 465, 18°22.1'S, 163°05.0'E, 45 m. — Stn 473, 18°24.2'S, 163°03.3'E, 50 m.
Vauban LAGON 1987-88, NE zone of Lagoon, (MNHN): stn 855, 20°38.35'S, 165°09.11'E, 22 m. — Stn 885, 20°26.1'S, 164°42,15'E, 32 m.
Vauban LAGON 1988, NW zone of Lagoon, (MNHN): stn 916, 20°55.5'S, 164°28.3'E, 13 m. — Stn 923, 20°48.7'S, 164°24.2'E, 9 m. — Stn 936, 20°40.7'S, 164°16.4'E, 15 m. — Stn 940, 20°38.1'S, 164°15.5'E, 10 m. — Stn 941, 20°38.9'S, 164°13.3'E, 16 m. — Stn 984, 20°21.2'S, 163°56.4'E, 23 m. — Stn 1026, 20°04,6'S, 163°47.6'E, 29 m. — Stn 1060, 20°14.3'S, 164°15.4'E, 13 m.
Alis LAGON 1989, N zone of Lagoon. — Stn 1063, 20°03'S, 163°47'E, 31 m. — Stn 1065, 19°58'S, 163°51'E, 28 m. — Stn 1084, 19°51'S, 163°50'E, 35 m. — Stn 1088, 19°46'S, 163°58,E, 23 m. — Stn 1094, 19°54'S, 163°41'E, 26 m. — Stn 1104, 19°42'S, 163°59,E, 22 m. — Stn 1105, 19°40'S, 163°57'E, 25 m. — Stn 1118, 19°35'S, 163°52'E, 30 m. — Stn 1126, 19°33'S, 163°46'E, 41 m. — Stn 1140, 19°24'S, 163°44'E, 44 m. — Stn 1145, 19°21'S, 163°45'E, 38 m. — Stn 1146, 19°08'S, 163°31'E, 185 m. — Stn 1154, 19°09'S, 163°19'E, 40 m. — Stn 1157, 19°10'S, 163°10'E, 48 m. — Stn 1158, 19°10'S, 163°07'E, 48 m. — Stn 1168, 19°16'S, 163°09'E, 50 m. — Stn 1169, 19°19'S, 163°11'E, 47 m. — Stn 1174, 19°21'S, 163°14'E, 53 m. — Stn 1182, 19°27'S, 163°16'E, 48 m. —

Stn 1195, 19°30'S, 163°19'E, 38 m. — Stn 1205, 19°42'S, 163°26'E, 38 m. — Stn 1213, 19°50'S, 163°33'E, 32 m. — Stn 1217, 19°52'S, 163°36'E, 30 m.
Coriolis Corail 2 1988, Chesterfield Atoll (MNHN): stn DW 51, 19°18.50'S, 158°36.55'E, 69 m. — Stn DW 148, 19°54.08'S, 158°27.12'E, 34 m.
Alis MUSORSTOM VI 1989, Loyauté Island Rise, (MNHN): stn DW 435, 20°20.56'S, 166°07.83'E. — Stn DW 436, 20°20.27'S, 166°07.49'E, 33 m.
Alis PLOUVEAL 1992, Ouvea Lagoon (MNHN): stn 1219, 20°30'S, 166°28'E, 15 m.
Vidal's Survey, beaches of main island 1989-92, (MNHN): Néhoué Bay. — Koumac Harbour. — Ouen Toro reef flat. — Kuto Bay, Île des Pins. — Pointe aux Longs Cous, Nouméa. — Anse Kuenda, Presqu'île Nou. — Baie des Citrons, Nouméa.
MONTROUZIER EXPEDITION 1993, Koumac area (MNHN): stn 1277, 20°34'S, 164°16'E, Baie de Ouanap, 0-2 m. — Stn 1282, 20°33'S, 164°13'E, Îlot Tangadiou, 0 m. — Stn 1283, 20°33.5'S, 164°12'E, Îlot Magone, 0 m. — Stn 1286, 20°38'S, 164°17'E, Plateau Karembé, 0 m. — Stn 1292, 20°22.4'S, 164°06.8'E, Pointe de Barbouillat, 0 m. — Stn 1301, 20°37.3'S, 164°15'E, Récif de l'Infernet, 1-5 m. — Stn 1303, 20°37.7'S, 164°16'E, Plateau Karembe, 0-8 m. — Stn 1304, 20°38.6'S, 164°13.2'E, Chenal de l'Infernet, 12-15 m. — Stn 1306, 20°39.1'S, 164°12.4'E, Chenal de l'Infernet, 11-13 m. — Stn 1307, 20°33.7'S, 164°10.3'E, Passe du Baron, 12m. — Stn 1308, 20°40'S, 164°15.2'E, Îlot Kendec, 15-20 m. — Stn 1309, 20°40.5S,164°13.4'E, Îlot Kendec, 18 m. — Stn 1314, 20°39.8'S, 164°15.3'E, Passe de Koumac, 30-63 m.
MONTROUZIER EXPEDITION 1993, Touho area, (MNHN): stn 1242, 20°46.2'S, 165°14.5'E, reef flat off Touho wharf, 0 m. — Stn 1246, 20°42.8'S, 165°08.7'E, 0 m.
Alis BATHUS I 1993, east coast (MNHN): stn DW 678, 20°49'S, 165°19'E, 94-100 m.
Kiribati. King's Mill Island (USNM 76105). — Tarawa Atoll (MNHN Paulay BTAR1).
Caroline Islands. Ponape Hotel (Hobbs). — Truck Lagoon (Hobbs). — Helen Reef (ANSP 208013).
Marshall Islands. 0.5 miles off Bikini Island 27 m (USNM 582996). — 15 miles S of Vena, Bikini (ANSP 585230). — Uterik (ANSP 615609) — Caaranbira (ANSP 584859). — Eniwetok (ANSP 285297, LACM 65-31). — Wotho (USNM 614342). — Over Eniwetok (USNM 542916). — Taka (USNM 615569). — Ailuk (USNM 615256). — N end of Lijeron Island, Jaluit (USNM 660006). — W of Rongelap Island, 37 m (USNM 585487).

DISTRIBUTION. — (Fig. 18) *Acrosterigma simplex* has a large but patchy distribution in the Indo-Pacific; it seems inexplicably absent from the north-western Indian Ocean and from the south-eastern west Pacific (eastern Melanesia and Polynesia).

DESCRIPTION

Medium-sized; adult shells generally asymmetrical on dorsal margin with a receding posterior side and a raised, inflated anterior one, and with an obtuse angle on dorsal margin at the level of anterior laterals; ventral part also asymmetrical, with an expansion of posterior side and ribs generally curved backwards in projection. Generally slightly truncated at PQ-MPQ limit; a weak furrow sometimes separates these two zones, producing an obtuse notch on margin. Moderately but variably elongated (mean L/H = 0.85; range 0.73-0.96), and rather inflated (mean W/L = 0.80; range 0.70-0.91).
Lunule rather large and flat on left valve, very large and appreciably depressed on right valve. An additional thick dark brown layer of lamellat-ed periostracum present on PQ and part of MPQ of adult shells. Exterior of the young shells generally marked with irregular concentric light purple stains; on adults, which generally remain uniform pale white to yellow, these aligned stains can persist on MPQ. Interiorly white to some-what purple by transparency; PQ always white. Hinge slightly asymmetrical, with ratio D always higher than 1.0 (mean D = 1.07; range 1.0- 1.18); angle A rather small, in a range of 110°-125°.
Mean rib number 47.6, range 42-59.
Rib morphology: on PQ (Fig. 16P), smooth anterior part of ribs flat, with an abrupt anterior flank, and much wider than posterior part, represented by a thin, low ridge between axial furrow and interstice; this ridge, in turn, bears a very thin top furrow in which very small irregular scales occur, often connected by a thin ridge. These features present only on juvenile part of shell; on adult part (except for some of last ribs), posterior ridge and scales disappear and posterior part of ribs becomes a "pseudo-interstice", with or without an axial cicatrice; simultaneously anterior part of ribs lowers, shell surface becoming almost smooth on most adult margin of large shells. On median part of shell (MPQ and MAQ), there are low ribs of slightly rounded profile, at first smooth beside PQ, then becoming finely and regularly retro-ridged. Interstices

rounded, smooth, and half width of ribs. On AQ, posterior thin ridges of ribs disappear or change into scarce, irregular, very thin top-ridges; ribs beside lunule become very low, sometimes with somewhat wide, tubercular top-ridges, sometimes entirely smooth and almost indistinct on fully adult part of shell.

REMARKS

Acrosterigma simplex can be separated from the other species of the species-group mainly by its large lunule, the lack of bright colours (though exceptions exist), unique character of PQ rib morphology [particularly with ontogenic disappearance of scales and smoothing of surface (Fig. 16P) and the weak ornamentation of the ribs elsewhere]. As discussed below, this species shows several transitional characters between the species-group of *A. maculosum* and the following species-group of *A. biradiatum*.

Species-group of *Acrosterigma biradiatum* (Bruguière, 1789)

DIAGNOSIS. — See Table 5.

INCLUDED SPECIES. — 1) Recent: *A. biradiatum* (Bruguière, 1789); *A. attenuatum* (Sowerby, 1841). 2) Fossil: no data.

REMARKS

These two species have been referred by all other authors to the genus *Laevicardium*, subfamily Laevicardiinae Keen, 1951 (Keen 1936 is invalid). This subfamily has often been viewed as representing a wide group encompassing a number of genera and subgenera (Keen 1951; Thiele 1935; Adam & Leloup 1939; Fischer-Piette 1977; Schneider 1995). Kafanov (1975: 145; 1980: 299) reduced the number of genera to only *Laevicardium* and *Fulvia*. *Fulvia* has been removed from the group by Wilson & Stevenson (1977). I have shown (Vidal 1994) that *Fulvia* must be placed in the subfamily Cardiinae (tribe Vepricardiini), so that Laevicardiinae now would contain only the genus *Laevicardium*.

Even restricted in this way, this subfamily still lacks homogeneity, as remarked by Wilson & Stevenson (1977: 57): "Shell characters of species assigned to *Laevicardium* s.l. are variable [...] This variability of shell characters within *Laevicardium* suggests that subdivision of *Laevicardium* [...] may be necessary".

The separation from this genus of the species-group of *A. biradiatum* constitutes one of the subdivisions considered necessary by Wilson & Stevenson. The two species of this species-group have numerous characters typical of *Acrosterigma* and are here included in that genus, in agreement with Wilson & Stevenson who stated (1977: 57) that "in some [species assigned to *Laevicardium*] shell characters approach the shell characters of the Trachycardiinae very closely". The characters shared with *Acrosterigma* are: similar shape; similar hinge structure (short, massive, and strongly angled); presence of two coloured, internal umbonal rays and a sterigma; on PQ ribs bipartite, with scales in juvenile shells; crenulate posterior margin and retrocrenulated ribs on part of the anterior half; and, in the siphonal area of the soft parts, a similar disposition of tentacles bearing no ocular organs.

In addition to these factors, several peculiar characters of this species-group already appear, more or less developed, in some species of *Acrosterigma*. In addition to general lowering and smoothing of ribs, and increasing rib number, these are:

1. Progressive ontogenic smoothing of PQ, concurrent with the creation of "pseudo-interstices" (particularly in *A. simplex* and some other species of the species-group of *A. maculosum*).
2. Lateral lowering and disappearance of ribs in AQ, in two stages separated by "diachronous" (not occurring on the same rib during growth, but on successive ribs) demarcation lines (particularly visible in *A. simplex*; many other species show only gradual degeneration, even disappearance of the first ribs).
3. Appearance of concentric arrangements in the anterior part of the shell (more or less marked in the species-group of *A. maculosum*).

In conclusion it appears that the two species of the group in question here are very close to *Acrosterigma*, and must be placed in this genus. Nor have I any doubts that this species-group phylogenetically derives from *Acrosterigma* and

particularly from the species-group of *A. maculosuma*, *A. simplex* representing an intermediate stage of this evolution.

The genus *Laevicardium* remains represented in the Indo-Pacific by only two species, *Laevicardium multipunctatum* (Sowerby, 1833) and *L. lobulatum* (Deshayes, 1855).

Acrosterigma biradiatum (Bruguière, 1789)
(Figs 16Q, R; 19A-F; Table 34)

Cardium biradiatum Bruguière, 1789: 231.
Laevicardium rubropictum Habe & Kosuge, 1966b: 153, pl. 59, fig. 2.
Not *Cardium serratum* Linné, 1758 [= *Laevicardium laevigatum* (Linné) *sensu* Clench & Smith, 1944: 22].

TYPES. — *Cardium biradiatum*: not traced. Some authors consider that a possible type specimen is a shell from Sri Lanka, MHNG 1085/60 Lamarck coll. (Fig. 16Q, R); I here select this shell as neotype of *C. biradiatum*. *Laevicardium rubropictum*: holotype and two paratypes, from Zamboanga (Philippines), in National Science Museum (Tokyo).

MATERIAL EXAMINED. — The following lots:
South Africa. N Zululand, from off Kosi Bay to off Sodwana Bay (In Natal Museum):
Meiring Naudé 1987: stn ZA2, 26°56.0'S, 32°54.7'E, 50 m (D7304). — Stn ZA5, 26°54.7'S, 32°55.1'E, 45-47 m (D6265). — Stn ZA11, 26°55.3'S, 32°55.4'E, 50 m (D8757). — Stn ZA30, 26°53.8'S, 32°55.5'E, 50 m (D7917). — Stn ZB2, 27°00.8'S, 32°54.3'E 50 m (D9173). — Stn ZB5, 27°00.0'S, 32°55.2'E, 70 m (D6419). — Stn ZH7, 27°32.5'S, 32°42.0'E, 48-58 m (D6557). — Stn ZJ6, 27°42.7'S, 32°39.9'E, 50 m (E4323).
NMDP 1990: ZB14, 27°00.8'S, 32°54.3'E, 51 m (S6542). — Stn ZB26, 27°03.8'S, 32°53.4'E, 44 m (S8951). — Stn ZH22, 27°31.8', 32°43.0'E, 70 m (S3884).
Mauritius. (MNHN Vidal, two lots). — (MNHN Cloué 1850). — (MNHN Charret 1874). — (MNHN Arnould 1927). — (MNHN Carrié 1941).
Madagascar. (MNHN Pawis 1840). — Nosi Be (MNHN Vidal). — Nosi Be (MNHN von Cosel 1986). — Nosi Be (MNHN Thomassin).
Thomassin Survey 1962-1973, Tulear area (MNHN): stn D16, 23°29'36"S, 43°41'48"W, Tulear Lagoon, 13-17 m. — Stn 726, 733, 737, 738, 822, S Pass, Tulear Lagoon, 12 m.
Mozambique. (LACM 50865). Conducia Bay (Natal Museum H4211, H4212, H4213, H4214, H4216 Grosch 1975).
Comores. (MNHN Jousseaume 1921). — Mayotte (MNHN Joly 1923).
Seychelles. *Rèves 2* 1980 (MNHN): stn 4, 05°08'S, 56°35'E, 32 m. — Stn 5, 05°05'S, 56°24'E, 33 m. — Stn 7, 04°53'S, 56°01'E, 57 m. — Stn 32, 04°23'S, 54°16'E, 51 m. — Stn 37, 04°35'S, 55°12'E, 65 m. — Stn 47, 04°03'S, 55°59'E, 50 m. — Stn 50, 03°55'S, 55°40'E, 45 m.
Zanzibar. (MNHN Rousseau 1841). — (ANSP 213623).
Somalia. Near Mogadiscio (MNHN Lavranos 1969). — 14 km N of Mogadiscio (ANSP 295837).
Yemen. Socotra Island (MNHN Lavranos 1967).
Red Sea. (LACM 13471). — El Eliath, Aquaba Gulf (ZMUC).
Sri Lanka. (MNHN Staadt 1969). — (LACM 50879). — (ANSP 54174).
Maldive Islands. (ANSP 305458).
Philippines. Luzon (MNHN). — Cape Calavite, Mindoro (LACM 89958). — Burias Island (MNHN Staadt 1969); (ANSP 54310, 225865). — Bentayan Island, Cebu (MNHN Vidal). — Mindanao (ANSP 223705). — Zamboanga (LACM 50862). — Sulu Archipelago (MNHN Vidal). — Sulu Archipelago (ANSP 223681). — Jolo Island, Sulu Archipelago (MNHN, ZMUC). — Siasi Island, Sulu Archipelago (LACM 89-913, BPBM 203567).
Japan. Oshima (LACM 61161). — Lookoos, Kumejima Island, Okinawa (ANSP 321631). — Yagashi Island, N of Nagao, Okinawa (LACM 28275). — Off Homan, Okinawa (BPBM 10232a). — Ryukyu Island (ANSP 252733).
Palau. Koror Island (ANSP 202421).
Indonesia. Java, 08°30'-08°35'S, 114°28'E, 70-150 m (ZMUC Mortensen 1929). — Aoeri Island, Irian Jaya (ANSP 208880). — Lombok (MNHN Vidal).
Papua New Guinea. Hansa Bay, S of Madang, 45 m (IRSNB 26132).
Australia. Off Darwin, Northern Territory (ANSP 219289).
New Caledonia. *Coriolis* CHALCAL 1984, Chesterfield Atoll, (MNHN): stn D14, 19°26.90'S, 158°31.90E, 246 m. — Stn D16, 19°11.90'S, 158°57.00'E, 63-67 m. — Stn D17, 19°11.90'S, 158°55.80'E, 44 m. — Stn D26, 19°10.72'S, 158°34.95'E, 48 m. — Stn D28, 19°24.18'S, 158°31.40'E, 51 m. — Stn D33, 19°44.80'S, 158°25.80'E, 205 m. — Stn D39, 20°28.90'S, 148°48.70'E, 40 m.
Coriolis CHALCAL 1984, Bellona Reefs (MNHN): stn D44, 20°46.03'S, 158°33.73'E, 79 m. — Stn D46, 20°52.26'S, 158°33.74'E, 65 m. — Stn D48, 20°46.25'S, 158°41.64'E, 70 m. — Stn D49, 20°58.20'S, 158°35.00'E, 48 m. — Stn D51, 21°13.21'S, 158°42.50'E, 55 m. — Stn D53, 21°19.50'S, 158°55.30'E, 60 m. — Stn D55, 21°23.90'S, 158°59.60'E, 55 m. — Stn D59, 21°40.36'S, 159°21.29'E, 56 m. — Stn D60, 21°48.65'S, 159°27.95'E, 45 m.
Vauban LAGON, (MNHN): SW zone of Lagoon

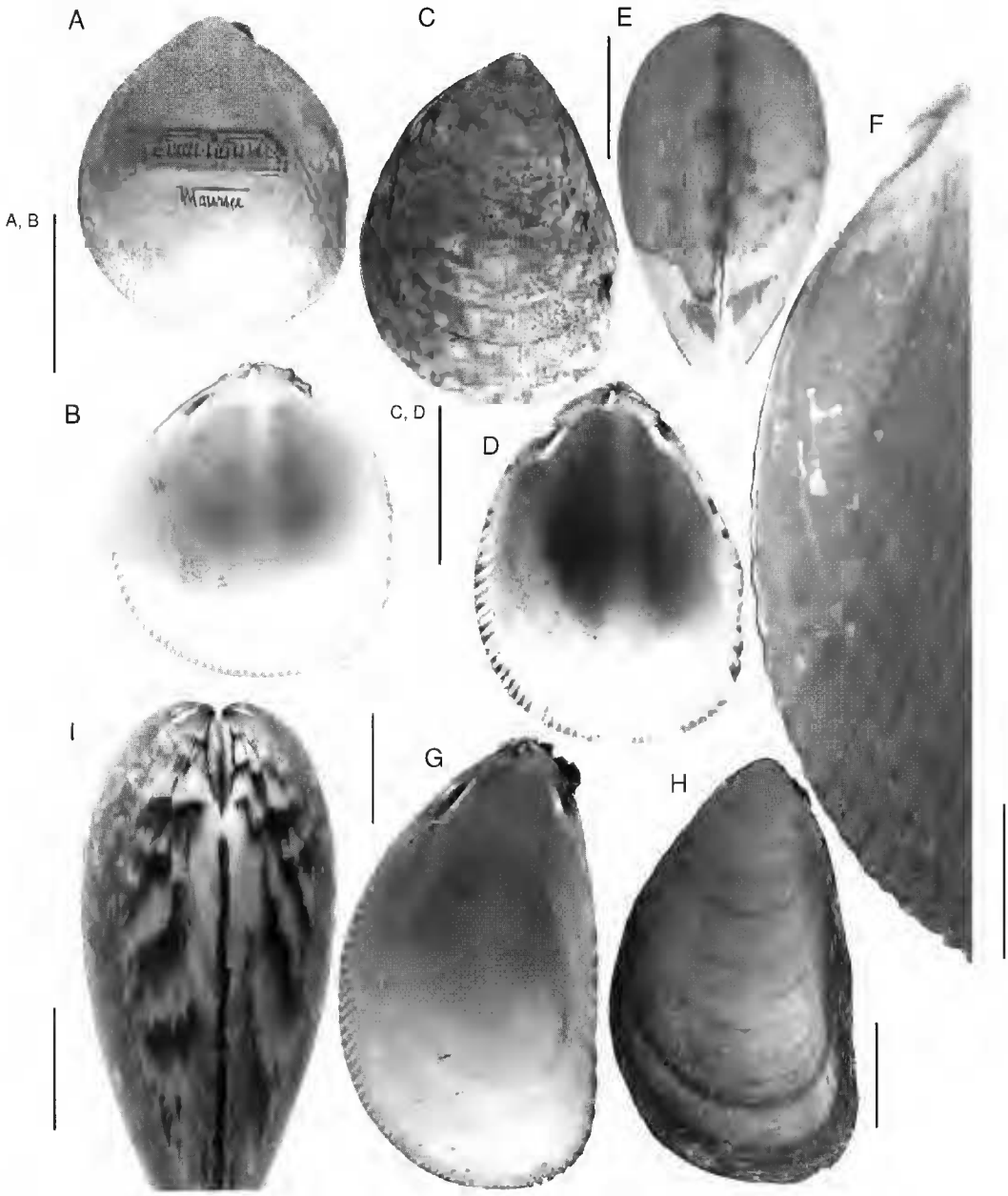

FIG. 19. — **A, B**, *Acrosterigma biradiatum*, a specimen from Mauritius, MNHN; **C, D**, *Acrosterigma biradiatum*, a specimen from Sri Lanka, MNHN; **E**, *Acrosterigma biradiatum*, detail of juvenile PQ in a specimen from Chesterfield Plateau, New-Caledonia, MNHN, showing the scaled ribbing of *Acrosterigma* type; **F**, *Acrosterigma biradiatum*, detail of AQ in a left valve from Mauritius, MNHN, showing the variation and disappearance of ribbing; **G, H**, *Acrosterigma attenuatum*, a specimen from Chesterfield-Bellona Plateau, New Caledonia, MNHN; **I**, *Acrosterigma attenuatum*, a specimen from west coast of Gulf of Thailand (Thailand), MNHN; detail of PQ, showing particularly the thin remaining two last ribs white coloured. Scale bars: A-D, G, H, 20 mm; E, F, 5 mm; I, 10 mm.

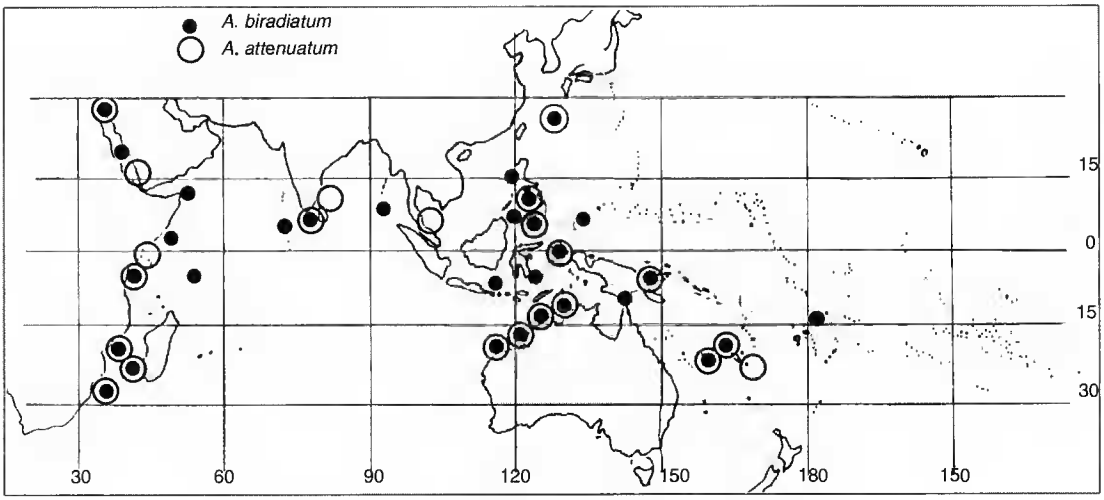

FIG. 20. — Distribution of *Acrosterigma biradiatum* and *A. attenuatum*.

1984, stn 290, 22°36.6'S, 166°45.0'E, 35 m. — S zone of Lagoon 1985, stn 410, 22°45.9'S, 167°22.2'E, 35 m. — SE zone of Lagoon 1986, stn 716, 21°22.1'S, 165°58.9'E, 30 m.
Vauban LAGON 1985, Surprise Atoll (MNHN): stn 465, 18°22.1'S, 163°05.0'E, 45 m. — Stn 473, 18°24.2'S, 163°03.3'E, 50 m. — Stn 474, 18°02.4'S, 163°01.8'E, 52 m.
Coriolis CORAIL 2 1988, Fairway Bank (MNHN): stn DW 04, 20°52.30'S, 161°36.56'E, 64 m.
Coriolis CORAIL 2 1988, Chesterfield Atoll (MNHN): stn DW 31, 19°24.86'S, 158°45.03'E, 57 m. — Stn DW 32, 19°24.90'S, 158°48.75'E, 55 m. — Stn DW 34, 19°21.62'S, 158°55.77'E, 47 m. — Stn DW 41, 19°21.52'S, 158°31.87'E, 52 m. — Stn DW 42, 19°21.53'S, 158°28.83'E, 45 m. — Stn DW 44, 19°21.82'S, 158°22.95'E. — Stn DW 48, 19°18.30'S, 158°27.00'E, 44 m. — Stn DW 50, 19°18.30'S, 158°33.57'E, 50 m. — Stn DW 51, 19°18.50'S, 158°36.55'E, 69 m. — Stn 54, 19°18.57'S, 158°43.50'E, 71 m. — Stn 59, 19°18.50'S, 158°56.55'E, 50 m. — Stn 60, 19°14.98'S, 158°56.98'E, 45 m. — Stn 63, 19°15.15'S, 158°47.73'E, 71 m. — Stn 65,

TABLE 34. — Measurements (in mm) and rib count of *Acrosterigma biradiatum* (Bruguière, 1789).

	H	L	W	L/H	W/L	D	A°	Ribs
Neotype *biradiatum*	40.0	33.1	21.0	0.83	0.63	0.95	110	53
MNHN, Madagascar	45.4	34.2	24.9	0.75	0.73	≈1.0	105	50
MNHN, Zanzibar	51.3	39.7	28.2	0.77	0.71	≈1.0	110	50
MNHN, Sri Lanka	45.6	33.5	23.4	0.73	0.70	≈1.0	100	51
MNHN, Philippines	42.7	34.3	22.4	0.80	0.65	≈1.0	115	52
MNHN, Surprise Atoll	48.0	36.2	26.3	0.75	0.73	0.95	100	46
MNHN, Chesterfield Atoll	42.4	34.2	20.8	0.81	0.61	0.90	105	52
MNHN, Socotra Is	56.8	45.2	(30.0)	0.80	0.66	≈1.0		49
Total adult shells measured and rib counts				38	38	27	30	34
General mean values				0.80	0.67	0.98	110	50.9
Standard deviation				0.05	0.04	0.06	4.5	3.9
Largest specimen observed, MNHN, Socotra Island (see above)								

19°15.00'S, 158°40.64'E, 62 m. — Stn DW 67, 19°14.92'S, 158°36.94'E, 66 m. — Stn DW 71, 19°15.37'S, 158°24.37'E, 55 m. — Stn DW 72, 19°15.30'S, 158°20.89'E, 32 m. — Stn DW 76, 19°12.25'S, 158°32.90'E, 53 m. — Stn DW 77, 19°12.01'S, 158°35.98'E, 60 m. — Stn DW 79, 19°11.55'S, 158°43.40'E, 58 m. — Stn DW 80, 19°11.98'S, 158°47.81'E, 66 m. — Stn DW 87, 19°06.14'S, 158°59.94'E, 31 m. — Stn DW 88, 19°05.98'S, 158°55.85'E, 32 m. — Stn DW 93, 19°05.92'S, 158°53.00'E, 59 m. — Stn DW 94, 19°06.00'S, 158°50.00'E, 40 m. — Stn DW 96, 19°06.00'S, 158°41.92'E, 41 m. — Stn DW 102, 19°09.03'S, 158°29.99'E, 58 m. — Stn DW 103, 19°01.01'S, 158°31.94'E, 58 m. — Stn DW 104, 19°08.95'S, 158°35.67'E, 49 m. — Stn DW 106, 19°09.00'S, 158°42.62'E, 62 m. — Stn DW 110, 19°08.95'S, 158°55.82'E, 40 m. — Stn DW 118, 19°25.06'S, 158°28.35'E, 52 m. — Stn DW 119, 19°25.00'S, 158°24.60'E, 56 m. — Stn DW 122, 19°28.17'S, 158°17.06'E, 32 m. — Stn DW 126, 19°28.07'S, 158°27.00'E, 38 m. — Stn DW 128, 19°27.89'S, 158°30.44'E, 46 m. — Stn DW 133, 19°31.10'S, 158°25.35'E, 45 m. — Stn DW 137, 19°34.00'S, 158°14.60'E, 32 m. — Stn DW 143, 19°37.40'S, 158°25.16'E, 45 m. — Stn DW 144, 19°27.73'S, 158°23.28'E, 50 m. — Stn DW 145, 19°37.00'S, 158°19.12'E, 54 m. — Stn DW 146, 19°37.00'S, 158°16.28'E, 44 m. — Stn DW 147, 19°36.87'S, 158°13.52'E, 25 m. — Stn DW 154, 19°52.04'S, 158°26.50'E, 35 m. — Stn DW 158, 19°46.00'S, 158°16.50'E, 28 m. — Stn DW 160, 19°46.00'S, 158°23.00'E, 41 m. — Stn DW 164, 19°41.48'S, 158°18.79'E, 58 m.

Alis LAGON, N zone 1989 (MNHN): stn 1157, 19°10'S, 163°10'E, 48 m. — Stn 1168, 19°16'S, 163°09'E, 50 m.

Wallis and Futuna. *Alis* MUSORSTOM 7, 1992 MNHN: stn DW 538, 12°31'S, 176°40'W, Waterwitch Bank, 276-295 m.

DISTRIBUTION. — (Fig. 20) In addition to the locations above, this species has been recorded from the Seychelles, Nicobar Island, Central Indonesia (*Siboga* campaign), Queensland and north Western Australia (Wilson & Stevenson, 1977: 60).

DESCRIPTION

Shell of medium size, roughly pear-shaped (maximum length measured much closer to ventral than dorsal margin), with median ventral margin straightened, and almost equilateral with posterior dorsal margin often more receding; MPQ margin sometimes slightly expanded and PQ often slightly truncated with an obtuse notch in margin. Variably elongated (mean L/H = 0.80; range 0.72-0.88), and somewhat compressed (mean W/L = 0.67; range 0.61-0.75).

Lunule *s.s.* not delineated, because there are no ribs on the anterior-most part (sublunule); umbonal margin rising slightly on right valve. External colour variable, beige-yellow with fairly numerous irregular red-brown splashes (sometimes lacking); on PQ there are several radially disposed darker stains, often triangular and well-delineated. Hinge rather symmetrical (mean ratio D = 0.98; range 0.85-1.09) and appreciably angled (mean < A = 110°; range 100°-120°). A thin sterigma in the umbonal cavity of some shells in about 10% of lots.

Mean rib number 50.9, range 46-61. On the most anterior part, this number is based on internal marginal marks of ribbing, which is clearer than the degenerated ribbing itself.

Rib morphology: on PQ, the characteristic ribbing features of the genus are only discernible on the juvenile part (Fig. 19E): very thin interstices; flat ribs divided into two parts roughly equivalent in width and separated by a thin axial furrow; irregular, tubercular, more or less ptismatic scales present on the last ribs, becoming progressively smaller. Presence of scales restricted to a small part of juvenile shell, mainly on the last ribs (Fig. 19E); then the axial furrow and posterior part of rib unite to form a wide "pseudo-interstice" (see equivalent process in *A. simplex*). On MPQ, ribs very low, slightly rounded and smooth (except for some ribs near PQ which have a little fine posterior ridging); interstices smooth. On MAQ, ribs become progressively retro-ridged with numerous thin oblique ridges regularly disposed, causing crenulations of posterior side of top zone. On AQ, posterior half identical to MPQ with retro-ridged ribs (Fig. 19F). Then a zone occurs of three to five unornamented ribs that are almost indistinct, but still well-marked on margin (Fig. 19F); this is followed by a smooth zone of equal width, with neither ribs nor marginal-internal marks, posteriorly confused with lunule, i.e., a sublu-nule (Fig. 19F).

In addition to features described above, anterior and posterior parts of shell also with a rather irregular concentric ornamentation.

TABLE 35. — Measurements (in mm) and rib count of *Acrosterigma attenuatum* (Sowerby, 1841).

	H	L	W	L/H	W/L	D	A°	Ribs
Lectotype *attenuatum*	77.1	50.2	35.0	0.65	0.70			
MNHN, Mozambique	60.0	41.1	27.8	0.69	0.68	≈1.0	95	53
MNHN, Madagascar	52.3	35.7	23.8	0.68	0.67	1.05	95	52
MNHN, Kenya	42.3	30.6	19.7	0.72	0.64	1.10	90	53
MNHN, India	74.4	48.8	34.9	0.66	0.72	1.10	85	53
MNHN, Thailand	52.3	36.5	22.5	0.70	0.62	≈1.0	90	52
MNHN, New caledonia	82.5	50.0	33.6	0.61	0.67	0.91	80	62
MNHN, New caledonia	76.8	45.5	33.3	0.59	0.73	≈1.0	85	60
MNHN, Philippines	87.6	55.7	37.6	0.64	0.68	1.07	85	59
Total adult shells measured and rib counts				20	20	17	17	21
General mean values				0.66	0.68	1.03	88	56.9
Standard deviation				0.05	0.04	0.06	4.5	3.9
Largest specimen observed, MNHN, Philippines (see above)								

REMARKS

Some authors thought that *C. biradiatum* is a junior synonym of *Cardium serratum* Linné, 1758 [for example Clench & Smith (1944: 23)]. I have examined the syntypes of *C. serratum* in Linné's personal collection in London, three single valves that belong undoubtedly to the American Atlantic *Laevicardium laevigatum* (Linné) *sensu* Clench & Smith, 1944. The largest, a left valve [37.7 × 31.5 × (24.0)], with Linné's hand marks 73 and 89 (numbers in the 1758 and 1767 listings) still discernible, is here selected as lectotype of *Cardium serratum* Linné. As for *Cardium laevigatum*, Linné left three syntypes, two bivalved shells that are *Fulvia papyracea* (Bruguière, 1789) [see Vidal 1994: 99] and a single valve of *Fulvia australis* (Sowerby, 1834). The largest of the two bivalved shells [46.2 × 46.5 × 31.1], hand marked 88 by Linné (1767 listing) is here selected as lectotype of *Cardium laevigatum* Linné, senior synonym of *Cardium papyraceum* Bruguière, 1789. The two above Linné's species have been misidentified by all the subsequent authors [except Hanley (1855: 51), cited by Weinkauff (1867: 148) and Bucquoy *et al.* (1892: 301)].

Acrosterigma attenuatum (Sowerby, 1841)
(Fig. 19G-I; Table 35)

Cardium attenuatum Sowerby, 1841a: 109.

TYPES. — Several bivalved shells, bearing data "Ceylon, Zanzibar, Philippines, M. C." (although only "Ceylon" [Sri Lanka] is mentioned in Sowerby's description), are considered as syntypes (BMNH, Reg. 1971-26). A lectotype was selected by Wilson & Stevenson (1977: 57).

MATERIAL EXAMINED. — The following lots in addition to the type specimens:

South Africa. N Zululand, from off Kosi Bay to off Sodwana Bay (in Natal Museum):
NMDP 1990: stn ZA56, 26°56.4'S, 32°54.2'E, 35 m (S7665). — Stn ZA57, 26°56.8'S, 32°53.6'E, 29 m (S8803). — Stn ZH24, 27°32.2'S, 32°42.2'E, 49-53 m (S4722).

Madagascar. Nosi Be (MNHN Plaute 1968). — Nosi Be (ANSP 261742).
Thomassin Survey 1962-1973, Tulear area (MNHN): stn D16, 23°29'36"S, 43°41'48"W, Tulear Lagoon, 13-17 m. — Stn D17, 23°29'00"S, 43°41'39"W, Tulear Lagoon, 7-8 m. — Stn 630, 735, 740, 741, S Pass of Tulear Lagoon, 12-13 m.

Mozambique. (MNHN Staadt 1969). — (ANSP 247520). (LACM 13483, 50850, 50851). — SW Conducia Bay, N of Choca (Natal Museum H4204 Grosch 1975).

Zanzibar. (ANSP 226416, 213419).

Kenya. Shimoni, 80 km S of Mombassa, 18 m (MNHN Bentley-Buckle 1972).

Red Sea. Aquaba Gulf (MNHN Dolfuss 1929, stn 39).

India. (MNHN Vidal).

Sri Lanka. (ANSP 54313).

Thailand. E coast of peninsula, Gulf of Thailand (MNHN Vidal).

Philippines. (MNHN). — Cape Calavite, Mindoro (LACM 89958). — Zamboanga (LACM 50881).

Japan. Off Homan, Okinawa (BPBM Thaanum).

Indonesia. Padaido Island, Irian Jaya (ANSP

206098). — Aoeri Island, Irian Jaya (ANSP 205664).
Papua New Guinea. Hansa Bay, S of Madang (IRSNB 26132).
Australia. Darwin, Northern Territory (ANSP 219279).
New Caledonia. *Vauban* LAGON 1984, SW zone of Lagoon (MNHN): stn 80, 22°30.5'S, 166°27.7'E, 33 m. — Stn 113, 22°22.9'S, 166°48.3'E, 32 m. — Stn 115, 22°25.2'S, 166°46.2'E, 26 m.
Vauban LAGON 1984-85, S zone of Lagoon (MNHN): stn 336, 22°41.5'S, 166°51.4'E, 26 m. — Stn 339, 22°46.2'S, 166°47.9'E, 26 m. — Stn 346, 22°44.8'S, 166°51.6'E, 40 m. — Stn 544, 22°50.8'S, 166°48.5'E, 25 m. — Stn 596, 22°31.0'S, 166°21.0'E, 35 m.
Vauban LAGON 1986, SE zone of Lagoon (MNHN): stn 626, 21°57.9'S, 166°52.5'E, 48 m. — Stn 633, 21°55.6'S, 166°48.2'E, 50 m. — Stn 724, 21°19.7'S, 165°57.8'E, 37 m.
Vauban LAGON 1987, NE zone of Lagoon (MNHN): stn 885, 20°26.1'S, 164°42.15'E, 32 m. — Stn 900, 20°14.6'S, 164°23.1'E, 40 m.
Vauban LAGON 1988, NW zone of Lagoon (MNHN): stn 937, 20°39.5'S, 164°15.4'E, 53 m. — Stn 989, 20°18.1'S, 163°57.1'E, 21 m. — Stn 990, 20°19.0'S, 163°55.3'E, 23 m. — Stn 1008, 20°11.0'S, 163°53.4'E, 27m. — Stn 1009, 20°09.9'S, 163°55.1'E, 19 m. — Stn 1024, 20°05.5'S, 163°50.3'E, 26 m.
Alis LAGON 1989, N zone of Lagoon (MNHN): stn 1068, 19°57'S, 163°53'E, 26 m. — Stn 1069, 19°59'S, 163°53'E, 30 m. — Stn 1085, 19°50'S, 163°53'E, 33 m. — Stn 1105, 19°40'S, 163°57'E, 25 m. — Stn 1118, 19°35'S, 163°52'E, 30 m. — Stn 1128, 19°31'S, 163°52'E, 26 m. — Stn 1138, 19°27'S, 163°47'E, 42 m. — Stn 1155, 19°09'S, 163°16'E, 48 m. — Stn 1168, 19°16'S, 163°09'E, 50 m. — Stn 1181, 19°24'S, 163°15'E, 45 m. — Stn 1190, 19°34'S, 163°31'E, 40 m. — Stn 1205, 19°42'S, 163°26'E, 38 m. — Stn 1214, 19°50'S, 163°37'E, 29 m. — Stn 1217, 19°52'S, 163°36'E, 30 m.
Coriolis CHALCAL 1984, Lansdowne-Fairway Banks: stn D02, 21°14.41'S, 162°16.27'E, 80-120 m. — Stn D03, 21°14.00'S, 162°16.40'E, 120-150 m. — Stn D07, 20°50.86'S, 161°36.99'E, 62 m. — Stn D10, 20°36.09'S, 161°05.82'E, 87 m. — Stn D12, 20°31.33'S, 161°06.51'E, 80 m.
Coriolis CHALCAL 1984, Bellona Reefs, (MNHN): stn D52, 21°13.40'S, 158°49.20'E, 69 m. — Stn D55, 21°23.90'S, 158°59.60'E, 55 m.
Coriolis CORAIL 2 1988, Landsdowne Bank, (MNHN): stn DW 19, 20°41.72'S, 161°00.17'E, 77 m. — Stn DW 20, 20°38.97'S, 161°01.01'E, 88 m. — Stn DW 21, 22°07.88'S, 161°01.75'E, 86 m. — Stn DW 22 20°32.89'S, 161°01.09'E, 88 m. — Stn DW 23, 20°30.60'S, 161°03.55'E, 80 m. — Stn DW 28, 22°07.88'S, 160°56.34'E, 78 m.
Coriolis CORAIL 2 1988, Chesterfield Atoll (MNHN): stn DW 48, 19°18.30'S, 158°27.00'E, 44 m. — Stn DW 75, 19°12.00'S, 158°29.50'E, 65 m. — Stn DW 100, 19°05.99'S, 158°26.89'E, 40 m.

DISTRIBUTION. — (Fig. 10) No additional information in the literature.

DESCRIPTION

Shell medium-sized to (rarely) large; ovoid and almost equilateral when juvenile, becoming more and more inequilateral with expansion of MPQ and strong straightening of entire PQ margin; adults very elongated (mean L/H = 0.66; range 0.58-0.77), and moderately inflated (mean W/L = 0.68; range 0.62-0.74).
Lunule sometimes marked on right valve by a narrow hollowed zone; umbonal margin raised and slightly spatuliform. External colour generally white and yellow, rarely purple, PQ and AQ being darker. Interior white, with yellow margin and umbonal cavity. Hinge almost symmetrical (ratio D slightly variable but generally greater than 1.0), and strongly angled (mean < A = 88°; range 80°-95°). A weak sterigma is present in the umbonal cavity of some shells in about 40% of lots.
Mean rib number 56.9, range 52-65 (again, rib count based on internal marginal "ribbing").
Rib morphology: on PQ, characteristic ribbing features of genus only discernible on juvenile part: interstices very thin; flat ribs divided into two roughly equal parts, separated by a thin axial furrow; irregular, tubercular, more or less prismatic scales present on last ribs, becoming progressively smaller; presence of scales restricted to a small part of juvenile shell, mainly on last ribs. Three wide pseudo-interstices (see equivalent process on *A. simplex* and *A. biradiatum*) are already formed on very juvenile part of shell, separating the last ribs that thereby become well-marked; generally two (rarely three) of these last ribs remain prominent and always readily discernible in adult shells (Fig. 19I); other more anterior ribs of PQ less discernible but strongly marked on margin which is always crenulate (Fig. 19G, I). On the median part of shell (MPQ and MAQ), ribs, not marked on the external surface of shell, but often discernible by colours and confirmed by internal marginal "ribbing", which is visible at

some distance from margin. On post-erior part of AQ, ribs become again apparent very occasionally with posterior crenulations as on other species of genus, then disappear and are replaced by rather irregular longitudinal striation; this disappearance happens, on each rib, more and more backwards as shell grows; as it is rather abrupt, it forms an oblique, "diachronous" demarcation line. On anterior striated zone, vague ribbing can still be visible by colouring, and still marked on internal margin; this internal marginal ribbing, and associated coloured ribbing, disappear eventually, always at the same distance from "lunule", most anterior part of shell being totally smooth (Fig. 19G).

In addition to features described above, anterior and posterior parts of shell bear a rather irregular concentric ornamentation.

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INDEX OF SPECIFIC AND SUBSPECIFIC TAXA

(**A.**= *Acrosterigma*, **F.**= *Fulvia*, **L.**= *Laevicardium*, **T.**= *Trachycardium*, **V.**= *Vasticardium*, **Vp.**= *Vepricardium*)

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