Tropical deep-water lucinids (Mollusca: Bivalvia) from the Indo-Pacific: essentially unknown, but diverse and occasionally gigantic

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ABSTRACT

Species of the bivalve family Lucinidae form a previously unrecognized and significant component of bivalve assemblages at bathyal depths (150-1000 m) in the Indo-West Pacific province. *Elliptiolucina labeyriei* n. gen., n. sp., from 2570 m, is the deepest-occurring lucinid species. South-East Asian seas, from Taiwan to the Arafura Sea, are a hotspot of deep-water lucinid diversity, with 11 species recorded from the Philippines and 14 from Indonesia. Numerous species are in the 20-50 mm range, with several up to 75-80 mm in size, and *Meganodontia acetabulum* reaches 150 mm. Several species co-occur with representatives of the Vesicomyidae, characteristic of seep and vent communities. It is hypothesized that the lucinid species of this radiation live in discrete pockets of poorly oxygenated sediments enriched in sulfide by plant debris from nearby land masses and/or diffuse seeping. A parallel is drawn with the "Calcari a *Lucina*" from the Miocene of Europe. Nine new genera and 32 new species are described.

RÉSUMÉ

Bivalves Lucinidae des eaux profondes de l'Indo-Pacifique.

Les représentants de la famille des Lucinidae constituent un compartiment jusqu'ici méconnu de la faune de bivalves aux profondeurs bathyales (150-1000 m) dans la province Indo-Ouest Pacifique. Avec 2570 m, *Elliptiolucina labeyriei* n. gen., n. sp. détient le record de profondeur de la famille. Les mers d'Asie du Sud-Est, de Taiwan à la Mer d'Arafura, représentent le maximum de richesse en lucines profondes, avec 11 espèces connues des Philippines et 14 d'Indonésie. De nombreuses espèces entrent dans la gamme des 20-50 mm, plusieurs dépassent 75 mm, et *Meganodontia acetabulum* atteint même 150 mm. Plusieurs espèces ont été échantillonnées en compagnie de bivalves Vesicomyidae, qui sont des marqueurs biologiques des communautés associées à l'hydrothermalisme et aux suintements froids. Nous faisons l'hypothèse que les lucines de cette radiation bathyale vivent dans de petites taches de sédiments peu

COSEL R. von & BOUCHET P. 2008. — Tropical deep-water lucinids (Mollusca: Bivalvia) from the Indo-Pacific: essentially unknown, but diverse and occasionally gigantic, *in* HÉROS V., COWIE R. H. & BOUCHET P. (eds), Tropical Deep-Sea Benthos 25. *Mémoires du Muséum national d'Histoire naturelle* 196: 115-213. Paris ISBN: 978-2-85653-614-8.

oxygénés enrichis en sulfures par la décomposition des débris végétaux terrestres et/ou des suintements diffus, et nous établissons un parallèle avec les "Calcari a Lucina" du Miocène d'Europe. Neuf genres et trente-deux espèces sont décrits comme nouveaux.

INTRODUCTION

Symbiosis between chemoautotrophic bacteria and large bivalves in the families Mytilidae (Le Pennec *et al.* 1983; Le Pennec & Prieur 1984; Fiala-Medioni 1984; Childress *et al.* 1986; Fisher *et al.* 1987; Tunnicliffe 1991) and Vesicomyidae (Cavanaugh 1983; Fiala-Medioni *et al.* 1993; Turner 1985) had initially been considered to be a trait of deep-water benthic communities inhabiting hydrothermal vents and cold seeps. This discovery, however, drew attention to the feeding strategies of other bivalves from these and other sulphide-rich sediments, and symbiosis with chemoautotrophic bacteria was found also to occur in five other bivalve families in deep as well as shallow water: Solemyidae (Felbeck 1983; Cavanaugh 1983), Thyasiridae (Reid & Brand 1986), Manzanellidae (J. Taylor, pers. comm.), some Teredinidae (Distel & Roberts 1997) and Lucinidae (e.g., Fisher & Hand 1984; Schweimanns & Felbeck 1985; Cary *et al.* 1989; Herry *et al.* 1989; Diouris *et al.* 1990; Johnson 1993; Le Pennec *et al.* 1995; Barnes & Hickman 2001; Glover *et al.* 2004; Williams *et al.* 2004; Holmes *et al.* 2005; Oliver & Holmes 2006; Glover & Taylor 2007). Of these seven bivalve families in which chemosymbiosis has been demonstrated, the Lucinidae are by far the most diverse. Geographically, the lucinids are the most widespread family, live in the greatest range of habitats and have the longest and richest geological history (Reid & Brand 1986; Hickman 1994; Taylor & Glover 2000; Barnes & Hickman 2001; Glover & Taylor 2007). The size range of the Lucinidae, from smaller than 2 mm to more than 150 mm, is also impressive, but is similar to that of other chemosynthetic bivalve families.

The family Lucinidae had been thought to contain about 200 to 250 Recent species (Boss 1971) but more recent estimates suggest more than 500 living species; the number of fossil species (first occurrence in the Silurian) may be at least of the same order. The number of Recent and fossil genera may eventually well exceed 150. According to new data, lucinid diversity has been very much underestimated, especially in the tropics, and there remain many undescribed species and genera (Glover & Taylor 2001; Taylor & Glover 2002, 2006, pers. comm.; pers. obs.). The same applies to fossils, as evidenced by unpublished Cenozoic material in MNHN (P. Lozouet & J. Le Renard pers. comm.). In fact, the Lucinidae, Veneridae and Tellinidae now appear to be three of the most species-rich families of eulamellibranchs, if not of bivalves in general. (The also very speciose Galeommatoidea may contain several families and are still less well known).

Recent research into the taxonomy of tropical lucinids has focussed on the shallow-water members of the family (Taylor & Glover 1997a, 1997b, 2002, 2005, 2006; Glover & Taylor 1997, 2001, 2007; Glover *et al.* 2003). The literature contains only scattered references to deep-water representatives, and the classical deep-sea expeditions have together recorded only about 20 deep-water lucinid species worldwide (Table 2). Single species have also recently been found at cold seeps (Salas & Woodside 2002; Oliver & Holmes 2006; Cosel 2006) and hydrothermal vents (Glover *et al.* 2004). By contrast, deep-sea work carried out during the last 25 years has revealed that species of the family Lucinidae form a hitherto unrecognized significant part of bivalve assemblages at bathyal depths (150-1000 m) in the Indo-West Pacific province, occasionally occurring down to 2570 m. The purpose of the present paper is to further document this previously unrecognized lucinid diversity, chiefly from the Philippines and Indonesia but also from other parts of the Indo-West Pacific, and discuss its significance in the context of Recent and fossil communities from sulphide-rich environments. Considering the large size of many of the species involved, it is unexpected that a radiation of deep-water lucinids has remained unnoticed to this day. Many of the species treated in this paper cannot be classified in the genera recognized by Chavan (1937, 1969) and Bretsky (1976), whose works constitute the last monographic treatments of the Lucinidae, each with a different classification. Of the 37 species monographed herein, 16 (11 new) are classified in the previously established genera *Cardiolucina*, *Megaxinus*, *Myrtea*, *Lucinoma*, *Alucinoma*, *Meganodontia* and *Discolucina*; the other 21 species (all new) are classified in the nine new genera *Troendleina*, *Elliptiolucina*, *Gloverina*, *Taylorina*, *Rostrilucina*, *Semelilucina*, *Dulcina*, *Epidulcina* and *Minilucina*.

MATERIAL AND METHODS

A large part of the material reported in the present study was collected by the second author during three deep-sea biodiversity surveys carried out in South-East Asian seas by the Institut de Recherche pour le Développement (IRD, formerly ORSTOM), Muséum national d'Histoire naturelle (MNHN), and the Institute of Oceanology (MZB, Jakarta) of the Indonesian Research Council (LIPI). Background information on these and other cruises is presented in Table 1 (see also Bouchet *et al*., this volume). As a matter of convenience, and based on observations in the south-west Pacific, we have placed an upper bathymetric limit for the tropical Indo-Pacific "bathyal" fauna at 150 m. Altogether, the expeditions referred to in Table 1 collected material of over 50 species of lucinids from depths below 150 m. Many of them, with adult sizes between 4 mm and 15 mm, may represent undescribed species; however, comparison with numerous nominal species described from subtidal to offshore waters is necessary, and a complete report of this magnitude is beyond the scope of the present paper. Because of these limitations, we have chosen here to focus primarily on the larger and more spectacular species.

TABLE 1. Deep-sea expeditions to the tropical West Pacific that have yielded lucinid material studied in the present paper.

CRUISE ACRONYM	YEAR	SHIP	AREA
MUSORSTOM 2	1980	R/V *Coriolis*	Philippines
CORINDON 2	1980	R/V *Coriolis*	Strait of Makassar, Indonesia
ESTASE 2	1984	R/V *Jean Charcot*	Philippines
MUSORSTOM 3	1985	R/V *Coriolis*	Philippines
MUSORSTOM 4	1985	R/V *Vauban*	New Caledonia
KARUBAR	1991	R/V *Baruna Jaya 1*	Arafura Sea, Indonesia
MUSORSTOM 9	1997	R/V *Alis*	Marquesas Islands
MUSORSTOM 10	1998	R/V *Alis*	Fiji
SUVA 4	1999	R/V *Alis*	Fiji
BORDAU 1	1999	R/V *Alis*	Fiji
TAIWAN 2	2001	F/V *Jin Tung Long Nº 26*	Tashi fishing ground, northeast Taiwan
SALOMON 1	2001	R/V *Alis*	Solomon Islands
BENTHAUS	2002	R/V *Alis*	Austral Islands, French Polynesia

Repositories

BMNH: The Natural History Museum, formerly British Museum (Natural History), London
BPBM: Bernice P. Bishop Museum, Honolulu
MNHN: Muséum national d'Histoire naturelle, Paris
MZB: Museum of Zoology, Bogor
NMNS: National Museum of Natural Sciences, Taichung, Taiwan
NMP: National Museum of the Philippines
NSMT: National Science Museum, Tokyo
USNM: National Museum of Natural History, Smithsonian Institution, Washington, DC
ZMA: Zoologisch Museum, University of Amsterdam
ZMC: Universitets Zoologisk Museum, Copenhagen.

TABLE 2. Occurences of deep-water Lucinidae in major oceanographic expeditions.

EXPEDITION	AUTHOR	SPECIES	LOCALITY, DEPTH	SIZE
Challenger 1873-76	Smith 1885	*Lucina lamellata* E.A. Smith, 1881 [=*Lucinoma lamellata*]	Strait of Magellan, 245 fms	47 mm
Investigator 1884-1914	Smith 1894, 1895, 1906; Alcock & Anderson 1897	*Lucina bengalensis* E.A. Smith, 1894 [=*Lucinoma bengalensis*]	S. Arabia, 1415 m	37 mm
		"*Lucina spinifera* (Montagu, 1803)" [= *Myrtea investigatoris* n. sp.]	Trincomalee, Ceylon, 366-640 m	17.5 mm
		"*Cryptodon philippinarum* (Hanley)" [=*Lucina* s.l. sp.]	Trincomalee, Ceylon, 366-640 m	20 mm
		Cryptodon omanensis Smith, 1906 [= *Megaxinus omanensis*]	Gulf of Oman, 414 m	18.6 mm
Valdivia 1898-1899	Thiele & Jaeckel 1931	"*Phacoides philippinarun* (Hanley)"	Somalia, 1362 m	
Siboga 1899-1900	Prashad 1932	"*Lucina bengalensis* Smith, 1894" [= *Lucinoma sibogae* n. sp.]	N of Bali, Indonesia, 1060 m	53 mm
		Dentilucina inanis Prashad, 1932 [=*Tinalucina inanis*]	Java Sea, 217 m	8.5 mm
		Cardiolucina hedleyi (Prashad, 1932) [= *C. civica* (Yokoyama, 1927)]	Sulu Sea, 275 m	8.5 mm
		Cardiolucina quadrata (Prashad, 1932)	S of Sulawesi, Indonesia, 462 m	10.5 mm
		Myrtea flabelliformis (Prashad, 1932)	Kai Is., Indonesia, 397 m	6.5 mm [here to 10 mm]
John Murray 1933-34	Knudsen 1967; Glover & Taylor 1997	*Lucina bengalensis* Smith, 1894	S. Arabia, 1415 m	37 mm
		"*Lucina inanis* (Prashad, 1932)" [in sense of Knudsen]	Zanzibar, 805 m	11.9 mm
		Megaxinus omanensis (Smith, 1906)	East Africa, 183-194 m	37.5 mm
Galathea 1951-52	Marwick 1953	*Lucinoma galathea* Marwick, 1953	New Zealand, 268 m	37 mm
Japanese research vessels, 1950s to date	Okutani *et al.* 1989, Okutani & Hashimoto 1997	*Lucinoma yoshidai* Habe, 1958	Sagami Bay, 700-750 m	37-44 mm
		Lucinoma spectabilis (Yokoyama, 1920)	Sagami Bay, 480 m	79 mm
		L. acutilineatum (Conrad, 1849)		
		Mesolinga soliditesta Okutani & Hashimoto, 1997	Suruga Bay, Japan, 363 m	64 mm
Discovery 1994 (cruise 211)	Oliver & Holmes 2006	*Lucinoma gagei* Oliver & Holmes, 2006	Oman margin, Arabian Sea, 919-967 m	60 mm
Vidal Gormaz [Chile]	Holmes, Oliver & Sellanes 2005	*Lucinoma anemiophila* Holmes, Oliver & Sellanes, 2005	NW of Concepcion, Chile	61 mm

Abbreviations

CP: beam trawl
CC: otter trawl
DW: Warén rock dredge
ext.: exterior of valve
int.: interior of valve
juv.: juvenile
leg.: legit, collected by
l/h: length/height ratio
lv: left valve
rv: right valve
sh: dead-collected specimen (both valves)
spm: live-collected specimen
v: single valve.

For comparative semi-schematic drawings, right valves were chosen whenever possible. Only in cases of damaged or missing right valves, was a left valve drawn; in some special cases (e.g. inequivalve species), additional drawings of left valves were made. The scale bar is always 1 cm, except on Fig. 68.

SYSTEMATIC ACCOUNT

Family LUCINIDAE Fleming, 1828

Genus ***TROENDLEINA*** n. gen.

Type species: *Troendleina marquesana* n. sp. (here designated).

Two species, Marquesas Islands, Austral Islands, Fiji, Solomon Islands.

DIAGNOSIS. – Shells medium-sized (30-45 mm), white, subcircular, slightly longer than high to almost as long as high, rather tumid, with a broad anterior part and a posteriorly more or less truncated posterior part. Posterior margin slightly indented or not. Anterior margin more or less evenly convex. Beaks slightly in front of or on the vertical midline. Umbones rather prominent. Surface with very fine, irregular and densely spaced radial incisions that are not always present. Antero-dorsal depression short and pronounced, postero-dorsal depression broad and shallow but well developed and ending in a straight posterior margin with occasionally a shallow sinuosity. Lunule narrow and asymmetric. Ligament hinge plate rather narrow, with slight vestiges of 1 or 2 cardinals. Ligament rather long, more or less sunken. Ventral part of anterior adductor scar diverging from pallial line, moderately long to long, with a length of about half the total length of the scar, with an angle to the base of the anterior pallial line of between 6° and 20°. Pallial line entire. Inner margins finely crenulate; interior with radial sculpture, most visible on muscle impressions and ventral zone between margin and pallial impression.

REMARKS. – The species of *Troendleina* are characterized by the rather tumid shell with fine and often partially missing radial sculpture on the exterior and interior, the finely crenulate margin, the rather prominent umbones, the vestiges of cardinals and laterals on the narrow hinge plate and the white colour. The only genus bearing superficial resemblance to *Troendleina* is *Ferrocina* Glover & Taylor, 2007, which is smaller, somewhat more irregular and with much stronger radial ribs. The most outstanding difference exhibited by *Ferrocina* is its rusty reddish-brownish colour, unique in the Lucinidae.

ETYMOLOGY. – Named after Jean Tröndlé, a dedicated enthusiast of the molluscs of French Polynesia, who has accompanied us in the field on many occasions.

Troendleina marquesana n. sp.

Figs 1A-H, 2A-B, 5

TYPE MATERIAL. – Holotype, sh (37.0 x 35.3 x 22.2 mm), MNHN 20687, 10 paratypes (1 sh, 4 rv, 5 lv) MNHN 20688, 4 paratypes (2 rv, 2 lv) USNM, 2 paratypes (1 rv, 1 lv) BPBM.

TYPE LOCALITY. – Marquesas Islands, northern group, Motu One, 7°48'S, 140°21'W, 450-455 m [MUSORSTOM 9: stn DW 1281].

MATERIAL EXAMINED. – **Marquesas**. MUSORSTOM 9: stn CP 1169, Nuku Hiva, 8°59'S, 140°05'W, 391-408 m, 24 v; stn CP 1268, 7°56'S, 140°43'W, 285-320 m, 1 lv; stn CP 1276, 7°52'S, 140°37'W, 800-805 m, 3 rv; stn DW 1281, Motu One, 7°48'S, 140°21'W, 450-455 m, 2 sh (holotype; paratype 37.2 x 34.8 x 20.4 mm, MNHN), 7 rv, 8 lv (paratypes: 42.4 x 41.3, 39.7 x 37.5, 38.6 x 37.1, 37.7 x 36.1, 35.2 x 34.2, 34.5 x 33.5, 32.8 x 31.2, 32.6 x 28.7, 18.1 x 16.5 mm, MNHN; 35.5 x 33.8, 35.3 x 34.7 mm, BPBM; 37.6 x 34.1, 34.6 x 31.4, 35.2 x 32.2, 34.5 x 33.5 mm, USNM); stn DW 1286, off Eiao, 7°53'S, 140°39'W, 760 m, 1 lv; stn DR 1301, 8°57'S, 140°15'W, 489-497 m, 1 rv.
Austral Islands. BENTHAUS: stn CP 1863, East of Rapa Is., 27°39'S, 144°16'W, 650-684 m, 1 lv; stn DW 1885, Marotiri Is., 27°52'S, 143°32'W, 620-1000 m, 12 rv, 17 lv; stn DW 1886, Marotiri Is., 27°51'S, 143°33'W, 700-800 m, 2 rv; stn DW 1887, Marotiri Is., 27°52'S, 143°33'W, 750-1000 m, 1 rv, 1 lv; stn CP 1890, East of Rapa Is., 27°39'S, 144°16'W, 800-822 m, 2 rv; stn CP 1891, East of Rapa Is., 27°37'S, 144°15'W, 800-850 m, 1 rv, 5 lv; stn CP 1892, East of Rapa Is., 27°39'S, 144°16'W, 742-1000 m, 1 lv; stn CP 1911, East of Rapa, 27°38'S, 144°15'W, 900-1300 m, 1 rv, 1 lv; stn DW 1937, Banc Président Thiers, 24°40'S, 145°56'W, 469-500 m, 1 lv; stn CP 1957, Tubuai, 23°19'S, 149°29'W, 558-1000 m, 1 rv, 1 lv, some juv. v; stn CP 1961, Tubuai, 23°21'S, 149°33.5'W, 470-800 m, 3 rv; stn CP 1965, Tubuai, 23°21'S, 149°34'W, 500-1200 m, 3 rv, 3 lv; stn CP 1967, Tubuai, 23°24'S, 149°34'W, 600-1200 m, 2 lv.

DISTRIBUTION. – Known from the northern group of the Marquesas Islands, shells and valves in 320-800 m; valves from the deeper records (more than 500 m) have probably fallen or been washed downslope.

Several mostly old and worn valves of a *Troendleina* (herein referred to as *Troendleina* cf. *marquesana*) were taken by the R/V *Alis* during the BENTHAUS expedition to the Australs, French Polynesia, at Tubuai and Rapa Islands, in 500-900 m. The valves are quite variable and extremely close to *T. marquesana*. Although many of them are at first glance distinguished by a more pronounced radial sculpture, a slightly narrower diverging part of the anterior adductor scar, a more visible impression of the pallial blood vessel and a slightly more protruding umbo, we consider them within the range of variability observed in *T. marquesana*.

DESCRIPTION. – Shell 35-43 mm long, rather thick and solid, equivalve, moderately inflated, subcircular, slightly longer than high (l/h 1.0-1.1). Umbones prominent, directed forward, beaks about at the vertical midline or just in front of it. Antero-dorsal margin somewhat convex, with a slight indentation, antero-dorsal corner very weak to non-existent. Anterior margin evenly to more narrowly rounded, ventral margin well rounded and in its posterior section less convex than in the anterior section. Posterior margin nearly vertically truncated, with a slight sinuosity in the middle and with rounded postero-dorsal and postero-ventral corners.

Exterior with dense and very irregular growth lines and a few fine, shallow, widely-spaced and irregularly set commarginal grooves. On a narrow zone running vertically from the umbones to the ventral margin, the growth lines are stronger than on the rest of the shell surface. There are also very shallow, somewhat irregularly and densely spaced, radial grooves, which are visible only under a lens or at a certain angle of light. They are absent on the very anterior and posterior shell areas, on the early regions of the valve and often also on the ventral region; occasionally they are missing on the whole valve. Anterior angle almost absent, anterior radial depression not visible, antero-dorsal area ill-defined. In some specimens, two shallow anterior depressions are hardly visible. Posterior angle rounded, posterior radial depression broad and well-defined, ending in an indentation of the posterior margin. Lunule small, narrow, more or less asymmetric, longer than broad, a little sunken; escutcheon absent, ligament deeply sunken.

Hinge plate narrow but strong, with a rudimentary single cardinal in the right valve, which may be reduced to a shallow knob and occasionally the vestige of an anterior lateral. Left valve with two small cardinals and sometimes the vestige of a posterior lateral. Anterior adductor scar elongate, with a moderately long and broad diverging part, the pallial line meeting the scar slightly above its middle. Trace of the pallial blood vessel shallow to almost invisible, more or less curved, oblique and ending about in the middle of the valve. Interior with an irregular and very shallow radial sculpture that is best visible on the adductor and pallial scars. Inner valve surface with indistinct punctations. Inner margin faintly crenulate to almost smooth.

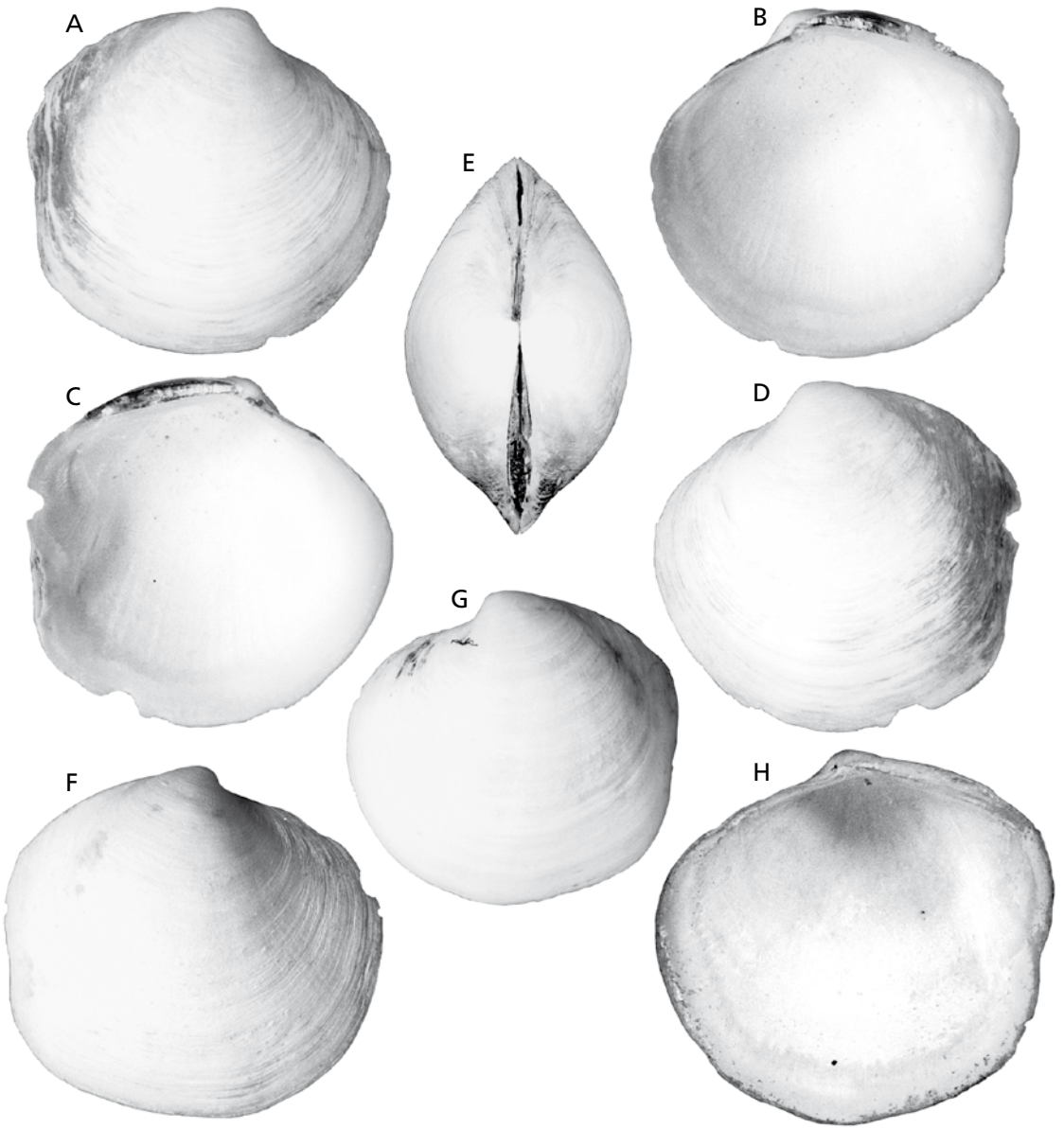

FIG. 1. *Troendleina marquesana* n. sp. **A-E**, holotype MNHN 20687, 37.0 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal view; **F**, paratype MNHN 20688, 37.2 mm, ext. of rv; **G**, paratype MNHN 20688, 32.8 mm, ext. of lv; **H**, paratype MNHN 20688, 37.7 mm, int of rv; all Marquesas, MUSORSTOM 9 stn DW 1281.

Valves entirely white. Periostracum thin, pale straw-coloured, often eroded on large parts of the valves and persistent only on the anterior and posterior regions or near the margins.

ETYMOLOGY. – After the Marquesas Islands, the location of the type locality.

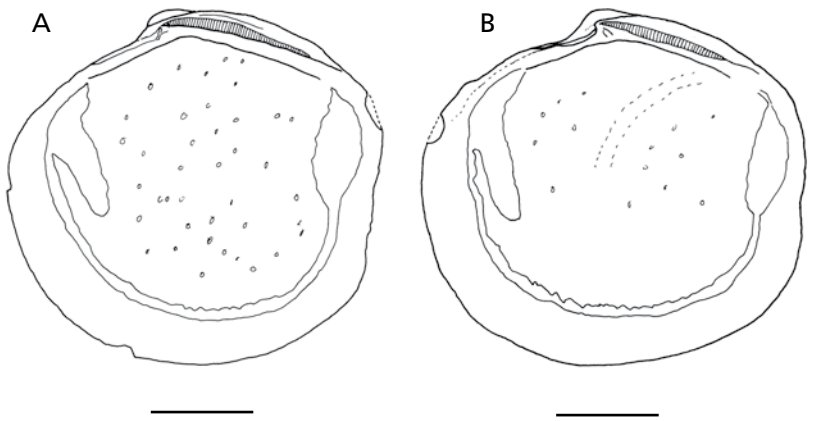

FIG. 2. *Troendleina marquesana* n. sp., outline drawings of the insides of valves. **A**, holotype MNHN 20687; **B**, paratype MNHN 20688, 37.2 mm.

Troendleina musculator n. sp.

Figs 3A-E, 4A-C, 5

TYPE MATERIAL. – Holotype, lv (31.1 x 29.6 mm) MNHN 20689, 2 paratypes (1 lv, 1 rv) MNHN 20690.

TYPE LOCALITY. – Solomon Islands, SE Santa Isabel, 8°39'S, 160°04'E, 396-411 m [SALOMON 1: stn DW 1762].

MATERIAL EXAMINED. – **Solomon Islands**. SALOMON 1: stn DW 1762, SE Santa Isabel, 8°39'S, 160°04'E, 396-411 m, 2 lv, 1 rv (holotype, paratypes 33.1 x 32.1, 28.3 x 28.0 mm); stn CP 1783, W Malaita, 8°33'S, 160°48'E, 399-700 m, 1 rv (18.8 x 17.8 mm).

DISTRIBUTION. – Only known from the Solomon Islands, in 399-411 m.

DESCRIPTION. – Shell up to 33 mm long, rather thick and solid, equivalve, inflated, subcircular, almost as long as high (l/h 1.0-1.1). Umbones protruding and prominent, directed forward, beaks in front of the vertical midline. Antero-dorsal margin convex, antero-dorsal corner very weak to obsolete. Anterior margin rounded, ventral margin well rounded. Posterior margin convex or somewhat truncated in its middle section, where a slight sinuosity may be present. Postero-dorsal corner rounded, postero-ventral corner non-existent.

Exterior generally smooth, except for fine, dense, irregular growth lines, a few coarser growth ridges and vestiges of very shallow radial sculpture in some areas, visible only under a lens or at a certain angle of light. Anterior angle almost absent, anterior radial depression ill-defined. Posterior angle rounded, posterior radial depression broad and more or less well-defined, occasionally ending in a shallow indentation of the posterior margin. Lunule small, narrow, slightly asymmetric, longer than broad, minimally sunken; escutcheon absent, ligament moderately long and deeply sunken.

Hinge plate narrow but strong, with a rudimentary single cardinal in the right valve, which may be reduced to a shallow knob, occasionally the vestige of an anterior lateral, and a small anterior lateral, more or less reduced to a small knob. Left valve with vestiges of two small cardinals and a small anterior lateral. No posterior laterals. Anterior adductor scar large, with long and exceptionally broad diverging part, close to the pallial line, which meets the scar above its middle, at a very low angle. Posterior adductor scar also very large. Trace of the pallial blood vessel shallow to almost invisible, more or less curved, oblique and ending in the middle of the valve. Interior with small spot-like

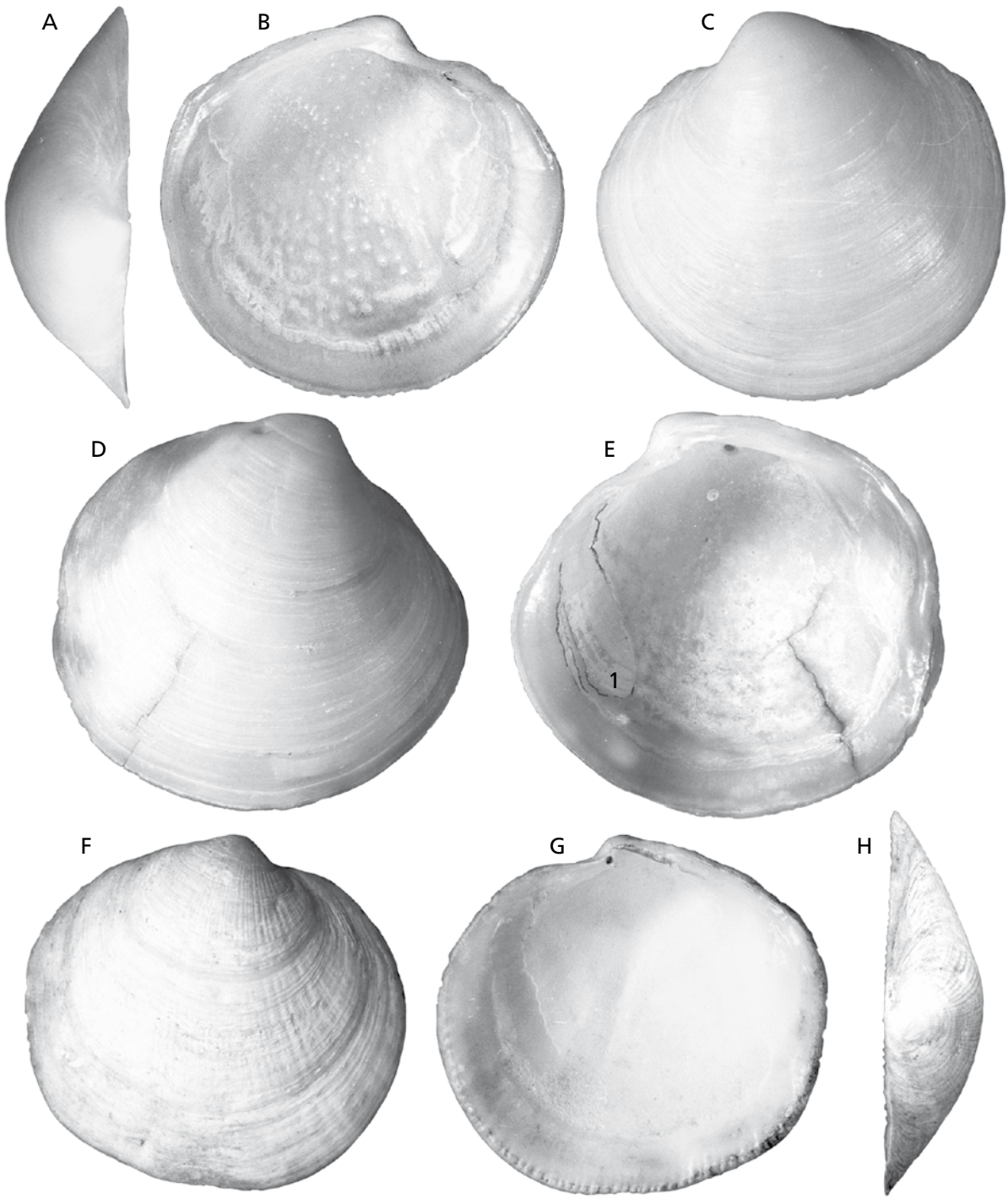

FIG. 3. *Troendleina musculator* n. sp. **A-C**, holotype MNHN 20689, 31.1 mm; **A** dorsal view of lv; **B**, int. of lv; **C**, ext. of lv; **D-E**, paratype MNHN 20690, 33.1 mm; **D**, ext. of rv; **E**, int. of rv; all Solomon Islands, SALOMON 1 stn DW 1762. *Troendleina* sp., **F-H**, specimen from Somosomo Strait, Fiji, BORDAU 1 stn DW 1453, 24.5 mm; **F**, ext. of rv; **G**, int. of rv; **H**, dorsal view of rv.

scars (punctations) where the mantle is attached to the valves. Near the margins and on the muscle impressions, a faint, irregular and very shallow radial sculpture is visible. Inner margin faintly crenulate to almost smooth.

Valves entirely white. Periostracum not seen.

REMARKS. – *Troendleina musculator* is characterized by its large anterior adductor scar with enormous diverging part, which is not exceptionally long but very broad and thus appearing massive; moreover, its anterior limit is very close to the pallial line and almost parallel, a feature not often seen in other lucinids. The most similar species is *Troendleina marquesana* n. sp., which can be differentiated from *T. musculator* by its smaller muscle scars, although the angle of the diverging parts of the anterior adductor scars to the pallial line is almost the same. This species clearly belongs to *Troendleina* because of the irregular growth lines, the missing escutcheon, the sunken ligament, the vestiges of a radial sculpture, the tumidity and the cardinal dentition.

An undescribed species of *Troendleina* from Fiji, taken in Somosomo Strait, between Vanua Levu and Taveuni Islands, during the BORDAU 1 cruise (stn DW 1453, 16°45'S, 179°59'E, 414-510 m), of which only a single right valve is available (Figs 3F-H; 4D; 5) is smaller (24.5 x 22.8 mm) than *T. musculator* and *T. marquesana* and slightly less tumid but also has rather large adductor scars. From *T. marquesana*, it is distinguished by its distinctly crenulate anterior, ventral and posterior margins, a coarser and more visible radial sculpture on the anterior and middle regions of the surface, a longer diverging part of the anterior adductor scar, a slightly shorter ligament and a more circular outline with non-indented posterior margin.

ETYMOLOGY. – The name highlights the very large anterior adductor and the large posterior adductor of this species.

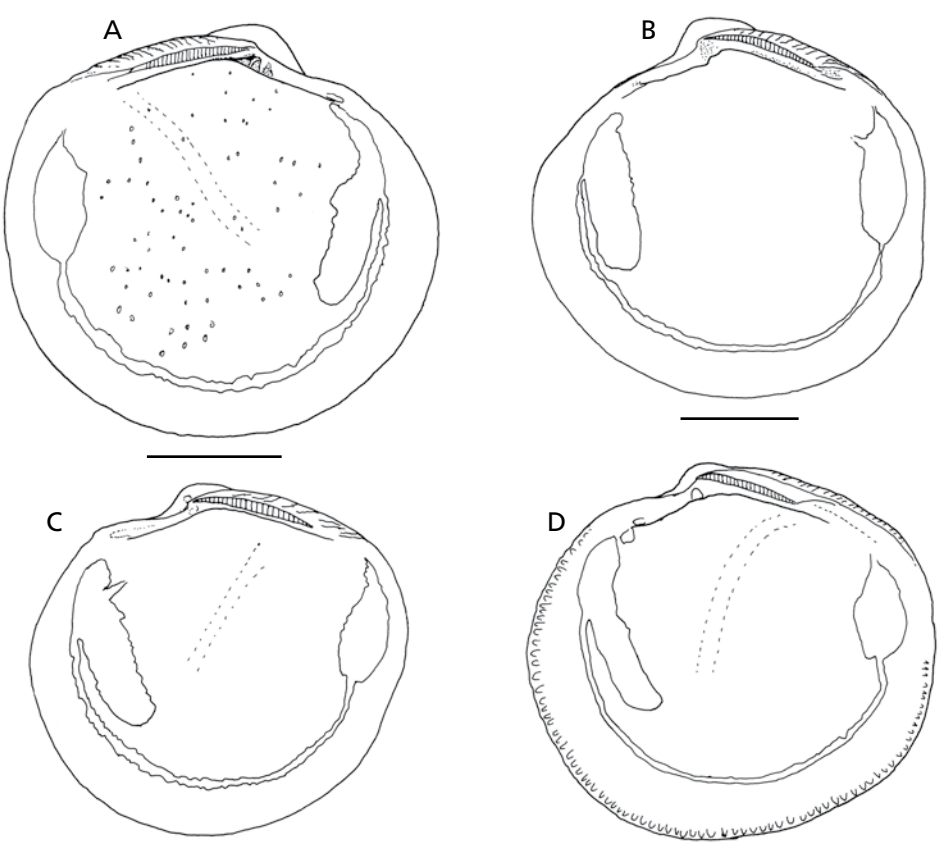

FIG. 4. *Troendleina* spp., outline drawings of the insides of valves. **A**, *Troendleina musculator* n. sp., holotype MNHN 20689; **B**, paratype MNHN 20690, 33.1 mm; **C**, another paratype MNHN 20690; **D**, *Troendleina* sp., Somosomo Strait, Fiji, BORDAU 1 stn DW 1453.

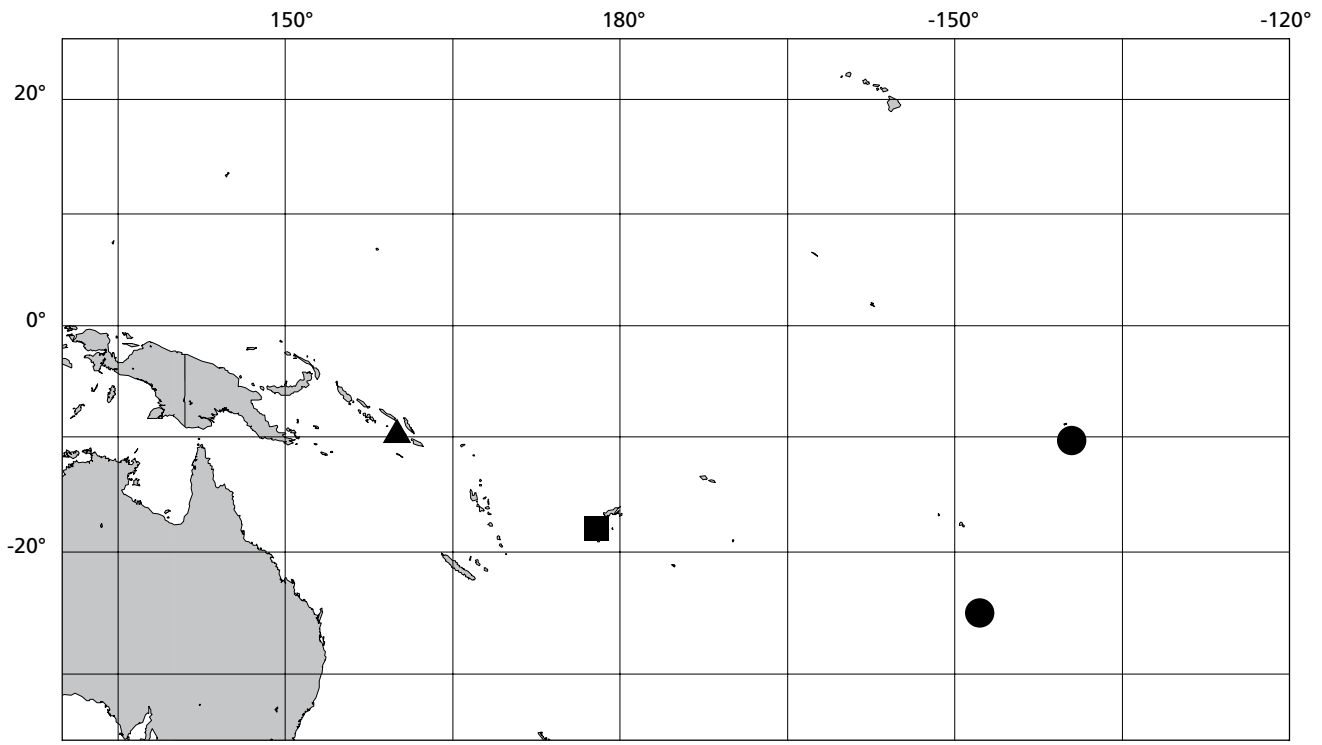

FIG 5. Distribution of *Troendleina*. Circle: *T. marquesana*. Square: *T.* sp. Triangle: *T. musculator*.

Genus ***CARDIOLUCINA*** Sacco, 1901

Type species: *Cardium agassizi* Michelotti, 1839, by original designation; Miocene, Italy.

DIAGNOSIS. – Shells small, almost circular, solid, moderately to very inflated, with more or less strong commarginal lamellae, crossed by smaller radial ribs. Posterior angle well developed, anterior angle in some species present but mostly weak, in others obsolete. Lunule heart-shaped, varying from very small to large and pronounced. Umbones near the vertical midline. Hinge plate broad, with two cardinals and fully developed laterals in each valve. Diverging part of anterior adductor scar short to very short. Inner margins with numerous rather fine to less numerous and coarser crenulations. For more details, nomenclature and revision of the species, see Taylor & Glover (1997).

Cardiolucina quadrata (Prashad, 1932)

Figs 6A-K, 7

Dentilucina (*Bellucina*) *hedleyi* var. *quadrata* Prashad, 1932: 164, pl. 5, figs 19, 20.

Other reference:
Cardiolucina quadrata – Taylor & Glover 1997: 105, 107, figs 16, 17.

TYPE MATERIAL. – Holotype, sh (10.5 x 10.5 x 8.2 mm), ZMA, and 4 paratypes, (3 lv, 1 rv, 10.7 x 11.7, 10.0 x 10.4, 9.9 x 10.1, 8.0 x 7.7 mm), ZMA.

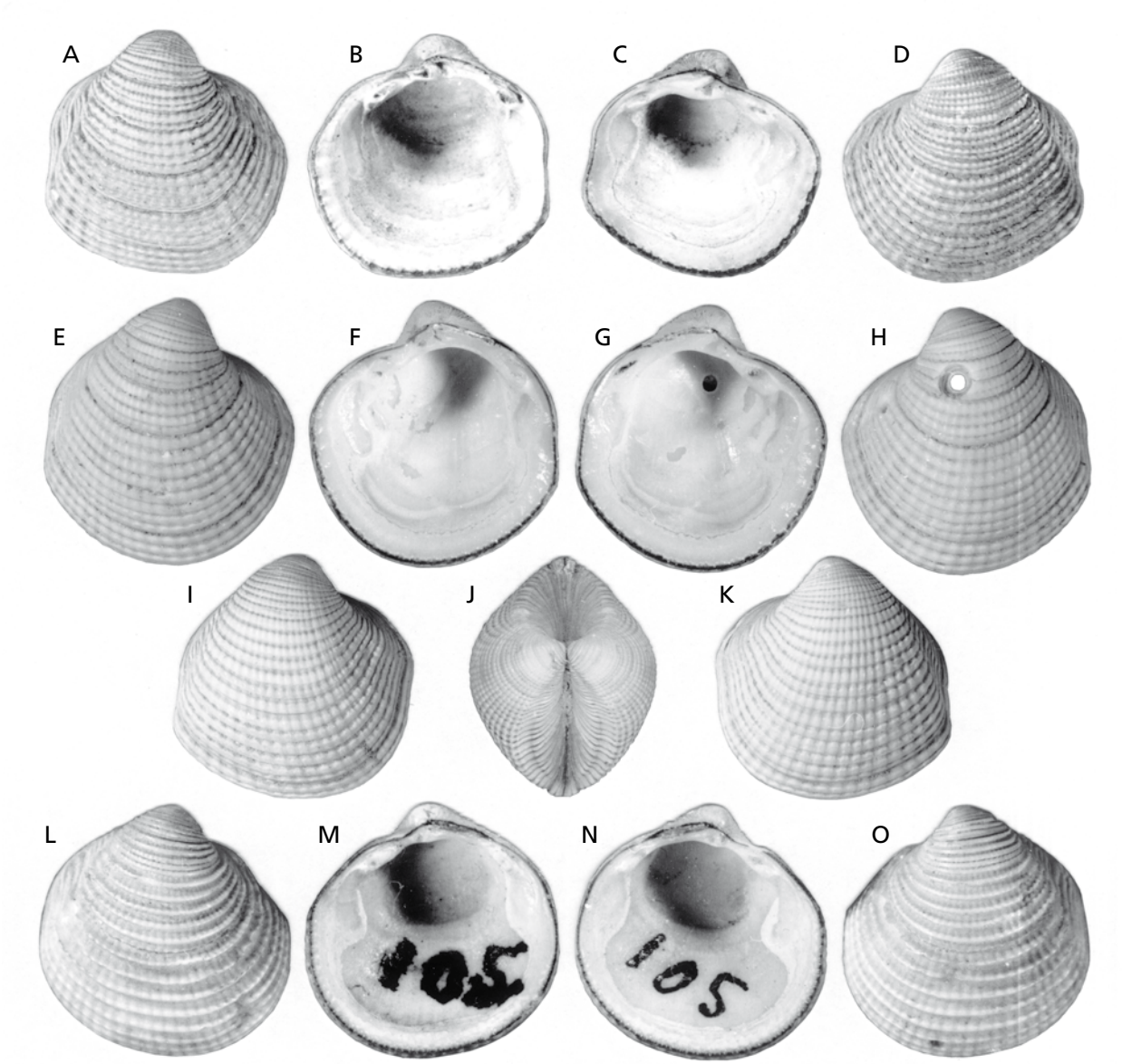

FIG. 6. *Cardiolucina quadrata* (Prashad, 1932). **A-B**, holotype ZMA, 10.5 mm, **A**, ext. of rv; **B**, int. of rv; **C-D**, paratype ZMA, 10.1 mm; **C**, int. of lv; **D**, ext. of lv; **E-H**, KARUBAR stn CP 35, 10.6 mm; **E**, ext. of rv; **F**, int. of rv; **G**, int. of lv; **H**, ext. of lv; **I-K**, KARUBAR stn CP 12, 13.3 mm; **I**, ext. of rv; **J**, dorsal view; **K**, ext of lv. **L-O**, *Cardiolucina hedleyi* (Prashad, 1932), holotype ZMA, 8.4 mm; **L**, ext. of rv; **M**, int. of rv; **N**, int. of lv; **O**, ext. of lv.

TYPE LOCALITY. – To the south of Sulawesi (Celebes), Indonesia, 5°54.5'S, 120°19.2'E, 462 m [*Siboga* stn 212].

MATERIAL EXAMINED. – **Philippines**. MUSORSTOM 3: stn CP 135, W of Leyte, 11°58'N, 122°02'E, 486-551 m, 1 v (7.9 x 8.4 mm); stn CP 143, 11°29'N, 124°11'E, 205-214 m, 1 v (5.1 x 5.1 mm).

Indonesia. The type material. – KARUBAR: stn DW 07, Kai Islands, 5°46'S, 132°21'E, 283-285 m, 1 v; stn DW 08, 5°20'S, 132°31'E, 358-360 m, several v; stn CP 09, 5°23'S, 132°29'E, 368-389 m, 1 lv (13.0 x 13.2 x 10.4 mm); stn CP 12, 5°23'S, 132°37'E, 413-436 m, 3 lv (13.3 x 13.6 x 10.3, 13.1 x 13.5 x 10.6, 13.0 x 13.4 x 10.1 mm); stn DW 13, 5°26'S, 132°38'E, 417-425 m, several v and fragm.; stn DW 28, 5°31'S, 132°54'E, 448-467 m, 1 v; stn DW 31, 5°40'S, 132°51'E, 288-289 m, 1 v

(6.9 x 6.9 mm); stn CP 35, 6°08'S, 132°45'E, 390-502 m, 5 lv, 8 v (13.0 x 13.7, 12.7 x 13.7, 12.2 x 13.2, 11.4 x 11.8 x 8.8, 11.2 x 11.4 x 7.6, 11.1 x 11.8 x 8.4, 11.1 x 11.6 x 8.1, 10.6 x 12.1 x 9.1, 10.6 x 11.4 x 8.3, 10.3 x 10.5 mm); stn DW 44, Tanimbar Islands, 7°52'S, 132°48'E, 291-295 m, 1 v, fragm; stn CC 57, 8°58'S, 132°06'E, 146-233 m, 8 v.

Solomon Islands. SALOMON 1: stn CP 1747, Honiara Bay, Guadalcanal, 9°22'S, 159°59'E, 364-402 m, 8 spms; stn CP 1800, N of Guadalcanal, 9°21'S, 160°24'E, 357-359 m, 10 spms.

DISTRIBUTION. – Central Philippines; southeast Indonesia, from south of Sulawesi eastward to Tanimbar and Kai Islands; Solomon Islands. Total known depth range 146-502 m, shells taken by our expeditions in 214-486 m, live in 359-364 m.

DESCRIPTION. – See Taylor & Glover (1997a).

REMARKS. – Prashad (1932) separated *C. quadrata* as a variety of *Cardiolucina hedleyi* (Prashad, 1932), which is smaller, more rounded and lacks the well separated postero-dorsal area (see Figs 6L-O). In view of these constant differences, we rank *C. quadrata* as a distinct species. With a size up to more than 13 mm, this deep water species is a giant within the genus. There are no notable differences between the Indonesian material, the two fresh valves from the Philippines and the material from the Solomon Islands.

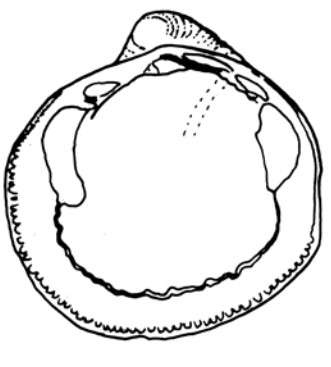

FIG. 7. *Cardiolucina quadrata* (Prashad, 1932), outline drawing of the inside of a rv, KARUBAR stn CP 35.

Genus ***MEGAXINUS*** Brugnone, 1880

Type species: *Lucina transversa* Bronn, 1831, by subsequent designation (Pallary 1904: 146; see Glover & Taylor 1997); Mediterranean.

DIAGNOSIS. – Shells small to medium-sized, subcircular to very irregularly oval or subquadrate, solid, compressed, with anterior margin often broadly angular. Anterior and posterior areas more or less pronounced. Surface with well-developed growth lines, coarser ridges and undulations, sometimes with irregular commarginal lirae. Hinge almost edentulous. Diverging part of anterior adductor scar narrow, about two thirds the length of the entire scar. Inner margin of valves smooth. For more details on the genus, see Glover & Taylor (1997).

Megaxinus quadrangularis n. sp

Figs 8A-G, 9

TYPE MATERIAL. – Holotype, sh (19.9 x 17.4 x 7.4 mm), MNHN 20691, 6 paratypes (3 rv, 3 lv) MNHN 20696-20699, 1 paratype (rv) USNM, 2 paratypes (rv) NMP.

TYPE LOCALITY. – Philippines, west of Luzon, near Lubang Island, 14°00'N, 120°18'E, mud with shell debris, 190-198 m [MUSORSTOM 3: stn CP 109].

MATERIAL EXAMINED. – **Philippines**. MUSORSTOM 2: stn CP 17, 14°00'N, 120°17'E, 174-193 m, 1 rv; stn CP 18, 14°00'N, 120°18'E, 188-195 m, 1 rv, 1 lv; stn CP 20, same coordinates, 185-192 m, 1 rv; stn CP 26; 13°49'N, 120°50E, 299-320 m, 4 rv; stn CP 72; 14°00'N, 120°17'E, 182-197 m, 1 rv. – MUSORSTOM 3, stn CP 87, 14°00'N, 120°19'E, 191-197 m, 1 fragm; stn CP 97, 14°00'N, 120°18'E, 198-194 m, 2 rv (paratypes 19.3 x 18.1 mm, USNM and 19.2 x 17.6 mm,

NMP), 1 chipped v; stn CP 100, same coordinates, 189-199 m, 1 lv, 1 rv (paratypes 17.0 x 16.5, 16.8 x 16.6 mm, MNHN 20696); stn CP 101, 14°00'N, 120°19'E; 194-196 m, 1 rv, 1 lv (paratypes 22.4 x 22.0, 18.8 x 18.6 mm, MNHN 20697); stn CP 109, 14°00'N, 120°18'E, 190-198 m, 1 sh (holotype); stn CP 111, same coordinates, 193-205 m, 1 rv, (paratype 22.8 x 24.1 x mm, MNHN 20699); stn CP 112, same coordinates, 187-199m, 1 rv (paratype 20.5 x 18.6 mm, NMP), 1 lv (paratype 21.6 x 21.0 mm, MNHN 20698).

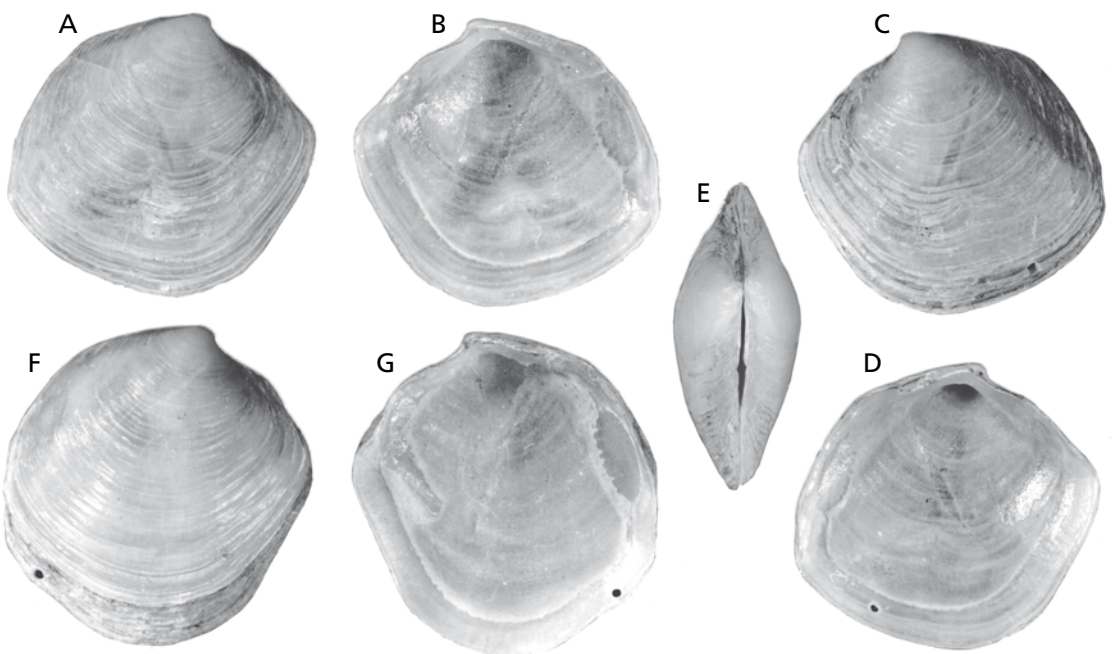

FIG. 8. *Megaxinus quadrangularis* n. sp. **A-E**, holotype MNHN 20691, 19.9 m; **A**, ext. of rv; **B**, int. of rv; **C**, ext. of lv; **D**, int of lv; **E**, dorsal view, MUSORSTOM 3 stn CP 109; **F-G**, paratype MNHN 20699, 22.4 mm. **F**, ext. of rv; **G**, int of rv, MUSORSTOM 3 stn CP 111.

DISTRIBUTION. – All samples were taken from a small area near Lubang Island that was repeatedly trawled in search of the "living fossil" crustacean *Neoglyphaea inopinata* Forest & de Saint Laurent, 1975 (Forest 1986, 1989), in 192-299 m.

DESCRIPTION. – Shell small, up to 23 mm long, moderately thick but rather fragile, oblique-subquadrangular, from about as high as long to occasionally slightly higher (l/h 1.0-1.1), equivalve, moderately compressed, inequilateral, beaks slightly in front of the vertical midline. Anterior part attenuated and pointed, with narrowly rounded anterior margin. Ventral margin in its middle section narrowly rounded, antero- and postero-ventral margin very slightly convex or nearly straight. Antero-dorsal margin divided into two short, slightly concave sections with a rounded corner between them, the upper representing the lunular area. Postero-dorsal margin in its middle section narrowly rounded, near the beaks and posteriorly very weakly convex to straight. Anterior part of the ventral margin and posterior part of the postero-dorsal margin nearly parallel, as are the postero-ventral margin and the antero-dorsal margin, giving the shell the peculiar oblique-subquadrangular aspect.

Exterior with strong, irregular commarginal lirae and growth lines, a few coarser growth ridges and occasionally on the anterior region irregular commarginal undulations. Anterior area small and ill-defined, posterior area

delimited by a narrow, very shallow radial depression. Lunule small, very short and well delimited, no escutcheon, ligament sunken.

Hinge plate narrow, nearly toothless, but in the left valve with a very weak indication of the posterior cardinal and rarely also the anterior cardinal, anterior lateral occasionally visible as a small knob. Right valve with only a very slight depression on the hinge plate, the laterals occasionally represented by very small knobs. Anterior adductor scar with rather long diverging part, pallial line meeting the scar above its middle. Angle between diverging part and pallial line about 27°. Scar of the pallial blood vessel narrow, straight, oblique and ending ventrally, posterior to the ventral end of the extension of the anterior adductor scar. Inner margin of valves smooth.

Valves entirely white. Periostracum pale brownish, with folds and wrinkles mostly on the posterior area and eroded on the umbonal region.

REMARKS. – The genus *Megaxinus*, for a long time known only from the Pliocene to Recent in the eastern Atlantic and Mediterranean, has been recognized in the Indian Ocean by Glover & Taylor (1997); there are three species, *M. omanensis* (Smith, 1906), *M. arabicus* Glover & Taylor, 1997 and *M. yemenensis* Glover & Taylor, 1997. *Megaxinus quadrangularis* most resembles the very variable *M. omanensis*, smaller specimens of which may have a rather similar outline. *Megaxinus omanensis* differs from *M. quadrangularis* in lacking the lunule and by its larger adult size (up to 37.5 mm vs 23 mm in *M. quadrangularis*). *Megaxinus arabicus* and *M. yemenensis* are longer and more suboval, with a convex antero-dorsal area. *Megaxinus arabicus* has a more pointed anterior margin, whereas *M. yemenensis* is distinguished by a narrower hinge plate.

Megaxinus quadrangularis extends the known range of the genus in the Indo-Pacific eastwards to the Philippines region.

FIG. 9. *Megaxinus quadrangularis* n. sp.,outline drawing of the inside of holotype MNHN 20691.

ETYMOLOGY. – The name refers to the oblique-quadrate outline of this species.

Genus ***MYRTEA*** Turton, 1822

Type species: *Venus spinifera* Montagu, 1803, by monotypy; Recent, British Isles.

DIAGNOSIS. – Shells mostly small, suboval to quadrangular, longer than high, more or less thick, compressed to rather tumid. Anterior and posterior areas not developed. Surface with very fine to prominent commarginal sculpture. Edge of lunule and escutcheon elevated and often bearing tiny scales. Hinge in the right valve with 1 cardinal, in the left valve with 2 cardinals, laterals present in both valves. Ligament external. Diverging part of anterior adductor scar very short and broad; pallial line meeting the scar from slightly above to slightly below the middle. Angle between base of diverging part and pallial line about 25° to 40°. Pallial line entire. Inner margin smooth.

Myrtea flabelliformis (Prashad, 1932)

Figs 10A-E, 13D

Dentilucina (*Callucina*) *flabelliformis* Prashad, 1932: 163, pl. 5, figs 11, 12.

TYPE MATERIAL. – Holotype, sh (6.5 x 5.4 x 3.8 mm) and 2 paratypes (2 v), both ZMA.

TYPE LOCALITY. – Indonesia, Kai Islands, 5°26,6'S, 132°32'E, 397 m [*Siboga* stn 256].

OTHER MATERIAL EXAMINED. – **Indonesia**. KARUBAR: stn DW 08, Kai Islands, 5°20'S, 132°31'E, 358-360 m, numerous v; stn DW 13, 5°26'S, 132°38'E, 417-425 m, 1 sh, numerous v; stn DE 23, 5°25'S, 132°57'E, 538-546 m, 1 lv, 1 fragm; stn DW 24, 5°32'S, 132°51'E, 243-230 m, 1 lv; stn DW 31, 5°40'S, 132°51'E, 288-289 m, 2 spm (dry); stn CP 35, 6°08'S, 132°49'E, 390-502 m, 1 sh; stn DW 44, 7°52'S, 132°48'E, 291-295 m, numerous spm (dry); stn DW 49, 8°00'S, 132°59'E, 206-210 m, 2 spm (dry), 4 sh.
Solomon Islands. SALOMON 1: stn CP 1764, 8°37'S, 160°07'E, 1327-1598 m, 3 rv; stn CP 1798, 9°21'S, 160°29'E, 513-564 m, 1 spm, 1 lv.

DISTRIBUTION. – Known from Kai Islands, Indonesia and the Solomon Islands, live in 210-513 m, shells (probably transported downslope) to 1327 m.

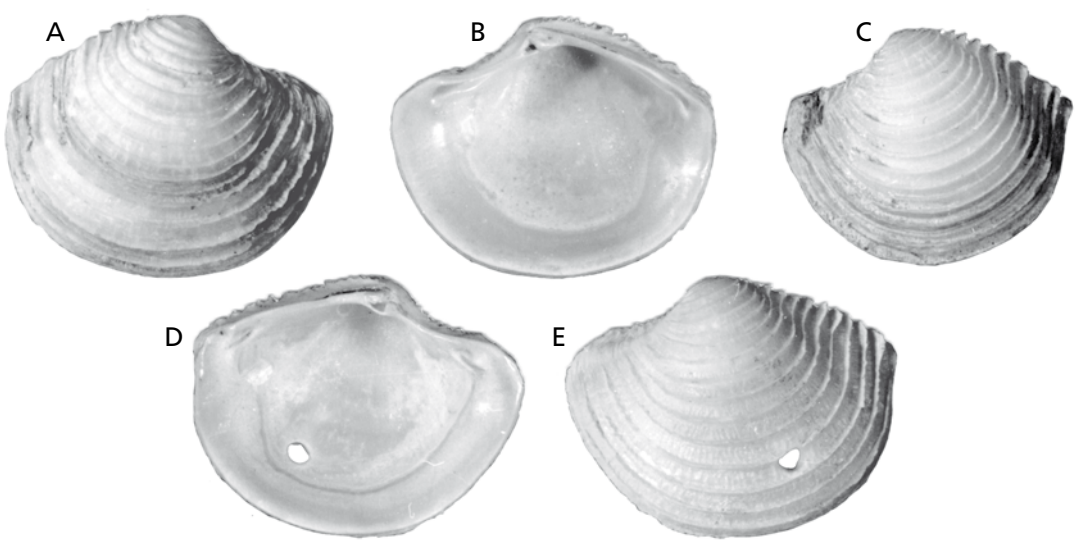

FIG. 10. *Myrtea flabelliformis* (Prashad, 1932). **A-B**, KARUBAR stn DW 08, 9.8 mm; **A**, ext. of rv; **B**, int. of rv; **C**, KARUBAR stn DW 13, 7.6 mm, ext. of lv; **D-E**, KARUBAR stn DW 13, 8.7 mm; **D**, int. of lv; **E**, ext. of lv.

DESCRIPTION. – Shell very small (*ca*. 6-10 mm long), thick, longer than high, subovate (l/h 1.2), slightly inequilateral, equivalve, rather inflated. Beaks slightly in front of the vertical midline. Antero-dorsal margin divided into two parts, the upper (posterior) comprising the lunular area markedly concave, the lower (anterior) very short to nearly absent, with a corner between them; postero-dorsal margin slightly convex to straight. Anterior margin with a well marked, only slightly rounded corner to the antero-dorsal margin. Posterior margin with a rather sharp corner to the postero-dorsal margin. Ventral margin well rounded, nearly semicircular.

Exterior with *ca*. 18-25 fine, more or less densely and slightly irregularly spaced commarginal lamellae, which on the earlier (umbonal) part of the valve are slightly less dense than on the later (marginal) part. Interspaces with fine growth lines and differently developed, occasionally rather coarse, irregular radial wrinkles, visible under a lens only. Anterior and posterior area of the valve not distinct. Lunule and escutcheon delimited by a sharp, prominent row of numerous leaflike prolongations of the commarginal lamellae.

Hinge plate rather narrow but strong, right valve with 1 cardinal, small but prominent and more or less oblique. Anterior and posterior laterals strong and prominent. Left valve with 1 knob-like anterior cardinal directly below the umbones, 1 oblique posterior cardinal, and between them a very deep pit for the right valve cardinal. Short, thick anterior and posterior lateral. Lunule rather deeply sunken, long, slightly asymmetric; escutcheon long, well defined and also asymmetric, slightly broader in the right than in the left valve; ligament very short. Adductor scar small, diverging part extremely short, pallial line meeting the scar in the lower fourth of the entire scar. Pallial line entire. Scar of the pallial blood vessel not visible. Inner margin of valves smooth.

Valves whitish cream. Periostracum thin, translucent and hardly visible.

REMARKS. – In spite of its very strange form, this species is a *Myrtea*: the sculpture, the long and well-defined escutcheon delimited by prolongations of the commarginal lamellae, the hinge configuration and the extremely short diverging part of the anterior adductor muscle scar characterize it as such. The Solomon Islands specimens are identical to those from southern Indonesia, and, together with the original records of this species from Tanimbar, indicate a much wider distribution than initially assumed.

Myrtea investigatoris n. sp.

Figs 11A-E, 14B

Lucina spinifera - Smith 1895: 12. – Alcock & Anderson 1897: Mollusca pl. 3, figs 3, 3a, 3b.

TYPE MATERIAL EXAMINED. – Holotype, sh (17.5 x 14.2 x 7.6 mm), BMNH 1895.7.2.18.

TYPE LOCALITY. – Off Trincomalee, Sri Lanka, *Investigator* stn 172, 8°40'10"N, 81°17'45"E, 200-350 fms (= 360-630 m).

MATERIAL EXAMINED. – The holotype only.

DISTRIBUTION. – Sri Lanka, known only from the type locality.

DESCRIPTION. – Shell small (17.4 mm long), thick and solid, subcircular-oval (l/h 1.2), inequilateral, equivalve, rather inflated. Beaks about 2.5 mm in front of the vertical midline. Antero-dorsal margin concave in the lunular area; postero-dorsal margin straight. Anterior margin below the lunular area broadly and evenly rounded. Posterior margin obliquely truncated, with a sharp corner to the postero-dorsal margin and a rounded postero-ventral margin. Ventral margin gently rounded.

Exterior with 29 fine, dense, commarginal lamellae, which on the earlier (umbonal) part of the valve are slightly less dense than on the later (marginal) part. Interspaces with very fine growth lines, otherwise smooth. Anterior area missing. Posterior area visible but only slightly delimited from the rest of the shell. Posterior area delimited from the escutcheon by a sharp, prominent row of numerous very fine leaflike prolongations of the commarginal sculpture.

Hinge plate rather narrow but strong; right valve with 1 strong cardinal, slightly hooked towards anterior, not bifid. Anterior and posterior laterals very strong and prominent. Left valve with 1 oblique anterior cardinal directly below and parallel to the lunular margin and 1 strong posterior cardinal, between them with a very deep pit for the right valve cardinal. Thick and rather short anterior lateral and a longer, quite thin posterior lateral. Lunule somewhat sunken, slightly asymmetric, escutcheon narrow, long and well defined; ligament short. Anterior adductor scar very small, diverging part short, pallial line meeting the scar in its middle. Inner margin of valves smooth.

Valves white. Periostracum on the earlier part thin and translucent, on the latter (marginal) part light reddish brown.

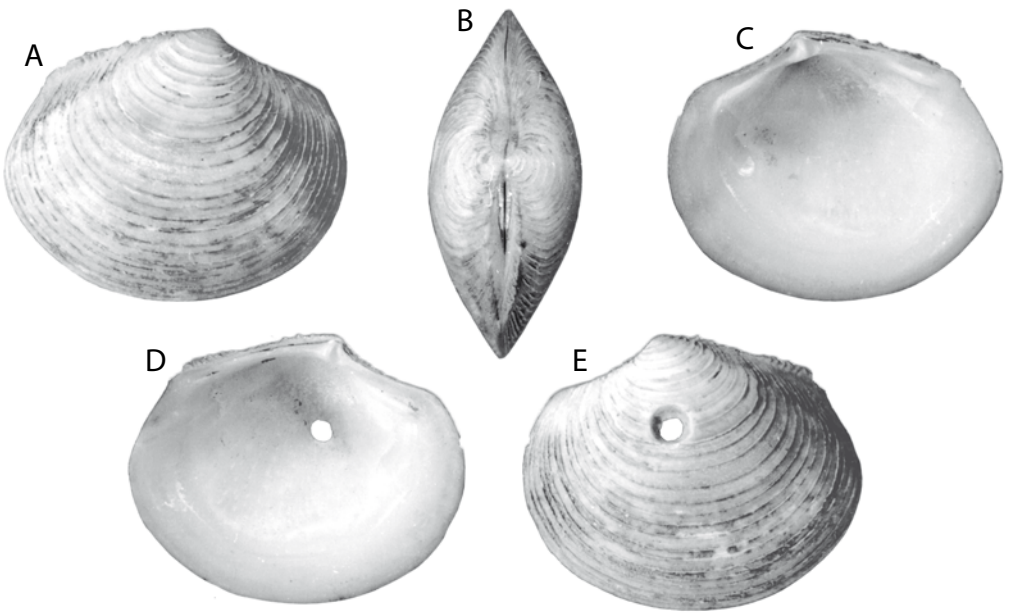

FIG. 11. *Myrtea investigatoris* n. sp. **A-E**, holotype, Trincomalee, Sri Lanka, *Investigator* stn 172, BMNH 1895.7.2.18, 17.5 mm. **A**, ext. of rv; **B**, dorsal view; **C**, int. of rv; **D**, int. of lv; **E**, ext. of lv.

REMARKS. – *Myrtea investigatoris* superficially resembles *M. triclotae* but differs in having the following characters: smaller size with fewer lamellae, slightly thicker shell, anterior area not separated and anterior margin evenly rounded over its whole length, straight postero-dorsal margin, absence of small radial wrinkles in the interspaces of the lamellae, slightly stronger hinge line and hinge teeth, and length of escutcheon longer in relation to shell length than in *M. triclotae*.

ETYMOLOGY. – After the research vessel *Investigator*, from which this new species was collected.

Myrtea tanimbarensis n.sp.

Figs 12A-I, 14C

TYPE MATERIAL. – Holotype, rv (13.7 x 11.4 mm) MNHN 20692, 2 paratypes (lv) MNHN 20693, 2 paratypes (1 rv, 1 lv) MZB.

TYPE LOCALITY. – Indonesia, Tanimbar Islands, 9°23'S, 131°09'E, 246-275 m, [KARUBAR: stn CP 84].

MATERIAL EXAMINED. – **Indonesia**. KARUBAR: stn DW 31, Kai Islands, 5°40'S, 132°51'E, 288-289 m, several v (12.7 x 11.0, 12.4 x 10.2, 11.8 x 9.9, 11.4 x 9.6 mm); stn CP 67, Tanimbar Islands, 8°58'S, 132°06'E, 146-233 m, 1 v (14.5 x 11.1 mm); stn CP 83, 9°23'S, 131°00'E, 285-297 m, 1 lv (14.1 x 11.6 mm); stn CP 84, 9°23'S, 131°09'E, 246-275 m, 2 rv, 3 lv (holotype, paratypes 13.2 x 11.0, 11.3 x 9.2 mm, MHNH); 1 rv, 1 lv (paratypes 9.5 x 7.8, 12.7 x 10.1 mm, MZB).

DISTRIBUTION. – Only known from Tanimbar Islands, Indonesia, in 233-288 m.

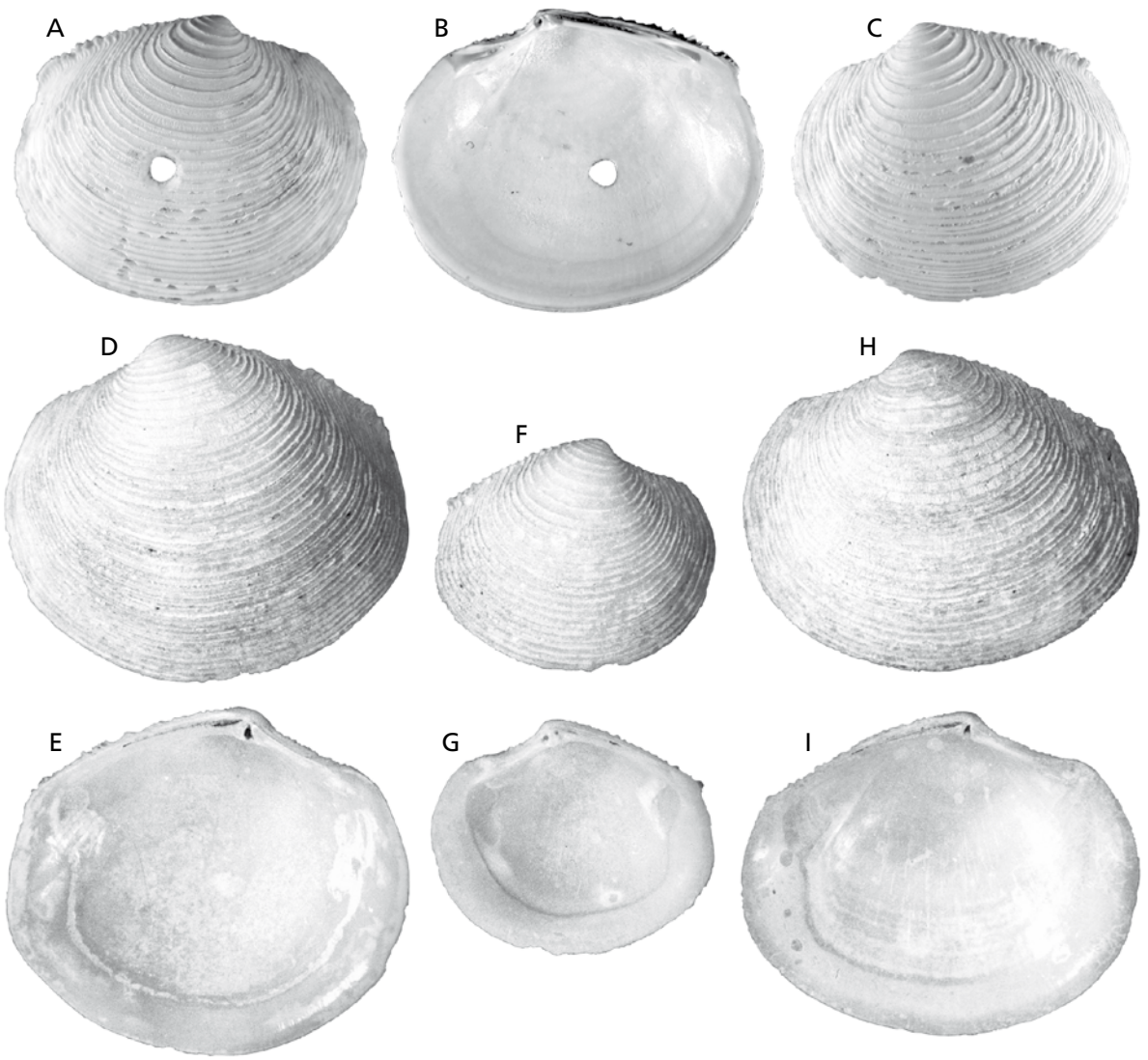

FIG. 12. *Myrtea tanimbarensis* n. sp. **A-B**, holotype MNHN 20692, 13.7 mm; **A**, ext. of rv; **B**, int. of rv; **C**, paratype MNHN 20693, KARUBAR stn CP 84, Tanimbar Islands, 13.2 mm, ext. of lv; **D-E**, KARUBAR stn DW 31, 12.7 mm; **D**, ext. of lv; **E**, int. of lv; **F-G**, KARUBAR stn DW 31, 8.7 mm; **F**, ext. of rv; **G**, int. of rv; **H-I**, KARUBAR stn DW 31, 12.5 mm; **H**, ext of lv; **I**, int of lv.

DESCRIPTION. – Shell small (up to 14.5 mm), rather thin, subcircular-oval (l/h 1.2), inequilateral, equivalve, quite inflated. Beaks in front of the vertical midline. Antero-dorsal margin concave in the lunular area; postero-dorsal margin almost straight. Anterior margin below the lunular area broadly rounded. Posterior margin obliquely truncated, with a rather sharp corner to the postero-dorsal margin and a rounded postero-ventral margin. Ventral margin gently rounded.

Exterior with numerous fine, dense, commarginal lamellae (35-37 in adult specimens), which on the earlier (umbonal) part of the valve are rather widely spaced, becoming denser ventrally and densely packed near the margins. Interspaces with extremely fine, irregular radial wrinkles, visible under a lens only. Anterior area not clearly demarcated. Posterior area delimited from the rest of the shell only by the abrupt weakening of the commarginal striae.

Escutcheon delimited from the posterior area by a sharp, prominent keel which bears a row of conspicuous leaflike prolongations of the commarginal sculpture.

Hinge in the right valve with 1 strong cardinal that is not bifid. Anterior and posterior lateral strong and prominent. Left valve with 1 oblique anterior cardinal, in part on the lunular margin, and 1 strong posterior cardinal, between them a very deep pit for the right valve cardinal. Anterior lateral rather thin, posterior lateral thin and long. Lunule somewhat sunken, slightly asymmetric; escutcheon narrow, long and well defined; ligament short. Anterior adductor scar very small, diverging part very short, pallial line meeting the scar in the lower (ventral) half. Scar of the pallial blood vessel not visible. Inner margin smooth.

Valves white. Periostracum not seen.

REMARKS. – *Myrtea tanimbarensis* is distinguished from the very close *M. triclotae* by possessing the following characters: smaller size, the quite conspicuous difference between the spaced commarginal lamellae on the earlier (umbonal) part of the valve and the much more densely packed lamellae on the lower, marginal part of the valve, the more prominent postero-dorsal keel and the still shorter diverging part of the anterior adductor scar. From *M. investigatoris*, *M. tanimbarensis* is distinguished by having radial wrinkles in the interspaces of the commarginal lamellae, a narrower hinge plate with more delicate laterals and a shorter diverging part of the anterior adductor scar. Slight differences in shell outline seem to be apparent between material from Tanimbar Islands (type locality, Fig. 12C) and from the Kai Islands (Figs 12D-I) but they do not justify their taxonomic separation.

ETYMOLOGY. – After the Tanimbar island group in Indonesia, where the species was discovered.

Myrtea triclotae n. sp.

Figs 13A-I, 14A

TYPE MATERIAL. – Holotype, sh (26.5 x 20.5 x 11.9 mm), MNHN 20694, 24 paratypes (12 dried spm, 10 sh, 1 rv, 1 lv) MNHN 20695, 2 paratypes (1 sh, 1 rv) USNM, 4 paratypes (2 sh, 2 rv) NMP, 2 paratypes (1 sh, 1 rv) NSMT.

TYPE LOCALITY. – NW of San Isidro, Leyte, Central Philippines, 11°12'N, 124°15'E, mud, 379-383 m [MUSORSTOM 3: stn CP 144].

MATERIAL EXAMINED. – **Philippines**. MUSORSTOM 3: stn CP 144, NW of San Isidro, Leyte, Central Philippines, 11°12'N, 124°15'E, 379-383 m, 1 sh (holotype); 12 dried spm, 10 sh, 1 rv, 1 lv (paratypes 29.4 x 23.2, 28.5 x 23.7 x 14.2, 26.9 x 22.3 mm, 24.7 x 20.6 x 12.4, 24.2 x 20.2 x 12.1, 23.4 x 19.8 x 10.8, 22.7 x 19.2 x 12.1, 22.3 x 19.1 x 12.2, 22.0 x 18.5 x 10.6, 21.4 x 18.6 x 11.3, 21.1 x 17.6 x 10.6, 18.0 x 15.6 x 8.5, 17.3 x 15.2 x 7.4, 16.5 x 14.3 x 7.5, 12.5 x 10.8 mm, MNHN); 2 sh, 2 rv (paratypes 26.8 x 22.8, 22.3 x 18.4 x 11.8, 26.2 x 23.0, 21.9 x 18.0 x 10.6 mm, Manila NMP); 1 sh, 1 rv (paratypes 26.4 x 21.5, 24.0 x 19.4 x 12.1 mm, USNM); 1 sh, 1 rv (paratypes 25.0 x 19.4, 23.2 x 19.3 x 11.2 mm, NSMT) and numerous additional fresh valves from the type locality; stn CP 145, 11°01'N, 124°04'E, 214-246 m, 1 juv. sh, 8 v.

DISTRIBUTION. – Central Philippines, in 246-379 m.

DESCRIPTION. – Shell small to medium-sized (*ca.* 20-29 mm long), moderately thick and solid, subcircular to subcircular-oval (l/h 1.1-1.3), inequilateral, almost equivalve, inflated. Beaks slightly in front of the vertical midline (in the holotype 2.5 mm in front). Antero-dorsal margin divided into two slightly concave parts with a narrowly rounded corner between them, the upper comprising the lunular area. Anterior margin broadly rounded, with a slight, more or less

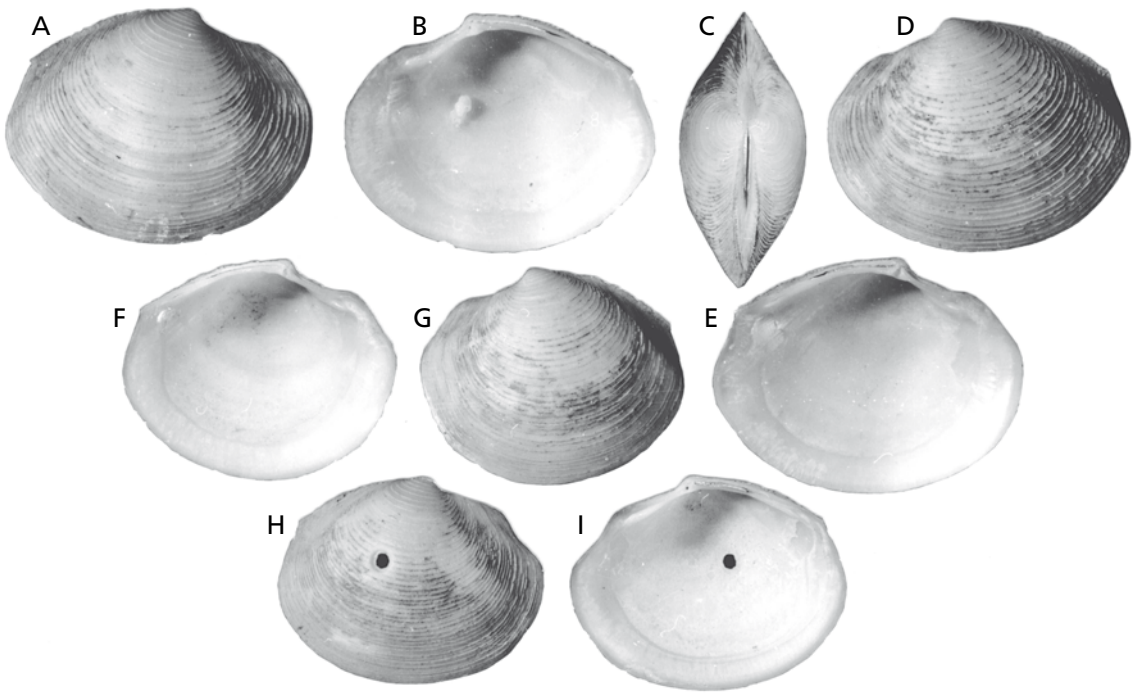

FIG. 13. *Myrtea triclotae* n. sp. **A-E**, holotype MNHN 20694, 26.5 mm; **A**, ext. of rv; **B**, int. of rv; **C**, dorsal view; **D**, ext of lv; **E**, int. of lv; **F-G**, paratype MNHN 20695, 26.2 mm; **F**, int. of lv; **G**, ext. of lv; **H-I**, paratype MNHN 20695, 26.4 mm; **H**, ext. of rv; **I**, int. of rv; all MUSORSTOM 3 stn CP 144.

rounded corner to the antero-dorsal margin. Postero-dorsal margin weakly convex; posterior margin obliquely-truncated, with a sharp corner to the postero-dorsal margin and rounded postero-ventral margin. Ventral margin gently rounded.

Exterior with numerous fine, dense, commarginal lamellae (up to 50, in the holotype 46), which on the earlier (umbonal) part of the valve are slightly less dense than on the later (marginal) part. Interspaces with very fine growth lines and fine, very irregular radial wrinkles, visible only under a lens. Anterior and posterior areas of the valve visible but only slightly delimited from the rest of the valve. Anterior area with much denser commarginal lamellae. Demarcation between posterior area and escutcheon with a sharp and prominent keel bearing a row of numerous very fine leaflike prolongations of the commarginal sculpture.

Hinge plate narrow to very narrow, right valve with 1 cardinal, which varies from broad, vertical and knob-like to narrow, oblique and curved towards the anterior, and which occasionally is bifid. Prominent anterior and posterior laterals. Left valve with 1 oblique anterior cardinal directly below and parallel to the lunular margin and 1 more or less vertical posterior cardinal, between them a very deep pit for the right valve cardinal. Small, thick anterior lateral and longer, quite thin posterior lateral. Lunule sunken, markedly asymmetric, escutcheon narrow, long and well defined, its posterior part in the right valve partly overlapping that of the left valve; ligament short. Anterior adductor scar very small, diverging part very short, pallial line meeting the scar in its middle. Scar of the pallial blood vessel not visible. Inner margin of valves smooth.

Valves white, interior occasionally with a very faint pinkish hue. Periostracum on the earlier part thin and translucent, on the latter (marginal) part brownish and less translucent.

REMARKS. — *Myrtea soyoae* (Habe, 1951) is a similar species originally described in the genus *Notomyrtea* Iredale, 1924. It is higher, with more sloped dorsal margins than in *M. triclotae*. Another very similar species is *Myrtea fabula* (Reeve, 1850) from Batangas, Philippines. According to Reeve's figure (Reeve 1850, *Lucina*, pl. 11, fig. 69), this is a

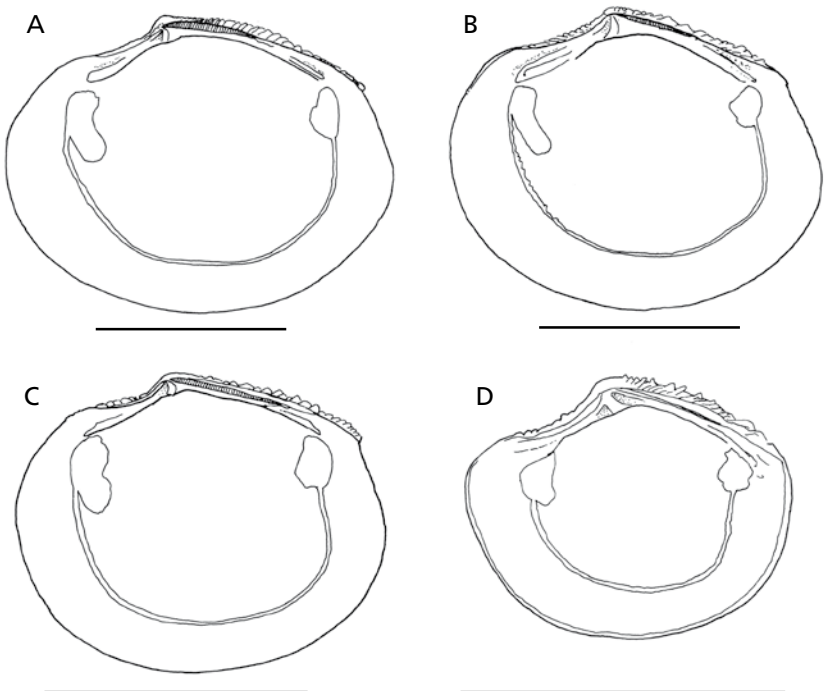

FIG. 14. *Myrtea* spp., outline drawings of the insides of valves. **A**, *Myrtea triclotae* n. sp., holotype MNHN 20694. **B**, *Myrtea investigatoris* n. sp., holotype BMNH 1895.7.2.18. **C**, *Myrtea tanimbarensis* n. sp., paratype MNHN 20693, KARUBAR stn CP 84. **D**, *Myrtea flabelliformis* (Prashad, 1932), KARUBAR stn DW 13.

smaller species (*ca*. 5 mm high only, figure enlarged) that has about the same outline but lacks the shallow indentation on the antero-dorsal margin.

For comparison with *Myrtea investigatoris*, see that species.

ETYMOLOGY. — Named after Marie-Pierre Triclot, former and long-time partner of the second author and his companion during the Musorstom 3 expedition.

Genus ***ELLIPTIOLUCINA*** n. gen.

Type species: *Elliptiolucina magnifica* n. sp. (here designated).

Three species, central Philippines, central and southeastern Indonesia.

DIAGNOSIS. — Shells medium-sized to large, oblong, oval-rectangular, compressed. Surface almost smooth, with fine, irregular commarginal lirae and irregular growth lines and undulations. Antero-dorsal and postero-dorsal areas weakly demarcated if at all. Lunule rather short, shallow to deeply sunken and more or less asymmetric. Umbones in front of the vertical midline. Escutcheon the same width as ligament and not very deeply sunken, delimited by sharp keel. Hinge plate narrow, almost toothless. Diverging part of anterior adductor scar short and rather broad, with a length just over half the total scar length. Angle between base of diverging part and pallial line rather large, between 22° and 30°. Posterior adductor scar small, with a narrow slit open to the direction of the umbones. Pallial line entire. Trace of pallial blood vessel not marked as a scar. Inner margins smooth.

REMARKS. – *Elliptiolucina* is characterized by the large, thick, oblong shell with oval-rectangular outline, a narrow and almost toothless hinge plate, a weakly sculptured surface and a rather short and broad diverging part of the anterior adductor scar. The posterior adductor scar has a characteristic narrow slit that is open towards the umbonal cavity. *Elliptiolucina* most resembles *Gloverina*, see remarks under that genus.

There also exist several large "smooth" lucinids in the Tertiary of Europe (some of them from deeper water) that superficially resemble *Elliptiolucina*. These include *Lucina gigantea* Deshayes, 1824 (100 mm), *L. mutabilis* (Lamarck, 1805) (95 mm), both from the Middle Eocene of the Paris Basin (see Deshayes 1837: pl. 15, figs 11, 12 and pl. 14, figs 6, 7), and *L. defrancei* Deshayes, 1864 (72 mm) from the Lower Eocene of the Paris Basin (see Deshayes 1856-60: pl. 39, figs 9-11). However, these differ from *Elliptiolucina* in the shape and form of the anterior adductor scar, which is very long and slender in the Paris Basin fossils. *Cryptolucina megadyseides* Saul, Squires & Goedert, 1996, the type species of *Cryptolucina*, from the Eocene of Washington state, U.S. Pacific coast, may also be compared to the type species of *Elliptiolucina* in spite of the fact that the specimens are incomplete and in part crushed. *Cryptolucina megadyseides* is considerably larger, more tumid and has much more prominent umbones and a strong and broad hinge line.

ETYMOLOGY. – The name reflects the elliptical shell outline of this genus.

Elliptiolucina magnifica n. sp.

Figs 15A-F, 18A, 19

TYPE MATERIAL. – Holotype, spm (80.4 x 57.8 x 30.3 mm) MNHN 20700.

TYPE LOCALITY. – Philippines, to the north of Mindoro, 13°39'N, 120°43'E, 520-550 m, mud [MUSORSTOM 2: stn CP 25].

MATERIAL EXAMINED. – The type material only.

DISTRIBUTION. – Central Philippines, only known from the type locality.

DESCRIPTION. – Shell large, 80.4 mm long, thick and quite heavy, rather elongate for a lucinid, subrectangular-oval, inequilateral, slightly inequivalve. Umbones small and flattened, almost not protruding and hardly visible from internal view of the valves; highest dorsoventral extension about 10 mm behind the umbones. Beak of the right valve very slightly higher than beak of the left valve. Posterior end of the shell weakly twisted to the right side. Beaks 9 mm in front of the vertical midline. Anterior margin broadly rounded, posterior margin slightly oblique and rounded-truncate. Antero-dorsal margin somewhat concave, postero-dorsal margin slightly convex. Ventral margin evenly convex.

Exterior with dense, irregular growth lines and fine and narrow, irregular commarginal undulations overlain by numerous commarginal, very fine and very irregular threads that are visible at magnifications of 10-20x only. These threads diverge from the commarginal sculpture at the postero-dorsal angle and run in a more upward direction on the postero-dorsal slope. Very slight broad radial depression on the antero- and postero-dorsal slope.

Hinge plate very narrow and edentulate, in the left valve in front of the beaks protruding laterally into the narrow lunular area (Fig. 15F), in the right valve placed back to make space for the left valve. Lunule rather long, deeply sunken and asymmetric, in a dorsal view only visible on the left valve. In the same view split between the valves near the beaks covered by the slightly higher lunular keel of the right valve. Anterior part of the escutcheon the same width as the ligament, narrower posteriorly and delimited by a sharp keel. Diverging part of the anterior adductor

scar slightly longer than half the total length of the scar. Impression of pallial blood vessel not visible. Inner surface of valves slightly punctate on the dorsal part below the umbonal cavity, that is with small pitlike scars where the mantle is attached to the valves. Inner margin smooth.

Valves entirely white. Periostracum thin, straw-coloured, not translucent, slightly wrinkled near the margins.

REMARKS. – For comparisons with *E. labeyriei* and *E. virginiae*, see those species.

ETYMOLOGY. – The name refers to the large size and outstanding appearance of this magnificent species.

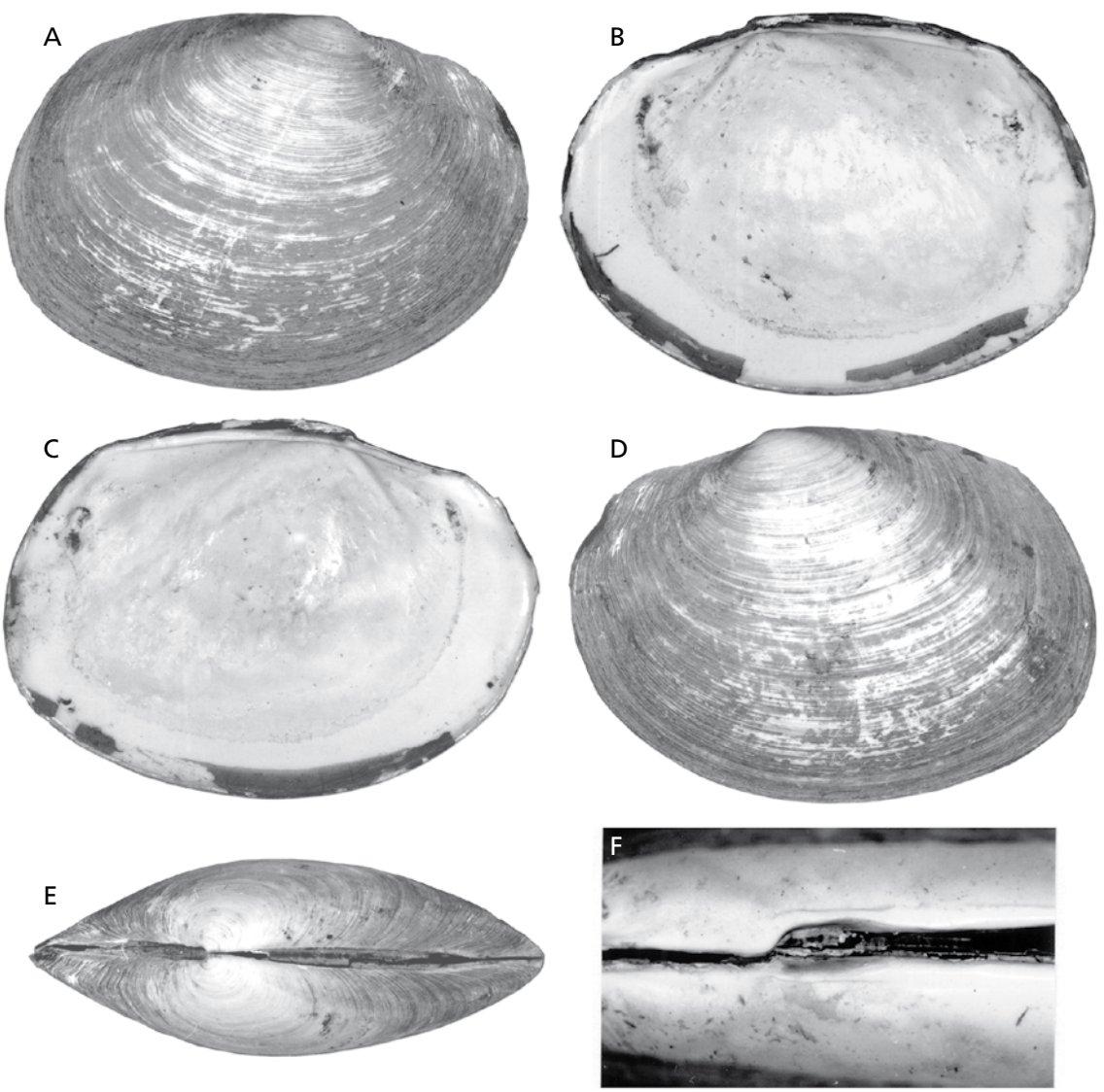

FIG. 15. *Elliptiolucina magnifica* n. sp. **A-F**, holotype MNHN 20700, 80.4 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal view; **F**, inside view of hinge from ventral side of holotype.

Elliptiolucina labeyriei n. sp.

Figs 16A-I, 17B, 19

TYPE MATERIAL. – Holotype, spm (33.6 x 23.5 x 9.4 mm) MNHN 20701, 12 paratypes (2 adult sh, 1 half-grown sh, 1 juv. sh, 2 rv, 6 lv) (43.6 x 30.8 x 14.5, 42.7 x 30.0 x 12.0, 42.2 x 30.4, 41.7 x 29.4, 40.3 x 27.6, 35.1 x 26.7, 31.1 x 21.6 x 9.0, 20.6 x 14.3 x 5.5, 18.5 x 14.8 mm) MNHN 20702, 2 paratypes (1 sh, 1 lv) (31.6 x 22.0 x 9.0, 30.4 x 21.2 mm) USNM, 1 paratype (lv) (39.1 x 27.3 mm) NSMT, 3 paratypes (lv) (36.7 x 26.4, 35.2 x 26.0, 33.0 x 23.1 mm), NMP.

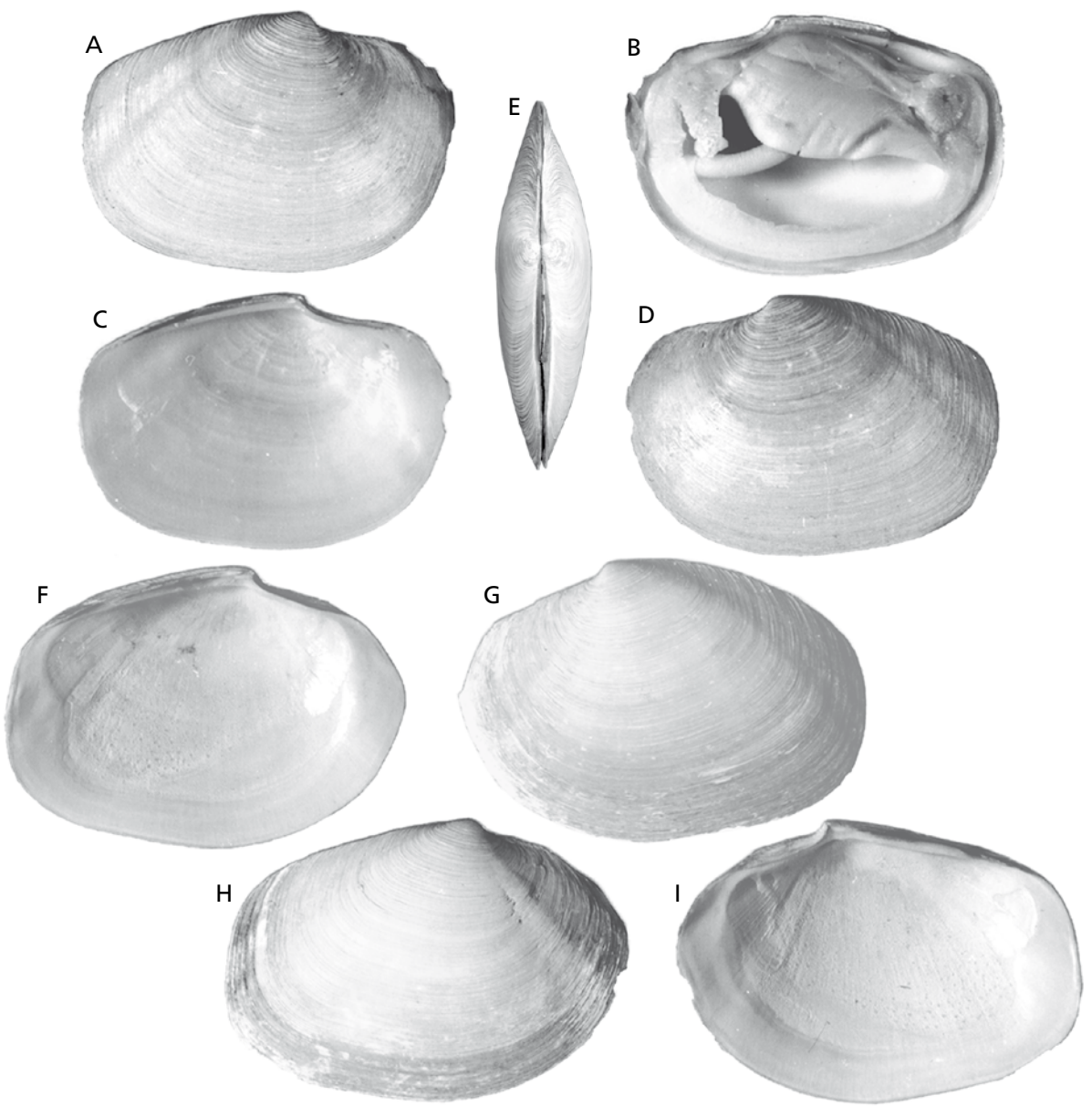

FIG. 16. *Elliptiolucina labeyriei* n. sp. **A-E**, holotype MNHN 20701, 33.6 mm; **A**, ext. of rv; **B**, int. of rv with soft parts; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal view; **F-G**, paratype MNHN 20702, 43.6 mm; **F**, int. of lv; **G**, ext. of lv; **H-I**, paratype MNHN 20702, 42.7 mm; **H**, ext. of rv; **I**, int. of rv; all from Sulu Sea, ESTASE 2 stn CP 6.

TYPE LOCALITY. – Philippines, Sulu Archipelago, SW of Tawitawi, 4°38'N, 119°49'E, 2570 m [ESTASE 2: stn CP 6].

OTHER MATERIAL EXAMINED. – Nine fragments from the type locality.

DISTRIBUTION. – Southern Philippines (Sulu Archipelago), in 2570 m.

DESCRIPTION. – Shell medium-sized, up to 53 mm long, quite thin but strong, somewhat variable, elongate, egg-shaped (l/h 1.4-1.5), very compressed, inequilateral, nearly equivalve. Anterior part somewhat bent to the left, antero-dorsal part often slightly twisted to the left. Umbones flattened, not protruding. Beaks well in front of the vertical midline, in the two largest specimens 6 mm in front. Antero-dorsal margin slightly convex to straight, postero-dorsal

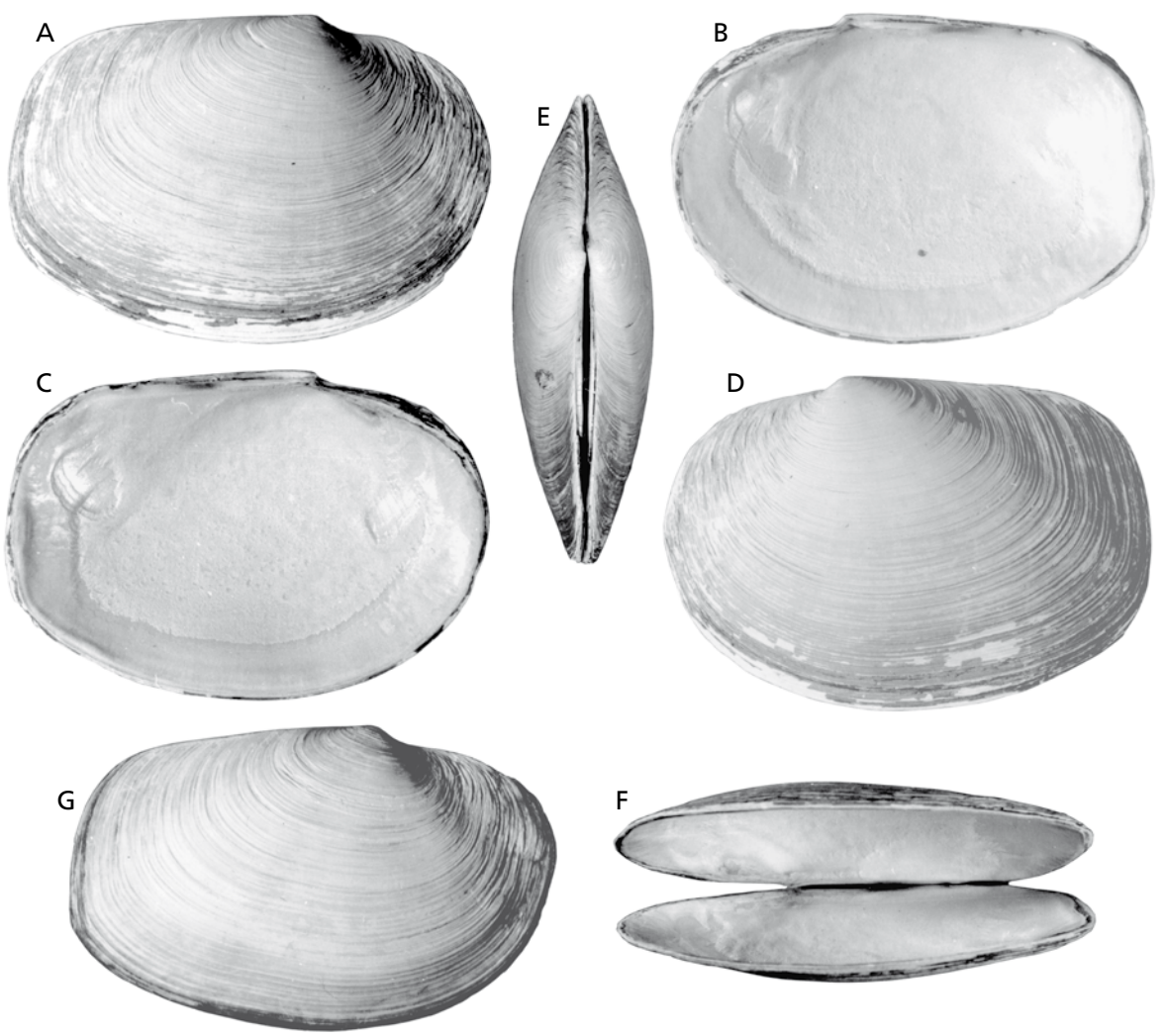

FIG. 17. *Elliptiolucina virginiae* n. sp. **A-F**, holotype MNHN 20703, 60.0 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal view; **F**, ventral view of the opened valves to show hinge plate; **G**, paratype MNHN 20704, KARUBAR stn CP 54, 45.6 mm, ext. of rv.

margin more or less convex. Anterior margin well rounded, posterior margin rounded-truncate, vertical section slightly convex. Ventral margin convex, posteriorly less convex or straight for a short distance.

Exterior with dense irregular growth lines. Very early (umbonal) region of the valves (first 3-5 mm) with very fine, regular, commarginal lamellae that become very fine narrow irregular undulations ventrally. Also, on the lower region of the valves a few very fine irregular commarginal threads, which on the antero-dorsal and postero-dorsal area diverge from the commarginal sculpture and running in a more upward direction, visible under a lens only (10-20x). Antero-dorsal and postero-dorsal areas very faintly marked.

Hinge plate narrow, mostly without hinge teeth but occasionally with very faint indications of a cardinal tooth in the right or the left valve. Lunule very narrow and asymmetric, sunken; escutcheon with ligament broader than lunule and slightly less sunken. Anterior adductor scar small, with short diverging part, pallial line meeting the scar in its middle. Scar of the pallial blood vessel not visible. Very few, faintly visible punctations under the umbonal cavity. Inner margin of valves smooth.

Valves entirely white. Periostracum thin, a pale light brown to translucent, with small, dense folds towards the shell margin.

REMARKS. – *Elliptiolucina labeyriei* is most similar to *E. magnifica* and *E. virginiae* (see next entry) in shape and hinge plate morphology. In all three species, the anterior and posterior areas are not well separated and hardly distinguishable. *Elliptiolucina labeyriei* is smaller, more elongate, more compressed and thinner than *E. magnifica* and is less rectangular than *E. virginiae*. From both species, *E. labeyriei* is distinguished by the presence of a narrow but well developed and sharply delimited escutcheon over the whole length of the posterior dorsal margin. The general external shape of *E. labeyriei* is convergent with that of *Calyptogena* (*s.l.*) *compressa* (Prashad, 1932), which is also very compressed and oblong and has the same size and l/h ratio, and it is remarkable that the two taxa were taken together in the same trawl haul.

ETYMOLOGY. – Dedicated to Dr Laurent Labeyrie (CNRS, Gif-sur-Yvette), chief scientist of the cruise ESTASE during which the species was taken.

Elliptiolucina virginiae n. sp.

Figs 17A-G, 18C, 19

TYPE MATERIAL. – Holotype, sh (60.0 x 41.5 x 17.3 mm) MNHN 20703, 1 paratype (spm in alcohol) MNHN 20704.

TYPE LOCALITY. – Indonesia, Tanimbar Islands, 8°29'S, 131°33'E, 840-855 m [KARUBAR: stn CP 73].

MATERIAL EXAMINED. – **Indonesia**. KARUBAR: stn CP 52, Tanimbar Islands, 8°03'S, 131°48'E, 1244-1266 m, 1 juv. sh (23.0 x 14.7 mm); stn CP 54, 8°21'S, 131°43'E, 836-869 m, 1 spm (paratype 45.6 x 29.6 x 11.7 mm), 2 rv (47.0 x 31.7, 46.0 x 29.0 mm); stn CP 73, 8°29'S, 131°33'E, 840-855 m, 1 sh (holotype); stn CP 91, 8°44'S, 131°05'E, 884-891 m, 1 lv (78.5 x 49.1 mm), 1 fragm.

DISTRIBUTION. – Southeastern Indonesia (Tanimbar Islands region), in 855-1244 m.

DESCRIPTION. – Shell large, *ca.* 60-78 mm long, moderately thick and solid when adult, subrectangular, oblong (l/h 1.4-1.6), markedly inequilateral, with umbones well in front of the vertical midline. Umbones very small and only slightly protruding. Almost inequivalve, beak of the right valve very slightly higher than beak of the left valve. Shell posteriorly weakly or not twisted to the right side. Anterior margin broadly rounded, with a slight rounded angle in the middle; posterior margin slightly oblique to nearly vertical and rounded-truncate. Antero-dorsal and postero-dorsal margin almost straight. Ventral margin gently convex.

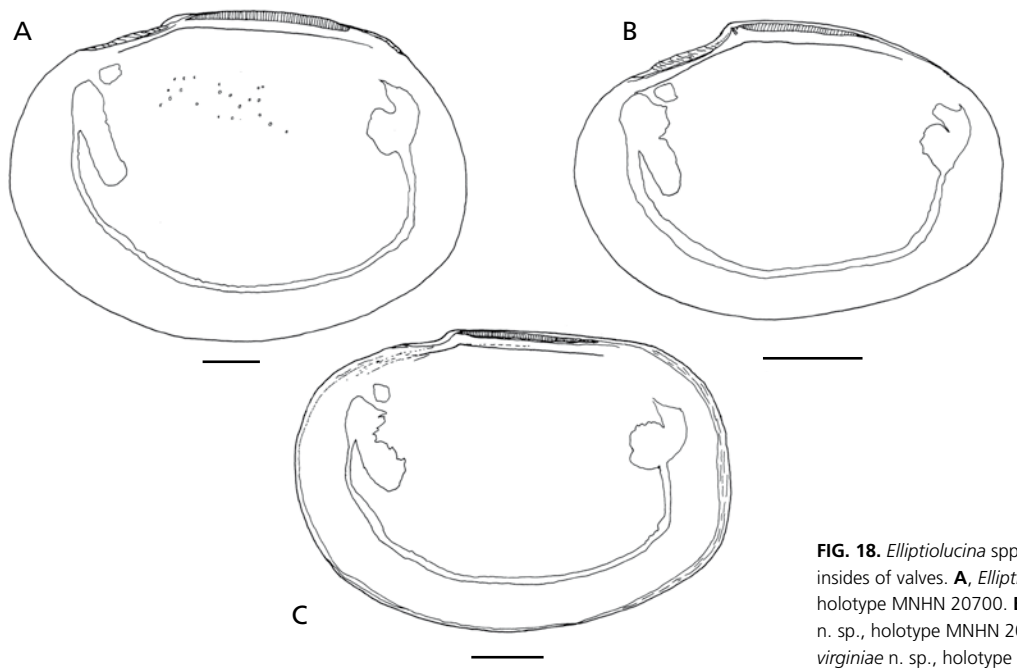

FIG. 18. *Elliptiolucina* spp., outline drawings of the insides of valves. **A**, *Elliptiolucina magnifica* n. sp., holotype MNHN 20700. **B**, *Elliptiolucina labeyriei* n. sp., holotype MNHN 20701. **C**, *Elliptiolucina virginiae* n. sp., holotype MNHN 20703.

Exterior with dense, coarse and irregular growth lines and fine, narrow irregular commarginal lirae, overlain by numerous commarginal, very fine and very irregular threads that are visible under a lens only (10-20x). At the postero-dorsal angle these threads diverge from the commarginal sculpture, running in a more upward direction on the postero-dorsal slope. A very slight broad radial depression present on the antero- and postero-dorsal slope.

Hinge plate very narrow, with no hinge teeth at all. Lunule short, broad only directly in front of the umbones, deep sunken and very slightly asymmetric. Escutcheon indistinct, the same width as the ligament. Anterior adductor scar with rather short and broad diverging part, pallial line meeting the scar just above its middle. Scar of the pallial blood vessel not visible. Inner margin smooth.

Valves entirely white. Periostracum thin, straw-coloured, not translucent, and slightly folding near the margins.

REMARKS. — *Elliptiolucina virginiae* is in outline and especially in surface sculpture very similar to *E. magnifica*. However, it is slightly smaller, somewhat more compressed, longer and more rectangular, and the postero-dorsal corner is higher. The lower free part of the anterior adductor scar is slightly more divergent from the pallial line than in *E. magnifica*. The most striking difference is the short and nearly symmetrical lunule in *E. virginiae*, contrasting with the long and strongly irregular lunule in *E. magnifica*.

ETYMOLOGY. — Dedicated to our colleague Virginie Héros, collection manager, "soul" and backbone of our malacology group, in appreciation for her moral support, professional skills and friendship.

Genus ***GLOVERINA*** n. gen.

Type species: *Gloverina vestifex* n. sp. (here designated).

Two species, southeastern Indonesia, central Philippines.

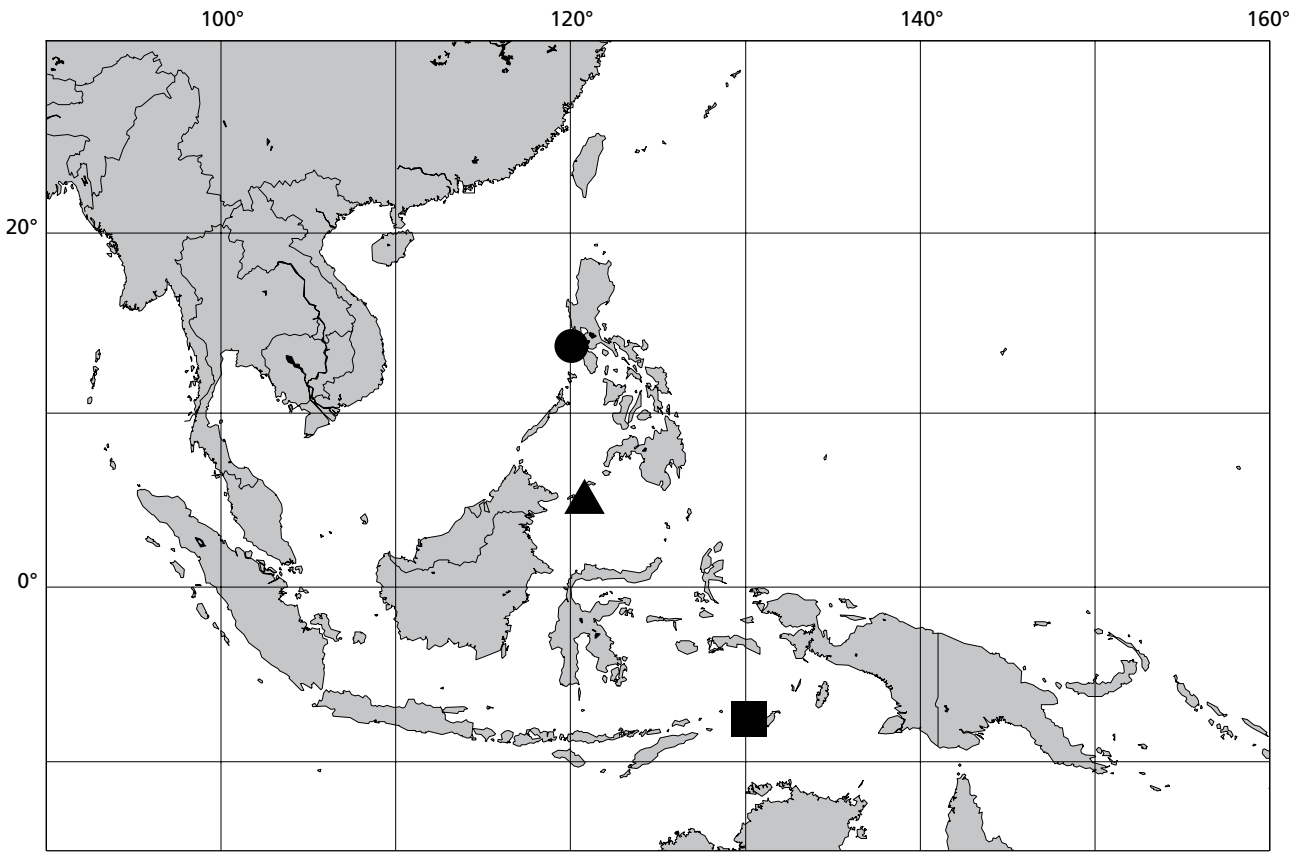

FIG. 19. Distribution of *Elliptiolucina*. Circle: *E. magnifica*. Square: *E. virginiae*. Triangle: *E. labeyriei*.

DIAGNOSIS. — Shells medium-sized to rather large, high-oblong, oval-rectangular, very compressed. Surface with evenly and densely spaced, strong commarginal lamellae. Antero-dorsal and postero-dorsal areas weakly marked if at all. Lunule rather long, deeply sunken and more or less asymmetric. Umbones very small, flattened and not protruding, situated in front of the vertical midline. Escutcheon similar in width to ligament and not very deeply sunken, delimited by a sharp keel. Hinge plate narrow, with weak cardinals. Diverging part of the anterior adductor scar short and rather broad, pallial line meeting the scar at its middle or just below. Angle between base of diverging part and pallial line rather broad, between 20° and 30°. Posterior adductor scar small, with a narow slit open towards the umbones. Pallial line entire; no trace of pallial blood vessel. Inner margins smooth.

REMARKS. — *Gloverina* is characterized by a very compressed shell with oval-rectangular outline and a narrow hinge plate. Besides the general outline, *Gloverina* and *Elliptiolucina* share the rather short and broad diverging part of the anterior adductor scar and the typical narrow slit in the posterior adductor scar, open towards the umbonal cavity. *Gloverina* is differentiated from *Elliptiolucina* by having smaller, more compressed, thinner and more delicate shells, strong and dense commarginal sculpture and occasionally shallow sulci on the anterior part. Also, in contrast to *Elliptiolucina*, weak cardinals or their traces are present on the hinge plate.

ETYMOLOGY. — Named after our colleague Emily Glover, in recognition of her infectious enthusiasm for lucinid systematics and natural history.

Gloverina vestifex n. sp.

Figs 20A-E, 22A, 23

TYPE MATERIAL. – Holotype, sh (35.1 x 28.2 x 10.6 mm) MNHN 20705, 3 paratypes (1 juv. sh, 2 juv. lv) MNHN 20706-20707.

TYPE LOCALITY. – Indonesia, Kai Islands, 06°08'S, 132°45'E, mud, 390-502 m [KARUBAR: stn CP 35].

MATERIAL EXAMINED. – **Indonesia**. KARUBAR: stn CP 12, Kai Islands, 05°23'S, 132°37'E, 413-436 m, 1 juv. sh (22.2 x 17.4 x 6.3 mm), 1 juv. lv (20.7 x 17.4 mm), paratypes MNHN 20707; stn CP 35, 06°08'S, 132°45'E, mud, 390-502 m, 1 sh, holotype and 1 juv. lv, paratype (16.0 x 12.1 mm) MNHN 20706.

DISTRIBUTION. – Southeastern Indonesia (Kai Islands region), in 413-436 m.

DESCRIPTION. – Shell up to 35 mm long, not very thick but strong, oblong (l/h 1.2-1.3), inequilateral, equivalve and very compressed. Beaks in front of the vertical midline, in the largest specimen nearly 5 mm in front. Anterior margin broadly rounded, antero-dorsal corner quite sharp. Postero-dorsal margin almost straight, postero-dorsal corner also quite sharp. Posterior margin broad and obliquely rounded-truncated. Ventral margin evenly convex, postero-ventral corner well rounded.

Exterior with numerous fine, dense, regularly spaced, commarginal lamellae that become more prominent towards the ventral margin. Interspaces with some irregular growth lines, visible under a lens (10-20x) only. Antero-dorsal

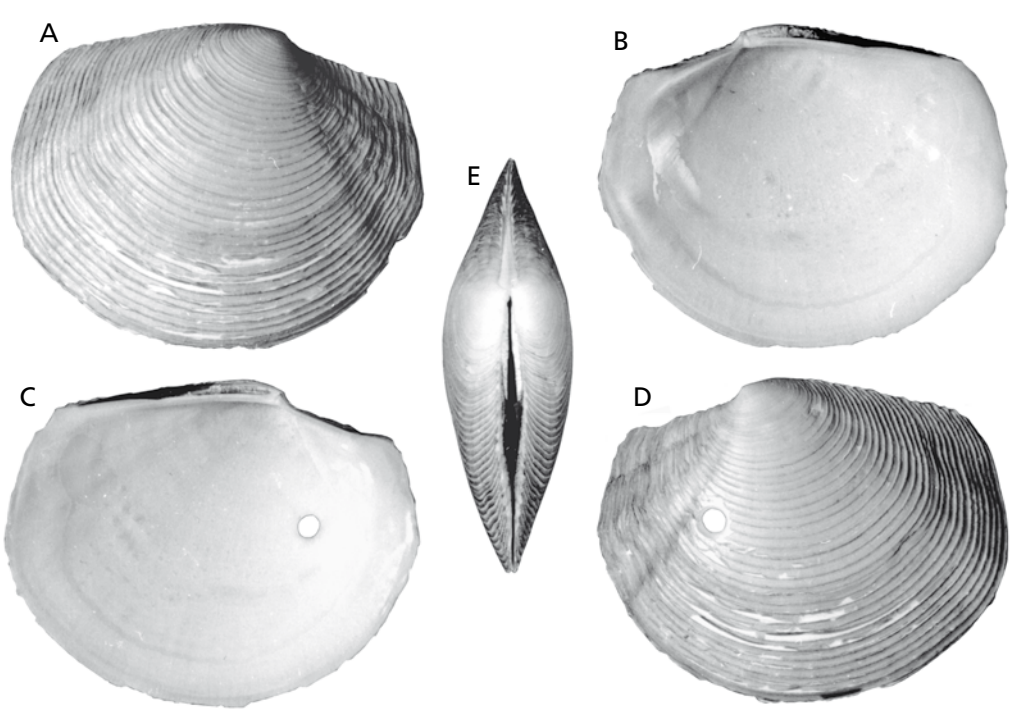

FIG. 20. *Gloverina vestifex* n. sp. **A-E**, holotype MNHN 20705, 35.1 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal view, KARUBAR stn CP 35.

slope with three very slight radial depressions or sulci on the left valve and two on the right valve, visible because of irregularities of the periostracum; radial depression on the postero-dorsal slope gentle and visible only in adult specimens.

Hinge plate narrow, right valve with 1 cardinal, which is somewhat variable in direction, a fairly prominent anterior lateral and a small and hardly visible posterior lateral. Left valve with 1 posterior cardinal and 1 anterior cardinal, which mostly merges with the protruding lunular area. Both teeth can be merged together or disappear. Lateral teeth only very slightly developed or absent. Lunule and escutcheon very narrow and not very deeply sunken, delimited by a sharp keel. Lunule in left valve only slightly broader than in right valve. Anterior adductor scar elongate, with very short diverging part, pallial line meeting the scar just below its middle. Impression of the pallial blood vessel not visible. Inner surface of valves with faintly visible punctations. Inner margin of valves smooth.

Valves entirely white. Periostracum thin, pale-straw coloured, translucent.

REMARKS. – *Gloverina vestifex* is most similar to *Gloverina rectangularis* (next species), with which it shares the general sculpture, compressed shell, hinge line and dentition and narrow lunule and escutcheon. The difference lies mainly in the outline: *G. vestifex* is slightly shorter and more oval than *G. rectangularis*, and has a much more evenly convex ventral margin and a therefore less marked postero-ventral corner. The commarginal lamellae of *G. vestifex* are slightly coarser than those of *G. rectangularis*. Sulci are present on the anterior part of *G. vestifex* but are missing in *G. rectangularis*.

ETYMOLOGY. – *Vestifex* (Latin) = tailor, noun in apposition, with reference to the commarginal sculpture that resembles drapery.

Gloverina rectangularis n. sp.

Figs 21A-G, 22B, 23

TYPE MATERIAL. – Holotype, spm (38.3 x 29.1 x 10.4 mm, animal taken out) MNHN 20708, 2 paratypes (1 sh, 1 juv. lv) MNHN 20709, 1 paratype (sh) USNM, 2 paratypes (sh, rv) Manila Museum.

TYPE LOCALITY. – Central Philippines, North of Panay Island, 13°08'N, 122°40'E, 280-440 m [MUSORSTOM 2: stn CP 40].

MATERIAL EXAMINED. – **Philippines**. MUSORSTOM 2: stn CP 40, 13°08'N, 122°40'E, 280-440 m, 1 spm (holotype) and paratypes, 1 sh (37.2 x 28.6 x 9.9 mm), 1 juv. lv (19.7 x 14.6 mm) MNHN; 1 sh (31.5 x 22.6 x 7.7 mm) USNM; 1 sh (24.7 x 19.0 x 5.9 mm), 1 rv (24.0 x 18.0 mm) NMP. – MUSORSTOM 3: stn CP 125, 11°57'N, 121°28'E, 388-404 m, 1 adult rv (36.7 x 28.8 mm); stn CP 135, 11°58'N, 122°02'E, 486-551 m, 1 half-grown sh (30.2 x 22.7 x 8.1 mm), 2 juv. sh (25.1 x 19.2 x 6.4 mm), 23.7 x 18.2 x 6.5 mm, 2 juv. lv (21.2 x 16.5, 17.3 x 13.7 mm).

DISTRIBUTION. – Central Philippines, in 404-486 m.

DESCRIPTION. – Shell medium-sized, up to 37 mm long, not very thick but solid, oblong (l/h 1.3, occasionally 1.4), subrectangular, inequilateral, equivalve and very compressed. Beaks in front of the vertical midline, in the largest specimen 3 mm in front. Anterior margin broadly rounded, with a quite sharp antero-dorsal corner. Posterior part broad, posterior margin nearly vertically truncated, in its middle section very slightly convex, straight or even somewhat concave. Anterior section of the ventral margin more convex than posterior section or whole margin more regularly convex.

Exterior with numerous fine, dense, slightly irregularly spaced, commarginal lamellae that become more prominent towards the ventral margin. Interspaces with faint, irregular, commarginal growth lines, visible under a lens (10-20x) only. Very slight, broad radial depression on the antero-dorsal slope; radial depression on the postero-dorsal slope, well-marked only in adult specimens.

Hinge plate narrow, right valve with 1 cardinal, which is somewhat variable in its direction, a fairly prominent anterior lateral and a hardly visible posterior lateral. Left valve with 1 posterior cardinal and 1 anterior cardinal, which more or less merges with the protruding lunular area. Both teeth can merge together or disappear. Lateral teeth only

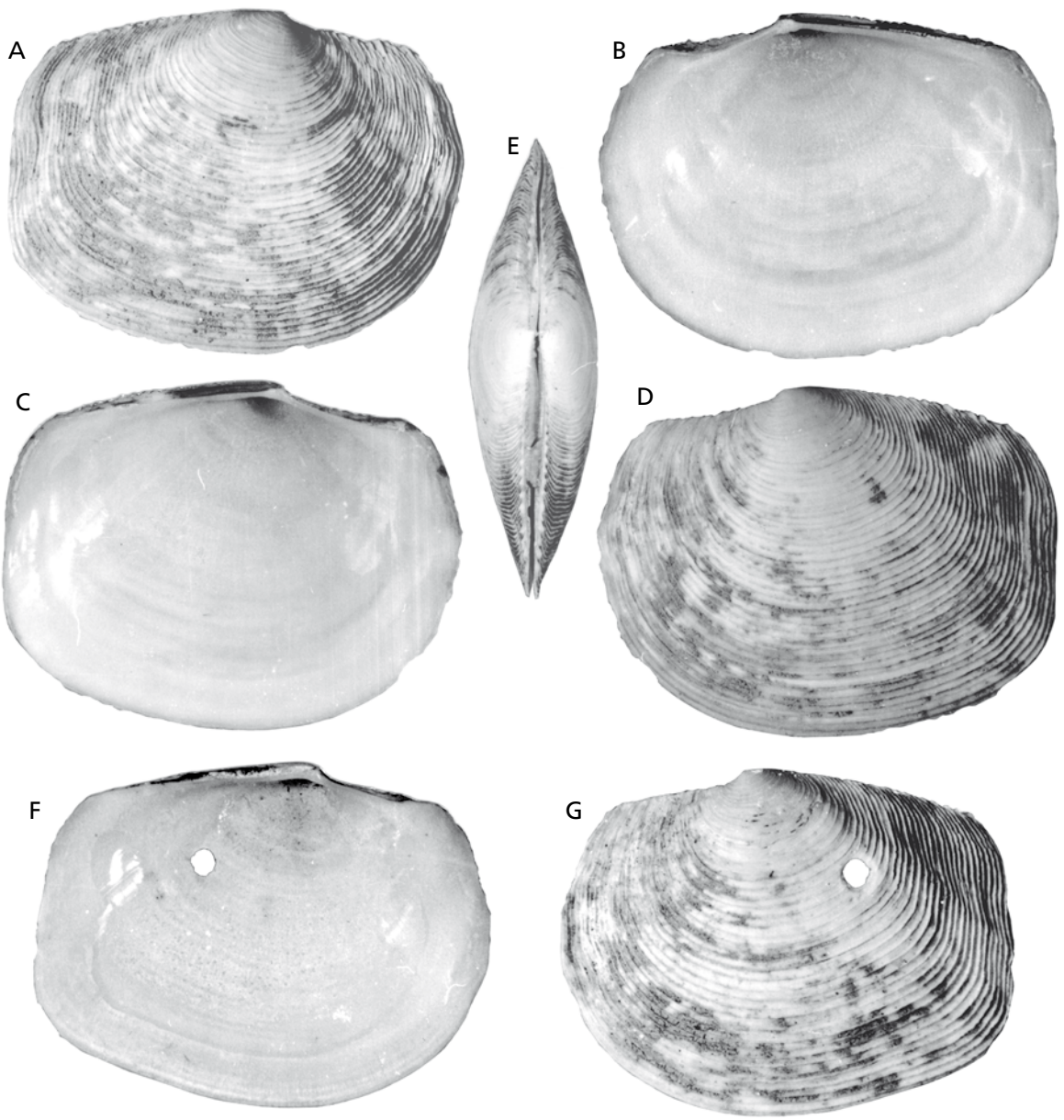

FIG. 21. *Gloverina rectangularis* n. sp. **A-E**, holotype MNHN 20708, 38.3 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal view; **F-G**, paratype MNHN 20709, 37.2 mm; **F**, int. of lv; **G**, ext. of lv; all MUSORSTOM 2 stn CP 40.

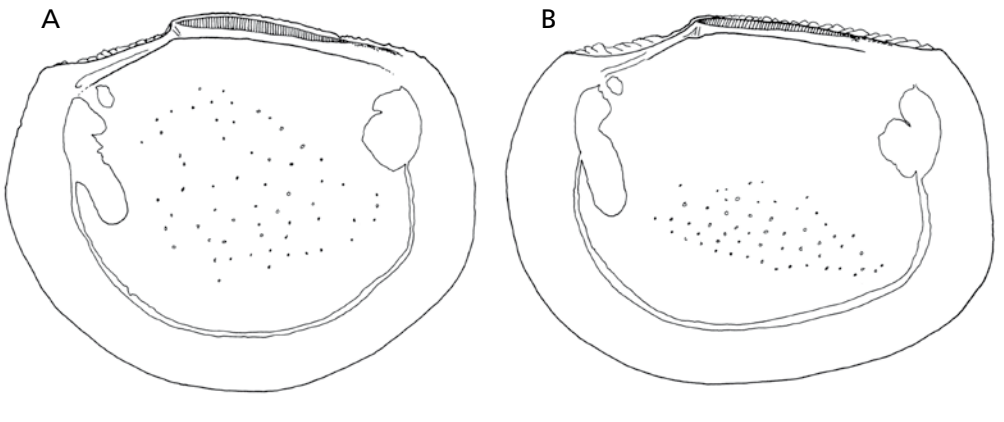

FIG. 22. *Gloverina* spp., outline drawings of the insides of valves. **A**, *Gloverina vestifex*, holotype MNHN 20705. **B**, *Gloverina rectangularis*, holotype MNHN 20708.

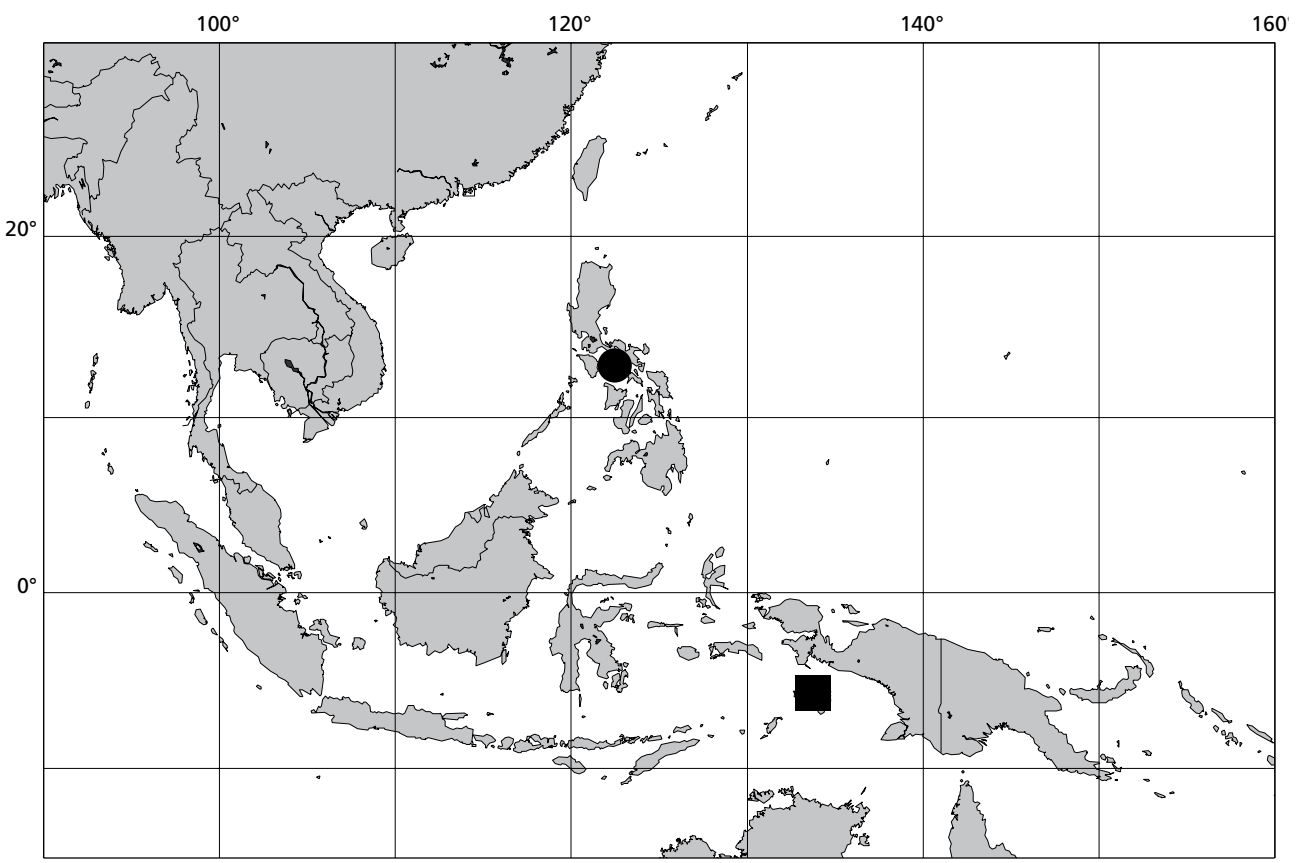

FIG. 23. Distribution of *Gloverina*. Circle: *G. rectangularis*. Square: *G. vestifex*.

very faintly developed or absent. Lunule and ligamental area (escutcheon) very narrow and not very deeply sunken, lunule in left valve only slightly broader than in right valve. Anterior adductor scar small, elongate, with short diverging part; pallial line meeting the scar in its middle. Scar of the pallial blood vessel not visible. Punctations on inner surface partly visible and indistinct. Inner margin of valves smooth.

Valves entirely white. Periostracum thin, light brownish pale, translucent.

REMARKS. — In outline, *Gloverina rectangularis* is somewhat comparable to *Elliptiolucina virginiae*, but it is smaller, more rectangular and more compressed. It is also distinguished by its sculpture, the sunken and extremely narrow lunule and escutcheon and by the presence of hinge teeth, which are lacking in *E. virginiae*.

ETYMOLOGY. — The name reflects the rectangular shape of the species.

Genus ***TAYLORINA*** n. gen.

Type species: *Taylorina alata* n. sp. (here designated).

Four species, central Philippines, central and southeastern Indonesia, Solomon Islands.

DIAGNOSIS. — Shells small to medium-sized, oblong, rectangular-ovate, compressed. Surface with fine and densely spaced commarginal lamellae and a broad and shallow postero-dorsal radial depression. Postero-dorsal area with a more or less developed wing-like extension of the margin at the upper part. Lunule and escutcheon long and very deeply sunken, delimited by a sharp and extremely delicate and high keel, especially thin above the ligament. Umbones in front of the vertical midline, very small. Hinge plate narrow, in general toothless. Diverging part of the anterior adductor scar short and more or less broad, half the length of the total scar length. Angle between diverging part and pallial line very large, between 35° and 47°. Posterior adductor scar small, sometimes with a narrow slit open towards the umbones. Pallial line entire. Inner margins smooth.

REMARKS. — Superficially, *Gloverina* is the most similar genus. However, distinguishing features of *Taylorina* are the narrow lunule and escutcheon, which are extremely deeply impressed, and the presence of a more or less developed wing-like projection of the postero-dorsal margin, a feature unique among the Lucinidae. There is a fossil species that is here placed in the genus *Taylorina*: *Myrtea tenuicardinata* Cossmann & Peyrot, 1912 (Cossmann & Peyrot 1912: 674, pl. 28, figs 26-29), from the Upper Oligocene of the Aquitanian Basin. This species has a similar general outline to that of the Recent species but is smaller, only up to about 20 mm long and slightly shorter (see Fig. 28E). Lunule and ligamental area are much less sunken, the anterior adductor scar is somewhat narrower, and the outer surface has more densely spaced lamellae. The main difference, compared to the Recent species, are the vestiges of a cardinal and anterior and posterior laterals on the hinge plate of the right valve. Fossil vestiges of hinge teeth, now absent from Recent species, indicate a discrete time interval from the Tertiary to Recent over which the loss of hinge teeth seems to have occurred.

Recent species of this well-defined genus are now known from four widely separated localities in the tropical Indo-West Pacific: central Philippines, southern Indonesia (Tanimbar Islands), central Indonesia (Makassar) and Solomon Islands (north of Guadalcanal). Makassar and Tanimbar are the closest together, about 1200 km apart, while all other localities are separated by distances of 2000 km or more.

ETYMOLOGY. — Dedicated to our colleague John Taylor (BMNH), the leading specialist of Lucinidae.

Taylorina alata n. sp.
Figs 24A-E, 28A, 29

TYPE MATERIAL. – Holotype, spm (25.7 x 18.0 x 5.3 mm) MNHN 20710.

TYPE LOCALITY. – Philippines, Tablas Strait, east of Mindoro Island, 12°20'N, 121°42'E, mud, 673-675 m [MUSORSTOM 3: stn CP 122].

MATERIAL EXAMINED. – Only known from the holotype.

DISTRIBUTION. – Central Philippines, in 673-675 m.

DESCRIPTION. – Shell rather small, 25.7 mm long, moderately thick and solid, elongate-subrectangular (l/h 1.4), inequilateral, somewhat inequivalve, with postero-dorsal part slightly twisted to the right side. Beaks situated about 3 mm in front of the vertical midline. Margin of the lunular keel concave, anterior shell margin broadly rounded, with a sharp antero-dorsal corner. Postero-dorsal keel margin slightly convex, postero-dorsal region with a short wing-like projection; posterior margin concave. Postero-ventral margin rounded, anterior section of the ventral margin more convex than posterior section.

Exterior with numerous fine commarginal lamellae, which on the earlier (umbonal) part of the valve are slightly more densely spaced than on the later (marginal) part. Postero-dorsal radial depression broad, delimiting the postero-

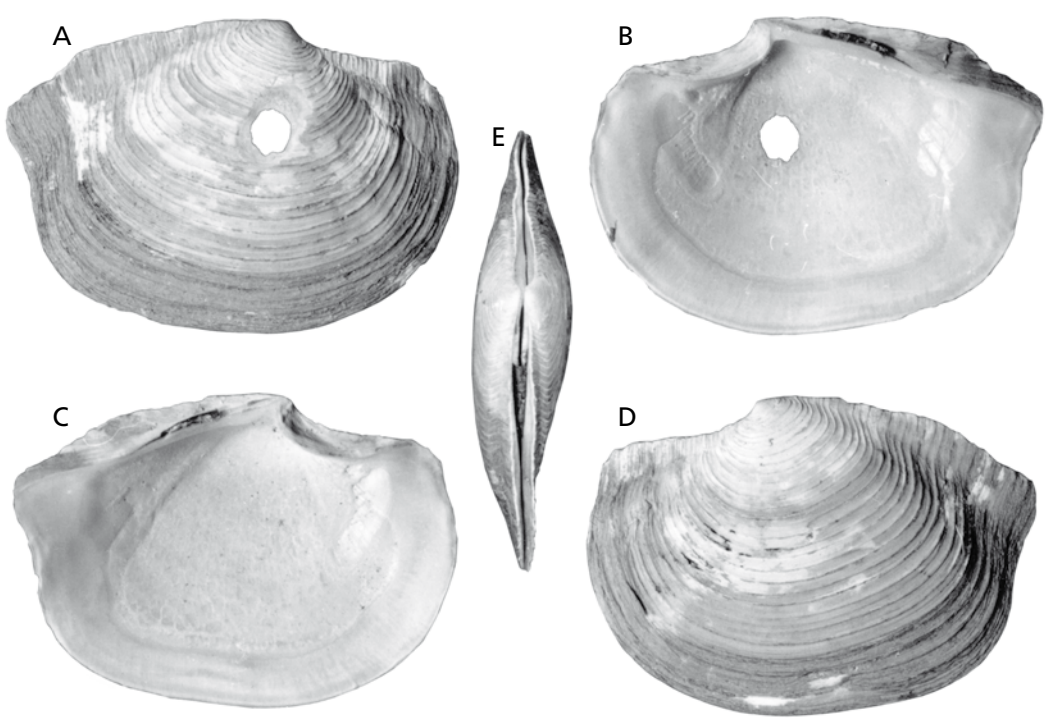

FIG. 24. *Taylorina alata* n. sp. **A-E**, holotype MNHN 20710, 25.7 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal view.

dorsal area with the wing-like projection from the rest of the shell. Postero-dorsal angle rounded, more developed on the left than on the right valve. Antero-dorsal radial depression hardly visible.

Hinge plate narrow, but appearing broad because of the extremely sunken and very narrow lunule and escutcheon with ligament. Beaks bent forward. Hinge with no visible teeth. Anterior adductor scar small, with short diverging part, pallial line meeting the scar slightly above its middle. Impression of the pallial blood vessel not visible. Inner surface partly and faintly punctated with tiny dotted pits. Inner margin of valves smooth.

Valves entirely white. Periostracum thin, greenish brown, not translucent, slightly wrinkled.

REMARKS. – This peculiar species is somewhat similar to *Gloverina rectangularis*, but is distinguished by its less rectangular outline, the extremely deep sunken and narrow lunule and escutcheon and the short wing-like projection of the postero-dorsal margin, which G. *rectangularis* lacks (see remarks for the genus).

ETYMOLOGY. – The name reflects the wing-like projection of the dorsal part of the posterior margin.

Taylorina makassar n. sp.

Figs 25A-E, 28C, 29

TYPE MATERIAL. – Holotype, sh, rv chipped at posterior end (24.5 x 17.6 x 5.5 mm) MNHN 20711.

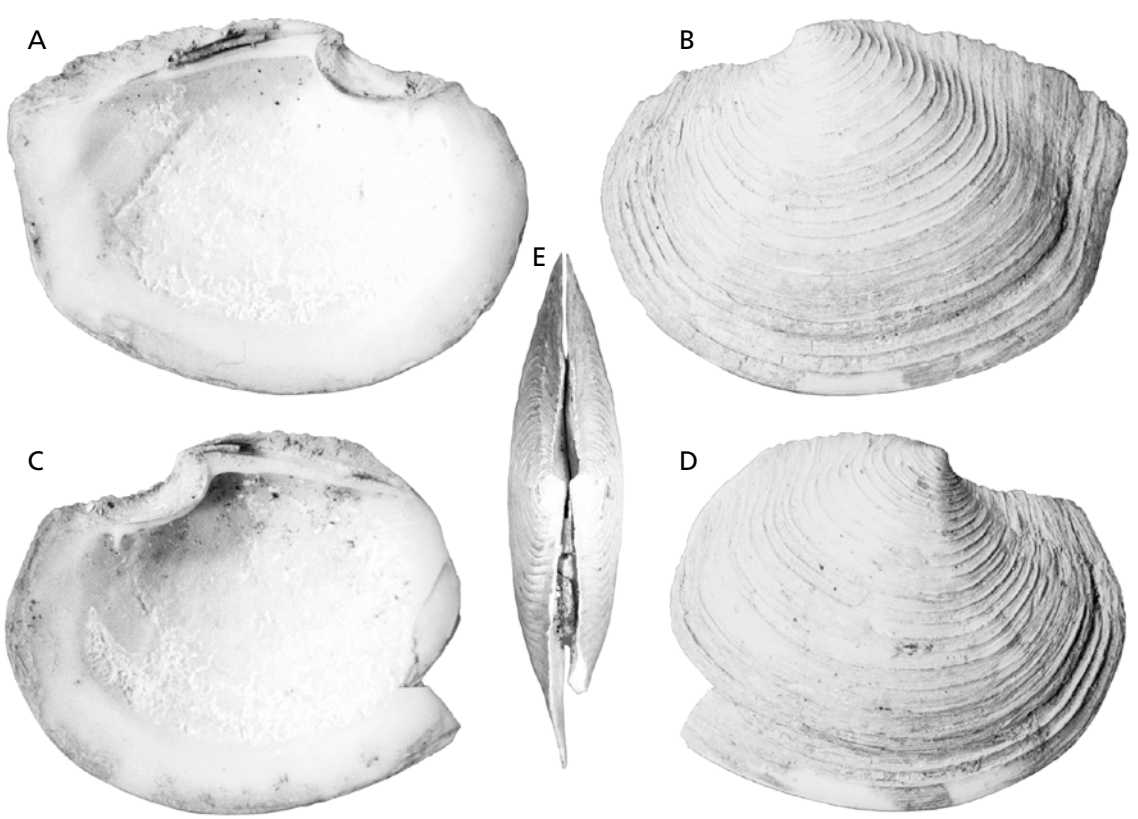

FIG. 25. *Taylorina makassar* n. sp. **A-E**, holotype MNHN 20711, 24.5 mm; **A**, int. of lv; **B**, ext. of lv; **C**, int. of chipped rv; **D**, ext. of chipped rv; **E**, dorsal view.

TYPE LOCALITY. – Indonesia, Strait of Makassar, N of Paternoster Islands, 00°31'N, 117°50'E, 595 m [CORINDON: stn CH 214].

MATERIAL EXAMINED. – The holotype only.

DISTRIBUTION. – Only known from the type locality in the Strait of Makassar.

DESCRIPTION. – Shell rather small, 24.5 mm long, rather light but solid, elongate-subrectangular (l/h 1.4), inequilateral, somewhat inequivalve, with postero-dorsal part very slightly twisted to the right side. Beaks about 3 mm in front of the vertical midline. Margin of the lunular keel concave, on its anterior section straight, anterior shell margin broadly rounded, with a sharp antero-dorsal corner. Postero-dorsal keel margin slightly convex, postero-dorsal section with a very short and broad wing-like projection; posterior margin barely concave, but well inclined postero-dorsally. Postero-ventral corner rounded, anterior section of the ventral part more convex than posterior section.

Exterior with numerous fine commarginal lamellae that are slightly more densely spaced on the earlier (umbonal) region of the valve than on the later (marginal) region. Postero-dorsal radial depression very broad and shallow, delimiting the postero-dorsal area from the rest of the shell. Postero-dorsal angle rounded, more developed on the left than on the right valve. Antero-dorsal radial depression hardly visible.

Hinge plate narrow, but appearing broad because of the extremely sunken and very narrow lunule and escutcheon with ligament. Beaks bent forward. No visible hinge teeth. Anterior adductor scar with short and rather broad diverging part, pallial line meeting the scar slightly above its middle. Impression of the pallial blood vessel not visible. Inner surface not punctate but appearing rough with a kind of irregularly vermiculate sculpture. Inner margin of valves smooth.

Valves entirely white. Periostracum thin, greenish brown, not translucent, slightly wrinkled.

REMARKS. – This species has a slightly less pronounced wing-like projection on the postero-dorsal corner than does *T. alata* and a somewhat broader diverging part of the anterior adductor scar. It differs from *T. manusutor* in its much smaller size.

ETYMOLOGY. – After the type locality, noun in apposition.

Taylorina manusutor n. sp.

Figs 26A-E, 28D, 29

TYPE MATERIAL. – Holotype, spm (44.7 x 33.1 x 11.1 mm) MNHN 20712.

TYPE LOCALITY. – Indonesia, Tanimbar Islands, 8°16'S, 13°59'E, 549-552-m [KARUBAR: stn CC 56].

MATERIAL EXAMINED. – The holotype only.

DISTRIBUTION. – Southeast Indonesia (Tanimbar Islands region), in 549-552 m.

DESCRIPTION. – Shell medium-sized, 45 mm long, moderately thick and solid, elongate-subrectangular (l/h 1.4), inequilateral, somewhat inequivalve, with postero-dorsal part not visibly twisted. Beaks 9 mm in front of the vertical midline. Antero-dorsal margin hardly convex, anterior margin broadly rounded, with a rather narrowly rounded antero-dorsal corner. Posterior margin oblique and slightly concave, upper section extended towards posterior. Postero-ventral corner rounded, anterior section of ventral margin more convex than the posterior section.

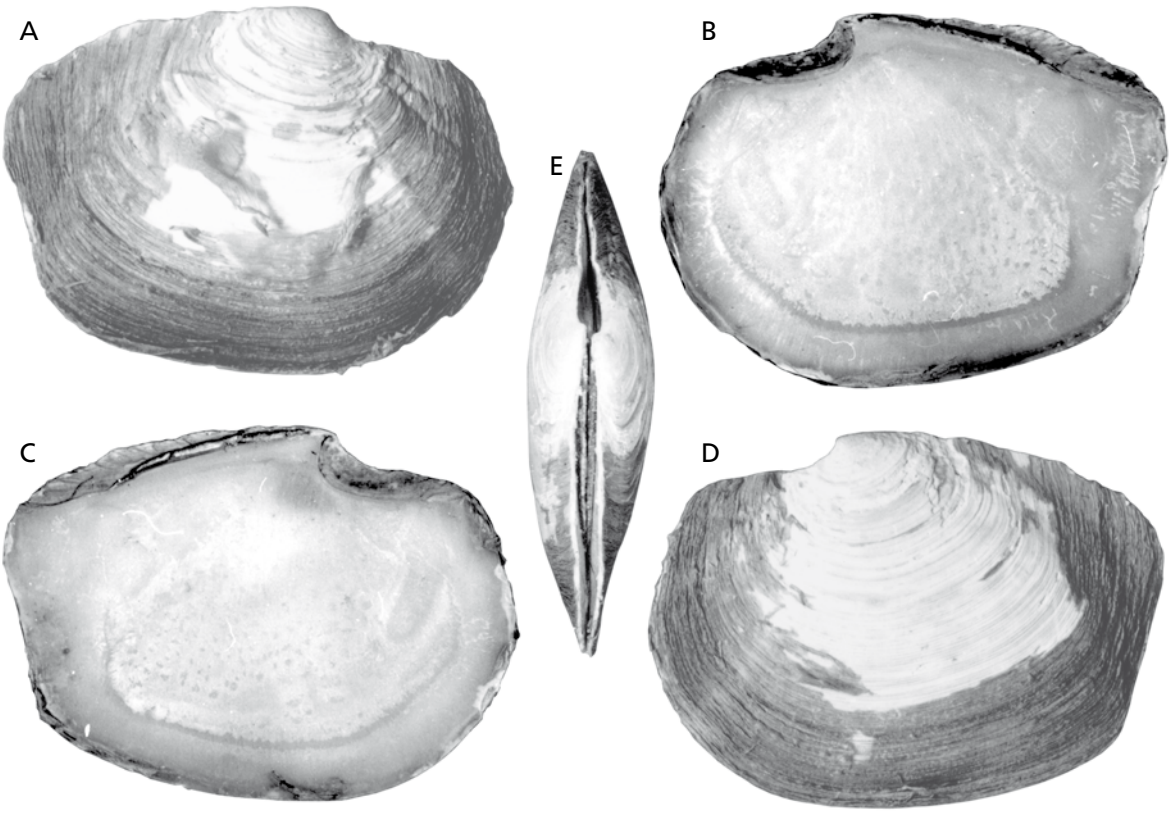

FIG. 26. *Taylorina manusutor* n. sp. **A-E**, holotype MNHN 20712, 44.7 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D** ext. of lv; **E**, dorsal view.

Exterior with numerous very fine, dense, commarginal striae and a few rather widely-spaced commarginal lamellae on the early (umbonal) third of the valves. Postero-dorsal radial depression very broad and shallow. Antero-dorsal radial depression hardly visible. Lunule and escutcheon very narrow and extremely deeply sunken, delimited by sharp keels. Lunule asymmetric, in a dorsal view of the shell visible only on the left valve.

Hinge plate narrow, but appearing broad because of the extremely sunken lunule and escutcheon with ligament. Beaks bent forward. Hinge with no visible teeth. Anterior adductor scar with short and rather broad diverging part, pallial line meeting the scar slightly above its middle. Scar of the pallial blood vessel not visible. Interior of valve somewhat rough, but not punctate. Inner margin of valves smooth.

Valves entirely white. Periostracum thin, greenish brown, not translucent and slightly wrinkled. Surface of the umbonal region eroded.

REMARKS. — *Taylorina manusutor* differs from the other three species of *Taylorina* in its much larger size, thicker shell and the more irregular, densely spaced and finer commarginal striae, which are not present in this form in the smaller species of the genus. It shares the similar shell outline, the extremely deeply sunken lunule and escutcheon, and the very compressed shell with its congeners. *Taylorina manusutor* has a more rounded postero-dorsal corner than *T. alata* and a less developed wing-like projection of the postero-dorsal area. *Taylorina alata* is not a juvenile of *T. manusutor* because growth lines of *T. manusutor*, at the size of *T. alata*, do not show any projection of the postero-dorsal part towards the posterior. The lunule in *T. manusutor* is strongly asymmetric, whereas in the three smaller species, the asymmetry is less pronounced.

ETYMOLOGY. – *Sutor* (Latin) = shoemaker, *manus* (Latin) = hand, *manusutor* = glovemaker or glover, noun in apposition.

Taylorina solomonensis n. sp.

Figs 27A-E, 28B, 29

TYPE MATERIAL. – Holotype, sh (24.0 x 18.1 x 6.1 mm) MNHN 20713.

TYPE LOCALITY. – Solomon Islands, N of Guadalcanal, 9°16'S, 160°08'E, 494-504 m [SALOMON 1: stn CP 1794].

OTHER MATERIAL EXAMINED. – The holotype only.

DISTRIBUTION. – Only known from the type locality, in 494-504 m.

DESCRIPTION. – Shell rather small, 24.0 mm long, light but solid, elongate-subrectangular (l/h 1.3), inequilateral, slightly inequivalve, with postero-dorsal part somewhat twisted to the right side. Beaks about 4 mm in front of the vertical midline. Margin of the lunular keel straight. Anterior margin broadly rounded, with a sharp antero-dorsal corner to the lunular area. Postero-dorsal keel margin slightly convex, postero-dorsal part without a visible wing-like

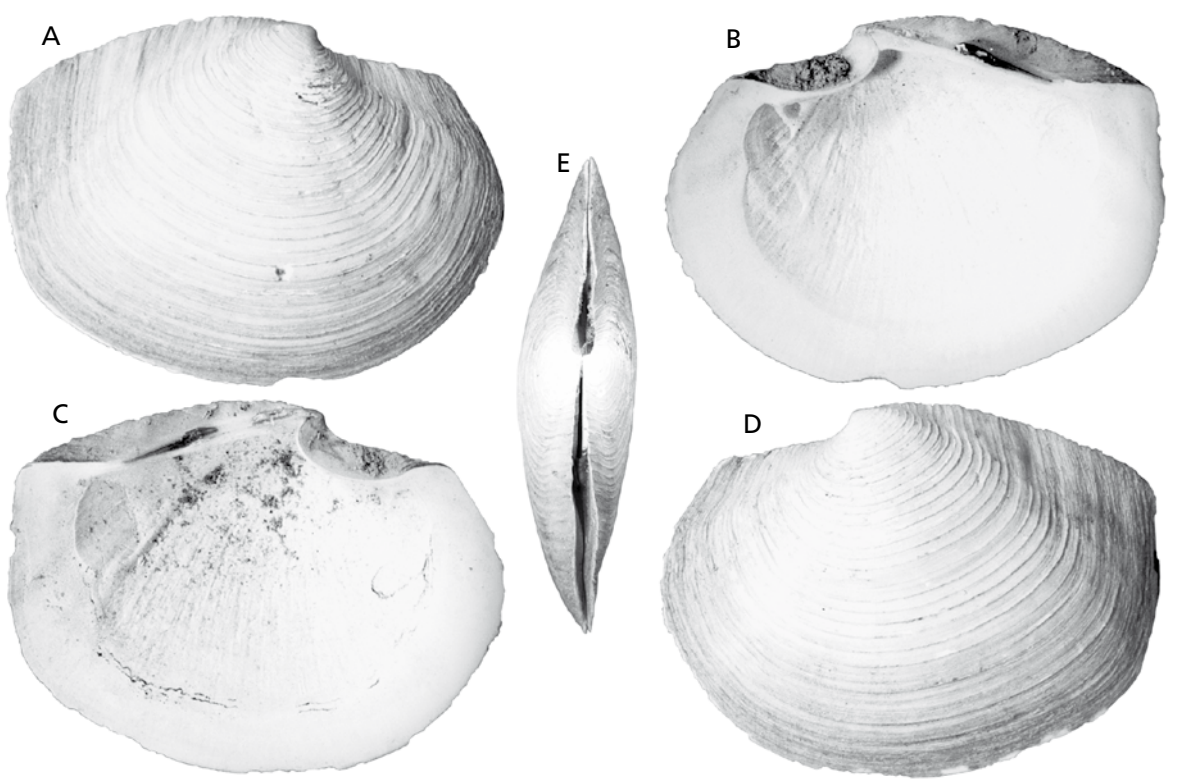

FIG. 27. *Taylorina solomonensis* n. sp. **A-E**, holotype MNHN 20713, 24.0 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal view.

projection but postero-dorsal corner very sharp (90°); posterior margin truncated, almost straight and only slightly inclined. Postero-ventral margin rounded, anterior section of the ventral margin more convex than posterior part. Exterior with numerous fine commarginal lamellae, which on the earlier (umbonal) part of the valve are slightly more densely spaced than on the later (marginal) part. Postero-dorsal radial depression broad and indistinct, postero-dorsal angle almost absent, antero-dorsal radial depression hardly visible.

Hinge plate narrow, but appearing broad because of the extremely sunken and very narrow lunule and escutcheon with ligament. Beaks bent forward. Hinge with no visible teeth. Anterior adductor scar with short and rather broad diverging part, pallial line meeting the scar slightly above its middle. Scar of the pallial blood vessel not visible. Very few minute pits (punctations) on the interior. Inner margin of valves smooth.

Valves entirely white. Periostracum thin, brownish, slightly wrinkled.

REMARKS. – In contrast to *T. alata* and the other two *Taylorina* species, *Taylorina solomonensis* has no well-formed wing-like projection of the postero-dorsal margin and its shell is somewhat shorter. The postero-dorsal depression of *T. solomonensis* is less pronounced, the anterior margin is slightly more convex, the anteriormost point of the anterior margin is placed more forward; the lunule is still somewhat more deeply sunken; the diverging part of the anterior adductor scar is slightly broader than in *T. alata*.

ETYMOLOGY. – After the Solomon Islands, where the type locality is situated.

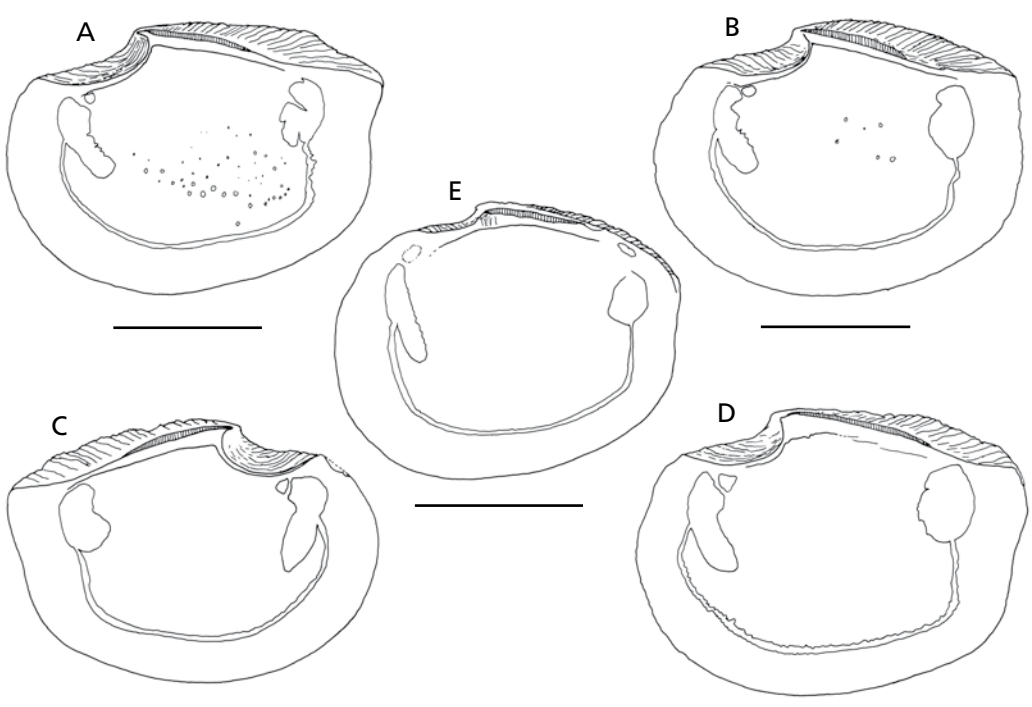

FIG. 28. *Taylorina* spp., outline drawings of the insides of valves. **A**, *Taylorina alata*, holotype MNHN 20710. **B**, *Taylorina solomonensis*, holotype MNHN 20713. **C**, *Taylorina makassar*, holotype MNHN 20711. **D**, *Taylorina manusutor*, holotype MNHN 20712. **E**, *Taylorina tenuicardinata* (Cossmann & Peyrot, 1912) comb. nov., Ruisseau Verdun, Lestelle, St. Etienne d'Orthe, Landes, Aquitanian Basin, leg. P. Lozouet, MNHN.

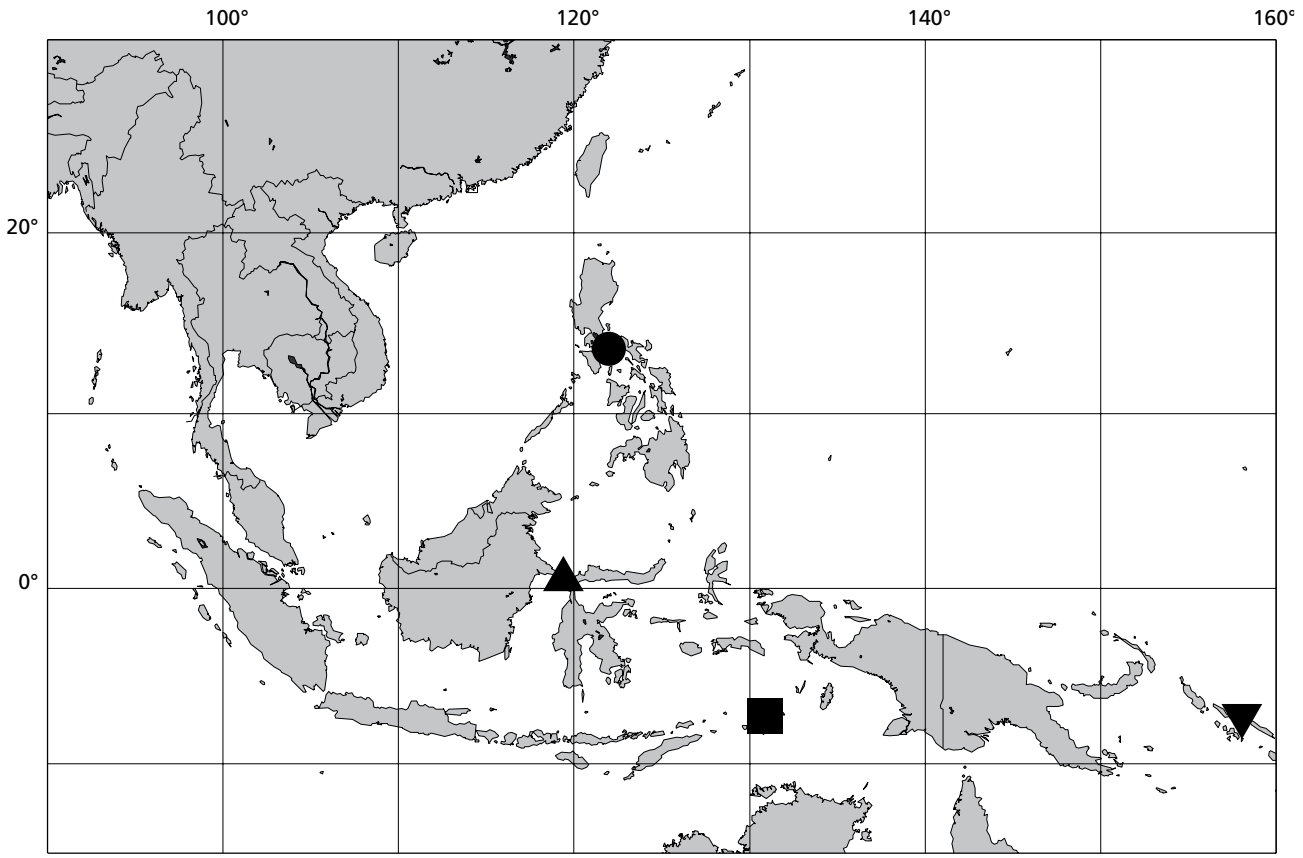

FIG. 29 Distribution of *Taylorina*. Circle: *T. alata*. Square: *T. manusutor*. Triangle: *T. makassar*. Inverted triangle: *T. solomonensis*.

Genus ***ROSTRILUCINA*** n. gen.

Type species: *Rostrilucina garuda* n. sp. (here designated).

Two species, central Philippines, southeastern Indonesia.

DIAGNOSIS. — Shells large, oblong-ovate, compressed with short anterior part and broader and longer posterior part, dorsal half of anterior part rostrate. Surface with fine, densely spaced commarginal lamellae. Lunule and escutcheon long and deeply sunken, delimited by sharp keel. Hinge plate narrow, with very weak vestiges of cardinals and laterals. Diverging part of the anterior adductor scar very short and broad, length less than half the total scar length. Angle between base of diverging part and pallial line very large, between 36° and 50°. Posterior adductor scar small, with a deep, narrow slit open towards the umbones. Pallial line entire. Inner margins smooth.

REMARKS. — *Rostrilucina* is distinguished from other lucinid genera by a combination of features including the pronounced rostriform anterior part of the valve, the very short diverging part of the anterior adductor scar and the large shell size. No other genus of Lucinidae exhibits this suite of characters. Another genus that shares characters with *Rostrilucina*, including the short and tapering anterior part, the broad posterior part and the small anterior adductor scar with short diverging part, is the monospecific *Falsolucinoma* Cosel, 2006 (type species *F. leloeuffi* (Cosel, 1989))

from the Liberia/Côte d'Ivoire border and Cameroon, tropical West Africa (200-300 m), see also Cosel (1998). It differs from *Rostrilucina* in its shorter and higher shell with an almost circular posterior part and a few strong and widely spaced commarginal lamellae.

ETYMOLOGY. – The name highlights the rostrate anterior part of the shell.

Rostrilucina garuda n. sp.

Figs 30A-J, 32A, 33

TYPE MATERIAL. – Holotype, spm (76.0 x 51.2 x 22.4 m) MNHN 20714, 14 paratypes (8 spm in alcohol, 6 sh) MNHN 20715, 1 paratype (spm in alcohol) USNM, 3 paratypes (spm in alcohol) MZB, 1 paratype (spm in alcohol) NSMT.

TYPE LOCALITY. – Indonesia, Tanimbar Islands, 8°21'S, 131°43'E, 836-869 m [KARUBAR: stn CP 54].

MATERIAL EXAMINED. – **Indonesia**. KARUBAR: stn DW 24, Kai Islands, 5°32'S, 132°51'E, 230-243m, 1 lv; stn CP 54, Tanimbar Islands, 8°21'S, 131°43'E, 836-869 m, 1 spm in acohol (holotype); 8 spm in alcohol and 6 sh (paratypes: 74.2 x 54.7 x 21.8, 73.8 x 51.7 x 21.7, 73.6 x 51.8 x 22.7, 69.6 x 48.6 x 20.2, 68.9 x 50.4 x 21.2, 66.5 x 48.5 x 19.5, 66.5 x 47.5 x 20.2, 65.0 x 46.1 x 18.6, 64.5 x 44.3 x 18.6, 63.5 x 46.0 x 18.2, 61.8 x 43.1 x 18.0, 59.7 x 43.6 x 17.7, 54.1 x 38.4 x 14.6, 53.8 x 38.0 x 15.7, 52.7 x 38.5 x 15.0 mm, MNHN); 1 spm in alcohol (paratype 70.7 x 50.5 x 20.2 mm, USNM); 3 spm in alcohol (paratypes: 70.0 x 49.1 x 20.3, 63.5 x 46.7 x 19.3, 60.4 x 43.5 x 18.8 mm,); 1 spm in alcohol (paratype 68.0 x 49.6 x 19.3 mm, NSMT); and numerous v (45.5 x 33.0 x 13.0, 43.2 x 31.0 x 12.4, 38.5 x 27.4 x 10.6, 35.2 x 25.2 x 9.4, 32.2 x 22.7 x 9.6, 29.4 x 19.5 x 8.3, 26.0 x 17.6 x 7.1, 23.8 x 16.8 x 6.9 mm); stn CP 73; Tanimbar Islands, 8°29'S, 131°33'E, 840-8455m, 2 adult, 2 juv. spm, 4 sh, 2 v.

DISTRIBUTION. – Only known from the Tanimbar and Kai Islands region, southeast Indonesia, in 840-855 m (1 v. in 230-243 m).

DESCRIPTION. – Shell large, up to 76 mm long, not very thick given the large size, inequilateral, nearly equivalve, compressed, elongate, ovate-rostrate (l/h 1.4-1.5), somewhat variable in outline and l/h ratio. Beaks in front of the vertical midline, in the holotype by 7 mm. Anterior part triangular-rostrate, anterior margin pointed. Posterior part broad, posterior margin almost vertically truncate and in its middle vertical section nearly straight. Postero-dorsal corner rather narrowly rounded. Antero-dorsal and postero-dorsal margin nearly straight. Ventral margin from anterior point to postero-ventral corner evenly rounded, postero-ventral corner broadly rounded.

Exterior with numerous fine, regular commarginal lamellae, evenly spaced on the early and middle part of the valves, becoming more dense ventrally. Postero-dorsal slope not convex, but with a very shallow and broad radial depression. Antero-dorsal angle close to the antero-dorsal margin and well marked.

Hinge plate in the left valve in front of the umbones hardly protruding laterally into the lunular area. A nearly absent anterior cardinal and an often weak posterior cardinal, with a very small and more or less absent anterior lateral are present; no visible posterior lateral. Right valve with a small, very weak to nearly absent cardinal, a lamelliform anterior lateral and a short posterior lateral. Lunule and escutcheon long, very narrow and very deeply sunken. Lunule slightly asymmetric, in the left valve somewhat broader than in the right valve, the two delimiting keels blade-shaped. Anterior adductor scar small, with very short diverging part, pallial line meeting the scar slightly below its middle. Impression of the pallial blood vessel not visible. Interior of valves with few small pits (punctations), inner margin smooth.

Valves entirely white. Periostracum thin, brownish, not translucent and slightly wrinkled near the margins.

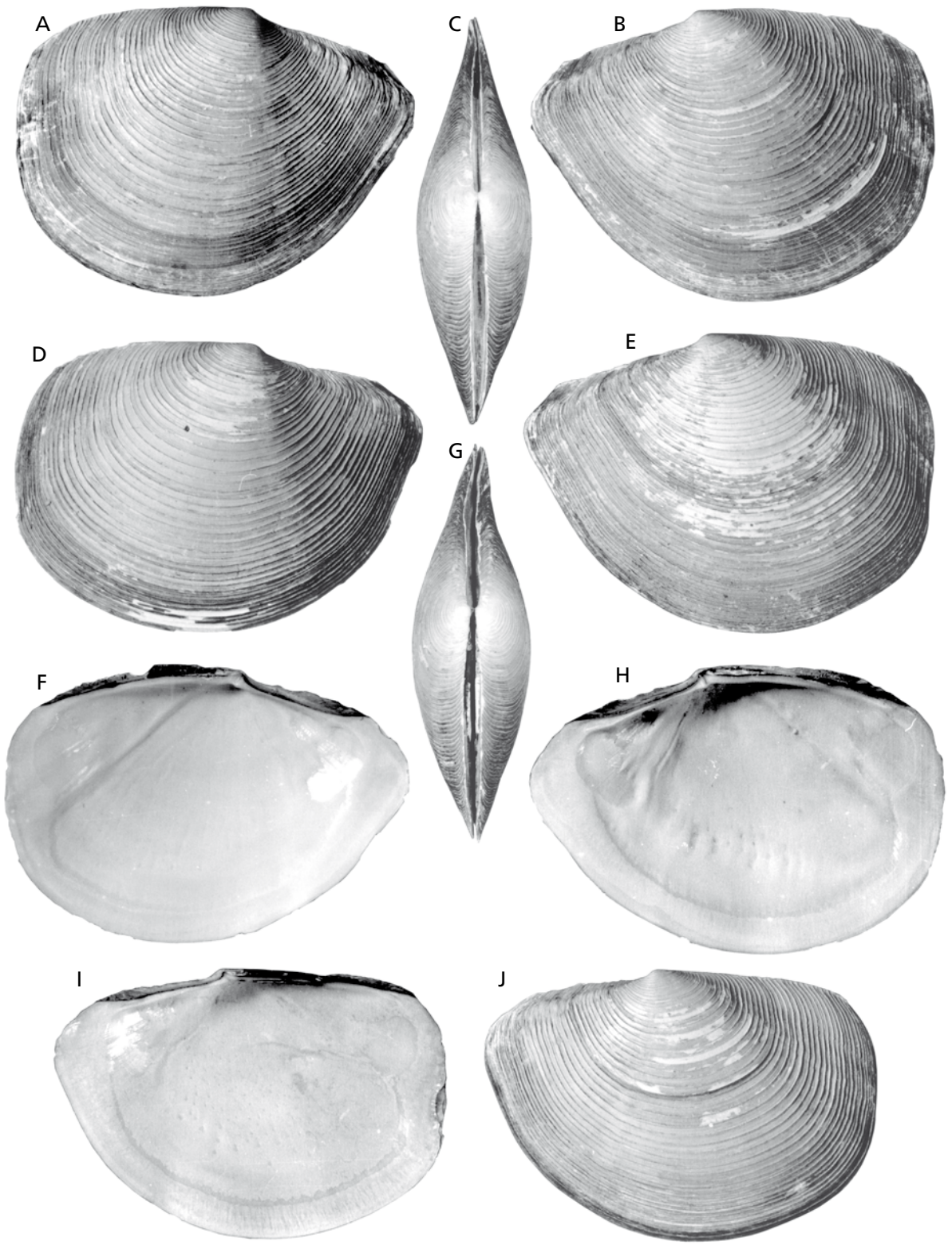

FIG. 30. *Rostrilucina garuda* n. sp. **A-C**, holotype MNHN 20714, 76.0 mm; **A**, ext. of rv; **B**, ext. of lv; **C**, dorsal view; **D**, associated specimen, 66.3 mm, ext. of rv; **E**, paratype MNHN 20715, 66.5 mm, ext of lv; **F-H**, paratype MNHN 20715, 69.6 mm; **F**, int. of lv; **G**, dorsal view; **H**, int of rv; **I-J**, paratype MNHN 20715, 64.5 mm; **I**, int. of rv; **J**, ext. of lv; all KARUBAR stn CP 54.

REMARKS. — *Rostrilucina garuda* is characterized by large and fairly elongate valves with a conspicuously rostrate anterior margin, a shorter anterior part, sharp keels delimiting a narrow lunule and escutcheon and the small anterior adductor scar with a very short diverging part.

ETYMOLOGY. — As the rostrate anterior part of the shell is reminiscent of a bird's wing, the species is named after the mythic bird Garuda, the state symbol of the Republic of Indonesia (noun in apposition).

Rostrilucina anterostrata n. sp.

Figs 31A-H, 32B, 33

TYPE MATERIAL. — Holotype, sh (50.6 x 36.8 x 19.1 mm) MNHN 20716, 3 paratypes (1 juv. dried spm, 1 sh, 1 lv) MNHN 20717.

TYPE LOCALITY. — Central Philippines, N of Mindoro, 13°39'N, 120°43'E, 520-550 m [MUSORSTOM 2: stn CP 25].

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 2: stn CP 24, 13°37'N, 120°42'E, 640-647 m, 2 juv. dried spm (32.7 x 24.6 x 10.8, 22.7 x 16.5 x 7.1 mm), 1 chipped rv (52.5 x 39.8 mm), 1 fragm; stn CP 25, 13°39'N, 120°43'E, 520-550 m, 2 sh (holotype; paratype 27.3 x 20.0 x 8.0 mm), 1 juv. dried spm (paratype 16.0 x 11.1 x 4.6 mm), 1 lv (paratype 55.5 x 41.6 mm).

DISTRIBUTION. — Central Philippines, in 550 to 640 m.

DESCRIPTION. — Shell medium-sized, up to 55 mm long, very thick and solid, inequilateral, nearly equivalve, rather inflated, elongate, (l/h 1.3-1.4), ovate-rostrate. Beaks in front of the vertical midline, in the holotype by 5.5 mm. Anterior part triangular-rostrate, anterior margin pointed. Posterior part broad, posterior margin rounded-truncate, in its middle vertical section nearly straight. Antero-dorsal margin slightly concave, postero-dorsal margin convex. Ventral margin well rounded, antero-ventral margin in adult specimens nearly straight, ventral margin in juvenile specimens more evenly rounded than in adults.

Exterior with numerous fine, dense, regular commarginal lamellae, which on the early (umbonal) and middle region of the valves are evenly spaced, becoming more dense ventrally and nearly touching each other close to the margin. Postero-dorsal slope not convex with a very shallow and broad radial depression, separated from the rest of the valve by the weak, rounded posterior angle. Antero-dorsal angle close to the antero-dorsal margin and more pronounced.

Hinge plate strong, protruding laterally into the lunular area in the left valve in front of the beaks, in the right valve placed slightly back to make space for the left valve. Left valve with a very weakly developed vestige of a cardinal or no cardinal at all, an anterior lateral and a weakly developed or sometimes missing posterior lateral. Right valve with 1 thin cardinal, a short and rather strong anterior lateral and a small posterior lateral. Lunule and escutcheon very deeply sunken, lunule asymmetric, in the left valve broader and in the right valve very narrow and hardly visible in dorsal view. Anterior adductor scar small, with very short diverging part, pallial line meeting the scar below its middle. Impression of the pallial blood vessel not visible. Inside punctate, with very few small pits. Inner margin of valves smooth.

Valves entirely white. Periostracum thin, brownish, not translucent, slightly wrinkled near the margins.

REMARKS. — This species is quite thick and heavy for its size. In general shape and outline, the only similar species is *Rostrilucina garuda*, and both species share the small anterior adductor scar with a very short diverging part. *Rostrilucina anterostrata* has a less convex antero-ventral margin, which makes the anterior part appear more rostrate. *R. garuda* is considerably larger, thinner-shelled and more compressed than *R. anterostrata*, the hinge plate is thinner and almost straight to slightly convex behind the umbones, whereas in *R. anterostrata* the hinge plate is bent. The

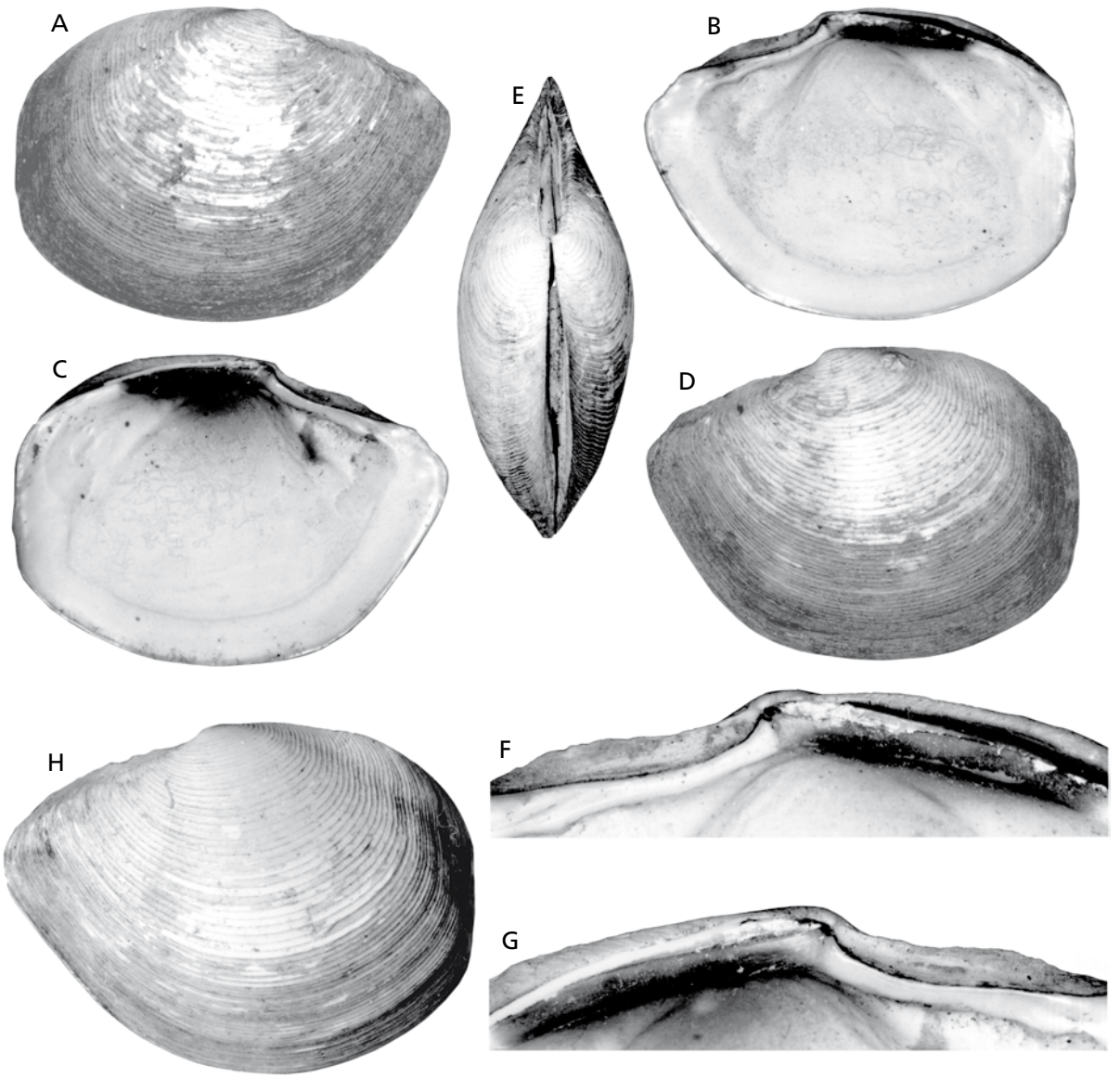

FIG. 31. *Rostrilucina anterostrata* n. sp. **A-E**, holotype MNHN 20716, 50.6 mm; **A**, ext. of rv; **B**, int. of rv.; **C**, int of lv.; **D**, ext. of lv; **E**, dorsal view; **F-G**, holotype, close-up of hinge line; **H**, paratype MNHN 20717, MUSORSTOM 2 stn CP 25, 55.5 mm.

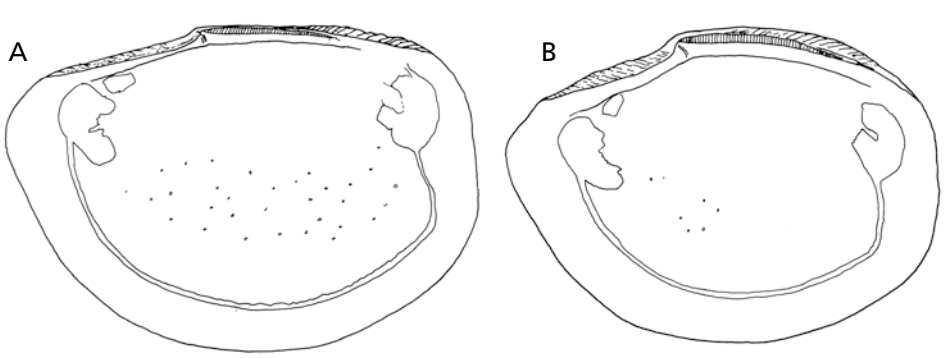

FIG. 32. *Rostrilucina* spp., outline drawings of the insides of valves. **A**, *Rostrilucina garuda* n. sp., paratype MNHN 20715. **B**, *Rostrilucina anterostrata* n. sp., holotype MNHN 20716.

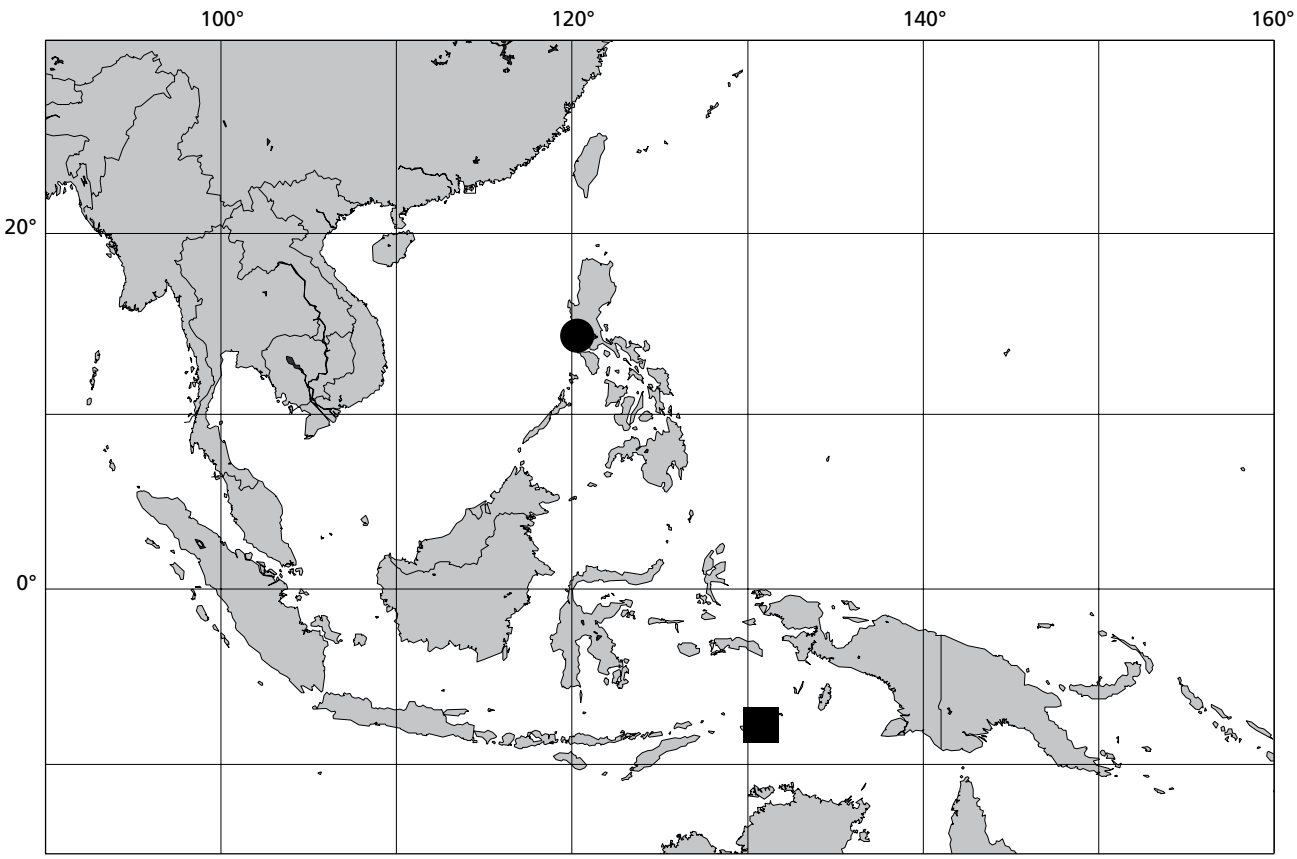

FIG. 33. Distribution of *Rostrilucina*. Circle: *R. anterostrata*. Square: *R. garuda*.

postero-dorsal corner of *R. anterostrata* is less narrowly rounded than in *R. garuda*. The commarginal sculpture in *R. anterostrata* is denser and the lunule more asymmetric. Juvenile specimens are very close and more difficult to distinguish, but can be separated by the more rounded postero-dorsal corner in *R. anterostrata*. A few individuals of *R. garuda* may approach *R. anterostrata* as they exhibit a somewhat more rounded antero-dorsal corner and a slightly more bent posterior hinge plate than is typical. However, size, tumidity, the lighter shell and the even higher postero-dorsal corner clearly identify them as *R. garuda*.

ETYMOLOGY. — In reference to the characteristically tapering anterior margin.

Genus ***LUCINOMA*** Dall, 1901

Type species: *Lucina filosa* Stimpson, 1851, by original designation; east coast of North America.

Many species, distributed worldwide, shallow to very deep.

DIAGNOSIS. — Shells medium-sized to very large, rather thick and heavy, very variable in outline, but in general sub-circular to somewhat angulate, and also almost circular to even short-oval. Anterior margin broadly rounded to more or less pointed. Umbones in front of the vertical midline. Surface with more or less pronounced commarginal ribs

or lamellae with finer threads between them. Hinge with two well developed, often bifid cardinals in each valve and a small anterior lateral and often a small posterior lateral knob. Ventral part of anterior adductor scar diverging from the pallial line very long and more or less narrow. Angle between base of diverging part and pallial line very large, between about 30° and 50°. Pallial line entire. Scar of the pallial blood vessel generally visible.

REMARKS. – The genus *Lucinoma* has very recently been reviewed by Oliver & Holmes (2006: 70-75) who listed 21 described and named Recent species and divided them into four different "informal" groups by shell morphology. With those described herein and by Cosel (2006), the number of named species of *Lucinoma* goes up to 29. The genus is one of, if not the most, species-rich genera in Lucinidae. The species, especially the tropical ones, pose thorny identification problems, and assigning a name to them is extremely difficult. One reason for this difficulty is that often only one or very few specimens of a morphological entity are available, frequently only as single valves. Furthermore, two or more "morphospecies" often superficially resemble each other, and without more than one or two specimens or valves on hand, it is often not possible to say if the differences are constant or if they fall into the variability of one species. On the other hand, in cases where many specimens from one locality are available, some of them may show considerable differences from others, but all kinds of intermediates are often present. Species differences often appear minimal but are constant and clearly visible on closer examination.

An example of the problems just mentioned is given here (see also Okutani & Hashimoto 1997). The specimens figured as "*Lucinoma yoshidai* Habe" in six publications seem to belong to at least three different species: one species in Habe (1961, 1964), Okutani (1962) and Habe (1975); one species in Kuroda, Habe & Oyama (1971); and a third species in Habe (1981) and Okutani, Tagawa & Horikawa (1988), these last two being still slightly different from each other. This example illustrates well the taxonomic and identification problems in *Lucinoma*. The figured specimens differ in shell outline, prominence of beaks and density of the commarginal lamellae.

The eight larger species (20 mm and more, including the two worn valves mentioned earlier) present in the material dealt with herein, are no exception. Moreover, in the sparse literature, including the original descriptions, the illustrations of the valves are often restricted to exterior views, and examination of museum material revealed that sometimes obviously different species were figured under the same name or were misidentified. One of these species, *Lucinoma sibogae*, is described here as new.

Because of insufficient material, two of the species treated herein could not be properly identified.

Lucinoma taiwanensis n. sp.

Figs 34A-H, 35A-C, 44

Lucinoma yoshidai - Lee 2001: 53, 61, fig. 109 [*non* Habe, 1958b].

TYPE MATERIAL. – Holotype, sh (76.5 x 73.3 x 39.1 mm) NMNS-4523-001, 1 paratype (sh) NMNS-4523-002, 3 paratypes (2 sh, 1 rv) MNHN 20718-20719, 1 paratype (sh) NSMT.

TYPE LOCALITY. – NE coast of Taiwan, off Tashi, Tashi fishing ground, near Kueishan Island (Turtle Mountain Island), 24°55.8'N, 122°05.7'E, 269-360 m [TAIWAN 2001: stn CP 95].

MATERIAL EXAMINED. – **Taiwan**. TAIWAN 2001: stn CP 68, NE coast, off Tashi, 24°50'N, 122°01'E, 370 m, 2 rv, 2 lv (78.0 x 69.8, 72.2 x 65.8 mm, 68.1 x 62.9, 36.8 x 33.6 mm); stn CP 77, 24°54°N, 122°03'E, 360 m, 1 half grown sh, 3 juv. rv, 1 juv. lv (45.0 x 42.3 x 20.3, 37.0 x 35.0, 29.5 x 26.6, 19.7 x 17.1 mm); stn CP 81, 24°51'N, 122°00'E, 205 m, 1 sh, 1 rv (paratypes 69.0 x 60.0 x 34.9, 69.4 x 62.3 mm, MNHN 20718), 1 sh (paratype 71.2 x 63.8 x 37.0 mm, NSMT); stn CP 95, 24°56'N, 122°06'E, 269-360 m, 2 sh, (holotype; paratype 70.0 x 64.8 x 37.9 mm, NMNS); stn CP 101, 24°48'N, 122°07'E, 248-257

m, 1 old rv (70.7 x 63.0 mm); stn CP 106, 24°51'N, 122°05'E, 650-800 m, 1 rv (76.7 x 66.2 mm); stn CP 109, 24°48'N, 122°84'E, 246-256 m, 1 rv; stn CP 110, 24°48'N, 122°04'E, 316-350 m, 1 sh (paratype 79.6 x 70.5 x 39.1 mm, MNHN 20719); stn CP 115, 24°54'N, 122°02'E, 381-440 m, 1 old rv (54.6 x 53.4 mm).

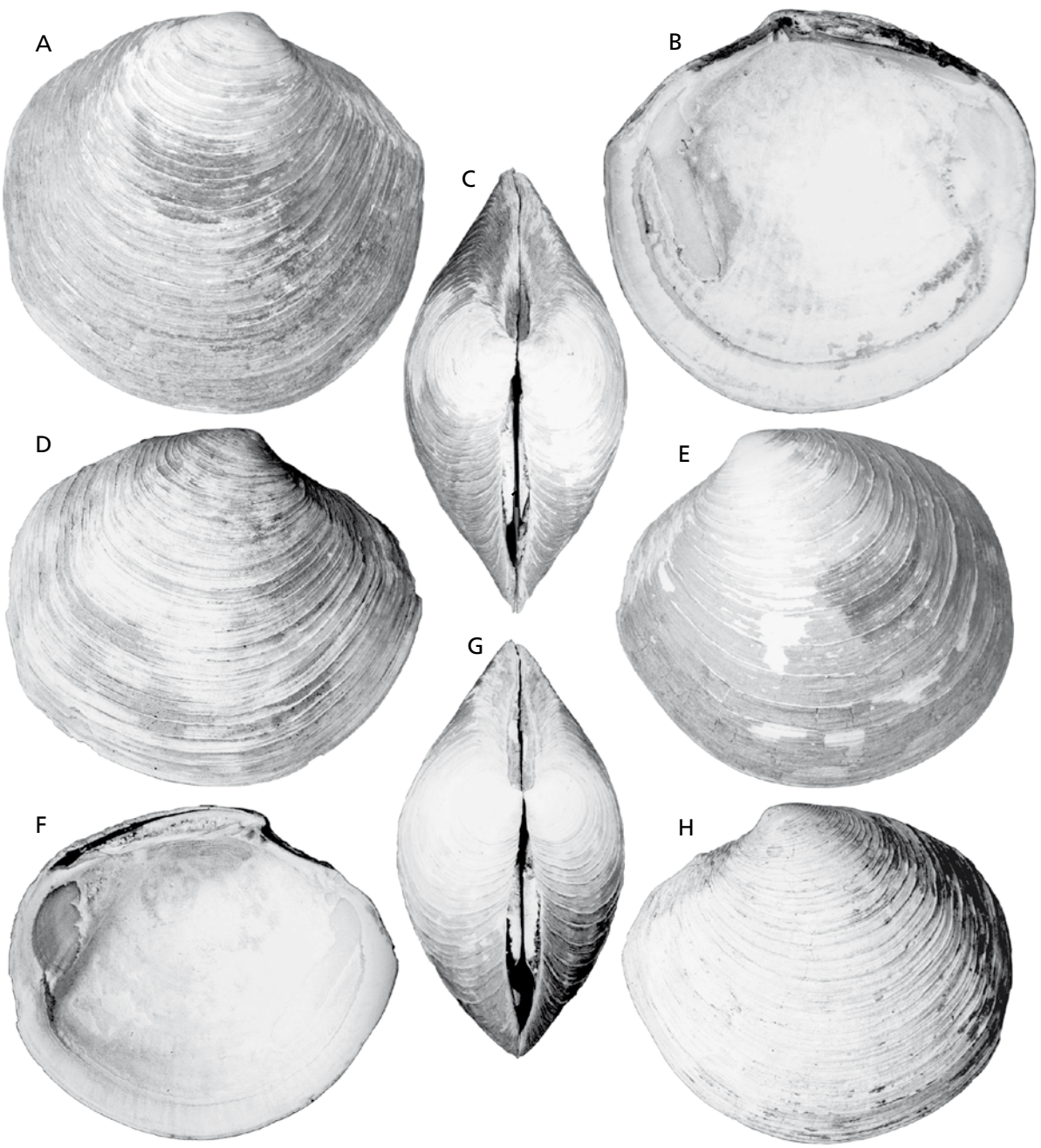

FIG. 34. *Lucinoma taiwanensis* n. sp. **A-C**, holotype NMNS-4523-001, 76.5 mm; **A**, ext. of rv; **B**, int. of rv; **C**, dorsal view; **D**, TAIWAN 2001 stn CP 106, 76.7 mm, ext. of rv; **E**, paratype NMNS-4523-002, TAIWAN 2001 stn CP 95, 70.0 mm, ext. of lv; **F-H**, paratype MNHN 20718, TAIWAN 2001 stn CP 81, 69.0 mm; **F**, int. of lv; **G**, dorsal view; **H**, ext. of lv.

DISTRIBUTION. – Only known from the Tashi vent area, off the northeast coast of Taiwan, near Kueishan Island in 205-650 m (shells only; one valve deeper, in 650-800m). This area is characterized by the presence of hydrothermal vents. The species was trawled together with *Meganodontia acetabulum* Bouchet & Cosel, 2004 (see below) and/or cold seeps (Cosel in press).

DESCRIPTION. – Shell large, up to 80 mm long, rather thick and solid, subcircular, slightly longer than high (l/h 1.1), somewhat variable in outline, inequilateral, equivalve, moderately inflated. Beaks just in front of the vertical midline. Anterior part broadly triangular-rostrate, antero-dorsal margin in the lunular area concave. Postero-dorsal margin convex, posterior margin vertically or slightly obliquely truncated, sometimes somewhat convex, occasionally with a shallow indentation on the lower section. Postero-dorsal corner broadly rounded. Ventral margin well and evenly rounded.

Exterior with irregular and more or less widely spaced, thin commarginal lamellae, on the earlier (umbonal) part of the valves becoming more dense and more regular. Interspaces with fine, irregular and very dense commarginal threads and growth lines. Antero-dorsal area with dense growth lines and lamellae, separated by a rounded but yet well marked angle. Postero-dorsal area visible, but separated only by a very shallow depression.

Hinge plate rather broad and arched. Right valve with 1 small anterior cardinal, 1 bifid posterior cardinal and 1 small, knob-like anterior lateral, no posterior lateral. Left valve with 1 anterior bifid, 1 posterior simple cardinal and 1 knob-like anterior lateral, no posterior lateral. Lunule narrow, slightly asymmetric, on the left valve somewhat broader

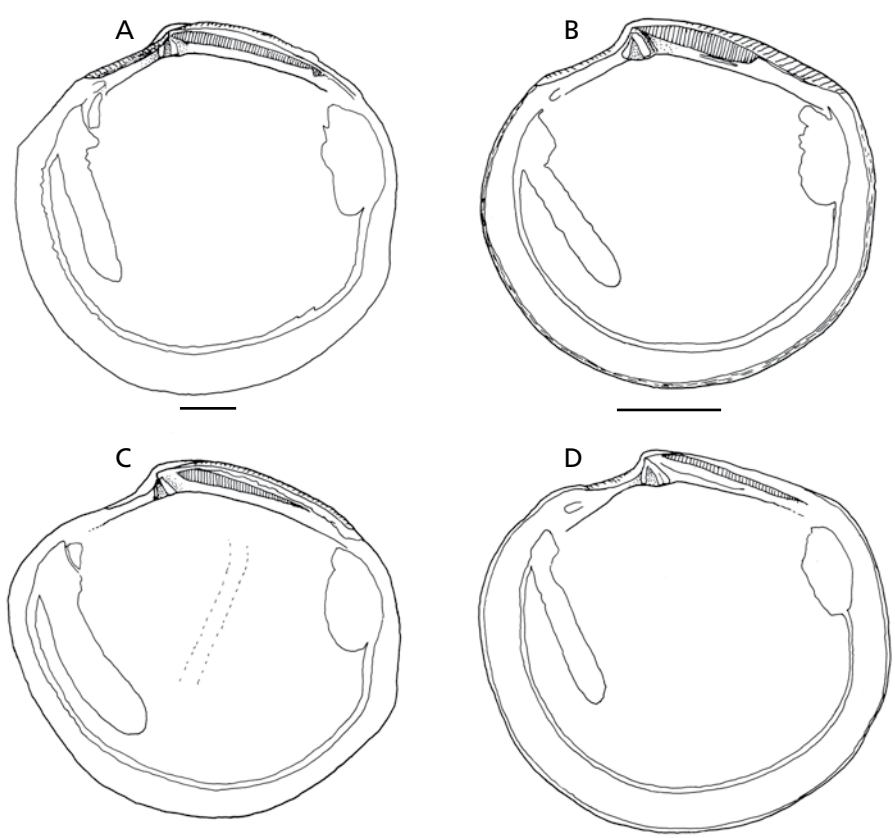

FiG. 35. *Lucinoma* spp. (1), outline drawings of the insides of valves. **A**, *Lucinoma taiwanensis* n. sp., holotype NMNS-4523-001. **B**, *Lucinoma taiwanensis*, TAIWAN 2001 stn CP 77. **C**, *Lucinoma taiwanensis*, TAIWAN 2001 stn CP 110. **D**, *Lucina annulata* Reeve, 1850, syntype BMNH 1963 121/1.

than on the right valve. Escutcheon narrow, lunule and escutcheon deeply sunken. Anterior adductor scar long and narrow, with very long diverging part close to the pallial line, pallial line meeting the scar in its dorsalmost fourth. Impression of the pallial blood vessel faintly visible, oblique and straight. Inner margin of valves smooth.

Valves dirty whitish. Periostracum dark brownish and dull, eroded on the umbonal (earlier) part of the valves.

REMARKS. — *Lucinoma taiwanensis* is characterized by its very large size, the more or less irregularly spaced commarginal lamellae, the rather broad anterior adductor scar and the tumid shell. Within these limits, it is quite variable, and at a first glance, *L. taiwanensis* would fall within the range of variation of *Lucinoma yoshidai* Habe, 1958, from Japan, if interpreted according to figs 19-25 in Okutani & Hashimoto (1997). These figures show considerable variability in size and form (outline) of the species, with some of the figured specimens very close or almost identical to the new species. Lee (2001: fig. 109) figured as "*L. yoshidai*" a 75 mm left valve of the new species, from 100-150 m. The holotype of *L. yoshidai*, figured by Higo *et al.* (2001: 160), however, is smaller and looks rather different (see Fig. 41B), with more densely spaced lamellae and a much less circular and more angular outline. Okutani & Hashimoto (1997: 277) stated that "this species undergoes remarkable transformation of shell outline with growth". In contrast, the available material of *L. taiwanensis* shows that juvenile and half-grown specimens of this species are similar in shell outline to the adult specimens and that they are well differentiated from the holotype of *L. yoshidai* at the same size. Also, the hinge margin of the holotype of *L. yoshidai* is narrower and finer than that of an even smaller *L. taiwanensis*. On these grounds and because of the almost uniform very large shell size, we separate the Taiwanese material and describe it as new.

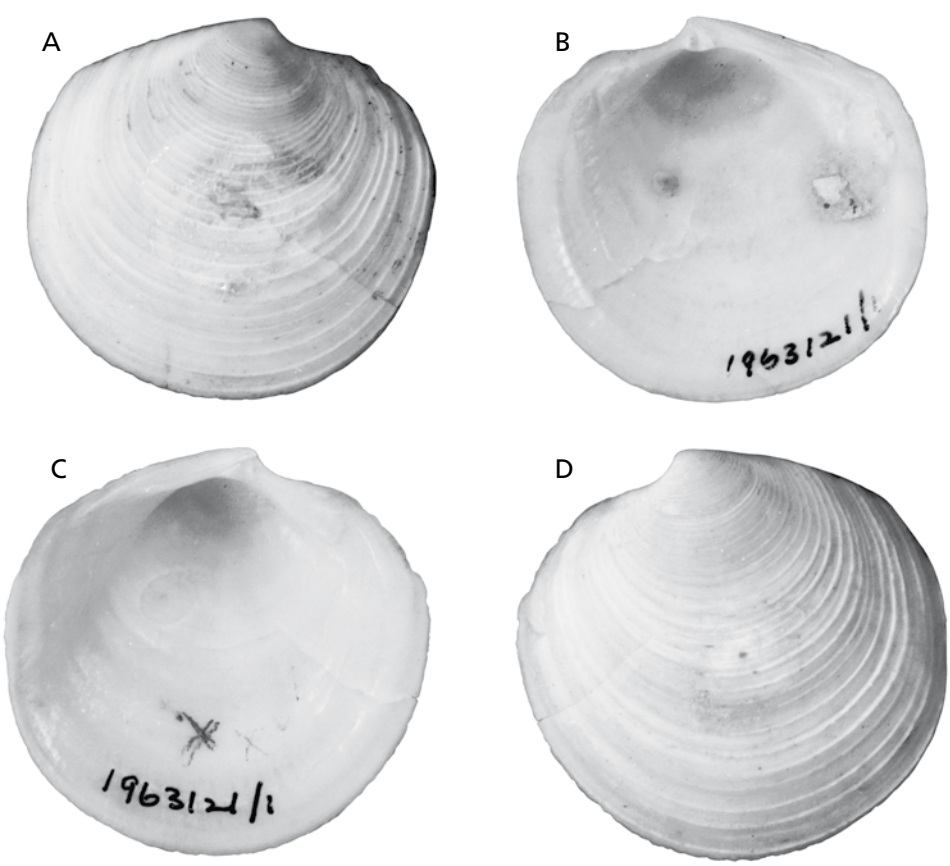

FIG. 36. *Lucina annulata* Reeve, 1850. **A-B**, lectotype BMNH 1963/21/1, 27.1 mm; **A**, ext. of rv; **B**, int. of rv; **C-D**, paralectotype BMNH 1963/21/1, 28.2 mm; **C**, int. of lv; **D**, ext. of lv.

Lucinoma gagei Oliver & Holmes, 2006 has a similar outline but does not attain the size of *L. taiwanensis* and has a much smaller anterior adductor scar in relation to shell size. Another similar species is *Lucinoma annulata* (Reeve, 1850), as figured by Reeve (1850), Okutani *et al.* (1988) and Okutani (2000), which was synonymized with *Lucina acutilineata* Conrad, 1849 by Okutani & Hashimoto (1997). The type lot of *Lucina annulata* in BMNH consists of a complete shell of one species and two single valves of another species. The complete shell with a predominantly smooth surface (BMNH 1963121/2) was identified as *Pseudomiltha floridana* (Conrad, 1833) by Myra Keen (label in BMNH) and is definitely not a *Lucinoma*. However, the two single valves (Figs 36A-D), a right and a left valve (BMNH 1963121/1, locality "California"), are indeed *Lucinoma*, and to avoid confusion, the slightly smaller right valve (27.3 x 25.5 mm) (Figs 35D, 36A-B) is here selected as the lectotype of *Lucina annulata*. It differs from *L. taiwanensis* by its much smaller size, and the narrower diverging part of the anterior adductor scar, more distant from the anterior pallial line. The shell of *L. annulata* is more circular and has denser lamellae; the hinge margin is also less convex.

ETYMOLOGY. – After the island of Taiwan, where the type locality is situated.

Lucinoma dulcinea n. sp.

Figs 37A-B, 41A, 44

TYPE MATERIAL. – Holotype, rv (38.2 x 33.3 mm) MNHN 20720, 2 paratypes (1 juv. sh, 23.9 x 21.2 x 8.6 mm, 1 lv, 23.9 x 20.7 mm) MNHN 20721.

TYPE LOCALITY. – Central Philippines, Leyte, NW of San Isidro, 11°12'N, 124°15'E, 379-383 m [MUSORSTOM 3: stn CP 144].

MATERIAL EXAMINED. – The type material only.

DISTRIBUTION. – Philippines, only known from the type locality.

DESCRIPTION. – Shell medium-sized, up to 38 mm long, thin but solid, subcircular, longer than high (l/h 1.1), inequilateral, equivalve, moderately inflated. Beaks just in front of the vertical midline, in the largest specimen 4 mm in front. Anterior part broadly triangular-rostrate, antero-dorsal margin in the lunular area concave. Postero-dorsal margin straight to slightly concave, posterior margin obliquely truncated, with a rounded postero-dorsal corner. Ventral margin well and evenly rounded.

Exterior with conspicuous, prominent, regular, thin and delicate commarginal lamellae (22 in the largest specimen, 19 and 20 in the other two specimens), which on the earlier (umbonal) part are denser than on the marginal part of the valves. Interspaces with fine irregular commarginal undulations and growth lines. The earliest 2.5 mm on the umbonal region of the valves with tiny and much closer commarginal lamellae that suddenly change to the wide-spaced lamellae on the rest of the shell. Antero-dorsal area with several lamellae intercalated between those present on the rest of the shell. Postero-dorsal area visible, but hardly separated.

Hinge plate narrow, right valve with 1 small anterior cardinal, 1 bifid posterior cardinal and 1 small, knob-like anterior lateral, no posterior lateral. Left valve with 1 anterior bifid, 1 posterior simple cardinal and 1 knob-like anterior lateral, no posterior lateral. Lunule narrow, only very slightly asymmetric, escutcheon narrow, gaping behind the ligament, both only slightly sunken. Anterior adductor scar long and narrow, with very long diverging part, pallial line meeting the scar in its dorsalmost fourth. Pallial line entire. Impression of the pallial blood vessel slightly S-shaped. Inner margin of valves smooth.

Valves entirely white. Periostracum very thin, translucent and colourless.

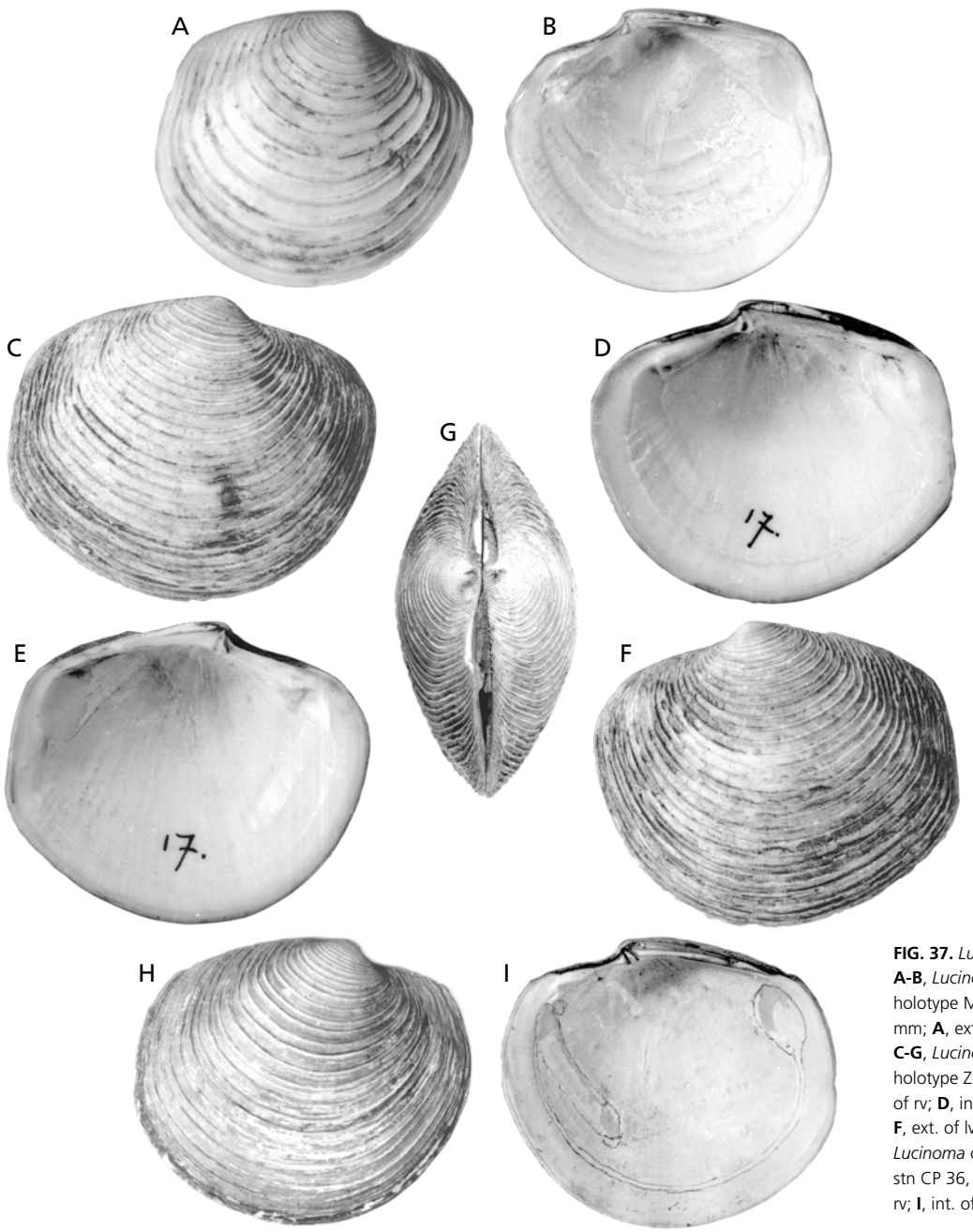

FIG. 37. *Lucinoma* spp. **A-B**, *Lucinoma dulcinea* n. sp., holotype MNHN 20720, 38.2 mm; **A**, ext. of rv; **B**, int. of rv. **C-G**, *Lucinoma sibogae* n. sp., holotype ZMA, 52.2 mm; **C**, ext. of rv; **D**, int. of rv; **E**, int. of lv; **F**, ext. of lv; **G**, dorsal view. **H-I**, *Lucinoma* cf. *sibogae*, KARUBAR stn CP 36, 47.2 mm; **H**, ext. of rv; **I**, int. of lv.

REMARKS. – *Lucinoma dulcinea* most resembles *L. yoshidai* Habe, 1958 (see Fig. 41B); however, *L. yoshidai* is somewhat higher, has much more densely spaced commarginal lamellae and a shorter and broader diverging part of the anterior adductor scar.

ETYMOLOGY. – Dulcinea (full name: Dulcinea de Toboso) was the "girlfriend" of Don Quixote in Cervantes' famous novel. The name is given to this *Lucinoma* because of the nice and clean aspect of this species with the delicate lamellae, in contrast to most other lucinid species (noun in apposition).

Lucinoma sibogae n. sp.

Figs 37C-G, 41B, 44

TYPE MATERIAL. – Holotype, fresh sh, most probably live-collected or at least fresh dead with remains of the animal (52.2 x 44.0 x 25.5 mm), ZMA.

TYPE LOCALITY. – Indonesia, between Bali and Kangeang Island, 7°28.5'S, 115°28'E, 1060 m [*Siboga* stn 17].

MATERIAL EXAMINED. – Only known from the holotype.

DISTRIBUTION. – Indonesia, north of Bali, only known from the type locality.

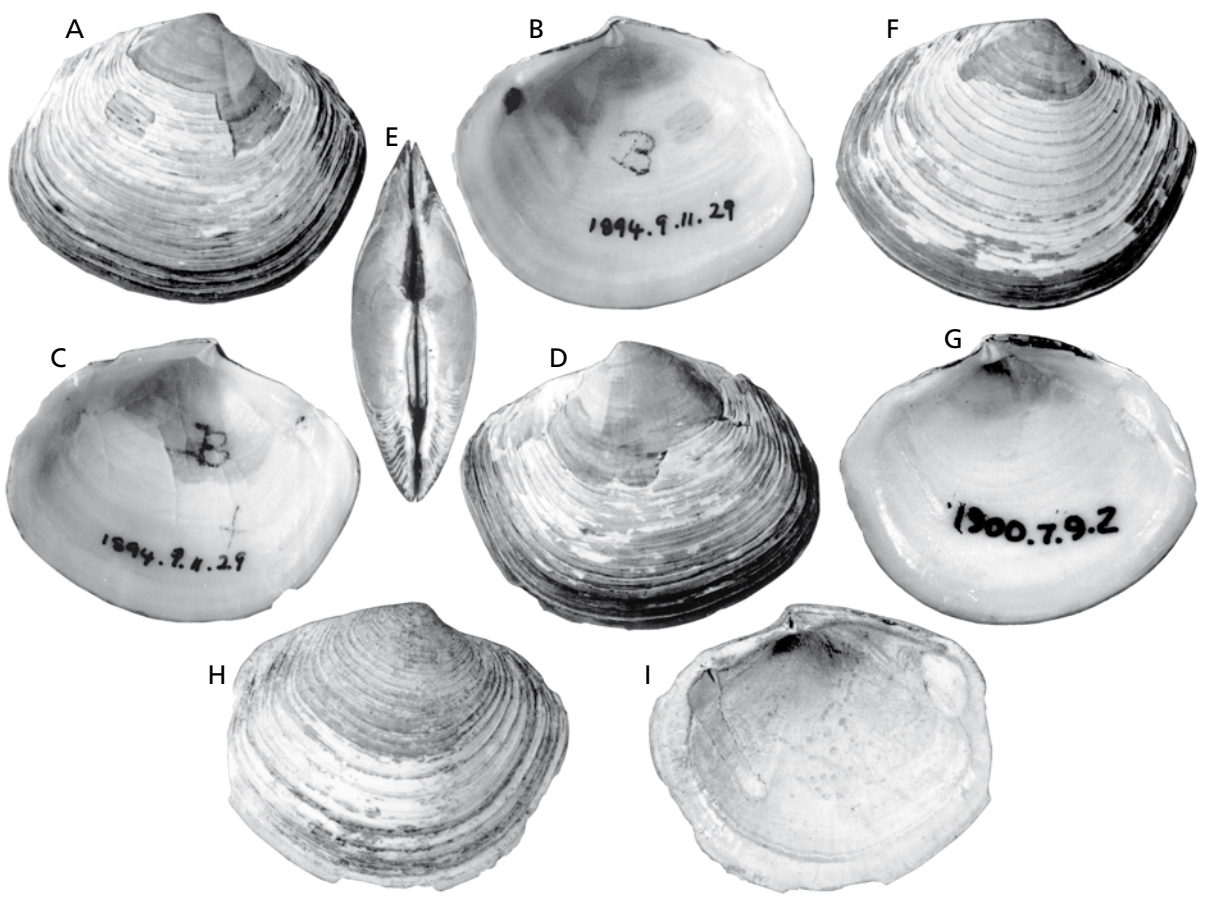

FIG. 38. *Lucinoma* spp. **A-E**, *Lucina bengalensis* E. A. Smith, 1894, paratype BMNH 1894.9.11.29, 35.5 mm, *Investigator*; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal view; **F-G**, paratype BMNH 1900.7.9.2, 35.0 mm, *Investigator*; **F**, ext. of rv; **G**, int of rv. **H-I**, *Lucinoma gagei* Oliver & Holmes, 2006, mentioned specimen (Knudsen 1967: 285, pl. 2, fig. 10) of "*L. bengalensis*", *John Murray* Expedition, stn 42, S Arabian coast, 17°26'N, 55°49'E, 1415 m, 33.5 mm; **H**, ext. of rv; **I**, int. of rv.

DESCRIPTION. – Shell rather large, 52 mm long, thick and solid, prolonged-subcircular (l/h 1.2), inequilateral, equivalve, inflated. Beaks just in front of the vertical midline, in the holotype 5.5 mm in front. Anterior part broadly and indistinctly triangular, dorsal section of anterior margin well rounded, posterior margin obliquely truncated, with rounded corners. Antero-dorsal margin rather short and straight, lunular area not distinct. Postero-dorsal margin very slightly convex. Ventral margin well rounded, nearly semicircular.

Exterior with thin, prominent, rather dense commarginal lamellae, which on the earlier (umbonal) 10-12 mm of the valve are thinner and very close-set, becoming wider and evenly spaced ventrally. Interspaces with very fine growth lirae only. Antero-dorsal area marked by denser commarginal lamellae, otherwise not demarcated; antero-dorsal angle absent. Postero-dorsal area visible, but posterior angle rounded and rather indistinct.

Hinge plate rather narrow but strong, with 2 cardinals and 2 knob-like laterals in the right valve. A strong anterior and a weak posterior cardinal as well as a very strong anterior and a weak posterior lateral present in the left valve. Lunule rather long and narrow, very slightly asymmetric and sunken. Anterior adductor scar narrow, with a very long diverging part, pallial line meeting the scar in its dorsalmost fifth. Inner margin of valves smooth.

Valves entirely white. Periostracum straw-coloured.

REMARKS. – This species was first reported by Prashad (1932: 162) as "*Dentilucina* (*Dentilucina*) *bengalensis* (Smith)", and on the original *Siboga* Expedition label in ZMA, the specimen is labelled as "*Phacoides* (*Dentilucina*) *bengalensis* (Smith)". This specimen looks similar to, but clearly is not that species. Prashad (1932) himself acknowledged the larger size and the "a little better developed" commarginal lamellae of the *Siboga* specimen. From the two examined paratypes of *L. bengalensis* in BMNH (Figs 38A-G, 41E-F), *L. sibogae* is distinguished in having a different outline: the antero-dorsal margin ends anteriorly in an evenly and rather broadly rounded corner, whereas in *L. bengalensis* it is divided into two parts, with a rounded corner between them and a slightly more angular anterior corner to the ventral margin. The postero-dorsal margin is longer, and the posterior margin is less oblique and more truncated than in *L. bengalensis*. The adductor scars of the new species are larger and, especially, the diverging part of the anterior adductor scar is longer and broader; lunule and escutcheon are deeper.

Lucinoma dulcinea is smaller, thinner and shorter than *L. sibogae* and has much more widely spaced commarginal lamellae and a narrower hinge plate. The antero-dorsal margin is divided into two parts with a well marked corner between them. *Lucinoma gagei* Oliver & Holmes, 2006 from the Oman margin, Arabian Sea, is higher and has a smaller anterior adductor scar.

ETYMOLOGY. – After the R/V *Siboga*, from which the new species was collected.

Lucinoma sp. cf. ***sibogae***

Figs 37H-J, 41D, 44

MATERIAL EXAMINED. – **Indonesia**. KARUBAR: stn DW 07, Kai Islands, 5°48'S, 132°21'E, 283-285 m, 2 rv (34.1 x 30.0 mm, 27.0 x [ventrally chipped]); stn DW 32, 5°47'S, 132°51'E, 170-206 m, 1 chipped rv; stn CP 36, 6°05'S, 132°44'E, mud, 210-268-m, 1 rv (47.2 x 41.1 mm).

DISTRIBUTION. – Southeast Indonesia, Kai Island region, in 206-283 m.

DESCRIPTION. – Shell 47 mm long, rather thin but solid, subcircular (l/h 1.1), inequilateral, equivalve and moderately inflated. Beaks 6 mm in front of the vertical midline. Anterior margin rather broadly rounded, posterior margin indistinctly truncated, convex, with rounded corners. Antero-dorsal margin short and nearly straight, lunular area not distinct. Postero-dorsal margin slightly convex. Ventral margin well rounded, almost semicircular.

Exterior with thin, prominent, rather dense commarginal lamellae, which on the early (umbonal) 10-12 mm of the valve are thinner and very close-set, but which become wider and more evenly spaced ventrally. Interspaces with very fine irregular growth lirae and wrinkles. Antero-dorsal area marked by dense and well-marked commarginal wrinkles and commarginal lamellae becoming absent, otherwise not separated; antero-dorsal angle absent. Shallow depression just below the antero-dorsal margin and parallel to it. Postero-dorsal area visible, separated by a very shallow radial depression.

Hinge plate rather narrow. Right valve with 2 cardinals, the posterior one bifid, a small anterior lateral and an indistinct, barely present posterior lateral. Lunule rather long, very narrow and sunken. Escutcheon extremely narrow, long and deeply sunken. Anterior adductor scar with long diverging part, pallial line meeting the scar in its dorsalmost fifth. Pallial line entire. Inner margin of valves smooth.

Valves entirely white. Periostracum straw-coloured.

REMARKS. — With only one fresh, adult valve in hand and only right valves available, we refrain from describing this species of *Lucinoma*. It is very close to *L. sibogae* but thinner-shelled, slightly stouter, with a shorter and somewhat less-sloping antero-dorsal margin and a more broadly rounded anterior margin. The posterior margin is slightly more rounded, the hinge plate narrower. The external sculpture is more or less the same as in *L. sibogae*. The Japanese *L. yoshidai* is smaller, with a higher, more arched dorsal margin and a slightly smaller diverging part of the anterior adductor scar.

Lucinoma kastoroae n. sp.

Figs 39A-F, 41G, 44

TYPE MATERIAL. — Holotype, sh (30.5 x 26.1 x 12.4 mm) MNHN 20722, 1 paratype (rv) MNHN 20723.

TYPE LOCALITY. — Indonesia, Tanimbar Islands, 8°47'S, 130°49'E, 1017-1024 m [KARUBAR: stn CP 87].

MATERIAL EXAMINED. — **Indonesia**. KARUBAR: stn CP 54, Tanimbar Islands, 8 °21'S, 131°43'E, 836-869 m, 1 chipped rv; stn CC 58, 8°19'S, 132°02'E, 457-461 m, 1 chipped rv, 1 chipped lv; stn CP 87, 8°47'S, 130°49'E, 1017-1024 m, 1 sh (holotype); stn CP 91, 8°44'S, 131°05'E, 884-891 m, 1 rv (paratype 34.6 x 28.6 mm).

DISTRIBUTION. — Tanimbar Islands, Indonesia, in 461-1017 m.

DESCRIPTION. — Shell medium-sized, 34 mm long, rather thin, subcircular-triangular (l/h 1.2), inequilateral, equivalve, moderately inflated. Beaks in front of the vertical midline. Anterior part broadly triangular and tapering, anterior margin somewhat rostrate in its dorsal section. Posterior part broadly rounded and posterior margin convex with indistinct corners. Antero-dorsal margin rather short and nearly straight, lunular area not distinct. Postero-dorsal margin almost straight. Ventral margin well rounded, its anterior part almost straight.

Exterior with thin, prominent commarginal lamellae, rather densely spaced on the early (umbonal) 10 mm of the valve, then becoming wider spaced, especially on the lower, ventral half. Interspaces with fine, shallow but distinct and quite regular growth undulations. Antero-dorsal area marked by commarginal lamellae becoming irregular and disappearing; antero-dorsal angle ill-defined. Postero-dorsal area visible and delimited by a shallow radial depression, no posterior angle.

Hinge plate rather narrow but strong. Right valve with one very thin anterior and a thin but strong posterior cardinal, a very indistinct anterior lateral and no visible posterior lateral. Left valve with a strong but narrow anterior and a very thin posterior cardinal; anterior lateral small and hardly visible; posterior lateral missing. Lunule rather long

and narrow, very slightly asymmetric and sunken. Escutcheon extremely narrow, long and deeply sunken. Adductor scars large, anterior scar with long diverging part, pallial line meeting the scar in its dorsalmost fourth. Inner margin of valves smooth.

Valves entirely white. Periostracum pale straw-coloured.

REMARKS. — *Lucinoma kastoroae* looks close in outline and sculpture to a species figured by Knudsen (1967: pl. 2, fig. 10) as "*Lucina bengalensis* E. A. Smith, 1894" (see also Figs 38H-I), which is the Arabian Gulf species *Lucinoma gagei* Oliver & Holmes, 2006. Based on comparison with the original figure of the holotype of *L. bengalensis* in Alcock & Anderson (1897: pl. 2, figs 4, 4a), and from study of the paratypes of *L. bengalensis* in BMNH (see Figs 38A-G), *L. kastoroae* differs in having a much higher postero-dorsal corner resulting in a less obliquely rounded-truncated posterior margin. The anterior part of *L. kastoroae* is more tapering, and the anterior margin more narrowly rounded. The hinge of *L. bengalensis* is about as broad and strong as in the Indonesian species, but the diverging parts of the anterior adductor scar are narrower and the adductors smaller in *L. bengalensis*. The quite variable *L. gagei* is larger and higher than *L. kastoroae* and has a more pronounced posterior area.

Lucinoma kastoroae is distinguished from *L. sibogae* by its smaller size, the less numerous commarginal striae, the thinner shell, the more tapering anterior part, the more rounded posterior margin and the different delimitation of the posterior area by a slight radial depression. The Japanese *L. yoshidai* differs in its more circular shell shape, more densely spaced lamellae, more rounded outline and a longer ligament in relation to the length of the postero-dorsal margin. *Lucinoma dulcinea* is more circular than *L. kastoroae* and has a longer and much narrower diverging part of the anterior adductor scar.

ETYMOLOGY. — Dedicated to Mrs W. W. Kastoro from the MZB–LIPI who participated in the KARUBAR cruise.

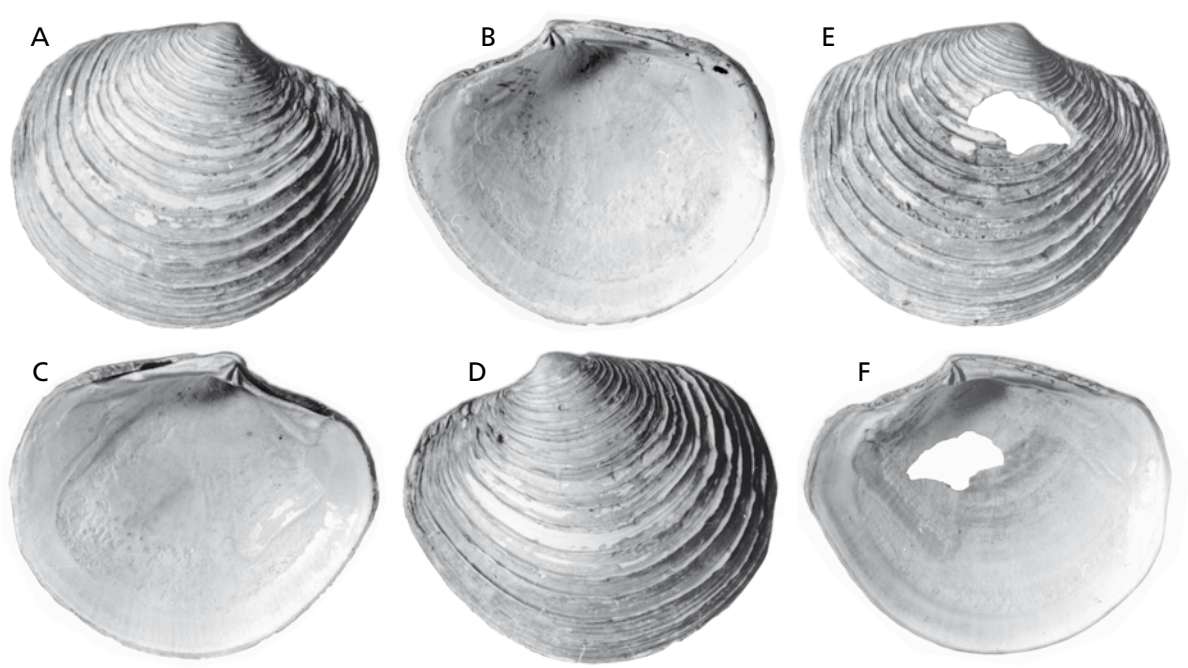

FIG. 39. *Lucinoma kastoroae* n. sp. **A-D**, holotype MNHN 20722, 30.5 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E-F**, paratype MNHN 20723, 34.6 mm;**E**, ext. of rv; **F**, int. of rv.

Lucinoma sp. 1

Figs 40A-E, 41H, 44

MATERIAL EXAMINED. – **Solomon Islands**. SALOMON 1: stn CP 1756, W of Tulagi Island, 8°52'S, 159°50'E, 497-511 m, 1 old rv, 1 old lv; stn CP 1798, N of Guadalcanal, 9°21'S, 160°29'E, 513-564 m, 1 fresh adult sh (34.2 x 29.8 x 14.8 mm), 1 juv. rv (16.6 x 14.7 mm).

DISTRIBUTION. – Only known from Solomon Islands, in 511-513 m.

DESCRIPTION. – Shell medium-sized, 34 mm long, not very thick but strong, subcircular-triangular (l/h 1.1), inequilateral, equivalve, moderately inflated. Beaks in front of the vertical midline, about 3 mm in the fresh adult specimen. Anterior part very broadly triangular, anterior margin rather narrowly rounded in its dorsal section. Posterior part broadly rounded, posterior margin somewhat truncate, with a rounded postero-dorsal corner and indistinct postero-ventral corner. Antero-dorsal margin rather short and nearly straight, lunular area not distinct. Postero-dorsal margin almost straight. Ventral margin well rounded.

Exterior with thin, prominent commarginal lamellae, densely spaced on the earlier (umbonal) 10 mm of the valve, then becoming wider spaced, especially on the lower, ventral half. Interspaces with fine, shallow but pronounced growth undulations. Commarginal lamellae becoming irregular and disappearing in the antero-dorsal area; antero-dorsal angle almost absent. Posterior area ill-defined, no visible posterior angle.

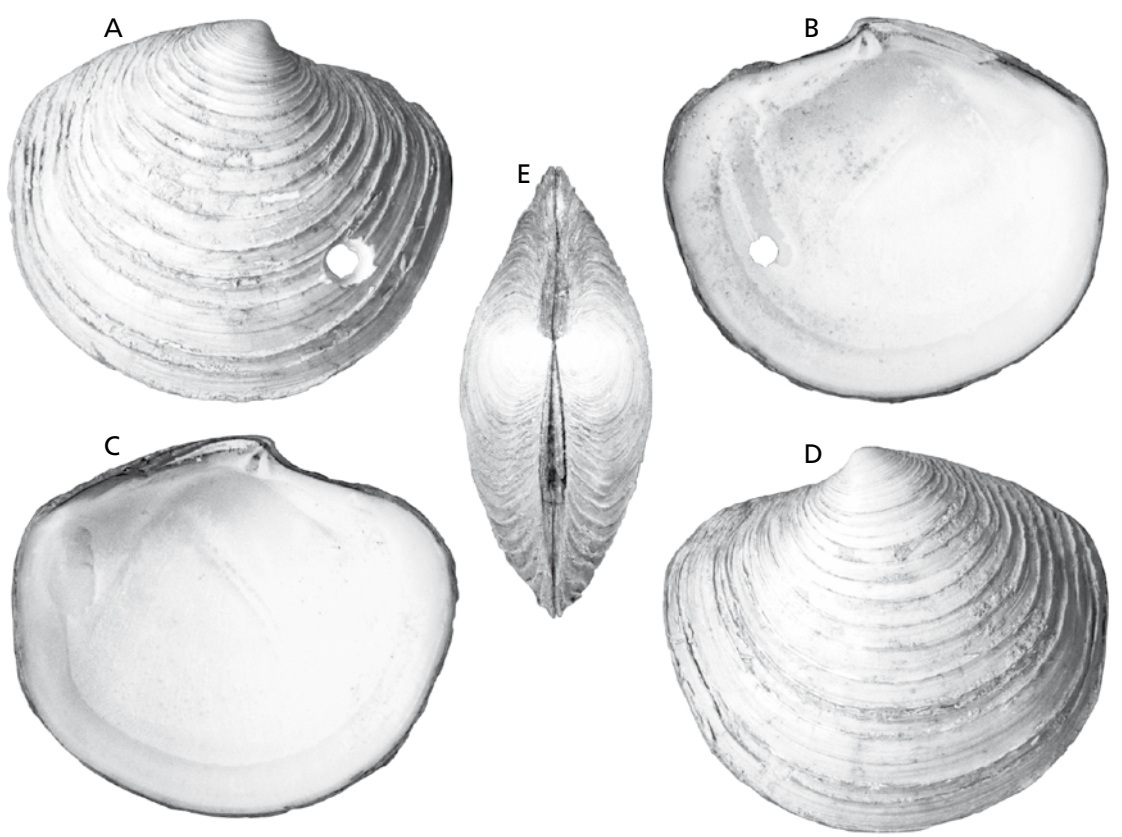

FIG. 40. *Lucinoma* sp. 1, Solomon Islands. **A-E**, SALOMON 1 stn CP 1798, 34.2 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int of lv; **D**, ext. of lv; **E**, dorsal view.

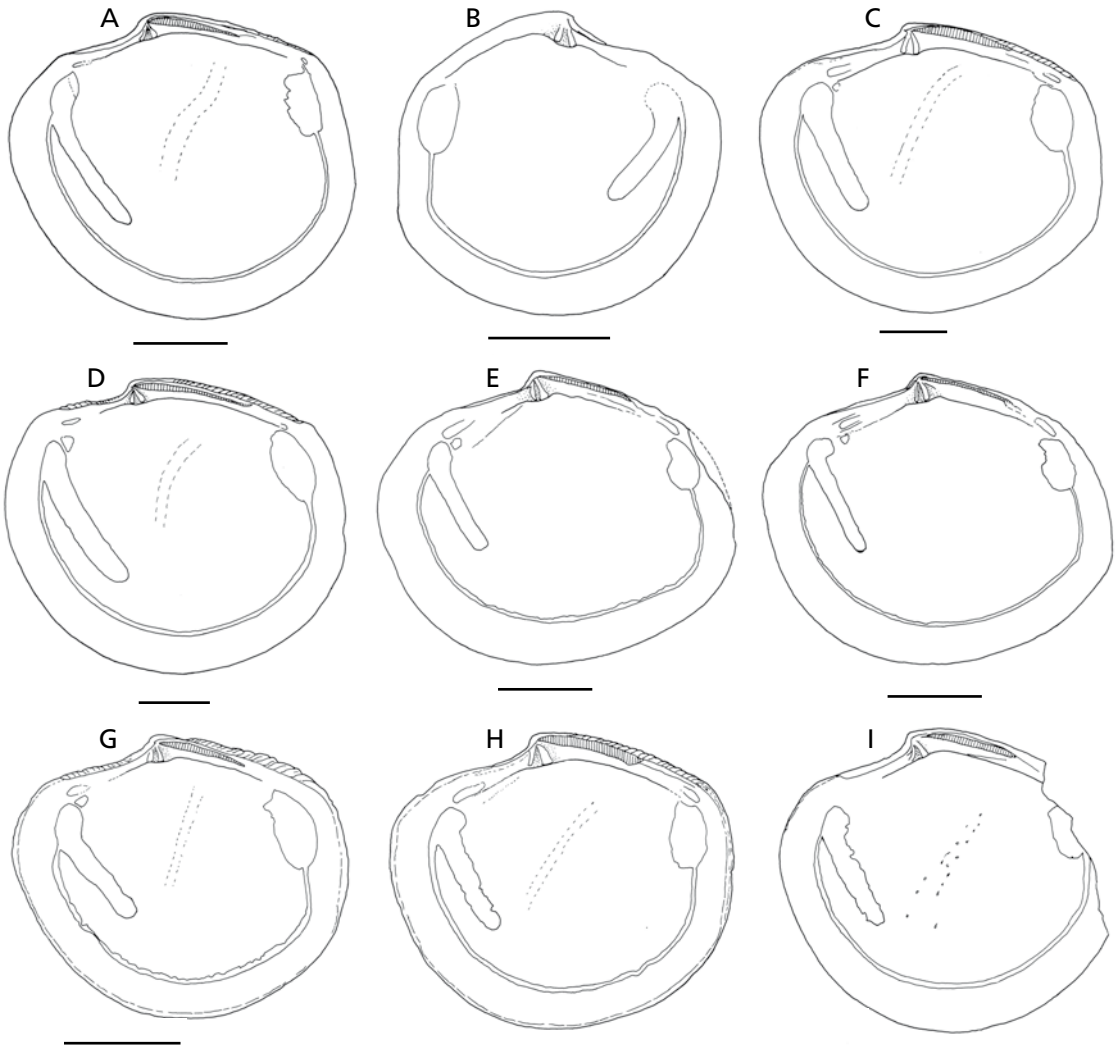

FIG. 41. *Lucinoma* spp., outline drawings of the insides of valves. **A**, *Lucinoma dulcinea* n. sp., holotype MNHN 20720. **B**, *Lucinoma yoshidai* Habe, 1958, holotype NSMT (drawn after the fig. in Higo *et al*. 2001: 160, B 604). **C**, *Lucinoma sibogae* n. sp., holotype ZMA. **D**, *Lucinoma* cf. *sibogae*, KARUBAR stn CP 36. **E**, *Lucina bengalensis* E. A. Smith, 1894, paratype BMNH 1894.9.11.29; **F**, paratype BMNH 1900.7.9.2. **G**, *Lucinoma kastoroae* n. sp., holotype MNHN 20722. **H**, *Lucinoma* sp. 1, SALOMON 1 stn CP 1798. **I**, *Lucinoma* sp 2, ESTASE stn CP 6.

Hinge plate strong, with 1 very thin anterior cardinal and a strong and rather large posterior cardinal, a rather large and strong anterior lateral and a small but distinct posterior lateral in the right valve. Left valve with a strong and moderately broad anterior and a moderately thin posterior cardinal; anterior lateral rather strong, posterior lateral a very small knob. Lunule rather long and narrow, very slightly asymmetric and sunken. Escutcheon extremely narrow, long and deeply sunken. Adductor scars large. Anterior adductor scar with long diverging part, pallial line meeting the scar in its dorsalmost fourth. Pallial line entire. Inner margin of valves smooth.

Valves entirely white. Periostracum light straw-coloured.

REMARKS. — This species is distinguished from *L. kastoroae* by its slightly shorter shell with less pointed anterior part and the stronger and slightly broader hinge plate with stronger teeth. Otherwise, both species are very similar, and we

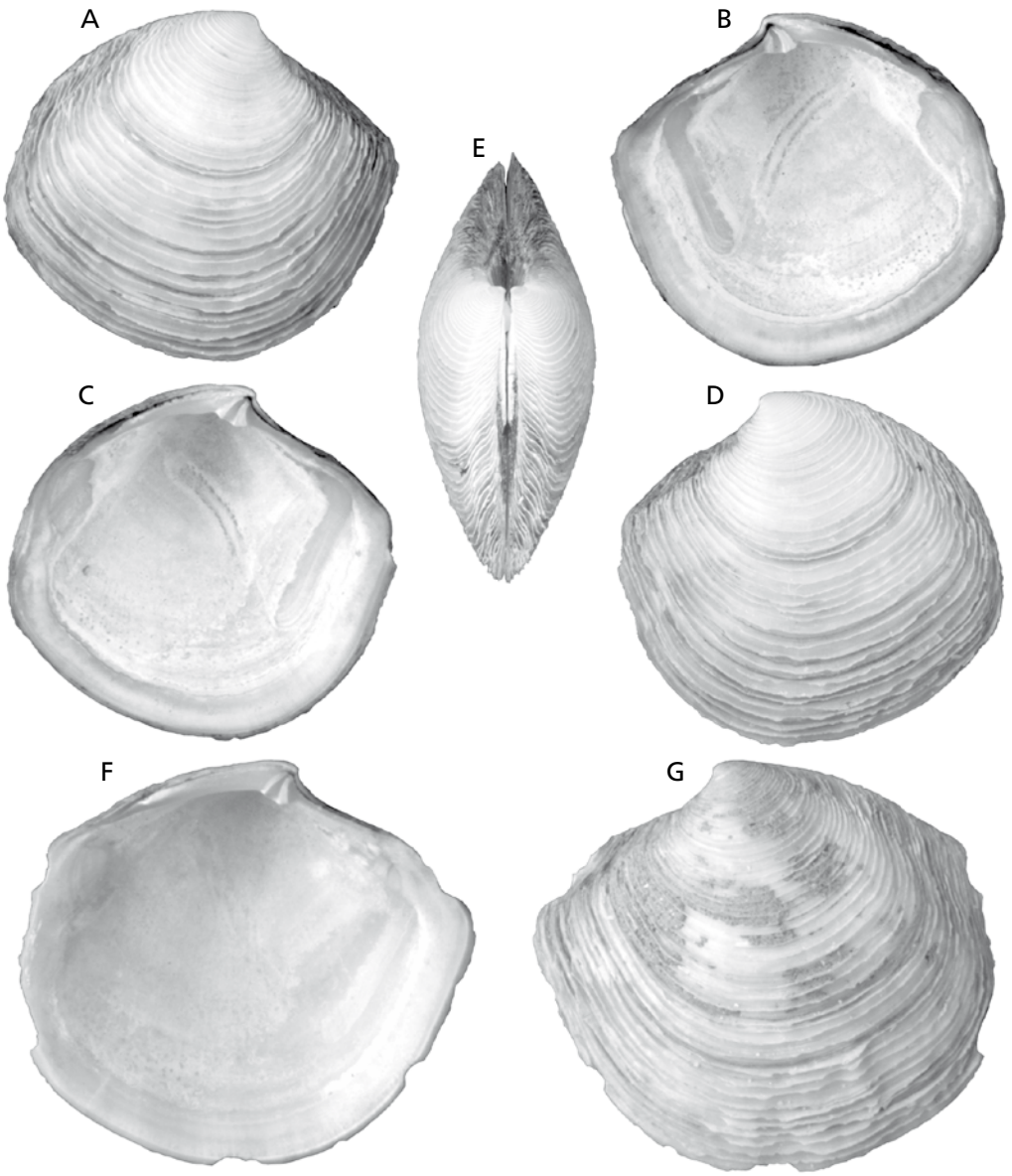

FIG. 42. *Lucinoma rhomboidalis* n. sp. **A-E**, holotype NMNS-4522-001, 24.0 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal viewv; **F-G**, paratype MNHN 20724, 28.0 mm; **F**, int. of lv; **G**, ext. of lv.

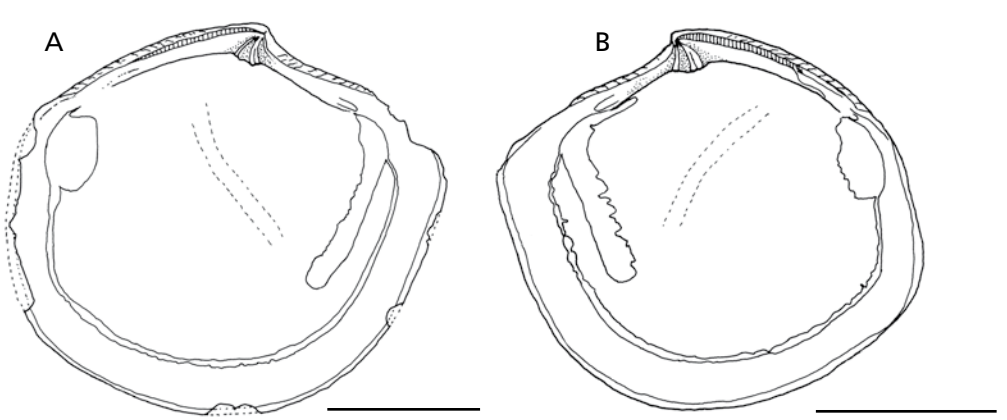

FIG. 43. *Lucinoma rhomboidalis* n. sp., outline drawings of the insides of valves. **A**, paratype MNHN 20724; **B**, holotype NMNS-4522-001.

refrain for the moment from naming the Solomon Islands species until more material becomes available. The smaller right valve mentioned above is more rostrate anteriorly and has denser and more delicate commarginal lamellae. It may belong to another species.

A slightly chipped single valve of a similar looking *Lucinoma* (*Lucinoma* sp 2, Fig. 41I) was taken in the Philippines (Sulu Archipelago, SW of Tawitawi, 4°38'N, 119°49'E, 2570 m, cruise ESTASE 2: stn CP 6).

Lucinoma rhomboidalis n. sp.

Figs 42A-G, 43A-B, 44

TYPE MATERIAL. – Holotype, sh (24.0 x 21.2 x 9.7 mm) NMNS-4522-001, 1 paratype, lv (28.0 x 25.2 mm) MNHN 20724.

TYPE LOCALITY. – South China Sea, southern Taiwan, southwest of Kaohsiung, 22°17'N, 119°15'E, 377 m [TAIWAN 2000: stn DW 15].

MATERIAL EXAMINED. – Only known from the type material.

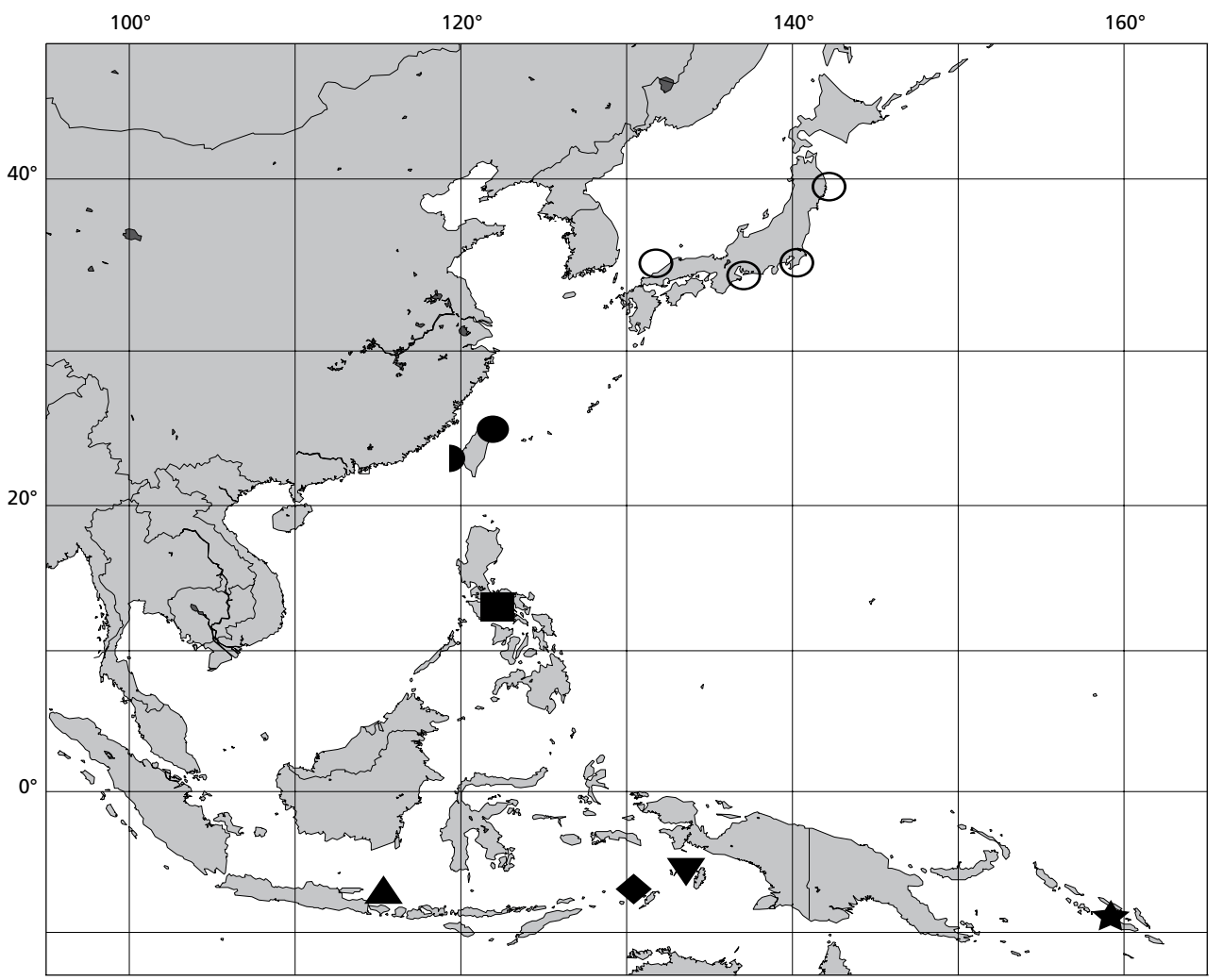

FIG. 44. Distribution of *Lucinoma*. Circle: *L. taiwanensis*. Empty circle: *L. yoshidai*. Square: *L. dulcinea*. Triangle: *L. sibogae*. Inverted triangle: *Lucinoma* sp. cf. *sibogae*. Diamond: *L. kastoroae*. Star: *Lucinoma* sp. 1. Half-circle: *L. rhomboidalis*. Records of *L. yoshidai* after Higo *et al*. (1999).

DISTRIBUTION. – Only known from the type locality.

DESCRIPTION. – Shell rather small, up to 28 mm long, thin but strong, triangular-rhombiform (l/h 1.1), inequilateral, equivalve, rather compressed. Beaks in front of the vertical midline, in the holotype about 5 mm in front. Anterior part broadly triangular and tapering, anterior margin sharply rostrate slightly above the horizontal midline. Posterior part broadly tapering, posterior margin obliquely truncated, with rounded corners. Antero-dorsal margin almost straight, postero-dorsal margin slightly convex. Ventral margin straight in its anterior section, strongly convex in the middle and only slightly convex in its posterior section, under the postero-ventral angle.

Exterior with numerous close-set, thin and prominent commarginal lamellae, more densely spaced on the earliest (umbonal) 4 mm of the valve, becoming somewhat leafy and more irregularly spaced on the lower (ventral) half. Interspaces with fine growth lirae. Antero-dorsal area marked by commarginal lamellae becoming more irregular and very densely spaced; antero-dorsal angle shallow but distinct. Posterior area with a very shallow radial depression and marked by more dense lamellae, no posterior angle.

Hinge plate rather narrow but strong. Right valve with 1 thin anterior and a rather broad, strong and bifid posterior cardinal, a small anterior lateral and almost no visible posterior lateral. Left valve with a strong, bifid anterior and a very thin posterior cardinal; anterior lateral small, posterior lateral absent. Lunule rather long and narrow, very slightly asymmetric, sunken. Escutcheon extremely narrow, long and sunken. Anterior adductor scar with long and narrow diverging part, pallial line meeting the scar in its dorsalmost seventh. Inner margin of valves smooth, but towards the interior microscopically dentate.

Valves entirely white. Periostracum very thin and pale straw-coloured, dull and almost translucent.

REMARKS. – This species is easily distinguished from other *Lucinoma* species by its more quadrangular-rhomboidal rather than subcircular outline, and the very dense and leafy commarginal lamellae. Nevertheless, the other features such as well developed, bifid cardinals and small laterals and a very long and narrow diverging part of the anterior adductor scar place it unambiguously in *Lucinoma*. The only other species with a similar outline is the Gulf of California species *L. heroica* (Dall, 1901), figured by Oliver & Holmes (2006). *Lucinoma heroica* is larger and the posterior area is more pronounced.

ETYMOLOGY. – In reference to its quadrangular-rhomboidal shell outline.

Genus ***SEMELILUCINA*** n. gen.

Type species: *Semelilucina semeliformis* n. sp. (here designated).

DIAGNOSIS. – Shells medium-sized, subcircular, slightly longer than high, compressed, with a very broad anterior part and a tapering, posteriorly truncated posterior part of about equal length. Antero- and postero-dorsal margins sloping. Valves with well delimited posterior area. Beaks situated in the vertical midline. Surface with fine, very dense commarginal lamellae; antero-dorsal depression absent, postero-dorsal depression well developed. Lunule short, narrow and sunken. Hinge plate narrow, almost toothless and arched at the umbones. Diverging part of anterior adductor scar narrow, length slightly more than half the total scar length. Angle between base of diverging part and pallial line small (*ca.* 16°). Posterior adductor scar small. Pallial line in general entire, occasionally with one or a few narrow interruptions, irregular. Trace of pallial blood vessel on the inside not marked as a scar. Inner margins smooth.

REMARKS. – This genus is close to *Dulcina* (see below) but is distinguished by the more backward-placed umbones, the longer and higher anterior part, the more sloping antero-dorsal margin, the much less pronounced antero-dorsal

depression on the margin and the almost entire pallial line. The typical outline with the very broad anterior part, well sloping antero- and postro-dorsal margins and the situation of the umbones, as well as the regular and densely spaced commarginal sculpture resembles the tellinoidean genus *Semele*.

ETYMOLOGY. – So named because of the high-oval outline with a broader anterior and narrower posterior part and the characteristic surface sculpture.

Semelilucina semeliformis n. sp.

Figs 45A-H, 52D

TYPE MATERIAL. – Holotype, rv (32.8 x 29.7 mm), MNHN 20725, 18 paratypes (9 lv, 9 rv) MNHN 20726, 2 paratypes (1 rv, 1 lv) USNM, 5 paratypes (3 rv, 2 lv) MZB, 2 paratypes (1 rv, 1 lv) NSMT .

TYPE LOCALITY. – SE Indonesia, Tanimbar Islands, 9°16'S, 131°22'E, mud, 239-250 m [KARUBAR: stn CP 79].

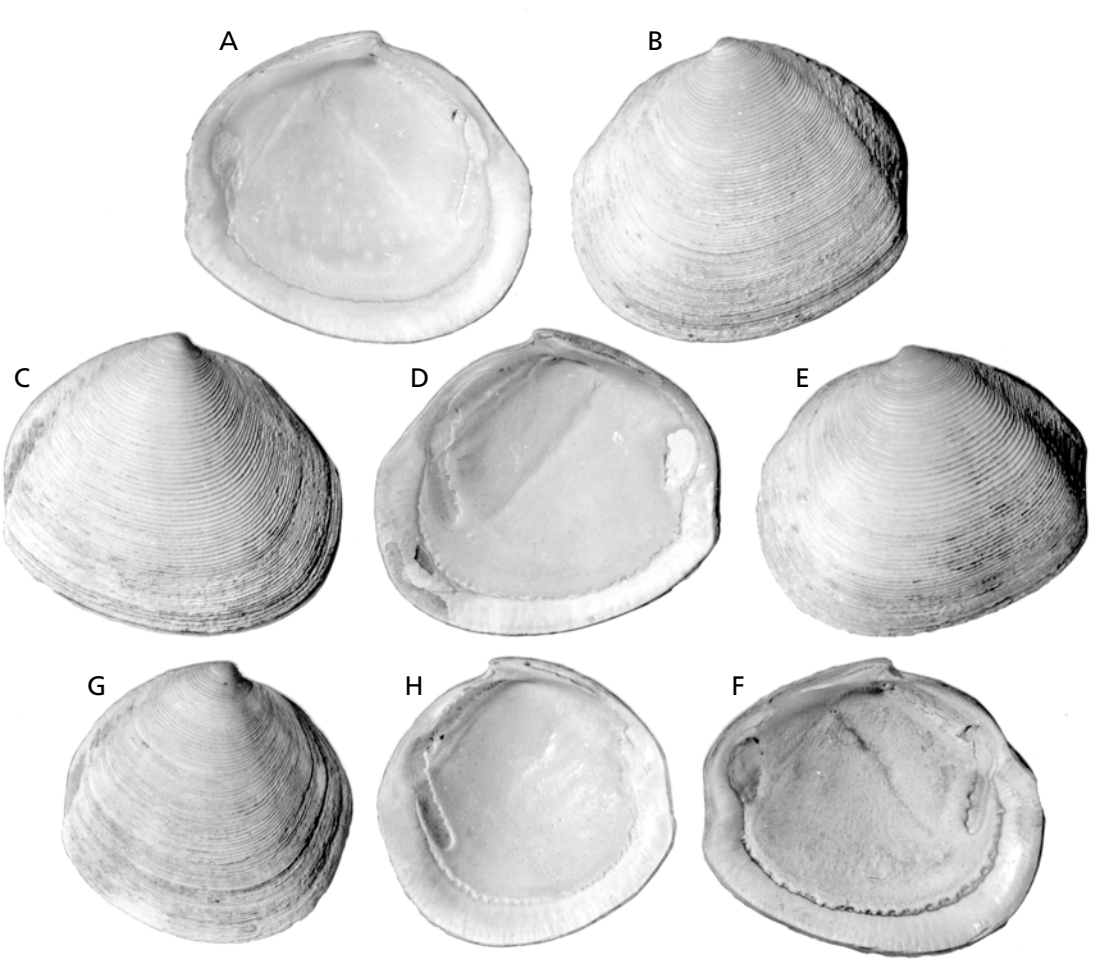

FIG. 45. *Semelilucina semeliformis* n. sp. **A-B**, holotype MNHN 20725, 32.8 mm; **A**, int. of lv; **B**, ext of lv; **C-D**, paratype MNHN 207226, 30.4 mm;**C**, ext. of rv; **D**, int. of rv; **E-F**, paratype MNHN 207226, 28.5 mm; **E**, ext. of lv; **F**, int. of lv; **G-H**, paratype MNHN 207226, 25.1 mm; **G**, ext of rv; **H**, int. of lv, all KARUBAR stn CP 79.

MATERIAL EXAMINED. – **Indonesia**. KARUBAR: stn CP 79, Tanimbar Islands, 9°16'S, 131°22'E, mud, 239-250 m, 1 rv (holotype) and 9 lv, 9 rv (paratypes 33.2 x 30.0, 31.5 x 28.4, 30.4 x 27.3, 29.3 x 27.0, 29.2 x 26.3, 28.8 x 26.3, 28.8 x 26.2, 28.8 x 25.5, 28.5 x 25.4, 28.2 x 25.0, 27.7 x 24.9, 27.3 x 24.0, 27.1 x 25.0, 27.0 x 23.4, 26.6 x 24.4, 25.1 x 24.6, 24.8 x 22.2, 21.7 x 19.0 mm, MNHN); 1 rv, 1 lv (paratypes 30.2 x 28.6, 29.7 x 28.0 mm, USNM); 3 rv, 2 lv (paratypes 32.4 x 29.0, 30.1 x 26.4, 28.8 x 26.7, 29.2 x 25.7, 27.4 x 25.4 mm, MZB); 1 rv, 1 lv (paratypes, 30.4 x 26.1, 28.9 x 26.6 mm, NSMT); and numerous associated v; stn DW 80, 9°37'S, 131°02'E, 199-201 m, 1 rv; stn CP 86, 9°26'S, 131°13'E, 223-225 m, 2 rv.

DISTRIBUTION. – Only known from Tanimbar Islands region, southeast Indonesia, in 201-239 m (valves only).

DESCRIPTION. – Shell medium-sized, up to 33 mm long and 30 mm high, rather thick and solid, inequilateral, equivalve, compressed, approximately subcircular (l/h 1.1), slightly variable in shape and l/h ratio. Beaks more or less in the middle. Anterior part broad, posterior part tapering. Antero-dorsal margin convex near the beaks, in its lower section almost concave, with a slight corner to the rather low situated anterior margin. Posterior margin vertically truncated and slightly concave, with broadly rounded postero-dorsal corner and narrowly rounded postero-ventral corner. Ventral margin well rounded, in its posterior section less convex.

Exterior with numerous fine, regular and densely spaced commarginal lamellae. Antero-dorsal area delimited by a shallow anterior angle with a very shallow to almost no radial depression. Postero-dorsal angle shallow but rather sharp and clearly distinct, postero-dorsal area with a well developed radial depression and delimited from the escutcheon by a row of small, short, leaflike lamellae, present only on every third commarginal lamellae.

Hinge plate quite narrow, without hinge teeth. Lunule very narrow and sunken, slightly asymmetric; escutcheon narrow and sunken, almost entirely filled by the ligament. Anterior adductor scar narrow, with moderately long diverging part meeting the scar slightly above its middle. Scar of the pallial blood vessel narrow and very oblique: from the posterior end of the ligament to the ventral end of the anterior adductor scar. Inner surface densely punctate with very small pits. Inner margin of valves smooth.

Valves entirely white. Periostracum pale yellowish brown, somewhat dull.

REMARKS. – As for the genus. Of this species, only single valves are present in the samples, and very few of them show vestiges of the periostracum; most valves seem to be subrecent. In shape, the species is distinct from any other species treated in this paper.

ETYMOLOGY. – *Semeliformis*: the form of a *Semele*.

Genus ***DULCINA*** n. gen.

Type species: *Dulcina guidoi* n. sp. (here designated).

Five species, northern and central Philippines, southeastern Indonesia, Madagascar.

DIAGNOSIS. – Shells rather small to medium-sized, subcircular, slightly longer than high, compressed. Valves with a very broad anterior part, a more or less tapering, posteriorly truncated posterior part and a clearly distinct posterior area. Upper section of antero-dorsal margin significantly convex, then straight or slightly indented until the anteriormost point. Beaks in front of the vertical midline. Exterior either smooth, with indistinct commarginal sculpture, or with widely spaced commarginal lamellae. Antero-dorsal depression short and pronounced, postero-dorsal depression weak or missing. Lunule very narrow and sunken, asymmetric, escutcheon entirely filled by the ligament, sunken. Hinge plate narrow, scarcely to moderately arched, almost toothless or with slight vestiges of a cardinal. Ligament long.

Diverging part of anterior adductor scar quite large, length about half the total scar length. Angle between base of diverging part and pallial line very large (13°-18°, occasionally more). Pallial line not entire but divided into a succession of scars of variable size, often very short and ovate; gaps between the scars very narrow. Inner margins smooth.

REMARKS. – *Dulcina* is readily distinguished from *Lucinoma* by the almost toothless hinge, the much shorter anterior adductor scar, the different shell outline with a broad anterior part and the less tumid valves. The new genus resembles *Semelilucina* more, but in *Dulcina* the umbones are always situated in front of the vertical midline; the anterior half is thus shorter, and the anteriormost point of the anterior margin is situated more dorsally. The lunule is slightly longer and more sunken, the ligament is longer and also more deeply embedded. In *Semelilucina*, the postero-dorsal depression is pronounced, while in *Dulcina* it is almost missing. The antero-dorsal depression is absent in *Semelilucina*, but well marked in *Dulcina*. Regarding sculpture, *Semelilucina* exhibits regular and densely spaced lamellae, whereas in *Dulcina*, the lamellae are widely spaced or missing. Another distinctive character of *Dulcina* is the interrupted pallial line, which is divided into separate scars. *Loripes lens* Verrill & Smith *in* Verrill, 1880, from the western Atlantic (Cape Cod to Rio de Janeiro, 90-835 m, Dall 1901) resembles species of *Dulcina* but is smaller. It is figured by Bretsky (1976: pl. 34, figs 14-16) as "*Myrtea* (*Myrteopsis*) *lens* (Verrill & Smith)". However, the species, on which the subgenus *Myrteopsis* Sacco, 1901 is based, *Myrtea* (*Myrteopsis*) *magnotaurina* Sacco, 1901 (p. 96, pl. 21, figs 32-36), bears no relation to *Dulcina*; its valves are more oval, with a longer and more narrow anterior part and with the beaks on the midline, a rounded rather than tapering posterior part, a narrower hinge line and no spines or projections on the postero-dorsal keel.

ETYMOLOGY. – The name *Dulcina* is a combination of "Dulcinea" and "*Lucina*". Dulcinea de Toboso was the "girl friend" of Don Quixote in Cervantes' novel, and the name is given in the tradition of naming certain lucinid genera after famous ladies in history or literature.

Dulcina guidoi n. sp.

Figs 46A-G, 49A, 50

TYPE MATERIAL. – Holotype, sh (42.4 x 36.8 x 14.8 mm) MNHN 20727, 1 paratype (sh) MNHN 20728, 1 paratype (lv) NMP.

TYPE LOCALITY. – Central Philippines, north of Mindoro, 13°39'N, 120°43'E, mud, 520-550 m [MUSORSTOM 2: stn CP 25].

MATERIAL EXAMINED. – **Philippines**. MUSORSTOM 2: stn CP 24, north of Mindoro, 13°37'N, 120°42'E, 640-647 m, 1 dried spm (30.0 x 25.2 x 8.6 mm), 2 sh (30.1 x 23.7 x 7.6, 21.7 x 17.2 x 5.6 mm), 1 broken v (19.8 x 16.3 x mm); stn CP 25, 13°39'N, 120°43'E, mud, 520-550 m, 2 sh (holotype MNHN and paratype 46.3 x 37.6 x 13.2 mm, MNHN), 1 lv (paratype 45.3 x 37.5 x 15.5 mm), 1 chipped lv, 5 fragm.

DISTRIBUTION. – Central Philippines, in 550-640 m.

DESCRIPTION. – Shell medium-sized, up to 46 mm long, not very thick but solid, subcircular to somewhat elongate (l/h 1.2-1.3), inequilateral, equivalve, moderately compressed, quite variable in shape. Beaks in front of the vertical midline, in the holotype 3.5 mm in front, in the largest paratype 5.5 mm. Anterior margin broadly rounded, antero-dorsal margin convex, with a slight corner to the antero-vertical margin. Posterior part tapering, posterior margin vertically to slightly obliquely truncated, with rounded corners. Ventral margin well rounded, the posterior section less convex.

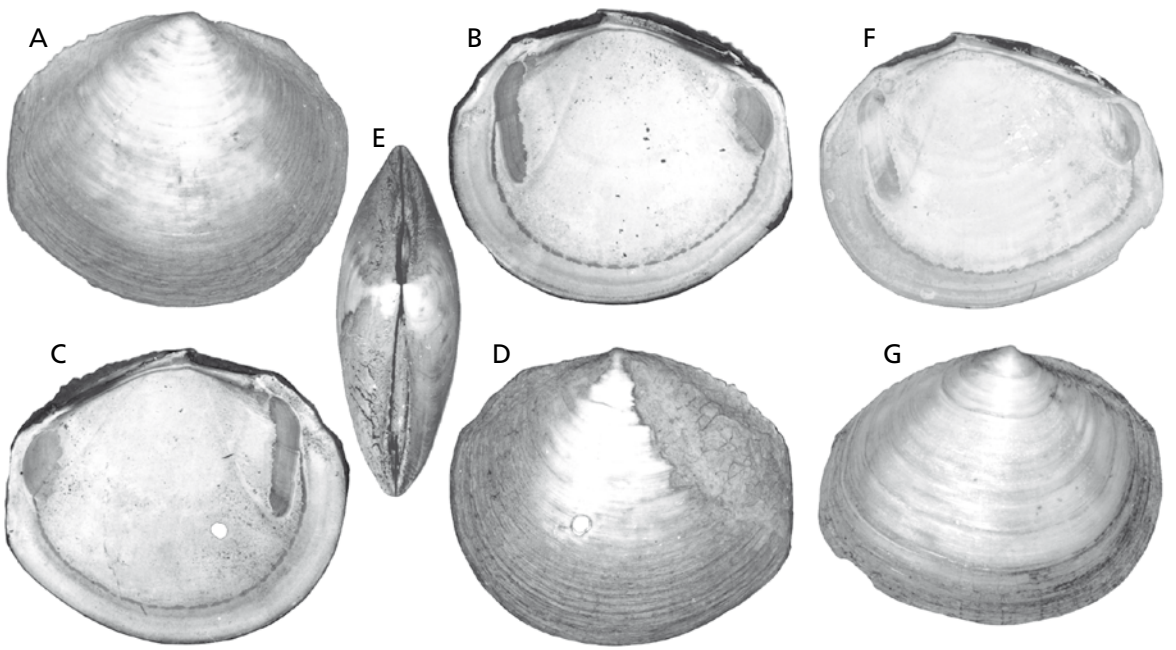

FIG. 46. *Dulcina guidoi* n. sp. **A-E**, holotype MNHN 20727, 42.4 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext of lv; **E**, dorsal view; **F-G**, paratype MNHN 20728, 46.3 mm; **F**, int. of rv; **G**, ext. of rv; all MUSORSTOM 2 stn CP 25.

Exterior with irregular growth lines. Antero-dorsal area with a short and shallow but sharp radial depression, delimited by a weak, narrow antero-dorsal angle. Postero-dorsal angle weak, broad and rounded, postero-dorsal area with a very faint radial depression and delimited from the escutcheon by a row of small, short, leaflike lamellae.

Hinge plate quite narrow, without hinge teeth. Lunule very narrow and sunken, slightly asymmetric and broader in the right valve; escutcheon also narrow and sunken, almost entirely filled by the ligament. Anterior adductor scar elongate with moderately long diverging part, pallial line meeting the scar slightly above its middle. Pallial line discontinuous, with ovate or elongate scars and narrow interruptions, especially on the ventral part. Impression of the pallial blood vessel not visible. Inner surface with no pits. Inner margin of valves smooth.

Valves entirely white. Periostracum pale yellowish brown, somewhat dull, translucent, with small dense wrinkles on the antero-dorsal area and the marginal area.

REMARKS. – As for the genus. This species resembles in outline the Eocene *Lucina* (*s.l.*) *mutabilis* Lamarck, 1805. However, the anterior adductor scar of the fossil species is much longer and the form of the escutcheon is different. The only similar Recent species are *D. madagascariensis* and *D. karubari* (see next two entries).

ETYMOLOGY. – Named after Guido Poppe (Berchem, Belgium and Lapu Lapu City, The Philippines) in acknowledgement of his long-time collaboration with MNHN.

Dulcina karubari n. sp.

Figs 47A-K, 49C-D, 50

TYPE MATERIAL. – Holotype, sh (27.9 x 24.3 x 9.6 mm) MNHN 20729, and 11 paratypes (2 sh, 4 rv, 5 lv) MNHN 20730, 2 paratypes (1 rv, 1 lv) USNM, 4 paratypes (2 rv, 2 lv) MZB, 2 paratypes (1 rv, 1 lv) NSMT.

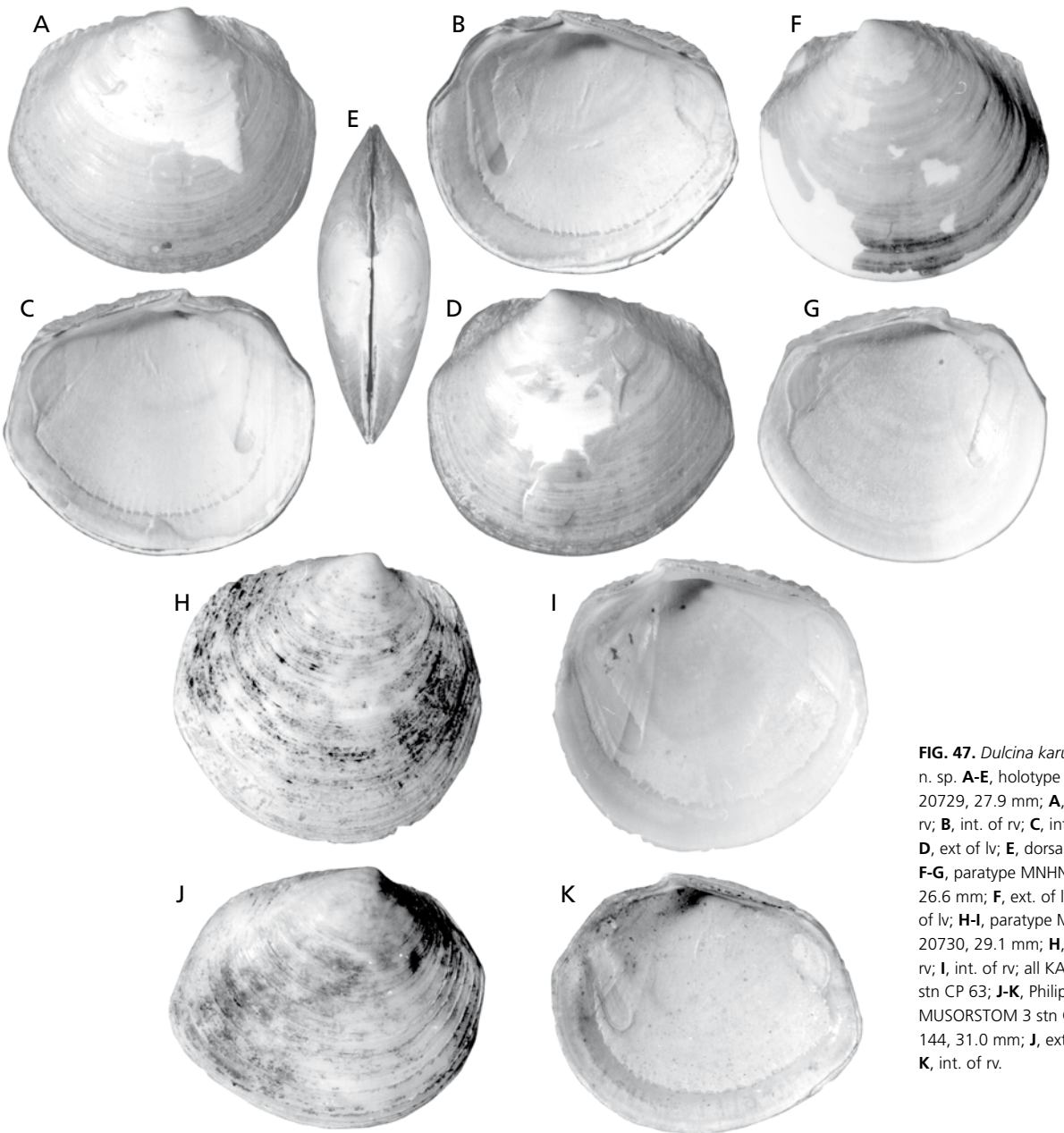

FIG. 47. *Dulcina karubari* n. sp. **A-E**, holotype MNHN 20729, 27.9 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext of lv; **E**, dorsal view; **F-G**, paratype MNHN 20730, 26.6 mm; **F**, ext. of lv; **G**, int. of lv; **H-I**, paratype MNHN 20730, 29.1 mm; **H**, ext. of rv; **I**, int. of rv; all KARUBAR stn CP 63; **J-K**, Philippines, MUSORSTOM 3 stn CP 144, 31.0 mm; **J**, ext. of rv; **K**, int. of rv.

TYPE LOCALITY. – Indonesia, Tanimbar Islands, 8°00'S, 132°58'E, mud, 215-214 m [KARUBAR: stn CP 63].

MATERIAL EXAMINED. – **Indonesia**. KARUBAR: stn DW 08, Kai Islands, 5°20'S, 132°31'E, mud, 358-360 m, 2 sh (15.9 x 13.5 x 5.5, 11.8 x 10.5 x 4.1 mm), 9 small v; stn CP 09, 5°23'S, 132°29'E, mud, 368-389 m, 2 juv. sh (19.5 x 16.0 x 5.7 mm), 2 rv; stn DW 13, 5°26'S, 132°38'E, mud, 417-425 m, 2 rv, 2 juv. lv, 1 juv. rv; stn DW 31, 5°40'S, 132°51'E, 288-289 m, 1 juv. rv; stn CP 39, Tanimbar Islands, 7°47'S, 132°26'E, mud, 466-477 m, 1 juv. sh (17.1 x 14.5 x 5.5 mm); stn CC 42, 7°53'S, 132°42'E, mud, 350-354 m, 1 lv; stn CP 63, 8°00'S, 132°58'E, mud, 214-215-m, 3 sh (holotype and paratypes 30.1 x 26.8 x 10.2, 21.6 x 19.0 x 6.6 mm, MNHN), 4 rv, 5 lv (paratypes 29.5 x 26.6, 29.1 x 27.4, 28.7 x 26.1, 26.8 x 24.5, 26.8 x 24.5, 26.6 x 24.4, 26.2

x 23.7, 22.7 x 20.2 mm, MNHN); 1 rv, 1 lv (paratypes 27.5 x 24.7, 27.3 x 24.2 mm, USNM); 2 rv, 2 lv (paratypes 29.8 x 27.4, 26.7 x 24.3, 28.4 x 25.4, 27.7 x 25.1 mm, Jakarta Museum); 1 rv, 1 lv (paratypes 29.4 x 26.5, 26.0 x 23.3 mm, NSMT) and 10 rv, 9 lv, 3 fragments (associated specimens); stn CP 77, 8°57'S, 131°27'E, mud, 346-352-m, 1 rv (35.0 x 30.0 mm).

DISTRIBUTION. — Southeast Indonesia (Kai Islands and Tanimbar Islands region), in 215-466 m.

DESCRIPTION. — Shell rather small, up to 35 mm long, not very thick but solid, subcircular (l/h 1.1-1.2), inequilateral, equivalve, moderately compressed. Beaks in front of the vertical midline, in the holotype by 4 mm, in the largest paratype by 7 mm. Anterior margin broadly rounded, antero-dorsal margin convex, with a well-marked corner to the anterior margin. Posterior part tapering, posterior margin obliquely truncated, with rounded corners. Ventral margin well rounded.

Exterior smooth, with irregular growth lines and growth lirae. Antero-dorsal area with a short and shallow but rather sharp radial depression, antero-dorsal angle weak to absent. Postero-dorsal angle weak, broad and rounded, postero-dorsal area with a very faint radial depression and separated from the escutcheon by a leafy keel, sometimes with a row of small, short, leaflike lamellae.

Hinge plate quite narrow, occasionally the vestige of a cardinal is present in the left valve, no laterals. Cardinal area of the right valve sometimes with a small knob; a very small anterior lateral may also be present. Lunule and escutcheon very narrow and sunken, lunule short and hardly asymmetric; escutcheon narrow, sunken and almost entirely filled by the ligament. Both lunule and escutcheon delimited by a sharp and leafy keel. Anterior adductor scar elongate with a moderately long diverging part, pallial line meeting the scar slightly above its middle or in the middle. Pallial line divided into a succession of ovate or longer scars with narrow interruptions between them. Scar of the pallial blood vessel faintly visible, short and only little inclined. Inner surface not punctate. Inner margin of valves smooth.

Valves entirely white. Periostracum pale yellowish brown, with a few wrinkles on the antero-dorsal area.

REMARKS. — *Dulcina karubari* is clearly distinguished from *D. guidoi* by its smaller and shorter shell, which has a more circular rather than oval outline, more forward placed umbones and a much shorter lunule. Both species share a compressed shell, a smooth surface and a broad anterior part combined with a tapering posterior part.

A single valve with the same shape, outline and tumidity (Figs 47J-K) was obtained in the Philippines during MUSORSTOM 3 (stn CP 144, 11°12'N, 124°15'E, 370-383 m). It seems to belong to another species that closely resembles *D. karubari* and differs in having an ornamented surface with a few widely spaced commarginal lamellae, and a less sunken lunule. As no other material is available, we refrain from naming the Philippine specimen at present.

ETYMOLOGY. — After the expedition KARUBAR, which itself takes its name from the Kai, Aru and Tanimbar archipelagoes, southeast Indonesia.

Dulcina madagascariensis n. sp.

Figs 48A-G, 49B, 50

TYPE MATERIAL. — Holotype, sh (26.8 x 24.4 x 9.7 mm) MNHN 20731, 2 paratypes (1 sh, 30.1 x 25.1 mm, 1 sh with 1 broken v, 26.4 x 23.7 mm) MNHN 20732.

TYPE LOCALITY. — SW Madagascar, off Tuléar, 21°26'S, 43°15'E, 425-550 m, leg. Crosnier, 24. II. 1973.

MATERIAL EXAMINED. — Known from the type material only.

DISTRIBUTION. — Indian Ocean (southwest coast of Madagascar), in 425-550 m.

DESCRIPTION. – Shell up to 30 mm long, thin but solid, subcircular to short-triangular (l/h 1.1-1.2), inequilateral, equivalve, compressed, variable in shape. Beaks in front of the vertical midline, in the holotype about 3 mm. Anterior margin broadly rounded, antero-dorsal margin convex, with a slight corner to the antero-vertical margin. Posterior part tapering, posterior margin vertically to slightly obliquely truncated, with rounded postero-ventral corner. Ventral margin well rounded and, in its posterior section, less convex to even almost straight.

Exterior with irregular growth lines and with faint but broad, irregular commarginal cords that may disappear on certain regions of the valves, especially in the middle. Antero-dorsal area with a short, shallow and occasionally rather sharp radial depression delimited by a weak, narrow antero-dorsal angle. Postero-dorsal angle weak, broad and rounded, postero-dorsal area with an indistinct radial depression and delimited from the ligamental area by a sharp and prominent keel.

Hinge plate quite narrow, without hinge teeth. Lunule short, very narrow and sunken, asymmetric; escutcheon narrow and sunken, almost entirely filled by the ligament. Anterior adductor scar elongate with moderately long diverging part, pallial line meeting the scar slightly above or in its middle. Pallial line discontinuous, with more or less elongate scars and narrow gaps between them, especially on the ventral part. Impression of the pallial blood vessel not visible. Inner surface not punctate. Inner margin of valves smooth.

Valves entirely white. Periostracum pale yellowish brown, somewhat velvety dull, translucent, with small dense folds on the antero-dorsal and marginal area.

REMARKS. – In spite of the enormous geographical distance between their ranges (8000 km), this species is most similar to the Philippine species *D. guidoi*, although it is much smaller and slightly shorter. The lunular margin of

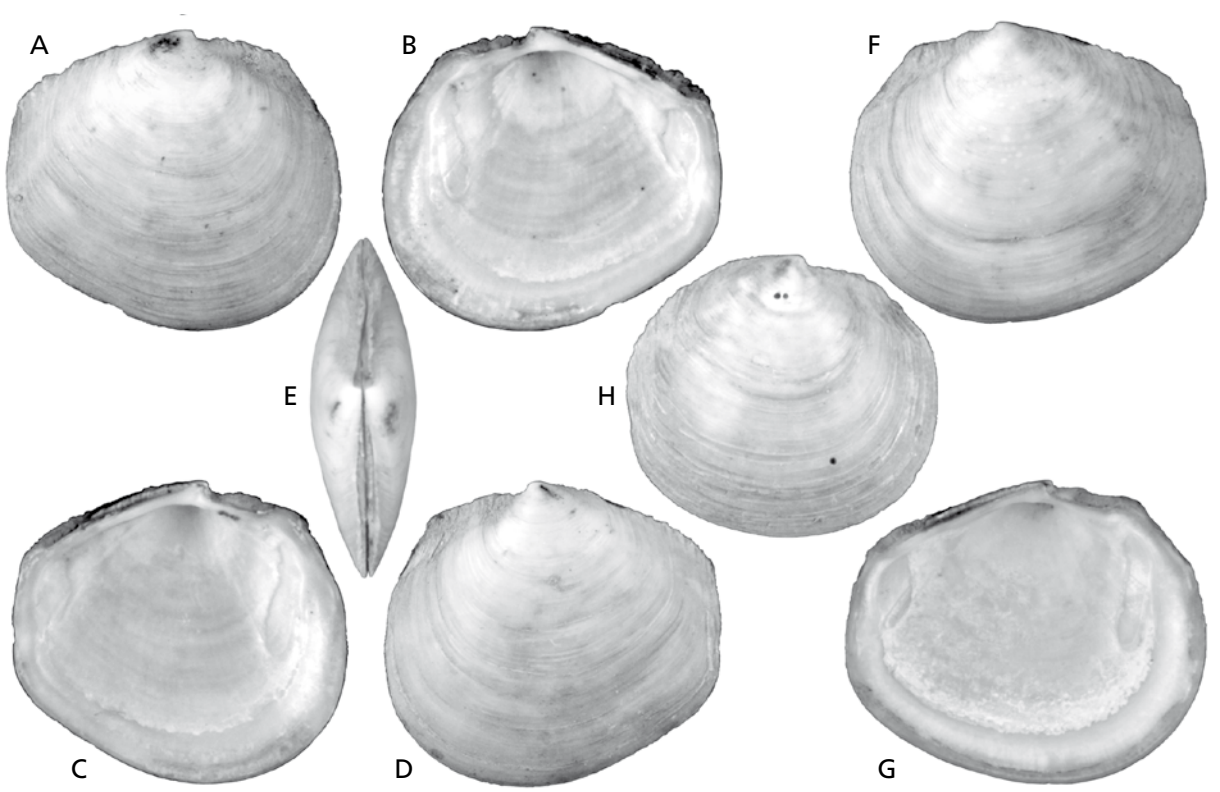

FIG. 48. *Dulcina madagascariensis* n. sp. **A-E**, holotype MNHN 20731, 26.8 mm; **A**, ext. of rv; **B**, int. of rv; **C**, ext. of lv; **D**; int of lv; **E**, dorsal view; **F-G**, paratype MNHN 20732, 30.1 mm; **F**, ext. of lv; **G**, int. of lv; **H**, paratype MNHN 20732, 26.4 mm, ext. of rv; all SW Madagascar, off Tuléar, 21°25,5'S, 43°14,5'E, 425-550 m, R/V *Vauban*, leg. Crosnier, 24. II. 1973.

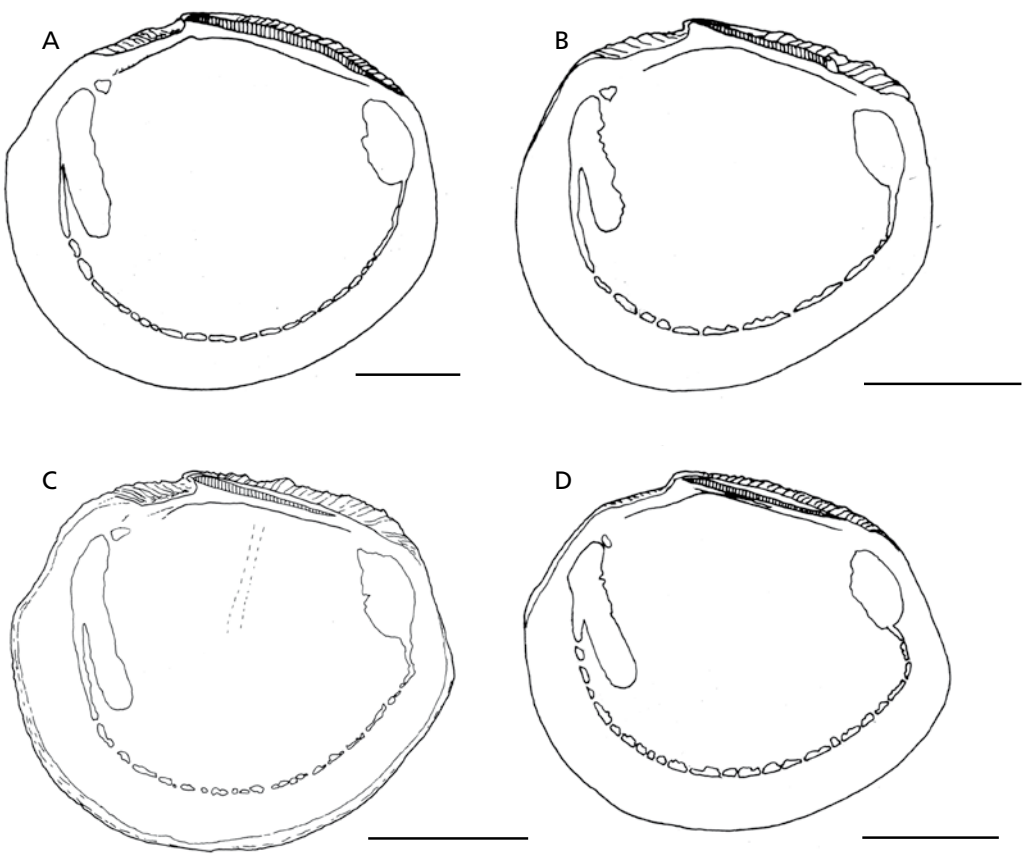

FIG. 49. *Dulcina* spp. outline drawings of the insides of valves. **A**, *D. guidoi* n. sp., holotype MNHN 20727. **B**, *D. madagascariensis* n. sp., holotype MNHN 20731. **C**, *D. karubari* n. sp., holotype MNHN. **D**, *D. karubari* n. sp., MUSORSTOM 3 stn CP 144.

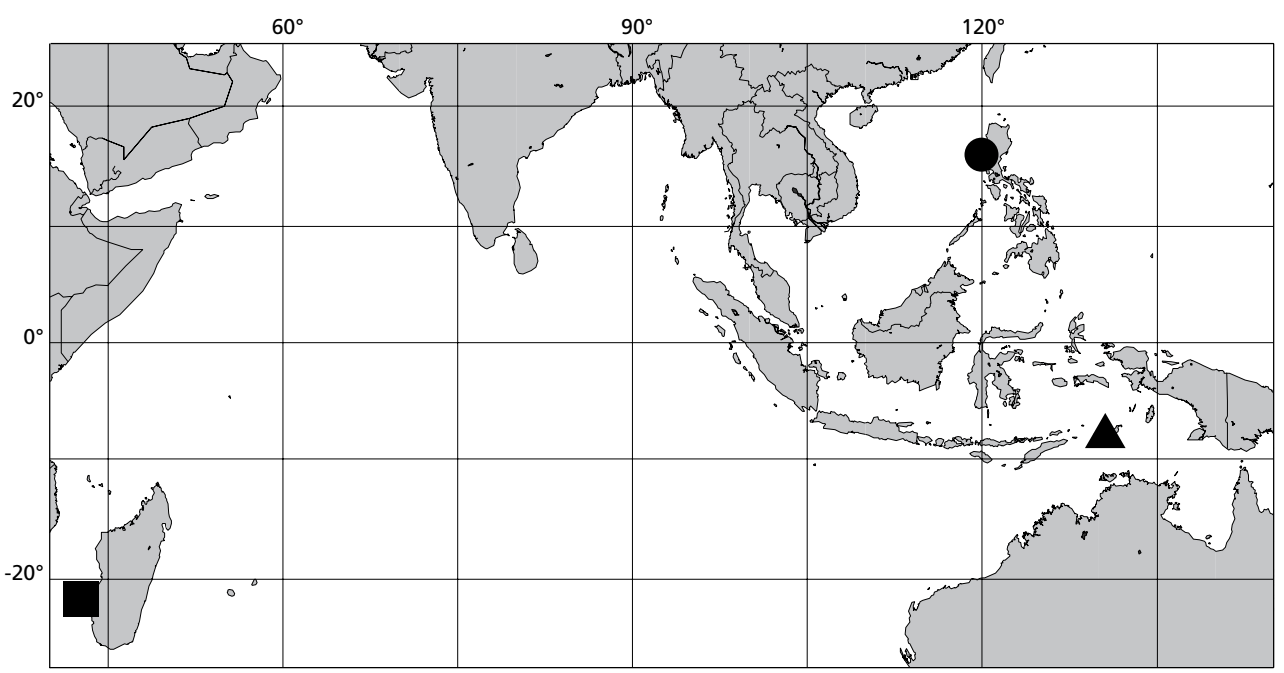

FIG. 50. Distribution of *Dulcina* (species with smooth surface). Circle: *D. guidoi*. Square: *D. madagascariensis*. Triangle: *D. karubari*.

D. madagascariensis is concave, whereas in *D. guidoi* it is straight. Juveniles of *D. guidoi* of the same size as *D. madagascariensis* have an oblique posterior truncation, whereas in *D. madagascariensis*, the truncation is vertical.

ETYMOLOGY. – After Madagascar where the type locality is situated.

Dulcina minor n. sp.

Figs 51A-E, 52B

TYPE MATERIAL. – Holotype, rv (22.1 x 20.0 mm) MNHN 20733, 7 paratypes (3 rv, 4 lv) MNHN 20734-20737, 1 paratype (rv) USNM, 2 paratypes (rv) NMP.

TYPE LOCALITY. – North central Philippines, off Luzon, near Lubang I., 14°01'N, 120°19'E, 191-195 m [MUSORSTOM 2: stn CP 64].

MATERIAL EXAMINED. – **Philippines**. MUSORSTOM 2: stn CP 13, W of Luzon, near Lubang I, 14°00'N, 120°20'E, 192-209 m, 1 rv (paratype 18.1 x 16.4 mm, NMP); stn CP 17, 14°00'N, 120°17'E, 174-193 m, 1 rv; stn CP 18, 14°00'N, 120°18'E, 188-195 m, 3 lv, 1 rv (paratypes 21.8 x 19.0, 21.5 x 19.0, 14.4 x 13.1, 13.5 x 11.5 mm, MNHN 20735); stn CP 21, same coordinates, 191-192 m, 2 rv, 1 lv (26.1 x 23.4, 22.1 x 19.3, 17.4 x 16.0 mm); stn CP 64, 14°01'N, 120°19'E, 191-195 m, 2 rv (holotype MNHN, paratype 17.4 x 16.0 mm, MNHN 20734); stn CP 66, 14°00'N, 120°20'E, 192-209 m, 1 rv; stn CP 68, 14°01'N, 120°18'E, 195-199 m, 1rv, 2 lv (19.7 x 18.0, 17.1 x 15.0, 17.0 x 15.5 mm). – MUSORSTOM 3: stn CP 97, 14°00N, 120°18°E, 189-194 m, 1 rv (paratype 24.9 x 22.0 mm, MNHN 20736); stn CP 103, same coordinates, 193-200 m, 1 rv (paratype 21.5 x 19.7 mm, USNM); stn CP 109, same coordinates, 190-198 m, 1 rv (paratype 22.4 x 19.8 mm, NMP); stn CP 112, same coordinates, 187-199 m, 1 lv (paratype 22.7 x 21.4 mm, MNHN 20737).

DISTRIBUTION. – North Central Philippines. Only known from the type locality and surroundings, in 190-193 m.

DESCRIPTION. – Shell rather small, up to 25.5 mm long, not very thick but solid, somewhat variable, subcircular (l/h 1.1), inequilateral, equivalve, rather compressed. Beaks in front of the vertical midline, in the holotype by about 4 mm. Anterior part broadly rounded, anterior margin with a slight but rather sharp corner to the antero-dorsal margin. Posterior part rounded-tapering, posterior margin obliquely truncated, slightly convex, with rounded corners. Antero-dorsal margin almost straight and with a rather sharp corner towards the lunular area. Postero-dorsal margin slightly convex to almost straight. Ventral margin well rounded.

Exterior with thin, rather densely spaced and prominent commarginal lamellae, missing on the early (umbonal) 5-7 mm of the valve and slightly more widely spaced towards the marginal part of the valves. Tops of the lamellae delicately curled in a ventral direction, giving them a thicker aspect. Interspaces almost smooth, very fine growth lines may be present. Antero-dorsal area short, with denser commarginal lamellae and wrinkles and a narrow, sharp radial groove in the middle; antero-dorsal angle distinct and rounded. Postero-dorsal area visible, but not distinctly separated.

Hinge plate narrow, almost toothless, only with a slight indication of an oblique cardinal, generally no laterals visible. Lunule very short and moderately narrow, slightly broader in the right valve, somewhat sunken. Anterior adductor scar with rather short diverging part, pallial line meeting the scar about in its middle or just above. Pallial line discontinuous, with small, rounded, ovate or occasionally elongate scars and narrow interruptions, especially on the ventral section. Impression of the pallial blood vessel occasionally faintly visible. Inner surface not punctate. Inner margin of valves smooth.

Valves translucent-grey white, with 2 clear radial white zones visible on the interior, extending ventrally to the pallial line and further to the ventral part of the adductor scar and sharply demarcated from the rest of the valves; one

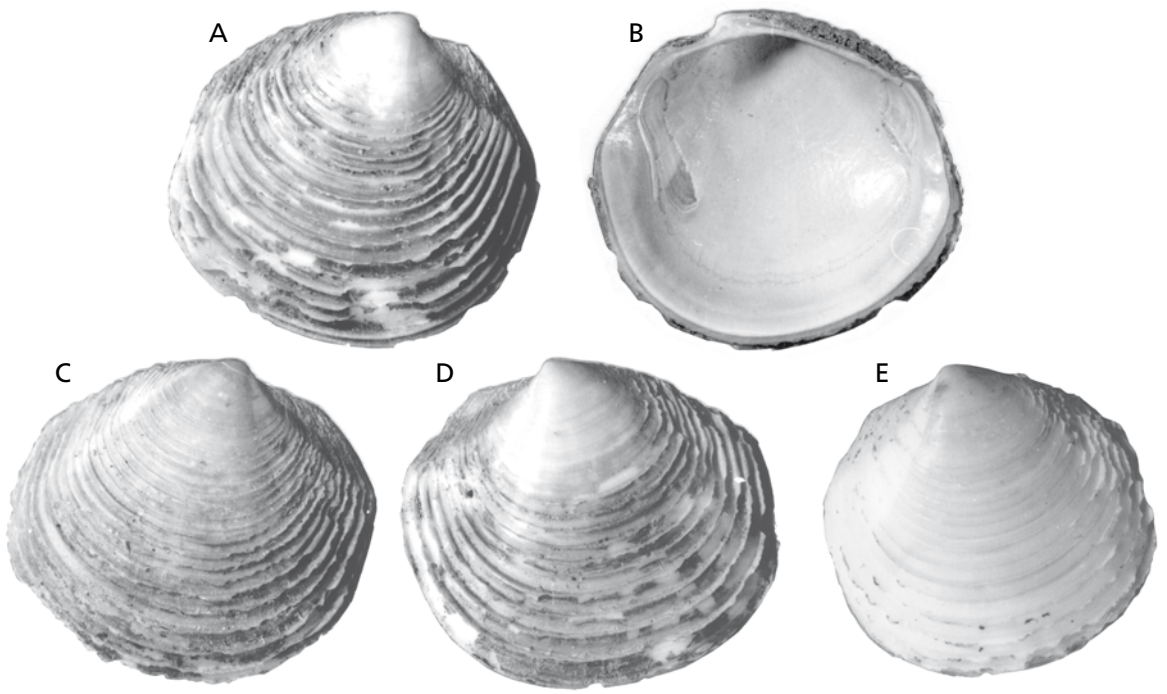

FIG. 51. *Dulcina minor* n. sp. **A-B**, holotype MNHN 20733, 22.1 mm; **A**, ext. of rv; **B**, int. of rv; **C**, paratype MNHN 20736, MUSORSTOM 3 stn CP 97, 24.9 mm, ext. of rv; **D**, paratype MNHN 20735, MUSORSTOM 2 stn CP 18, 21.8 mm, ext. of lv; **E**, paratype MNHN 20737, MUSORSTOM 3 stn CP 112, 22.7 mm, ext. of lv.

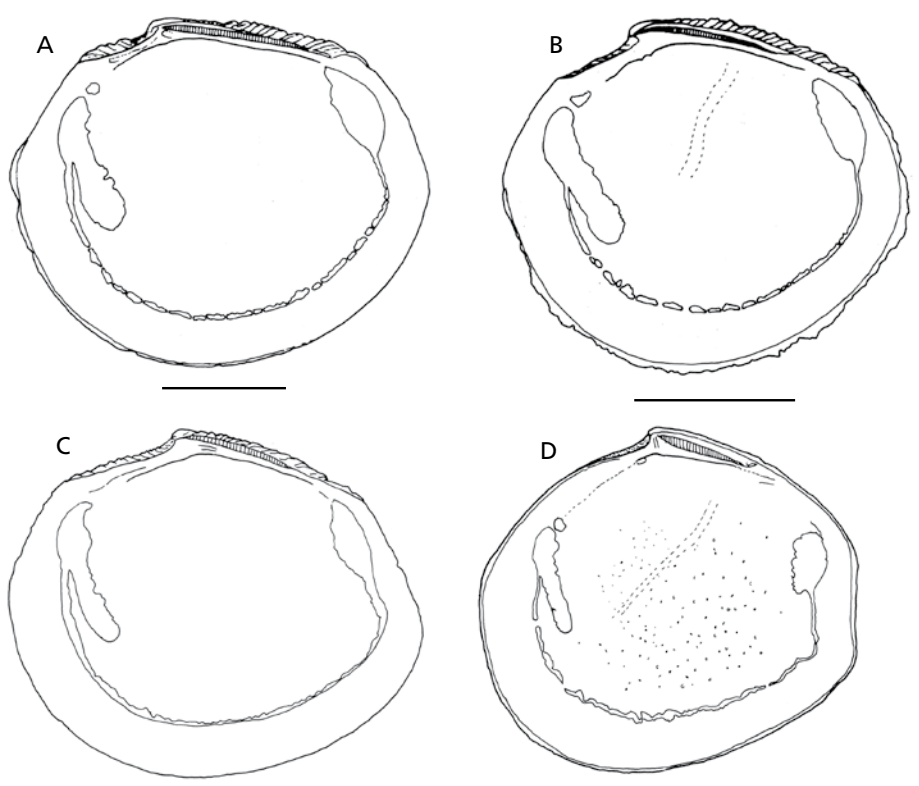

FIG. 52. *Dulcina* spp. *"Cryptodon"* and *Semelilucina*, outline drawings of the insides of valves. **A**, *D. musorstomi* n. sp., holotype MNHN 20738. **B**, *D. minor* n. sp., paratype MNHN 20736, MUSORSTOM 3 stn CP 97. **C**, "*Cryptodon philippinarum* (Hanley)", BMNH 1895.7.2.12. **D**, *Semelilucina semeliformis* n. sp., paratype MNHN 207226.

on the antero-dorsal area and one on the postero-dorsal area. Occasionally both zones showing through to the exterior; in less fresh valves they may be visible only on the muscle scars. Periostracum thin and straw-coloured, dull and in adult specimens eroded on the umbonal region.

REMARKS. – *Dulcina minor*, of which only single valves were taken, is very close to *D. musorstomi* (next entry) However, *D. minor* is smaller (maximum 25.5 x 23.2 mm), more circular and has more densely spaced commarginal lamellae, which are curled ventrally, a feature only occasionally seen in *D. musorstomi*. Apart from the size, *D. minor* is also similar to species of the genus *Alucinoma* Habe (see below).

ETYMOLOGY. – *Minor* (Latin) = smaller, in comparison to *Dulcina musorstomi*.

Dulcina musorstomi n. sp.

Figs 52A, 53H

TYPE MATERIAL. – Holotype, sh (34.7 x 28.7 x 12.4 mm) MNHN 20738, 11 paratypes (7 rv, 4 lv) MNHN 20739, 2 paratypes (1 rv, 1 lv) USNM, 4 paratypes (2 rv, 2 lv) NMP.

TYPE LOCALITY. – Central Philippines, northwest of Samar, San Bernardino Strait, 11°29'N, 124°11'E, mud with shell debris, 205-214 m [MUSORSTOM 3: stn CP 143].

MATERIAL EXAMINED. – **Philippines**. Northwest of Samar, MUSORSTOM 3: stn CP 143, 11°29'N, 124°11'E, mud with shell debris, 205-214 m, 1 sh (holotype), 7 rv, 4 lv (paratypes, 36.3 x 34.4, 35.7 x 32.6, 35.7 x 32.4, 35.5 x 30.5, 34.8 x 31.1, 34.5 x 30.1, 33.5 x 29.3, 30.4 x 28.4, 24.4 x 22.0 mm, MNHN; 1 rv, 1 lv (paratypes 2.2 x 29.1, 32.1 x 29.2 mm), USNM; 2 lv, 2 rv (paratypes, 35.5 x 31.8, 32.7 x 30.1, 31.0 x 28.0, 28.0 x 25.4 mm), NMP; stn CP 145, 11°01'N, 124°04'E, 214-246 m, 4 rv, 7 lv (28.6 x 25.0, 27.7 x 23.3 mm).

DISTRIBUTION. – Central Philippines, in 205-246 m.

DESCRIPTION. – Shell medium-sized, up to 36 mm long, not very thick but solid, somewhat variable, subcircular (l/h 1.1-1.2), inequilateral, equivalve, rather compressed. Beaks just in front of the vertical midline, in the holotype by 3.5 mm. Anterior part broadly rounded, anterior margin with a slight but rather sharp corner to the antero-dorsal margin. Posterior part rounded-tapering and posterior margin obliquely truncated, with rounded corners. Antero-dorsal margin divided into 2 short, more or less straight sections with a corner between them, the upper section comprising the lunular area. Postero-dorsal margin slightly convex to straight. Ventral margin well rounded.

Exterior with thin and prominent commarginal lamellae that are missing on the early (umbonal) 10-13 mm of the valve and are more widely spaced towards the later (marginal) part of the valves. Interspaces with very fine growth lines. Antero-dorsal area with more densely spaced commarginal lamellae and wrinkles than on the disk and a narrow, sharp radial groove; antero-dorsal angle weak. Postero-dorsal area visible, but separated.

Hinge plate narrow, in both valves almost toothless, only with a slight indication of an oblique cardinal, generally no laterals visible. Lunule very short and narrow, slightly asymmetric, sunken. Anterior adductor scar small with rather short diverging part, pallial line meeting the scar in its middle or just above it. Pallial line discontinuous, with short to ovate or elongate scars and narrow interruptions. Impression of the pallial blood vessel not visible. Inner surface rough but not punctate. Inner margin of valves smooth.

Valves entirely white. Periostracum very thin, pale brownish, with wrinkles on the antero-dorsal area.

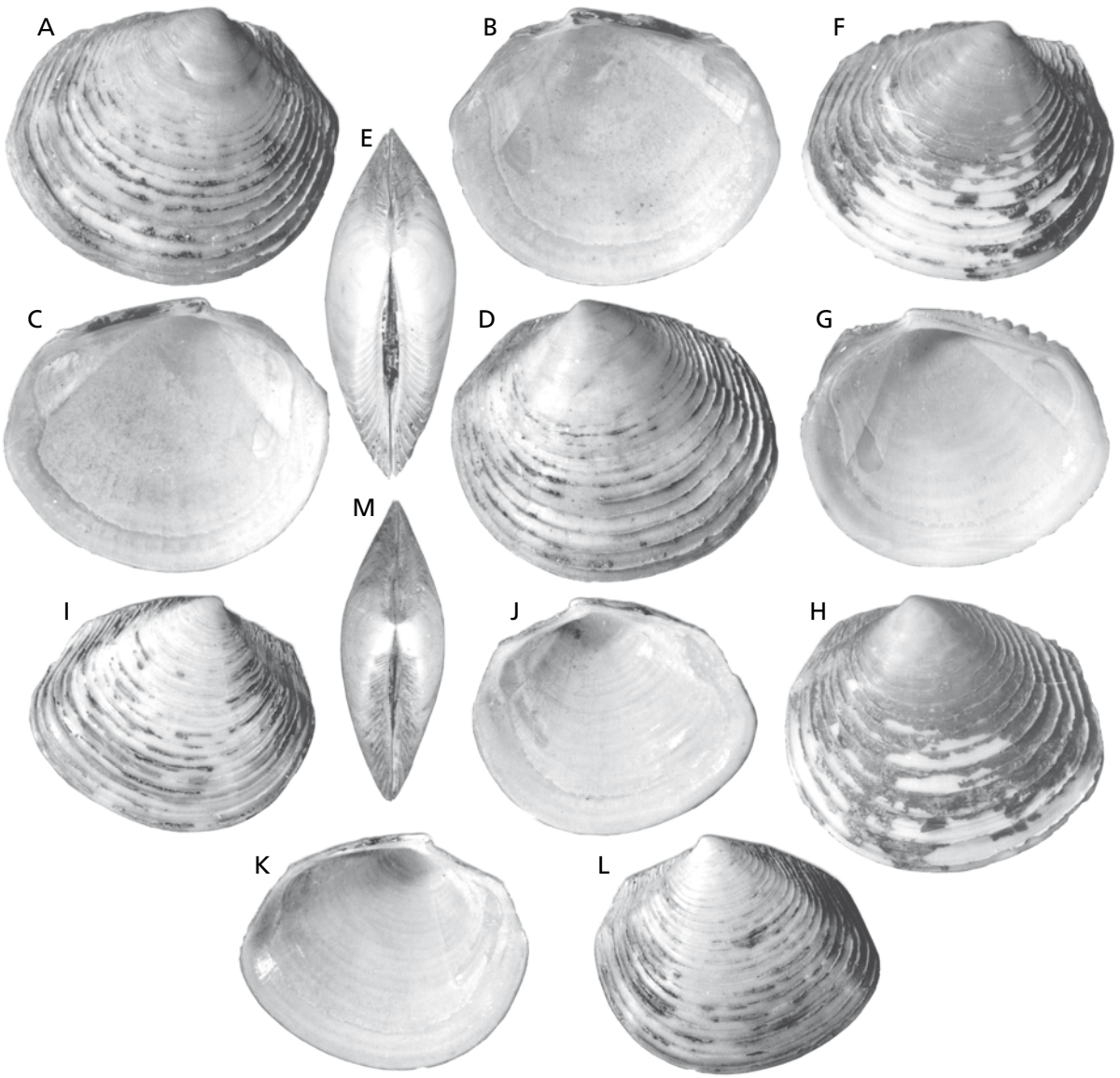

FIG. 53. *Dulcina musorstomi* n. sp. and "*Cryptodon philippinarum* (Hanley)". **A-E**, *D. musorstomi* n. sp. holotype MNHN 20738, 34.7 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext of lv; **E**, dorsal view; **F-G**, specimen from MUSORSTOM 3 stn CP 145, 27.7 mm; **F**, ext. of rv; **G**, int. of rv; **H**, specimen from MUSORSTOM 3 stn CP 145, 28.6 mm, ext. of lv. **I-M**, "*Cryptodon philippinarum* (Hanley)", mentioned specimen, *Investigator* stn 172, BMNH 1895.7.2.12, 18.5 mm. **I**, ext. of rv; **J**, int. of rv; **K**, int. of lv; **L**, ext. of lv. **M**, dorsal view.

REMARKS. — *Dulcina musorstomi* and *D. minor* are distinguished from *D. guidoi*, *D. madagascariensis* and *D. karubari* by their well-developed commarginal lamellae. All other characters, e.g. shell shape, almost toothless hinge, discontinuous pallial line and form of anterior adductor, are as in these species, and justify placing them in the genus *Dulcina*. Superficially *D. musorstomi* resembles species in the genus *Lucinoma*, which share the widely spaced commarginal lamellae. However, the hinge of *D. musorstomi* is nearly edentulous, whereas one of the characteristics of *Lucinoma* is the presence of well-defined hinge teeth. Also, in contrast with *Lucinoma*, species of which possess long and rather slender anterior adductor scars with a long diverging part, *D. musorstomi* has smaller scars with a shorter diverging part. The interrupted pallial line meets the anterior adductor scar about in its middle, whereas in species of *Lucinoma*, the pallial line is always entire and joins the scar near the upper end.

In addition to *D. minor*, one other species is close to *D. musorstomi*: an unnamed lucinid of which one specimen was taken by the *Investigator* Expedition (stn 172, off Trincomalee, Ceylon, 200-350 fms) and which was reported as "*Cryptodon philippinarum* (Hanley)" by Smith (1895: 13) (see Figs 53I-M and 52C). It resembles *D. musorstomi* in its shape and outline. However, it is much smaller, has a longer lunular area and much more densely spaced lamellae that cover almost the whole valve, leaving only the very young (umbonal) part smooth. The diverging part of the anterior adductor scar is slightly longer. It is definitely not *Lucina philippinarum* Hanley, 1843, which is a larger, much thicker, more circular and much more inflated species living in shallow water. We leave this species for the moment unnamed.

ETYMOLOGY. — After the MUSORSTOM expeditions, which supplied part of the material treated herein.

Genus ***ALUCINOMA*** Habe, 1958

Alucinoma Habe, 1958a: 181.
Gonimyrtea auct. *non* Marwick, 1929

Type species: *Alucinoma soyoae* Habe, 1958, by original designation; Japan (Sagami Bay).

Two species, central Indo-Pacific.

DIAGNOSIS. — Shells small, subcircular, slightly longer than high, rather compressed, with a broad anterior part, a slightly tapering posterior part and a posterior area delimited by a rounded posterior angle. Beaks in front of the vertical midline. Surface smooth, some irregularly spaced commarginal lamellae only on the posterior area and occasionally also near the ventral margin, terminating dorsally in more or less pronounced leaf-like prolongations. Lunule short, narrow and sunken, escutcheon very narrow and sunken. Hinge plate narrow, toothless. Diverging part of anterior adductor scar short, its length slightly less than half the total scar length. Angle between base of diverging part and pallial line small, between about 10° and 18°. Pallial line not entire but discontinuous, with ovate or elongate scars and narrow interruptions, mostly on the ventral part and sometimes hardly visible. Posterior adductor scar small. Inner margins smooth.

REMARKS. — Chavan (1969) wrongly placed this genus in the synonymy of *Gonimyrtea* Marwick, 1929. However, *Gonimyrtea* is a different genus from New Zealand, distinguished by the presence of hinge dentition, commarginal sculpture and a shorter anterior adductor. As a consequence, *Alucinoma* has not been recognized as a genus in most of the recent Japanese literature (e.g. Higo *et al* 2001; Okutani (ed.) 2000); in Higo *et al* (1999: 456), it is treated as a subgenus of *Gonimyrtea*. *Alucinoma* is here reinstated as a full genus. It is characterized by its small size (about 10-20 mm), the rather short and high shell, the predominantly smooth surface in combination with the leaf-like projections of the escutcheon keel, the toothless hinge, the rather long anterior adductor scar with comparatively short diverging part and the more or less discontinuous pallial line. The closest genus is *Dulcina* (see above), which shares the same basic form of the anterior adductor scar and the interrupted pallial line. However, species of *Dulcina* grow much larger and are broader in their anterior part and much more distinctly tapered posteriorly. Another similar looking genus, *Minilucina* (see next genus), is similar in size but is distinguished by its longer shell and a rather short anterior adductor scar with an exceptionally short diverging part.

The species figured by Knudsen (1967: pl. 2, figs 9, 11, from Zanzibar, 805 m) and cited as "*Lucina inanis* (Prashad)" is close to *Alucinoma* and may belong to this genus; it is certainly undescribed. Although Knudsen compared his specimens with the type lot of *Dentilucina inanis* Prashad, 1932 and "found them to agree well with

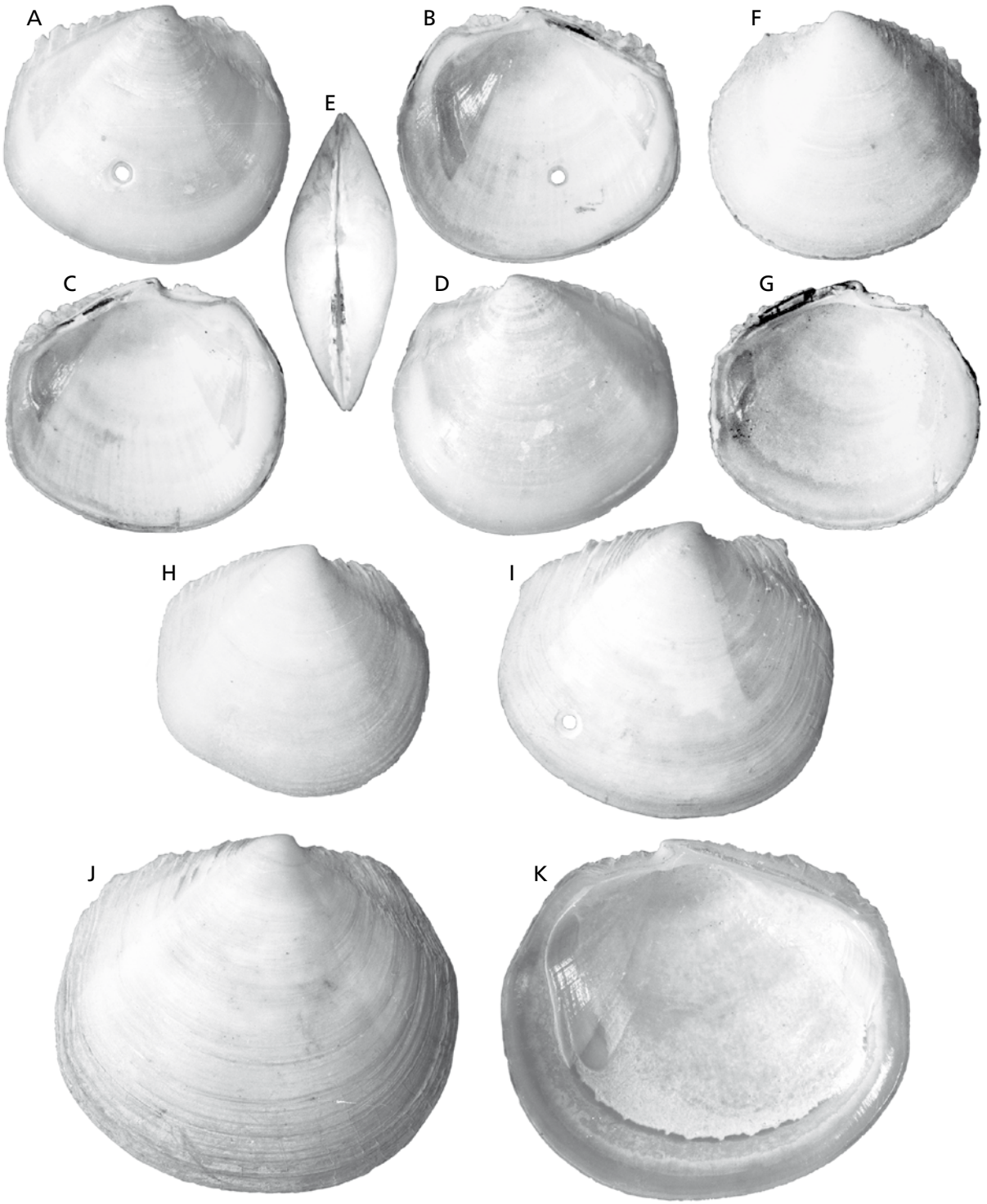

FIG. 54. *Alucinoma alis* n. sp. **A-E**, holotype MNHN 20740, 11.3 mm; **A**, ext. of rv; **B**, int. of rv; **C**, ext. of lv; **D**, int of lv; **E**, dorsal view; **F-G**, specimen from SALOMON 1 stn CP 1801, 11.2 mm; **F**, ext. of lv; **G**, int of lv; **H**, specimen from SALOMON 1 stn CP 1745, 11.2 mm, ext. of rv; **I**, specimen from MUSORSTOM 3 stn CP 125, 14.8 mm, ext. of rv; **J-K**, specimen from MUSORSTOM 3 stn CP 125, 19.9 mm; **J**, ext. of rv; **K**, int. of rv.

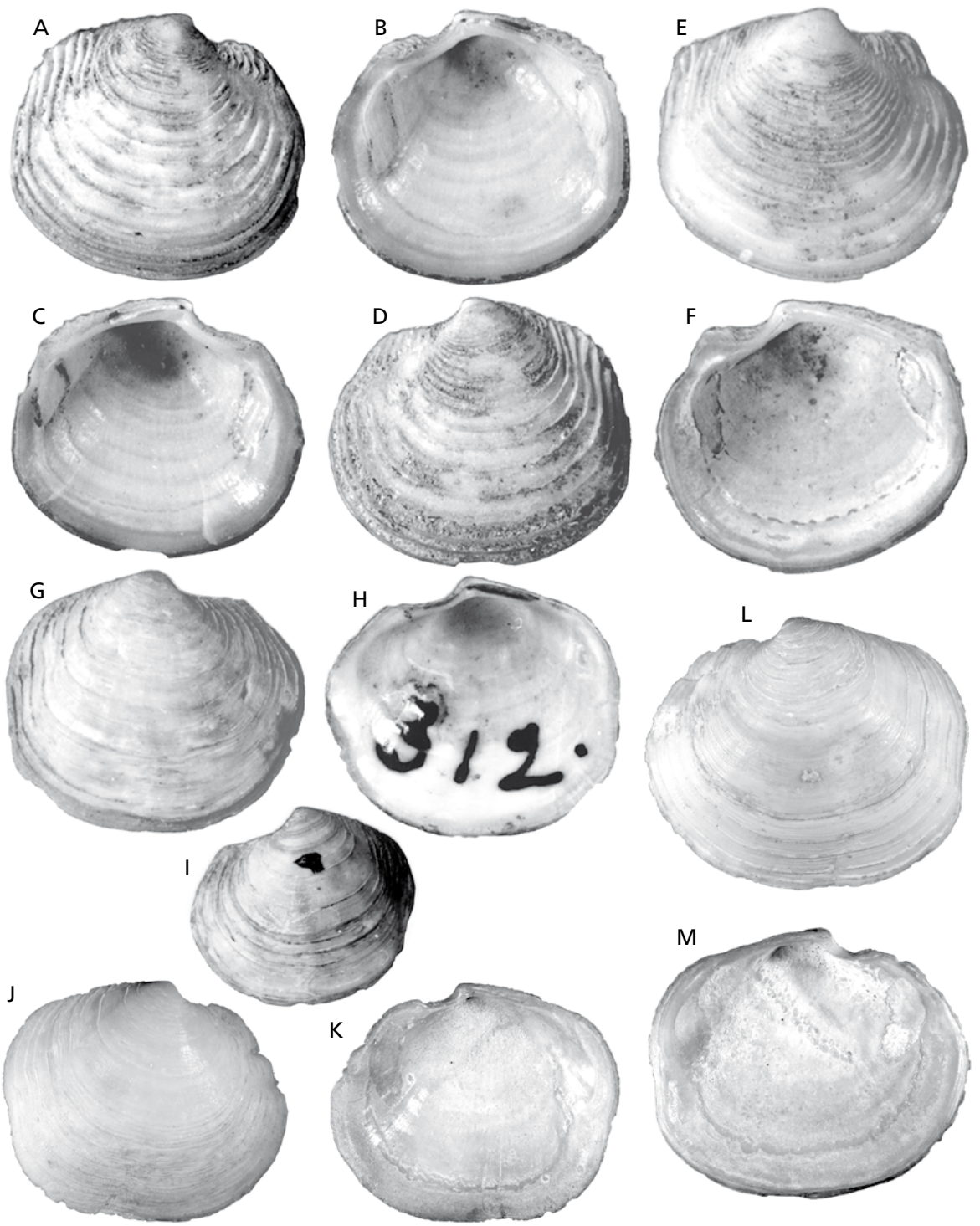

FIG. 55. *"Lucina inanis* Prashad" and *Dentilucina inanis* Prashad, 1932. **A-D**, *"Lucina inanis* Prashad", mentioned specimen 1, Knudsen (1967: 286, fig.19D, pl. 2, figs 9, 11), Zanzibar area, *John Murray* Expedition, stn 125, BMNH 1968.7.38, 10.5 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext of lv; **E-F**, mentioned specimen 2 (Knudsen 1967: 286), *John Murray* Expedition, stn 125, BMNH 1968.7.38, 10.8 mm; **E**, ext. of rv; **F**, int. of rv; **G-H**, *Dentilucina inanis* Prashad, 1932 (=*Tinalucina inanis* (Prashad), syntype 1 ZMA, 8.5 mm; **G**, ext. of rv; **H**, int of rv. **I**, *Dentilucina inanis* Prashad, 1932, syntype 2 ZMA, 5.4 mm, ext. of lv. **J-M**, *"Dentilucina"* cf. *inanis* Prashad, specimens from MUSORSTOM 3 stn CP 100, 13.7 mm; **J**, int. of rv; **K,** ext. of rv; **L**, MUSORSTOM 3 stn CP 112, 15.2 mm, int. of lv; **M**, ext. of lv.

the shells of *L. inanis*", after re-examination of the *John Murray* material (Figs 55A-F, 56F) and the type material of *Dentilucina inanis* (Figs 55G-I, 56G-H), we see more similarities between Knudsen's material and species in the genus *Alucinoma*. However, the anterior adductor scar of the species from the *John Murray* is still shorter (see Fig. 56F) and the ventral pallial line is well divided into successive small oval pallial impressions. Moreover, the surface is decorated with rather widely spaced, fine commarginal lamellae. More material is necessary to confirm these differences.

The real *Dentilucina inanis* Prashad, 1932 from Indonesia (Saleh Bay, north coast of Sumbava) has a longer anterior and a shorter posterior part; the adductor scars are also different (see Figs 55G-I and 56G-H), and the shell is more tumid. Furthermore, a right and a left valve of a species strongly resembling the type material were taken during MUSORSTOM 3 in the Philippines (west of Luzon, near Lubang I, 14°N, 120°18'E, 189-199 m, stn CP 100 and CP 112). However, they are somewhat larger than the type specimens and have a slightly more quadrangular outline (see Figs 55J-M and 56I). "*Dentilucina*" *inanis* belongs to *Tinalucina* Cosel, 2006, the type species of which is the tropical West African *T. aequatorialis* Cosel, 2006.

Alucinoma alis n. sp.

Figs 54A-K, 56A-C, 57

TYPE MATERIAL. – Holotype, sh (11.3 x 10.4 x 4.1 mm) MNHN 20740, 2 paratypes (1 sh, 1 broken rv) MNHN 20741.

TYPE LOCALITY. – Solomon Islands, N of Honiara, Guadalcanal, 9°22.9'S, 159°57.4'E, 302-396 m [SALOMON 1: stn DW 1746].

MATERIAL EXAMINED. – **Solomon Islands**. SALOMON 1: stn DW 1745, N of Honiara, 9°23'S, 159°59'E, 253-356 m, 2 sh (15.1 x 13.9 x 6.0, 7.0 x 6.6 x 3.1 mm), 3 rv, 1 lv (11.2 x 10.4 mm); stn DW 1746, 9°22.9'S, 159°57'E, 302-396 m, 2 sh, 1 broken rv (holotype and paratypes 8.5 x 7.9 x 3.3 mm); stn CP 1801, N of Guadalcanal, 9°25'S, 160°26E, 264-273 m, 3 sh (11.2 x 10.4 x 4.6 mm), 1 rv.
Philippines. MUSORSTOM 3: stn CP 125, Central Philippines, 11°57'N, 121°28'E, 388-404 m, 4 juv. v (19.9 x 17.8, 15.7 x 14.2, 14.9 x 13.2, 14.8 x 13.5 mm).

DISTRIBUTION. – Solomon Islands and central Philippines, in 273-388 m.

DESCRIPTION. – Shell small, up to 20 mm long but usually smaller, rather thin, somewhat variable, subcircular (l/h 1.1), inequilateral, equivalve, compressed. Beaks slightly in front of the vertical midline. Anterior part broadly rounded, posterior part slightly tapering, posterior margin truncated, somewhat oblique, with broadly rounded postero-ventral corner. Postero-dorsal margin slightly convex to almost straight. Ventral margin well rounded.

Exterior smooth, with weak commarginal lamellae on the posterior area that end in more or less pronounced leafy projections along the escutcheon keel. Interspaces almost smooth, very fine growth lines may be present. Antero-dorsal area short, with more densely spaced commarginal lamellae, also ending in delicate leafy projections delimiting the lunule, and with a radial groove in the middle. Antero-dorsal angle well marked, rounded. Posterior area separated by a broad and shallow posterior angle.

Hinge plate narrow, hinge generally toothless, although the vestiges of a cardinal are sometimes discernible. Lunule very short and moderately narrow, sunken. Escutcheon almost filled by the ligament. Anterior adductor scar elongate, diverging part less than half the scar length. Impression of the pallial blood vessel not visible. Inner surface of valves not punctate; inner margin smooth.

Valves translucent grey-white. Periostracum thin and pale straw-coloured, dull, in juvenile spcimens almost colourless and eroded on the earlier (umbonal) region of the valves. Occasionally, valves with two clear radial whitish-opaque zones visible on the interior, extending ventrally to the pallial line or ventral part of adductor scar and sharply delimited from the rest of the valves: one on the antero-dorsal region and one on the postero-dorsal region.

REMARKS. – *Alucinoma alis* fits well into the genus *Alucinoma*. The Philippine specimens, of which only 4 right valves are available, are only tentatively placed within this species; however, apart from their larger size, we do not see any differences from the Solomon Islands specimens.

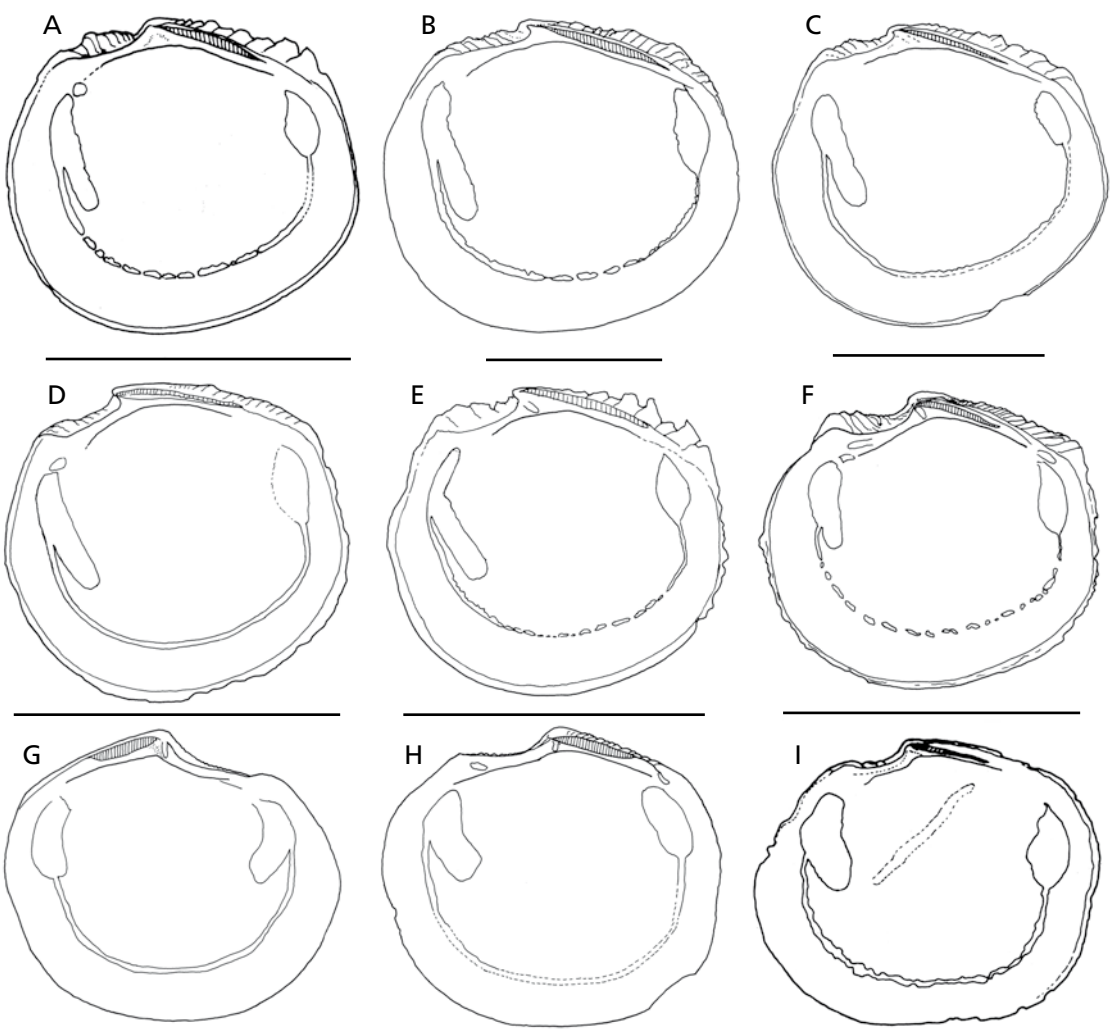

FIG. 56. *Alucinoma* spp. and *Tinalucina inanis*, outline drawings of the insides of valves. **A**, *Alucinoma alis* n. sp., holotype MNHN 20740; **B**, MUSORSTOM 3 stn CP 125; **C**, MUSORSTOM 3 stn CP 125. **D**. *Alucinoma soyoae* Habe, 1958, holotype (drawn after the fig. *in* Higo *et al*., 2001: 160, B 608); **E**, specimen figured in Okutani *et al*. (2000: pl. 463, fig. 20) and drawn from there. **F**, *"Lucina inanis* Prashad", mentioned specimen Knudsen (1967: 286), *John Murray* Expedition stn 125, BMNH 1968.7.38. **G**, *Dentilucina inanis* Prashad, 1932 (=*Tinalucina inanis* (Prashad), syntype 1 ZMA; **H**, *Dentilucina inanis* Prashad, 1932, syntype 2 ZMA. **I**, *"Dentilucina"* cf. *inanis* Prashad, MUSORSTOM 3 stn CP 100.

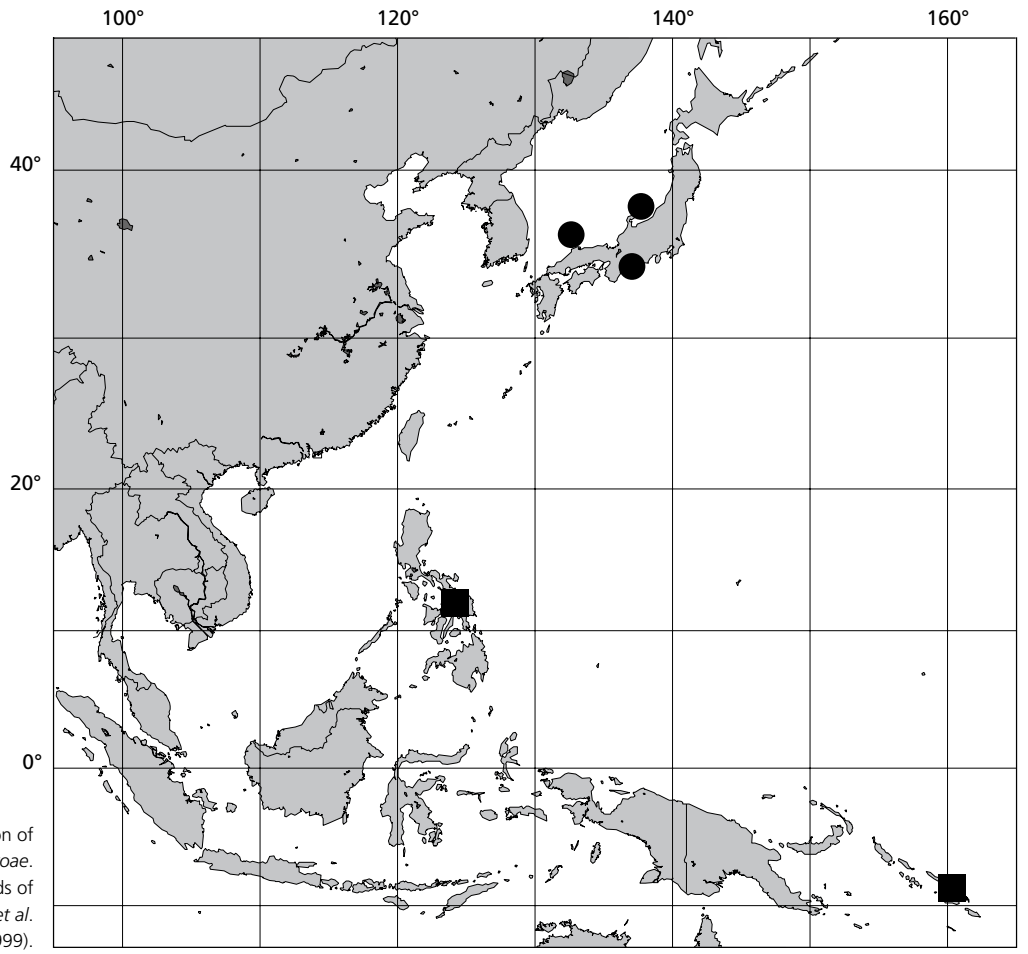

FIG. 57. Distribution of *Alucinoma*. Circle: *A. soyoae*. Square: *A. alis*. Records of *A. soyoae* after Higo *et al.* (1999).

ETYMOLOGY. — After the R/V *Alis*, which was used for several of the cruises during which material for this paper was taken, noun in apposition.

Genus ***EPIDULCINA*** n. gen.

Type species: *Epidulcina delphinae* n. sp. (here designated).

One species, Fiji.

DIAGNOSIS. — Shells small, subcircular, slightly longer than high, rather compressed, with a very broad anterior part, a tapering posterior part and well-delimited anterior and posterior areas. Beaks just in front of the vertical midline. Surface with, in general, quite evenly spaced very delicate commarginal lamellae that are broad and curling ventrally and cover the upper part of the interspace situated ventrally of each lamella. Postembryonal valve smooth. On the earlier (umbonal) region lamellae more densely spaced, finer and narrower, lamellae near the ventral margin often

less regularly spaced. Lamellae most widely spaced in the middle region of the valves. Last lamella near the ventral margin overlapping the margin towards the ventral region, thus forming a "secondary ventral margin". On an anterior and a posterior section next to the anterior and posterior area on the the right valve, lamellae much larger and towards the ventral region totally covering the interspaces and touching the next ventralward lamella; ventralmost lamella passing over the margin of the opposite left valve at its anterior and postero-ventral margins, giving the shell an inequivalve appearance (Figs 58G, 58I-K). On the left valve lamellae continuous. Lunule long, narrow, asymmetric and sunken, in the right valve slightly broader than in the left valve. Escutcheon narrow and deeply sunken. Hinge plate very narrow, toothless in general but occasionally with weak and undefined vestiges of teeth. Diverging part of the anterior adductor scar extremely short, its length one fourth to one fifth the total scar length. Angle between base of diverging part and pallial line rather small, about 20°. Pallial line not entire but more or less discontinuous. Posterior adductor scar small. Inner margins smooth.

REMARKS. – *Epidulcina* belongs to the same group as *Dulcina*, *Alucinoma* and *Minilucina* (see next entry), and its general shape corresponds to these genera except that the posterior part tapers ventrally more and the posterior margin is inversely oblique, with the posteriormost extremity on the postero-dorsal corner. In *Dulcina*, *Alucinoma* and *Minilucina*, the posteriormost extremity is at the postero-ventral corner.

However, the main distinguishing and outstanding character of *Epidulcina* is the external sculpture with the thin, delicate but very broad commarginal lamellae that are oriented ventralwards. Moreover, the ventralmost lamella passes over and beyond the real ventral margin where the two valves close, forming a "false margin". A feature previously not seen in Lucinidae is the greater width of the lamellae on the regions immediately ventral to the anterior and posterior area in the right valve. As a consequence, on these sections of the "false ventral margin" the ventralmost lamella overlaps the "false margin" of the left valve and gives the shell a secondarily inequivalve appearance. On the left valve, the lamellae on these regions are still more curled towards the surface of the ventralward interspaces, resulting in a very shallow indentation of the "false margin" sections, where the lamellae of the right valve overlap. As in *Dulcina* and *Alucinoma*, the pallial line is broken up into small, elongate scars and narrow interruptions. *Minilucina* and *Epidulcina* share the form of the anterior adductor scar and the extremely short diverging part. The specimen cited by Knudsen (1967: 286) as "*Lucina inanis* Prashad" has a similar very short diverging part and a discontinuous pallial line (see Figs 55E-F, 56F).

ETYMOLOGY. – In reference to the widely overlapping commarginal lamellae at the ventral valve margins and the close relation of this genus to *Dulcina*.

Epidulcina delphinae n. sp.

Figs 58-59

TYPE MATERIAL. – Holotype, sh (20.1 x 16.5 x 6.8 mm) MNHN 20742, 13 paratypes (1 spm, 12 sh) MNHN 20743, 1 paratype (spm) USNM, 2 paratypes (sh) BMNH.

TYPE LOCALITY. – Fiji, Vanua Levu, Natewa Bay, 16°39'S, 179°37'E, 360-380 m [BORDAU 1: stn CP 1406].

MATERIAL EXAMINED. – **Fiji**. MUSORSTOM 10: stn CP 1316, Bligh Water, 17°15'S, 178°22'E, 478-491 m, 1 rv; stn CP 1327, 17°13'S, 177°52'E, 370-389 m, 2 rv; stn CP 1330, 17°10'S, 177°56'E, 567-699 m, 2 rv; stn CP 1368, 18°11'S, 178°24'E, 380-469 m, 1 lv; stn DW 1376, S of Viti Levu, 18°19'S, 178°09'E, 497-504 m, 1 rv. – BORDAU 1: stn CP 1406, 16°39'S, 179°37'E, 360-380 m, 1 spm (paratype, 18.2 x 15.0 x 5.6 mm), 13 sh (holotype and paratypes, 21.1 x 17.6 x 8.0, 20.4 x 17.1 x 8.1, 19.7 x 16.2 x 7.0, 19.1 x 15.6 x 6.1, 19.0 x 16.1 x 7.4, 16.8 x 13.2 x 5.5 mm, MNHN; 2 sh (paratypes

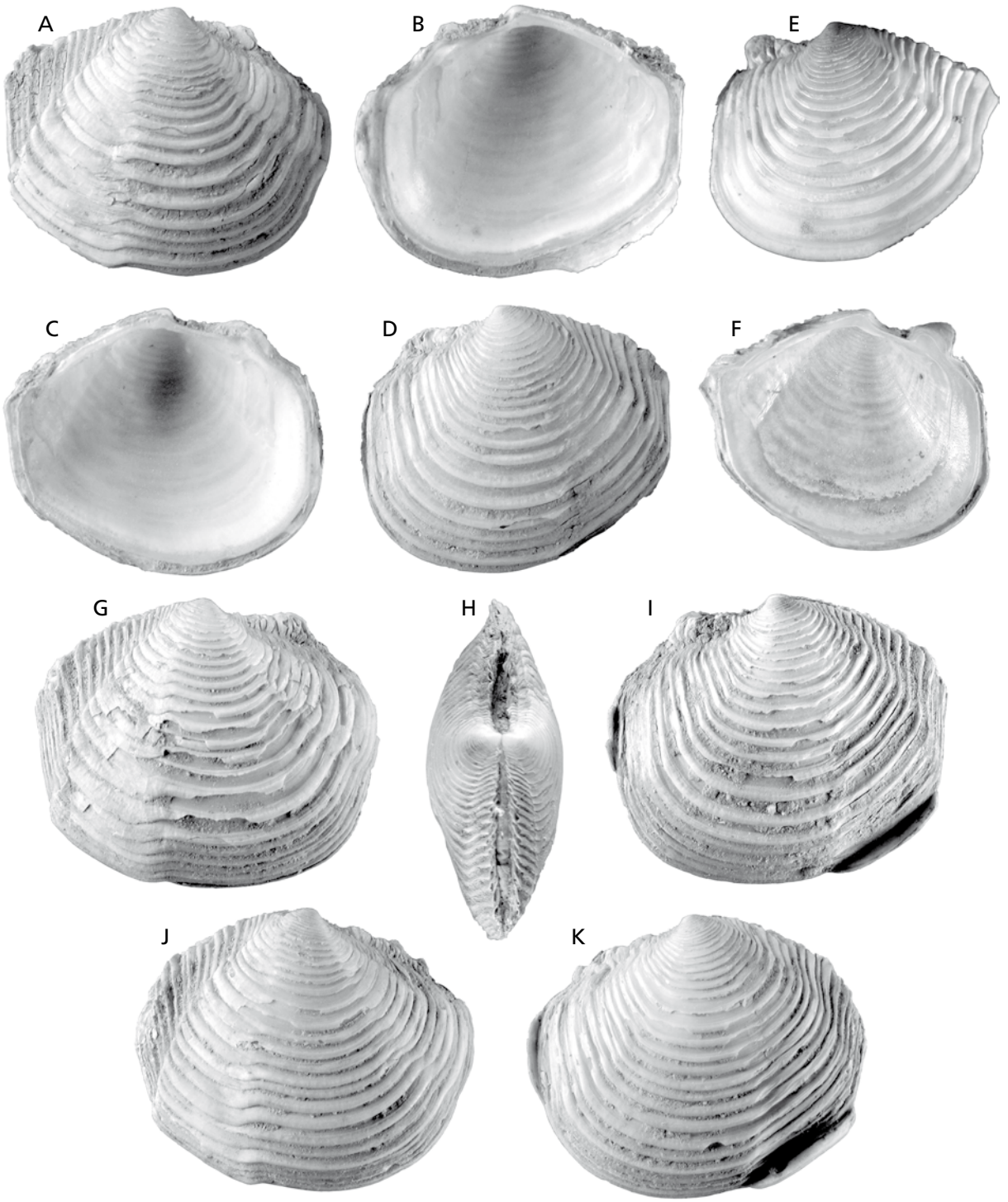

FIG. 58. *Epidulcina delphinae* n. sp. **A-D**, holotype MNHN 20742, 20.1 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E-F**, paratype MNHN 20743, 16.8 mm; **E**, ext. of lv; **F**, int. of lv; **G-I**, paratype MNHN 20743, 20.4 mm; **G**; ext. of rv; **H**, dorsal view; **I**, ext. of lv, with rv overlapping; **J-K**, paratype MNHN 20743, 21.1 mm; **J**, ext. of rv; **K**, ext. of lv, with rv overlapping; all BORDAU 1 stn CP 1406.

18.5 x 15.5 x 6.7, 18.4 x 15.7 x 6.4 mm), BMNH; 1 sh (paratype 18.2 x 15.3 x 7.0 mm), USNM; 17 rv, 14 lv (all associated specimens) 17.1 x 14.2 x 6.8, 16.7 x 14.1 x 6.3, 16.6 x 13.7 x 5.6, 15.4 x 12.1 x 5.0 mm); stn CP 1407, Vanua Levu, Natewa Bay, 16°40'S, 179°39'E, 499-527 m, 1 rv.

DISTRIBUTION. – Only known from Fiji, in 380-567 m (1 spm, otherwise shells and valves only).

DESCRIPTION. – Shell small, up to 20 mm long, rather thin, somewhat variable, oblong-subcircular (l/h 1.2), inequilateral, primarily equivalve (see below), rather compressed. Beaks just in front of the vertical midline. Anterior part broadly rounded, anterior margin with a narrowly rounded corner to the antero-dorsal margin. Posterior part tapering, posterior margin obliquely truncated, with the posteriormost point at the rather sharp postero-dorsal corner. Postero-ventral corner rounded. Antero-dorsal margin divided into two, short, concave to almost straight sections with a rounded corner between them, the upper section comprising the lunular area. Postero-dorsal margin slightly convex to straight. Ventral margin well-rounded more in the anterior section than in the posterior section.

Exterior with thin, more or less evenly spaced, broad, delicate and fragile commarginal lamellae, which are bent ventrally and thus cover the upper part of the corresponding ventral interspace. Distance between the lamellae slightly variable among specimens. Near the ventral margin, lamellae often more densely spaced; with the last lamella next to the (primary) ventral margin surpassing this margin and forming a rather broad, delicate secondary ventral margin. A broad section on the right valve ventral to the posterior area and another, narrower section ventral to the anterior area, possess much broader lamellae; these are almost twice their normal width, and ventrally

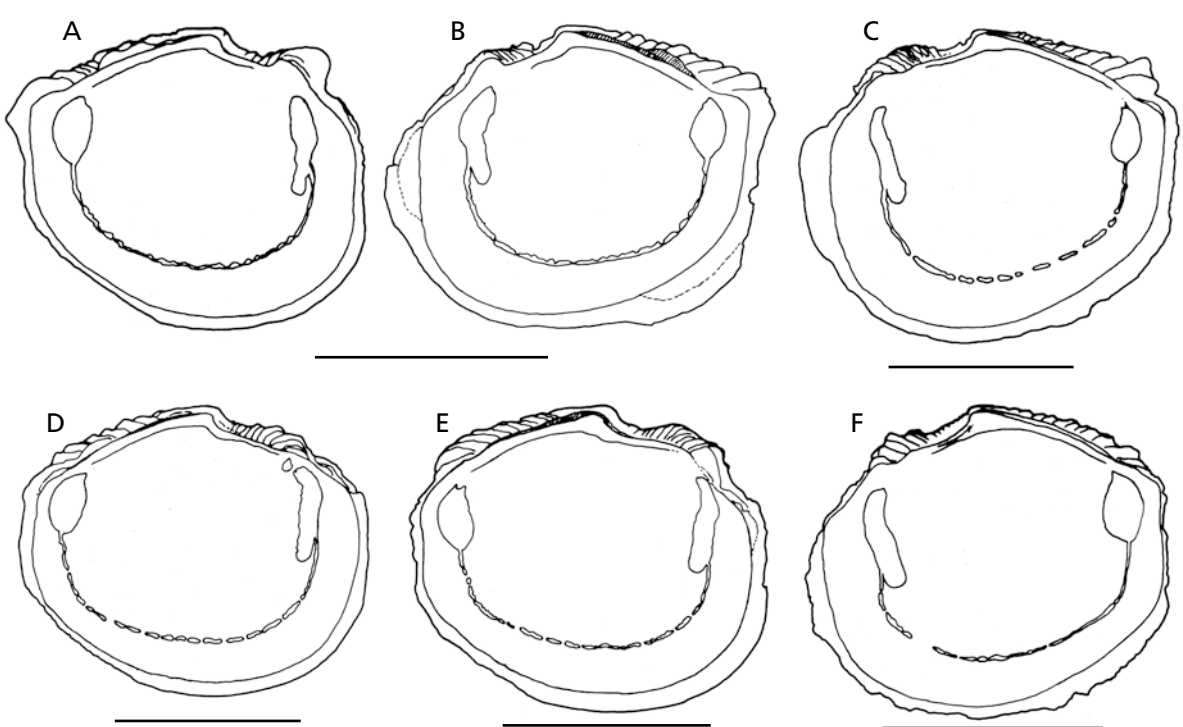

FIG. 59. *Epidulcina delphinae* n. sp. outline drawings of the insides of valves. **A-B**, paratype MNHN 20743, 16.8 mm, both v; **C-F**, associated specimens (**C**, **F**, rv; **D-E**, lv).

cover the whole corresponding interspace and touch the next lamella, giving these sections the aspect of broad radial undulations. On the ventral margins, in these sections, lamellae widely overlapping the left valve and giving the shell a secondary inequivalve aspect. On the left valve, these same sections with the lamellae more curling towards the interspaces, giving in part the appearance of additional, ventrally-situated anterior and posterior areas. On the early (umbonal) region of the valve, lamellae much finer and more densely spaced, immediate postlarval shell smooth. Anterior and posterior areas mostly delimited by the difference in appearance of the commarginal lamellae, anterior area with a narrow, sharp radial groove in its middle. Anterior and posterior areas delimited to lunule and escutcheon by sharp projections of the commarginal lamellae, these projections are often higher and more irregular along the lunule.

Hinge plate narrow, in both valves almost toothless, but often with a slight indication of a rounded oblique cardinal, no laterals visible. Lunule rather long and very narrow, slightly asymmetric, somewhat broader in the right valve and deeply sunken. Anterior adductor scar small with an extremely short diverging part, the pallial line meeting the scar at its ventral fourth or fifth. Pallial line discontinuous, with oval to long and elongate scars and mostly narrow interruptions. Impression of the pallial blood vessel not visible. Inner surface with external sculpture reflected on it. Inner (primary) margin of valves smooth.

Valves translucent white. Periostracum very thin, pale straw coloured.

REMARKS. — As for the genus.

ETYMOLOGY. — Dedicated to our colleague Delphine Brabant, in acknowledgement of her work on the image bank of the molluscan type collection of MNHN.

Genus ***MINILUCINA*** n. gen.

Type species: *Minilucina coriolis* n. sp. (here designated).

Two species, central Indonesia, Solomon Islands.

DIAGNOSIS. — Shells small, subcircular, slightly longer than high, rather compressed, with a very broad anterior part, a tapering posterior part and a visible but not well delimited posterior area. Beaks just in front of the vertical midline. Surface with irregularly spaced, almost absent to rather conspicuous commarginal cords instead of delicate lamellae, only on the lower part of the valve. Lunule short, narrow and sunken, escutcheon narrow and sunken. Hinge plate very narrow, toothless in general but occasionally with weak vestiges of a cardinal. Diverging part of the anterior adductor scar extremely short, length one-fourth to one-fifth the total scar length. Angle between base of diverging part and pallial line very large, between about 20° and 43°. Pallial line irregular but entire. Posterior adductor scar small. Inner margins smooth.

REMARKS. — *Minilucina* is close to *Dulcina* but distinguished by its uninterrupted pallial line and the long anterior adductor scar with the typical exceptionally short diverging part, a character justifying separation at the generic level. The postero-ventral corner is situated more ventrally, thus diminishing the taper of the posterior part. In comparison with *Alucinoma*, the new genus is distinguished by the presence of commarginal cords on the surface, the more oblong shell and the shorter diverging part of the anterior adductor scar. *Minilucina* seems to be restricted to depths below 1000 m.

ETYMOLOGY. — This is the smallest genus described herein, as expressed in the name.

Minilucina coriolis n. sp.

Figs 60A-G, 62A, 63

TYPE MATERIAL. – Holotype, sh (14.4 x 12.3 x 5.0 mm) MNHN 20744, 1 paratype, sh (16.5 x 14.2 x 5.7 mm) MNHN 20745.

TYPE LOCALITY. – Indonesia, between Sulawesi and Borneo, Makassar Strait, 0°07'N, 119°45'E, 1730 m [CORINDON 2: stn B 236].

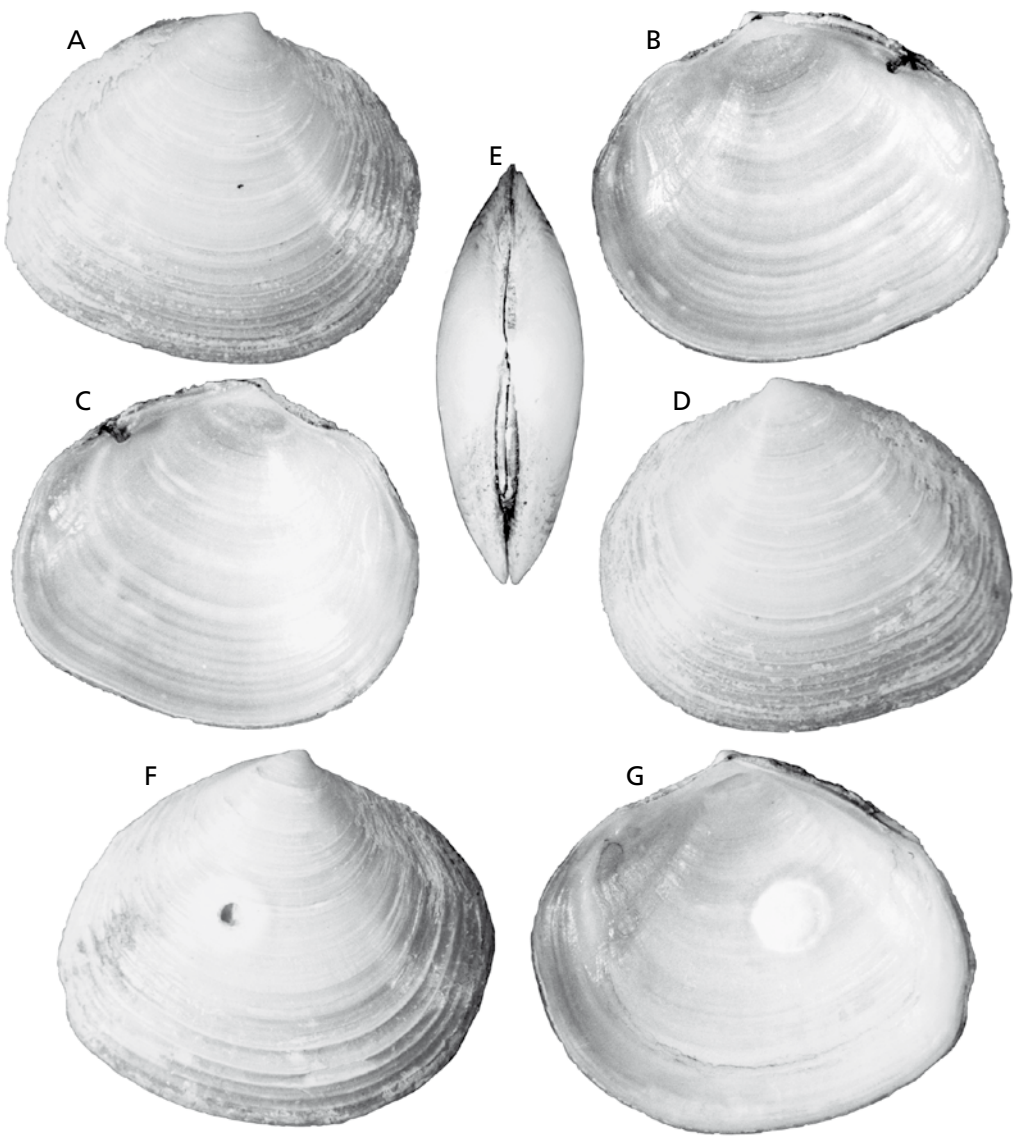

FIG. 60. *Minilucina coriolis* n. sp. **A-E**, holotype MNHN 20744, 14.4 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv; **E**, dorsal view; **F-G**, paratype MNHN 20745, 16.5 mm, CORINDON 2 stn B 236 (**F**, ext. of rv; **G**, int. of rv).

MATERIAL EXAMINED. – The type material only.

DISTRIBUTION. – Makassar Strait, Indonesia, known only from the type locality, in 1730 m.

DESCRIPTION. – Shell small, up to 16.5 mm long, rather thin, somewhat variable, triangular-subcircular (l/h 1.2), slightly oblique, inequilateral, equivalve, rather compressed. Beaks just in front of the vertical midline. Anterior part broadly rounded, anterior margin with a hardly distinguishable corner to the antero-dorsal margin. Posterior part rounded-tapering and posterior margin oblique with rounded corners. Antero- and postero-dorsal margins sloping; antero-dorsal margin divided into two short, more or less straight sections with a very shallow corner between them, the upper section comprising the lunular area. Postero-dorsal margin slightly convex. Ventral margin rounded in its anterior part, less convex in its posterior part.

Exterior somewhat glossy, with thin but strong, more or less irregularly spaced commarginal cords, present only on the ventral half or third of the valve. Interspaces with very fine growth lines. Earlier (umbonal) 9-11 mm of the valve almost smooth, with very fine growth lines and a few more prominent growth lirae. Antero-dorsal area with more densely spaced commarginal wrinkles; antero-dorsal angle very weak. Postero-dorsal area not clearly separated, posterior angle rounded and indistinct.

Hinge plate very narrow, somewhat inclined towards the umbonal cavity, hinge toothless, but in the holotype the weak vestige of a cardinal is present. Lunule short and narrow, slightly asymmetric, broader in the right valve and sunken. Escutcheon long, very narrow and sunken, almost completely filled with the ligament. Anterior adductor scar rather small but long, with a very short diverging part and pallial line meeting the scar at its ventralmost fourth. Impression of the pallial blood vessel only faintly visible in one specimen. Inner surface of valves not punctate; inner margin smooth.

Valves entirely white. Periostracum thin and colourless on the earlier regions of the valve, pale brownish near the margins and peeling off on dried specimens.

REMARKS. – *Minilucina coriolis* resembles *Dulcina musorstomi*, *D. guidoi* and *D. karubari* but it cannot be included in that genus. It differs from these species, as it has a conspicuously sloping antero- and postero-dorsal margin. The anterior adductor scar is met by the pallial line within its ventralmost fourth or fifth, near the lower extremity, making the diverging part extremely short. This feature is typical for some *Myrtea* and a few *Anodontia* but seems rather rare elsewhere in the Lucinidae. It has been observed in only two other deepwater lucinids examined for this paper, *Epidulcina delphinae* and "*Lucina inanis* Prashad" *sensu* Knudsen 1967 (= "*Alucinoma*" sp., Fig. 56F). Other differences between *M. coriolis* and *Dulcina musorstomi* are the indistinct commarginal lamellae on the upper part of the valve and the more rounded anterior margin.

ETYMOLOGY. – After the R/V *Coriolis*, from which this species was collected, noun in apposition.

Minilucina sp. cf. ***coriolis***

Figs 61A-H, 62B, 63

MATERIAL EXAMINED. – **Solomon Islands**. SALOMON 1: stn CP 1755, 8°58'S, 159°42'E, 1288-1313 m, 1 rv; stn CP 1764, SE Santa Isabel, 8°37'S, 160°07'E, 1327-1598 m, 1 spm in alcohol (16.1 x 13.6 x 6.0 mm), 1 sh (12.2 x 11.0 x 4.1 mm).

DISTRIBUTION. – Only known from the Solomon Islands between Santa Isabel and Guadalcanal, in 1313-1327 m.

DESCRIPTION. – Shell small, up to 16 mm long, rather thin, somewhat variable, subcircular-oblong (l/h 1.1-1.2), slightly oblique, inequilateral, equivalve, compressed. Beaks in front of the vertical midline. Anterior part broadly

rounded, anterior margin with a rounded but distinguishable corner to the antero-dorsal margin. Posterior part slightly rounded-tapering, posterior margin oblique and rounded to rounded-truncated. Antero- and postero-dorsal margins sloping, antero-dorsal margin divided into two short, slightly concave sections with a rounded but well marked corner between them, with the upper section comprising the lunular area. Postero-dorsal margin slightly convex. Ventral margin well rounded, only slightly less so in its posterior section.

Exterior somewhat glossy, with widely and more or less irregularly spaced, very fine to rudimentary commarginal cords on the lower half or third of the valve. Lamellae almost absent in the middle of the valves and marked there only by strengthened commarginal periostracal wrinkles. Interspaces with very fine growth lines. Earlier (umbonal) part of the valve almost smooth, with very fine growth lines. Antero-dorsal area with more pronounced and more densely spaced commarginal lamellae, antero-dorsal angle very weak. Anterior angle shallow and rounded. Postero-dorsal area visible and differentiated by the different sculpture and periostracum, posterior angle indistinct.

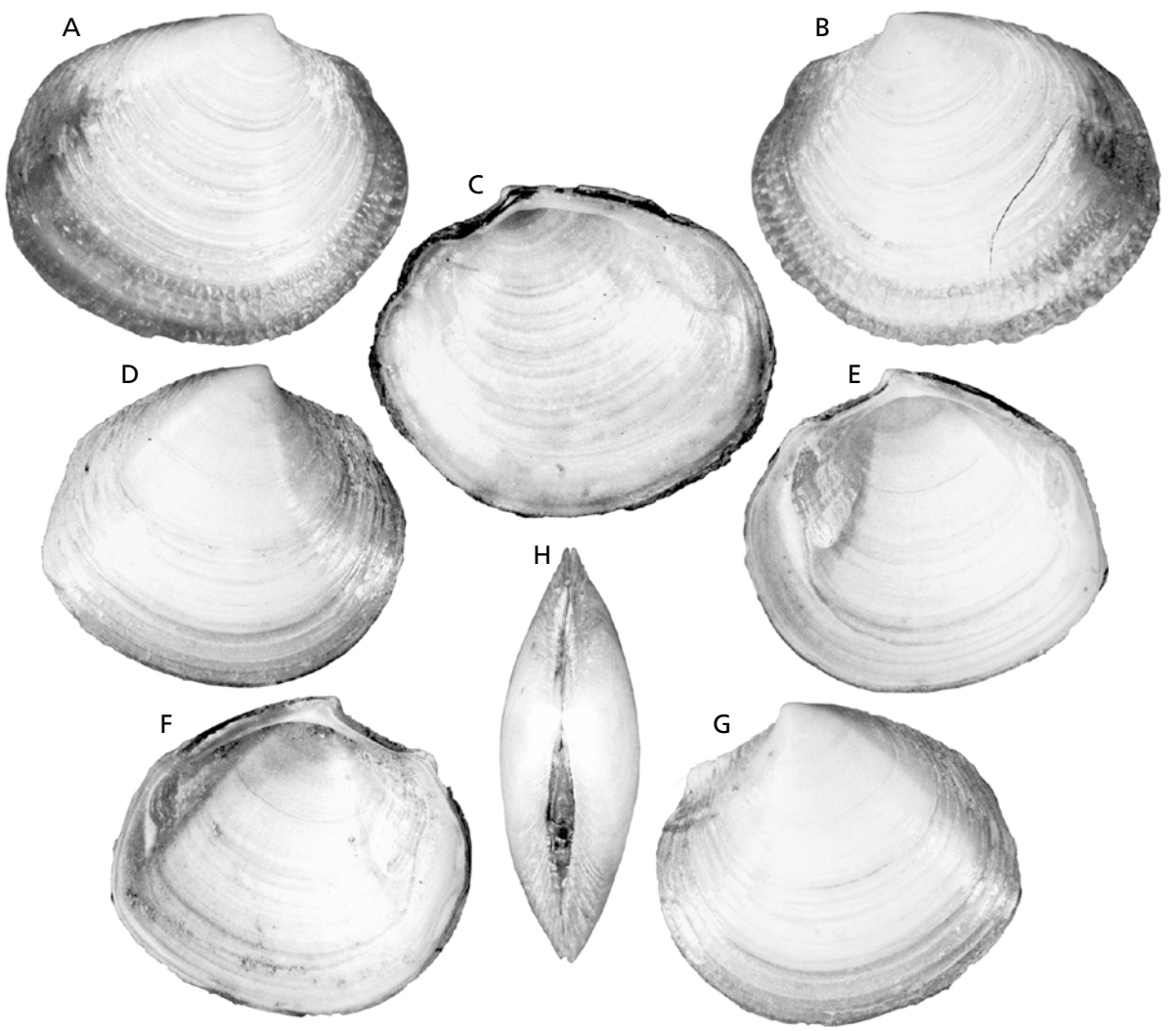

FIG. 61. *Minilucina* sp. cf. *coriolis*. **A-C**, SALOMON 1 stn CP 1764, 16.1 mm; **A**, ext. of rv; **B**, ext. of lv; **C**, int. of rv; **D-H**, SALOMON 1 stn CP 1764, 12.2 mm; **D**, ext. of rv; **E**, int. of rv; **F**, int. of lv; **G**, ext. of lv; **H**, dorsal view.

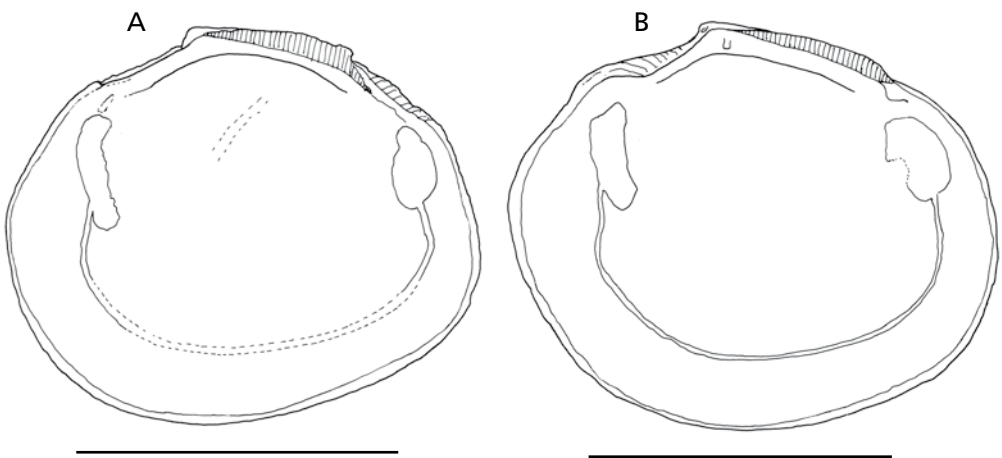

FIG. 62. *Minilucina* spp., outline drawings of the insides of valves. **A**, *Minilucina coriolis* n. sp., holotype MNHN 20744. **B**, *Minilucina* sp. cf. *coriolis*, SALOMON 1 stn CP 1764.

Hinge plate narrow, toothless. Lunule short and narrow, slightly asymmetric, broader in the right valve, sunken. Escutcheon long, very narrow and sunken, almost completely filled with the ligament. Anterior adductor scar rather small and moderately long, with a very short diverging part and the pallial line meeting the scar at its ventralmost fourth. Impression of the pallial blood vessel not visible. Inner surface of valves not punctate; inner margin smooth. Valves entirely white. Periostracum thin, colourless on the earlier parts of the valve, pale brownish near the margins and peeling off there on dried specimens. On the lower part of the valve towards the ventral margin periostracum becoming more and more leafy on the vestiges of the commarginal lamellae.

REMARKS. — This *Minilucina* from the Solomon Islands is very similar to *Minilucina coriolis* in size, muscle impressions and shell form, and the gross shell shape seems to overlap to a large degree among individuals of the two forms. However, the Solomons form has much weaker to absent commarginal lamellae with a more leafy periostracum, and the anterior depression seems slightly more pronounced. The hinge plate, especially the posterior part, is narrower in *M. coriolis s. str.* and slanting more towards the interior, whereas in the Solomons specimens it appears somewhat broader, and its surface is parallel to the plane between the valves. We refrain from giving the Solomons specimens specific rank, until more material becomes available.

Genus ***DISCOLUCINA*** Glover & Taylor, 2007

Type species: *Lucina virginea* Deshayes, 1832 by original designation.

Two species, Indonesia, central and southern Philippines, Solomon Islands, New Caledonia.

DIAGNOSIS. — See Glover & Taylor (2007: 146).

REMARKS: *Discolucina* is characterized by a combination of features not previously seen to the same extent in other Lucinidae: large adductor scars, a very broad hinge plate with narrow and long cardinals, a long and intramarginal, deeply sunken ligament, a broad and entire pallial line and the placement of the very long and broad diverging part of the anterior adductor scar extremely close to and parallel with the pallial line. The most outstanding feature is that the anterior adductor scar has a long dorsal extension on to the hinge plate itself. For more details, see Glover & Taylor (2007).

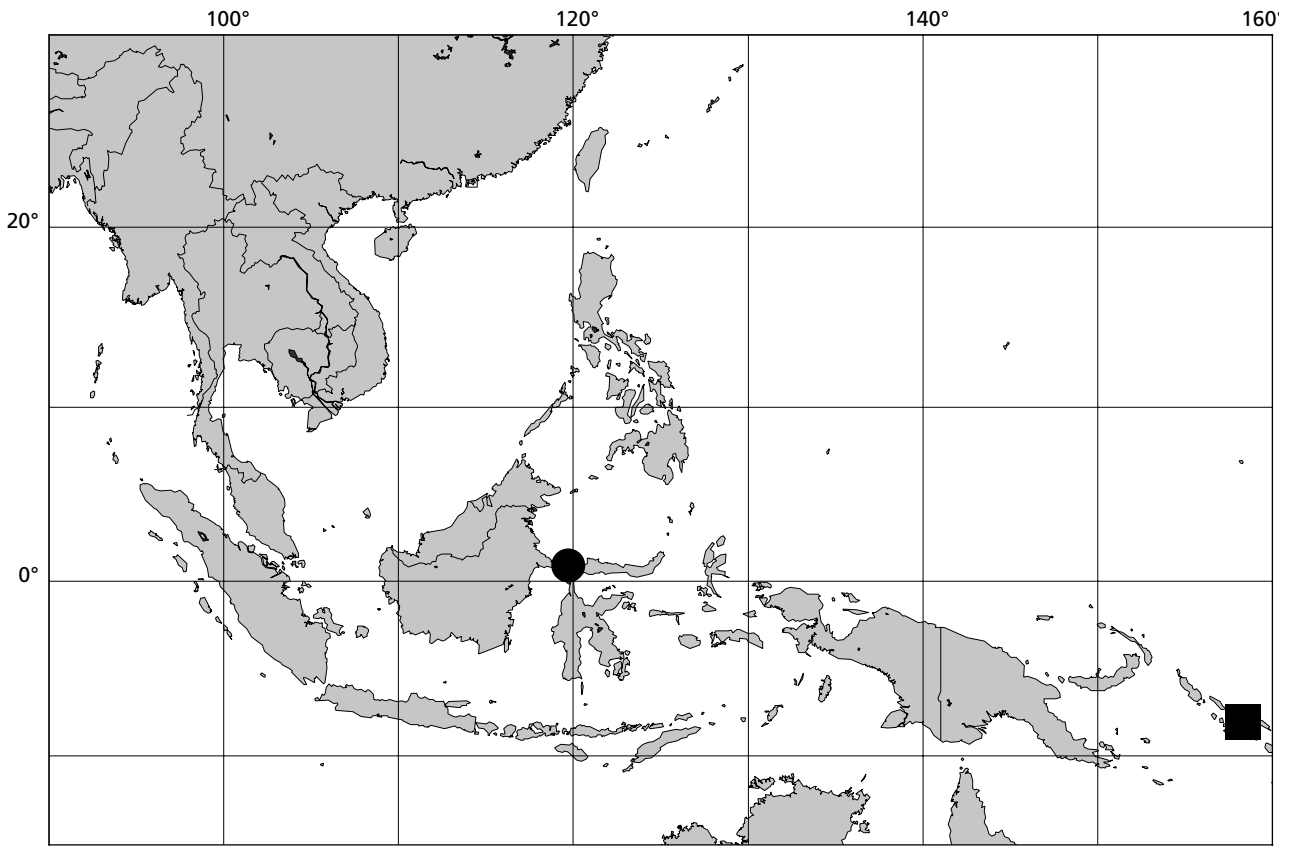

FIG. 63. Distribution of *Minilucina*. Circle: *M. coriolis*. Square: *M.* sp. cf. *coriolis*.

Discolucina solomonensis n. sp.
Figs 64A-F, 66A

TYPE MATERIAL. – Holotype, lv (33.4 x 30.3 mm) MNHN 20745.

TYPE LOCALITY. – Solomon Islands, north of Malaita Island, 8°19'S, 160°40'E, 98-200 m [SALOMON 1: DW 1767].

MATERIAL EXAMINED. – The holotype only.

DISTRIBUTION. – Only known from the Solomon Islands.

DESCRIPTION. – Shell up to about 33 mm long, thick and solid, compressed, subcircular, slightly longer than high (l/h 1.1). Umbones very small and protruding little, directed forward, with beaks in front of the vertical midline. Antero-dorsal margin in its upper (dorsal) section indented, in its lower section convex, antero-dorsal corner rounded. Anterior margin rounded, ventral margin strongly and evenly convex. Posterior margin convex and postero-dorsal corner indistinct.

Exterior somewhat irregular on the anterior part, with fine, low, slightly irregular and densely spaced commarginal lamellae, which are more dense near the margin and on the earlier (umbonal) part but disappear towards the umbones. Coarser growth lines present near the ventral margin. Anterior area small and well-separated by the sharp angle, anterior radial depression incised and ending in a well-marked indentation between anterior angle and lunular margin. Posterior area almost absent, only a very slight radial depression visible. Lunule extremely small, narrow, apparently

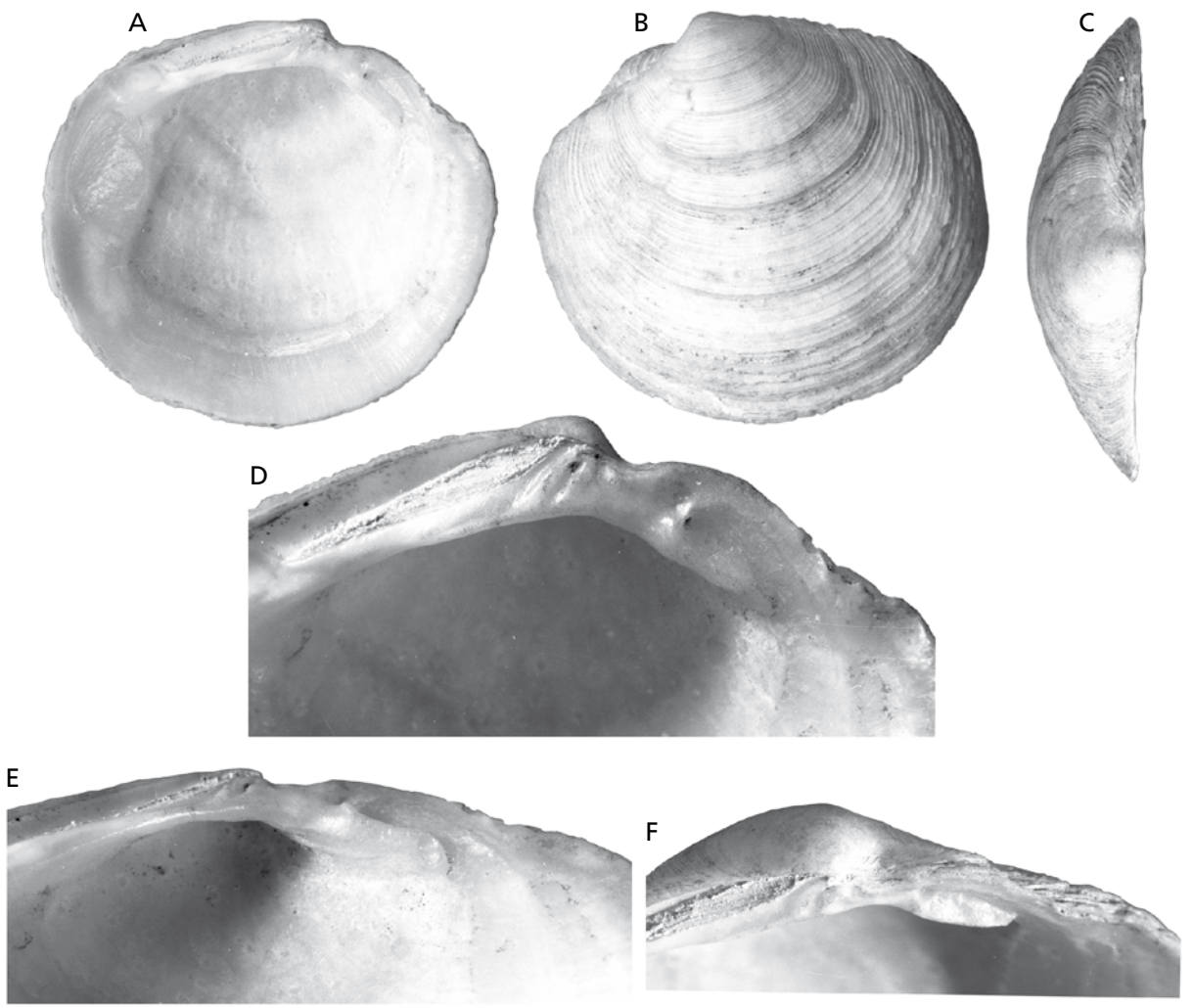

FIG. 64. *Discolucina solomonensis* n. sp. **A-C**, holotype MNHN 20745, 33.4 mm; **A**, int. of lv; **B**, ext. of lv; **C**, dorsal view; **D**, close-up of hinge plate; **E**, hinge plate, viewed from obliquely-ventrally; **F**, hinge plate, viewed from obliquely-dorsally.

slightly asymmetric, longer than broad and little sunken. Escutcheon absent and dorsal margin partly hiding the very deeply sunken and rather long ligament.

Hinge plate strong and very broad, in the left valve with two narrow and close-set cardinals and possibly the vestige of a posterior lateral. Anterior lateral on top of a crest between the lower margin of the hinge plate and the longitudinal depression along the hinge plate with the upper part of the anterior adductor scar. Right valve unknown. Anterior adductor scar very long, with a long and broad diverging part, extending parallel and very close to the pallial line and meeting the scar above its middle, at a very small angle. Dorsal (upper) part of the anterior adductor scar narrow and extending onto the broad hinge plate and bent in the direction of the umbones. Middle region of this upper extension of the scar deeply and sharply indented, forming a "V" in cross-section. Posterior adductor scar very large and broad. Pallial line broad and entire. Trace of the pallial blood vessel on the inside slightly curved. Interior punctate, that is with small spotlike scars where the mantle is attached to the valves. Zone between pallial line and margin with fine and irregular crenulations, mostly next to the margins, with coarser radial crenulations on the pallial line. Inner margin almost smooth.

Valve gray white. Periostracum not seen.

REMARKS. — As for the genus; for details, see Glover & Taylor (2007). The type species of the genus, *D. virginea* (Deshayes, 1832), is larger, and the antero-dorsal indentation below the lunular area is much more pronounced (Figs 65A-D, 66B-C)

The tropical West African *Joellina dosiniformis* Cosel, 2006 from off northern Angola (Cosel 2006: 842-845) superficially resembles *D. solomonensis*. It has the same general outline, outer sculpture and very broad hinge plate, but the anterior adductor scar has the usual form without a dorsal extension onto the hinge plate, and the antero-dorsal margin has no

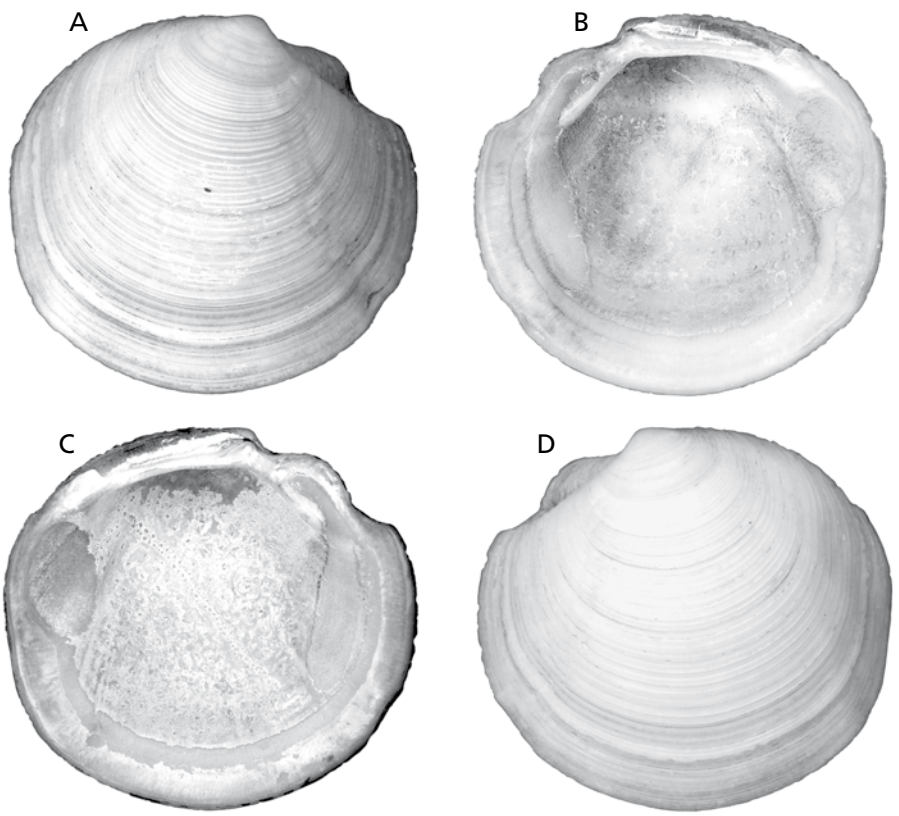

FIG. 65. *Discolucina virginea* (Deshayes, 1832). **A-D**, holotype MNHN 20815, 46.5 mm; **A**, ext. of rv; **B**, int. of rv; **C**, int. of lv; **D**, ext. of lv.

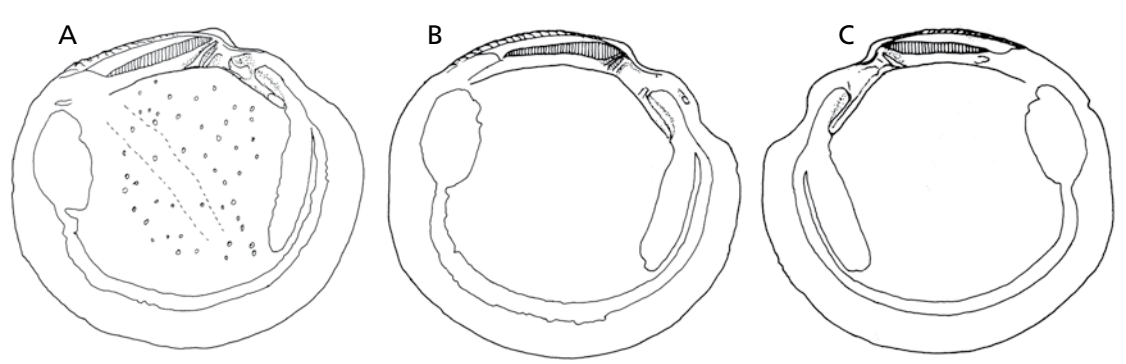

FIG. 66. *Discolucina* spp., outline drawings of the insides of valves. **A**, *Discolucina solomonensis* n. sp., holotype MNHN 20745. **B-C**, *Discolucina virginea* (Deshayes, 1832), holotype MNHN 20815, both v.

sinuosity. Another species with a rather large anterior adductor scar is *Troendleina musculator* (described herein, see above); but in this species, the dorsal extension of the anterior adductor scar is situated under the (narrower) hinge plate.

ETYMOLOGY. – After the Solomon Islands, where the type locality is situated.

Genus ***MEGANODONTIA*** Bouchet & Cosel, 2004

Type species: *Meganodontia acetabulum* Bouchet & Cosel, 2004, by original designation.

Two species, Indo-West Pacific: Taiwan, Recent, Northern Italy, Pliocene. No living specimens yet found.

DIAGNOSIS. – Shells very large to gigantic (type species up to 150 mm), subcircular, very tumid, thick-shelled and heavy. Exterior with dense, strong, irregular growth lines, but no sculpture. Hinge edentulous. Hinge plate rather sturdy, arched, with thick, intramarginal, ligament. Ligament plate horizontal and not slanting towards the cavity of the valve. Umbones very shallow, not protruding, markedly bent forward, situated anteriorly, within the anterior sixth of the dorsal margin. Greatest shell height not marked by the umbones but by the postumbonal dorsal shell margin, thus, in combination with the non-protruding umbones, giving the valves the aspect of a round soup-bowl. or salad dish. Anterior adductor scar large, with a long and broad diverging part, pallial line meeting the scar in its dorsalmost fourth. Angle between the base of the diverging part and the pallial line very large, between about 35° and 40°. Pallial line entire. Ventral margin smooth.

Meganodontia acetabulum Bouchet & Cosel, 2004

Figs 67A-E, 68A-B

Meganodontia acetabulum Bouchet & Cosel, 2004: 706.

TYPE MATERIAL. – Holotype, lv (133.9 x 122.8 x 80 mm) NMNS-4524-001, 1 paratype (rv) MNHN 20747.

TYPE LOCALITY. – Taiwan, northeast coast, off Tashi, 24°50'N, 122°01'E, 370 m [TAIWAN 2001: stn CP 68].

MATERIAL EXAMINED. – **Taiwan**. TAIWAN 2001: stn CP 66, off Tashi, 24°04'N, 122°04'E, 472-586 m, 1 fragm of rv with hinge plate, NMNS; stn CP 68, 24°50'N, 122°01'E, 370 m, 1 lv (holotype, NMNS); stn CP 109, 24°48'N, 122°84'E, 246-256 m, 1 rv (paratype 150.3 x 135.2 x 96 mm, MNHN); stn CP 110, 24°48'N, 122°04'E, 316-350 m, 1 fragm of lv with hinge plate, MNHN. – TAIWAN 2004: stn CP 246, off Tashi, 24°50'N, 122°02'E, 393-427 m, 1 fragment of lv with parts of ligament.

DISTRIBUTION. – Only known from off Tashi, northeast coast of Taiwan, in 256-472 m (valves only).

DESCRIPTION. – See Bouchet & Cosel (2004).

REMARKS. – This is the largest modern species of Lucinidae; the largest ever being "*Lucina*" *megameris* Dall, 1901 from the late Eocene of Jamaica and Florida, which reaches a length of 318 mm (J. D. Taylor pers. comm.). All collected valves and fragments of *M. acetabulum* exhibit a chalky, subfossil aspect, but in 2004 a fragment with an intact outer ligament was obtained (TAIWAN 2004 stn CP 246) that proves the Recent occurrence of *M. acetabulum*. For details, see Bouchet & Cosel (2004).

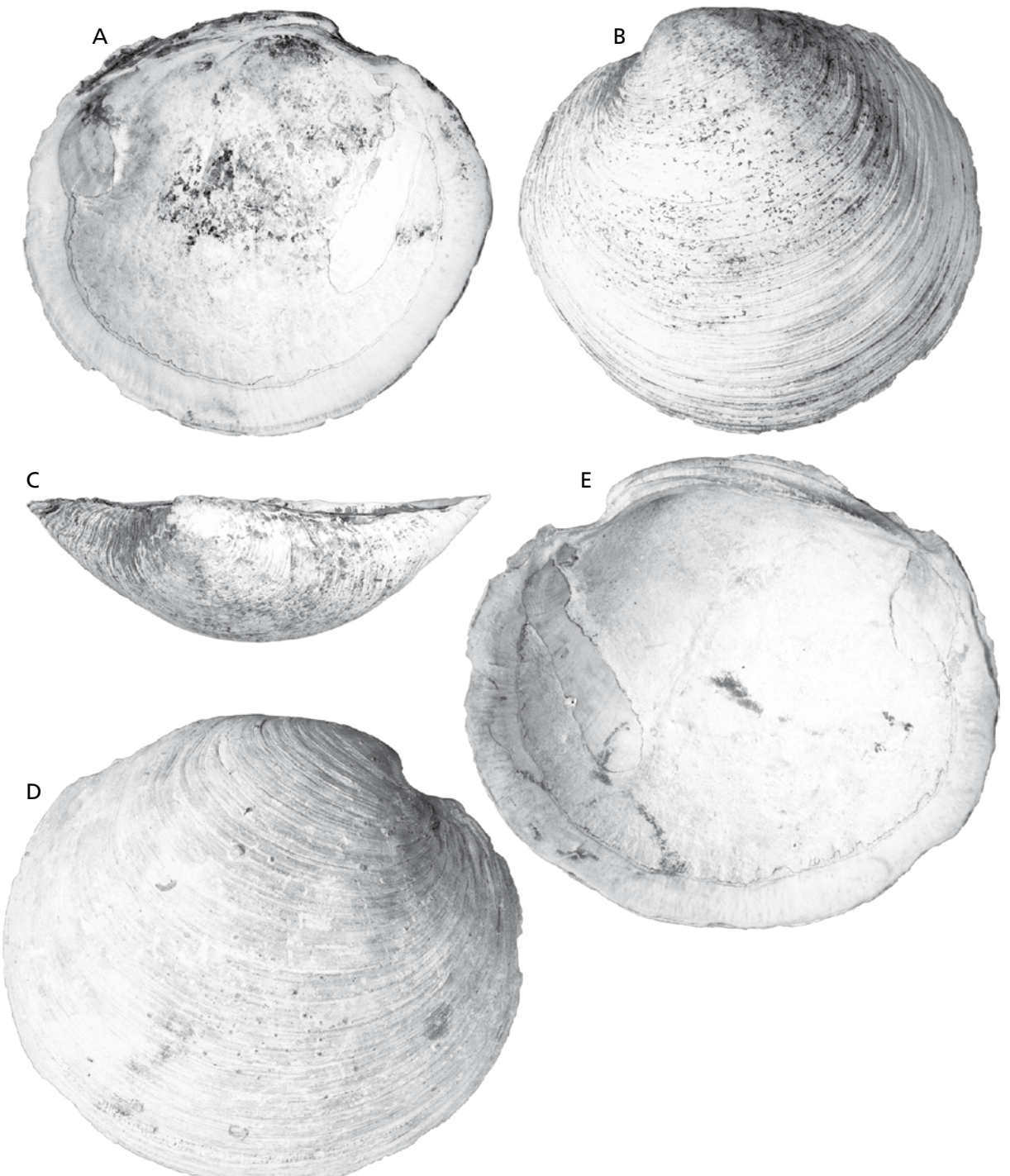

FIG. 67. *Meganodontia acetabulum* Bouchet & Cosel, 2004. **A-C**, holotype NMNS-4524-001, 133.9 mm; **A**, int. of lv; **B**, ext. of lv; **C**, dorsal view; **D-E**, paratype MNHN 20747, 150.3 mm; **D**, ext. of rv; **E**, int. of rv.

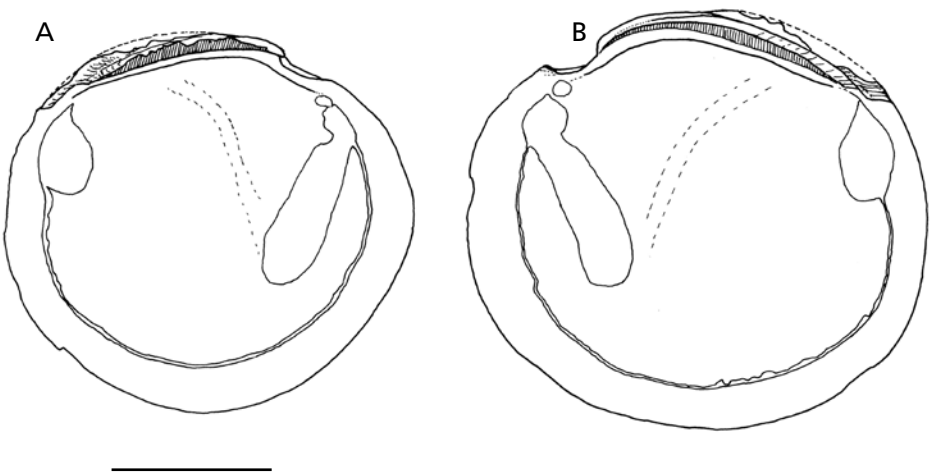

FIG. 68. *Meganodontia acetabulum* Bouchet & Cosel, 2004, outline drawings of the insides of the valves; **A**, holotype NMNS-4524-001; **B**, paratype MNHN 20747.. Scale bar: 50 mm.

DISCUSSION

DIVERSIFICATION OF TROPICAL DEEP-WATER LUCINIDS

Fourteen species of Lucinidae have been reported in the literature from depths greater than 150 metres in the tropical Indo-Pacific (Table 2). The present paper describes an additional 32 species (and leaves two others unnamed) (Table3) and the material obtained during our deep-sea expeditions contains specimens representing at least 37 additional species, not treated herein. In fact, every new survey of deep-water benthic fauna in the tropics yields new species, and the total number of Indo-Pacific lucinid species living below 150 m is probably well in excess of 100. When the large size of the shells of some of the species is taken into consideration, it seems surprising that this lucinid radiation has remained unnoticed until now; there are at least a couple of reasons that may have contributed to this. First, many species appear to be very patchily distributed. The recent discovery (Okutani & Hashimoto 1997) of *Mesolinga soliditesta* Okutani & Hashimoto, 1997, which reaches a size of 64 mm in a well-investigated part of Japan is an example of this patchiness, as well as the discovery of *Lucinoma anemiophila* Holmes, Oliver & Sellanes, 2005 of almost similar size off Bahia de Concepcion, Chile, in 780 m (Holmes *et al.* 2005). Moreover, the finding of a rather large new *Lucinoma* species, *L. kazani* Salas & Woodside, 2002, on mud volcanoes on the Anaximander Mountains in the eastern Mediterranean just south of Turkey, in 1700 m during the cruise ANAXIPROBE (Salas & Woodside 2002) supports this idea. Three other species of large lucinids were discovered very recently on the Angola margin near the Zaïre Canyon between mounds of the deepwater coral *Lophelia pertusa* (Linné, 1758) in 360-425 m (Cosel 2006). The previously mentioned first record of a lucinid, *Bathyaustriella thionipta* Glover *et al*., 2004, on hot vents north of New Zealand is another example of restricted distribution of this deepwater lucinid fauna. Second, it may be that many species of lucinids burrow deep in the sediment and are not successfully collected by commercial trawling gear operating for fish and decapod crustaceans. The discovery of *Lucinoma taiwanensis* n. sp. and *Meganodontia acetabulum* Bouchet & Cosel, 2004 as recently as 2001 in the Tashi fishing ground off northeast Taiwan, a hot vent area, may be related to this behaviour and fishing practice. This fishing area is trawled daily by several dozen fishing boats, and many new species of benthic molluscs have been described (see Bouchet & Cosel 2004) based on material collected as by-products of their commercial operations. However, the trawlers use otter trawls with rather light footropes that normally do not dig deep into the bottom. The new lucinids were discovered when a fishing boat was chartered to use a beam trawl, specially equipped for collecting infaunal invertebrates. When the trawl occasionally became stuck in the mud, deeply buried animals and empty shells embedded in the sediment were fortuitously collected.

The lucinid fauna reported in the present paper is remarkable in the highly localized nature of the observed distributions. Of the 40 species included, only 2 (*Cardiolucina quadrata*, Indonesia, Philippines; *Troendleina marquesana*, Marquesas and Austral Islands) occur in more than one region; the other 38 are restricted to just a single region, as far as can be ascertained from the present sampling efforts. Among these, there are in total 8 groups of sibling species: 6 species pairs and 2 triplets (Table 4). One of the pairs includes a species mentioned but not treated herein (*Alucinoma soyoae*). Five pairs (including two species of the "triplets") are from the central Philippines – southeast Indonesia, two (including two species of one "triplet") from Indonesia – Solomon Islands, two other pairs are from Solomon Islands – Japan and Marquesas – Austral Islands, and the largest range is exhibited by one of the "triplets": Indonesia – Philippines – Madagascar. Whether this reflects actual regional endemism or an artefact of collecting effort, however, remains unknown.

The tropical deep-water lucinid radiation is not only diverse at the species level, it is also diverse at higher taxonomic levels. We report 16 genera, which may reflect a complex and ancient diversification at bathyal depths. The genera *Troendleina*, *Elliptiolucina*, *Gloverina*, *Taylorina*, *Rostrilucina*, *Semelilucina*, *Dulcina*, *Alucinoma*, *Epidulcina* and *Minilucina* contain only deep-water species, including two of the deepest dwelling species, *Elliptiolucina labeyriei* in 2570 m and *Minilucina coriolis* in 1730 m. We consider, at least provisionally, these nine genera as confined to deep-water. If the similarity of *Elliptiolucina magnifica* to Paris basin Eocene species reflects relationships, this would mean that these deep-water genera have a long history, but also that this history may have originated in shallow water rather than in deep water. An example is the previously mentioned discovery of *Bathyaustriella thionipta* Glover *et al.*, 2004 on a

TABLE 3. Depth ranges of all deepwater Indo-Pacific Lucinidae, in bathymetrical sequence (from shallow to deep). Species monographed herein are in bold.

Discolucina solomonensis	98-200 m	Solomon Is.
Alucinoma soyoae	129-200 m	Japan
Megaxinus omanensis	183-414 m	Gulf of Oman, E Africa
Dulcina minor	190-193 m	Philippines
Megaxinus quadrangularis	192-299 m	Philippines
Semelilucina semeliformis	201-239 m	Indonesia
Dulcina musorstomi	205-246 m	Philippines
Lucinoma taiwanensis	205-381 m	N Taiwan
Lucinoma sp. cf. ***sibogae***	206-283m	Indonesia
Myrtea flabelliformis	210-513 m	Indonesia
Cardiolucina quadrata	214-364 m	Indonesia, Philippines, Solomon Is.
Tinalucina inanis	217 m	Indonesia (Java Sea)
Myrtea tanimbarensis	233-288 m	Indonesia
Myrtea triclotae	246-379 m	Philippines
Dulcina karubari	250-466 m	Indonesia
Meganodontia acetabulum	256-472 m	N Taiwan
Lucinoma galathea	268 m	New Zealand
Alucinoma alis	273-388 m	Solomon Is.
Cardiolucina hedleyi	275 m	Indonesia (Sulu Sea)
Gloverina rectangularis	288-486 m	Philippines
Troendleina marquesana	320-980 m	Marquesas Is., Austral Is.
Myrtea investigatoris	360-630 m	Sri Lanka
Mesolinga soliditesta	363 m	Japan (Suruga Bay)
"Cryptodon philippinarum (Hanley)"	366-640 m	Trincomalee, Sri Lanka
Lucinoma rhomboidalis	377 m	S Taiwan
Lucinoma dulcinea	379-383 m	Philippines
Epidulcina delphinae	380-567 m	Fiji
Troendleina musculator	399-411 m	Solomon Is.
Gloverina vestifex	413-436 m	Indonesia
Troendleina sp.	414-510 m	Fiji
Dulcina madagascariensis	425-550 m	SW Madagascar
Lucinoma lamellata	441 m	Straits of Magellan
Lucinoma kastoroae	461-1017 m	Indonesia
Lucinoma spectabilis	480 m	Japan (Sagami Bay)
Taylorina solomonensis	494-504 m	Solomon Is.
Lucinoma sp. 1	511-513 m	Solomon Is.
Elliptiolucina magnifica	520-550 m	Philippines
Rostrilucina anterostrata	550-640 m	Philippines
Dulcina guidoi	550-640 m	Philippines
Taylorina manusutor	552-549 m	Indonesia
Taylorina makassar	595 m	N Indonesia
Taylorina alata	673-675 m	Philippines
Lucinoma yoshidai	700-750 m	Japan (Sagami Bay)
Lucinoma bengalensis	738-1415 m	S Arabia – India (Godavari)
"*Lucina inanis* (Prashad)" [in sense of Knudsen]	805 m	E Africa (Zanzibar)
Rostrilucina garuda	840-855 m	Indonesia
Elliptiolucina virginiae	855-1244 m	Indonesia
Lucinoma gagei	919-967 m	Arabian Sea (Oman margin)
Lucinoma sibogae	1060 m	Indonesia
Minilucina sp. cf. ***coriolis***	1313-1327 m	Solomon Is.
Minilucina coriolis	1730 m	N Indonesia
Elliptiolucina labeyriei	2570 m	Sulu Sea, S Philippines

TABLE 4. Presumed sibling species pairs or triplets.

Troendleina marquesana	320-980 m	Marquesas and Austral Is.
Troendleina sp.	414-510 m	Fiji
Elliptiolucina magnifica	520-550 m	Philippines
Elliptiolucina virginiae	855-1244 m	Indonesia
Gloverina vestifex	413-436 m	Indonesia
Gloverina rectangularis	288-486 m	Philippines
Taylorina alata	673-675 m	Philippines
Taylorina makassar	595 m	N Indonesia
Taylorina solomonensis	494-504 m	Solomon Is.
Rostrilucina garuda	840-855 m	Indonesia
Rostrilucina anterostrata	520-647 m	Philippines
Dulcina guidoi	550-640 m	Philippines
Dulcina madagascariensis	425-550 m	SW Madagascar
Dulcina karubari	215-466 m	Indonesia
Alucinoma alis	273-388 m	Solomon Is.
Alucinoma soyoae	129-200 m	Japan
Minilucina coriolis	1730 m	N Indonesia
Minilucina sp. cf. *coriolis*	1313-1327 m	Solomon Is.

hydrothermal vent on the Kermadec Ridge, New Zealand in 144-504 m. The closest relatives of this species (genus *Austriella* Tenison Woods, 1881) occur in shallow water (Glover *et al.* 2004). Conversely, the genera *Cardiolucina*, *Megaxinus*, *Myrtea*, *Lucinoma* and *Discolucina* have bathymetric distributions that extend to the intertidal or shallow subtidal. However, it is difficult to polarize the direction of the invasion. Do the deep-water species represent occasional invasions of the deep sea from a predominantly shallow-water stock, or the reverse, i.e. the shallow-water species represent occasional invasions of near-shore environments from a predominantly deep-water stock? If species number is taken as an indicator, *Cardiolucina*, *Megaxinus* and *Myrtea*, which are most diverse in shallow water, may be regarded as essentially shallow-water stocks with occasional deep-water species. However, in contrast *Lucinoma* appears to be most diverse in the deep sea and may be regarded as an essentially deep-water stock with occasional shallow-water species, especially in temperate regions (see also Oliver & Holmes 2006). The genus *Mesolinga* Chavan, 1951, hither to known only as a fossil taxon (Chavan 1969), is superficially close to *Lucinoma*, and a new species that can attain a size of 64 mm was recently described from a chemosynthetic community off Japan in 363 m (Okutani & Hashimoto 1997); the genus may now be confined to deeper water.

Finally, the issue of large adult size needs discussion. We have deliberately focussed on the larger representatives of the Lucinidae collected during a series of recent expeditions, and as a consequence the result is a biased representation of the fauna. However, several of the species treated herein (*Elliptiolucina magnifica*, 80.4 mm; *E. virginiae*, 78 mm; *Rostrilucina garuda*, 76 mm; *Lucinoma taiwanensis*, 80 mm; *Meganodontia acetabulum* 150 mm) rank among the largest, or are even the largest known Recent members of the family, and confirm that "shells of deep-water taxa often are larger than those of shallow-water sister taxa" (Barnes & Hickman 2001). Also the fact that Lucinidae live in symbiosis with chemoautotrophic bacteria may offer an explanation for the large size of certain species. As previously mentioned, other families of chemosynthetic bivalves attain large and occasionally record sizes for their families: Thyasiridae (*Conchocele*, more than 80 mm), Solemyidae (*Acharax*, more than 200 mm), Vesicomyidae (*Calyptogena*, up to 260 mm) and Mytilidae (*Bathymodiolus*, *Gigantidas*, up to 360 mm).

To summarize, the lucinid taxa described herein significantly alter our perception of the diversity of the family Lucinidae, which is now known to have radiated extensively at bathyal depths, where some of the largest representatives of the family occur. This radiation may have a long fossil history, as discussed below regarding the Italian "Calcari a *Lucina*".

ECOLOGY OF TROPICAL DEEP-WATER LUCINIDS

Sulfide-oxidizing bacteria have been identified in all members of the Lucinidae that have been investigated (Taylor & Glover 2000; Williams *et al.* 2004; Oliver & Holmes 2006) and it is tempting to hypothesize that the deep-water taxa treated herein also live in association with such bacteria. The lucinids recorded here have frequently been collected from bottoms with dark sediment inhabited by a low-diversity fauna, also including of Solemyidae and Vesicomyidae,

two families also known to host chemosymbiotic bacteria. For instance, *Elliptiolucina labeyriei* has been taken in the same haul as *Vesicomya compressa* Prashad, 1932, and up to three different large species of Lucinidae have been taken together in the same haul. Such anecdotal observations support the idea that tropical deep-water lucinids do conform to the general model of lucinid ecology and inhabit bottoms especially rich in sulfides. What remains much more speculative is whether these patches of sulfide-rich bottoms are the result of large-scale geophysical events, involving seeping, or are the result of local conditions without tectonic context, or perhaps of both. We would like also to stress the complex bottom topography of South-East Asian seas, where several semi-enclosed basins are delimited by sills 400-800 m deep, with the consequence of poor circulation of bottom-water, and thus poorly oxygenated deep water layers. At the local level, it should also be noted that South-East Asian seas are notable for the large amount of plant debris (wood, leaves, nipa and other palm nuts) washed out by tropical rivers and accumulating on the sea floor, which may also result in sulfide-rich bottoms.

In conclusion, the many semi-enclosed basins with poor bottom water circulation and accumulation of continental plant material in South-East Asian seas create local ecological conditions favourable to animals with associated chemoautotrophic bacteria. In addition, local seeping and venting may enhance these ecological conditions. Solemyidae, Vesicomyidae, Mytilidae and Lucinidae among bivalves, and turrids of the genus *Buccinaria*, among gastropods (Bouchet & Sysoev 1997), are good biological markers of such bottoms.

FOSSIL DEEP-WATER LUCINID ASSEMBLAGES

Taviani (2001) reviewed the distribution and interpretation of limestone blocks and lenses, often containing an associated macrofauna typically dominated by large lucinid bivalves, that occur in Oligo-Miocene hemipelagic and turbiditic environments at various localities of the Apennine chain from the Italian Piedmont to Sicily. Collectively grouped under the name "Calcari a *Lucina*", their origin had triggered a lively debate since their discovery in the 19th century. For a long time, these were interpreted as blocks of shallow-water origin slumped to an offshore hemipelagic-turbiditic setting, but it remained mysterious why the supposedly shallow-water macrofaunas were only recorded from such gravity-flow deposits and never from shallower depths where they presumably lived. Taviani (1994, 2001) reviewed the geochemical and tectonic evidence and reinterpreted these "Calcari a *Lucina*" as chemoherms formed *in situ* by chemosynthetically sustaining specialized biota associated with extensive fluid venting. The mollusc fauna of the "Calcari a *Lucina*" includes modioline mytilids, Vesicomyidae, and *Thalassonerita* (Gastropoda, Neritidae) and in this respect appears taxonomically similar to the fauna from the seeps of the Louisiana-Texas slope. Very recently, two species of Lucinidae were reported from the Louisiana slope mollusc assemblages (Garcia 2002), and the mollusc fauna of the "Calcari a *Lucina*" is similar to both that from the Louisiana-Texas slope and that described herein. This may contradict Taviani's conclusion that the Apennine chemoherms are the result of large-scale venting associated with fault zones or, conversely, it may indicate that diffuse seeping occurs sporadically throughout vast areas in South-East Asia.

Another fossil lucinid population that originates from cold seeps or sites with "local methane enrichments" was discovered in middle to late Eocene outcrops in western Washington, U.S.A. A new genus, *Cryptolucina* Saul, Squires & Goedert, 1996, with two species was described (Saul *et al.* 1996). These populations have in common with some of the Recent lucinid populations here discussed the large size of the species (Saul *et al.* 1996) as one of them attains a length of 180 mm. Another interesting fact is that both species of *Cryptolucina* have an elongate shell form similar to some of the genera treated herein, and that Saul *et al.* (1996) compared their large size with that of the hot vent vesicomyid bivalve *Calyptogena magnifica* Boss & Turner, 1980. A parallel may be drawn with *Elliptiolucina labeyrei* n. sp., which is even similar in size and shape to *Calyptogena compressa* (Prashad), both co-occurring and present in the same haul.

At the moment this paper goes to press, more large Indo-Pacific deepwater lucinids have been found during several recent expeditions (after 2002), the material of which is mostly still being processed. Some are range extension of species known or described herein, others are additional new species. These lucinids will be the subject of a future follow-up paper.

ACKNOWLEDGEMENTS

We cordially thank our colleague Bertrand Richer de Forges (IRD), chief scientist of several of the cruises during which part of the material dealt with herein was taken, as well as the captains and crews of the R/V *Jean Charcot*, *Coriolis*, *Vauban*, *Baruna Jaya I* and *Alis*, and the fishing boat *Jin Tung Long No 26*. Robert Moolenbeek (ZMA), Kathie Way and John Taylor (BMNH) are thanked for the loan of specimens. The material taken during the CORINDON cruise was sorted by the Centre National de Tri d'Océanographie Biologique (CENTOB), Brest. Special thanks go to John Taylor and Emily Glover (BMNH) for carefully reading the manuscript in different phases of development, for sharing their knowledge of Lucinidae in many fruitful discussions, and for cordial encouragement, suggestions and improvements while working on this manuscript. Lisa Kirkendale (Florida Museum of Natural History) and Robert H. Cowie (University of Hawaii and MNHN) revised the English text.

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