

Holocene and Recent shallow soft-bottom mollusks from the Western Gulf of Thailand: Pak Phanang Bay and additions to Phetchaburi fauna

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Abstract

Gastropods and bivalves recently recovered from offshore soft bottoms in the Northern Gulf of Thailand, along with those obtained from the Ban Laem Phak Bia sand spit (Phetchaburi Province) and the Pak Phanang Bay (Nakhon Si Thammarat Province) are described and discussed. Mollusk assemblages in the Gulf appear to be similar to those described in previous papers by the present authors, while the Pak Phanang ones reflect a confined environment which is undergoing heavy modifications. Galeommatoida, Tellinoidea, Triphoroidea, Conoidea and Pyramidelloidea are the most diverse groups. This paper covers 150 species, of which 3 are proposed as new; 53 remain unidentified and might be, at least partly, undescribed by previous workers. The species treated are complemented with taxonomic remarks when necessary and with information on respective ecological requirements if available. All species are illustrated. A list of references to the mollusk fauna of the Indo-Pacific Region is also given.

Riassunto

Vengono passati in rassegna e descritti i gasteropodi e i bivalvi recentemente campionati da fondi mobili al largo nel Golfo di Thailandia settentrionale e da depositi olocenici nei pressi della costa, nonché quelli rinvenuti sulla barra sabbiosa di Ban Laem Phak Bia (Provincia di Phetchaburi) e nella baia di Pak Phanang (Provincia di Nakhon Si Thammarat).

Le associazioni a molluschi infralitorali sono molto simili a quelle già descritte nei lavori precedenti. I popolamenti viventi risultano essere a bassa diversità e comprendono pochi esemplari, soprattutto bivalvi. Le tafocenosi recenti sono invece molto ricche in specie e/o esemplari; tra le specie dominanti si possono citare i bivalvi *Nuculana (Scaeolea) mauritiana* (Sowerby, 1833), *Timoclea (Timoclea) lionota* (Smith, 1885), *Corbula (Anisocorbula) solidula* Hinds, 1843 e *Corbula (Notocorbula) monilis* Hinds, 1843.

Le associazioni campionate sulla barra di Ban Laem Phak Bia riflettono la compresenza di sedimento sabbioso e fangoso; la specie dominante, *Nuculana (Jupiteria) puellata* (Hinds, 1843), si accompagna infatti tanto a taxa psammofili quanto pelofili o euritopici.

Le faune della baia di Pak Phanang denotano condizioni di ambiente confinato, recentemente sottoposto a pesanti modificazioni. Sia le tafocenosi che i popolamenti viventi sono dominati dai gasteropodi *Sermyla riqueti* (Grateloup, 1840) e *Tarebia granifera* (Lamarck, 1822) sulle piane tidali, dai bivalvi *Potamocorbula laevis* (Hinds, 1843) e *Pitar (Costellipitar) manillae* (Sowerby, 1851) nella parte più esterna della baia.

Nel complesso delle aree in esame, Galeommatoida, Tellinoidea, Triphoroidea, Conoidea e Pyramidelloidea risultano essere i gruppi a maggiore diversità.

Il presente lavoro considera in tutto 150 specie, 3 delle quali (appartenenti alla famiglia Turridae) sono proposte come nuove; 53 rimangono al momento identificate solo a livello generico e, almeno in parte, non sono mai state rinvenute in precedenza; 16 taxa, già trattati nei precedenti lavori, sono qui rivisti e/o rifigurati sulla base di informazioni o materiale di recente acquisizione. La trattazione delle specie include, se necessari, commenti di tipo tassonomico, nonché le informazioni disponibili sulle rispettive esigenze ecologiche, distribuzione geografica e rinvenimenti fossili. Tutte le 150 specie sono illustrate; in Appendice si riporta la lista completa delle 692 specie trattate nei 3 lavori relativi al Golfo di Thailandia, con informazioni relative all'esame del materiale tipo e alle aree di ritrovamento. Viene infine fornita una lista bibliografica relativa alla malacofauna della regione Indopacifica.

Key words

Holocene, Recent, coastal area, soft-bottom, Mollusca, Pak Phanang Bay, Phetchaburi, Gulf of Thailand.

Introduction

The present paper is the third and final one in a series that attempts to describe all the mollusks recovered from both the Holocene Bangkok Clay and the modern intertidal and shallow sublittoral soft-bottoms of the Western Gulf of Thailand. It follows those by Robba *et al.* (2002, 2004) and expands to 692 the total number of species covered. The study treats 150 bivalve and gastropod species; of these, 134 were newly recorded dur-

ing latest surveys off Phetchaburi coastline and in the Pak Phanang Bay, 16 were already considered by the present authors (2002, 2004), but are herein revised or refigured since other better preserved material has come across.

The Bangkok Clay, a predominantly clayey unit, was surveyed and sampled at some locations in the coastal plain of Phetchaburi as far south as Cha Am (Figs. 1, 2) in the framework of geologic research. For information on the Bangkok Clay and its mollusk assemblages, ref-

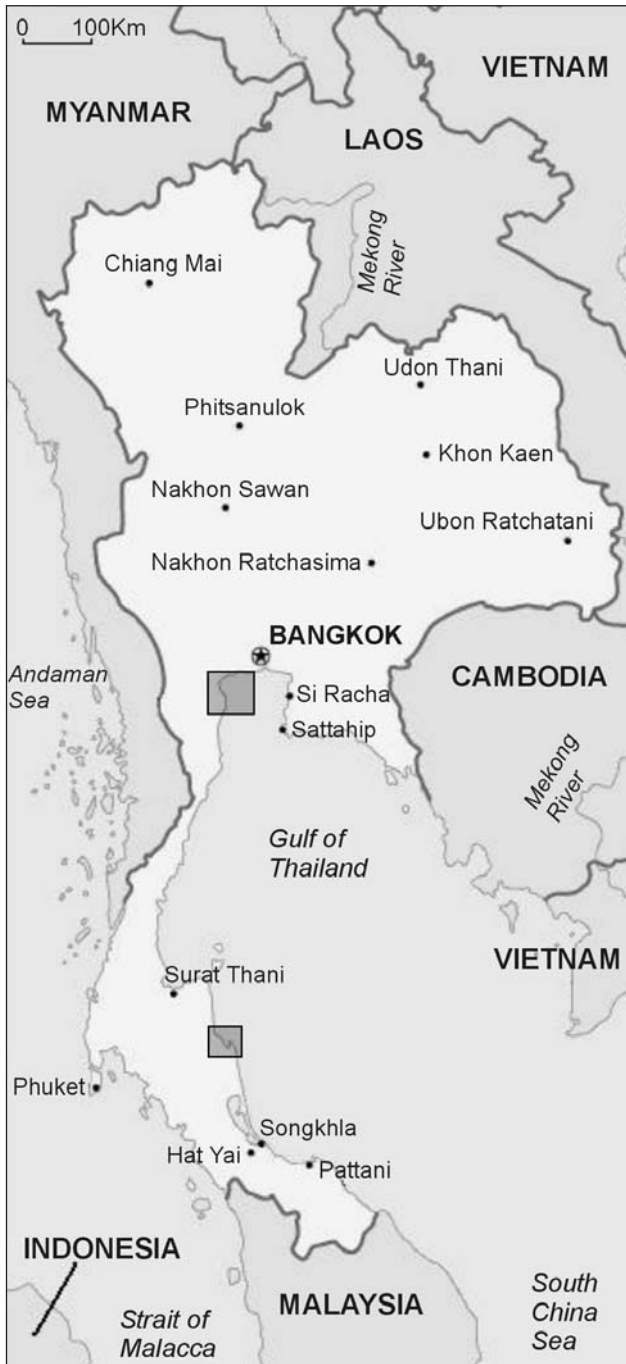


Fig. 1. Map showing the location of study areas (the University of Texas Libraries, modified). Phetchaburi area: upper shaded quadrangle; Pak Phanang Bay: lower shaded quadrangle.

reference can be made to Chonglakmani *et al.* (1983), Dheeradilok *et al.* (1984), Somboon (1988), Robba *et al.* (1993), Robba *et al.* (2002), Robba *et al.* (2003) and Robba *et al.* (2005). The work at sea was carried out during several campaigns (years 1996 through 2003) at first southwest of Bangkok in the coastal area of Phetchaburi (Figs. 1, 2) and, more recently, also in the Pak Phanang Bay (Figs. 1, 3) on the eastern coast of peninsular Thailand (Nakhon Si Thammarat Province). The Phetchaburi area was briefly illustrated by Robba *et al.* (2002); further information can be found in Chaimanee *et al.* (1999) and Di Geronimo *et al.* (2005). The mollusk assemblages of the Pak Phanang Bay were basically unknown and will be described and discussed in detail by the present authors in a forthcoming paper.

The Indo-Pacific Recent mollusks were extensively dealt with by the early 1800's and number of papers and major monographs were published. Robba *et al.* (2002, 2004) already cited the most comprehensive accounts issued during the last decades, covering the mollusks of the Red Sea, Arabian Gulf, India, Australia, Indonesia, Philippines, Japan, China and the Pacific Islands; to this list, the monumental work on Japanese mollusks edited by Okutani (2000) is to be added. Conversely, Thai mollusks have received less attention; except for the basic monograph on bivalves by Lyngø (1909) and the comprehensive book on Southern Gulf of Thailand recently published by Swennen *et al.* (2001), only a few other contributions were produced so far (Nielsen, 1976 a, b; Tantanasiwong, 1978, 1979; Scott, 1995; Yoosukh & Duangdee, 1999; Vidal, 2000; Vongpanich, 2000; Tuaycharoen & Matsukuma, 2001; Yoosukh & Matsukuma, 2001; Vongpanich & Matsukuma, 2004; Lützen & Nielsen, 2005). Brackish water species occurring in the mangrove forest and in tidal flats were dealt with by Brandt (1974). Papers concerning the Holocene mollusks have been already referred to (see above); they consider the paleoecological meaning of species, but none of these is described.

The present paper, as the previous ones (Robba *et al.*, 2002, 2004), aims to offer an up-to-date treatment of the recovered species, based on the critical analysis of the greatest part of the existing literature. The original publications concerning the recorded species, except for a few that we fail to recover, were consulted and are cited in the systematic account. All species are illustrated. A full list of mollusks collected in the course of the research in the Gulf of Thailand area, i.e. those covered in Robba *et al.* (2002, 2004) as well as in the present study, is provided in the appendix; species are listed following the systematic order used by Beesley *et al.* (1998).

The appendix (columns from left to right) comprises reference to the examination of type- and/or relevant material, denotes the occurrence as fossils and/or in modern environments and indicates in which paper/s (Robba *et al.*, 2002, 2004, present paper) the species are dealt with. A comprehensive bibliography contains references that 1) comprise original descriptions of species, 2) are included in synonymies and 3) provide information on species distribution, both recent and fossil, and on their ecological requirements, with the aim to make the reader well acquainted with Indo-Pacific mollusks.

Material and methods

The Holocene mollusks were studied at some localities where irrigation trenches exposed a variable thickness of the Bangkok Clay. At these locations, the unit was bulk-sampled (30 dm³), but hand-picking from the outcrops occurred as well in order to collect larger specimens. Other material was obtained from short cores near the shoreline. The material was washed and fossils were separated from their clay or sand matrix using a 1 mm sieve. Recent mollusks were mainly obtained at 7

stations seaward of the village of Ban Laem Phak Bia (Fig. 2), from shallow infralittoral bottoms in the 13-25 m depth interval, and at 25 stations within the Pak Phanang Bay (Fig. 3), between the tidal flat and 2 m depth at low tide. The bottom sediment and fauna were sampled using a Van Veen grab (20 l) or a Charcot-Picard dredge; usually three replicate samples were taken. The recovered material was washed on board on a 1 mm mesh and the sieve content was preserved in 4% formalin. Further material was sampled from shell debris on the Ban Laem Phak Bia sand spit or hand-picked on the Laem Talumpuk sand spit; a single sample was obtained from the tidal flat northeast of the Mae Khlong river mouth.

All the recovered mollusks were identified to the species level whenever possible. The classification currently adopted in this account is that used by Beesley *et al.* (1998). Pyramidelloidea are arranged according to Schander *et al.* (1999). Photographs of shells were taken by digital camera and Scanning Electron Microscope. Photographs have been digitized using Adobe Photoshop 8.0.1 in order to prepare plates.

The work on Thai mollusks being still in progress (presently extended to the west coast of peninsular Thailand), the whole material is provisionally housed in the Dipartimento di Scienze Geologiche e Geotecnologie, University of Milano Bicocca and, partly, in the Dipartimento di Scienze Geologiche, Sezione di Oceanologia e Paleocologia, University of Catania. The original material on which the new species were based is stored in the Museo di Storia Naturale di Milano (MSNM).

Brief account on the mollusk associations

General information on mollusk associations was already provided by Robba *et al.* (2002, 2004) and it is unnecessary to expand this topic herein, since it will be dealt with extensively in a series of forthcoming papers. In the following we shortly focus on the broad characters of the mollusks associations found at the various sampling sites.

In the most offshore area located southeast of Phetchaburi coastline, live specimens occur uncommonly and species are almost invariably represented by few

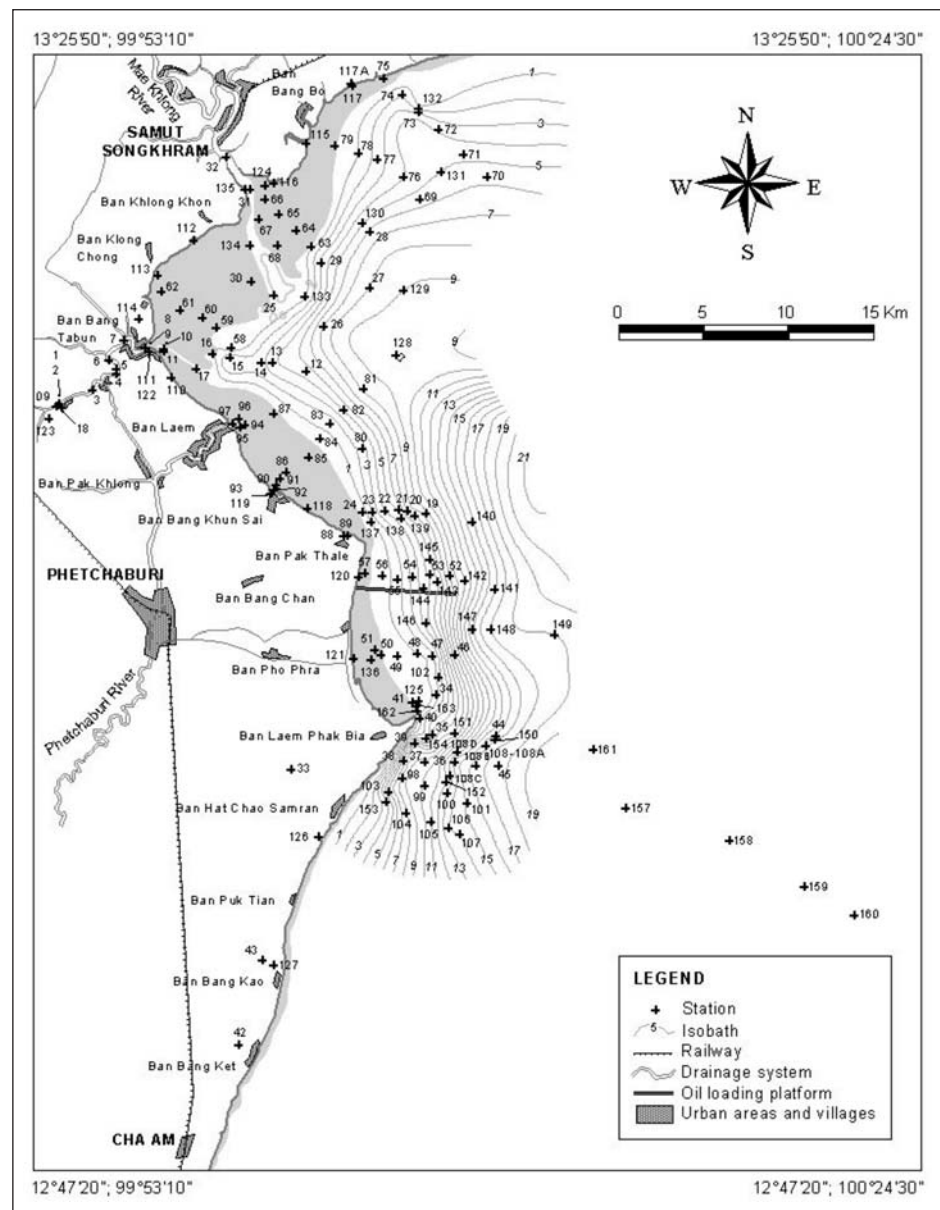


Fig. 2. Digitalized map of coastal area of Phetchaburi showing bathymetric contours, location of sampling stations and the extent of the tidal flat (shaded).

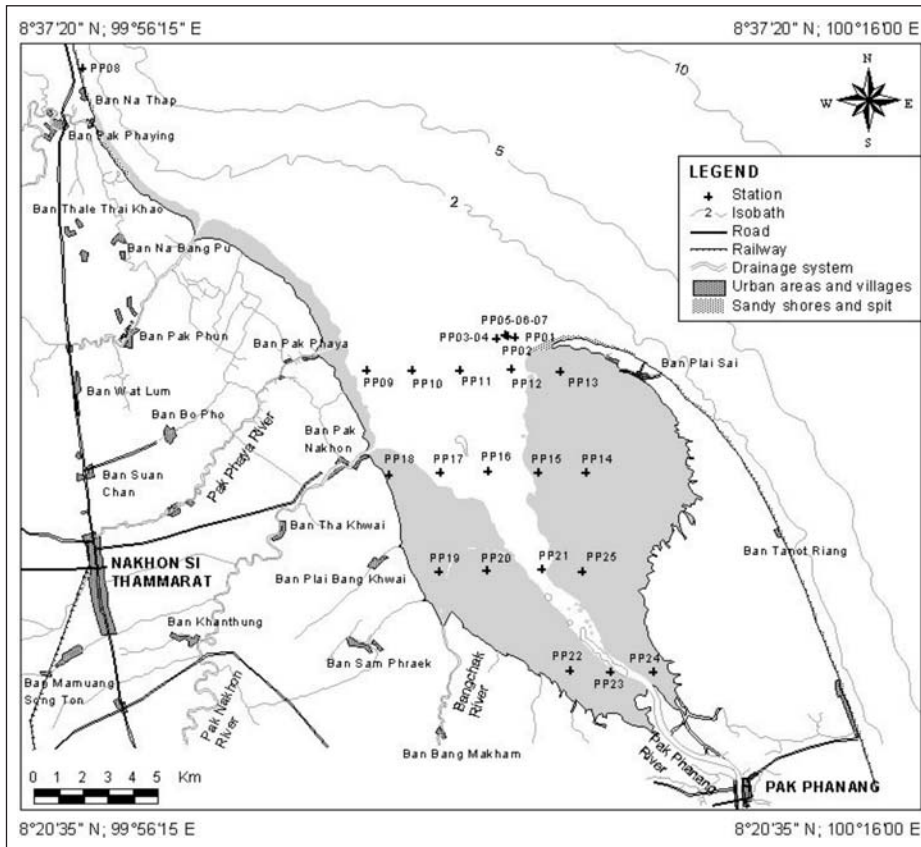


Fig. 3. Digitalized map of Pak Phanang Bay showing location of sampling stations and the extent of the tidal flat (shaded).

specimens, gastropods being markedly less diverse and less abundant than bivalves. On the whole, only 38 species were represented by live specimens. *Striarca symmetrica* (Reeve, 1844); *Planostrea pestigris* (Hanley, 1845); *Cardiolumina semperiana* (Issel, 1869); *Carditella (Carditellona) pulchella* Lyngø, 1909; *Paphia (Paphia) undulata* (Born, 1778); *Corbula (Anisocorbula) solidula* Hinds, 1843; *Corbula (Notocorbula) monilis* Hinds, 1843 and *Crepidula walshi* (Reeve, 1859) are the most common taxa. Conversely, the modern taphocoenoses are usually very rich in both species and specimens. *Nuculana (Scaeolea) mauritiana* (Sowerby, 1833), *Timoclea (Timoclea) lionota* (Smith, 1885), *Corbula (Anisocorbula) solidula* Hinds, 1843 and *Corbula (Notocorbula) monilis* Hinds, 1843 are by far the most common species and bear the greatest abundance values; the latter species is represented by over 8,000 specimens at one location. Other significant components of taphocoenoses are *Arca (Arca) navicularis* Bruguière, 1789; *Sheldonella lateralis* (Reeve, 1844); *Striarca symmetrica* (Reeve, 1844); *Planostrea pestigris* (Hanley, 1845); *Plicatula (Plicatula) chinensis* Mörch, 1853; *Chama asperella* Lamarck, 1819; *Cardiolumina semperiana* (Issel, 1869); *Pillucina australis* Glover & Taylor, 2001; *Carditella (Carditellona) pulchella* Lyngø, 1909; *Timoclea (Chioneryx) scabra* (Hanley, 1844); *Dorisca melvilli* (Lyngø, 1909); *Bittium* sp. 1; *Haustator (Kurosoia) cingulifer* (Sowerby, 1825); *Alvania (Alvania) novarensis* (Frauenfeld, 1867); *Stosicia annulata* (Dunker, 1860); *Zafra pumila* (Dunker, 1860); *Amathina tricarinata* (Linnaeus, 1767); *Odostomia serenei* Saurin, 1959; and *Ringicula (Ringiculina) gouldi* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004, which occur nearly at all stations ordinarily with high abundance values. The majority of

dominant species are linked to hard or coarse substrates and are consistent with the shell gravel seafloor encountered at offshore locations; some of them, however, appear to be eurytopic.

Samples from the Ban Laem Phak Bia sand spit (approximately 2 dm³ each) yielded no live specimens, since they were collected from shell heaps exposed at low tide. Nevertheless, they proved to be useful for monitoring recent sand-related taphocoenoses and comparing them with Holocene counterparts (cf. Robba *et al.*, 2005). The faunal composition reflects both sandy and muddy bottoms inputs; the dominant species is *Nuculana (Jupiteria) puellata* (Hinds, 1843), a mud-related element, accounting for over 2,000 specimens at two locations; among other relevant taxa, *Cardiolumina semperiana* (Issel, 1869); *Mactra (Mactra) luzonica* Deshayes, 1854; *Raeta (Raetellops) pulchella* (Adams & Reeve, 1850); *Tellina (Moerella) pallidula* Lischke, 1871; *Donax semigranosus* Dunker, 1877; *Dosinia derupta* Römer, 1860 and *Corbula (Notocorbula) monilis* Hinds, 1843 are clearly sand-related elements or, at least, commonly sand-dwellers; conversely, *Nuculana (Scaeolea) mauritiana* (Sowerby, 1833); *Timoclea (Chioneryx) scabra* (Hanley, 1844); *Lucidestea* sp.; *Odostomia eutropia* Melvill, 1899; *Chrysallida melvilli* (Dautzenberg & Fischer, 1906); *Chemnitzia nodai* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004 and *Decorifer* sp. are either mud-related or eurytopic taxa.

Mollusk faunas from the Pak Phanang Bay show a markedly different composition, since they thrive in a confined environment with predominantly muddy substrates, very shallow depths (less than 2 m at low tide) and a variable freshwater input from the Pak Phanang River. Recent taphocoenoses can be divided into three

main assemblages. They are largely dominated by *Sermyla riqueti* (Grateloup, 1840) and *Tarebia granifera* (Lamarck, 1822) on the tidal flats of the inner bay, seaward of mangrove forest; relevant accompanying species are *Arcuatula arcuatula* (Hanley, 1844), *Cerithidea cingulata* (Gmelin, 1791), *Melanoides tuberculata* (Müller, 1774) and *Stenothyra* sp. In the northern (outer) part of the bay, intertidal species are markedly less important and assemblages are dominated by *Potamocorbula laevis* (Hinds, 1843) and *Pitar* (*Costellipitar*) *manillae* (Sowerby, 1851); this latter taxon is a marine element becoming abundant where freshwater influence is greater. Along the axis of the bay an intermediate association occurs, dominant elements being *S. riqueti* and *P. laevis*, reflecting both direct freshwater input from the Pak Phanang river and sea water intrusion during tides. Live associations are very similar to taphocoenoses, but for a lower diversity (1-4 species at each location) and a more homogenous distribution in the inner bay, where only the tidal flat molluscan community occurs.

Systematic account

A note is to be made as regards unidentified species recorded in this study. When following other unidentified species of the same genus treated in Robba *et al.* (2002, 2004), they are denoted with subsequent numerals in order to avoid confusion (e.g. *Nucula* sp., 2002 and *Nucula* sp. 1, present paper; *Pseudorhaphitoma* sp. 1 through 4, 2004 and *Pseudorhaphitoma* sp. 5, 6, present paper). Symbols for shell dimensions (new species only) are: H, height of the shell; D, maximum diameter; ha, height of the aperture; MSA, mean spire angle.

Classis BIVALVIA
Subclassis PROTOBRANCHIA
Ordo NUCULOIDA
Superfamilia NUCULOIDEA
Familia NUCULIDAE

Nucula (Nucula) paulula Adams, 1856 Fig. 4 a, b

1856 *Nucula paulula* Adams, p. 52.
1968 *Nucula paulula* Habe, p. 159, pl. 48, fig. 2.
1971 *Nucula (Nucula) paulula* Kuroda, Habe & Oyama, p. 316, pl. 117, figs. 1, 2.
1977 *Nucula paulula* Habe, p. 14, pl. 4, figs. 7, 8.
1989 *Nucula paulula* Ito, p. 57, pl. 17, fig. 10.
1991 *Nucula paulula* Tsuchida, Hori & Mitoki, pl. 3, fig. 1.
2000 *Nucula paulula* Kurozumi & Tsuchida in Okutani, p. 835, pl. 415, fig. 1.
2002 *Nucula (Nucula)* sp. Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 52, pl. 1, fig. 2.
2004 *Nucula (Nucula) paulula* Noda, Kikuchi & Nikaido, p. 65, fig. 10 (6, 7).

The species is characterized by 1) ovate-trigonal, oblique, markedly inequilateral, rather inflated, robust shell attaining 4 mm in length, 2) anterior side long, oval,

with narrowly rounded edge, posterior side subtruncate, 3) beaks at the posterior one-fourth, 4) hinge with 11-13 anterior, 5-6 posterior teeth, 5) resilifer small, oblique, subquadrangular, 6) inner ventral margin finely crenulated, 7) outer surface with uneven growth lines crossed by faint radial striation.

Remarks

The Thai specimens conform to the Japanese shells in all respects but for a somewhat more triangular outline.

Distribution and habitat

Nucula paulula was hitherto known from East China Sea and Southern Japan. It occurs in mud and sandy mud, intertidally and down to 20 m depth (Kurozumi & Tsuchida in Okutani, 2000).

Fossil records

Pliocene of Japan (Noda *et al.*, 2004); Holocene of Thailand (Robba *et al.*, 2002, sub *Nucula* sp.).

Nucula (Nucula) sp. 1 Fig. 4 c, d

A single left valve 4 mm long, featured by 1) elongate, ovate-triangular outline, 2) posterior side very short, truncated, 3) beak at the posterior one-eighth, 4) lunule excavated, 5) inner ventral margin coarsely crenate, 6) outer surface with faint growth lines and obsolete radial striation; a row of 8 distinct nodes occurs along the anterodorsal margin.

Remarks

The present specimen seems not to fit in with the characters of any nuculid species described in the literature.

Subclassis PTERIOMORPHIA
Ordo MYTILOIDA
Familia MYTILIDAE
Subfamilia MODIOLINAE

Modiolus (Modiolusia) elongatus (Swainson, 1821) Fig. 4 e, f

1821 *Modiola elongata* Swainson, pl. 1 (*non vidimus*).
1841 *Modiola elongata* Swainson, p. 31, pl. 8.
2000 *Modiolus elongatus* Kurozumi in Okutani, p. 869, pl. 432, fig. 30.
2002 *Modiolus (Modiolus) elongatus* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 62, pl. 3, fig. 6 (*cum syn.*).

The present authors (2002) already treated Swainson's taxon and illustrated an incomplete right valve. A live specimen newly recovered from the middle part of Bangkok

Embayment is figured herein. Diagnostic characters are 1) trigonal-ovate, very elongate, thin shell attaining 80 mm in length, 2) beaks swollen, at the anterior one-eighth, 3) posterodorsal and ventral margins nearly straight, forming an angle of about 12°, 4) posterior side obliquely truncate, 5) surface with rather dense growth markings, some more raised anteriorly; colour olive-brown.

Remarks

Modiola elongata Swainson, 1821 is the type species of the subgenus *Modiolusia* Yamamoto & Habe, 1958 by original designation. For information on synonyms, distribution, habitat and fossil records, reference can be made to Robba *et al.* (2002).

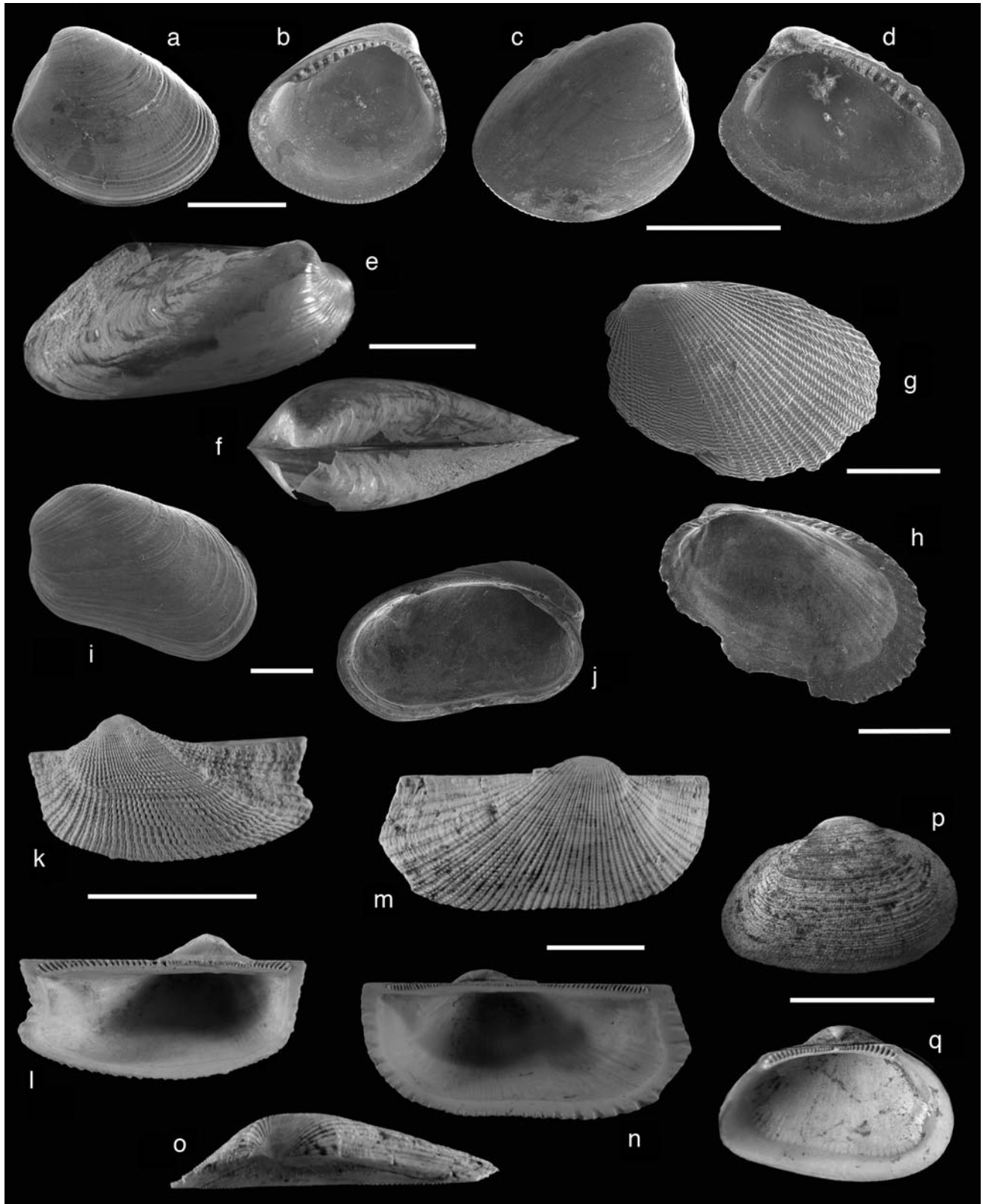


Fig. 4. a-b. *Nucula (Nucula) paulula* Adams, 1856; Station TH 103; scale bar 1 mm; c-d. *Nucula (Nucula) sp. 1*; Station PP 25; scale bar 2 mm; e-f. *Modiolus (Modiolusia) elongatus* (Swainson, 1821); Station TH 161C; scale bar 8 mm; g-h. *Musculus nanus* (Dunker, 1856), g. Station TH 157D, h. Station TH 158D; scale bars 1 mm; i-j. *Botula cinnamomea* (Gmelin, 1791); Station TH 108A; scale bar 1 mm; k-l. *Arca (Arca) ventricosa* Lamarck, 1819; Station TH 108D; scale bar 1 cm; m-o. *Barbatia (Barbatia) signata* (Dunker, 1868); Station TH 108D; scale bar 1 cm; p-q. *Estellacar galactodes* (Benson, 1842); Station PP 18; scale bar 1 cm.

Subfamilia CRENELLINAE

Musculus nanus (Dunker, 1856)

Fig. 4 g, h

- 1856 *Lanistina nana* Dunker, p. 365.
1909 *Modiolaria nana* Lyngø, p. 139, pl. 2, fig. 15.
1985 *Musculus nanus* Lee & Morton, p. 57, pl. 3, fig. D.
? 1998 *Musculus nanus* Lamprell & Healy, p. 88, fig. 201.
2000 *Musculus nanus* Kurozumi in Okutani, p. 873, pl. 434, fig. 56.

Distinctive characters are 1) oval, rather flattened and thin shell hardly exceeding 7 mm in length, 2) anterior side semicircular, distinctly narrower than the posterior one, 3) beaks small, at the anterior one-eighth, 4) inner dorsal margin with dysodont teeth on both sides of ligament, other margins crenulate, 5) anterior and posterior parts sculptured with thin, even and evenly spaced radial ribs crossed by undulating commarginal threads; 10-11 ribs occur anteriorly, 20-25 posteriorly; median area with commarginal threads and much weaker radials; umbonal area unsculptured.

Distribution and habitat

Musculus nanus is distributed in the West Pacific, from Australia to Japan. It is reported to occupy byssal nests on intertidal and subtidal soft substrates (Lee & Morton, 1985). According to Bernard *et al.*, 1993, the species occurs on mud and sand in the upper infralittoral zone, between 20 and 30 m depth. Previous records in the Gulf of Thailand were from infralittoral muddy and sandy substrates (Lyngø, 1909).

Fossil records

None recorded. The quotation from Pliocene deposits of Java (Oostingh, 1935) might refer to another species and needs to be confirmed.

Subfamilia LITHOPHAGINAE

Botula cinnamomea (Gmelin, 1791)

Fig. 4 i, j

- 1791 *Mytilus cinnamomeus* Gmelin, p. 3352.
1951 *Botula silicula* Habe, p. 56, figs. 106, 107.
1977 *Botula silicula* Habe, p. 63, pl. 10, figs. 3, 4.
1984 *Botula fusca* Wilson & Tait, p. 114, figs. 1, 2 B-F, 3-7 (*cum syn.*).
1986 *Botula cinnamomea* Nielsen, p. 7, fig. 21.
1990 *Botula silicula* Ito, p. 117, pl. 27, fig. 14.
1995 *Botula silicula* Kubo & Kurozumi, p. 155, fig. 4.
2000 *Botula silicula* Kurozumi in Okutani, p. 877, pl. 435, fig. 72.
2002 *Botula cinnamomea* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 64 (*cum syn.*).

Remarks

Botula cinnamomea was already described by the present authors (2002), but not illustrated, the available shell material being represented by fragments. New fairly well preserved specimens recovered later on (one figured herein), along with additional relevant references have led to reconsider the species primarily in terms of name to be used and authorship. According to Wilson & Tait (1984), populations of the Western Atlantic, currently referred to as *Botula fusca* (Gmelin, 1791), are indistinguishable from those of the Indian and Pacific oceans ordinarily assigned to *Botula cinnamomea* (Gmelin, 1791 or Lamarck, 1819) or to *Botula silicula* Lamarck, 1819. They concluded that the genus *Botula* Mörch, 1853 contains a single species and used the name *fusca* Gmelin, 1791 for it. From papers by Wilson & Tait and by Nielsen (1986), it appears that the publication of Gmelin (1791) is the first source of available names. In that publication, Gmelin quoted *Mytilus cinnamomeus* (p. 3352) and *Mytilus fuscus* (p. 3359), making reference to figures of Lister (1687) and Chemnitz (1785) clearly illustrating the same species. Consequently, the names *cinnamomeus* and *fuscus* are synonyms; *cinnamomeus* Gmelin, 1791 bears page priority and is the oldest valid name. Surprisingly, Wilson & Tait seem to have overlooked Gmelin's citation of *cinnamomeus* since they used the name *fuscus* as valid. The names *favanni* Potiez & Michaud, 1844, *projectans* Tate, 1892, *hawaiensis* Dall, Bartsch & Rehder, 1938, *laysana* Dall, Bartsch & Rehder, 1938, and *cylista* Berry, 1959 are other synonyms.

Distribution and habitat

Botula cinnamomea, herein intended following Wilson & Tait, is a most widespread species, distributed in the tropical and subtropical Western Atlantic, Indian and Pacific oceans. It is a rocks, shells and dead corals borer, occurring abundantly in the intertidal and upper sublittoral zones; deeper records likely refer to dead shells. In western Thai waters, the species was recovered from reef flats (Nielsen, 1976a); in the Gulf of Thailand, it was obtained from rocky or shelly substrates and coral blocks at depths of from 2 to 54 m (Lyngø, 1909).

Fossil records

Possible occurrences in the Eocene and Oligocene of United States, Europe and Africa (Wilson & Tait, 1984) need to be confirmed.

Ordo ARCOIDA
Superfamilia ARCOIDEA
Familia ARCIDAE
Subfamilia ARCINAE

Arca (Arca) ventricosa Lamarck, 1819

Fig. 4 k, l

- 1819 *Arca ventricosa* Lamarck, p. 38.

- 1907 *Arca ventricosa* Lamy, p. 39.
 1927 *Navicula ventricosa* Cox, p. 93.
 1932 *Arca (Navicula) ventricosa* Prasad, p. 33.
 1960 *Arca (Arca) ventricosa* Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 2, fig. 2.
 1965 *Arca ventricosa* Kira, p. 123, pl. 44, fig. 2.
 1976a *Arca ventricosa* Nielsen, p. 2, fig. 1.
 1978 *Arca ventricosa* Kirtisinghe, p. 18, pl. 3, fig. 3.
 1979 *Arca ventricosa* Kay, p. 500, figs. 158A, 161C, D.
 1982 *Arca ventricosa* Abbott & Dance, p. 291, fig. in lower mid row, middle.
 Not 1982 *Arca ventricosa* Bosch & Bosch, p. 149, bottom fig. (= *Arca symphenacis* Oliver & Chesney, 1994).
 1984 *Arca ventricosa* Morris in Sharabati, pl. 38, figs. 6-6b.
 1984 *Arca ventricosa* Matsukuma, p. 4, pl. 1, fig. 9.
 1986 *Arca ventricosa* Springsteen & Leobrera, p. 292, pl. 84, figs. 2, 3.
 Not 1989 *Arca ventricosa* Bosch & Bosch, p. 79, side upper fig. (= *Arca symphenacis* Oliver & Chesney, 1994).
 1991 *Arca ventricosa* Abbott, p. 88, pl. 42, fig. 4.
 1992 *Arca ventricosa* Oliver, p. 34, pl. 1, fig. 2; text-fig. 6 (p. 31).
 1995 *Arca ventricosa* Kubo & Kurozumi, p. 153, fig. 1.
 1995 *Arca ventricosa* Bosch, Dance, Moolenbeek & Oliver, p. 206, fig. 906.
 1998 *Arca (Arca) ventricosa* Lamprell & Healy, p. 44, fig. 51.
 2000 *Arca ventricosa* Matsukuma & Okutani in Okutani, p. 847, pl. 421, fig. 3.
 2002 *Arca (Arca)* sp. Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 55, pl. 1, fig. 8.

Several not fully grown valves are assigned to the present species on the basis of 1) subrectangular, markedly inequilateral outline, 2) anterior margin more or less arched, forming an acute to straight angle with the hinge line, 3) posterior margin sinuate, 4) beak at the anterior one-fourth, 5) broad dorsal area with evidence of anterior ligament, 6) blunt umbonal keel, 7) sculpture of numerous radial riblets made beaded by crossing commarginal ridges; 1-3 finer riblets develop in the intervening furrows about halfway between the dorsal and ventral margins; 4 ribs occur on the slightly concave postero-dorsal area.

Remarks

Arca (Arca) avellana Lamarck, 1819 is closely similar, but differs in having shorter and higher shell, the ligament distributed throughout the dorsal area, and 4-6 ribs on the postero-dorsal part.

Distribution and Habitat

Arca ventricosa is widely distributed in the Indo-West Pacific, from Madagascar to Australia and as far east as Hawaii and Polynesia, northward to Japan. It attaches by byssus to rocks, corals and coral rubble, intertidally and down to 20 m depth (Bernard *et al.*, 1993).

Fossil records

Pleistocene of Kenya (Crame, 1986) and Zanzibar (Cox, 1927).

Barbatia (Barbatia) signata (Dunker, 1868)

Fig. 4 m-o

- 1868 *Arca signata* Dunker, p. 112, pl. 38, figs. 3-5.
 2002 *Barbatia (Barbatia) signata* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 55 (not pl. 1, fig. 10).

Remarks

The species was dealt with by the present authors (2002) to whom reference can be made for the relevant characters and other information. Due to an error in composing plate 1, a specimen of *Barbatia (Barbatia) foliata* (Forsskål, 1775) was illustrated (pl. 1, fig. 10). *Barbatia signata* is correctly figured herein.

Familia NOETIIDAE

Estellacar galactodes (Benson, 1842)

Fig. 4 p, q

- 1987 *Estellacar galactodes* Oliver, p. 285, pl. 26, figs. 1, 3; pl. 27, fig. 1.
 1990 *Estellacar galactodes* Oliver, pp. 1015-1021, pl. 1, text-figs. 1, 2.

The species is characterized by 1) squarely-oval, slightly inequilateral shell attaining 20 mm in length, 2) anterior side rounded, higher than the obliquely truncated posterior one, 3) blunt postero-ventral angle, 4) slightly arched hinge line, 5) sculpture of numerous, distinct radial riblets, 4 per millimeter length.

Remarks

The Thai specimens from the inner Pak Phanang Bay conform in all respects to the figures and the description of *Estellacar galactodes* published by Oliver (1987). The strongly related *Estellacar olivacea* (Reeve, 1844) differs in having a subelliptical shell sculptured with finer and more numerous thread-like riblets, 8-9 per millimeter length.

Distribution and habitat

Estellacar galactodes was hitherto known from Hong Kong and South China Sea; the quotation from Hawaii needs to be confirmed. The species is a deep infaunal element dwelling in soft intertidal mud (Oliver, 1990; Bernard *et al.*, 1993). Oliver (1987) reported that the specimens from China were collected from estuarine or brackish water habitats.

Fossil records

None recorded.

Ordo OSTREOIDA
Subordo PECTININA
Superfamilia PECTINOIDEA
Familia PECTINIDAE

Complicachlamys wardiana Iredale, 1939

Fig. 5 a-d

- 1939 *Complicachlamys wardiana* Iredale, pp. 362, 363, pl. 5, figs. 25, 25a.
1982 *Semipallium wardiana* Abbott & Dance, p. 308, fig. in bottom row, right.
1991 *Complicachlamys wardiana* Dijkstra, p. 37.
1992 *Complicachlamys wardiana* Lamprell & Whitehead, pl. 12, fig. 73.

Distinguishing features are 1) shell rather thin, subequilateral, higher than long, attaining 45 mm in height, 2) right valve slightly convex, left one much less so, 3) anterior auricles long, with several scaly radial ribs, 4) posterior auricles small, triangular, that of the right valve with 3 scaly radial riblets on the lower part, that of the left valve only with growth markings, 5) byssal notch deep, ctenolium present, 6) sculpture of 7 radial folds, broad and low on the right valve, narrower and somewhat more elevated on the left one; folds and interspaces with thin, scaly radial riblets; a faint *Camptonectes* microsculpture occurs only over the umbonal area.

Remarks

Pecten dringi Reeve, 1853 exhibits a superficial resemblance, but belongs to the genus *Semipallium* Jousseaume in Lamy, 1928, since it bears a shagreen microsculpture throughout.

Distribution and habitat

Complicachlamys wardiana was reported to range from Australia to Indonesia and the Philippines. It occurs on intertidal and inner sublittoral sandy or muddy substrates, attached by byssus to boulders and coral rubble.

Fossil records

None recorded.

Decatopecten plica (Linnaeus, 1758)

Fig. 5 e, f

- 1758 *Ostrea plica* Linnaeus, p. 697, n° 162.
1956 *Pecten plica* Satyamurti, p. 61, pl. 9, fig. 3 (?).
1960 *Pecten plica* Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 78, fig. 65.
1968 *Decatopecten plica* Habe, p. 174, pl. 53, fig. 11.
1982 *Decatopecten plica* Bosch & Bosch, p. 159, upper fig.
1982 *Decatopecten plicus* Abbott & Dance, p. 307, fig. in mid lower row, left.

- 1989 *Decatopecten plica* Bosch & Bosch, p. 84, mid fig., left.
1991 *Decatopecten (Decatopecten) plica* Rombouts, p. 37, pl. 13, figs. 8, 8a.
1991 *Decatopecten plica* Abbott, p. 93, pl. 45, fig. 4.
1991 *Decatopecten plica* Dijkstra, p. 41.
1992 *Decatopecten plicus* Dharma, p. 84, pl. 20, fig. 15.
1992 *Decatopecten plica* Oliver, p. 77, pl. 12, fig. 8.
1994 *Decatopecten plicus* Masuda & Chi-Yue Huang, p. 517, pl. 5, figs. 9-15.
1995 *Decatopecten plica* Bosch, Dance, Moolenbeek & Oliver, p. 232, fig. 1008.
1999 *Ostrea plica* Dijkstra, p. 404, figs. 2 A-D (lectotype).
2000 *Decatopecten plica* Hayami in Okutani, p. 907, pl. 451, fig. 48.
2001 *Decatopecten plica* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 74, fig. 071.

Diagnostic characters are 1) ovate-triangular, somewhat compressed shell up to 50 mm in height, 2) auricles small, subequal, radially ridged, 3) sculpture of 3 broad, rather prominent median radial folds and 2 lateral twin ribs; radials and interspaces bear thin radial riblets on mid ventral part of the disc; a commarginal microsculpture occurs throughout; fresh specimens exhibit a colour pattern of large reddish patches and white stripes over a pale yellow background.

Remarks

Decatopecten striatus (Schumacher, 1817) is related, but differs in having only 5, lower radial folds.

Distribution and habitat

Decatopecten plica ranges in the tropical Indo-Pacific, from the Red Sea to South China Sea, Taiwan and Amami Islands. It is an intertidal and infralittoral element dwelling on mud, muddy sand and coarse sand with shell gravel (Dijkstra, 1991; Bernard *et al.*, 1993; Hayami in Okutani, 2000). Live specimens were recovered in the Gulf of Thailand off Pattani, on muddy sand at depths of 16-22 m (Swennen *et al.*, 2001).

Fossil records

Pleistocene of Taiwan and Japan (Nomura & Zinbo, 1934; Masuda & Huang, 1994).

Excellichlamys histrionica (Gmelin, 1791)

Fig. 5 g, h

- 1791 *Pecten histrionicus* Gmelin, p. 3326.
1909 *Pecten (Vola) sannionis* Lyne, p. 157.
1912 *Pecten (Aequipekten) histrionicus* Dautzenberg & Bavay, p. 22.
? 1951 *Excellichlamys spectabilis* Habe, p. 79, figs. 146, 147.
? 1965 *Excellichlamys spectabilis* Kira, p. 139, pl. 50, fig. 2.
? 1971 *Excellichlamys spectabilis* Kuroda, Habe & Oyama, p. 366, pl. 79, figs. 12, 13.

- 1972 *Excellichlamys histrionica* Waller, p. 248, pl. 6, figs. 103-106.
 ? 1977 *Excellichlamys spectabilis* Habe, p. 87, pl. 16, figs. 10, 11.
 1982 *Excellichlamys histrionica* Abbott & Dance, p. 308, fig. in upper row, middle.
 1990 *Excellichlamys spectabilis* Ito, p. 118, pl. 28, fig. 2.
 1991 *Excellichlamys histrionica* Rombouts, p. 39, pl. 14, fig. 6.
 1992 *Excellichlamys histrionica* Dharma, p. 84, pl. 20, fig. 9.
 1992 *Excellichlamys histrionica* Lamprell & Whitehead, n. 77, pl. 13, fig. 77.

Distinctive features are 1) roundly triangular, equilateral, almost as long as high shell attaining 35 mm in height, 2) right valve more convex than left, 3) auricles prominent, the anterior more so, 4) byssal notch moderately deep, ctenolium with 5 denticles, 5) sculpture of 11 rather prominent, rounded radial ribs slightly wider than the intervening furrows; the ribs bear dense, evenly spaced, concave downward hollow rings; a *Camptonectes* micro-sculpture occurs over the umbonal area, quickly replaced by closely spaced commarginal lamellae; colour pattern of reddish-brown spots on ribs, background whitish.

Remarks

The closely related *Excellichlamys spectabilis* (Reeve, 1853) differs in having broader ribs bearing radial furrows, with 1-3 riblets in the intervening spaces.

Distribution and habitat

Excellichlamys histrionica is distributed in the tropical Indo-Pacific, from Sri Lanka to Australia and northward to Japan. It is an epibyssate element occurring in the inner sublittoral zone, on sand, gravel and coral rubble (Waller, 1972; Bernard *et al.*, 1993). Previous records in the Gulf of Thailand were from infralittoral shelly bottoms (Lynge, 1909, sub *Pecten sannionis*).

Fossil records

None recorded.

Amusium pleuronectes (Linnaeus, 1758)

Fig. 5 i, j

- 1758 *Ostrea pleuronectes* Linnaeus, p. 696.
 1885 *Amusium pleuronectes* Smith, p. 308.
 1909 *Amusium pleuronectes* Lynge, p. 62.
 1933 *Pecten (Amusium) pleuronectes* Nomura, p. 60, pl. 3, fig. 24.
 1951 *Amusium pleuronectes* Habe, p. 71, figs. 138, 139.
 1960 *Amusium pleuronectes* Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 80, fig. 67.
 1965 *Amusium pleuronectes* Kira, p. 138, pl. 49, fig. 16.
 1969 *Amusium pleuronectes* Treatise I.P., p. N350, fig. C73 (1).
 1977 *Amusium pleuronectes* Habe, p. 75, pl. 15, figs. 6, 7.

- 1978 *Amusium pleuronectes* Kirtisinghe, p. 22, pl. 8, fig. 3.
 1978 *Amusium pleuronectes* Popenoe & Kleinpell, pl. 14, fig. 172.
 1980 *Amusium pleuronectes* Wen-lung, p. 104, pl. 2, fig. G.
 1981 *Amusium pleuronectes* Eisenberg, p. 158, pl. 140, fig. 10.
 1982 *Amusium pleuronectes* Abbott & Dance, p. 303, fig. in lower mid row, right.
 1986 *Amusium pleuronectes pleuronectes* Springsteen & Leobrera, p. 326, pl. 93, fig. 1.
 1991 *Amusium pleuronectes* Abbott, p. 93, pl. 46, fig. 1.
 1991 *Amusium pleuronectes* Rombouts, p. 4, pl. 3, fig. 3.
 1992 *Amusium pleuronectes* Dharma, p. 84, pl. 20, fig. 1.
 1992 *Amusium pleuronectes* Lamprell & Whitehead, pl. 7, fig. 37.
 1994 *Amusium pleuronectes* Scott, p. 73, pl. 6, fig. D.
 1994 *Amusium pleuronectes* Masuda & Chi-Yue Huang, p. 524, pl. 8, figs. 1-3.
 1998 *Amusium pleuronectes* Slack-Smith in Beesley *et al.*, fig. 6.18 G.
 1999 *Ostrea pleuronectes* Dijkstra, p. 399, fig. 1C-F (lectotype).
 2000 *Amusium pleuronectes* Hayami in Okutani, p. 911, pl. 453, fig. 62.
 2001 *Amusium pleuronectes* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 75, fig. 074.

This is a well known species featured by 1) orbicular, rather flat shell up to 139 mm in height, 2) auricles nearly symmetrical, 3) inner surface of both valves with 11-15 pairs of low, slender radial ribs.

Remarks

The related *Amusium japonicum* (Gmelin, 1791) differs primarily in that has more numerous inner ribs.

Distribution and habitat

Amusium pleuronectes is distributed in the Indo-West Pacific, from Sri Lanka to Australia and northward to South China Sea. It is a mostly infralittoral element dwelling on sand and mud (Bernard *et al.*, 1993). Previous records in the Gulf of Thailand were from muddy substrates at depths of from 15 to 54 m (Lynge, 1909; Swennen *et al.*, 2001). In western Thai waters, the species was recovered from mud at a depth of 30 m (Tantanasiwong, 1979). Morris & Purchon (1981) reported on the occurrence of *Amusium pleuronectes* on intertidal sands and stony reefs along the east coast of Malaysia.

Fossil records

? Miocene of California (Skwarko *et al.*, 1994); Late Miocene of Philippines and Taiwan (Nomura, 1933; Masuda & Huang, 1994); Pliocene of Kenya, Zanzibar, Indonesia, Philippines, Taiwan and Japan (Popenoe & Kleinpell, 1978; Skwarko *et al.* 1994; Masuda & Huang, 1994); Quaternary of Indonesia, Philippines and Taiwan (Popenoe & Kleinpell, 1978; Skwarko *et al.* 1994; Masuda & Huang, 1994).

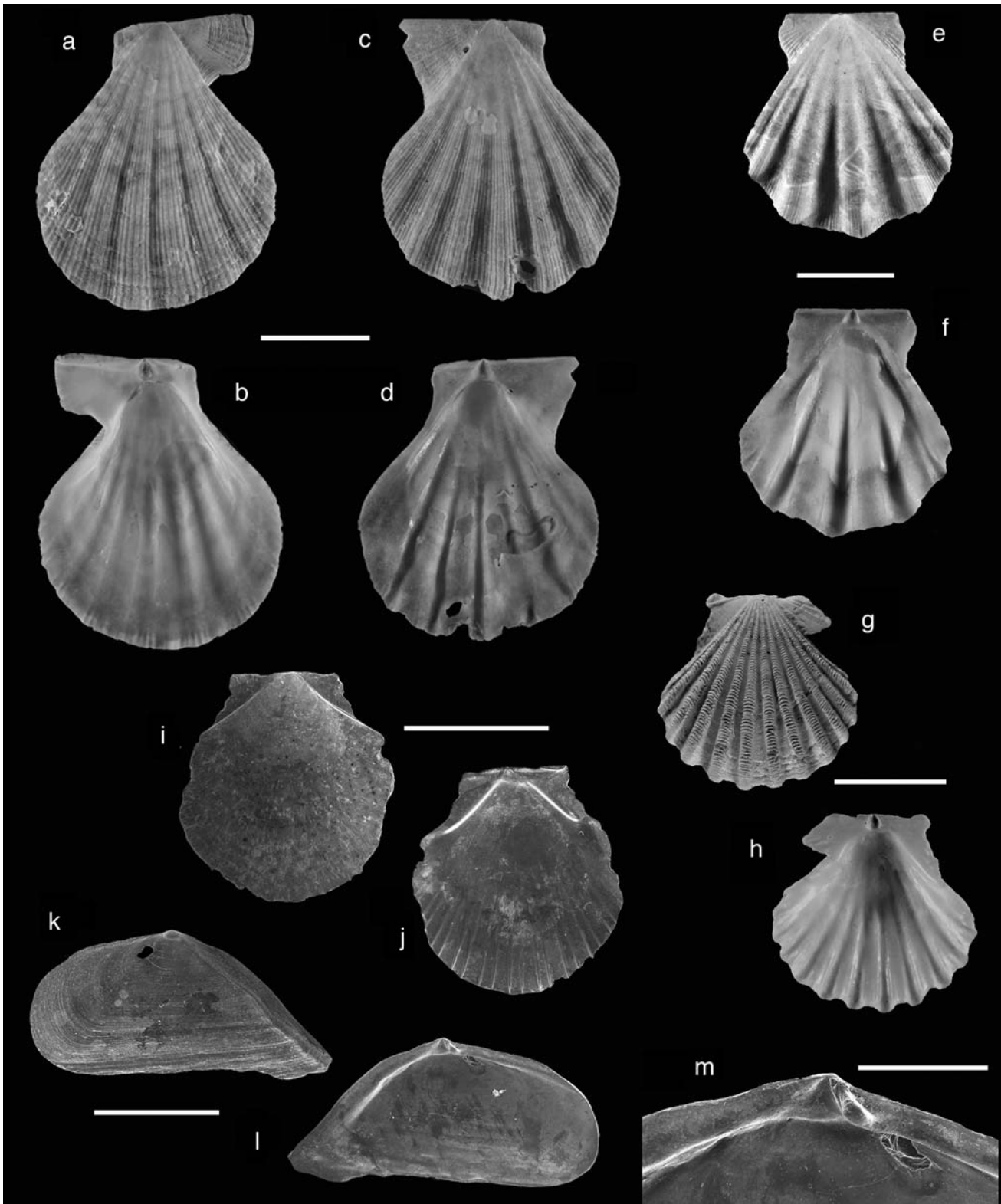


Fig. 5. a-d. *Complicachlamys wardiana* Iredale, 1939; Station TH 161C; scale bar 1 cm; e-f. *Decatopecten plica* (Linnaeus, 1758); Station TH 161C; scale bar 1 cm; g-h. *Excellichlamys histrionica* (Gmelin, 1791); Station TH 161C; scale bar 1 cm; i-j. *Amusium pleuronectes* (Linnaeus, 1758); Station TH 158D; scale bar 5 mm; k-m. *Aenictomya mirabilis* (Lynge, 1909); Station TH 159, k, l. scale bar 2 mm, m. scale bar 1 mm.

Subclassis HETERODONTA
 Ordo VENEROIDA
 Superfamilia GALEOMMATOIDEA
 Familia GALEOMMATIDAE

Aenictomya mirabilis (Lynge, 1909)
 Fig. 5 k-m

1909 *Corbula* (?) *mirabilis* Lynge, p. 271, pl. 5, figs. 35-37.

1995 "*Corbula*" *mirabilis* Bosch, Dance, Moolenbeek & Oliver, p. 238, fig. 1041.

1997 *Aenictomya mirabilis* Oliver & Chesney, p. 55, figs. 7-9.

A single left valve about 7.8 mm long, characterized by 1) subtrapezoidal, nearly equilateral shape, anterior side roundly rectangular, posterior one acutely triangular, somewhat twisted and with sharp, bifurcated umbonal keel close to the postero-dorsal margin, 2) beak

small, only slightly prominent, 3) antero-dorsal margin very gently sloping, gradually merging into the bluntly rounded anterior one, postero-dorsal margin long and steep, ventral margin straight, subhorizontal, 4) hinge right anterior to the resilifer, with 1 small, tubercular tooth under the beak followed by another strong, prominent, triangular tooth, 5) pallial line entire, 6) outer surface with pustulose commarginal lines.

Remarks

The species is so far represented by 2 right valves, respectively from the Gulf of Thailand and from Oman and by the present left valve.

Distribution and habitat

Aenictomya mirabilis is a quite uncommon species occurring in the tropical Indo-West Pacific, from the Persian Gulf to the Gulf of Thailand, Philippines and South China Sea. It is an intertidal and shallow sublittoral element, dwelling in sand and mud.

Fossil records

None recorded.

Eolepton crassum (Yokoyama, 1927)

Fig. 6 a-c

1954 *Erycina crassa* Taki & Oyama, pl. 45, fig. 13; pl. 46, figs. 4, 5.

1977 *Eolepton crassus* Habe, p. 146, pl. 28, figs. 3, 4.

1989 *Eolepton crassus* Ito, p. 62, pl. 23, fig. 3.

Distinguishing characters are 1) ovate-triangular, moderately inequilateral shell attaining 3.5 mm in length, 2) posterior side subrounded, broader than the subtriangular anterior one, 3) beaks small, only slightly prominent, 4) antero-dorsal and postero-dorsal margins nearly straight, forming an angle of about 100°, 5) hinge with 2 divergent, symmetrical laterals in each valve, robust, short and prolonged into narrow ridges parallel to the margins in the left valve, longer, appearing as projections of the margin in the right valve, 6) sculpture of evenly spaced commarginal cords.

Remarks

The bulk of Thai specimens conform to the holotype of the present species figured by Taki & Oyama (1954, pl. 46, fig. 4); one shell is more elongated and fits in with that published by Ito (1989).

Distribution and habitat

Eolepton crassum was so far known from Japanese waters. It seems to be an infralittoral element.

Fossil records

The original material was recovered from Late Pleistocene deposits of Japan (Taki & Oyama, 1954).

Fastimysia sp.

Fig. 6 d-f

Several valves are in hand. Distinguishing characters are 1) elongate-elliptical, inequilateral shell about 3.0 mm long, 2) anterior side slightly more attenuated than the posterior one, 3) beaks small, obtuse, at the anterior one-third, 4) inner dorsal margin distinctly crenate, the others less so, 5) resilifer deep under beaks, 6) hinge with 1 anterior and 1 posterior subequal, elongated laterals in each valve, 7) sculpture of divaricating, low and flat-topped radial riblets crossed by commarginal threads giving the surface a pitted aspect.

Remarks

The Thai shells closely resemble to *Fastimysia viastellata* (Hedley, 1909), type species of the genus *Fastimysia* Iredale, 1929, but that species is reported to have the radials "obsolete medially" (cf. Lamprell & Healy, 1998, p. 160), whereas the present form is sculptured throughout.

Kellia sp. 4

Fig. 6 g, h

A single right valve 2.4 mm long, featured by 1) subtrapezoidal, moderately inequilateral outline, 2) anterior side longer and more attenuated than the subtruncate posterior one, 3) antero-dorsal and postero-dorsal margins equally sloping, forming rounded, obtuse angles with the anterior and posterior margins, ventral margin very gently arched, 4) beak small, rather pointed, 5) hinge with 1 prominent, curved cardinal tooth, 1 anterior and 1 posterior subtriangular, distant laterals, 6) outer surface bearing uneven growth markings.

Remarks

The present specimen closely resembles to the syntype of *Kellia adamsi* (Angas, 1868) figured by Lamprell & Healy (1998) and might belong to that species.

Kona oryzaeformis Kuroda & Habe, 1971

Fig. 6 i, j

1971 *Kona oryzaeformis* Kuroda & Habe in Kuroda, Habe & Oyama, p. 409, pl. 119, figs. 22, 23.

2000 *Thecodonta oryzaeformis* Matsukuma in Okutani, p. 941, pl. 468, fig. 7.

Distinguishing features are 1) elliptical, markedly in-

equilateral shell attaining 6.0 mm in length, 2) beaks small, prosogyrous, at the anterior one-tenth, 3) resilifer on distinct shelf perpendicular to greater shell axis, 4) hinge with 1 rudimentary cardinal, 1 anterior and 1 posterior unequal laterals, 5) anterior adductor scar broadly oval, posterior one elongate, pallial line discontinuous, 6) outer surface with uneven, distant growth markings.

Remarks

Thecodonta sieboldi Adams, 1864, type species of the genus *Thecodonta* Adams, 1864, is strikingly similar in shape, but has different hinge and ligamental characters.

Distribution and habitat

Kona oryzaeformis was hitherto known from East China

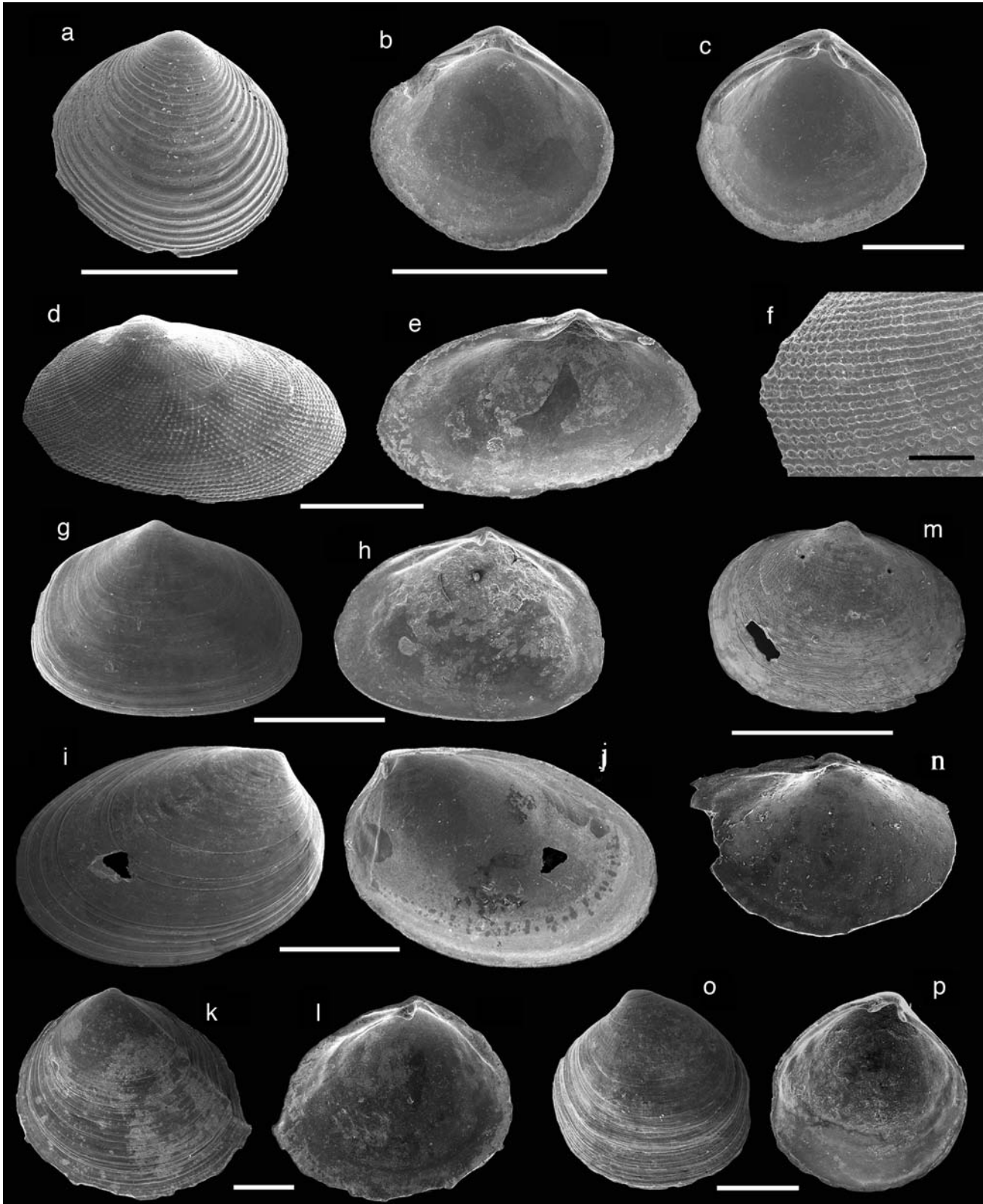


Fig. 6. a-c. *Eolepton crassum* (Yokoyama, 1927), a, b. Station TH 157D; scale bars 1 mm, c. Station TH 158D; scale bar 0.5 mm; d-f. *Fastimysia* sp.; Station TH 108D, d, e. scale bar 1 mm, f. scale bar 0.2 mm; g-h. *Kellia* sp. 4; Station TH 108A; scale bar 1 mm; i-j. *Kona oryzaeformis* Kuroda & Habe, 1971; Station TH 157D; scale bar 2 mm; k-l. *Lasaea* sp.; Station TH 157D; scale bar 1 mm; m-n. *Marikellia* sp.; Station PP 13; scale bar 1 mm; o-p. *Mysella* sp. 6; Station TH 108A; scale bar 1 mm.

Sea, Okinawa and Southern Japan. Records were from circalittoral sandy and muddy substrates.

Fossil records

None recorded.

Lasaea sp.

Fig. 6 k, l

A single right valve 6.0 mm long and 1 smaller left valve, characterized by 1) ovate-trigonal, inequilateral shape, 2) anterior side elliptical, longer than the posterior one that is less attenuated, 3) beaks rather small, weakly prosogyrous, 4) resilifer narrow, long and shallow behind the beaks, 5) hinge with 1 prominent, bicuspidate right cardinal tooth immediately anterior to the beak, 2 left cardinals, the anterior one nearly parallel to the margin, and 1 obscure posterior lateral in each valve, 6) outer surface shining, with uneven growth lines and with an anterior step-like flexure running from the beak to the antero-ventral corner where a sort of cusp is formed; a weak groove corresponding to the flexure occurs on the inner surface.

Marikellia sp.

Fig. 6 m, n

A rather inflated right valve 2.7 mm long, featured by 1) oval, moderately inequilateral outline, 2) posterior side slightly higher and longer than the anterior one, 3) beak rounded, rather prominent, prosogyrous, 4) hinge with 1 trigonal cardinal tooth just anterior to the beak and 1 lamellar posterior lateral, 5) ligament in a narrow, superficial groove behind the beak, 6) outer surface with fine, dense growth markings and distant radial lines on the mid-ventral part, defining broad, flat radial folds; inner surface with faint but distinct radial riblets corresponding to the outer radial lines.

Remarks

The anterior side shorter than the posterior one and the hinge characters are consistent with the assignment to the genus *Marikellia* Iredale, 1936. The other species of this genus are unsculptured.

Mysella sp. 6

Fig. 6 o, p

A single left valve 1.9 mm long, characterized by 1) roundly quadrangular, moderately inequilateral outline, height slightly greater than length, 2) antero-dorsal margin nearly straight, postero-dorsal margin longer and gently arched, 3) beak swollen, moderately prominent, 4) hinge with 2 diverging, short, robust laterals separated from the margin by an elongate, triangular socket, 5) outer surface with uneven growth markings stronger in the mid-ventral part.

Remarks

The high shell distinguishes the present form from the other species of the genus described in the literature.

Nipponomysella subtruncata (Yokoyama, 1927)

Fig. 7 a, b

1954 *Mysella subtruncata* Taki & Oyama, pl. 45, fig. 8.

1995 *Nipponomysella subtruncata* Kubo & Kurozumi, p. 177, fig. 8.

2000 *Nipponomysella subtruncata* Matsukuma in Okutani, p. 939, pl. 467, fig. 12.

2001 *Nipponomysella subtruncata* Lützen, Takahashi & Yamaguchi, p. 431, figs. 2-4.

2002 *Mysella costata* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 85, pl. 10, fig. 1 (not *Montacuta costata* Lyngé, 1909).

The species is distinguished by 1) elongate-oval, markedly inequilateral shell attaining 6.8 mm in length, 2) anterior side subtruncate, shorter than the oval posterior one, 3) beaks small, at the anterior one-third, 4) hinge with 2 laterals appearing as moderate projections of the margins on the right valve, 2 unequal, diverging laterals on the left valve, 5) triangular resilial pit under the beaks, 6) outer surface with coarse growth markings and feeble radial angulation running from the beaks to the antero-ventral corner.

Remarks

The right valve formerly referred to as *Mysella costata* (Lyngé, 1909) by the present authors (2002) actually lacks the sharp umbonal keel of that species. It conforms fairly well to the holotype of Yokoyama's taxon figured by Taki & Oyama (1954). *Nipponomysella oblongata* (Yokoyama, 1922) is rather similar, but is more elongated, with the beaks at the anterior one-fourth to one-fifth.

Distribution and habitat

Nipponomysella subtruncata was hitherto known from Japanese waters. It is reported to dwell in sand and sandy mud, intertidally and down to 20 m depth, being commensal with the sipunculan *Siphonosoma cumanense* (Matsukuma in Okutani, 2000; Lützen *et al.*, 2001).

Fossil records

Late Pleistocene of Japan (Taki & Oyama, 1954); Holocene of Thailand (Robba *et al.*, 2002, sub *Mysella costata*).

Nipponomysella tanabensis Habe, 1960

Fig. 7 c, d

1960 *Nipponomysella tanabensis* Habe, p. 284, pls. 10, 11.

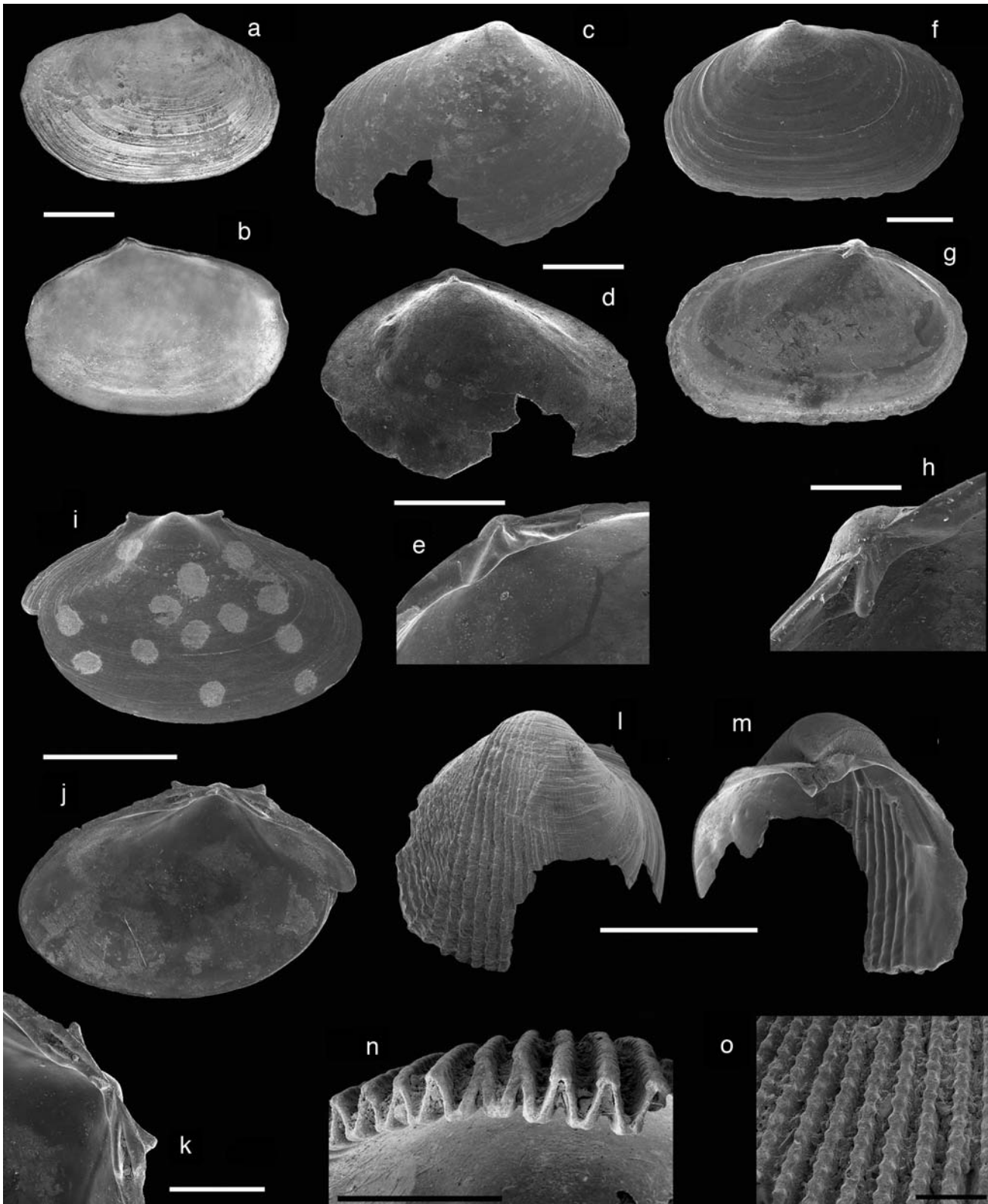


Fig. 7. **a-b.** *Nipponomysella subtruncata* (Yokoyama, 1927); Senanivate, Quarry 1, level 6-7 m, Holocene; scale bar 1 mm; **c-d.** *Nipponomysella tanabensis* Habe, 1960; Station TH 108; scale bar 1 mm; **e.** *Pseudopythina* sp. 1; Station TH 159; scale bar 1 mm; **f-h.** *Pseudopythina* sp. 1; Station TH 159, **f, g.** scale bar 2 mm, **h.** scale bar 0.5 mm; **i-k.** *Galeommatidae* sp.; Station TH 159, **i, j.** scale bar 2 mm, **k.** scale bar 1 mm; **l-m.** *Cardillia semisulcata* (Lamarck, 1819); Station TH 160; scale bar 2 mm; **n-o.** *Vasticardium fidele* (Vidal, 1992); Station TH 158D, **n.** scale bar 2 mm, **o.** scale bar 1 mm.

1977 *Nipponomysella tanabensis* Inaba & Oyama, p. 119, pl. 4, fig. 3.

The present species somewhat resembles to *Nipponomysella subtruncata*, but differs from it in that has 1) anterior side narrowly rounded, 2) more attenuated posterior side, 3) steeper antero-dorsal margin, and 4) stronger dentition.

Distribution and habitat

Nipponomysella tanabensis was so far known from Japanese waters. It seems to be an infralittoral element; its possible host association is unknown.

Fossil records

None recorded.

Pseudopythina sp. 1

Fig. 7 e-h

One right and 1 left valves characterized by 1) oval-elongated, inequilateral shell attaining 7.2 mm in length, 2) anterior side ovate-rectangular, longer than the posterior one that is somewhat more attenuated, 3) beaks small, barely prominent, topped by the subcircular, cup-like prodissoconch, located at the posterior two-fifths, 4) antero- and postero-dorsal margins gently arched, the latter slightly more sloping, gradually merging into rounded anterior and posterior margins, ventral margin nearly straight, 5) resilifer broad and shallow, obliquely directed backward from below the beak, 6) hinge with 1 robust right cardinal tooth and 2 approximate left cardinals, one small just under the beak, the other, immediately anterior to it, large and subtriangular, 7) pallial line entire, broad, rather distant from the ventral margin, 8) outer surface with low, well spaced commarginal folds that tend to fade both anteriorly and posteriorly.

Galeommatidae sp.

Fig. 7 i-k

Two right valves not exceeding 5.4 mm in length, featured by 1) elliptical, nearly equilateral shape, 2) beak rather small, barely prominent, 3) early and middle stages developing 2 dorsal projections symmetrical to the beak and connected by a short, horizontal dorsal margin, 4) antero- and postero-dorsal margins very gently arched and equally sloping, merging into the dorsal margin below the projections, 5) resilifer shallow, long, obliquely backward directed from below the beak to the level of the posterior projection, 6) hinge with 1 triangular cardinal tooth, 2 anterior and 2 posterior lateral teeth, lower ones elongate and strong, upper ones weaker, 7) outer surface with commarginal growth markings and microscopic radial striation.

Remarks

The present specimens appear to be galeommatid, but do not fit in satisfactorily with the characters of any described genus. The dorsal projections and the hinge are the main distinguishing features.

Superfamilia CARDIOIDEA

Familia CARDIIDAE

Subfamilia TRACHYCARDIINAE

Vasticardium fidele (Vidal, 1992)

Fig. 7 n, o

1986 *Trachycardium* (*Vasticardium*) *elongatum* Springsteen & Leobrera, p. 308, pl. 87, fig. 7.

1992 *Acrosterigma fidele* Vidal, p. 24, figs. 1-5.

2001 *Vasticardium fidele* Swennen, Moolenbeek, Ruttanadaku, Hobbelink, Dekker & Hajisamae, p. 80, fig. 96.

A single, broken juvenile right valve is assigned to the present species on the basis of the sculptural features, i.e. 1) narrow, elevated, rail-like ribs bearing the "helical scales" cited in the original description, 2) intervening furrows deep, moderately wider than the ribs, 3) total number of ribs estimated to slightly exceed 30 (27 ribs occur on the preserved part).

Distribution and habitat

Vasticardium fidele is distributed in the Indo-West Pacific, from Madagascar to Philippines and Japan. There is no information about its ecological requirements except for records in the Gulf of Thailand that refer to live specimens obtained from near-shore fisheries off Bang Rapa and Pattani, at depths of 8-12 m (Swennen *et al.*, 2001).

Fossil records

None recorded.

Superfamilia MACTROIDEA

Familia CARDILIIDAE

Cardilia semisulcata (Lamarck, 1819)

Fig. 7 l, m

1919 *Isocardia semi-sulcata* Lamarck, p. 32.

1915 *Isocardia semi-sulcata* Lamy, p. 251.

1954 *Cardilia semisulcata* Taki & Oyama, pl. 45, fig. 16.

1968 *Cardilia semisulcata* Habe, p. 195, pl. 60, fig. 13.

1969 *Cardilia semisulcata* Treatise I. P., p. N 608, fig. E 100 (4).

1971 *Cardilia semisulcata* Kuroda, Habe & Oyama, p. 440, pl. 97, figs. 11, 12.

1977 *Cardilia semisulcata* Habe, p. 190, pl. 37, figs. 3-6.

1990 *Cardilia semisulcata* Ito, p. 124, pl. 31, fig. 4.

1998 *Cardilia semisulcata* Lamprell & Healy, p. 246, fig. 747.

1998 *Cardilia semisulcata* Healy & Lamprell in Beesley *et al.*, p. 340, fig. 8.24.

2000 *Cardilia semisulcata* Matsukuma in Okutani, p. 969, pl. 482, fig. 1.

A single, incomplete right valve; the observable characters are 1) ovate-triangular, higher than long outline, 2) beak prominent, recurved and strongly prosogyrous, 3) hinge with 1 elongate, triangular and moderately arched cardinal tooth just in front of the backward directed resilifer, 4) posterior adductor scar on a projecting postero-dorsal flange, 5) sculpture of 18 scabrous radial ribs on posterior part, those close to the margin discontinuous, anterior part only with commarginal growth markings.

Distribution and habitat

Cardilia semisulcata ranges in the West Pacific, from Australia to Philippines and Japan. It is an intertidal and infralittoral element dwelling in sand and mud (Bernard *et al.*, 1993).

Fossil records

Pleistocene of Japan (Taki & Oyama, 1954).

Superfamilia TELLINOIDEA
Familia TELLINIDAE
Subfamilia TELLININAE

Tellina (Arcopella) isseli Adams, 1870

Fig. 8 a, b

- 1870 *Tellina (Arcopagia) isseli* Adams, p. 790, pl. 48, fig. 10.
1909 *Tellina (Arcopagia) isseli* Lyngø, p. 192.
1932 *Tellina (Arcopagia) isseli* Prashad, p. 185.
1968 *Arcopella isseli* Habe, p. 200, pl. 61, fig. 28.
1971 *Arcopella isseli* Kuroda, Habe & Oyama, p. 449, pl. 99, fig. 20.
1977 *Arcopella isseli* Habe, p. 197, pl. 40, fig. 1.
1990 *Arcopella isseli* Ito, p. 124, pl. 31, fig. 6.
1992 *Tellina (Arcopella) isseli* Oliver, p. 151, pl. 30, fig. 2.
1995 *Arcopella isseli* Bosch, Dance, Moolenbeek & Oliver, p. 257, fig. 1145.
1995 *Arcopella isseli* Kubo & Kurozumi, p. 191, fig. 4.

Diagnostic characters are 1) oval, subequilateral, slightly compressed shell attaining 12 mm in length, 2) beaks small, pointed, 3) obscure umbonal ridge, 4) hinge with 2 cardinals, 1 anterior and 1 posterior lateral in each valve, 5) pallial sinus deep, subquadrangular, extending beyond mid-line in the right valve, but not reaching the anterior adductor scar, 6) sculpture of thin, distant, even commarginal lirations that tend to vanish on antero- and postero-dorsal areas.

Distribution and habitat

Tellina isseli is distributed in the Indo-West Pacific, from the Red Sea to Indonesia and northward to Japan. It is reported to occur in sand and mud, intertidally and down to 100 m depth (Bernard *et al.*, 1993). Previous records in the Gulf of Thailand were from sandy substrates 1.8 m deep (Lyngø, 1909).

Fossil records

None recorded.

Tellina (Cadella) obtusalis Deshayes, 1854

Fig. 8 c, d

- 1854 *Tellina obtusalis* Deshayes, p. 355.
1909 *Tellina (Moerella) obtusalis* Lyngø, p. 201.
1992 *Tellina (Cadella) obtusalis* Lamprell & Whitehead, pl. 44, fig. 318.
1995 *Cadella obtusalis* Bosch, Dance, Moolenbeek & Oliver, p. 253, fig. 1127.

A single left valve, 4.7 mm long, featured by 1) ovate-triangular, markedly inequilateral outline, 2) anterior

part elongately oval, posterior one short, subtriangular, 3) beak small, opisthogyrous, at the posterior one-fourth, 4) posterior angulation weak, but distinct, 5) hinge with 2 cardinal teeth, the anterior one larger, triangular, 6) pallial sinus rather deep, ascendent, 7) sculpture of rather flat commarginal cords starting from the posterior angulation and abruptly vanishing at the anterior one-third, anterior part smooth.

Remarks

The sculpture is the most distinctive character.

Distribution and habitat

Tellina obtusalis is distributed in the tropical Indo-West Pacific, from the Persian Gulf to Australia and northward to the Gulf of Thailand. It is a shallow water element occurring in sand.

Fossil records

None recorded.

Tellina (Cadella) semen Hanley, 1844

Fig. 8 e, f

- 1844 *Tellina semen* Hanley, p. 164.
1885 *Tellina (?) semitorta* Smith, p. 111.
1909 *Tellina (Moerella) semitorta* Lyngø, p. 199, pl. 3, figs. 43-46.
1968 *Cadella semitorta* Habe, p. 199, pl. 61, fig. 22.
1991 *Cadella semitorta* Lan Xiu, p. 338, pl. 10, figs. 5, 6.
Not 1992 *Tellina (Cadella) semen* Lamprell & Whitehead, pl. 44, fig. 317 (= *Tellina smithi* Lyngø, 1909).
1995 *Cadella semitorta* Kubo & Kurozumi, p. 191, fig. 7.
2000 *Cadella semitorta* Matsukuma in Okutani, p. 977, pl. 486, fig. 31.
2002 *Tellina (Cadella) semen* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 93, pl. 13, fig. 6 (*cum syn.*).

Remarks

The present species was already dealt with by the present authors (2002). Further examination of the material and newly recovered specimens have shown that the Gulf of Thailand shells ordinarily exhibit the most typical subelliptical outline, with distinct posterior truncation (specimens refigured herein). We concur with Boss (1969) in considering *Tellina semitorta* Sowerby, 1867 as a synonym of *Tellina semen*.

Distribution and habitat

Reference can be made to Robba *et al.* (2002).

Fossil records

Quaternary of Taiwan (Nomura, 1933, sub *Tellina semitorta*); Holocene of Thailand (Robba *et al.*, 2002).

Tellina (Cadella) smithi Lyngø, 1909

Fig. 8 g, h

1909 *Tellina (Arcopagia ?) smithi* Lyngø, p. 194, pl. 3, figs. 38, 39.

1951 *Tellina smithi* Viader, p. 139.

1992 *Tellina (Cadella) semen* Lamprell & Whitehead, pl. 44, fig. 317 (not *Tellina semen* Hanley, 1844).

Diagnostic characters are 1) ovate-triangular, slightly longer than high, robust shell attaining 7.5 mm in length, 2) anterior side oval, posterior one very short, subtruncate, 3) beaks pointed, opisthogyrous, at the posterior one-fifth, 4) hinge with 2 cardinal teeth, 1 anterior and 1 posterior lateral tooth in each valve, these latter strong and elongate, 5) pallial sinus deep, oval, upward directed, extending to the end of the anterior

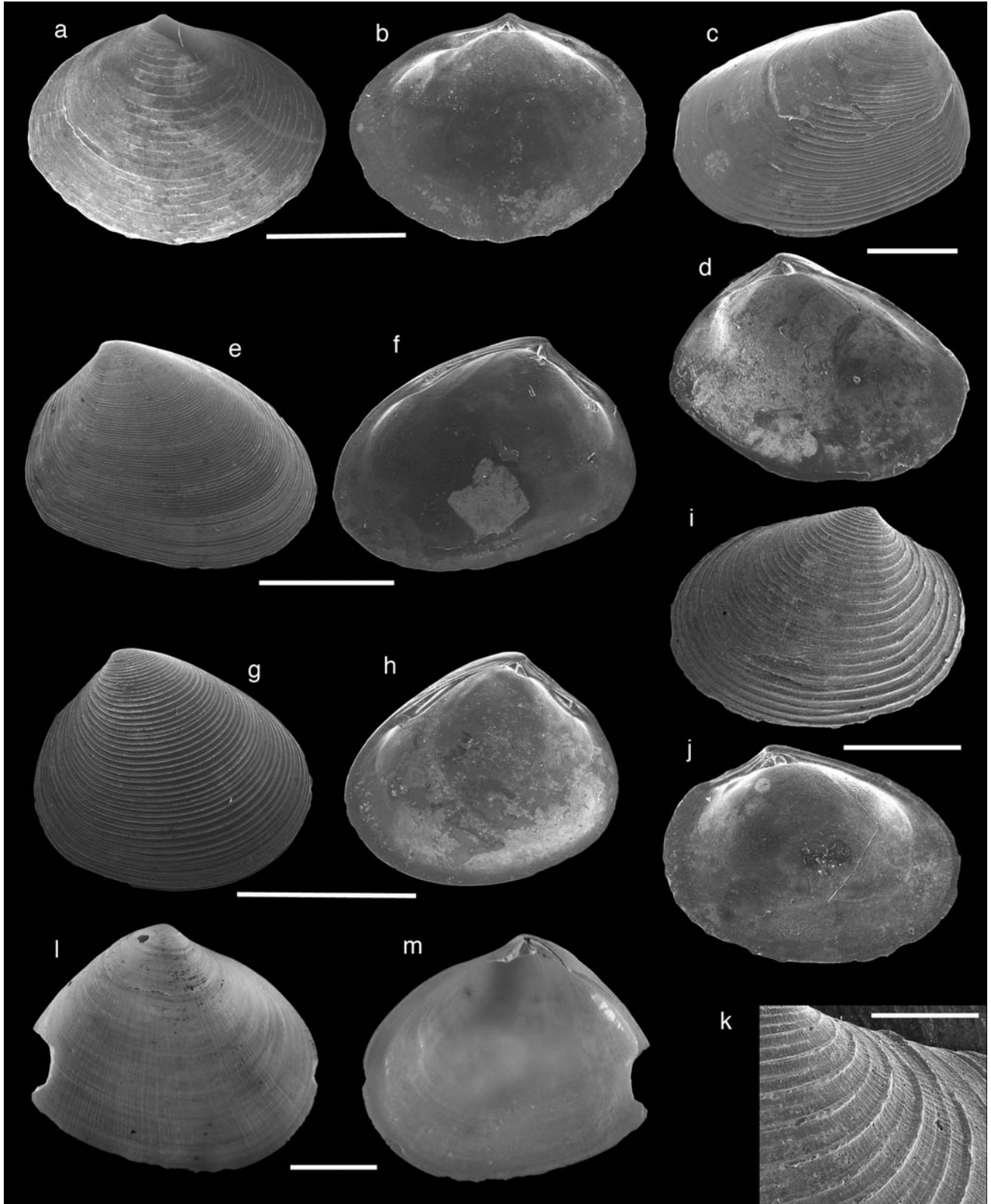


Fig. 8. a-b. *Tellina (Arcopella) isseli* Adams, 1871; Station TH 108D; scale bar 1 mm; c-d. *Tellina (Cadella) obtusalis* Deshayes, 1854; Station TH 160; scale bar 1 mm; e-f. *Tellina (Cadella) semen* Hanley, 1844; Ban Laem Phak Bia Spit, sample 2C; scale bar 3 mm; g-h. *Tellina (Cadella) smithi* Lyngø, 1909; Station TH 40; scale bar 3 mm; i-k. *Tellina (Cadella)* sp.; Station TH 158D, i, j. scale bar 2 mm, k. scale bar 0.5 mm; l-m. *Macalia bruguieri* (Hanley, 1844); Station TH 158D; scale bar 6 mm.

lateral tooth, 6) sculpture of closely set, flat-topped commarginal cords, each second continuing over the postero-dorsal area where they are thinner and more raised.

Remarks

Tellina delta Yokoyama, 1922 is the most closely similar species, differing in that has more elongate shell, with less steep postero-dorsal margin and no posterior truncation. *Tellina semen* Hanley, 1844 has even longer, subelliptical shell with finer sculpture.

Distribution and habitat

Tellina smithi is distributed in the Indo-West Pacific, from Mauritius Island to Australia, Thailand, Philippines and South China Sea. It occurs intertidally and down to 30 m depth, in mud and sand (Bernard *et al.*, 1993). Previous records in the Gulf of Thailand refer to a single right valve obtained from sandy mud at 54 m depth (Lynge, 1909).

Fossil records

None recorded.

Tellina (Cadella) sp.
Fig. 8 i-k

Several valves, the greatest 7.5 mm long. Distinctive features are 1) elliptical, inequilateral outline, 2) anterior side oval, posterior one shorter, with bluntly rounded truncation, 3) beaks small, pointed, opisthogyrous, at the posterior one-third, 4) blunt posterior angulation, 5) hinge typical for the genus, 6) pallial sinus apparently deep, with ascending upper border, 7) sculpture of commarginal thin cords overridden by fine radial threads; the cords are narrower than the flat intervening spaces and alternately extend over the postero-dorsal area where they are somewhat lamellar, or end about at the middle of the valve length, or vanish close to the posterior angulation.

Remarks

Compared to *Cadella semen* Hanley, 1844, the present form exhibits more inflated valves and coarser sculpture.

Subfamilia MACOMINAE

Macalia bruguieri (Hanley, 1844)
Fig. 8 l, m

1844 *Tellina bruguieri* Hanley, p. 142.
1873 *Tellina (Macoma) bruguieri* Römer, p. 268, pl. 50, figs. 6-9.
1956 *Tellina bruguieri* Satyamurti, p. 156, pl. 23, fig. 4.

1965 *Macalina bruguieri* Kira, p. 171, pl. 60, fig. 17.
1969 *Macalia (Macalia) bruguieri* Afshar, p. 94, pl. 41, figs. 1-5.
1969 *Macalia bruguieri* Treatise I. P., p. N626, fig. E112 (5).
1977 *Macalia bruguieri* Habe, p. 212, pl. 43, figs. 5-7.
1978 *Macalina bruguieri* Kirtisinghe, p. 39, pl. 20, fig. 2.
1992 *Macalia bruguieri* Lamprell & Whitehead, pl. 50, fig. 377.
1995 *Macalia bruguieri* Kubo & Kurozumi, p. 193, fig. 1.

A single, rather thin right valve 20 mm long, characterized by 1) trigonal-ovate, inequilateral outline, 2) anterior or side broadly rounded, posterior one subtriangular, with short truncate edge, 3) postero-dorsal margin gently arched and very steep, 4) beak at the posterior two-fifths, 5) hinge with 2 cardinal teeth, anterior one long, up-curved, posterior one small, bifid, 6) pallial sinus deep, reaching about mid-line between the beak and the anterior edge, its upper border subangular, 7) sculpture of rather distant commarginal threads crossed by faint radial striae.

Distribution and habitat

Macalia bruguieri is distributed in the West Pacific, from Australia to Japan. It is a sand and mud dweller, occurring intertidally and down to 25 m depth (Bernard *et al.*, 1993). Previous records in Thailand were from the west coast (Andaman Sea), in littoral coarse sand among coral rubble.

Fossil records

Quaternary of Indonesia (Skwarko *et al.*, 1994).

Familia PSAMMOBIIDAE

Gari (Gari) truncata (Linnaeus, 1767)
Fig. 9 a, b

1767 *Tellina truncata* Linnaeus, p. 1118.
1965 *Gari gari* Kira, p. 170, pl. 60, fig. 1.
1971 *Gari truncata* Kuroda, Habe & Oyama, p. 441, pl. 98, fig. 4.
1977 *Gari truncata* Habe, p. 219, pl. 46, figs. 4, 5.
1978 *Gari truncata* Cernohorsky, p. 185, pl. 67, fig. 5.
1992 *Gari (Gari) truncata* Lamprell & Whitehead, pl. 52, fig. 390.
2000 *Gari truncata* Matsukuma in Okutani, p. 985, pl. 490, fig. 1.
2001 *Gari truncata* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 88, fig. 156.

A juvenile left valve, featured by 1) elongate, ovate-quad-rangular outline, 2) anterior part narrowly oval, posterior one roundly truncate, 3) beak small, submedian, 4) posterior angulation weak, but distinct, 5) hinge with 2 small cardinals, the anterior one bifid, 6) pallial sinus deep, confluent, with rounded edge slightly anterior to the

beak, 7) outer surface with commarginal growth markings crossed by oblique grooves over the anterior three-quarters; the grooves end abruptly against a radial line running somewhat anterior to the angulation.

Distribution and habitat

Gari truncata is distributed in the Indo-Pacific, from the Red Sea to Australia and northward to Japan. It is a sand-related element occurring in the intertidal and infralittoral zones.

Fossil records

None recorded.

Superfamilia VENEROIDEA
Familia VENERIDAE
Subfamilia GAFRARIINAE

Circe scripta (Linnaeus, 1758)
Fig. 9 c, d

- 1758 *Venus scripta* Linnaeus, p. 689.
1885 *Circe scripta* Smith, p. 141.
1909 *Circe scripta* Lyngø, p. 230.
1932 *Circe scripta* Prashad, p. 223.
1935 *Circe scripta* Oostingh, p. 180.
1960 *Gafrarium scriptum* Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 147, fig. 122.
1960 *Circe scripta* Makiyama, pl. 94, figs. 7, 8; pl. 106, fig. 2.
1960 *Gafrarium scriptum* Paes da Franca, p. 95, pl. 26, fig. 4.
1965 *Circe scripta* Kira, p. 163, pl. 58, fig. 7.
1971 *Circe (Circe) scripta* Kuroda, Habe & Oyama, p. 413, pl. 90, fig. 6.
1974 *Circe scripta* Fischer-Piette, p. 271 (*cum syn.*).
1975 *Gafrarium scriptum* Fischer-Piette & Vukadinovic, p. 20 (*cum syn.*).
1977 *Circe (Circe) scripta* Habe, p. 253, pl. 52, figs. 10, 11.
1978 *Circe scripta* Kirtisinghe, p. 34, 36, pl. 16, fig. 7.
1981 *Circe scripta* Eisenberg, p. 168, pl. 150, fig. 13.
1982 *Circe scripta* Abbott & Dance, p. 354, fig. in top row, middle.
1986 *Circe scripta* Springsteen & Leobrera, p. 300, pl. 85, fig. 12.
1992 *Circe (Circe) scripta* Lamprell & Whitehead, n. 489, pl. 64, fig. 489.
1992 *Circe (Circe) scripta* Oliver, p. 181, pl. 39, fig. 1.
1994 *Circe scripta* Scott, p. 80, pl. 10, fig. B.
1995 *Circe scripta* Bosch, Dance, Moolenbeek & Oliver, p. 267, fig. 1197.
1995 *Circe scripta* Kubo & Kurozumi, p. 200, fig. 4.
2000 *Circe (Circe) scripta* Matsukuma in Okutani, p. 1007, pl. 501, fig. 21.
2001 *Circe scripta* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 91, fig. 173.

quilateral, compressed shell attaining 50 mm in length, 2) anterior side oval, posterior one truncated, 3) flattened umbonal area, 4) lunule and escutcheon narrow, lanceolate, the former bounded by a distinct angulation, 5) hinge with 3 elongate, radiating cardinals and 1 approximate, prominent anterior lateral in each valve, 6) pallial sinus obsolescent, 7) sculpture of even commarginal cords that are weaker over the umbonal area.

Remarks

Circe rivularis (Born, 1780) is closely related, but differs in having higher shell and somewhat weaker sculpture.

Distribution and habitat

Circe scripta ranges throughout the Indo-West Pacific, from Natal to New Caledonia and northward to Japan (Fischer-Piette, 1974; Bernard *et al.*, 1993). It is a tolerant sand-related element occurring intertidally and down to 30 m depth. Previous records in Thai waters were from a variety of soft substrates in the upper infralittoral zone (Lyngø, 1909; Tantanasiriwong, 1979).

Fossil records

Late Miocene of Indonesia and Malaysia; Pliocene of Indonesia, Taiwan and Japan; Quaternary of East Africa, Red Sea, Indonesia, Taiwan and Japan (Skwarko *et al.*, 1994).

Ordo MYOIDA
Superfamilia MYOIDEA
Familia CORBULIDAE

Corbula (Notocorbula) tunicata Hinds, 1843
Fig. 9 e, f

- 1843a *Corbula tunicata* Hinds, p. 55.
1885 *Corbula tunicata* Smith, p. 29.
1909 *Corbula (Aloidis) tunicata* Lyngø, p. 266.
1932 *Aloidis tunicata* Prashad, p. 310.
1935 *Aloidis tunicata* Oostingh, p. 201.
1941 *Corbula tunicata* Lamy, p. 22.
1998 *Corbula (Notocorbula) tunicata* Lamprell & Healy, p. 190, fig. 556.
2002 *Corbula (Anisocorbula) sp.* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 119, pl. 20, fig. 11.

Diagnostic characters are 1) trigonal, slightly inequilateral and markedly inequivalve, very thick shell up to 25 mm in length, 2) anterior side narrowly rounded, posterior one trapezoidal and truncated, umbonal ridge sharp in young specimens, much less so in adult shells, 3) umbonal area stout in the right valve, more pointed in the left one, 4) ventral margin of the right valve largely encompassing the left valve, 5) pallial sinus small and shallow, 6) sculpture of strong commarginal cords that occur throughout the right valve and are re-

stricted to the earlier part of the left valve; a thick periostracum coats the ventral part of the left valve.

Remarks

The sharp umbonal ridge developed in juvenile shells only and the sculptural features are the main distinguishing characters.

Distribution and habitat

Corbula tunicata is distributed in the Indo-West Pacific, from Mauritius to Australia and northward to South China Sea. It dwells in sand and mud, intertidally and down to 60 m depth (Bernard *et al.*, 1993). Previous records in the Gulf of Thailand were from infralittoral muddy substrates (Lynge, 1909).

Fossil records

Late Miocene to Pleistocene of Indonesia (Skwarko *et al.*, 1994).

Potamocorbula laevis (Hinds, 1843) Fig. 9 g-k

- 1843a *Corbula laevis* Hinds, p. 59.
1941 *Corbula (Erodona) laevis* Lamy, p. 248.
1960 *Aloidis laevis* Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 224, fig. 188.
2000 *Potamocorbula laevis* Okutani in Okutani, p. 1023, pl. 509, fig. 10.

The species is characterized by 1) ovate-trigonal, equilateral, moderately thin shell attaining 25 mm in length, 2) anterior side oval, 3) posterior side subtriangular, with weak umbonal ridge, 4) beaks rather small, pointed, 5) both valves somewhat flattened toward the ventral margin, 6) ventral margin of the right valve slightly encompassing the left valve, with a distinct sinuation at the mid-posterior part, 7) pallial sinus very weak, 8) outer surface with uneven growth markings usually coarser over the postero-dorsal area; the whole surface is covered with a thin, olive-green periostracum.

Remarks

Potamocorbula amurensis (Schrenck, 1867) appears to be related but differs primarily in having 1) more trigonal, higher shell, 2) swollen umbonal area, and 3) concave postero-dorsal margin. According to Bernard *et al.* (1993), the latter taxon is a junior synonym of *Corbula ustulata* Reeve, 1844.

Distribution and habitat

Potamocorbula laevis was hitherto known from the Philippines, South China Sea, Taiwan (Bernard *et al.*, 1993)

and Korea (Okutani in Okutani, 2000). It is reported to dwell in sandy and muddy substrates, intertidally and down to 10 m depth (Bernard *et al.*, 1993). Hinds (1843) presumed the species to live "where the water is brackish rather than salt". Actually, the present authors noted *Potamocorbula laevis* to occur abundantly in the thanatocoenoses recovered from muddy bottoms in the brackish Pak Phanang Bay, on the west coast of the Southern Gulf of Thailand.

Fossil records

None recorded.

Superfamilia GASTROCHAEONOIDEA Familia GASTROCHAENIDAE

Eufistulana agglutinans (Deshayes, 1854) Fig. 9 l, m

- 1854 *Chaena agglutinans* Deshayes, p. 330.
1925 *Fistulana agglutinans* Lamy, p. 318.

Three fragmentary right valves lacking the posterior part. The observable characters are 1) shell thin, markedly inequilateral, 2) beak small, prosogyrous, 3) anterior side angular, with rather deep radial depression followed backward by a hood-like swelling with the apex just below the beak, 4) hinge edentulous, 5) outer surface with *Solen*-like growth markings and 10 scabrous, uneven radial ridges in the anterior depression.

Remarks

The present material fits in well with the original description.

Distribution and habitat

Eufistulana agglutinans was hitherto known to range from Philippines to Taiwan. It is an infralittoral element burrowing in sand. *Eufistulana* species construct a club-like calcareous tube standing vertically in the substrate.

Fossil records

None recorded.

Superfamilia PHOLADOIDEA Familia PHOLADIDAE Subfamilia PHOLADINAE

Zirfaea subconstricta (Yokoyama, 1924) Fig. 9 n, o

- 1954 *Zirphaea subconstricta* Taki & Oyama, pl. 39, figs. 11, 13.

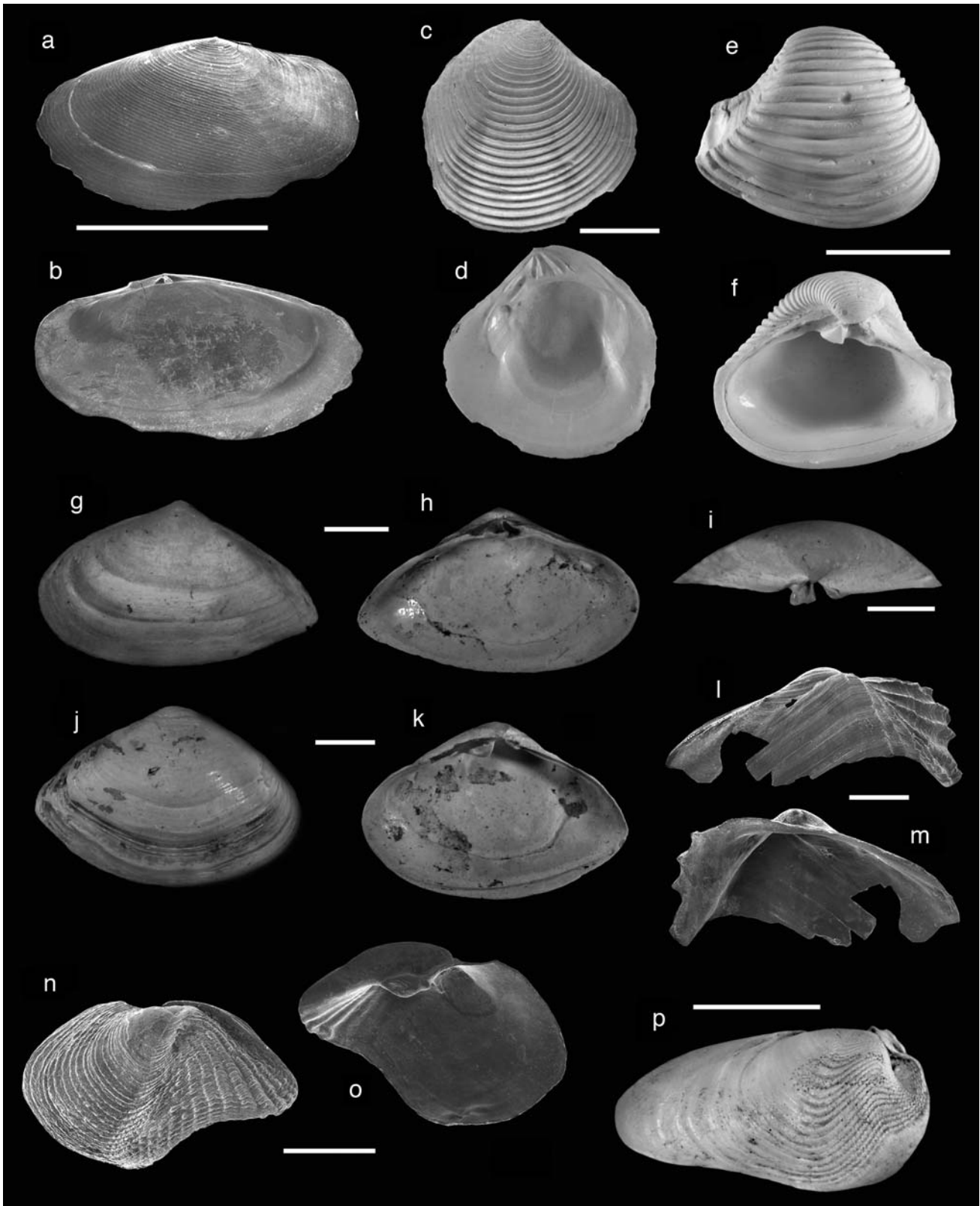


Fig. 9. **a-b.** *Gari (Gari) truncata* (Linnaeus, 1767); Station TH 159; scale bar 7 mm; **c-d.** *Circe scripta* (Linnaeus, 1758); Station TH 157D; scale bar 5 mm; **e-f.** *Corbula (Notocorbula) tunicata* Hinds, 1843; Station TH 159; scale bar 7.5 mm; **g-k.** *Potamocorbula laevis* (Hinds, 1843); Station PP 18; scale bars 1 mm; **l-m.** *Eufistulana agglutinans* (Deshayes, 1854); Station TH 159; scale bar 1 mm; **n-o.** *Zirfaea subconstricta* (Yokoyama, 1924); Station TH 158D; scale bar 1 mm; **p.** *Martesia (Martesia) striata* (Linnaeus, 1758); Station TH 76; scale bar 5 mm.

1960 *Zirfaea minor* Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 239, fig. 198.

1965 *Zirfaea subconstricta* Kira, p. 184, pl. 63, fig. 21.

1977 *Zirfaea subconstricta* Habe, p. 290, pl. 61, figs. 9, 10.

2000 *Zirfaea subconstricta* Okutani in Okutani, p. 1029, pl. 512, fig. 5.

A single juvenile valve featured by 1) ovate-quadrangular, inequilateral outline, 2) elongate umbonal reflection, 3) pedal gape wide, bounded by a sinuous rim, 4) anterior part inflated, transition to the posterior one marked by a distinct slope followed by a broad and shallow umbonal-ventral sulcus, 5) anterior part sculptured with radial ribs overridden by commarginal threads

forming elongate nodes on crossing the ribs; slope with commarginal threads; posterior part with growth markings; a few radial rows of small scales occur posterior to the umbonal ventral sulcus.

Remarks

The Thai specimen conforms to the figure of the holotype of *Jouannetia yabei* Yokoyama, 1924, published by Taki & Oyama (1954, pl. 39, fig. 11). This latter taxon is currently regarded as a synonym of *Zirfaea subconstricta*. Other synonyms are *Zirfaea minor* Tchang, Tsi & Li, 1960, *Pholas constricta* Sowerby, 1849 and *Pholas crispata* auctororum (not Linnaeus, 1758).

Distribution and habitat

Zirfaea subconstricta is distributed from Southeast Asia to Taiwan and Japan. According to Bernard *et al.* (1993), the species is a soft rocks borer occurring intertidally. The present record expands its depth range to the upper infralittoral zone.

Fossil records

Quaternary of Japan (Taki & Oyama, 1954).

Subfamilia PHOLADINAE

Martesia (Martesia) striata (Linnaeus, 1758)

Fig. 9 p

1758 *Pholas striatus* Linnaeus, p. 669.

1998 *Martesia striata* Turner in Beesley *et al.*, p. 374, figs. 8.48 g-j.

2001 *Martesia striata* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 99, fig. 223.

2002 *Martesia (Martesia) striata* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 121 (*cum syn.*), pl. 21, fig. 7a (not *Pholadidea* sp.), not fig. 6 (= *Pholadidea* sp.).

Remarks

The species was already dealt with by the present authors (2002). Because of an error in composing Pl. 21, illustrations of *Martesia striata* and *Pholadidea* sp. have been interchanged. *Martesia striata* is refigured herein.

Classis GASTROPODA
Subclassis ORTHOGASTROPODA
Superordo VETIGASTROPODA
Superfamilia TROCHOIDEA
Familia SKENEIDAE

Cyclostremiscus (Miralabrum) sp.

Fig. 10 a-d

This unidentified species is characterized by 1) subdis-

coidal, nearly flat-spired shell attaining 5 mm in diameter, 2) protoconch low-turbiform, of 2 convex whorls, the first smooth, the second with unevenly arranged granules, demarcation from teleoconch abrupt, marked by the appearance of spiral sculpture, 3) spire of 1.75 slightly convex whorls meeting at gently impressed sutures, 4) body whorl large, cup-shaped, with angular periphery and convex base, upper basal outline subvertical toward the aperture, 5) umbilicus widely open and deep, bounded by a distinct angulation, umbilical wall with 1 weak spiral ridge but otherwise smooth, 6) aperture subquadrangular, lying in a prosocline plane, outer lip with 1 adapical and 1 middle moderate spurs, inner lip with thick band of callus that extends toward the umbilicus at the level of the umbilical ridge, 7) sculpture of 2 separate rows of collabral folds, respectively on the shoulder slope and on lower base, and of spiral cords; 22 low, prosocline and slightly arched folds lie on the shoulder slope of the body whorl and vanish at the level of the peripheral angulation; 15 coarser folds occur on lower base and form prominent nodes adapically; the spirals occur throughout, are flat-topped and wider than the pitted intervening furrows.

Remarks

The generic assignment of the present form is provisional, based on its resemblance to *Cyclostremiscus (Miralabrum) rostratus* (Hedley, 1900).

Superordo NERITOPSINA
Superfamilia NERITOIDEA
Familia PHENACOLEPADIDAE

Phenacolepas newtoni (Sowerby, 1894)

Fig. 10 e-g

1894 *Plesiothyreus newtoni* Sowerby, p. 156, pl. 12, fig. 27.

1968 *Plesiothyreus newtoni* Habe, p. 23, pl. 8, fig. 16.

2000 *Phenacolepas newtoni* Fukuda, Asami, Yamashita, Satô, Hori & Nakamura, p. 124, figs. 4 l-n, 5 m.

2000 *Plesiothyleus* (sic) *newtoni* Tsuchiya in Okutani, p. 113, pl. 55, fig. 9.

A single specimen 4.5 mm long, featured by 1) depressed, capuliform shell, ovate-quadrangular in outline, 2) apex helicoid, with bulbous tip, nearly overhanging the posterior margin, 3) aperture in a gently concave surface, posteriorly and laterally constricted by a slightly concave shelf with serrated edge, 4) sculpture of collabral (concentric) riblets overridden by radial cordlets forming a square-reticulated pattern with small nodes at intersections.

Remarks

The present taxon is easily distinguished from the other Indo-Pacific species on account of regular, square-reticulated sculpture and serrated edge of the apertural shelf (or septum).

Distribution and habitat

Phenacolepas newtoni was hitherto known to range from China Sea to Japan. It is reported to be a shallow subtidal element dwelling on sandy bottoms and under boulders. According to Fukuda *et al.* (2000), the species also occurs in anaerobic tide pools.

Fossil records

None recorded.

Superordo CAENOGASTROPODA
Ordo ARCHITAENIOGLOSSA
Superfamilia AMPULLARIOIDEA
Familia VIVIPARIDAE
Subfamilia BELLAMYINAE

Filopaludina (Filopaludina) sumatrensis (Dunker, 1852) Fig. 10 h, i

1852 *Paludina sumatrensis* Dunker, p. 128.

1956 *Bellamyia sumatrensis* van Benthem Jutting, p. 324, fig. 36.

1974 *Filopaludina (Filopaludina) sumatrensis* Brandt, p. 20.

1974 *Filopaludina (Filopaludina) sumatrensis speciosa* Brandt, p. 21, pl. 1, fig. 14.

1974 *Filopaludina (Filopaludina) sumatrensis polygramma* Brandt, p. 22, pl. 1, figs. 15, 16.

1974 *Filopaludina (Filopaludina) sumatrensis peninsularis* Brandt, p. 23, pl. 1, fig. 17.

2001 *Filopaludina sumatrensis* Swennen, Moolenbeek, Ruttanadakul, Hobbelink, Dekker & Hajisamae, p. 109, fig. 280.

The single specimen recovered from the sand spit bounding the Pak Phanang Bay is characterized by 1) ovate-conic, rather thin shell 24 mm high, 2) spire whorls shaped like a segment of a cone, with rounded shoulder, meeting at adpressed, well incised sutures, 3) body whorl irregularly oval, three-fourths of total height, with subangular periphery, 4) umbilicus a narrow chink, 5) aperture subrounded, with thin peristome, 6) sculpture of 3 slightly raised, thin spirals on earlier whorls that fade away on later whorls; a spiral microsculpture is noted, also vanishing during growth; apical whorls violet, subsequent 2 reddish-brown, rest of the shell yellowish-olive; the 3 main spirals are red in colour.

Remarks

It appears difficult to distinguish from one another the subspecies treated by Brandt (1974) on the basis of shell features. The present specimen could match the characters of the subspecies *peninsularis* Brandt, 1974.

Distribution and habitat

Filopaludina sumatrensis was quoted from Java, Sumatra, Malaya, Myanmar, Thailand and Indo-China. It is a freshwater element living in running or stagnant waters.

Fossil records

None recorded.

Ordo SORBEOCONCHA
Superfamilia CERITHIOIDEA
Familia CERITHIIDAE
Subfamilia BITTIINAE

Bittium sp. 1 Fig. 10 j-l

The distinguishing characters are 1) somewhat turreted, cyrtoconoid shell approximately 4 mm high, 2) protoconch conical, of 3.5 convex whorls, the first smooth, the rest with 3 faint spiral threads, respectively submedian, abapical and suprasutural and with subsutural axial wrinkles, 3) spire whorls gently convex, with the periphery placed abapically and contracted below the latter, meeting at slightly impressed sutures, 4) body whorl ovate-cylindrical, base convex, 5) sculpture of collabral ribs overridden by spiral cords; the ribs, 13 increasing to 16 on later whorls, are nearly as wide as the intervening spaces and tend to vanish on the most abapical part of the whorls; 2 spirals occur on earlier whorls, another develops between these and the adapical suture on middle whorls, followed after 1.5 whorls by a fourth placed further adapically; the 4 spirals are of decreasing strength downward; base with 1 spiral at the level of the suture, 1 just abapical to it, 1 on middle base and a few approximate cordlets over the neck.

Remarks

The present specimen does not match satisfactorily the characters of any *Bittium* species described in the available literature.

Bittium sp. 2 Fig. 10 m-o

A single specimen including the protoconch and earliest part of the spire. The observable characters are 1) protoconch of 3.5 whorls with the periphery at the abapical one-third, first 2 apparently smooth, the rest developing an increasingly prominent peripheral keel followed over the last three quarters of whorl by another one at the middle of the shoulder slope, bicarinate part with arched collabral riblets adapical to the upper keel, prosocline axial threads in between the keels and uneven granules throughout, 2) earliest teleoconch whorls nearly flat-sided, 3) sculpture of collabral ribs overridden by 3 spiral cords of the same strength to form a square-reticulated pattern.

Remarks

The assignment to the genus *Bittium* Gray, 1847 is made with some reservation.

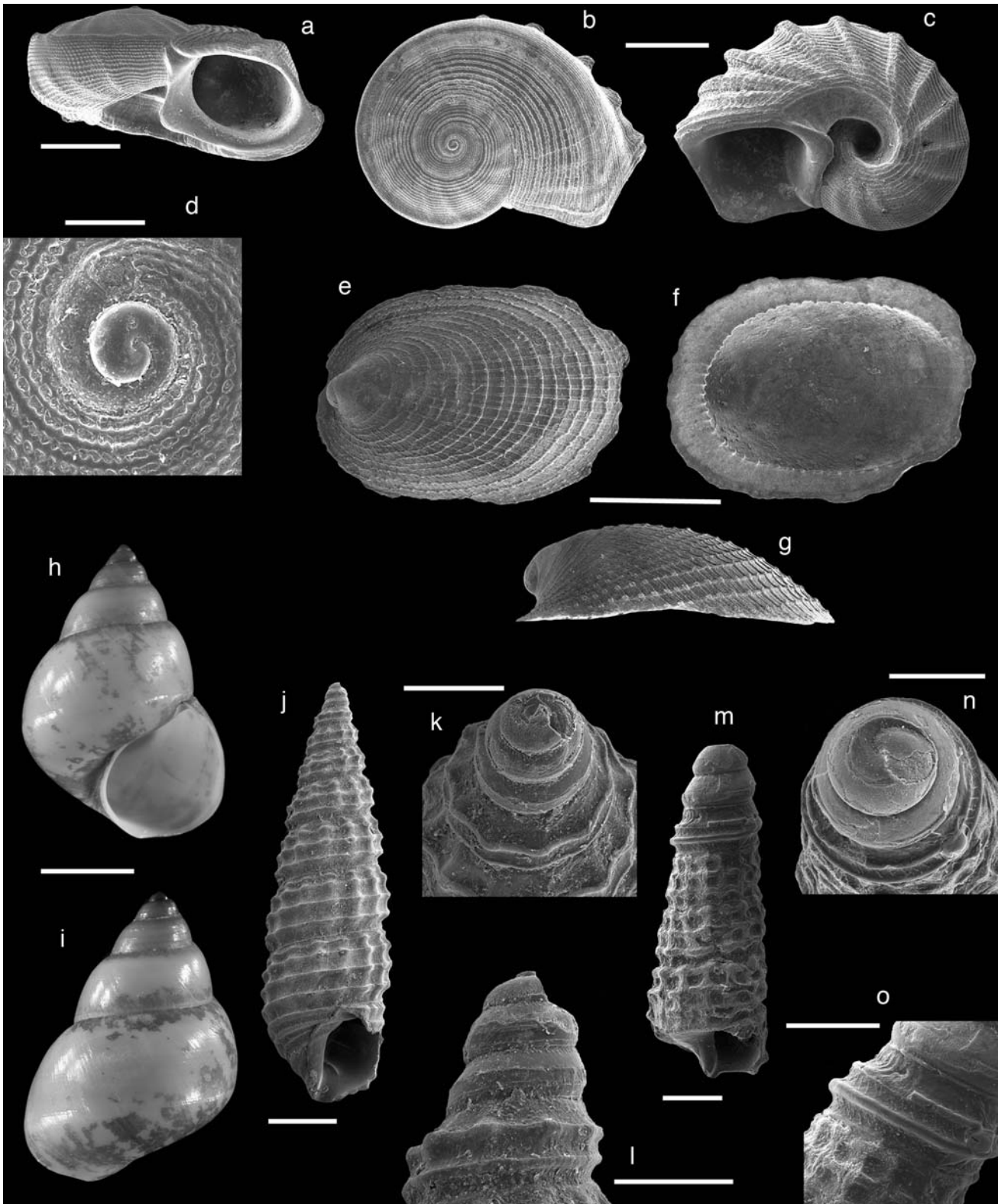


Fig. 10. **a-d.** *Cyclostremiscus (Miralabrum)* sp.; Station TH 158D, **a, b, c.** scale bars 1 mm, **d.** scale bar 0.2 mm; **e-g.** *Phenacolepas newtoni* (Sowerby, 1894); Station TH 159; scale bar 2 mm; **h-i.** *Filopaludina (Filopaludina) sumatrensis* (Dunker, 1852); Laem Talumphuk Spit (Pak Phanang Bay); scale bar 8 mm; **j-l.** *Bittium* sp. 1; Station TH 161C, **j.** scale bar 0.5 mm, **k, l.** scale bars 0.2 mm; **m-o.** *Bittium* sp. 2; Station TH 161C; scale bars 0.2 mm.

Familia TURRITELLIDAE
Subfamilia TURRITELLINAE

Haustator (Kurosoia) cingulifer (Sowerby, 1825)

Fig. 11 a-c

1825 *Turritella cingulifera* Sowerby, p. 56, n° 1442 (nomen nudum), p. 14 (appendix), n° 1442.

1909 *Turritella (Turritella) cingulifera* Schepman, p. 187.

1935 *Turritella filiola* Nomura, p. 189.

1959 *Turritella (Kurosoia) filiola* Kotaka, p. 85, pl. 3, figs. 6-8; pl. 11, figs. 1, 3.

1960 *Turritella filiola* Makiyama, pl. 90, fig. 7.

1960 *Turritella (Haustator) filiola* MacNeil, p. 36, pl. 1, fig. 20; pl. 11, figs. 22-26.

1969 *Turritella (Kurosoia) cingulifera filiola* Shuto, p. 59, pl. 2, figs. 14, 15; text-fig. 17 (2, 3).

1975 *Haustator cingulifera* Hinton, p. 5, fig. 17.

- 1982 *Turritella (Haustator) filiola* Wang Huiji, p. 143, pl. 5, figs. 22, 23.
 1984 *Turritella cingulifera* Beets, p. 10.
 1985 *Haustator cingulifer* Wilson & Gillett, p. 54, pl. 9, fig. 3.
 1993 *Haustator (Kurosoia) cingulifera* Wilson, p. 139, pl. 14, fig. 9.
 1999 *Turritella cingulifera* Kohn & Arua, p. 106, pl. 1, figs. 7, 8.
 2000 *Haustator (Kurosoia) cingulifera* Hasegawa in Okutani, p. 127, pl. 63, fig. 1 (bottom).
 2001 *Haustator cingulifera* Swennen, Moolenbeek, Ruttanadakul, Hobbelink, Dekker & Hajisamae, p. 110, fig. 290.
 2004 *Kurosoia* sp. Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 28, pl. 3, fig. 2.

This is a rather variable species featured by 1) slenderly turreted shell not exceeding 25 mm in height, 2) protoconch small, of slightly more than 2 convex whorls, tip prominent and tilted, transition to teleoconch marked by the appearance of a mid-abapical keel, 3) earliest spire whorls angular, middle ones flat sided, latest whorls convex, sutures increasingly impressed during growth, 4) body whorl about 40% of total height, with subangular periphery and quickly tapering abapical to the latter, 5) aperture broadly oval, columella slightly twisted, 6) growth lines following a reverse S-shaped course, with a deep sinuation about halfway between sutures, 7) sculpture of a mid-abapical keel on the first 2 whorls; by the third whorl, the keel shifts abapically, changes into a strong cord and another 2 cords of decreasing strength upward develop adapical to it; secondary spirals may appear on the fourth or on later whorls and became increasingly stronger; body whorl with 10-12 adapical and 8-10 basal cords; the primary spirals are usually finely beaded on earlier whorls; some specimens retain a reddish-brown colour on the primary cords, occasionally on some others.

Remarks

We concur with Beets (1950) in considering *Turritella filiola* Yokoyama, 1928 as a synonym of Sowerby's species. *Haustator (Kurosoia) fascialis* (Menke, 1828) is closely similar, but differs in having somewhat slenderer shell, flat-sided whorls throughout and finer sculpture.

Distribution and habitat

Haustator cingulifer ranges from the Eastern Indian Ocean to Indonesia and northward to Japan; it was recently recorded also from Fiji (Kohn & Arua, 1999). The species is reported to live in sandy and algal bottoms in the sublittoral zone (Hasegawa in Okutani, 2000). In the Southern Gulf of Thailand, abundant live specimens were trawled off Laem Tachi from a vegetated bottom at 3 to 6 m depth (Swennen *et al.*, 2001).

Fossil records

Miocene of Okinawa (McNeil, 1960) and Japan (Skwar-

ko & Sufiati, 1994); Middle and Late Miocene of Indonesia (Skwarko & Sufiati, 1994); Pliocene of Indonesia, Philippines, Taiwan, China, Okinawa and Japan (Nomura, 1935; Kotaka, 1959; McNeil, 1960; Shuto, 1969; Wang Huiji, 1982; Beets, 1984; Skwarko & Sufiati, 1994; Kohn & Arua, 1999); Quaternary of Indonesia, Japan and Fiji (Shuto, 1969; Beets, 1984; Skwarko & Sufiati, 1994; Kohn & Arua, 1999); Holocene of Thailand (Robba *et al.*, 2004).

Familia SILIQUARIIDAE

Tenagodus (Tenagodus) anguinus (Linnaeus, 1758)

Fig. 11 d, e

- 1758 *Serpula anguina* Linnaeus, p. 787.
 1968 *Siliquaria (Agathirses) anguina* Habe, p. 35, pl. 11, fig. 6.
 1981 *Siliquaria anguina* Eisenberg, p. 48, pl. 30, fig. 14.
 1986 *Siliquaria anguina* Springsteen & Leobrera, p. 44, pl. 8, fig. 12.
 1988 *Siliquaria anguina* Dharma, p. 40, pl. 6, fig. 18.
 1991 *Siliquaria anguina* Abbott, p. 27, pl. 6, fig. 9.
 1993 *Siliquaria anguina* Wilson, p. 141, pl. 15, figs. 3, 4.
 2000 *Tenagodus (Tenagodus) anguina* Hasegawa in Okutani, p. 129, pl. 64, fig. 2.

Three juvenile specimens are assigned to Linnaeus' species on account of 1) tubular, loosely coiled shell, 2) continuous slit, and 3) appearance of spinose spirals.

Distribution and habitat

Tenagodus anguinus occurs commonly in the tropical Indo-West Pacific. It is a sublittoral element, reported to form aggregations within sponges (Habe, 1968; Hasegawa in Okutani, 2000).

Fossil records

Late Miocene of Java (Skwarko & Sufiati, 1994).

Familia THIARIDAE Subfamilia THIARINAE

Melanoides tuberculata (Müller, 1774)

Fig. 11 f, g

- 1774 *Nerita tuberculata* Müller, p. 191.
 1956 *Melanoides tuberculata* van Benthem Jutting, p. 412, figs. 69, 73, 91 (*cum syn.*).
 2004 *Melanoides tuberculata* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 33, pl. 3, fig. 6 (*cum syn.*).

Mature shells of the present species are usually decoliate or have the apical whorls eroded. Two recently recovered and nicely preserved juvenile fossil specimens, comprised of protoconch and earliest spire whorls, ex-

hibit 1) protoconch planorbisid, of 1.5 smooth whorls, 2) first 4 whorls biangulated, fifth whorl convex, 3) sculpture of spiral cords overridden by thin, flexuous and opisthocline axial riblets; 2 spirals lying on the angulations appear immediately, followed by an intermediate one and a spiral thread on the shoulder slope at the beginning of the fourth whorl; 1 spiral cord occurs at the level of the abapical suture, a weaker one on upper

base, 2-3 spiral threads on mid-lower base; the ribs vanish at the level of the upper basal cord; a faint spiral microstriation is noted throughout.

Remarks

The present record refers to the Holocene of Thailand. For the description of the adult characters, distribution,

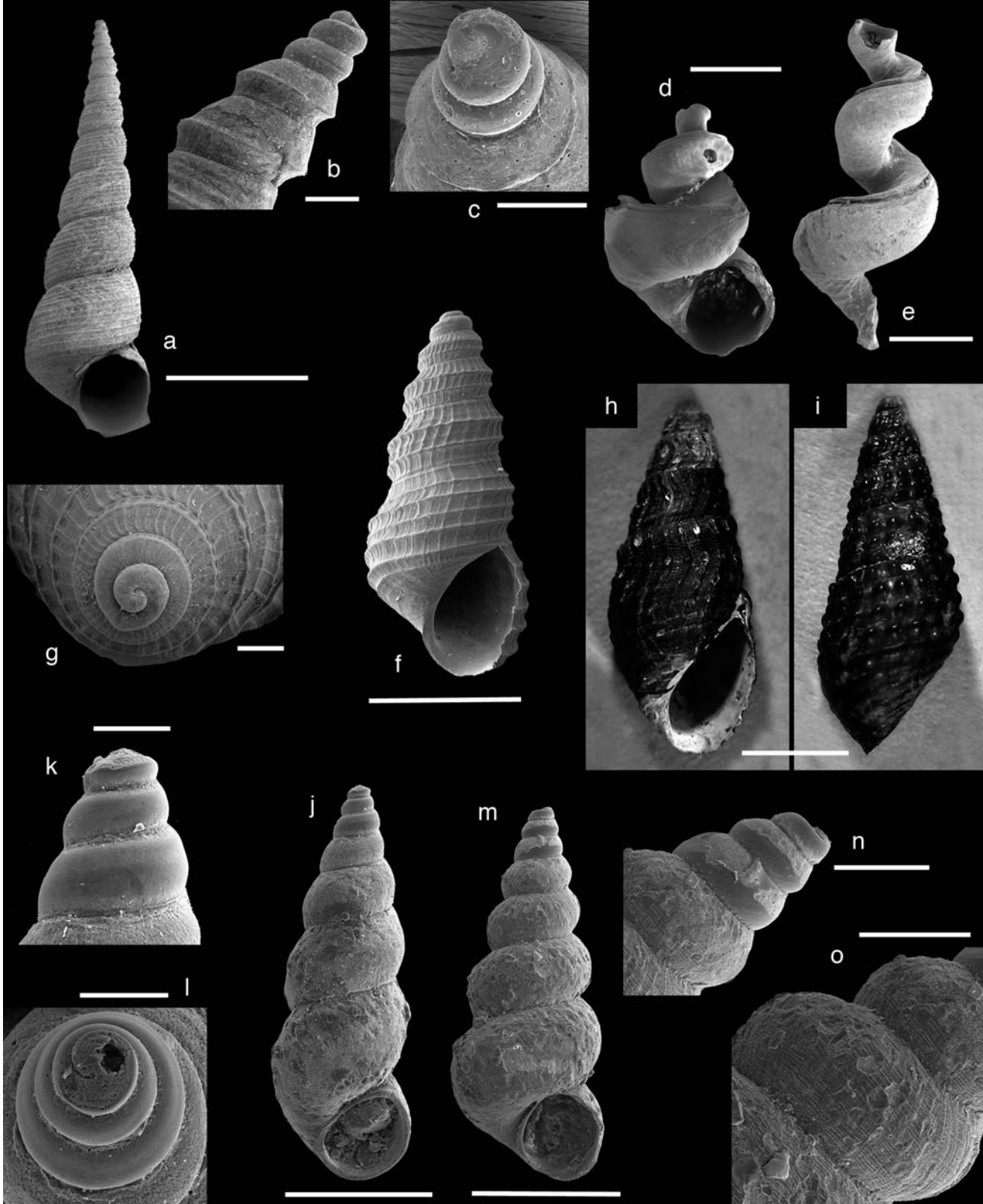


Fig. 11. a-c. *Haustator (Kurosoia) cingulifer* (Sowerby, 1825); Station TH 161C, a. scale bar 5 mm, b, c. scale bars 0.2 mm; d-e. *Tenagodus (Tenagodus) anguinus* (Linnaeus, 1758); Station TH 157D, d. scale bar 1 mm, e. scale bar 2 mm; f-g. *Melanoides tuberculata* (Müller, 1774); Station TH 43, f. scale bar 1.5 mm, g. scale bar 0.2 mm; h, i. *Tarebia granifera* (Lamarck, 1822); Station PP 18; scale bar 5 mm; j-l. *Scaliola glareosa* Adams, 1862; Station PP 13, j. scale bar 0.5 mm, k, l. scale bars 0.1 mm; m-o. *Scaliola* sp.; Station TH 157D, m. scale bar 0.7 mm, n, o. scale bar 0.2 mm.,

ecological requirements and other fossil records of the species, reference can be made to Robba *et al.* (2004).

Tarebia granifera (Lamarck, 1822)

Fig. 11 h, i

- 1822 *Melania granifera* Lamarck, p. 167.
 1956 *Melanooides granifera* van Benthem Jutting, p. 404, fig. 90 (*cum syn.*).
 1974 *Tarebia granifera* Brandt, p. 167, pl. 12, figs. 14-18 (*cum syn.*).
 1986 *Melanooides granifera* Springsteen & Leobrera, p. 355, pl. 100, fig. 28.
 1995 *Thiara granifera* Kubo & Kurozumi, p. 49, fig. 2.
 2001 *Tarebia granifera* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 112, fig. 299.

Distinctive characters are 1) elongate-oval, somewhat turreted shell up to 44 mm in height, 2) protoconch flat-topped, of about 2 smooth whorls, pale yellow and distinctly demarcated from the teleoconch, 3) spire flat-sided or slightly cyrtocoid, 4) earlier teleoconch whorls convex, subsequent ones flat, meeting at impressed sutures, 5) body whorl oval, about two-thirds of total height, quickly tapering at the base, 6) aperture teardrop-shaped, outer lip sinuous following a reverse-S course, inner lip with moderately wide, thin callus, 7) sculpture of oblique, curved collabral ribs, 15-18 throughout, soon dissected by spiral grooves to form 3-4 spiral rows of tubercles; 5-6 spiral cords occur over the base, gradually thinner downward; the adapical 1-2 basal cords may be noded; fresh specimens are brown-olive colored.

Distribution and habitat

Tarebia granifera occurs commonly in India, Sri Lanka, mainland Southeast Asia, Indonesia, Philippines, Taiwan, South China and various Western Pacific Islands (Brandt, 1974). It prefers fresh waters of lakes, ponds, rivers, canals, creeks, but can live also in brackish waters of estuaries and of the intertidal zone. According to van Benthem Jutting (1956), the species can tolerate a high amount of turbidity and pollution. In the Southern Gulf of Thailand, *Tarebia granifera* was noted to occur abundantly in the brackish waters of the inner Pattani Bay and at the mouth of the Saiburi River (Swennen *et al.*, 2001).

Fossil records

Late Pliocene and Quaternary of Java (van Benthem Jutting, 1956; Skwarko & Sufiati, 1994).

Familia SCALIOLIDAE

Scaliola glareosa Adams, 1862

Fig. 11 j-l

- 1868 *Scaliola glareosa* Adams, p. 53.

- 1968 *Scaliola glareosa* Habe, p. 39, pl. 12, fig. 5.
 1979 *Scaliola glareosa* Kay, p. 117, fig. 44 J.
 Not 1993 *Scaliola glareosa* Fukuda, p. 32, pl. 10, fig. 129 (= *Scaliola bella* Adams, 1860).
 2000 *Scaliola glareosa* Hasegawa in Okutani, p. 135, pl. 67, fig. 3.

Distinctive features are 1) elongately conical, somewhat pupoid shell attaining 4 mm in height, 2) protoconch conical, of 3.5 convex whorls, ending with a sinusigera lip, 3) teleoconch whorls moderately convex, meeting at impressed sutures, 4) body whorl oval, slightly more than one-half the total height, quickly tapering at the base, 5) aperture broadly oval, with thick peristome, slightly detached adapically, 6) surface retaining part of the agglutinated sand grains.

Remarks

The Indian Ocean *Scaliola elata* Semper in Issel, 1869 appears to be closely related. It differs in having a 4-whorled protoconch and somewhat more inflated teleoconch whorls.

Distribution and habitat

Scaliola glareosa was so far known from Japan and Hawaii. It occurs on fine sand and sandy mud in the infralittoral zone (Habe, 1968; Hasegawa in Okutani, 2000).

Fossil records

None recorded.

Scaliola sp.

Fig. 11 m-o

- 1994a *Scaliola* sp. Ponder, p. 230, pl. 5, text-fig. 5.
 1998 *Scaliola* sp. Healy & Wells in Beesley *et al.*, p. 732, fig. 15.97 (g-i).

Two specimens about 1.8 mm high, featured by 1) elongately conical shell, 2) protoconch conical, of about 3.5 convex whorls, ending with a sinusigera lip developed on the adapical one-half of the whorl, 3) spiral angle of about 30°, 4) whorls moderately high, well convex, meeting at deeply impressed sutures, 5) body whorl 47% of total height, 6) aperture rather small, roundly quadrangular, inner lip touching the parietal wall, then disjunct in its mid-abapical part, 7) outer surface with uneven, dense spiral threads and covered with agglutinated sand grains.

Remarks

The present shells appear to conform to those illustrated from Hong Kong, cited in the above synonymy and referred to as *Scaliola* sp. In particular, they have basically identical protoconch and spiral sculpture of the

teleoconch whorls. *Scaliola bella* Adams, 1860 is closely related, but differs in having the protoconch with axial riblets (cf. Kay, 1979, p. 117) and more depressed whorls; no mention of spiral sculpture is made in the literature relative to this species.

Distribution and habitat

Scaliola sp. was obtained at Hong Kong locations, from intertidal sandy and muddy substrates.

Finella sp. 1 Fig. 12 a-c

The present unidentified specimen is characterized by 1) moderately turreted, straight-sided and very thin shell 6 mm high, 2) protoconch of about 4 convex whorls, the last 1.25 whorls with an abapical spiral thread, transition to teleoconch marked by a distinct sinusigera varix, 3) spire whorls convex, meeting at fine, impressed sutures, 4) body whorl oval, about 60% of total height, base convex, 5) aperture oval, outer lip thin, inner lip somewhat reflexed abapically, 6) sculpture of narrow spiral grooves over the abapical one-half of the whorls; 3 grooves occur on earlier and middle whorls, 4 on later ones; base with 6 grooves; 2 reddish-brown spiral bands are noted, respectively over the periphery and on the base just abapical to the suture, background pale yellowish-brown.

Remarks

The present shell is distinguished by the adapical one-half of the whorls devoid of sculpture and by the presence of spiral grooves instead of threads.

Subordo HYP SOGASTROPODA
Superfamilia RISSOIDEA
Familia RISSOIDAE
Subfamilia RISSOININAE

Rissoina (*Rissoina*) sp. Fig. 12 d, e

Several specimens not exceeding 4 mm in height, featured by 1) slender, fusiformly-elongate shell, 2) protoconch broadly conical, blunt-tipped, of 3 smooth whorls, the last half whorls subangular, 3) spire whorls gently convex, meeting at impressed, slightly undulating sutures, 4) body whorl oval, about 50% of total height, regularly tapering at the base, 5) aperture D-shaped, adapical notch narrow, abapical one wide and shallow, outer lip with prominent, broad varix behind, 6) sculpture of moderately opisthocline collabral ribs nearly as wide as the intervening spaces, 15 on the first whorl, 22 on the penultimate; body whorl with finer and more numerous ribs crossed by spiral threads distinctly coarser over the base; a dense spiral microstria-tion occurs throughout.

Remarks

The present shell closely resembles *Rissoina* (*Rissoina*) *mijana* Ladd, 1966, described from Miocene deposits of Eniwetok and Bikini, and might belong to that species. However, the holotype of Ladd's taxon (cf. pl. 13, fig. 24, 25) appears to be stouter.

Familia IRAVADIIDAE

Iravadia (*Fairbankia*) *bombayana* (Blanford, 1868) Fig. 12 f-i

1868 *Fairbankia bombayana* Blanford, p. 399.
1974 *Fairbankia cochinchinensis* Brandt, p. 138, pl. 10, fig. 79.
1974 *Fairbankia bombayana* Brandt, p. 139, pl. 10, fig. 80.
2001 *Fairbankia cochinchinensis* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 114, fig. 314.
Not 2004 *Iravadia* (*Fairbankia*) *cochinchinensis* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 44, pl. 5, fig. 1 (= *Fairbankia rohdei* Brandt, 1968).

Distinctive characters are 1) elongate-oval, somewhat turreted shell attaining 12 mm in height, 2) protoconch small, mammillate, of 2 smooth and convex whorls, tip missing but apparently tilted, demarcation from teleoconch distinct, marked by the appearance of the spiral sculpture, 3) spire more or less cyrtocoid, whorls convex with the periphery at the abapical one-third, sutures impressed, 4) body whorl oval, slightly more than 50% of total height, base rather rapidly tapering, 5) aperture oval, outer lip thickened by a low varix, inner lip triflingly reflexed abapically, 6) sculpture of spiral threads that may occur throughout or vanish on mid and later whorls; base with or without spirals.

Remarks

Brandt (1974) noted that *Fairbankia bombayana* differs from *Fairbankia cochinchinensis* Bavay & Dautzenberg, 1910 only in that has smaller size and more delicate spiral sculpture. A recently recovered large lot of shells from a core sample contains several specimens whose characters are transitional between those of the two taxa discussed by Brandt. On this basis, we consider *Fairbankia cochinchinensis* indistinguishable from *Fairbankia bombayana*. The latter name bears priority.

Distribution and habitat

Iravadia bombayana is distributed from India to Myanmar, Thailand, Sumatra and Vietnam. It is a brackish water element occurring in drainage channels of mud flats and mangrove forest (Brandt, 1974). In the Southern Gulf of Thailand, live specimens were recovered from muddy tidal flats and near the mouth of the Pattani River (Swennen *et al.*, 2001).

Fossil records

Holocene of Thailand (personal data).

Iravadia (Fairbankia) rohdei Brandt, 1968

Fig. 12 j, k

1968 *Fairbankia rohdei* Brandt, p. 266, pl. 10, fig. 54.

1974 *Fairbankia rohdei* Brandt, p. 139, pl. 10, fig. 81.

2004 *Iravadia (Fairbankia) cochinchinensis* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 44, pl. 5, fig. 1.

The species is featured by 1) ovate-pupiform shell not exceeding 6 mm in height, 2) protoconch planorbid, of about 2.5 convex and smooth whorls, distinctly demarcated from the teleoconch, 3) spire cyrtocooid, whorls convex meeting at impressed sutures, 4) body whorl oval, about 70% of total height, base gradually tapering, 5) aperture oval, inner lip slightly reflexed abapically, 6)

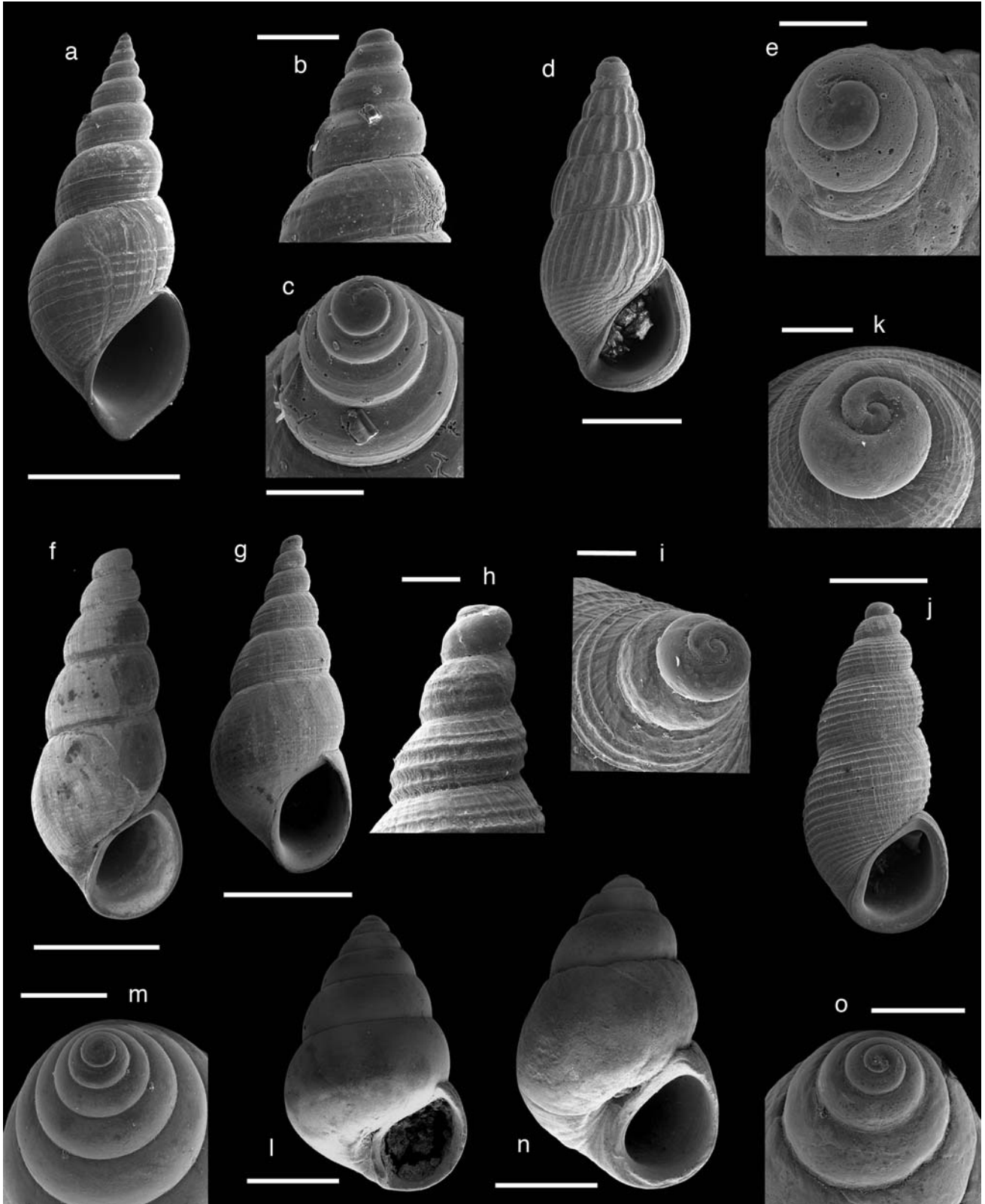


Fig. 12. a-c. *Finella* sp. 1; Ban Laem Phak Bia Spit, sample 5C, a. scale bar 2 mm, b, c scale bars 0.2 mm; d-e. *Rissoina (Rissoina)* sp.; Station TH 157D, d. scale bar 1 mm, e. scale bar 0.2 mm; f-i. *Iravadia (Fairbankia) bombayana* (Blanford, 1868); Station TH 117A, f, g. scale bars 2 mm, h, i. scale bars 0.2 mm; j-k. *Iravadia (Fairbankia) rohdei* Brandt, 1968; Station TH 117, j. scale bar 1.2 mm, k. scale bar 0.2 mm; l-m. *Assiminea (Assiminea) spiralis* Brandt, 1974; Station TH 117, l. scale bar 0.8 mm, m. scale bar 0.5 mm; n-o. *Assiminea (Assiminea) zilchi* Brandt, 1974; Station TH 93, n. scale bar 1.2 mm, o. scale bar 1 mm.

sculpture of well spaced spiral threads, 5 on earlier whorls, 9 on the body whorl, about 7 over the base.

Remarks

The shell figured by Robba *et al.* (2004) and referred to as *Iravadia (Fairbankia) cochinchinensis* (Bavay & Dautzenberg, 1910) proved to belong to Brandt's species (see above).

Distribution and habitat

Iravadia rohdei was reported to occur along the west coast of Malaya and Thailand and in coastal areas of the Gulf of Thailand. It lives in drainage channels of mud swamps and mangrove forest (Brandt, 1974).

Fossil records

Holocene of Thailand (Robba *et al.*, 2004, sub *Iravadia cochinchinensis*).

Familia ASSIMINEIDAE
Subfamilia ASSIMINEINAE

Assiminea (Assiminea) spiralis Brandt, 1974
Fig. 12 l, m

1974 *Assiminea (Sculptassiminea) spiralis* Brandt, p. 143, pl. 11, fig. 84.

Distinctive characters are 1) ovate-conical, moderately high-spined shell attaining 2.7 mm in height, 2) protoconch low-conical, of 2.25 convex and smooth whorls, 3) spire whorls well convex, axially compressed, meeting at impressed sutures, 4) body whorl cup-shaped, about 65% of total height, base rapidly tapering, with distinct umbilical chink, 5) aperture widely drop-shaped, with rather thick peristome, inner lip reflexed abapically toward the umbilical chink and separated from the basal lip by a moderately prominent angulation, 6) outer surface with faint spiral microsculpture crossed by fine growth lines.

Remarks

The present species appears to match the characters of the nominotypical subgenus better than those of *Sculptassiminea* Thiele, 1927 in that it lacks the cancellate sculpture of the latter.

Distribution and habitat

Assiminea spiralis is restricted to Thailand. It lives in tidally influenced swamps with freshwater (Brandt, 1974).

Fossil records

None recorded.

Assiminea (Assiminea) zilchi Brandt, 1974

Fig. 12 n, o

1974 *Assiminea (Assiminea) zilchi* Brandt, p. 150, pl. 11, fig. 94.

Diagnostic features are 1) ovate-conical, rather high-spined shell attaining 4 mm in height, 2) protoconch low-conical, of 2 convex and smooth whorls, tip slightly tilted, 3) spire whorls convex, sutures impressed, 4) body whorl broadly oval, about 75% of total height, base rather rapidly tapering, with narrow umbilical chink, 5) aperture oblique, nearly D-shaped, with thick peristome, inner lip thickly callused and slightly covering the umbilical chink, 6) outer surface with growth markings and obscure spiral microstriation.

Remarks

Assiminea nitida (Pease, 1865) appears to be related, but differs in having 2 spiral threads, 1 subsutural, 1 encircling the quite narrow umbilical chink. *Assiminea schlickumi* Brandt, 1974 is related too, but is devoid of umbilical chink.

Distribution and habitat

Assiminea zilchi was hitherto known from the type locality in the Trat Province, Eastern Gulf of Thailand. There is no information about its ecological requirements.

Fossil records

Holocene of Thailand (personal data).

Familia TRUNCATELLIDAE

Truncatella guerinii Villa & Villa, 1841
Fig. 13 a, b

1841 *Truncatella guerinii* Villa & Villa, p. 59.

1972 *Truncatella guerinii* Cernohorsky, p. 58, pl. 12, fig. 16.

1995 *Truncatella guerinii* Kubo & Kurozumi, p. 216, fig. on same page.

2000 *Truncatella guerinii* Hasegawa in Okutani, p. 171, pl. 85, fig. 1.

A single specimen assigned to the present species on account of 1) subcylindrical shell 3.2 mm high (decollated), 2) spire whorls gently convex, meeting at impressed sutures, 3) body whorl oval, base rather rapidly tapering, 4) aperture asymmetrically oval, peristome not duplicated, inner lip with slightly expanded callus in the mid-adapical part, 5) sculpture of collabral ribs, 32 throughout, nearly as wide as the intervening spaces, narrowing close to the adapical suture and vanishing over the base.

Remarks

The Japanese *Truncatella pfeifferi* von Martens, 1860 is re-

lated, but differs in having nearly flat-sided whorls and less numerous ribs.

Distribution and habitat

Truncatella guerinii is distributed in the tropical Indo-Pacific, from Reunion Island eastward to Samoa and northward to Amami Islands (Japan). It is reported to be a supratidal element.

Fossil records

None recorded.

Taheitia sp. Fig. 13 c, d

A single juvenile specimen 1.7 mm high, including the protoconch and 1.5 teleoconch whorls; distinctive characters are 1) subcylindrical shell, 2) protoconch of 2.5 convex whorls sculptured with dense collabral threads, clearly demarcated from the teleoconch, 3) earliest spire whorls also convex, with coarse growth markings, suture impressed.

Remarks

The present shell is tentatively included in the genus *Taheitia* H. & A. Adams, 1863 on account of the sculptured apical whorls.

Fossil records

Holocene of Thailand (personal data).

Familia VITRINELLIDAE

Circulus mortoni Ponder, 1994 Fig. 13 e-g

1994b *Circulus mortoni* Ponder, p. 258, pl. 6 (A-F), pl. 7 (A-G), pl. 8 (A-F); text-fig. 6.

Distinguishing characters are 1) discoidal shell up to 4 mm in diameter, 2) protoconch planorbid, of 1.75 smooth whorls, clearly demarcated from the teleoconch, 3) spire markedly depressed, whorls convex meeting at fine sutures, 4) body whorl large, 86% of total height, umbilicus rather wide, deep and steep-sided, 5) aperture circular, lying in a strongly prosocline plane, peristome moderately thick, inner lip somewhat reflexed toward the umbilicus, 6) sculpture of prominent spiral ridges; 2 distinctly beaded (beads vanishing after 1.5 whorls) spirals appear immediately soon followed by an adapical smooth one; body whorl with 7 spirals, lower base smooth except for 4 spirals developing just behind the outer lip; colour uniformly light-brown.

Distribution and habitat

Circulus mortoni was so far known from the type locality: Lantau Island, Hong Kong. The original specimens were recovered from shelly mud at 3 m depth, in brackish water of 17‰ salinity (Ponder, 1994b).

Fossil records

None recorded.

Circulus sp. 4 Fig. 13 h-j

Distinctive characters are 1) discoidal shell 1.8 mm in diameter, 2) protoconch planorbid, of 2.5 convex and smooth whorls, 3) spire sunken, whorls convex, with angular shoulder and sloping inward shoulder slope ending with a subsutural furrow bounded by a crisp angulation, suture canaliculated, 4) body whorl large, base moderately convex, with deep funnel-shaped umbilicus, 5) aperture circular, with thick peristome, lying in a markedly prosocline plane, parietal callus thick, 6) sculpture of noded spiral keels, 2 adapical, 1 peripheral and 1 on upper base; 2 beaded spiral cords occur on mid-lower base, the lowermost encircling the umbilicus; thin axials are present in the subsutural furrow; microscopic granules arranged into irregular spiral rows occur throughout.

Pseudoliotia sp. Fig. 13 k-m

A single specimen characterized by 1) low-turbinate shell 1.7 mm in diameter, 2) protoconch planorbid, of 2 smooth whorls, ending with a broad, low varix, 3) spire markedly depressed, the tip only slightly emerging from the body whorl, 4) whorls strongly angular at the periphery, with a rather wide subsutural depression, meeting at fine sutures, 5) body whorl large, 94% of total height, quickly tapering at the base, umbilicus moderately wide and deep, 6) aperture irregularly hexagonal, lying in a slightly prosocline plane, peristome thin, inner lip callused, its abapical part somewhat reflexed over the umbilicus, 7) sculpture of prominent spiral ridges, 1 adapical, 1 peripheral and 2 basal, the lowermost encircling the umbilicus; 3 spiral threads occur between the adapical and peripheral ridges (increasing to 5 behind the outer lip), 4 over the base; thin, distant collabral riblets override the spirals forming low nodes at intersections.

Teinostoma sp. 6 Fig. 13 n-p

A single specimen featured by 1) low-turbinate shell 2 mm in diameter, 2) protoconch planorbid, of 3 smooth whorls, 3) spire markedly depressed, whorls very slightly convex, sutures grooved, 4) body whorl large, with broadly rounded periphery, expanded toward the

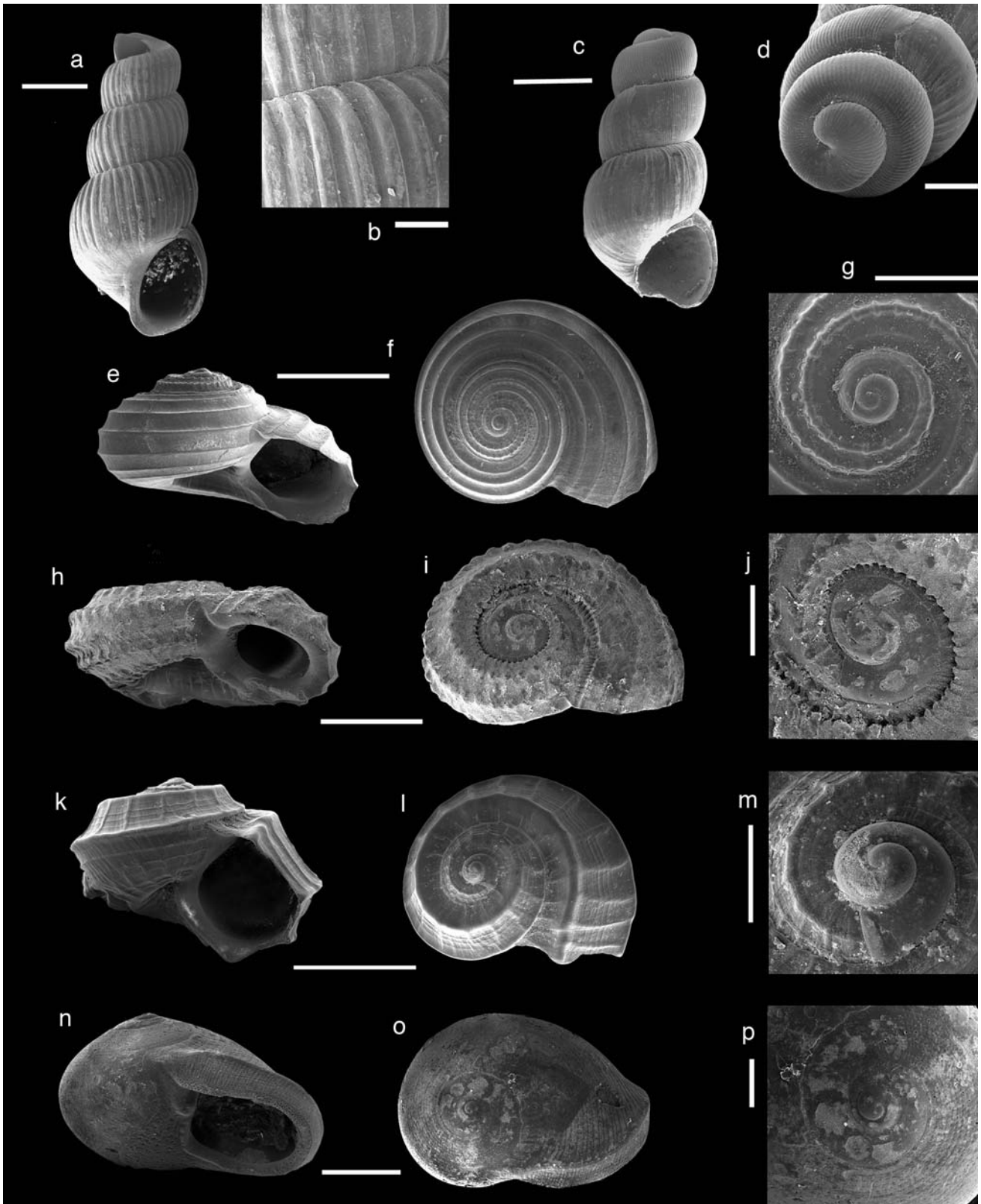


Fig. 13. a-b. *Truncatella guerinii* Villa & Villa, 1841; Station TH 117, a. scale bar 0.8 mm, b. scale bar 0.2 mm; c-d. *Taheitia* sp.; Station TH 93, c. scale bar 0.5 mm, d. scale bar 0.2 mm; e-g. *Circulus mortoni* Ponder, 1994; Station PP 09, e, f. scale bar 1.5 mm, g. scale bar 0.5 mm; h-j. *Circulus* sp. 4; Station TH 161C, h, i. scale bar 0.7 mm, j. scale bar 0.2 mm; k-m. *Pseudoliotia* sp.; Station TH 117A; k, l. scale bar 0.8 mm; m. scale bar 0.2 mm; n-p. *Teinostoma* sp. 6; Station TH 161C; n, o. scale bar 0.5 mm; p. scale bar 0.2 mm.

aperture, 5) base convex, umbilicus fully covered by a callus shield bearing minute pits, 6) aperture roundly quadrangular, lying in a prosocline plane, pointed adapically, outer lip thickened by a prominent band bounded behind by a distinct step, inner lip callused, with a parietal tooth, 7) outer surface with even, fine pitted grooves, the subsutural one somewhat more marked.

Remarks

The present specimen closely resembles that figured by Ponder & de Keyzer (1998, in Beesley *et al.*) and referred to as *Teinostoma lucidum* (Adams & Angas, 1864) in terms of general shell shape, but that shell seems to be devoid of pitted spiral grooves. It is of note that the

specimens assigned to *Teinostoma lucidum* by Takayasu (1986) and Hasegawa in Okutani (2000) are quite different in that have lenticular, flat spired shell and lack the thick margining of the outer lip.

Superfamilia STROMBOIDEA
Familia STROMBIDAE

Strombus (Doxander) vittatus vittatus Linnaeus, 1758
Fig. 14 a-c

- 1758 *Strombus vittatus* Linnaeus, p. 745, n° 439.
1909 *Strombus (Gallinula) vittatus* Schepman, p. 148.
1960 *Strombus (Doxander) vittatus vittatus* Abbott, p. 111, pl. 17, fig. 14.
1968 *Doxander vittatus* Habe, p. 58, pl. 17, fig. 2.
1972 *Strombus (Doxander) vittatus vittatus* Cernohorsky, p. 80, pl. 18, figs. 4, 4a.
1975 *Strombus vittatus* Hinton, p. 9, figs. 4, 4a.
1976 *Strombus (Doxander) vittatus vittatus* Lindner, p. 144, pl. 17, fig. 4.
1976 *Strombus (Doxander) vittatus vittatus* Springsteen & Leobrera, p. 70, pl. 17, fig. 7.
1978 *Strombus vittatus vittatus* Tantanasiriwong, p. 9, fig. 98.
1979 *Strombus (Doxander) vittatus* Wilson & Gillett, p. 73, pl. 13, fig. 8.
1982 *Strombus vittatus vittatus* Abbott & Dance, p. 79, fig. in bottom row, left.
1988 *Strombus vittatus* f. *turritus* Dharma, p. 50, pl. 11, fig. 6.
1991 *Strombus vittatus* Abbott, p. 37, pl. 12, fig. 11.
1993 *Strombus (Doxander) vittatus* Wilson, p. 157, pl. 20, fig. 2.
2000 *Strombus (Doxander) vittatus* Okutani in Okutani, p. 183, pl. 91, fig. 17.
2001 *Strombus vittatus apicatus* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 117, fig. 340.

Five juvenile specimens are assigned to the present taxon on account of 1) protoconch broadly conical of 4.25 convex, smooth and glossy whorls, tip small, 2) spire slenderly turreted, 3) early whorls convex, subsequent ones less so and with rounded shoulder at the adapical one-third, sutures impressed, 4) sculpture of uneven, round-topped collabral ribs crossed by spiral grooves abapical to the shoulder; strong subsutural cord bisected by a groove on later whorls and bounded abapically by a distinct depression.

Remarks

Strombus japonicus Reeve, 1851 differs primarily in having stouter shell and angular whorls.

Distribution and habitat

Strombus vittatus vittatus is widely distributed in the Pacific, from Southeast Asia to Fiji and as far north as

Okinawa. It is an intertidal and infralittoral element dwelling on sand and mud. Previous records in western Thai waters were from muddy substrates in the 10-20 m depth range (Tantanasiriwong, 1978).

Fossil records

Pliocene and Quaternary of Indonesia (Skwarko & Sufiati, 1994).

Superfamilia VANIKOROIDEA
Familia VANIKORIDAE

Macromphalus styliferinus (Nevill, 1884)
Fig. 14 d-f

2000 *Macromphalus styliferina* (sic) Hasegawa in Okutani, p. 195, pl. 97, fig. 11.

Distinctive features are 1) turbinate, short-spined shell attaining 2.8 mm in height, 2) protoconch mammillated, of 3.25 convex and smooth whorls, 3) teleoconch whorls convex, slightly shouldered, suture impressed, 4) body whorl large, oval, 82% of total height, base convex, slowly tapering, umbilicus widely open, 5) aperture broadly oval, moderately disjunct, with thin peristome, 6) sculpture of even and evenly spaced, prominent spiral cords overridden by dense axial threads; 13 spirals occur on the body whorl, increasing to 26 toward the aperture due to the appearance of secondary cords soon reaching the same strength of the others.

Remarks

The mammillated protoconch stands as the most distinctive character. *Macromphalus thelacme* (Melvill, 1904) is similar, but has a conical, 2.5-whorled protoconch.

Distribution and habitat

Macromphalus styliferinus ranges in the Southwest Pacific, from Singapore to Japan. According to Hasegawa in Okutani (2000), it occurs subtidally among rocks with algal cover.

Fossil records

None recorded.

Superfamilia XENOPHOROIDEA
Familia XENOPHORIDAE

Xenophora (Xenophora) solariooides (Reeve, 1845)
Fig. 14 g-i

- 1845 *Phorus solariooides* Reeve, pl. 3, sp. 8.
1870 *Xenophora (Phorus) australis* Souverbie in Souverbie & Montrouzier, p. 423, pl. 14, fig. 4.
1953 *Xenophora solariooides* Habe, p. 173, text-fig. 11.

1968 *Xenophora solarioides* Habe, p. 57, pl. 16, fig. 3.
 1972 *Xenophora australis* Cernohorsky, p. 89, pl. 23, fig. 1.
 1975 *Xenophora solarioides* Hinton, p. 7, figs. 3, 3a.
 1978 *Xenophora australis* Tantanasiriwong, p. 9, fig. 104.
 1981 *Xenophora solarioides* Eisenberg, p. 57, pl. 39, fig. 12.
 1982 *Xenophora solarioides* Abbott & Dance, p. 74, fig. in lower mid row, left.

1983 *Xenophora (Xenophora) solarioides solarioides* Ponder, p. 47, figs. 10a, 12b, 14e, 27 a-j, 37 (cum syn.).
 1986 *Xenophora (Xenophora) solarioides solarioides* Springsteen & Leobrera, p. 80, pl. 19, fig. 5.
 1988 *Xenophora solarioides* Drivas & Jay, p. 92, unnumbered fig.
 1991 *Xenophora solarioides* Abbott, p. 33, pl. 9, fig. 4.

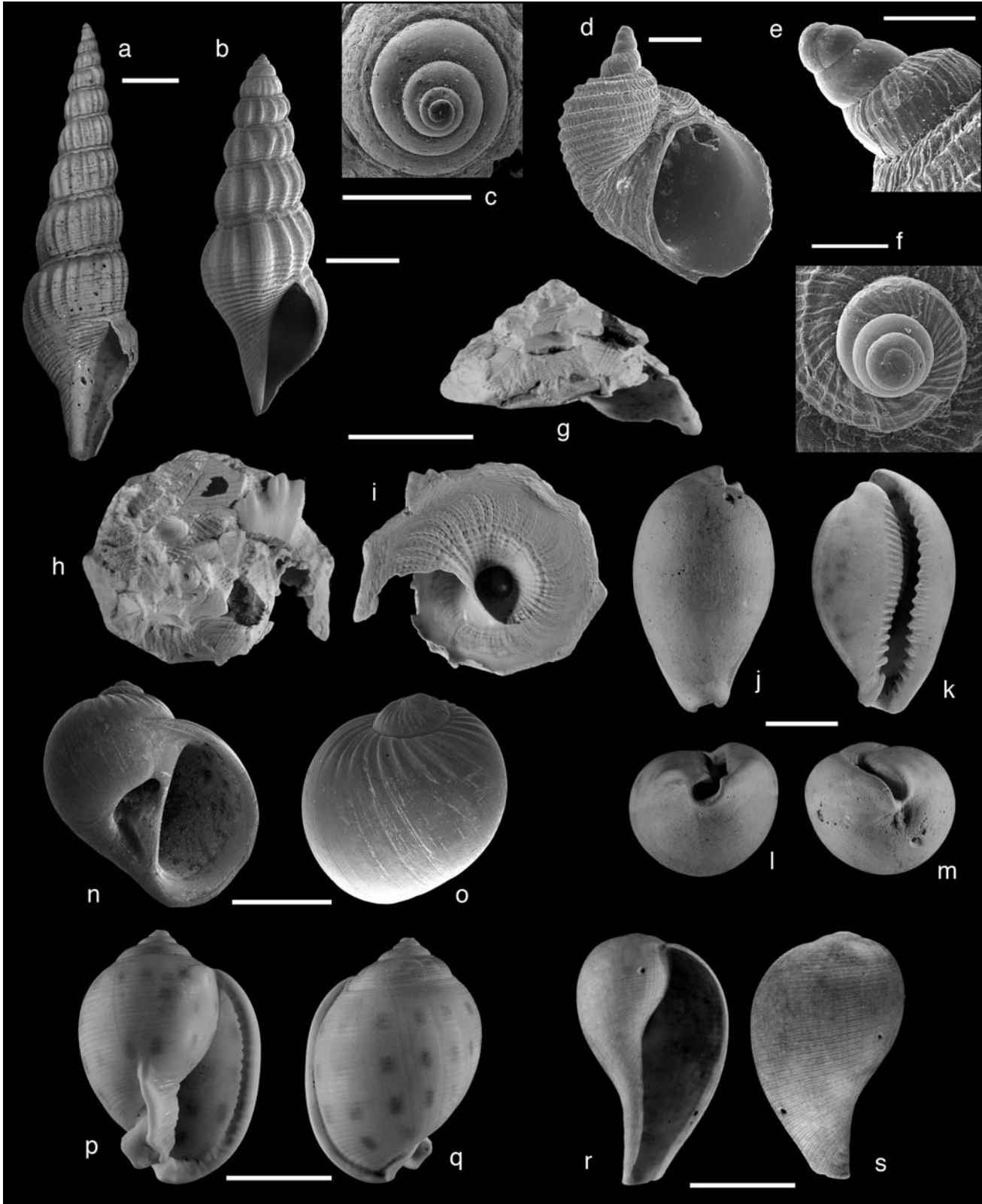


Fig. 14. a-c. *Strombus (Doxander) vittatus vittatus* Linnaeus, 1758, a. Station TH 108D; scale bar 5 mm, b, c. Station TH 157D, b. scale bar 2 mm, c. scale bar 0.7 mm; d-f. *Macromphalus styliferinus* (Nevill, 1884); Station TH 158D, d. scale bar 0.5 mm, e, f. scale bars 0.2 mm; g-i. *Xenophora (Xenophora) solarioides* (Reeve, 1845); Station TH 158D; scale bar 7 mm; j-m. *Erronea pyriformis* (Gray, 1824); Station TH 161C; scale bar 8 mm; n-o. *Notocochlis gualteriana* (Récluz, 1844); Station TH 157D; scale bar 2 mm; p-q. *Semicassis (Semicassis) bisulcata* (Schubert & Wagner, 1829); Laem Talumphuk Spit (Pak Phanang Bay); scale bar 1.7 cm; r-s. *Ficus variegatus* Röding, 1798; Laem Talumphuk Spit (Pak Phanang Bay); scale bar 1.7 cm.

- 1993 *Xenophora solarioides* Wilson, p. 168, pl. 23, fig. 2.
 1995 *Xenophora solarioides* Fukuda, p. 9, pl. 50, fig. 863.
 2000 *Xenophora solarioides* Okutani in Okutani, p. 203, pl. 101, fig. 6.
 2001 *Xenophora solarioides* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 118, fig. 348.

Several juvenile shells assigned to the present species on the basis of 1) depressed spire, 2) dorsal surface crowded with coarse foreign objects, 3) umbilicus wide, funnel-shaped, bounded by a distinct angulation.

Remarks

According to Ponder (1983), *Xenophora australis* Sowerbie, 1870 is a synonym.

Distribution and habitat

Xenophora solarioides ranges widely in the tropical Indo-Pacific, from Madagascar to Australia and as far east as Fiji, northward to Philippines, Vietnam and Japan. It is a sublittoral element, mostly found in shallow water (Ponder, 1983), dwelling on sand and gravel (Okutani in Okutani, 2000). Previous records in western Thai waters were from shell sand and coral bottoms, at 20-26 m depth (Tantanasiriwong, 1978).

Fossil records

Middle Miocene of Indonesia (Skwarko & Sufiati, 1994); Pliocene of Papua New Guinea (Ponder, 1993), Indonesia (Skwarko & Sufiati, 1994); Quaternary of Indonesia (Skwarko & Sufiati, 1994).

Superfamilia CYPRAEOIDEA
 Familia CYPRAEIDAE
 Subfamilia ERRONEINAE

Erronea pyriformis (Gray, 1824)
Fig. 14 j-m

- 1824 *Cypraea pyriformis* Gray, p. 371.
 1935 *Erronea (Adusta) pyriformis* Oostingh, p. 59.
 1967 *Erronea pyriformis* Cernohorsky, p. 88, pl. 15, fig. 81.
 1975 *Cypraea pyriformis* Hinton, pl. 12, fig. 10.
 1981 *Cypraea (Adusta) pyriformis* Eisenberg, p. 69, pl. 51, fig. 10.
 1982 *Cypraea pyriformis* Abbott & Dance, p. 89, fig. in upper mid row, right.
 1985 *Cypraea pyriformis* Wilson & Gillett, p. 94, pl. 19, figs. 11, 11a.
 1986 *Cypraea pyriformis* Springsteen & Leobrera, p. 87, pl. 22, fig. 10.
 1988 *Cypraea pyriformis* Dharma, p. 54, pl. 13, fig. 13.
 1993 *Cypraea (Erronea) pyriformis* Wilson, p. 182, pl. 32, fig. 15.
 2001 *Cypraea pyriformis* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 119, fig. 357.

Diagnostic characters are 1) convolute, pear-shaped, dorsally inflated shell attaining 35 mm in height, 2) adapical end moderately projecting, slightly reflexed, adapical sinus rather narrow and deep, 3) periphery at the adapical one-third, 4) sides moderately callused, with reddish-brown, sparse spots, 5) aperture narrow, twisted adapically, slightly widening behind the abapical canal, this latter somewhat twisted dorsally, 6) outer lip bent inward, with 20 spirally elongate teeth alternating with shorter ones in the median part, 7) inner lip bearing 20 ribs, stronger on lower part.

Distribution and habitat

Erronea pyriformis is distributed in the tropical Indo-West Pacific, from Andaman Sea to Australia and Southeast Asia. It is an intertidal and infralittoral element occurring on mud, sand, coral rubble and coral reefs. Previous records in the Southern Gulf of Thailand were between 7 and 12 m depth (Swennen *et al.*, 2001). In western Thai waters, the species was trawled from mud at a depth of 22 m (Tantanasiriwong, 1978).

Fossil records

Pliocene and Early Pleistocene of Indonesia (Skwarko & Sufiati, 1994).

Superfamilia NATICOIDEA
 Familia NATICIDAE
 Subfamilia NATICINAE

Notocochlis gualteriana (Récluz, 1844)
Fig. 14 n, o

- 1844 *Natica gualteriana* Récluz, p. 208.
 1883 *Natica gualteriana* Sowerby, p. 81, fig. 152.
 1914 *Natica gualteriana* Hedley, p. 298.
 1972 *Natica (Natica) gualteriana* Cernohorsky, p. 95, pl. 24, fig. 9.
 1976 *Natica (Natica) gualteriana* Kilburn, p. 835.
 1978 *Natica gualteriana* Tantanasiriwong, p. 11, fig. 138.
 1979 *Natica gualteriana* Kay, p. 207, figs. 72 E, F.
 1982 *Natica gualteriana* Bosch & Bosch, p. 72, bottom fig.
 1982 *Natica gualteriana* Abbott & Dance, p. 107, fig. in top row, middle.
 1984 *Natica gualteriana* Sharabati, pl. 13, figs. 3, 3a.
 1988 *Natica gualteriana* Drivas & Jay, p. 42, pl. 6, fig. 20.
 1989 *Notocochlis gualteriana* Majima, p. 77, pl. 12, fig. 21; text-figs. 15.53, 15.54 (*cum syn.*).
 1991 *Natica gualteriana* Abbott, p. 47, pl. 20, fig. 1.
 1993 *Natica (Natica) gualteriana* Wilson, p. 216, pl. 36, fig. 19.
 1994 *Natica gualteriana* Coulombel, p. 59, figs. on same page.
 1995 *Natica gualteriana* Kubo & Kurozumi, p. 65, fig. 8.
 1995 *Natica gualteriana* Bosch, Dance, Moolenbeek & Oliver, p. 86, fig. 319.
 1998 *Notocochlis gualteriana* Kabat in Beesley *et al.*, fig. 15.134 E.

? 1999 *Natica gualteriana* Kohn & Arua, p. 108, pl. 1, figs. 19, 20.
 2000 *Natica gualteriana* Saito in Okutani, p. 261, pl. 130, fig. 49.

The species is distinguished by 1) globose, rather thick shell up to 2.5 mm in height, 2) protoconch small, turbiniform, of slightly more than 3 whorls, smooth, 3) spire low-conical, whorls convex, suture incised, 4) body whorl inflated, 90% of total height, 5) aperture D-shaped, parietal callus subquadrangular, rather thick, reaching the basal fasciole, 6) umbilicus wide, more or less widely filled by the funicle, umbilical callus semi-circular, located at the mid-abapical part of the columellar lip and separated from the parietal callus by a moderately short, reverse J-shaped notch, 7) surface with coarse, oblique subsutural folds.

Remarks

The species has been often quoted as *Nerita marochiensis* Gmelin, 1791 that is an Atlantic-Mediterranean taxon.

Distribution and habitat

Notocochlis gualteriana is widely distributed throughout the tropical Indo-Pacific, from Reunion and Maurice Islands as far east as Hawaii, and northward to Japan. It is a sand-related element occurring intertidally and down to 20 m depth (Kay, 1979; Wilson, 1993; Saito in Okutani, 2000). In western Thai waters, the species was recovered from sand flats landward of coral reefs (Tantanasiriwong, 1978).

Fossil records

Late Miocene of Indonesia; Pliocene of India, Indonesia and Philippines; Quaternary of East Africa, Indonesia and Japan (Majima, 1989).

Superfamilia TONNOIDEA
 Familia CASSIDAE
 Subfamilia PHALIINAE

Semicassis (Semicassis) bisulcata
 (Schubert & Wagner, 1829)

Fig. 14 p, q

1829 *Cassis bisulcata* Schubert & Wagner, p. 68, figs. 3081, 3082.
 1909 *Cassis (Semicassis) bisulcata* Schepman, p. 122.
 1935 *Phalium (Semicassis) japonicum* Nomura, p. 169.
 1948 *Phalium (Semicassis) pila* Cox, p. 36, pl. 1, fig. 9.
 1957 *Semicassis japonica* Makiyama, pl. 16, fig. 5.
 1960 *Semicassis japonica* Makiyama, pl. 89, fig. 3.
 1960 *Semicassis pila* MacNeil, p. 58, pl. 13, figs. 2, 3.
 1965 *Semicassis persimilis* Kira, p. 54, pl. 22, fig. 3.
 1965 *Semicassis japonica* Kira, p. 54, pl. 22, fig. 4.
 1968 *Phalium (Semicassis) bisulcatum* Abbott, p. 126, pl. 8,

figs. 13-21 (not fig. 12 = *Cassis sophia* Brazier, 1872); pl. 105, fig. 1; pls. 106-114 (*cum syn.*).
 1968 *Semicassis bisulcata* Habe, p. 69, pl. 21, fig. 4.
 1968 *Semicassis pila* Habe, p. 70, pl. 21, fig. 8.
 1971 *Semicassis japonica* Kuroda, Habe & Oyama, p. 131, pl. 35, fig. 3.
 1971 *Semicassis bisulcata pila* Kuroda, Habe & Oyama, p. 332, pl. 35, figs. 1, 2.
 1972 *Phalium (Semicassis) bisulcatum bisulcatum* Cernohorsky, p. 105, pl. 28, fig. 3.
 1975 *Phalium bisulcatum* Hinton, p. 18, fig. 5.
 1978 *Phalium bisulcatum bisulcatum* Tantanasiriwong, p. 11, fig. 154.
 1980 *Phalium (Semicassis) bisulcatum* Tsi Chungyen & Ma Suitong, p. 88, pl. 2, fig. 5.
 1981 *Phalium (Semicassis) bisulcatum* Eisenberg, p. 80, pl. 62, fig. 12.
 1982 *Phalium bisulcatum* Abbott & Dance, p. 112, figs. in mid upper row, middle, mid lower row, left.
 1985 *Phalium (Semicassis) bisulcatum* Wilson & Gillett, p. 115, pl. 25, fig. 9.
 1986 *Phalium (Semicassis) bisulcatum bisulcatum* Springsteen & Leobrera, p. 102, pl. 27, fig. 8.
 1988 *Cassis japonica minor* Noda, p. 40, pl. 10, figs. 10-12.
 1988 *Phalium bisulcatum booleyi* Drivas & Jay, p. 60, pl. 15, fig. 3.
 1988 *Phalium bisulcatum* Dharma, p. 68, pl. 20, fig. 10.
 1991 *Semicassis japonica minor* Noda, p. 41, fig. 15 (2).
 1991 *Phalium bisulcatum* Abbott, p. 50, pl. 21, figs. 7, 8.
 1993 *Semicassis japonica* Noda, Kikuchi & Nikaido, p. 176, fig. 24 (10, 13).
 1993 *Semicassis bisulcata* Wilson, p. 233, pl. 37, fig. 7.
 1995 *Semicassis bisulcata* Bosch, Dance, Moolenbeek & Oliver, p. 94.
 1995 *Phalium bisulcatum* Kubo & Kurozumi, p. 69, fig. 6.
 1997 *Semicassis (Semicassis) bisulcata* Kreipl, p. 48, pl. 17, figs. 54-54g.
 2000 *Semicassis bisulcata bisulcata* Okutani in Okutani, p. 275, pl. 136, fig. 10.
 2000 *Semicassis bisulcata persimilis* Okutani in Okutani, p. 275, pl. 136, fig. 11.
 2000 *Semicassis bisulcata japonica* Okutani in Okutani, p. 275, pl. 136, fig. 12.
 2000 *Semicassis bisulcata pila* Okutani in Okutani, p. 275, pl. 136, fig. 13.
 2001 *Semicassis bisulcatum* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 122, fig. 381.
 2005 *Semicassis bisulcata* Beu, p. 51, figs. 106-134 (*cum syn.*).

This is a rather variable species featured by 1) globose-ovate, low-spined shell up to 80 mm in height, 2) spire whorls convex, meeting at adpressed sutures, 3) body whorl broadly oval, seven-eighths of total height, 4) umbilicus small and deep, 5) outer lip thickened by a narrow varix, with short inner ridges, 6) parietal callus rather thin, expanded, columellar callus detached and with several spiral ridges, 7) the Thai shells are sculptured with even spiral grooves throughout; colour pattern of reddish-brown squared spots arranged into spiral rows, 1 on spire whorls, 5 over the body whorl.

Remarks

Semicassis (*Semicassis*) *sophia* (Brazier, 1872), treated as a subspecies of the present taxon by some authors (cf. Abbott, 1968), differs primarily in having the whorls with a distinct shoulder bounded by a sharp angulation. The Indian Ocean *Semicassis* (*Semicassis*) *faurotis* (Jousseau, 1888) is closely related, but is readily distinguished by the dark apical whorls and by the strong, swollen columellar folds.

Distribution and habitat

Semicassis bisulcata ranges widely in the tropical Indo-West Pacific, from South Africa to Australia and as far east to Eniwetok, Solomon Islands and Fiji, northward to Japan (Beu, 2005). It is a sublittoral element dwelling on sand or mud. Way & Purchon (1981) recovered the species also from intertidal sands on both coasts of Malaysia. Live specimens were noted to occur abundantly off Bang Tawa and Pattani in the Southern Gulf of Thailand (Swennen *et al.*, 2001). In western Thai waters, the species was dredged from muddy bottoms at 10-18 m depth (Tantanasiriwong, 1978).

Fossil records

Miocene of Indonesia (Skwarko & Sufiati, 1994; Beu, 2005), Papua New Guinea and Japan (Skwarko & Sufiati, 1994); Pliocene of Indonesia, Papua New Guinea, Philippines, Taiwan and Japan (Nomura, 1935; McNeil, 1960; Noda *et al.*, 1993; Skwarko & Sufiati, 1994; Beu, 2005); Quaternary of Indonesia (Beu, 2005).

Familia FICIDAE

Ficus variegatus Röding, 1798

Fig. 14 r, s

- 1968 *Ficus ficus* Habe, p. 77, pl. 24, fig. 10.
 1972 *Ficus variegata* Cernohorsky, p. 113, pl. 33, fig. 1.
 1975 *Ficus ficus* Hinton, p. 19, fig. 13.
 1981 *Ficus ficus* Eisenberg, p. 81, pl. 63, fig. 13.
 1982 *Ficus variegata* Abbott & Dance, p. 117, fig. in top row, mid right.
 1988 *Ficus subintermedia* Dharma, p. 68, pl. 20, fig. 12.
 1991 *Ficus variegatus* Abbott, p. 51, pl. 23, fig. 12.
 1995 *Ficus variegata* Bosch, Dance, Moolenbeek & Oliver, p. 92, fig. 339.
 2000 *Ficus variegata* Okutani in Okutani, p. 279, pl. 138, fig. 4.
 2001 *Ficus variegata* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 123, fig. 384.

Diagnostic characters are 1) fig-shaped, elongate shell attaining 100 mm in height, 2) body whorl nearly as high as the total height, bulbous adapically, rather quickly tapering at the base toward a moderately long, somewhat twisted neck, 3) sculpture of 50-80 close set, flat-topped spiral cordlets; 1 fine thread always occurs

in between; interspaces with thin, dense collabral threads forming a reticulated pattern of axially oriented rectangles.

Remarks

The related *Ficus subintermedia* (d'Orbigny, 1852) differs in having less quickly tapering body whorl, longer siphonal canal and stronger spirals, usually with 3 intervening threads.

Distribution and habitat

Ficus variegatus is distributed in the Indo-West Pacific, from the Arabian Gulf to Indonesia and northward to Japan. It dwells on infralittoral sandy substrates (Habe, 1968; Abbott & Dance, 1982).

Fossil records

Miocene of Java (Skwarko & Sufiati, 1994).

Superfamilia TRIPHOROIDEA

Familia TRIPHORIDAE

Subfamilia METAXIINAE

Metaxia sp.

Fig. 15 a-c

Four specimens featured by 1) slender, turreted, triflingly cyrtocooid shell, the largest one 3.15 mm high, 2) protoconch of planktotrophic type, narrowly conical, of 4.5 whorls, the first 1.5 convex and with zigzag spiral threads, subsequent ones shouldered, with axial riblets that are retractively arched over the shoulder slope, nearly straight and prosocline abapical to the shoulder, slightly offset at the shoulder level, 3) spire whorls convex, meeting at impressed sutures, 4) body whorl 30% of total height, suddenly contracted at the base, 5) aperture ovate-quadrangular, inner lip coated with a thin, narrow callus, abapical notch wide, 6) sculpture of collabral ribs overridden by spiral cords forming elongated nodes on crossing the ribs; the spirals, 5 throughout, appear immediately, spiral 3 slightly stronger than the others, spiral 5 emerging from the abapical suture; the ribs, 11 on spire whorls, 12 on the body whorl, are narrower than the intervening spaces and vanish at the level of spiral 5; very fine, closely set axial striae occur throughout except for the unsculptured base.

Subfamilia TRIPHORINAE

Aclophora sp.

Fig. 15 d, e

Four specimens, featured by 1) turreted, gently cyrtocooid shell made of 7-9 whorls (teleoconch), attaining about 5 mm in height, 2) protoconch of planktotrophic

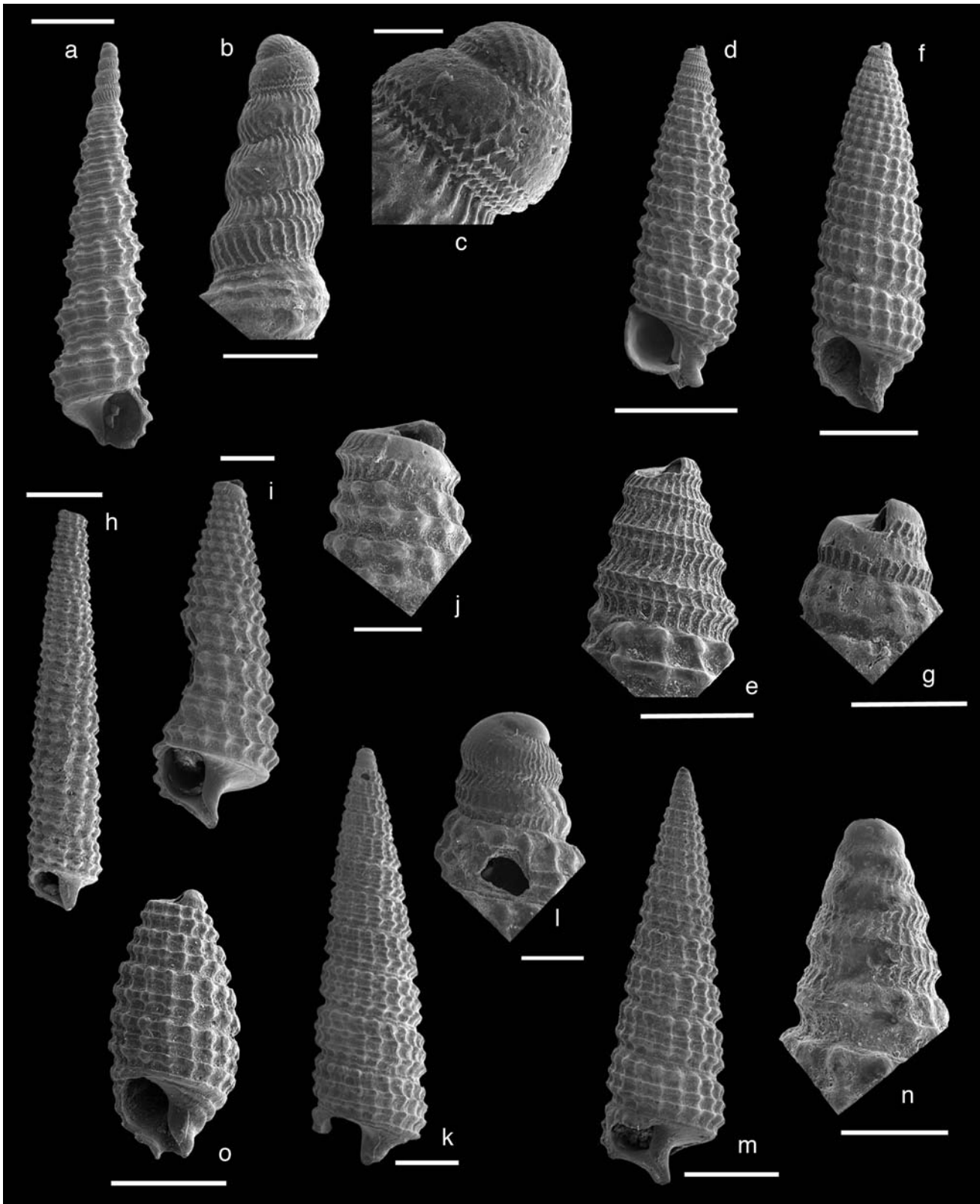


Fig. 15. a-c. *Metaxia* sp.; Station TH 157D, a. scale bar 0.6 mm, b. scale bar 0.2 mm, c. scale bar 0.05 mm; d-e. *Aclophora* sp.; Station TH 108A, d. scale bar 1 mm, e. scale bar 0.25 mm; f-g. *Aclophoropsis* ? sp.; Station TH 108, f. scale bar 1 mm, g. scale bar 0.3 mm; h. *Inella* sp.; Station TH 108D; scale bar 1 mm; i-j. *Mesophora* sp.; Station TH 108A, i. scale bar 0.5 mm, j. scale bar 0.2 mm; k-l. *Cheirodonta* sp. 1; Station TH 157D, k. scale bar 1 mm, l. scale bar 0.2 mm; m-n. *Cheirodonta* sp. 2; Station TH 158D; m. scale bar 1.4 mm; n. scale bar 0.3 mm; o. *Nanaphora* sp. 1; Station TH 108A; scale bar 0.65 mm.

type, narrowly conical, of 3.5 whorls (tip missing) sculptured with dense axial riblets crossed by 2 strongly angulating median spiral threads, the adapical one vanishing over the last quarter of whorl, 3) spire whorls flat-sided, meeting at linear sutures, 4) body whorl sub-cylindrical, rather quickly contracted at the base toward an oblique neck, 5) aperture subquadrangular, outer lip

expanded, with deep and narrow adapical notch, strongly folded abapically and nearly touching the thick lower part of inner lip, abapical canal subtubular, moderately long, 6) sculpture of thin collabral ribs overridden by spiral cords forming prominent nodes at intersections; spirals 1 and 3 appear immediately (3 as continuation of the abapical protoconch spiral), spiral 2 ap-

pears at the beginning of sixth whorl and gradually enlarges but never reaches the size of spirals 1 and 3; body whorl with 6 nodulose spirals, the 2 over the base less so; a secondary spiral intervenes behind the outer lip in interspaces between spirals 2-4; the ribs, 14 on the first whorl, 17-18 on the penultimate, gradually thin abapical to spiral 4 and vanish at the level of spiral 6.

Remarks

This unidentified species matches the characters of the genus *Aclophora* Laseron, 1958. *Aclophora xystica* (Joussseume, 1884) appears to be related, but attains a greater height (up to 16 mm), spiral 2 appears later (9th-10th whorl) and has more secondary spirals behind the outer lip (cf. Marshall, 1983, p. 73).

Aclophoropsis ? sp.

Fig. 15 f, g

Three incomplete specimens not exceeding 4 mm in height; observable characters are 1) turreted, gently cyrtocoid shell, 2) last 1.5 protoconch whorls (preserved part) sculptured with collabral riblets and 1 median spiral thread, 3) teleoconch whorls (8) slightly convex, meeting at impressed, fine sutures, 4) base rather quickly contracted, 5) sculpture of thin collabral ribs overridden by spiral cords forming a square-reticulated pattern with nodes at intersections; spirals 1-3 appear immediately (3 as continuation of the protoconch spiral); body whorl with 4 nodulose spirals, spiral 4 less so; 2 basal spirals nearly smooth; the ribs, 15 on the first whorl and 22 on the penultimate, are straight, orthocline and extend to the level of spiral 4, being obsolescent abapical to this latter; approximate spiral cordlets are noted over the neck.

Remarks

The assignment to the genus *Aclophoropsis* Marshall, 1983 is made with much reservation since the protoconch and apertural characters are not fully observable.

Inella sp.

Fig. 15 h

A single specimen lacking the protoconch, characterized by 1) very slender, turreted, straight-sided shell, 2) whorls (14 preserved) somewhat depressed, meeting at fine, shallow sutures, 3) body whorl cylindrical, base quickly contracted, 4) sculpture of thin collabral ribs overridden by spiral cords forming raised, spirally elongated nodes at intersections; spirals 1-3 already present on the first preserved whorl, 1 markedly weaker than the others, spiral 4 partly exposed at suture throughout; body whorl with 6 spirals, 1-3 nodulose, spiral 4 gently undulate, basal 5 and 6 smooth; the ribs, 11 increasing to 16 during growth, end against spiral 4.

Remarks

The present form closely resembles *Inella acicula* Laseron, 1958, primarily on account of the extremely slender shell, and might belong to that species. However, the protoconch being unavailable, we abstain from any assignment to species.

Mesophora sp.

Fig. 15 i, j

Two incomplete specimens about 4 mm high; the observable characters are 1) turreted, straight-sided shell, 2) protoconch apparently of planktotrophic type, the last 1.5 whorls (preserved part) angular, with collabral riblets, 1 median and 1 suprasutural spiral threads, 3) teleoconch whorls depressed, meeting at fine sutures, 4) sculpture of weak collabral ribs and strongly nodular spiral cords; spirals 1 and 3 commencing immediately (the latter as continuation of the protoconch thread), spiral 2 appearing as a thread at the beginning of seventh whorl and remaining weaker than the others throughout, spiral 4 partly exposed at suture also by the seventh whorl; body whorl with 6 spirals, 1-3 nodulose, 4 smooth and the basal 5 and 6 also smooth and weaker; the ribs, 15 increasing to 18, are spirally dislocated at the level of spiral 2.

Remarks

The protoconch sculpture and the spiral dislocation of the teleoconch axials point toward the assignment to the genus *Mesophora* Laseron, 1958.

Cheirodonta sp. 1

Fig. 15 k, l

Two specimens with the aperture badly damaged; the observable features are 1) turreted, straight-sided shell about 8 mm in height, 2) protoconch of slightly more than 2 whorls, the first large, dome-shaped, the rest sculptured with crisp axial riblets and encircled by 2 median spiral threads, suprasutural thread discontinuous, 3) teleoconch whorls depressed, distinctly angulated both adapically and abapically, meeting at linear sutures, 4) base quickly contracted, somewhat concave, 5) sculpture of collabral ribs overridden by spiral cords forming a reticulated pattern with nodes at intersections; spirals 1 and 3 appear immediately as continuation of protoconch threads, spiral 2 intervenes at the end of third whorl and rapidly enlarges to reach the same strength of the others, spiral 4 is partly exposed at suture by the sixth whorl; body whorl with 5 spirals, 1-3 nodulose, 4 less so, 5 smooth; a flat cord encircles the adapical end of the neck; the ribs, 17 on the first whorl, 23 on the penultimate, are straight, slightly opisthocline and vanish at the level of spiral 4.

Cheirodonta sp. 2

Fig. 15 m, n

A single specimen with the aperture badly damaged, featured by 1) turreted, straight-sided shell 5.8 mm in height, 2) protoconch conical, of 4.5 whorls, the first apparently smooth except for short suprasutural axial bars, subsequent ones weakly biangulated, sculptured with axial riblets and encircled by 2 spiral threads lying on the angulations, suprasutural thread distinct, 3) spire whorls depressed, angulated both apically and abapically, meeting at fine, impressed sutures, 4) base quickly contracted, slightly concave, 5) sculpture of collabral ribs overridden by spiral cords forming a reticulated pattern with nodes at intersections; spirals 1 and 3 appear immediately, the latter as continuation of protoconch abapical thread, spiral 2 intervenes on the sixth whorl and gradually enlarges to reach the same strength of spiral 3, spiral 4 is partly exposed at suture by the fourth whorl; 5 spirals are observable on the body whorl, 1-3 nodulose, 4 and 5 smooth; the ribs, 15 on the first whorl, 19 on the last one, are straight, slightly opisthocline and vanish against spiral 4.

Remarks

The present form and the preceding one are herein assigned to the genus *Cheirodonta* Marshall, 1983 in that are conchologically similar to *Cheirodonta pallescens* (Jeffreys, 1867), type species of the genus.

Nanaphora sp. 1

Fig. 15 o

A single specimen about 2 mm high, lacking the protoconch. It is provisionally assigned to the genus *Nanaphora* Laseron, 1958 on the basis of 1) small, bottle-shaped shell, 2) late appearance of spiral 2 (penultimate whorl), and 3) presence of spiral rows of microscopic granules in the furrows between spirals.

Remarks

The present form closely resembles to *Nanaphora* sp. described by Robba *et al.* (2004), but has smaller shell of 5 instead of 6 whorls.

Obesula lucidula (Hervier, 1897)

Fig. 16 a, b

2000 *Obesula lucidulus* Hasegawa in Okutani, p. 315, pl. 156, fig. 81.

The spire of a single specimen about 3 mm high; the observable characters are 1) protoconch apparently of planktotrophic type, the last whorl (the only one preserved) sharply angular, with dense collabral riblets and 1 spiral thread over the median angulation, 2) spire rather broadly conical, straight-sided, whorls de-

pressed, sutures fine, slightly impressed, 3) sculpture of collabral ribs overridden by spiral cords forming a square-reticulated pattern with prominent nodes at intersections; spirals 1 and 3 appear immediately (3 as continuation of the protoconch thread), spiral 2 intervenes on the fourth whorl as a thread and gradually enlarges but remains weak; spiral 4, partly exposed at suture on later whorls, is smooth; the ribs, 18 on the first whorl, 20 on the seventh whorl (last preserved), are straight and seem to vanish at the level of spiral 4.

Distribution and habitat

Obesula lucidula is distributed in the Indo-Pacific as far north as Japan. It is reported to occur on intertidal and subtidal coarse-grained bottoms (Hasegawa in Okutani, 2000).

Fossil records

None recorded.

Obesula sp. 1

Fig. 16 c

Six incomplete specimens, featured by 1) turreted, gently cyrtocoid shell attaining about 4 mm in height, 2) protoconch apparently of planktotrophic type and narrowly conical, last whorl (the only one preserved) sharply angular, with dense collabral riblets and 1 spiral thread over the median angulation, 3) spire whorls flat-sided, axially compressed, meeting at very fine, impressed sutures, 4) base evenly contracted toward a short, oblique neck, 5) aperture subquadrangular, 6) sculpture of thin collabral ribs overridden by spiral cords forming a square-reticulated pattern with prominent nodes at intersections; spirals 1 and 3 appear immediately (3 as continuation of the protoconch thread), spiral 2 intervenes by the fifth whorl and gradually enlarges to reach about the same strength of spiral 3 on the body whorl; body whorl with 6 spirals, the lowermost smooth encircling the neck; the ribs, 21 throughout, are straight, slightly opisthocline, as wide as one-half the intervening spaces and vanish over the base at level of spiral 5.

Remarks

The characters of the present unidentified species conform to those of the genus *Obesula* Jousseaume, 1898, as described by Marshall (1983).

Obesula sp. 2

Fig. 16 d

The present form exhibits a general resemblance with *Obesula* sp. 1, but differs in having 1) larger and stouter shell, 2) coarser sculpture, and 3) spiral 2 appearing on the third instead of fifth whorl.

Obesula sp. 3

Fig. 16 e

This is a tiny species featured by 1) elongate-ovate shell attaining 2 mm in height, 2) protoconch of planktotrophic type, the last 2 whorls (preserved part) sharply angular, sculptured with thin collabral riblets

and 1 spiral thread over the median angulation, 3) spire whorls moderately depressed, sutures fine, slightly impressed, 4) body whorl about 40% of total height, rather regularly attenuated at the base, 5) sculpture of collabral ribs overridden by spiral cords forming nodes at intersections; spirals 1 and 3 appear immediately, spiral 2 intervenes toward the end of the second whorl and

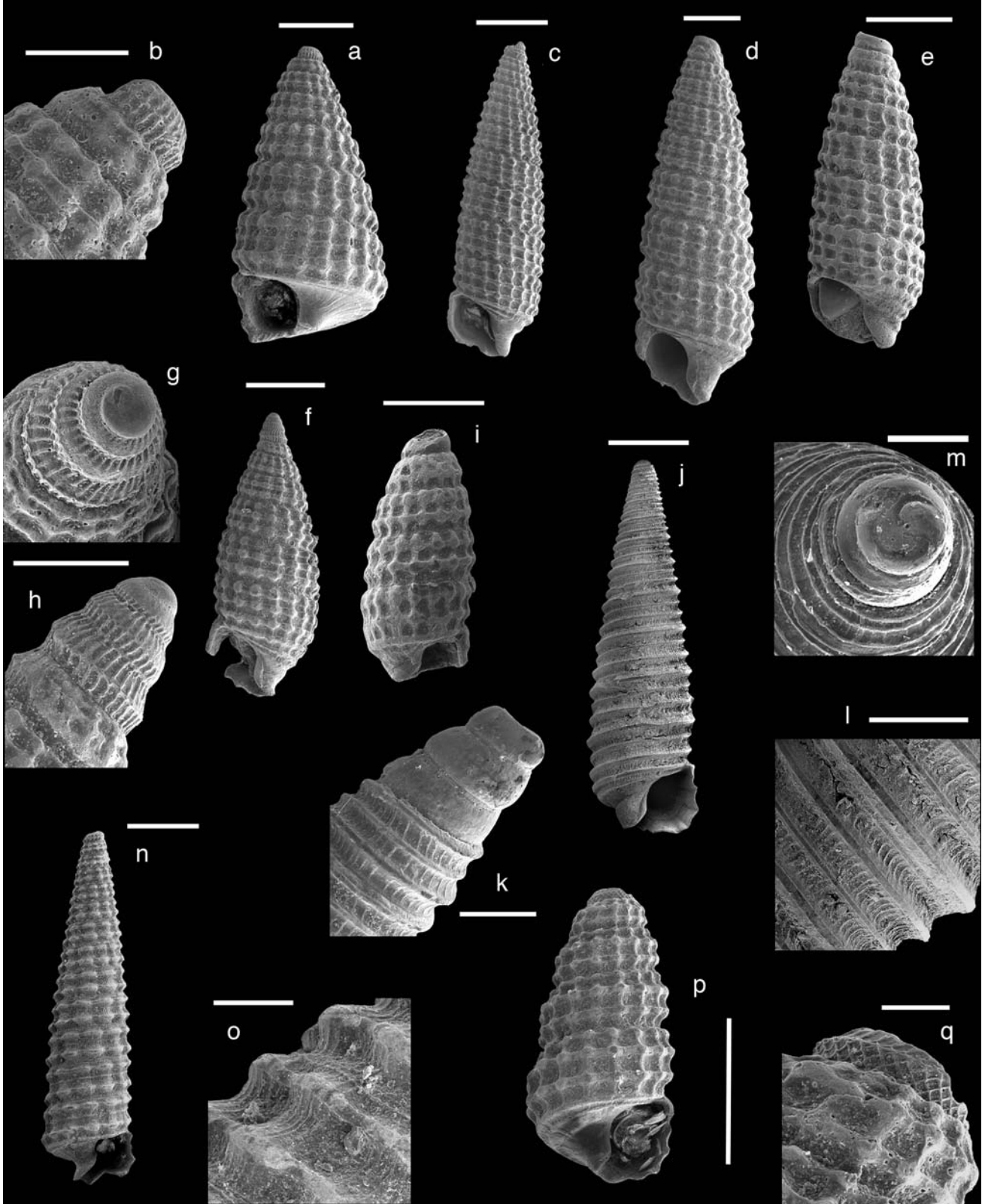


Fig. 16. a-b. *Obesula lucidula* (Hervier, 1897); Station TH 108A, a. scale bar 0.5 mm, b. scale bar 0.2 mm; c. *Obesula* sp. 1; Station TH 161C; scale bar 0.8 mm; d. *Obesula* sp. 2; Station TH 108; scale bar 0.6 mm; e. *Obesula* sp. 3; Station TH 103; scale bar 0.5 mm; f-h. *Tetraphora* sp.; Station TH 108D, f. scale bar 0.65 mm, g, h. scale bar 0.2 mm; i. *Horologica* sp.; Station TH 161C; scale bar 0.5 mm; j-m. *Seila* (*Notoseila*) sp., j, l. Station TH 108A, j. scale bar 1.4 mm, l. scale bar 0.5 mm, k, m. Station TH 157D; scale bars 0.2 mm; n-o. *Seila* (?) sp.; Station TH 108D, n. scale bar 1.3 mm, o. scale bar 0.2 mm; p-q. *Cerithiopsidella* sp.; Station TH 108D, p. scale bar 0.9 mm, q. scale bar 0.1 mm.

quickly reaches the same strength of the others; body whorl with 6 spirals, 1-4 distinctly nodulose, spiral 5 less so and spiral 6 smooth; the ribs, 16-17, are straight, slightly opisthocline and vanish at the level of spiral 5.

Tetrastoma sp.
Fig. 16 f-h

Two specimens about 3 mm high, featured by 1) turreted, markedly cyrtocone shell, 2) protoconch narrowly conical, of 4.25 angular whorls, first whorl abraded, subsequent ones with collabral riblets, 1 submedian and 1 suprasutural spiral threads, 3) teleoconch whorls (6) slightly convex, meeting at shallowly impressed sutures, 4) base convex, 5) aperture subquadrangular, inner lip with rather thick, reverse S-shaped callus, abapical canal open and short, 6) sculpture of collabral ribs overridden by spiral cords; spirals 1-3 appear immediately; body whorl with 6 spirals, 1-4 distinctly nodulose, spiral 5 less so, spiral 6 smooth; the ribs, 15 on the first whorl and 17 on the penultimate, are straight, orthocline, extend to the level of spiral 4, are thinner abapical to this latter and are absent between spirals 5 and 6; exceedingly fine spiral lines occur over the neck.

Familia CERITHIOPSIDAE
Subfamilia CERITHIOPSINAE

Horologica sp.
Fig. 16 i

Two poorly preserved specimens assigned to the genus *Horologica* Laserson, 1956 in that have only 2 nodulose spirals on spire whorls, the adapical one somewhat stronger, and a third spiral emerging from the insertion of the outer lip. Further, the adapical spiral starts to divide into 2 rows of nodes over the last part of the body whorl.

Seila (Notoseila) sp.
Fig. 16 j-m

Several specimens featured by 1) slenderly turreted, nearly straight-sided shell not exceeding 10 mm in height, 2) protoconch of planktotrophic type, conical, of about 4 (tip missing) convex whorls, 3) spire whorls flat, meeting at linear sutures, 4) body whorl cylindrical, with angular periphery, base slightly concave, 5) aperture subquadrangular, columella twisted, 6) sculpture of 3 evenly spaced spiral keels, the adapical and abapical ones more prominent on earlier whorls; the abapical keel becomes less prominent during growth and has the same strength of the middle one on later whorls; another 2 keels occur on upper base; fine, well spaced axial threads are noted in the furrows between the spirals.

Remarks

The protoconch of planktotrophic type is consistent with

the assignment to the subgenus *Notoseila* Finlay, 1927. The present shells exhibit some resemblance with *Cerithiopsis laqueata* Gould, 1861 (cf. Johnson, 1964, pl. 10, fig. 7).

Seila (?) sp.
Fig. 16 n, o

Two incomplete shells featured by 1) spire whorls flat-sided and axially compressed, meeting at linear sutures, 2) body whorl abruptly attenuated at the base, with distinct fasciole, 3) aperture subquadrangular, abapical canal short and twisted, 4) sculpture of 2 spiral rows of axially elongate nodes both overridden by 1 spiral cord; 1 adapical fine spiral cordlet lies close to the adapical suture, 1 develops by mid whorls between the primary cords; base with 2 spirals, 1 at the periphery, 1 just abapical to it; except for the base, the whole surface bears even and evenly spaced axial threads.

Remarks

The axial threads along with the flat whorls point toward the assignment to the genus *Seila* Adams, 1861. The incompleteness of the specimens in hand hinders any assignment to subgenus and species.

Subfamilia ALIPTINAE

Cerithiopsidella sp.
Fig. 16 p, q

A single incomplete specimen featured by 1) turreted shell, 2) protoconch apparently of planktotrophic type, the last whorl (preserved part) angular, with daphnelloid sculpture, 3) spire whorls gently convex, meeting at impressed sutures, 4) sculpture of collabral ribs overridden by spiral cords forming nodes at intersections; the ribs, 16 on the first whorl, 17 on the body whorl, are straight, narrower than the intervening spaces and vanish at the level of spiral 4; spirals 1-3 appearing immediately, 1 slightly weaker than the others, spiral 4, smooth, emerging from insertion of outer lip; 1 smooth spiral on upper base.

Remarks

The present shell is assigned to the genus *Cerithiopsidella* Bartsch, 1907 on account of the peculiar protoconch ornamentation (cf. Marshall, 1978, p. 71).

Superfamilia JANTHINOIDEA
Familia EPITONIIDAE
Subfamilia EPITONIINAE

Epitonium (Parviscala) columba Kilburn, 1985
Fig. 17 a-c

1985 *Epitonium (Parviscala) columba* Kilburn, p. 317, figs. 78, 135.

Five specimens, not exceeding 2.5 mm in height, are assigned to Kilburn's taxon on the basis of 1) rather broadly conical, turreted shell, 2) protoconch conical, of 3.5 convex and smooth whorls, transition to teleoconch marked by the appearance of the first collabral rib, 3) spire whorls convex, with the periphery slightly adapical to the middle, meeting at narrowly fenestrate sutures, 4) body whorl 54% of total height, with narrowly fenestrate umbilicus, 5) aperture broadly oval, with thick peristome, distinctly auriculate both at shoulder and basally, 6) sculpture of 6 moderately thin, prosocline, continuous, somewhat reflexed, lamellar axial ribs forming a blunt coronation in between shoulder and suture; interspaces with thin spiral threads crossed by very fine growth lines.

Distribution and habitat

Epitonium columba was hitherto known only from South Africa (Natal). The original material consists of dead shells obtained from shallow dredgings.

Fossil records

None recorded.

Opalia (Pliciscala) hidryma (Melvill, 1899)

Fig. 17 d

1899 *Scalaria (Cirsotrema) hidryma* Melvill, p. 92, pl. 1, fig. 10.

1912 *Nodiscala hidryma* Jousseume, p. 242, pl. 6, figs. 55-59.

A single specimen 2.7 mm high, characterized by 1) turriculate, nearly straight-sided shell, 2) spire whorls (4) convex, suture impressed, slightly undulating, 3) body whorl with weakly angular periphery topped by a blunt basal cord, base feebly convex, 4) aperture obliquely oval, with thick peristome and strong outer varix, 5) sculpture of collabral ribs overridden by spiral cords; the ribs, 14 on the first preserved whorl, 9 on the body whorl, are straight, narrower than interspaces and gradually vanish abapical to the basal cord; 1 varix per whorl also occurs; the spirals, 7 on earlier whorls, 12 on the penultimate, are rather even and evenly spaced, their interstices with distinct pits; about 10 cords occur over the base.

Remarks

The Thai shell appears to conform to the original description and figure in all respects. The South African *Opalia (Pliciscala) methoria* Kilburn, 1985 is the closest species, differing primarily in that has slightly sinuous, prosocline ribs and finer spirals.

Distribution and habitat

Opalia hidryma was reported to range from the Red Sea

to Pakistan. There is no information about its ecological requirements.

Fossil records

None recorded.

Superfamilia EULIMOIDEA

Familia EULIMIDAE

Eulima sp.

Fig. 17 e

A single specimen 2.0 mm high, featured by 1) slightly cyrtocoid, high-spined shell, 2) protoconch conical, of about 3.5 slightly convex whorls, tip smooth and somewhat tilted, subsequent whorls with even, sinuous and oblique axial lines, demarcation from teleoconch marked by a distinct lip, 3) spire whorls gently convex, meeting at impressed sutures, 4) body whorl elongate-oval, 53% of total height, tapering at the base, 5) aperture irregularly drop-shaped, rather high, outer lip thin, inner lip with narrow callus, thicker abapically, 6) outer surface smooth except for a few incremental scars.

Remarks

The present unidentified species has the larval shell similar to that of *Batheulima* Nordsieck, 1968 and *Fuscapex* Waren, 1981, but is assigned to the genus *Eulima* Risso, 1826 on account of the apertural characters. The Thai specimen closely resembles that figured by Ito (1990, pl. 6, fig. 11) and referred to as *Cuspeulima* sp. and might be conspecific of it. It is of note that *Cuspeulima* Laseron, 1955 is currently regarded as a synonym of *Eulima*.

Eulitoma sp.

Fig. 17 f

A single, 6-whorled, 2.1 mm high specimen lacking the larval shell. Distinctive characters are 1) conical-turreted, slightly cyrtocoid shell, 2) spire whorls high, very gently convex, with the periphery at the abapical one-fourth, suture flush, exceedingly fine, 3) body whorl oval, about 56% of total height, somewhat constricted adapically, base rather quickly attenuated, umbilical chink faint, 4) aperture rhomboid, broad abapically, outer lip with shallow subsutural sinuation, then forwardly arched, inner lip with very thin parietal callus, columella straight, forming a distinct angle with the parietal wall, basal lip slightly flaring, 5) outer surface with incremental scars roughly arranged into 2 oblique alignments half whorl apart.

Remarks

The present shell is assigned to the genus *Eulitoma* Laseron, 1955 on the basis of the apertural features.

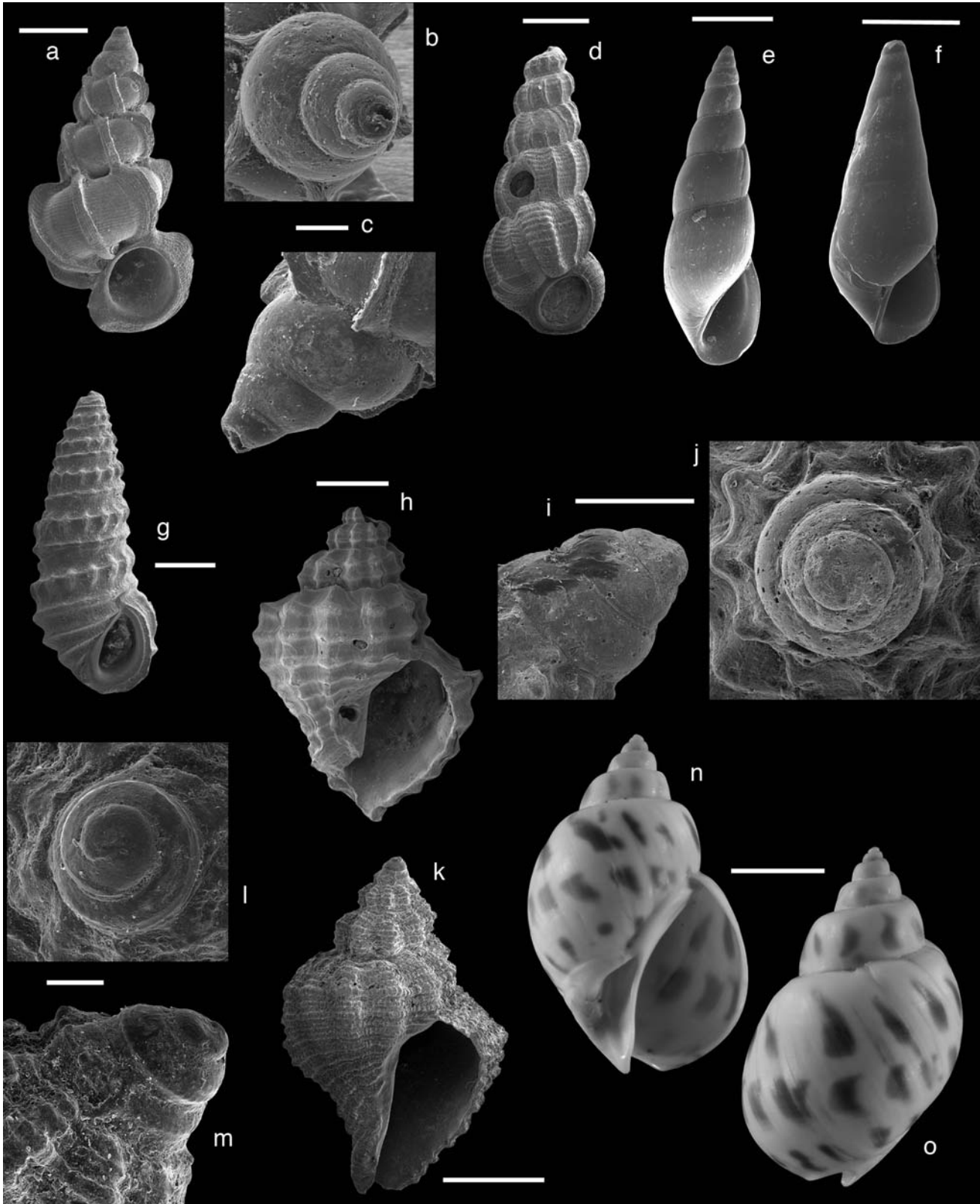


Fig. 17. **a-c.** *Epitonium (Parviscala) columba* Kilburn, 1985; Station TH 158D, **a.** scale bar 0.5 mm, **b, c.** scale bar 0.1 mm; **d.** *Opalia (Pliciscala) hidryma* (Melvill, 1899); Station TH 159; scale bar 0.5 mm; **e.** *Eulima* sp.; Station TH 108D; scale bar 0.5 mm; **f.** *Eulitoma* sp.; Station TH 161C; scale bar 0.5 mm; **g.** *Pyramidelloides mirandus* (Adams, 1861); Station TH 108A; scale bar 0.5 mm; **h-j.** *Lataxiena fimbriata* (Hinds, 1844); Station TH 159, **h.** scale bar 2 mm, **i, j.** scale bar 0.5 mm; **k-m.** *Coralliophila (Coralliophila) rubrococcinea* Melvill & Standen, 1901; Station TH 158D; **k.** scale bar 2 mm; **l, m.** scale bar 0.2 mm; **n-o.** *Babylonia areolata* (Link, 1807); Laem Talumphuk Spit (Pak Phanang Bay); scale bar 1.4 cm.

Pyramidelloides mirandus (Adams, 1861)

Fig. 17 g

- 1861 *Rissoina miranda* Adams, p. 135.
- 1968 *Pyramidelloides miranda* Habe, p. 31, pl. 10, fig. 14.
- 1979 *Pyramidelloides miranda* Kay, p. 82, fig. 29F.
- 1985 *Pyramidelloides miranda* Ponder, p. 106, figs. 150 F-I.

- ? 1989 *Pyramidelloides miranda* Ito, p. 44, pl. 3, fig. 9.
- 1993 *Pyramidelloides miranda* Wilson, p. 289, fig. on p. 289, upper left.
- 1993 *Pyramidelloides miranda* Fukuda, p. 61, pl. 21, fig. 390.
- 1995 *Pyramidelloides miranda* Bosch, Dance, Moolenbeek & Oliver, p. 112, fig. 451.

2000 *Pyramidelloides miranda* Hori in Okutani, p. 363, pl. 180, fig. 83.

This is a distinctive species easily recognized by 1) elongate-oval, robust shell attaining 3.5 mm in height, 2) protoconch subulate, of 3.5 smooth whorls, 3) spire gently cyrtocoid, sutures linear, 4) body whorl oval, slightly less than one-half the total height, base quickly tapering, 5) *Alvania*-like aperture, small and oblique, with thick peristome, 6) sculpture of robust spiral cords, 1 about half way between the sutures, strongly noded and giving the whorls an angular outline, 1 marginating the abapical suture; base with 4 spiral cords of decreasing strength downward; fine, evenly spaced axial threads occur throughout.

Remarks

Pyramidelloides mirandus appears to be rather variable in terms of teleoconch and sculptural features and many species were regarded as synonyms of it regardless of their protoconch characters (cf. Ponder, 1985). Actually, Laseron (1956) already noted that many species "can usually be readily separated, particularly by the protoconchs, which are of very diverse types".

Distribution and habitat

Pyramidelloides mirandus ranges from the Persian Gulf to Australia and as far east to Hawaii, northward to Japan. It is parasitic upon brittle stars (Bosch *et al.*, 1995; Hori in Okutani, 2000); records were from sandy bottoms of the intertidal and sublittoral zones.

Fossil records

None recorded.

Superfamilia MURICOIDEA
Familia MURICIDAE
Subfamilia ERGALATAXINAE

Lataxiensia fimbriata (Hinds, 1844)
Fig. 17 h-j

- 1844 *Trochon fimbriatus* Hinds, p. 14, pl. 1, figs. 18, 19.
1935 *Lataxiensia fimbriata* Nomura, p. 163, pl. 8, fig. 12.
1968 *Lataxiensia fimbriata* Habe, p. 83, pl. 27, fig. 7.
1976 *Coralliophila (Lataxiensia) fimbriata* Lindner, p. 174, pl. 32, fig. 3.
1978 *Lataxiensia fimbriata* Cernohorsky, p. 71, pl. 21, fig. 1.
1981 *Lataxiensia fimbriata* Eisenberg, p. 96, pl. 78, fig. 8.
1982 *Lataxiensia fimbriata* Abbott & Dance, p. 153, fig. in mid row, right.
1986 *Lataxiensia fimbriata* Springsteen & Leobrera, p. 145, pl. 40, fig. 3.
1994 *Lataxiensia (Lataxiensia) fimbriata* Wilson, p. 23, pl. 6, fig. 33.
2000 *Lataxiensia fimbriata* Fukuda, Asami, Yamashita, Satô, Hori & Nakamura, p. 134, fig. 12 p.

2000 *Lataxiensia fimbriata* Tsuchiya in Okutani, p. 381, pl. 189, fig. 85.

2001 *Lataxiensia fimbriata* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 127, fig. 416.

Three incomplete specimens assigned to the present species on the basis of 1) broadly fusiform shell, 2) protoconch conical, of about 3 convex and smooth whorls, 3) whorls shouldered, sutures adpressed, 4) sculpture of collabral ribs overridden by spiral cords; the ribs, 11 throughout, are as wide as the intervening spaces and continuous to the base; 2 spirals occur on the spire whorls, respectively over the shoulder and abapical to it, 7 over the base with minor ones in between; axial lamellae (more or less abraded in Thai specimens) form imbricate spiny projections at shoulder, more raised those over the ribs.

Distribution and habitat

Lataxiensia fimbriata is distributed in the tropical Indo-West Pacific. It is a shallow subtidal element, dwelling on rocks and coarse substrates. Previous records in the Gulf of Thailand were at depths of 6-10 m, off Pattani (Swennen *et al.*, 2001).

Fossil records

Pliocene of Taiwan (Nomura, 1935).

Familia CORALLIOPHILIDAE

Coralliophila (Coralliophila) rubrococcinea
Melvill & Standen, 1901
Fig. 17 k-m

- 1901 *Coralliophila rubrococcinea* Melvill & Standen, p. 401, pl. 21, fig. 2.
1995 *Coralliophila rubrococcinea* Bosch, Dance, Moolenbeek & Oliver, p. 125, fig. 505.
2000 *Coralliophila rubrococcinea* Tsuchiya in Okutani, p. 417, pl. 207, fig. 285, fig. in upper square.
2004 *Coralliophila* sp. Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 105, pl. 14, fig. 3.

Distinctive characters are 1) fusiform shell up to 27 mm in height, 2) protoconch conical of 2.75 whorls, the first convex, subsequent ones biangulated with 2 spiral threads (over the angulations) crossed by arched thin axials forming small nodes at intersections, transition to teleoconch marked by a narrow varix, 3) spire whorls angular, with broad shoulder slope, suture slightly impressed, 4) body whorl rather expanded, about 75% of total height, tapering at the base toward a short neck, fasciole long and narrow, with dense, moderately prominent growth scales, 5) aperture pear-shaped, abapical canal broad and shallow, outer lip thin, with crenulate edge, 6) sculpture of 9 stout collabral ribs overridden by crowded spiral cords bearing imbricate, raised scales, the spiral lying on the peripheral angulation somewhat stronger.

Remarks

The present species exhibits some variability in terms of maximum diameter, whorls outline more or less angular, and number of secondary spirals. *Coralliophila jefreysi* Smith, 1879 appears to be closely similar and could be a senior synonym.

Distribution and habitat

Coralliophila rubrococcinea is distributed in the Indo-West Pacific, from East Africa and the Red Sea to Southeast Asia and Japan. It is an upper sublittoral element reported to dwell on corals and sea fans (Bosch *et al.*, 1995).

Fossil records

None recorded.

Familia BUCCINIDAE Subfamilia BUCCININAE

Babylonia areolata (Link, 1807) Fig. 17 n, o

1807 *Buccinum areolatum* Link, p. 125.

1981 *Babylonia areolata* Eisenberg, p. 101, pl. 83, fig. 4.

1981 *Babylonia areolata* van Regteren Altena & Gittenberger, p. 16, pl. 1, fig. 1; pl. 2, fig. 2; pl. 4, figs. 2, 3; pl. 7, fig. 2; pl. 8, fig. 5; pl. 10, fig. 1; text-figs. 1, 2, 12 (*cum syn.*).

1982 *Babylonia areolata* Abbott & Dance, p. 173, fig. in bottom row, middle right.

1991 *Babylonia areolata* Abbott, p. 63, pl. 31, fig. 2.

2001 *Babylonia areolata* Swennen, Moolenbeek, Ruttanadakul, Hobbelenk, Dekker & Hajisamae, p. 128, fig. 426.

The species is featured by 1) oval shell attaining 90 mm in height, 2) protoconch apparently of 2 convex whorls, transition to teleoconch marked by the appearance of the shoulder, 3) spire whorls shaped like a segment of a cone, with slightly convex, very steep mid-abapical part, shoulder horizontal, narrow and shallowly concave, 4) suture adpressed, 5) body whorl broadly oval, about four-fifths of total height, with gently sloping, flat shoulder, 6) umbilicus open and deep, 7) fasciole rather prominent, bounded abaxially by a narrow ridge and adaxially by a shallow groove, 8) aperture oval, parietal callus thick and somewhat expanded, with an adapical ridge, 9) surface with uneven growth markings and spiral microstriation; colour pattern of reddish-brown large spots arranged into spiral rows, 1 on spire whorls, 3 over the body whorl.

Remarks

We follow van Regteren Altena & Gittenberger (1981) in considering *Eburna elata* Yokoyama, 1923 as a synonym of the present species. *Babylonia feicheni* Shikama, 1973 exhibits a similar colour pattern, but differs in that has less distinctly shouldered whorls and noded fasciole.

Distribution and habitat

Babylonia areolata is distributed from Sri Lanka to Taiwan. It is an infralittoral, sand-related element. Live specimens were reported to occur abundantly on fine sandy bottoms in the Gulf of Thailand, at 5 to 15 m depth (Swennen *et al.*, 2001).

Fossil records

Late Miocene and Pliocene of Japan (van Regteren Altena & Gittenberger, 1981).

Subfamilia PISANIINAE

Cantharus (Pollia) sp. Fig. 18 a, b

Two specimens, one juvenile, the other largely incomplete retaining only the earlier teleoconch whorls. The observable characters are 1) fusiform shell with straight-sided spire, 2) protoconch conical of about 3 convex whorls, with 3-4 arched axials at the end, 3) spire whorls (the first 5 preserved) low, shaped like a segment of a cone, meeting at impressed sutures, 4) base nearly obconical, abapical canal slightly flexuous, 5) sculpture of broad collabral ribs overridden by 3 robust spiral cords; the ribs, apparently 13-14 throughout, are continuous from whorl to whorl and vanish on upper neck; interspaces between cords with an increasing number of fine cordlets crossed by dense and fine axial threads; spirals on upper neck distinctly beaded.

Remarks

The quality of the material hinders any assignment to species. The observed characters seem to be alike those of the subgenus *Pollia* Gray in Sowerby, 1834.

Familia COLUMBELLIDAE Subfamilia PYRENINAE

Mokumea divaricata (Pilsbry, 1904) Fig. 18 c-e

1904 *Columbella divaricata* Pilsbry, p. 16, pl. 3, fig. 26.

1971 *Zafra divaricata* Kuroda, Habe & Oyama, p. 161, pl. 109, fig. 16.

1979 *Zafra divaricata* Okamoto & Habe, p. 170, figs. 3, 4.

1995 *Zafra divaricata* Fukuda, p. 18, pl. 61, fig. 939.

2000 *Mokumea divaricata* Tsuchiya in Okutani, p. 433, pl. 216, fig. 55.

Distinctive characters are 1) ovate-fusiform shell attaining 6 mm in height, 2) protoconch broadly conical, of 2.5 convex and smooth whorls, 3) spire whorls gently convex, meeting at slightly impressed sutures, 4) body whorl elongate-oval, about 70% of total height, gradually tapering at the base, 5) aperture rather narrow, abapical canal wide and deep, outer lip thickened, with 3 in-

ner tubercles of decreasing size downward, 6) outer surface smooth except for approximate spiral cords over the neck; colour pattern of oblique, divaricating reddish-brown lines over a light yellowish-brown background; a whitish band marginates the suture.

Distribution and habitat

Mokumea divaricata was hitherto known from Japanese waters. It is reported to occur intertidally and down to 20 m depth, among seaweeds on sandy and rocky bottoms (Tsuchiya in Okutani, 2000).

Fossil records

None recorded.

Zafra comistea (Melville, 1906)

Fig. 18 f, g

1906 *Columbella* (*Seminella*) *comistea* Melville, p. 75, pl. 7, fig. 16.

1990 *Zafra comistea* Drivas & Jay, p. 187, fig. 39.

1994 *Zafra comistea* Drivas & Jay, p. 32, fig. 39.

1995 *Zafra comistea* Bosch, Dance, Moolenbeek & Oliver, p. 131, fig. 542.

A single specimen featured by 1) broad, ovate-fusiform shell 2.5 mm in height, 2) protoconch conical, of 3.25 smooth and convex whorls, transition to teleoconch marked by a sinusigera lip and by the appearance of the first collabral rib, 3) spire whorls moderately convex, suture adpressed, 4) body whorl large, 68% of total height, attenuated at the base toward a short neck, 5) aperture narrow, with parallel margins, outer lip sinuated adapically, slightly bent adaxially, thickened inside and with 7 small tubercles, 6) sculpture of 22 collabral ribs, slightly wider than the intervening furrows, vanishing on lowermost base; the spirals consist of a shallow subsutural groove and 8 cords over the neck; remnants of reddish-brown color occur in between the sutures.

Distribution and habitat

Zafra comistea was so far known to range in the Indian Ocean, from Reunion to the Persian Gulf and India. It seems to be a sublittoral element.

Fossil records

None recorded.

Familia VOLUTIDAE Subfamilia CYMBIINAE

Cymbiola (*Aulica*) *nobilis* (Lightfoot, 1786)

Fig. 18 h, i

1786 *Voluta nobilis* Lightfoot, p. 6, n° 89.

1970 *Cymbiola* (*Aulica*) *nobilis* Weaver & duPont, p. 83, pl. 34, figs. A-D; text-fig. 17f.

1976 *Cymbiola* (*Aulica*) *nobilis* Lindner, p. 188, pl. 39, fig. 2.

1981 *Voluta* (*Cymbiola*) *nobilis* Eisenberg, p. 117, pl. 99, figs. 2, 2A.

1982 *Cymbiola nobilis* Abbott & Dance, p. 216, fig. in bottom row, mid right.

1986 *Cymbiola* (*Aulica*) *nobilis* Springsteen & Leobrera, p. 182, pl. 49, fig. 4.

1992 *Cymbiola* (*Aulica*) *nobilis* Dharma, p. 54, pl. 5, figs. 7-7c.

2001 *Cymbiola nobilis* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 131, fig. 447.

The juvenile specimens from the sand spit of Pak Phanang Bay are assigned to the present species on the basis of 1) ovately-biconical shell, 2) large, dome-shaped protoconch of 4 convex whorls, the tip rather flattened, 3) presence of 4 columellar plaits that are markedly oblique, the 2 anterior more so and stronger, 4) surface with reddish zigzag axial lines and sparse blotches of the same colour over a pale yellowish background; one shell exhibits 4 discontinuous, reddish spiral bands.

Distribution and habitat

Cymbiola nobilis ranges from Singapore to Philippines and Taiwan and dwells on intertidal and sublittoral sandy or muddy substrates (Weaver & duPont, 1970). More recently, *Cymbiola nobilis* was also illustrated from Indonesian waters (Dharma, 1992). In the Southern Gulf of Thailand, live specimens were obtained from intertidal mudflats in the Pattani Bay; other records (catchments by fishing boats) were from depths of 15 to 22 m (Swennen *et al.*, 2001). Way & Purchon (1981) recovered the species also from intertidal sands along the coasts of Singapore and Malaysia.

Fossil records

None recorded.

Familia MITRIDAE Subfamilia MITRINAE

Subcancilla interlirata (Reeve, 1844)

Fig. 18 j-l

1844 *Mitra interlirata* Reeve, pl. 10, sp. 70.

1903 *Mitra* (*Cancilla*) *flammea* Cossmann, p. 123, pl. 4, figs. 11, 12.

1915 *Mitra* (*Cancilla*) *flammea* Tesch, p. 45, pl. 79, fig. 96.

1967 *Cancilla interlirata* Cernohorsky, p. 156, pl. 36, fig. 245.

1969 *Tiara flammea* Shuto, p. 161, pl. 15, figs. 11, 12; text-fig. 29.

1975 *Subcancilla interlirata* Hinton, p. 41, fig. 10.

1977 *Subcancilla interlirata* Cernohorsky, p. 124, figs. 11, 12.

1978 *Subcancilla interlirata* Cernohorsky, p. 105, pl. 34, fig. 3.

1977 *Subcancilla interlirata* Ladd, p. 62, pl. 19, fig. 17.

1978 *Subcancilla interlirata* Tantanasiwong, p. 16, fig. 215.

Not 1978 *Mitra interlirata* Popenoe & Kleinpell, pl. 9, fig. 105 (= *Mitra flammea* Quoy & Gaimard, 1833).
 1981 *Subcancilla interlirata* Pechar, Prior & Parkinson, pl. 19, figs. 1, 2, 4-6, 11, 14, 15; pl. 20, figs. 4, 6.
 1984 *Subcancilla interlirata* Sharabati, pl. 27, figs. 6, 6a.
 1985 *Cancilla interlirata* Wilson & Gillett, p. 209, pl. 48, figs. 14, 14a.

1986 *Subcancilla interlirata* Springsteen & Leobrera, p. 205, pl. 56, fig. 18.
 1988 *Subcancilla interlirata pia* Drivas & Jay, p. 96, pl. 33, fig. 9.
 1989 *Subcancilla interlirata* Robba, Sartono, Violanti & Erba, p. 82.
 1991 *Cancilla interlirata* Abbott, p. 68, pl. 33, fig. 8.

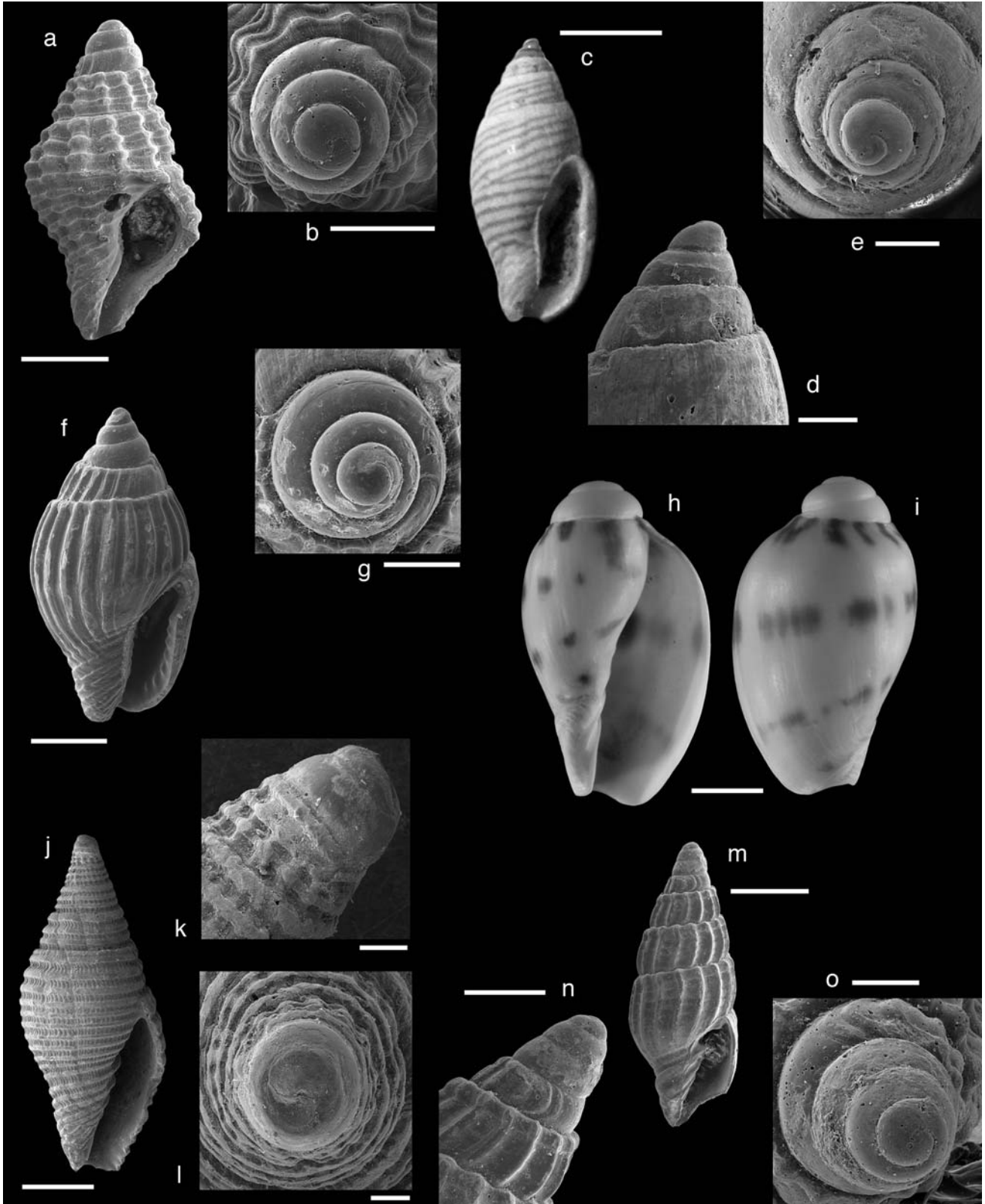


Fig. 18. a-b. *Cantharus (Pollia)* sp.; Station TH 161C, a. scale bar 1 mm, b. scale bar 0.5 mm; c-e. *Mokumea divaricata* (Pilsbry, 1904); Station TH 157D, c. scale bar 1 mm, d, e. scale bars 0.2 mm; f-g. *Zafra comistea* (Melvill, 1906); Station TH 161C, f. scale bar 0.5 mm, g. scale bar 0.2 mm; h-i. *Cymbiola (Aulica) nobilis* (Lightfoot, 1786); Laem Talumphuk Spit (Pak Phanang Bay); scale bar 7.5 mm; j-l. *Subcancilla interlirata* (Reeve, 1844); Station TH 161C; j. scale bar 1.6 mm; k, l. scale bars 0.2 mm; m-o. *Vexillum (Costellaria) malcolmense* (Melvill & Standen, 1901); Station TH 158D, m. scale bar 1 mm, n. scale bar 0.4 mm, o. scale bar 0.2 mm.

- 1992 *Ziba interlirata* Dharma, p. 48, pl. 2, fig. 18.
 1994 "*Ziba*" *interlirata* Wilson, p. 158, pl. 34, fig. 14.
 1999 *Ziba interlirata* Kohn & Arua, p. 115, pl. 3, figs. 43, 44.
 2000 *Scabricola interlirata* Tsuchiya in Okutani, p. 549, pl. 273, fig. 67.
 2001 *Subcancilla interlirata* Swennen, Moolenbeek, Rutta-nadakul, Hobbelink, Dekker & Hajisamae, p. 133, fig. 457.

A single juvenile specimen 8 mm high, featured by 1) fusiform shell, 2) protoconch conical, apparently of 2.5 smooth and convex whorls, 3) spire with slightly concave sides, whorls (4) shaped like a segment of a cone, sutures linear, 4) body whorl about 70% of total height, rather expanded at the adapical one-third, somewhat constricted at the base toward a short neck, 5) aperture elongate, narrowly oval, columella with 4 ascending folds of decreasing strength downward, abapical canal rather broad, 6) sculpture of raised spiral cords, 3 on earlier whorls, 20 on the body whorl, the subsutural one distinctly twin by the fourth whorl; interspaces with dense axial bars.

Remarks

The closely related *Subcancilla flammea* (Quoy & Gaimard, 1833) is distinguished primarily in having more biconical shell.

Distribution and habitat

Subcancilla interlirata is distributed in the Indo-West Pacific, from Mauritius and the Red Sea to Australia, Fiji and northward to Japan. It is a sublittoral element dwelling in mud, sand and shell gravel. Previous records in western Thai waters were from mud and shell gravel at 18-30 m depth (Tantanasiriwong, 1978).

Fossil records

Middle Miocene (Rembangian) and Late Miocene of Indonesia (Tesch, 1915); Late Miocene of the Philippines (Kohn & Arua, 1999); Pliocene of India, Indonesia, Philippines, Okinawa and Fiji (Cossmann, 1903; Tesch, 1915; Shuto, 1969; Ladd, 1977; Kohn & Arua, 1999); Pleistocene of Indonesia and Fiji (Robba *et al.*, 1989; Kohn & Arua, 1999); Quaternary of Japan (Shuto, 1969).

Familia COSTELLARIIDAE

Vexillum (Costellaria) malcolmense (Melvill & Standen, 1901)

Fig. 18 m-o

- 1901 *Mitra (Costellaria) malcolmensis* Melvill & Standen, p. 421, pl. 23, fig. 18.
 1978 *Vexillum (Costellaria) malcolmense* Cernohorsky, p. 110, pl. 36, fig. 9.
 1995 *Costellaria malcolmensis* Bosch, Dance, Moolenbeek & Oliver, p. 154, fig. 659.

Distinctive characters are 1) fusiform shell not exceeding 11 mm in height, 2) protoconch conical, rather slender, of 4 smooth whorls, clearly demarcated from the teleoconch, 3) spire whorls gently convex, with narrow but distinct shoulder slope, suture slightly impressed, 4) body whorl oval, 60% of total height, rather quickly tapering at the base toward a short neck, 5) aperture leaf-shaped, outer lip thin, slightly sinuous, inner lip narrowly callused and with 4 ascending columellar plaits of decreasing strength downward, 6) sculpture of collabral ribs and spiral grooves in the interspaces; the ribs, 15 on the first whorl, 17 on the penultimate, are retractively arched, narrower than the intervening spaces, somewhat constricted adapically to form a subsutural row of nodules and vanish on lower base; 3 strong spiral cords occur over the neck.

Remarks

Vexillum malcolmense was regarded as a synonym of *Mitra amanda* Reeve, 1845. In this respect, it is to be noted that Reeve's taxon, the same being the number of teleoconch whorls, attains twice the size of the present species.

Distribution and habitat

Vexillum malcolmense is distributed in the Indo-West Pacific, from the Persian Gulf to Australia and Philippines. It is an inner sublittoral element dwelling in sand and mud.

Fossil records

None recorded.

Superfamilia CANCELLARIOIDEA Familia CANCELLARIIDAE Subfamilia CANCELLARIINAE

Cancellaria asperella Lamarck, 1822

Fig. 19 a-c

- 1822 *Cancellaria asperella* Lamarck, p. 112.
 1849 *Cancellaria asperella* Sowerby, p. 447, pl. 93, fig. 38; pl. 95, fig. 74 (reprint 1985).
 1948 *Cancellaria asperella* Cox, p. 61, pl. 5, fig. 9.
 1954 *Cancellaria (Merica) laticosta* Taki & Oyama, pl. 22, fig. 2.
 Not 1965 *Merica asperella* Kira, p. 91, pl. 32, fig. 22 (= *Cancellaria elegans* Sowerby, 1822).
 1969 *Merica asperella* Shuto, p. 171, pl. 17, figs. 11-13.
 1971 *Merica asperella* Kuroda, Habe & Oyama, p. 202, pl. 54, fig. 8.
 1972 *Cancellaria asperella* Cernohorsky, p. 179, pl. 50, fig. 3, left (not fig. 3, right = *Cancellaria elegans* Sowerby, 1822).
 Not 1975 *Cancellaria asperella* Oliver, p. 262, fig. in front page (= *Cancellaria elegans* Sowerby, 1822).
 1975 *Cancellaria (Merica) elegans* Garrard, p. 3, fig. 1 (1).

1978 *Cancellaria asperella* Popenoe & Kleinpell, pl. 9, fig. 118.
 Not 1981 *Cancellaria asperella* Eisenberg, p. 132, pl. 114, fig. 1 (= *Cancellaria oblonga* Sowerby, 1825).
 1982 *Cancellaria (Merica) asperella* Ladd, p. 57, pl. 14, figs. 14, 15.
 1985 *Cancellaria elegans* Wilson & Gillett. p. 235, pl. 57, fig. 2.
 1986 *Cancellaria (Merica) asperella* Springsteen & Leobrer, p. 78, pl. 18, fig. 22.
 1994 *Cancellaria elegans* Wilson, p. 174, pl. 37, fig. 21.
 1998 *Cancellaria elegans* Harasewych & Petit in Beesley *et al.*, fig. 15.172 A.
 2000 *Cancellaria (Merica) laticosta* Hasegawa in Okutani, p. 581, pl. 289, fig. 1.
 2004 *Cancellaria elegans* Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 127.

Diagnostic characters are 1) ovate-conical, moderately tall-spined shell up to 50 mm in height, 2) protoconch conical of 2.25 convex whorls, 3) teleoconch whorls convex, with adapical narrow and shallow depression, 4) suture channeled, 5) body whorl broadly oval, tapering at the base, with prominent fasciole and narrow umbilical chink, 6) aperture oval, outer lip lirate within, parietal callus rather wide, columella with 3-5 oblique plaits, the uppermost stronger, 7) sculpture of numerous collabral ribs overridden by spiral cords and intervening threads.

Remarks

Some authors regarded the present species and *Cancellaria elegans* Sowerby, 1822 as synonyms (cf. Shuto, 1969 and Cernohorsky, 1972; Verhecken, 1985). According to the specimens figured in the literature and referred to as either *asperella* or *elegans*, it appears that two lots are distinguishable. The first includes shells with somewhat stepped, flat-sided spire, expanded body whorl and wide aperture; the sculpture consists of collabral ribs overridden by finer spirals. The second comprises usually slenderer, more fusiform shells with cyrtconoid spire, ovate body whorl and comparatively narrower aperture; these shells are sculptured with finer and more numerous ribs overridden by spirals nearly of the same strength, giving a rectangular reticulated pattern. There seem to be no intermediate specimens. The first lot fits in with the characters of *Cancellaria asperella*, whereas the second lot belongs to *Cancellaria elegans*. We regard these two taxa as distinct.

Distribution and habitat

Cancellaria asperella ranges in the West Pacific, from Australia to Japan. It is an infralittoral element dwelling on sandy and muddy substrates.

Fossil records

Pliocene of Myanmar, Indonesia, Philippines, Taiwan and Japan (Cox, 1948; Shuto, 1969; Popenoe & Klein-

pell, 1978; Skwarko & Sufiati, 1994); Quaternary of Philippines, Japan and New Hebrides (Cox, 1948; Shuto, 1969; Popenoe & Kleinpell, 1978; Ladd, 1982; Skwarko & Sufiati, 1994).

Cancellaria elegans Sowerby, 1822 Fig. 19 d, e

1849 *Cancellaria elegans* Sowerby, p. 446, pl. 93, fig. 36; pl. 96, fig. 104 (reprint 1985).
 1935 *Cancellaria (Cancellaria) reeveana* Nomura, p. 131, pl. 6, fig. 63.
 1965 *Merica asperella* Kira, p. 91, pl. 32, fig. 22.
 1972 *Cancellaria asperella* Cernohorsky, p. 179, pl. 50, fig. 3, right.
 1975 *Cancellaria asperella* Oliver, p. 262, fig. in front page.
 1981 *Cancellaria reeveana* Eisenberg, p. 132, pl. 114, fig. 14.
 1982 *Cancellaria elegans* Abbott & Dance, p. 225, fig. in bottom row, middle left.
 1982 *Cancellaria reeveana* Abbott & Dance, p. 225, fig. in bottom row, right.
 Not 1985 *Cancellaria elegans* Wilson & Gillett. p. 235, pl. 57, fig. 2 (= *Cancellaria asperella* Lamarck, 1822).
 Not 1994 *Cancellaria elegans* Wilson, p. 174, pl. 37, fig. 21 (= *Cancellaria asperella* Lamarck, 1822).
 Not 1998 *Cancellaria elegans* Harasewych & Petit in Beesley *et al.*, fig. 15.172 A (= *Cancellaria asperella* Lamarck, 1822).
 2001 *Merica elegans* Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 133, fig. 461.

Diagnostic characters are 1) ovate-fusiform, rather tall-spined shell up to 40 mm in height, 2) spire moderately cyrtconoid 3) whorls convex, with a very narrow and shallow adapical furrow, sutures slightly channeled, 4) body whorl oval, tapering at the base and with prominent fasciole, 5) aperture nearly D-shaped, outer lip thick and lirate within, parietal callus rather wide, columella with 3 oblique plaits, 6) sculpture of numerous collabral riblets overridden by spiral cords and intervening threads; 26 axials occur on earlier whorls, about 40 on the body whorl; the primary spirals are about of the same strength of the riblets and form a rectangular reticulated pattern.

Remarks

Cancellaria reeveana Crosse, 1861 is a junior synonym. *Cancellaria sinensis* Reeve, 1856 is strikingly similar and was regarded as a subspecies of Sowerby's taxon by some authors (cf. Kira, 1965; Kuroda *et al.*, 1971). It differs in having distinctly tilted protoconch, angled at 45° to the axis of teleoconch (Garrard, 1975; Hasegawa in Okutani, 2000), unchanneled sutures and more fine and dense sculpture. The Indian Ocean *Cancellaria melanostoma* Sowerby, 1849 and its Australian subspecies *westralis* Garrard, 1975 are very similar too, but differ in that have more deeply channeled sutures, more expanded body whorl and the axials that are as many as 65 on the body whorl.

Distribution and habitat

Cancellaria elegans is distributed from Thailand to the Philippines and Japan. The species was cited from various depths in the infralittoral zone. Except for this, there is no information about its ecological requirements.

Fossil records

Miocene of Indonesia (Skwarko & Sufiati, 1994); Pliocene and Quaternary of Japan (Nomura, 1935).

Superfamilia CONOIDEA
Familia TURRIDAE
Subfamilia TURRINAE

Epidirona multiseriata (Smith, 1877)
Fig. 19 f-h

1877 *Pleurotoma multiseriata* Smith, p. 491.
1964 *Epidirona multiseriata* Powell, p. 299, pl. 230, fig. 3.
1983 *Epidirona multiseriata* Kilburn, p. 583, figs. 56-58.

Distinctive characters are 1) fusiform, *Drillia*-like, rather solid shell attaining 19 mm in height, 2) protoconch of 2.5 whorls, the first depressed and with uneven granules, the rest carinated, transition to the teleoconch sharply marked by the appearance of adult sculpture, 3) spire conical and straight-sided, whorls axially compressed, sutures fine and slightly impressed, 4) body whorl about 60% of total height, rather rapidly tapering at the base toward a very short neck, 5) aperture rhomboid ending in a short and shallow canal, inner lip callosed, labial sinus roundly V-shaped with its apex on the upper part of the peripheral row of nodes, 6) earliest sculpture consisting of a subsutural cord and 1 spiral row of prominent nodes at the abapical one-third; the subsutural cord becomes nodulose by the second whorl; the nodes of both subsutural and peripheral rows gradually become axially elongated, giving the spirals a massive cog-like aspect; the subsutural nodes are retractive and alternate with the peripheral ones that are stronger and protractive; 15 nodes (peripheral) occur on the first whorl, 19 over the body whorl; 1 spiral thread intervenes between the two rows of nodes by the fifth whorl; base with thin collabral riblets overridden by 6 spiral cords to form a square-reticulated pattern with nodes at the intersections; 5 plain spirals occur over the neck.

Remarks

Shuto (1983) erected the new subgenus *Coronacomitas* (of *Paradrillia* Makiyama, 1940) and its new species *gemmata* to allocate Australian shells that appear to be quite close, if not identical, to the present taxon. However, the relationships between the two forms require the examination of the type material to be elucidated.

Distribution and habitat

Epidirona multiseriata is distributed in the Indo-West Pacific, from South Africa to Persian Gulf, Malaya, Thailand and South China Sea. It seems to be a sublittoral element dwelling in sandy and muddy substrates.

Fossil records

None recorded.

Subfamilia CRASSISPIRINAE

Ceritoturris thailandica n. sp.
Fig. 19 i-l

Etymology

With reference to the type locality in the Gulf of Thailand.

Holotype

TH 158 D (Fig. 19 i-l), MSNM i26944, dimensions (mm).
H: 2.7; D: 1.1; ha: 0.9; MSA: 35°.

Paratypes

TH 158 D (6 spms.), MSNM i26945-i26950; TH 159 (4 spms.), MNSM i26951-i26954; TH 160 (2 spms), MSNM i26955-i26956.

Type locality

Offshore station TH 158 D, about 20 km southeast of Ban Laem Phak Bia, depth 21.60 m.

Description

Ceritoturris thailandica n. sp. is distinguished by 1) narrowly claviform, high-spired shell attaining 3.7 mm in height, 2) protoconch large, low-conical, of 3.5 whorls, the last 2 with increasingly sharp median keel, subsutural thread developed over the last whorl, last quarter of whorl with microscopic granules, transition to teleoconch marked by a distinct, opisthocline sinusigera lip, 3) earlier spire whorls angular in the middle, the rest biangulate, sutures shallowly impressed, 4) body whorl slightly less than 50% of total height, gradually tapering at the base toward a very short neck, 5) aperture oval, abapical canal short, wide and unnotched, outer lip slightly arched forward, thin edged, backed by a broad, low varix, parietal callus pad projecting toward the anal sinus and constricting its entrance, anal sinus c-shaped, occupying the entire shoulder slope, 6) sculpture of short collabral ribs overridden by spiral cords; the ribs, 10 on the first whorl, 11-12 on the penultimate, are low, as wide as interspaces and vanish before reaching both the adapical and abapical sutures; the median and the finer subsutural spirals appear immediately (respectively as continuation of protoconch keel and subsutur-

al thread), the abapical cord develops after a quarter of whorl and remains slightly weaker than the median one, this latter and the abapical one forming prominent nodes on crossing the ribs; a weak cord emerges from the abapical suture by the third whorl; base with 8 spirals, those over the neck stronger; the whole surface is covered with microscopic granules.

Remarks

Ceritoturris bittium Dall, 1924, type species (original designation) of the genus *Ceritoturris* Dall, 1924, differs in having less angular whorls and weaker sculpture. The South African *Ceritoturris nataliae* Kilburn, 1988, also related, differs in that has more strongly angular whorls,

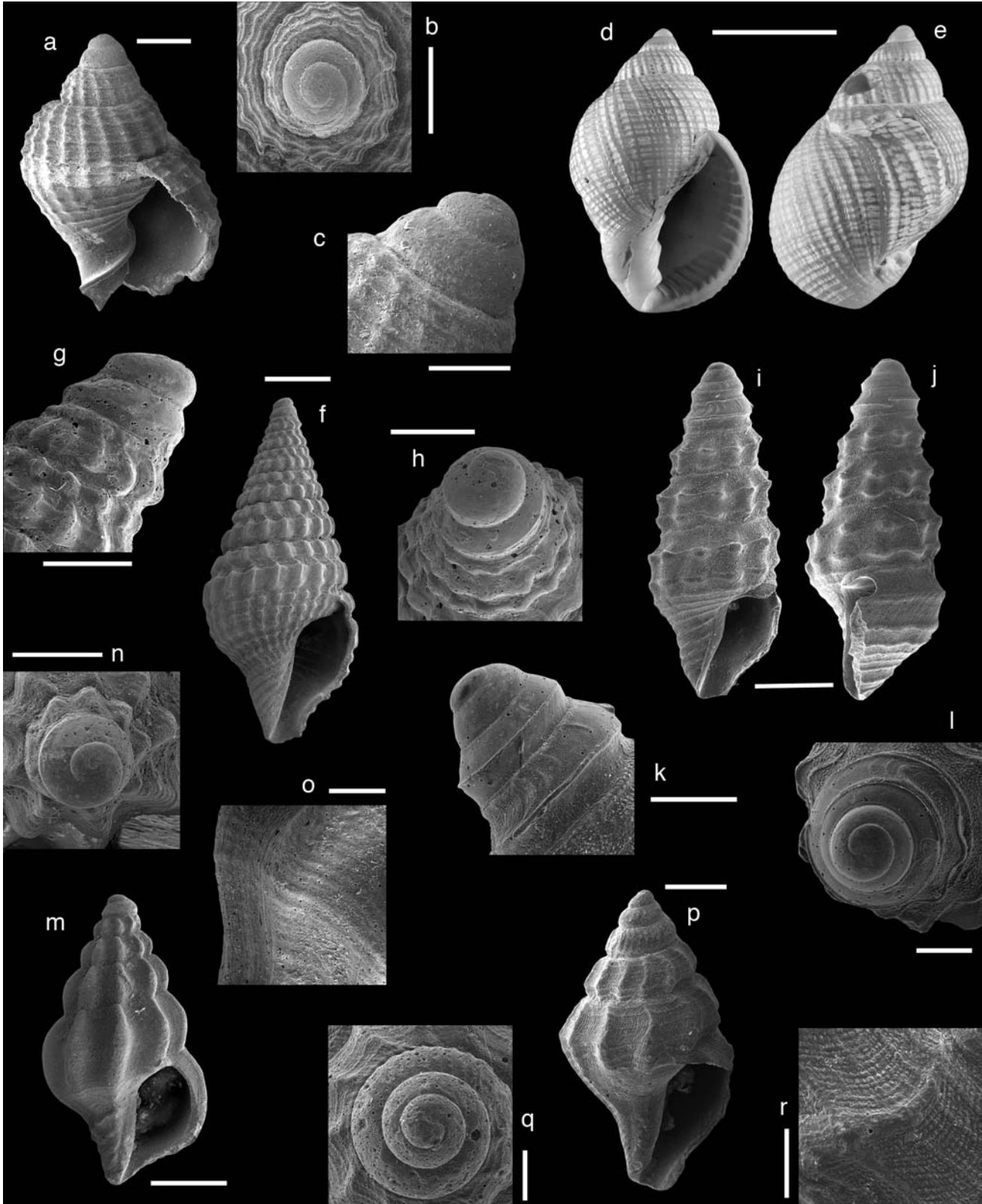


Fig. 19. a-c. *Cancellaria asperella* Lamarck, 1822; Station TH 32, a, b. scale bars 1 mm, c. scale bar 0.5 mm; d-e. *Cancellaria elegans* Sowerby, 1822; Laem Talumphuk Spit (Pak Phanang Bay); scale bar 1.4 cm; f-h. *Epidirona multiseriata* (Smith, 1877); Station TH 108A, f. scale bar 1.5 mm, g, h. scale bars 0.5 mm; i-l. *Ceritoturris thailandica* n. sp.; Station TH 158D (holotype, MSNM i26944), i, j. scale bar 0.5 mm, k. scale bar 0.25 mm, l. scale bar 0.2 mm; m-o. *Graciliclava costata* (Hedley, 1922); Station TH 108D, m. scale bar 1 mm, n. scale bar 0.5 mm, o. scale bar 0.2 mm; p-r. *Gingicithara* sp. 1; Station TH 159, p. scale bar 0.5 mm, q, r. scale bars 0.2 mm.

nearly obconic base, 8-9 ribs and a spiral thread over the shoulder slope whereas the present form has not.

Graciliclava costata (Hedley, 1922)

Fig. 19 m-o

1922 *Clavus costatus* Hedley, p. 256, pl. 45, figs. 48, 49.

1983 *Graciliclava mackayensis* Shuto, p. 11, pl. 1, figs. 2-5; text-fig. 6 (1-5).

1991 *Clavus costatus* Wells, p. 8, pl. 2, figs. 10, 11.

1994 *Graciliclava costata* Kilburn, p. 224, figs. 94, 95.

Distinctive characters are 1) claviform shell attaining 9 mm in height, 2) protoconch of 2 whorls, the first depressed and smooth, the second with a distinct sub-medial keel, transition to teleoconch marked by a sinusigera lip, 3) spire straight-sided, whorls convex, sutures impressed, slightly undulating, 4) body whorl broadly oval, about 60% of total height, constricted at the base toward a short neck, 5) aperture sub-rhomboid, inner lip callused, labial sinus broad and very shallow, stromboid notch deep and narrow, 6) sculpture of collabral ribs overridden by dense spiral lines; the ribs, 10 throughout, are fold-like, continuous from whorl to whorl, gradually attenuated over the base; the spiral lines are more distinct on crossing the ribs, obsolescent in the furrows between the latter; a spiral cord, made granular by the ends of the ribs, marks the transition to the neck that bears 4 approximated cords.

Remarks

The Thai specimens conform to the figure of the holotype published by Kilburn (1994). We concur with the latter author in considering *Graciliclava mackayensis* Shuto, 1983 as a synonym of Hedley's taxon.

Distribution and habitat

Graciliclava costata was hitherto known from Australian waters. It seems to be an infralittoral element; there is no information about its substrate requirements.

Fossil records

None recorded.

Subfamilia MANGELIINAE

Gingicithara sp. 1

Fig. 19 p-r

A single juvenile specimen 2.7 mm high, featured by 1) broadly fusiform, nearly biconic shell, 2) protoconch conical, of 3 convex whorls, the last half whorl with gently arcuate, slightly opisthocline collabral riblets that vanish close to the abapical suture, but do not reach it, 3) earliest spire whorls shaped like a segment of a cone, constricted both adapically and abapically, meeting at deeply im-

pressed sutures, 4) base nearly obconic, with apparently short neck, 5) sculpture of thin collabral ribs overridden by spiral threads and cords; the ribs, 13 throughout, are somewhat sigmoid, markedly narrower than interspaces and seem to fade away on middle base; the spirals consist of 3 threads, soon increasing to 4, on the broad shoulder slope, 1 peripheral and 1 abapical cords; the whole surface exhibits a microcancellate pattern.

Remarks

The present specimen is assigned to the genus *Gingicithara* Kilburn, 1992 on the basis of general shell shape and cancellate microsculpture.

Ithycythara apicodenticulata n. sp.

Fig. 20 a-d

Etymology

From Latin *apex* = tip and *denticulatus* = bearing denticles, with reference to the cog-like aspect of the last protoconch whorl.

Holotype

TH 159 (Fig. 20 a), MSNM i26957, dimensions (mm). H: 4.4; D: 1.6; ha: 1.1; MSA: 30°.

Paratypes

TH 158 D (6 spms.), MSNM i26958-i26963; TH 160 (1 spm.), MSNM i26964.

Type locality

Offshore station TH 159, about 26.7 km southeast of Ban Laem Phak Bia, depth 23.60 m.

Description

Ithycythara apicodenticulata n. sp. is featured by 1) fusiform, rather tall-spined shell attaining 4.5 mm in height, 2) protoconch conical, of 3.25 whorls, the first 2 convex and smooth, the rest with a submedian, prominent keel and collabral riblets forming strong nodes on crossing the keel and giving it a cog-like aspect, transition to teleoconch marked by the appearance of the adult sculpture, 3) spire whorls convex, meeting at fine, impressed sutures, 4) body whorl oval, about 51% of total height, somewhat constricted at the base toward a very short neck, 5) aperture subquadrangular, narrow, continuing in a rather deep, unnotched abapical canal, outer lip thin, backed by a varix and with 5 inner tubercles of decreasing strength downward, inner lip thin, bearing 1 parietal and 2 columellar elongate tubercles, anal sinus wide and shallow, reverse J-shaped, inclined downward, located between the suture and the periphery, 6) sculpture of rounded, prominent collabral ribs overridden by spiral cords; the ribs, 8 throughout, are

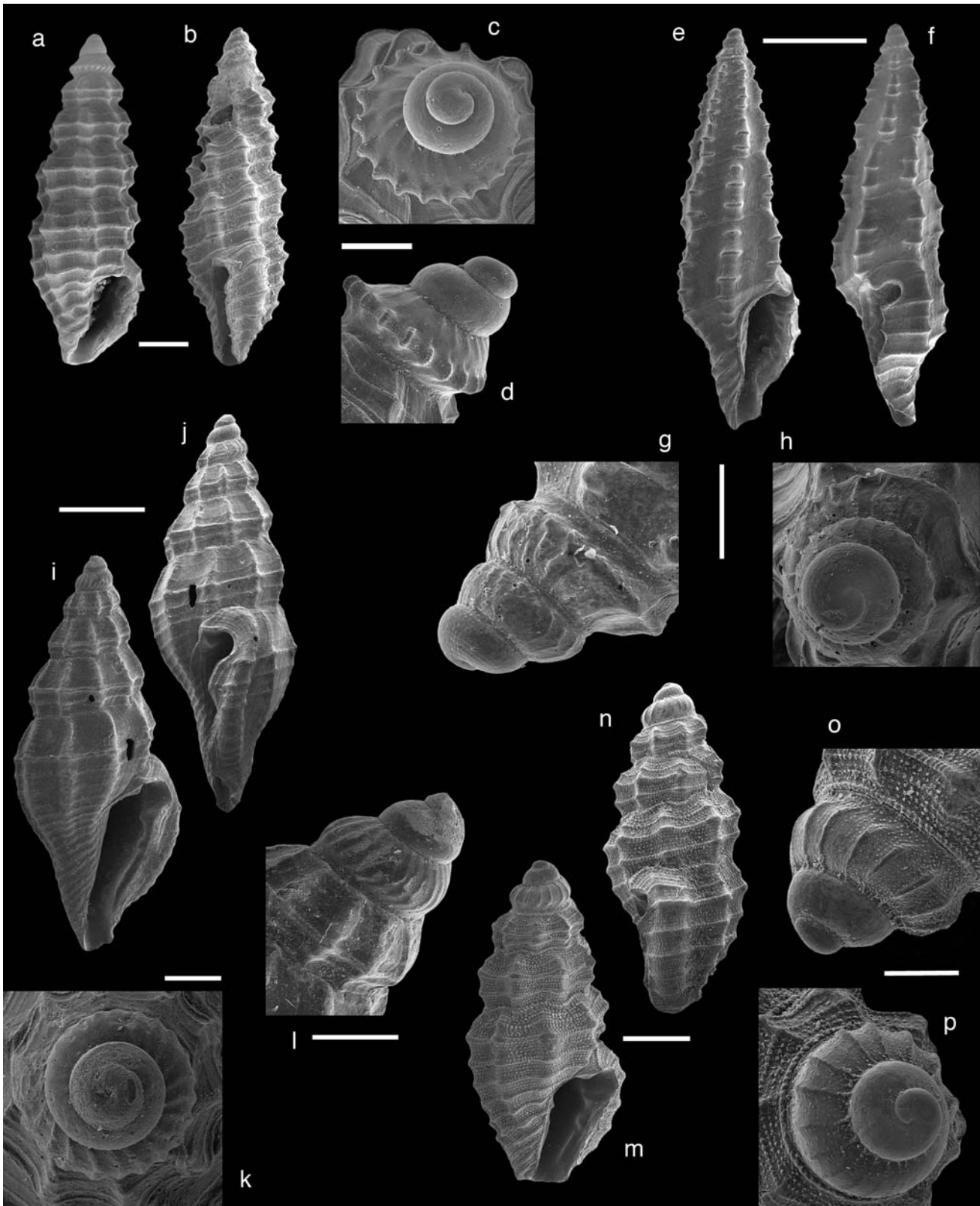


Fig. 20. a-d. *Ithycythara apicodenticulata* n. sp., a. Station TH 159 (holotype, MSNM i26957), b. Station TH 160 (paratype, MSNM i26964), c, d. Station TH 158D (paratype, MSNM i26958), a, b. scale bar 0.65 mm, c, d. scale bar 0.2 mm; e-h. *Ithycythara funicostata* n. sp.; Station TH 158D (holotype, MSNM i26965), e, f. scale bar 1.25 mm, g, h. scale bar 0.2 mm; i-l. *Leiocithara* sp. 1; Station TH 158D, i, j. scale bar 1.25 mm, k. scale bar 0.2 mm, l. scale bar 0.25 mm; m-p. *Pseudorhaphitoma heptagona* (Dunker, 1871); Station TH 158D, m, n. scale bar 0.5 mm, o, p. scale bar 0.2 mm.

aligned from whorl to whorl, narrower than the intervening furrows and vanish on lower base; 3 primary spirals appear immediately, the adapical one somewhat weaker, 1 thread develops between the latter and the suture on the second whorl, another one appears between spirals 2 and 3 on the third whorl, 8 spirals occur over the base; microscopic granules obscurely arranged

into spiral rows are noted on and below the protoconch keel as well as on the teleoconch spirals.

Remarks

The assignment to the genus *Ithycythara* Woodring, 1928 is based on 1) protoconch characters, 2) apertural fea-

tures, and 3) the ribs continuous from whorl to whorl. The genus *Ithythythara* is reported to include two Indo-Pacific species, i.e., *Ithythythara septemcostata* (Schepman, 1913) and *Ithythythara oyuuana* (Yokoyama, 1922). The former differs from the present form in having greater spiral angle, more distant ribs (7 instead of 8) and only 1 spiral thread on spire whorls. The latter appears to be more closely related, but has weaker, more numerous spirals and longer abapical canal.

Ithythythara funicostata n. sp.
Fig. 20 e-h

Etymology

From Latin *funis* = cord and *costatus* = ribbed, with reference to the ribs bearing cord-like nodes.

Holotype

TH 158 D (Fig. 20 e-h), MSNM i26965, dimensions (mm). H: 5.2; D: 1.6; ha: 1.7; MSA: 25°.

Paratypes

TH 160 (4 spms.), MSNM i26966-i26969.

Type locality

Offshore station TH 158 D, about 20 km southeast of Ban Laem Phak Bia, depth 21.60 m.

Description

Ithythythara funicostata n. sp. is featured by 1) slenderly fusiform, tall-spined shell attaining 5.5 mm in height, 2) protoconch conical, of slightly more than 3 whorls, the first 1.5 whorls convex and with granulose spirals, the rest with an increasingly sharp angulation at the abapical one-third and fine collabral riblets that are retractorily arched above the angulation, do not reach the abapical suture and form small nodes on crossing the keel over the last half whorl, transition to teleoconch marked by the appearance of the adult sculpture, 3) spire whorls (4.5) very gently convex, meeting at fine, impressed, undulating sutures, 4) body whorl elongately-oval, about 55% of total height, somewhat constricted at the base toward a short neck, 5) aperture narrowly oval, continuing in a rather deep, unnotched abapical canal, outer lip thin, backed by a varix and with 6 inner ribs not reaching the peristome, inner lip with moderately thick callus somewhat detached from the body whorl at its edge and bearing 2 obscure adapical tubercles, anal sinus deep, U-shaped, slightly constricted at the entrance and inclined downward, located halfway between the suture and the periphery, 6) sculpture of rounded and prominent collabral ribs overridden by spiral cordlets; the ribs, 7 throughout, are aligned from whorl to whorl, narrower than the intervening furrows and vanish on lower base; the spirals, 3 to the whorl,

form elongate nodes on crossing the ribs whereas are obsolescent in the interspaces; a fourth spiral partially emerges from the abapical suture by the third whorl and a weaker one develops between spirals 2 and 3 on the body whorl; 8 spirals occur over the base, those on the neck more approximate and devoid of nodes.

Remarks

The spirally corded ribs stand as the most distinctive character.

Leiocithara sp. 1
Fig. 20 i-l

A single specimen 6.5 mm high, featured by 1) fusiform, moderately high-spined shell, 2) protoconch conical, of slightly more than 3 convex whorls (tip abraded), the last 1.25 with retractorily arched riblets of increasing strength, transition to teleoconch marked by the appearance of adult sculpture, 3) spire whorls with mid-abapical angular periphery and broad, steep shoulder slope, sutures fine, shallowly impressed, 4) body whorl about 60% of total height, base rather quickly tapering toward a moderately long neck, 5) aperture narrow, with greatest width about at the adapical third, gradually merging into the short, unnotched abapical canal, outer lip apparently thin-edged, backed by a prominent, rather narrow varix and with 2 somewhat ridge-like adapical inner tubercles, parietal tubercle moderate, also ridge-like, anal sinus rather shallow, openly U-shaped and with longer upper rim, occupying the entire shoulder slope, 6) sculpture of collabral ribs and overriding spiral cords and threads; the ribs, 10 throughout, are markedly narrower than interspaces and vanish at the adapical end of the neck; the spirals consist of few rather faint threads on the shoulder slope and 2 cords, respectively peripheral and abapical; a suprasutural cord and a thread adapical to the latter develop on the third whorl; 14 spiral cords occur on the base abapical to the level of the suture, those over the neck slightly coarser and approximate.

Remarks

The present form matches the characters of the genus *Leiocithara* Hedley, 1922, as pointed out by Kilburn (1992). It is distinguished from the other *Leiocithara* species described from the Indo-Pacific primarily in having the periphery of the whorls placed more abapically and, thence, a broader shoulder slope. *Leiocithara* sp., described and illustrated by Robba *et al.* (2004; p. 143, pl. 19, fig. 11), has a different protoconch.

Pseudorhaphitoma heptagona (Dunker, 1871)
Fig. 20 m-p

1871 *Clathurella heptagona* Dunker, p. 161.

1993 *Pseudorhaphitoma heptagona* Kilburn, p. 349, figs. 54, 55.

Distinctive characters are 1) slenderly claviform, moderately high-spined shell attaining 4.4 mm in height, 2) protoconch rather large, broadly conical, of 2.5 convex whorls, the last with retractively arched riblets and sparse granules, transition to teleoconch marked by the appearance of adult spirals, 3) spire whorls subangular, with the periphery slightly adapical to the middle, meeting at impressed sutures, 4) body whorl about 55% of total height, base rapidly tapering, nearly obconic, 5) aperture narrowly subrectangular, outer lip thin-edged, backed by a broad varix and with 2 inner tubercles, the adapical one prominent and just anterior to the anal sinus, the middle one smaller, inner lip slightly callused with moderate parietal tubercle, anal sinus rather deep, U-shaped, occupying the shoulder slope, but not touching the suture, 6) sculpture of collabral ribs overridden by spiral cords; the ribs, 9 throughout, are as wide as interspaces, aligned from whorl to whorl and vanish on lower base; the spirals, 3 to the whorl, that over the peripheral angulation somewhat stronger, form low, elongate nodes on crossing the ribs; 1 abapical cord occasionally emerges from the abapical suture by the second whorl; 7-8 spirals occur over the base; microscopic granules arranged into spiral rows are noted throughout.

Remarks

The nearly obconic base (not constricted at all) appears to be a relevant distinguishing character. Compared to the neotype (cf. Kilburn, 1993), the Thai shells have 9 instead of 7 ribs, but are otherwise identical.

Distribution and habitat

Pseudorhaphitoma heptagona was so far known only from Western Samoa Islands. There is no information about its ecological requirements.

Fossil records

None recorded.

Pseudorhaphitoma sp. 5

Fig. 21 a-d

Two specimens featured by 1) slenderly claviform, high-spined shell attaining 5 mm in height, 2) protoconch broadly conical, of slightly more than 3 convex whorls, the last expanded, with retractively arched riblets and subsutural wrinkles, transition to teleoconch marked by the appearance of adult spirals, 3) spire whorls angular in the middle, sutures shallowly impressed, slightly undulating, 4) body whorl 52% of total height, gradually tapering at the base toward a very short neck, 5) aperture narrowly subrectangular, outer lip thin edged, backed by a prominent varix and with moderate tubercle just anterior to the anal sinus, inner lip slightly callused, with small parietal tubercle, anal sinus openly U-shaped, occupying the shoulder slope, but not in contact with the suture, 6) sculpture of collabral ribs overridden by 1 spiral cords and threads; the

ribs, 8 throughout, are prominent, slightly narrower than interspaces and vanish at the upper end of the neck; the spirals consist of 1 thread over the shoulder slope, 1 peripheral cord and 10 basal cords; microscopic granules arranged into spiral rows occur throughout.

Remarks

The present form seems to be unlike any other *Pseudorhaphitoma* species described from the Indo-Pacific. *Pseudorhaphitoma transitans* Hedley, 1922 appears to be the most closely related taxon, but differs in having stouter shell, 7 ribs to the whorl and 2 cords, respectively peripheral and abapical, on spire whorls.

Pseudorhaphitoma sp. 6

Fig. 21 e-h

Four specimens 3.5 mm high, featured by 1) slenderly claviform, moderately high-spined shell, 2) protoconch large, dome-shaped, of 3 whorls, the last biangulate, with 2 spiral rows of strong tubercles (1 on each angulation) that alternate from one row to other, and with thin axials connecting the tubercles over the last quarter, 3) spire whorls convex meeting at impressed, undulating sutures, 4) body whorl pear-shaped, about 60% of total height, gradually tapering, 5) aperture narrowly subrectangular, outer lip thin-edged, backed by a rather prominent and broad varix and with 3 inner tubercles, the adapical one stronger, inner lip thinly callused, with small parietal tubercle and 2 slightly ascending columellar plaits, anal sinus shallow, extending from the adapical suture to the periphery, 6) sculpture of collabral ribs overridden by spiral cords slightly stronger on crossing the ribs; the ribs, 8 throughout, are as wide as the interspaces and vanish on lower-mid base; 5 cords occur on spire whorls, respectively subsutural, mid-adapical, peripheral, abapical and suprasutural, the first two weaker, the last only partly emerging from the suture, and another 6 cords occur over the base; microscopic granules occur throughout except for the protoconch and the space between spirals 2 and 3.

Remarks

The protoconch, standing as the most distinctive character, is somewhat reminiscent of that of the Mediterranean and Atlantic genus *Bela* Gray, 1847 also having spiral rows of smaller tubercles (ordinarily more than 2). The assignment to the genus *Pseudorhaphitoma* Boettger, 1895 is made with much hesitation, mainly on the basis of overall shell shape and presence of granular microsculpture.

Subfamilia CLATHURELLINAE

Etrema acricula Hedley, 1922

Fig. 21 i-l

1922 *Etrema acricula* Hedley, p. 274, pl. 46, fig. 69.
? 1979 *Etrema acricula* Kay, p. 352, fig. 116 E.

A single specimen 3 mm high, featured by 1) fusiform, somewhat turreted shell, 2) protoconch broadly conical, of 3 whorls, the first 2 convex and with tilted tip, the last with a submedian angulation gradually changing into a sharp mid-abapical keel, transition to teleoconch abrupt, marked by a sinusigera lip, 3) spire whorls (about 3) angular in the middle, sutures shallowly impressed, slightly undulating, 4) body whorl slightly more than 50% of

total height, moderately constricted at the base toward a short neck, 5) aperture narrowly oval, abapical canal wide and rather deep, outer lip thin edged, apparently bent inward, backed by a varix and with 3 mid-adapical inner tubercles, the adapical one stronger, somewhat constricting the entrance of the anal sinus, inner lip thinly callused, with blunt parietal tubercle and 2 nearly horizontal columellar plaits, anal sinus deep, U-shaped,

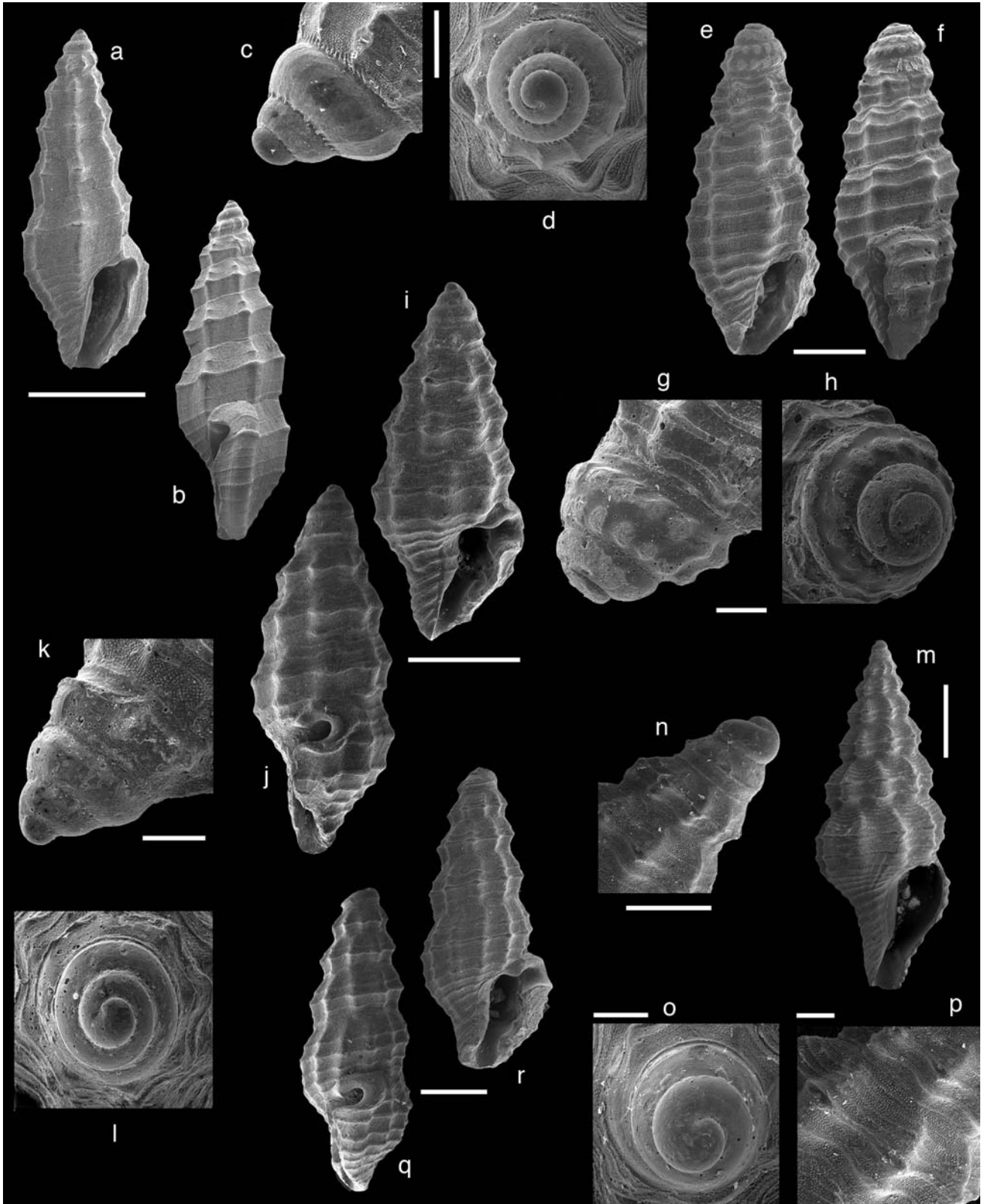


Fig. 21. a-d. *Pseudorhaphitoma* sp. 5; Station TH 158D, a, b. scale bar 1.6 mm, c, d. scale bar 0.2 mm; e-h. *Pseudorhaphitoma* sp. 6; Station TH 158D, e, f. scale bar 0.75 mm, g, h. scale bar 0.2 mm; i-l. *Etrema acricula* Hedley, 1922; Station TH 158D, i, j. scale bar 1 mm, k, l. scale bar 0.2 mm; m-p. *Etrema spurca* (Hinds, 1844); Station TH 157D, m. scale bar 1.5 mm, n. scale bar 0.5 mm, o. scale bar 0.2 mm, p. scale bar 0.15 mm; q-r. *Etrema* sp. 1; Station TH 158D; scale bar 0.75 mm.

with thick, somewhat everted rim, occupying the shoulder slope but not in touch with the suture, 6) sculpture of collabral ribs overridden by spiral cords and threads forming small nodes on crossing the ribs; the ribs, 9 throughout, are low, round-topped, slightly wider than interspaces, and vanish at the adapical end of the neck; the spirals consist of 2 threads on the shoulder slope, 1 cord over the peripheral angulations, 1 emerging from the abapical suture and becoming manifest on the body whorl; 9 cords occur over the base; the whole teleoconch surface bears microscopic granules.

Remarks

Records from Hawaiian Islands are doubtful, since those shells are reported to have 4.5 to 5.5-whorled greater protoconch (cf. Kay, 1979).

Distribution and habitat

Etrema acricula was so far known to range from the Red Sea to Australia. It seems to be an infralittoral element.

Fossil records

None recorded.

Etrema spurca (Hinds, 1843) Fig. 21 m-p

- 1843b *Clavatula spurca* Hinds, p. 39.
1913 *Lienardia spurca* Schepman, p. 436.
1922 *Etrema spurca* Hedley, p. 284, pl. 48, fig. 86.
1978 *Etrema spurca* Cernohorsky, p. 157, pl. 56, fig. 7.
1995 *Etrema spurca* Bosch, Dance, Moolenbeek & Oliver, p. 166, fig. 732.

Four not fully grown specimens (6 teleoconch whorls) whose apertural characters have not developed yet. The observable features are 1) fusiform shell about 9.0 mm high, 2) protoconch conical, smooth, of 2.25 whorls, the first convex, the rest with a submedian angulation gradually changing into a sharp mid-abapical keel, transition to teleoconch abrupt, marked by the appearance of the adult sculpture, 3) spire whorls bi-angulated, with rather wide shoulder slope, meeting at poorly distinct sutures, 4) body whorl about one-half the total height, quickly attenuated at the base toward a moderately long neck, 5) anal sinus deep, openly U-shaped, occupying the entire shoulder slope, 6) sculpture of broad collabral ribs overridden by spiral cords and threads; the ribs, 10 throughout, are prominent at the periphery, weaken over the shoulder slope hardly reaching the adapical suture and vanish on upper base; 2 primary spirals, peripheral and abapical, are present on earlier whorls enhancing their bi-angulated outline, and form spirally elongated, low nodes on crossing the ribs; an additional spiral emerges from the abapical suture on the fourth whorl and soon reaches the same strength of the other

two; 4 spiral threads, increasing to 5 during growth, occur on the shoulder slope, 1 intervenes between the 3 main cords; body whorl with 17 basal spirals, those over the neck even and smooth; the whole surface bears microscopic granules arranged into spiral rows.

Distribution and habitat

Etrema spurca is distributed in the tropical Indo-West Pacific, from the Persian Gulf to Australia and Southeast Asia. It is reported to occur on mud, sand and coarser substrates, in the infralittoral zone.

Fossil records

None recorded.

Etrema sp. 1 Fig. 21 q, r

A single specimen 3.7 mm high (incomplete), characterized by 1) slenderly fusiform shell, 2) protoconch apparently of planktotrophic type, the last whorl (preserved part) with a mid-abapical keel, 3) earlier spire whorls angular, subsequent ones less so, sutures shallowly impressed, 4) body whorl about 55% of total height, with rounded periphery, moderately constricted at the base, neck incomplete, apparently short, 5) aperture narrowly oval, abapical canal deep, outer lip thin edged, backed by a moderately prominent varix and with 4 inner tubercles, inner lip slightly callused, with blunt parietal tubercle and 2 subhorizontal columellar plaits, anal sinus deep, U-shaped, with thick, distinctly everted rim, occupying the shoulder slope but not in touch with the suture, 6) sculpture of collabral ribs overridden by spiral cord and threads forming small nodes on crossing the ribs; the ribs, 10 on the first whorl, 13 over the body whorl, are round-topped, moderately prominent, as wide as interspaces and vanish at the upper end of the neck; 1 spiral thread on the shoulder slope, 1 peripheral cord and a suprasutural thread appear immediately, 1 abapical thread develops by the third whorl, the threads changing into cords over the body whorl; the latter bears, besides these spirals, one more adapical thread and 7 basal cords; the whole teleoconch surface is covered with microscopic granules.

Remarks

The present form resembles *Etrema acricula* Hedley, 1922, but differs in having slenderer shell, convex instead of angular periphery of the body whorl, one more inner tubercle on the outer lip and more numerous ribs.

Neopleurotomoides sp. Fig. 22 a-c

Four juvenile specimens not exceeding 4 mm in height, characterized by 1) fusiform shell, 2) protoconch conical,

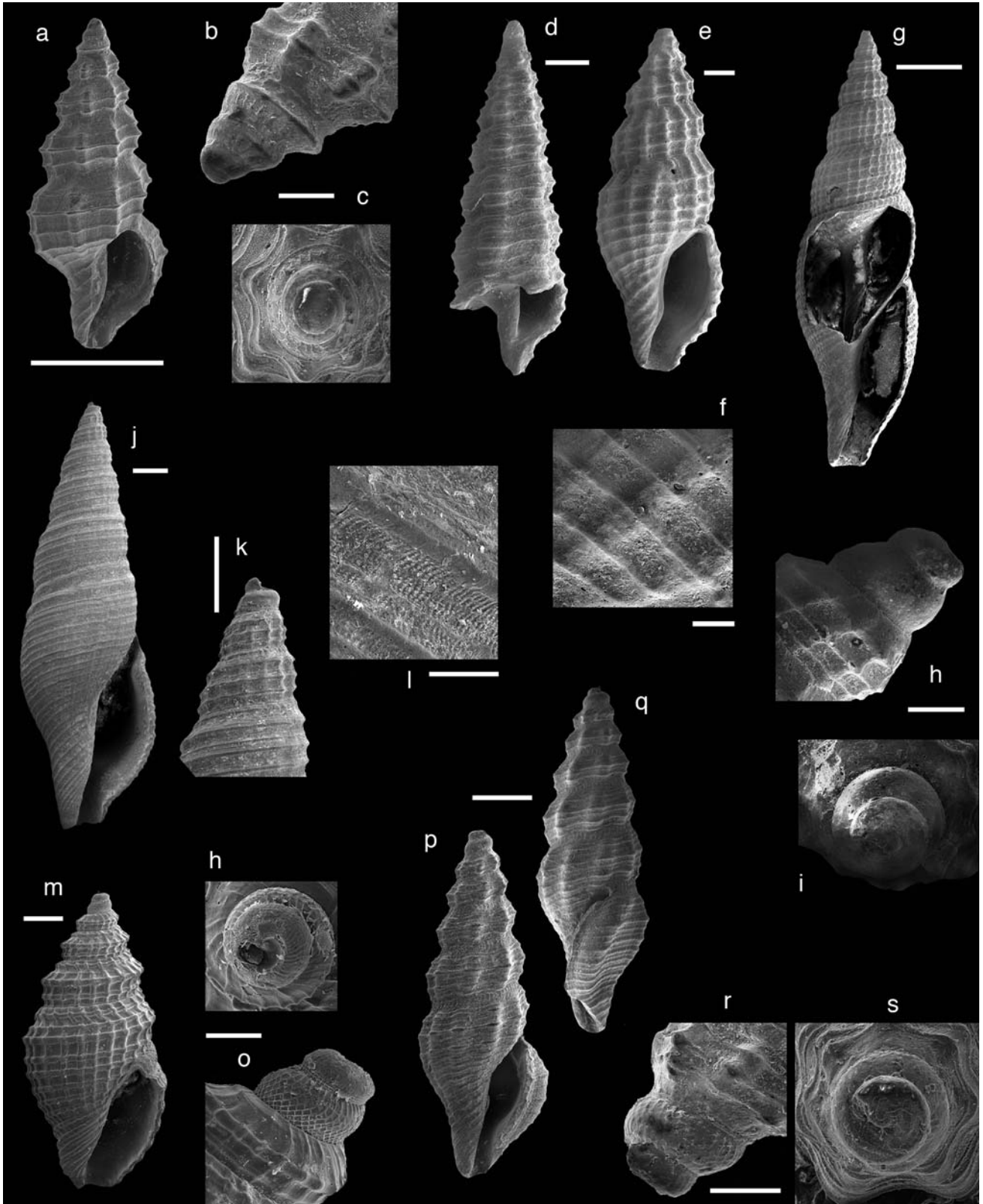


Fig. 22. **a-c.** *Neopleurotomoides* sp.; Station TH 158D, **a.** scale bar 1.5 mm, **b, c.** scale bar 0.2 mm; **d.** *Pseudoetrema* sp.; Station TH 108D; scale bar 0.7 mm; **e-f.** *Clathurellinae* sp.; Station TH 108D, **e.** scale bar 0.5 mm, **f.** scale bar 0.2 mm; **g-i.** *Antimitra celebensis* (Schepman, 1913); Station TH 108D, **g.** scale bar 1.8 mm, **h, i.** scale bar 0.2 mm; **j-l.** *Hemidaphne axis* (Reeve, 1846); Station TH 161C, **j.** scale bar 1.25 mm, **k.** scale bar 1 mm, **l.** scale bar 0.2 mm; **m-o.** *Taranidaphne amphitrites* (Melvill & Standen, 1903); Station TH 161C, **m.** scale bar 0.5 mm, **n, o.** scale bar 0.2 mm; **p-s.** *Vepridaphne cestrum* (Hedley, 1922); Station TH 161C, **p, q.** scale bar 0.65 mm, **r, s.** scale bar 0.2 mm.

cal, of 3.5 whorls, the first 1.5 convex and smooth, the rest with an increasingly prominent mid-abapical keel and opisthocyrt collabral riblets above the keel, 3) spire whorls (3) convex, sutures impressed, slightly undulating, 4) body whorl over 55% of total height, rather quickly constricted at the base toward a short, slightly twisted neck, 5) aperture oval, abapical canal moderate-

ly wide and shallow, anal sinus subsutural, broadly U-shaped, 6) sculpture of collabral ribs overridden by spiral cords; the ribs, 8 on the first whorl, 10 on the third (penultimate), are prominent, round-topped, narrower than interspaces, do not reach the adapical suture and vanish on lower base; the spirals, 3 to the whorl plus an abapical one emerging from the suture, form elongate

nodes on crossing the ribs; body whorl with 11 primary spirals and some intervening threads; anal band with distinct scars of the anal sinus; microscopic granules arranged into spiral rows occur throughout.

Remarks

The present form is provisionally assigned to the genus *Neopleurotomoides* Shuto, 1971 on the basis of some resemblance to *Neopleurotomoides rufoapicatus* (Schepman, 1913), type species of that genus. However, the protoconch of Schepman's species has the ribs extending across the whorls and not restricted to the adapical part as in the Thai shells.

Pseudoetrema sp. Fig. 22 d

A single, incomplete specimen comprised of the protoconch and 6 teleoconch whorls. The observable characters are 1) shell slender claviform, 2) protoconch somewhat eroded, apparently of 2.5 smooth whorls, the last subangular, 3) spire whorls convex, sutures impressed, 4) anal sinus openly U-shaped, located between the adapical suture and the periphery, with the apex at the level of the second spiral cord, 5) sculpture of broadly rounded collabral ribs overridden by spiral cords; the ribs, 7 throughout, are continuous from whorl to whorl, prominent in the middle, attenuated toward the sutures; 3 spirals occur on the first whorl, 1 subsutural, the other 2, even and evenly spaced, over the middle part of the whorl; the spirals increase to 4 on subsequent whorls, with 1 thread in each intervening space; except for the subsutural one, the spirals are slightly thickened on crossing the ribs.

Remarks

The present form is related to *Pseudoetrema fortilirata* (Smith, 1879), but differs from it in having smaller spiral angle, less numerous ribs (7 instead of 9) and distinct subsutural spiral.

Clathurellinae sp. Fig. 22 e, f

A single specimen lacking the protoconch and the outer lip. The observable characters are 1) fusiform shell 7 mm high, 2) spire whorls distinctly shouldered at the adapical one-third, meeting at impressed sutures, 3) body whorl about 64% of total height, gradually tapering at the base toward a short neck, 4) aperture oblong-ovate, inner lip narrowly callused, labial sinus reverse J-shaped, occupying the whole shoulder slope, 5) sculpture of slender collabral ribs overridden by spiral cords; the ribs, 10 on the first whorl, 16 on the body whorl, vanish over the base toward the neck; 2 even spirals occur on the first whorls, followed on subsequent ones by

1 thread over the shoulder slope, 1 intermediate and 1 above the abapical suture, the latter two soon reaching nearly the same strength of the primary spirals; body whorl with 4 spiral threads on the shoulder slope, 7 main spirals with 1 intermediate thread and 6 nodulose, approximate cords over the neck; remnants of microscopic granules arranged into spiral rows are also noted.

Remarks

The present unidentified form is tentatively included in the subfamily Clathurellinae because of the presence of the granulose microsculpture. No attempt is made to assign it to a genus since the protoconch and the outer lip are not preserved.

Subfamilia DAPHNELLINAE

Antimitra celebensis (Schepman, 1913) Fig. 22 g-i

1913 *Daphnella celebensis* Schepman, p. 441, pl. 29, fig. 9.
1971 *Antimitra celebensis* Shuto, p. 8, pl. 1, figs. 7-10.
2001 Turridae sp. 3 Swennen, Moolenbeek, Ruttanadukul, Hobbelink, Dekker & Hajisamae, p. 134, fig. 469.
2004 *Kuroshiodaphne* sp. Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 153, pl. 21, fig. 2.

Diagnostic characters are 1) elongate-fusiform, rather high-spined shell attaining 16 mm in height, 2) protoconch slender, apparently multispiral, with diagonally cancellated sculpture and 2 spiral ribs over the last 0.25 whorls, clearly demarcated from the teleoconch by a sinusigera lip, 3) spire whorls distinctly shouldered at the adapical one-fourth, gently convex abapical to the shoulder, meeting at undulating, slightly impressed sutures, 4) body whorl about 65% of total height, regularly tapering at the base toward a short neck, 5) aperture oblong, angular adapically, abapical canal wide and shallow, labial sinus subsutural, reverse J-shaped, 6) sculpture of thin collabral riblets overridden by spiral cords of equal strength to form a square reticulated pattern with small nodes at intersections; 3 spirals occur on earlier whorls, 1 intervenes between the adapical and middle ones by the third whorl soon reaching the same strength, additional spirals develop on following whorls up to 11 on the penultimate, the one on the shoulder somewhat stronger; the ribs are gently opisthocline, more so over the shoulder slope, end in a small tubercle on the subsutural spiral and gradually vanish on lower base, 14 occur on the first whorl, about 32 on the penultimate.

Remarks

The protoconch characters resemble to those of *Pleurotoma aegrota* Reeve, 1845 which is the type species of the genus *Antimitra* Iredale, 1917. *Daphnella subuloides* Schepman, 1913 has similar shell features, but the col-

labral ribs are less in number and do not extend over the shoulder slope.

Distribution and habitat

On the basis of known records, *Antimitra celebensis* appears to range from Indonesia to Thailand. The original material was obtained in the Makassar Strait, from muddy sand with coral, at a depth of 32 m. Beached shells were recovered in the Southern Gulf of Thailand (Swennen *et al.*, 2001).

Fossil records

Pliocene of Indonesia (Skwarko & Sufiati, 1994).

Hemidaphne axis (Reeve, 1846)

Fig. 22 j-l

1846 *Pleurotoma axis* Reeve, p. 3.

1995 *Hemidaphne axis* Bosch, Dance, Moolenbeek & Oliver, p. 167, fig. 739.

Distinctive characters are 1) mitriform shell attaining 20 mm in height, 2) protoconch with diagonally cancellated sculpture on later whorls, 3) spire whorls gently convex, with steep and shallowly concave shoulder slope, sutures fine, slightly impressed, 4) body whorl elongate-oval, about 60% of total height, tapering at the base toward a rather short neck, 5) aperture narrowly oval, outer lip moderately thick, with dentate edge, labial sinus deep, U-shaped, located over the shoulder slope, 6) first 2 whorls sculptured with 13 collabral ribs overridden by 3 evenly spaced spiral cords and 2 intermediate threads, the ribs ending abruptly just abapical to the shoulder slope; third whorl sculptured only with spirals, 1 finer marginating the adapical suture, 1 bounding the shoulder slope, 2 evenly spaced between the shoulder and the abapical suture; the spiral cords and intervening threads increase in number on subsequent whorls; body whorl with 6 adapical and about 20 basal main spirals and several intermediate threads; dense axial rows of microscopic granules occur in the interspaces between spirals; fresh specimens exhibit orange-brown blotches and streaks over a whitish background.

Remarks

Daphnella supracancellata Schepman, 1913 is exceedingly similar, differing only in that has somewhat slenderer shell and the first 4 whorls (instead of 2) with cancellated sculpture.

Distribution and habitat

Hemidaphne axis occurs uncommonly from the Persian Gulf to Australia and northward to the Philippines. There is little information about its ecological requirements; it seems to be an infralittoral element dwelling on sand.

Fossil records

None recorded.

Taranidaphne amphitrites (Melvill & Standen, 1903)

Fig. 22 m-o

1903 *Daphnella (Pleurotomella) amphitrites* Melvill & Standen, p. 316, pl. 23, fig. 3.

2001 *Taranidaphne amphitrites* Morassi & Bonfitto, p. 69, figs. 7-12.

Distinctive characters are 1) ovate-biconical shell attaining 7 mm in height, 2) protoconch nearly mammillate, of slightly more than 2 convex whorls, first whorl sculptured with thin axials crossed by somewhat arcade-like spirals to form a reticulated pattern, last whorl diagonally cancellated over the mid abapical part, only the protractive riblets continuing over the adapical part where they become retractive, transition to teleoconch abruptly marked by the appearance of a distinct peripheral angulation, 3) spire whorls angular midway between sutures, with wide, triflingly concave shoulder slope and adaxially inclined abapical part, sutures impressed, 4) body whorl pear-shaped, 60% of total height, gradually tapering at the base toward a quite short neck, 5) aperture rectangular, elongate, outer lip simple, anal sinus shallow, reverse L-shaped, with angular apex at the periphery, its upper rim divided into 3 segments and following a wavy course, 6) sculpture of thin collabral ribs overridden by spiral cords of the same strength to form a square-reticulated pattern with small nodes at the intersections; 2 spirals, peripheral and abapical, occur on the first whorl; a subsutural spiral develops by the second whorl, soon becoming twin; 1 additional spiral appears over the shoulder slope on the third whorl; base with 13 spirals, those over the neck plain and approximate; the ribs, 21 throughout, follow the same course of the growth lines, override the subsutural cord, are interrupted between the latter and the spiral lying on the shoulder slope and vanish on lower base just before the neck.

Remarks

The protoconch stands as the most distinctive character. The Thai shells have the spire whorls more distinctly angular, but otherwise conform fairly well to the figures published by Morassi & Bonfitto (2001). The relationships with the related taxa have been already discussed by the latter authors.

Distribution and habitat

Taranidaphne amphitrites was so far known from the Red Sea and the Gulf of Oman; records were from deep water.

Fossil records

None recorded.

Vepridaphne cestrum (Hedley, 1922)

Fig. 22 p-s

1922 *Daphnella cestrum* Hedley, p. 327, pl. 53, fig. 160.

1983 *Vepridaphne cestrum* Shuto, p. 18, pl. 1, fig. 1; text-figs. 1 (3), 7 (1-6).

Two specimens assigned to Hedley's taxon on the basis of 1) slenderly fusiform shell, 2) protoconch conical of 3.25 whorls, the last 1.5 whorls with diagonally cancelled sculpture over the abapical one-half of the whorls, 3) spire whorls bluntly angular, with the periphery placed about midway between sutures that are impressed and gently undulating, 4) body whorl about 55% of total height, rather rapidly contracted at the base toward a moderately long neck, 5) aperture narrowly oval, elongate, outer lip distinctly arched forward, with rather broad, prominent varix behind and with 3 inner adapical small denticles, 6) anal sinus subsutural, reverse J-shaped and rim-margined, its scars appearing as crescentic riblets over a gently concave subsutural band, 7) sculpture of varicose collabral ribs overridden by spiral cords; the ribs, 9 throughout, slightly wider than interspaces, start abapical to the subsutural band and vanish at the upper end of the neck; the primary spirals, 3 on spire whorls, 15 on the body whorl, are thickened on crossing the ribs and alternate with a secondary thread; the whole surface is covered with microscopic granules.

Remarks

Compared to the Australian shells, the present one appears to be somewhat less contracted at the base.

Distribution and habitat

Vepridaphne cestrum was hitherto known from Australian waters. Records were from the sublittoral zone.

Fossil records

None recorded.

Family TEREBRIDAE

Terebra textilis Hinds, 1843

Fig. 23 a

1843c *Terebra textilis* Hinds, p. 156.

1879 *Terebra subtextilis* Smith, p. 185, pl. 19, fig. 3.

1904 *Terebra hizenensis* Pilsbry, p. 4, pl. 1, figs. 2, 2a.

1913 *Terebra (Strioterebrum) textilis* Schepman, p. 368.

1913 *Terebra (Strioterebrum) roseata* Schepman, p. 370.

1913 *Terebra (Strioterebrum) macgillivrayi* Schepman, p. 370, pl. 25, fig. 6.

1968 *Strioterebrum subtextile* Habe, p. 127, pl. 40, fig. 14.

1971 *Strioterebrum (Strioterebrum) subtextile* Kuroda, Habe & Oyama, p. 241, pl. 60, fig. 4.

1975 *Terebra textilis* Hinton, p. 49, figs. 16, 16a.

1987 *Terebra textilis* Bratcher & Cernohorsky, p. 103, pl. 27, fig. 103; pl. 28, fig. 103 (*cum syn.*).

1988 *Terebra textilis* Drivas & Jay, p. 126, pl. 48, fig. 14.

1993 *Terebra textilis* Singer & Mienis, p. 58, fig. 22.

1994 *Terebra textilis* Wilson, p. 228, pl. 53, fig. 4.

1999 *Terebra textilis* Kohn & Arua, p. 122, pl. 4, fig. 69.

2000 *Strioterebrum subtextilis* Tsuchida in Okutani, p. 673, pl. 335, fig. 33.

2000 *Strioterebrum textilis* Tsuchida in Okutani, p. 673, pl. 335, fig. 34.

Distinctive characters are 1) slender, turreted shell up to 40 mm in height, 2) spire whorls slightly convex, meeting at fine, shallowly impressed sutures, 3) body whorl ovate-cylindrical, about 30% of total height, rather quickly tapering at the base, fasciole bounded by a narrow ridge, 4) aperture subquadrangular, outer lip thin, inner lip with moderately thick parietal callus, columella twisted, 5) sculpture of rather sharp, opisthocyrt collabral ribs crossed by spiral cords; the ribs, 12 on earlier whorls, 17 on middle whorls, 20 on the penultimate, are narrower than the intervening spaces and are cut adapically by a rather deep spiral furrow defining a broad subsutural band; 3 to 7 fine spiral threads lie on the subsutural band, 5 to 7 cords occur between the latter and the abapical suture, 24 on the body whorl.

Remarks

The Thai material conforms quite well to the holotype of *Terebra subtextilis* Smith, 1879. The latter taxon is regarded as a synonym of the present species (cf. Bratcher & Cernohorsky, 1987).

Distribution and habitat

Terebra textilis ranges in the tropical Indo-Pacific, from Mauritius and Red Sea to Australia and northward to Japan. It is a sand-related element occurring intertidally and down to 100 m depth (Tsuchida in Okutani, 2000).

Fossil records

Early Pleistocene of Fiji (Kohn & Arua, 1999).

Superordo HETEROBRANCHIA

Superfamilia ARCHITECTONICOIDEA

Familia MATHILDIDAE

Mathilda carystia Melvill & Standen, 1903

Fig. 23 b-d

1903 *Mathilda carystia* Melvill & Standen, p. 321.

1904 *Mathilda carystia* Melvill, p. 84, pl. 8, fig. 7.

1995 *Mathilda carystia* Bosch, Dance, Moolenbeek & Oliver, p. 175, fig. 794.

1995 *Mathilda carystia* Bieler, p. 605, fig. 13.

? 2000 *Mathilda sinensis* Hasegawa in Okutani, p. 689, pl. 343, fig. 2.

? 2001 *Mathilda* cf. *sinensis* Swennen, Moolenbeek, Rutta-nadukul, Hobbelink, Dekker & Hajisamae, p. 135, fig. 476.

A single specimen 4.6 mm high, featured by 1) turreted, nearly straight-sided shell, 2) protoconch low-turbinate, of 1.5 smooth whorls, largely exposed and slightly oblique, 3) spire whorls (7) biangulate, moderately depressed,

meeting at very fine sutures, 4) body whorl 33% of total height, base quickly attenuated, its lower part slightly concave, 5) aperture subrounded, somewhat higher than wide, inner lip thinly callous, reflexed to cover the umbilical chink, 6) sculpture of thin collabral riblets overridden by spiral cords and threads to form a reticulated pattern; the riblets, 22 on the first whorl, about 40 over the penulti-

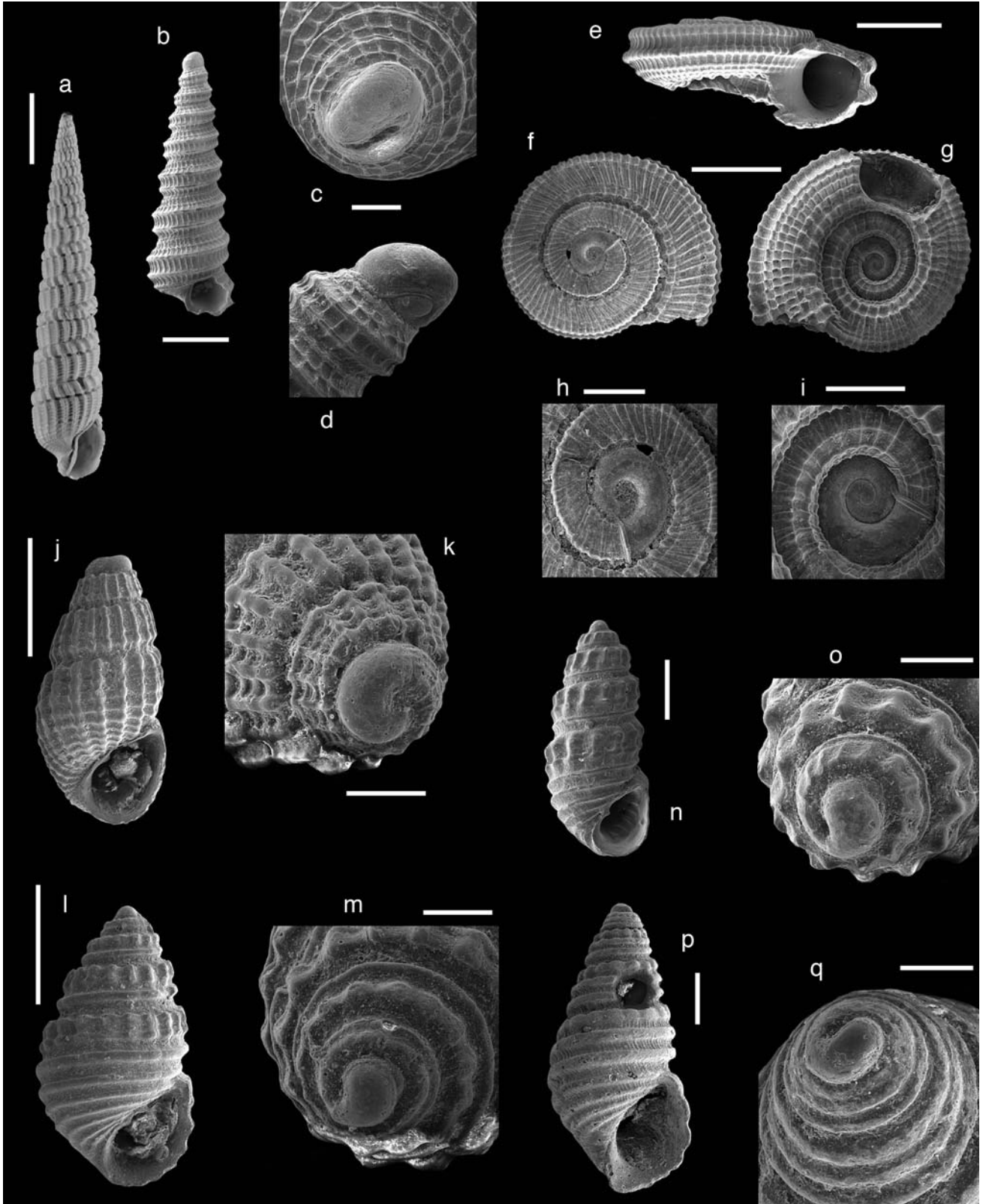


Fig. 23. a. *Terebra textilis* Hinds, 1844; Station TH 159; scale bar 3.75 mm; b-d. *Mathilda carystia* Melvill & Standen, 1903; Station TH 159, b. scale bar 1 mm, c, d. scale bar 0.2 mm; e-i. *Heliacus (Torinista) costatus* (Schepman, 1909); Station TH 159, e. scale bar 1 mm, f, g. scale bar 1.4 mm, h, i. scale bars 0.5 mm; j-k. *Chrysallida phohaiensis* (Saurin, 1958); Station TH 108A, j. scale bar: 0.7 mm, k. scale bar 0.2 mm; l-m. *Miralda diadema* (Adams, 1860); Station TH 108D, l. scale bar: 0.8 mm, m. scale bar 0.2 mm; n-o. *Miralda senex* (Hedley, 1902); Station TH 108A, n. scale bar: 0.5 mm, o. scale bar 0.2 mm; p-q. *Miralda stupa* (Hori & Fukuda, 1999); Station TH 108A, p. scale bar: 0.5 mm, q. scale bar 0.2 mm.

mate, are as wide as one-third of interspaces and gradually vanish on upper base; the spirals consist of 2 adapical threads, 1 subsutural, the other at the middle of the shoulder slope, both forming nodes on crossing the axials, 1 cord over each angulation, 1 abapical cord only partly emerging from suture by the third whorl, and 1 thread appearing between the main cords on the seventh whorl; base with 5 spirals (the uppermost at the level of the suture) of decreasing strength downward.

Remarks

The Thai shell fully conform to the lectotype of *Mathilda carystia* figured by Bieler (1995), but has a larger protoconch attaining 445 μm in diameter. In terms of protoconch size, it stands in between *Mathilda carystia* and the New Caledonian specimens referred to as *Mathilda* cf. *amanda* by Bieler (1995) and may prove the latter form to be conspecific of the present taxon.

Distribution and habitat

Mathilda carystia appears to range from the Persian Gulf eastward to the Gulf of Thailand (present record) at least and, possibly, to New Caledonia and Japan. It is a sublittoral element dwelling in mud and sand.

Fossil records

None recorded.

Familia ARCHITECTONICIDAE

Heliacus (Torinista) costatus (Schepman, 1909)

Fig. 23 e-i

1909 *Torinia costata* Schepman, p. 221, pl. 14, fig. 5.
Not 1977 *Heliacus (Torinista) costatus* Garrard, p. 544, figs. 5 (7-9) (= *Solarium caelatum* Hinds, 1844).
1993 *Heliacus (Tornista) costatus* Bieler, p. 246, fig. 201 a.

Distinguishing characters are 1) disc-shaped, depressed shell hardly attaining 9 mm in diameter, 2) protoconch heterostrophic, of 2.75 smooth and convex whorls, with well developed final varix, 3) spire only slightly protruding from the body whorl, whorls flat, sutures canaliculate, 4) body whorl expanded, with biangulate periphery, base gently convex, umbilicus broad and deep showing earlier whorls and protoconch, 5) aperture subtrapezoidal, 6) sculpture of spiral cords overridden by even collabral ribs forming axially elongate nodes at intersections; 2 cords, subsutural and upper peripheral, are visible on spire whorls; body whorl with 8 spirals: 1 subsutural, 2 peripheral lying over the angulations and stronger than the others, 5 basal, the lowermost bounding the umbilicus; another spiral cord occurs on the umbilical wall.

Distribution and habitat

Heliacus costatus was hitherto known to range from Singapore to New Zealand. The original material was re-

covered from muddy and sandy substrates. According to Bieler (1993), live records were from the upper sublittoral zone.

Fossil records

None recorded.

Superfamilia PYRAMIDELLOIDEA

Familia ODOSTOMIIDAE

Subfamilia CHRYSALLIDINAE

Chrysallida phohaiensis (Saurin, 1958)

Fig. 23 j, k

1958 *Pyrgulina (Pyrgulina) phohaiensis* Saurin, p. 73, pl. 2, figs. 4, 5.

Distinctive characters are 1) oval, more or less elongate, slightly cyrtconoid shell attaining 2.6 mm in height, 2) protoconch intorted, only the last whorl visible at the top of the spire, 3) spire whorls shaped like a segment of a cone, with narrow subsutural shelf, constricted abapically, suture impressed, 4) body whorl oval, 63% of total height, gradually tapering at the base, 5) aperture oval, outer lip thin, inner lip narrowly callused, columellar fold small, rather deeply set, 6) sculpture of collabral ribs overridden by spiral cords about of the same strength; the ribs, 16-19 throughout, are straight, narrower than the intervening spaces, continuous over the base to reach the inner lip; the spirals form low nodes on crossing the ribs, 4 occur on the first whorl, 4-6 on subsequent ones, 6-7 slightly weaker over the base.

Distribution and habitat

Chrysallida phohaiensis was so far known from Vietnamese waters. It seems to be a shallow water element occurring on sandy substrates.

Fossil records

None recorded.

Miralda diadema (Adams, 1860)

Fig. 23 l, m

1860 *Parthenia diadema* Adams, p. 479.
1906 *Odostomia (Miralda) diadema* Dall & Bartsch, p. 356, pl. 17, fig. 2.
1910 *Miralda diadema* Melvill, p. 195.
1959 *Miralda diadema* Saurin, p. 256, pl. 5, fig. 17.
1990 *Miralda diadema* Ito, p. 108, pl. 21, fig. 12.
2000 *Miralda diadema* Hori in Okutani, p. 727, pl. 362, fig. 154.

Diagnostic features are 1) conical-ovate, cyrtconoid shell attaining 3.0 mm in height, 2) protoconch globose,

obliquely immersed, tip scarcely visible, 3) spire whorls rather depressed, shaped like a segment of a cone, with narrow subsutural shelf, suture indistinct, 4) body whorl broad, cup-shaped, 63% of total height, 5) aperture nearly D-shaped, columellar fold thin, subhorizontal, 6) sculpture of robust spiral cords; 2 occur on the first whorl, the adapical one coarsely beaded, the other smooth; the adapical spiral is quickly bisected by a groove and 2 equal beaded spirals are formed, the beads being connected by axial bars; base with 6 smooth spiral cords of decreasing strength downward.

Remarks

According to Melvill (1910), *Actaeopyramis brevicula* Melvill & Standen, 1903 is a synonym of *Miralda diadema*. This latter is the type species of the genus *Miralda* Adams, 1864. *Miralda scopulorum* (Watson, 1886) is a related taxon differing in that has slenderer shell, less numerous basal spirals and thin axials in the furrows between the spiral cords.

Distribution and habitat

Miralda diadema is distributed from the Persian Gulf to Southeast Asia and northward to Japan. It is reported to be a sublittoral element dwelling on rocks, gravel and shell-sand.

Fossil records

Pliocene and Quaternary of Japan (Nomura, 1938).

Miralda senex (Hedley, 1902)

Fig. 23 n, o

1902 *Pyrgulina senex* Hedley, p. 10, pl. 3, fig. 31.

1959 *Miralda senex* Laseron, p. 229, figs. 128, 129.

The species is distinguished by 1) elongate-ovate, slightly cyrtocoenoid, slender shell attaining 2.2 mm in height, 2) protoconch helicoid, obliquely immersed, tip partly visible, 3) spire whorls cylindrical, depressed, with narrow subsutural shelf, suture fine, slightly impressed, 4) body whorl ovate-cylindrical, 56% of total height, regularly tapering at the base, 5) aperture irregularly drop-shaped, outer lip moderately thick and with 6 inner ribs not reaching the peristome, inner lip somewhat reflexed abapically, columellar fold weak, gently ascending, 6) sculpture of collabral ribs and overriding spiral cords; the ribs, 13-14 throughout, occur on the mid-adapical part of the whorls and vanish against the smooth abapical spiral; 2 adapical spirals develop by the second whorl and form prominent nodes on crossing the ribs; base with 5-6 smooth spiral cords of decreasing strength downward, the uppermost at the level of the suture; faint axial threads occur on the abapical part of the whorls.

Remarks

The present species is readily distinguished by the slender shell and the cog-like aspect of the first whorl.

Distribution and habitat

Miralda senex was so far known from Northern Australian waters. It seems to be a sublittoral element.

Fossil records

None recorded.

Miralda stupa (Hori & Fukuda, 1999)

Fig. 23 p, q

1999 *Chrysallida stupa* Hori & Fukuda, p. 177, figs. 4-8.

2000 *Chrysallida stupa* Hori in Okutani, p. 727, pl. 362, fig. 152.

Distinctive characters are 1) ovate-conical, straight-sided shell attaining 3.4 mm in height, 2) protoconch small, umboniform, of 1.5 whorls, obliquely immersed in the first teleoconch whorl, tip flat, hardly visible, 3) spire whorls shaped like a segment of a cone, meeting at slightly impressed sutures, 4) body whorl oval, about 60% of total height, tapering at the base, umbilical chink faint to absent, 5) aperture oval, outer lip moderately thin, inner lip slightly callous, columellar fold thin, oblique, deeply set, located at the posterior end of columella, 6) sculpture of strong, flat-topped spiral cords considerably wider than the intervening furrows; 3 spirals appear immediately, the adapical and intermediate ones usually beaded on earlier whorls, a fourth emerges from the abapical suture on the fourth whorl; body whorl with 4 spirals and 3-4 weaker basal spirals, lowermost base smooth; rather dense axial threads occur in the furrows between the spirals.

Remarks

Miralda stupa appears to be rather variable in terms of occurrence and persistence of beads on first whorls, breadth of spirals and number of basal cords. Compared to the Japanese specimens, the Thai shells constantly have more basal spirals. The present species is herein assigned to the genus *Miralda* Adams, 1863 on account of the strong spirals largely prevailing over the axial sculpture. The Red Sea *Miralda appeliusi* (Hornung & Mermod, 1925) is closely similar, but lacks both the beads on earlier teleoconch whorls and the axial threads in the furrows between the spirals.

Distribution and habitat

Miralda stupa was hitherto known from Japanese waters. The original material was obtained from "shelly sand piled in octopus traps" (Hori & Fukuda, 1999).

Fossil records

None recorded.

Miralda sp.
Fig. 24 a, b

A single specimen 1.2 mm high, featured by 1) pupoid shell, 2) protoconch intorted, only the last whorl visible at the top of the spire, 3) spire whorls shaped like a segment of a cone, with very narrow subsutural shelf, constricted abapically, suture poorly distinct, 4) body whorl subcylindrical, 64% of total height, 5) aperture oval, outer lip thin, columellar fold small, deeply set, 6) sculpture of spiral cords overridden by uneven axial threads continuous to the base; 1 abapical spiral occurs on the periphery of the first whorl soon followed by other 3 appearing, in succession from mid-abapical to adapical; base with 4 spirals of decreasing strength downward.

Remarks

The present form seems unlike any other chrysallidine species. It is herein assigned to the genus *Miralda* Adams, 1863 on account of the spirals largely prevailing over the axial sculpture.

Monotygmata punctigera (Adams, 1861)
Fig. 24 c, d

1861b *Monotygmata punctigera* Adams, p. 296.
1906 *Pyramidella (Actaeopyramis) punctigera* Dall & Bartsch, p. 331, pl. 19, fig. 2.

Diagnostic characters are 1) ovate-conical, straight-sided shell attaining 5.4 mm in height, 2) protoconch globose, small, obliquely immersed in the first teleoconch whorls, tip not visible, 3) spire whorls rather high, gently convex, with distinct shoulder at the adapical one-fifth and narrow, subhorizontal shoulder slope, suture narrowly grooved, 4) body whorl oval, about 70% of total height, base gradually tapering, umbilical chink narrow to absent, 5) aperture ovate-quadrangular, outer lip thin, with short inner ridges, inner lip somewhat reflexed abapically, columellar fold weak, hardly visible from in front, 6) sculpture of prominent spiral cords usually slightly narrower than the intervening furrows; 5 spirals occur on earlier whorls, 5-6 on the penultimate, 6-7 over the base, the uppermost at the level of the suture; a weaker subsutural spiral is noted in some specimens; the furrows between the spiral cords bear thin, prosocline collabral ribs delineating quadrangular pits.

Remarks

The stepped outline of the spire and the sculpture are the most distinctive characters.

Distribution and habitat

Monotygmata punctigera was hitherto known from Japanese waters. There is no information about its ecological requirements.

Fossil records

None recorded.

Morrisonietta spiralis Brandt, 1968
Fig. 24 e, f

1968 *Morrisonietta spiralis* Brandt, p. 279, pl. 10, fig. 69.
1974 *Morrisonietta spiralis* Brandt, p. 208, pl. 15, fig. 73.
2004 *Kleinella* sp. 1 Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, p. 181, pl. 26, fig. 1.

Remarks

The single shell figured by Robba *et al.* (2004) and referred to as *Kleinella* sp. 1 proved to match the characters of *Morrisonietta spiralis* Brandt, 1968. For detailed description, reference can be made to the cited authors.

Distribution and habitat

Morrisonietta spiralis is known from coastal zones of the Gulf of Thailand. It is a brackish water element occurring in estuarine areas and drainage channels of mud flats (Brandt, 1974).

Fossil records

None recorded.

Numaegilina sp.
Fig. 24 g, h

A single specimen 1.96 mm high, featured by 1) ovate-conical, slightly cyrtocoid shell, 2) protoconch intorted, only its last whorls visible at the top of the spire, 3) spire whorls gently convex, with very narrow but distinct subsutural shelf, suture slightly impressed, 4) body whorl oval, 62% of total height, base convex with faint umbilical chink, 5) aperture irregularly drop-shaped, outer lip moderately thick, inner lip somewhat reflexed abapically, columellar fold ascending, deeply set, 6) sculpture of collabral ribs overridden by spiral grooves; the ribs, clearly developed by the end of the first whorl, 22 on the penultimate whorl, are slightly opisthocline, as wide as the intervening spaces and quickly vanish at the level of the peripheral groove; the spiral grooves, 10 throughout, are shallow except for the subsutural and peripheral ones that are somewhat more marked; 12 grooves occur over the base.

Remarks

The present unidentified form is herein assigned to the genus *Numaegilina* Nomura, 1938 on account of the ribs ending at the level of the peripheral groove; it differs from the described *Numaegilina* species in having the spirals continuous over the ribs.

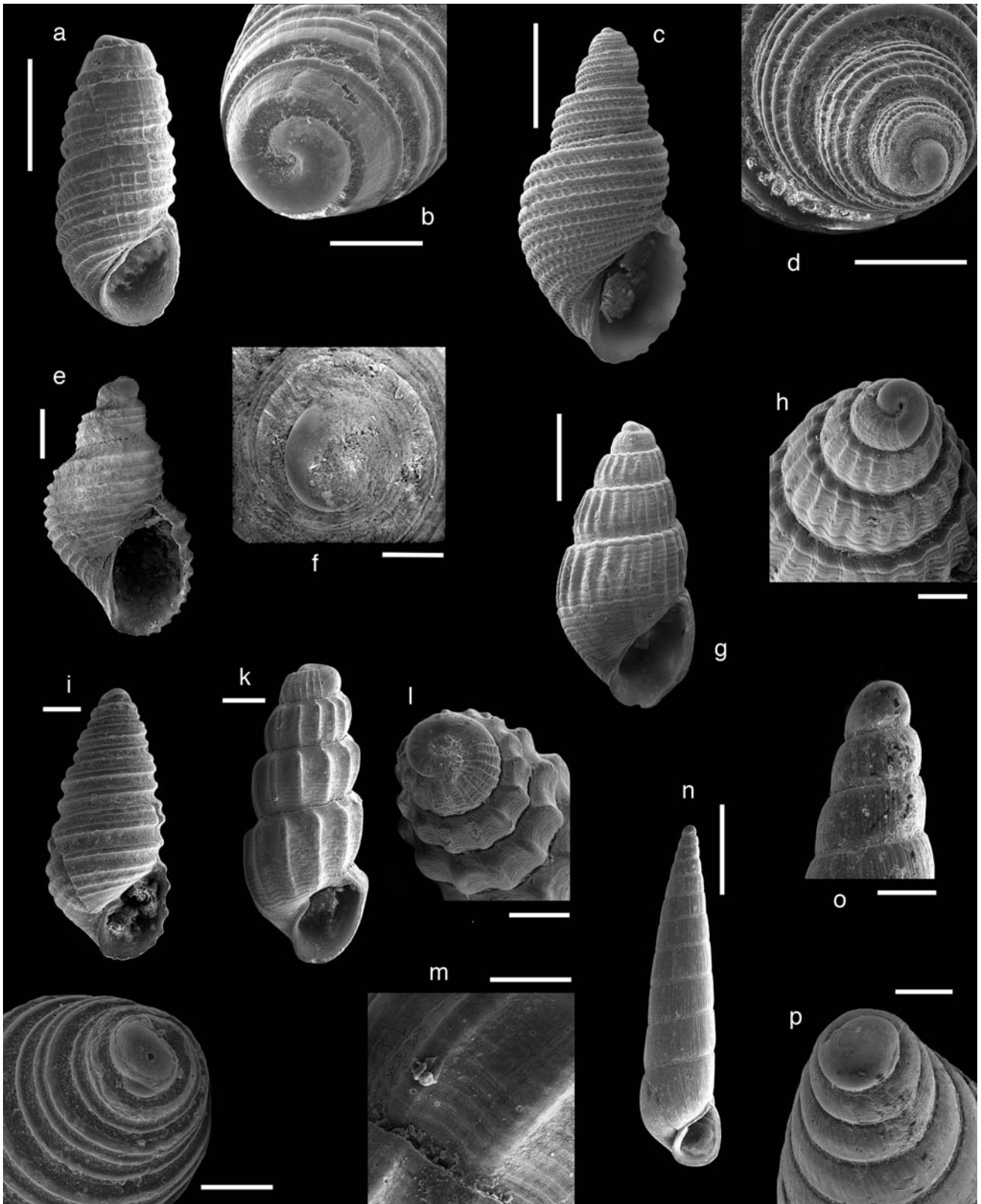


Fig. 24. **a-b.** *Miralda* sp.; Station TH 108A, **a.** scale bar 0.5 mm, **b.** scale bar 0.2 mm; **c-d.** *Monotygma punctigera* (Adams, 1861); Station TH 108D, **c.** scale bar 1 mm, **d.** scale bar 0.5 mm; **e-f.** *Morrisonietta spiralis* Brandt, 1968; Station TH 2, **e.** scale bar 0.5 mm, **f.** scale bar 0.2 mm; **g-h.** *Numaegilina* sp.; Station TH 108D, **g.** scale bar 0.5 mm, **h.** scale bar 0.2 mm; **i-j.** *Oscilla jocosa* Melvill, 1904; Station TH 108A, **i.** scale bar 0.25 mm, **j.** scale bar 0.2 mm; **k-m.** *Pyrgulina nigraerupis* Saurin, 1959; Station TH 108A, **k, l.** scale bars 0.2 mm, **m.** scale bar 0.1 mm; **n-p.** *Syrnola strigatula* (Adams, 1863); Station TH 108D, **n.** scale bar 1.5 mm, **o, p.** scale bars 0.2 mm.

Oscilla jocosa Melvill, 1904

Fig. 24 i, j

- 1904 *Oscilla jocosa* Melvill, p. 82, pl. 8, fig. 11.
- 1906 *Oscilla jocosa* Dautzenberg & Fischer, p. 181, pl. 6, figs. 6, 7.
- 1959 *Oscilla jocosa* Saurin, p. 258, pl. 6, fig. 8.

1959 *Oscilla jocosior* Saurin, p. 258, pl. 6, fig. 7.

1989 *Oscilla jocosa* van Aartsen, Barash & Carrozza, p. 71, fig. 8.

1994 *Oscilla jocosa* van Aartsen, p. 92, fig. 8.

Diagnostic characters are 1) elongately-oval, slightly cyrtoconoid shell attaining 2.7 mm in height, 2) proto-

conch helicoid, of about 2 whorls, obliquely immersed in the first teleoconch whorl, tip convex, partly visible, 3) spire whorls very gently convex, suture impressed, 4) body whorl broadly oval, 58% of total height, rather quickly tapering at the base, 5) aperture pear-shaped, outer lip thin, inner lip somewhat reflexed abapically, columellar fold strong, nearly horizontal, 6) sculpture of spiral cords, 3 throughout, the upper 2 approximate and separated from the abapical (peripheral) one by a wide interspace; base with 1 subperipheral cord at the level of the suture, followed by 1-3 weaker ones.

Distribution and habitat

Oscilla jocosa is distributed in the tropical Indo-West Pacific, from the Persian Gulf to Vietnam; it has recently entered the Mediterranean Sea via Suez Canal. There is no information about its ecological requirements. The present material consists of dead shells recovered from a muddy bottom at depths of 12-15 m.

Fossil records

None recorded.

Pyrgulina nigraerupis Saurin, 1959

Fig. 24 k-m

1959 *Pyrgulina nigraerupis* Saurin, p. 250, pl. 5, fig. 10.

Distinctive characters are 1) subcylindrical shell attaining 2.14 mm in height, 2) protoconch intorted, only its last whorls visible at the top of the spire, 3) spire somewhat pagoda-like, whorls with distinct shoulder at the adapical one-fourth, contracted abapically, suture impressed, 4) body whorl about 53% of total height, base convex, rather rapidly tapering, 5) aperture oval, inner lip slightly reflexed abapically, columellar fold thick, ascending, 6) sculpture of 12 sharp, distant collabral ribs, more prominent on the shoulder, absent from lower base; interspaces with 10-11 fine spiral grooves that may override the ribs; a spiral microstriation occurs throughout, more evident on the shoulder slope and in the spaces between the grooves.

Remarks

The Red Sea *Pyrgulina problematica* Hornung & Mermoud, 1924 exhibits an overall resemblance, but is reported to have 9 ribs continuous on lower base. Close examination of the Red Sea material could prove that the present species is a junior synonym of *problematica*.

Distribution and habitat

Pyrgulina nigraerupis was so far known from Vietnamese waters. There is no information about its ecological requirements.

Fossil records

None recorded.

Familia SYRNOLIDAE Subfamilia SYRNOLINAE

Syrnola strigatula (Adams, 1863)

Fig. 24 n-p

1959 *Syrnola praecostulata* Saurin, p. 230, pl. 1, fig. 18.

2000 *Syrnola strigulata* Hori in Okutani, p. 707, pl. 352, fig. 27.

Distinctive characters are 1) turreted, very slightly cyrtoconoid shell attaining 8 mm in height, 2) protoconch globose, of 2.5 smooth whorls, slightly oblique and only scarcely concealed by the first teleoconch whorl, tip flat, 3) spire of 9 moderately high whorls, the first 2-3 gently convex, subsequent ones flat-sided and somewhat contracted abapically, sutures impressed, 4) body whorl subcylindrical, 32% of total height, base quickly tapering, umbilical chink faint to indistinct, 5) aperture subtriangular, outer lip moderately thick, with 7 inner ridges not reaching the peristome, basal lip nearly horizontal, inner lip with rather thick callus, reflexed abapically, columellar fold robust, rather deeply set, 6) outer surface with fine, dense axial grooves; a fine, pale orange-brown line occurs at the periphery of whorls.

Remarks

The axially grooved outer surface stands as the most distinctive character. *Syrnola praecostulata* Saurin, 1959 appears to be indistinguishable from Adams' taxon and is regarded as a synonym of it.

Distribution and habitat

Syrnola strigatula was so far known from Japanese waters. It seems to be a sublittoral element dwelling on sandy substrates.

Fossil records

None recorded.

Costosyrnola sp. 1

Fig. 25 a-c

A single specimen approximately 4.7 mm high, characterized by 1) turreted, straight-sided shell, 2) protoconch rather globose, of 2.5 smooth whorls, slightly oblique and scarcely concealed by the first teleoconch whorl, tip bluntly convex, 3) spire of 9 depressed whorls, the first gently convex, subsequent ones flat-sided, sutures undulating, feebly impressed, 4) body whorl about 30% of total height, with roundly angular periphery, quickly attenuated below the latter, base almost flat, umbilical chink nearly indistinct, 5) aperture damaged, just showing a sharp, prominent columellar fold, 6) sculpture of 18 thin, closely set, arched collabral ribs on the first whorl; subsequent whorls with straight, bar-like ribs, as wide as interspaces, not touching the abapical suture, 12 on the second whorl, 15 on latest whorls; base smooth; a yellowish-brown line occurs suprasuturally.

Remarks

Costosyrnola nitidissima (Issel, 1869) appears to be related, but differs in having slenderer, more widely spaced ribs and more convex base.

Familia TURBONILLIDAE Subfamilia TURBONILLINAE

Chemnitzia cummingi (Hori & Okutani, 1997)

Fig. 25 d-f

1997 *Turbonilla cummingi* Hori & Okutani, p. 81, figs. 2-13, 17-24.

2000 *Turbonilla cummingi* Hori in Okutani, p. 711, pl. 354, fig. 48.

Diagnostic characters are 1) turreted, nearly straight-sided shell attaining 6.0 mm in height, 2) protoconch helicoid, of 2.5 whorls, obliquely prostrate on the first teleoconch whorl and slightly extending beyond the outline of this latter, 3) spire of 7-8 convex, rather high whorls, suture well impressed, 4) body whorl ovate-subcylindrical, 45% of total height, with rounded periphery and convex base, umbilical chink faint to absent, 5) aperture oval, somewhat produced abapically, outer lip thin, with shallow adapical sinuation, inner lip narrowly callosous, reflexed abapically, columella twisted at its upper end to form a very weak, deeply set fold, 6) sculpture of collabral ribs, usually as wide as the smooth intervening furrows, straight or gently sinuous, connected abapically by a narrow suprasutural band, not continuous to the base; 16-17 ribs occur on earliest whorls, up to 28 on the body whorl where they may fade toward the aperture.

Remarks

The protoconch characters and the intercostal furrows ending abruptly some distance from the abapical suture are consistent with the assignment to the genus *Chemnitzia* d'Orbigny, 1839.

Distribution and habitat

Chemnitzia cummingi ranges from Queensland eastward to Palau and Solomon Islands, northward to Philippines and Southern Japan (Hori & Okutani, 1997). According to the latter authors, it is an upper infralittoral element, ectoparasitic on *Tridacna* shells.

Fossil records

None recorded.

Chemnitzia humilis (Yokoyama, 1924)

Fig. 25 g-i

1938 *Turbonilla* (s.s.) *humilis* Nomura, p. 86, pl. 15, fig. 130.

1954 *Turbonilla* (s.s.) *humilis* Taki & Oyama, pl. 39, fig. 3.

1995 *Turbonilla* (*Chemnitzia*) sp. B Fukuda, p. 30, pl. 74, fig. 1034.

The species is distinguished by 1) turreted, slightly cyrtconoid shell attaining about 4.0 mm in height, 2) protoconch helicoid, of 2 smooth whorls, prostrate on the first teleoconch whorl, not extending beyond the outline of the latter and coiled nearly at a right angle to the teleoconch, 3) spire of 6 somewhat depressed whorls, earlier ones gently convex, subsequent ones more so, sutures impressed, 4) body whorl broadly oval, about 45% of total height, rather quickly attenuated at the base, 5) aperture ovate-quadrangular, inner lip angular in the middle, reflexed abapically, columella twisted at its upper end, 6) sculpture of broad, low, uneven collabral ribs, 16 on the first whorl, 23 on the body whorl, markedly wider than the intervening furrows that bear a faint spiral microstriation restricted to earlier whorls; ribs and interspaces end abruptly at the level of the abapical suture; base with fine axial lines.

Distribution and habitat

Chemnitzia humilis was based on Japanese fossil material; the record reported on by Fukuda (1995) refers to Recent shells recovered from the Ogasawara Islands. There is no information about the ecological requirements of the species.

Fossil records

Quaternary of Japan (Taki & Oyama, 1954).

Chemnitzia punctiperipherata (Nomura, 1936)

Fig. 25 j-l

1936 *Turbonilla* (*Turbonilla*) *punctiperipherata* Nomura, p. 53, pl. 6, fig. 46.

2000 *Turbonilla punctiperpherarta* (sic) Hori in Okutani, p. 711, pl. 354, fig. 55.

Significant characters are 1) turreted, slightly cyrtconoid shell attaining 5.0 mm in height, 2) protoconch helicoid, of 2.5 whorls, prostrate on the first teleoconch whorl and extending beyond the outline of the latter, 3) spire whorls rather low, convex, meeting at impressed sutures, 4) body whorl cup-shaped, 37% of total height, subangular at the periphery, base quickly attenuated, 5) aperture subquadrangular, inner lip somewhat reflexed abapically, columella straight, slightly twisted at its upper end, 6) sculpture of round-topped collabral ribs, as broad as or slightly wider than the intervening furrows, gently oblique or orthocline, 15-16 on the second whorl, 21-23 on the penultimate; ribs and interspaces ending abruptly at the periphery, base with axial striation only.

Remarks

Chemnitzia sandoi (Nomura, 1938) appears to be closely similar, but differs in having lower, more convex whorls and different number and development of the ribs.

Distribution and habitat

Chemnitzia punctiperipherata was hitherto known from Japanese waters. There is no information about its ecological requirements.

Fossil records

None recorded.

Chemnitzia sp. 3

Fig. 25 m, n

A single specimen 1.5 mm high, including the protoconch and 5.5 teleoconch whorls. Distinguishing characters are 1) slenderly turreted shell, 2) protoconch *Nisiturris*-like, of 2.5 smooth whorls, obliquely ascending and extended well beyond the outline of the first teleoconch whorl, 3)

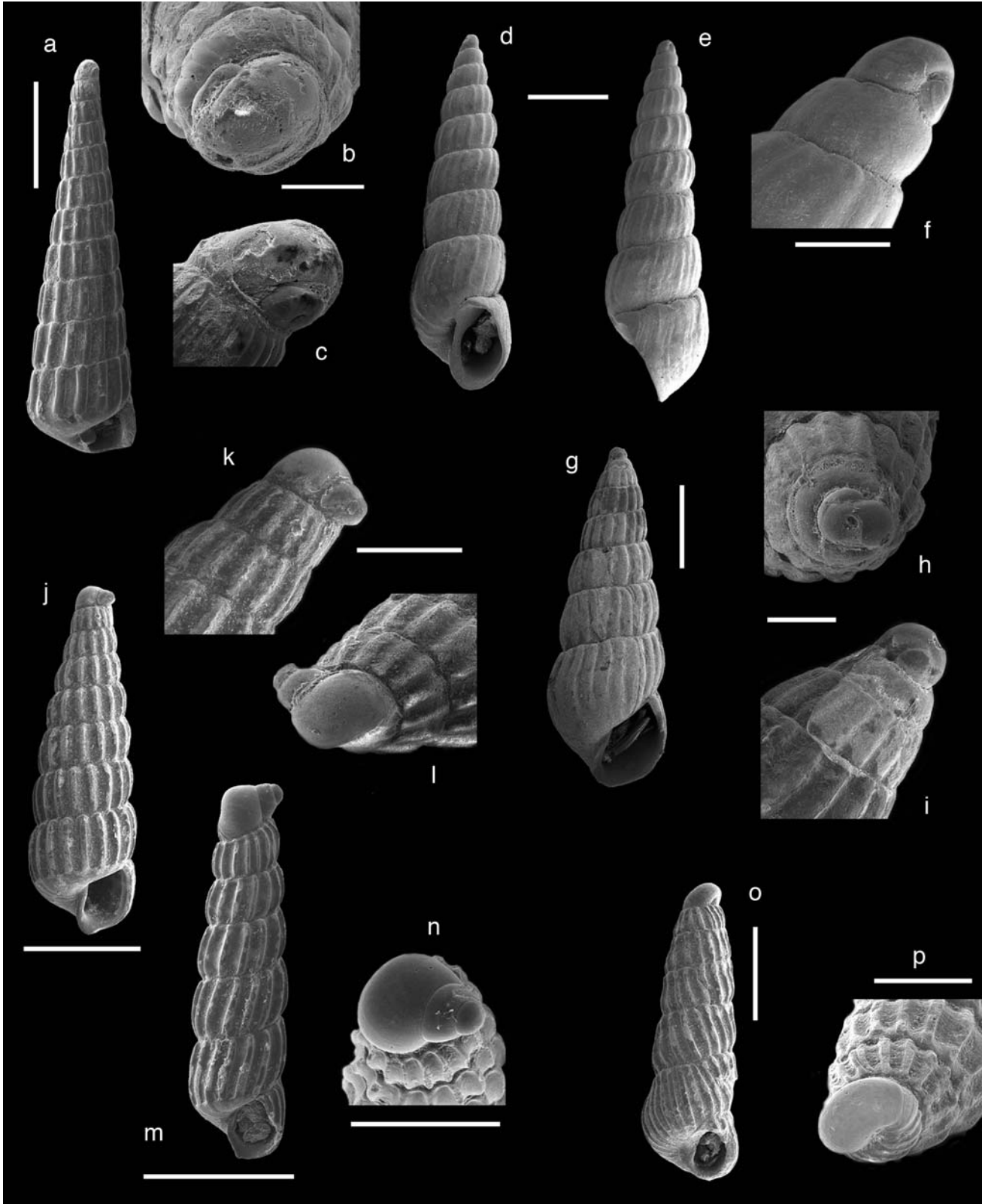


Fig. 25. a-c. *Costosyrnola* sp. 1; Station TH 160, a. scale bar 1.2 mm, b, c. scale bar 0.2 mm; d-f. *Chemnitzia cummingi* (Hori & Okutani, 1997); Station TH 117A, d, e. scale bar 1 mm, f. scale bar 0.2 mm; g-i. *Chemnitzia humilis* (Yokoyama, 1924); Station TH 161C, g. scale bar 1mm, h, i. scale bar 0.2 mm; j-l. *Chemnitzia punctiperipherata* (Nomura, 1936); Station TH 108D, j. scale bar 0.8 mm, k. scale bar 0.3 mm, l. scale bar 0.2 mm; m-n. *Chemnitzia* sp. 3; Station TH 161C, m. scale bar 0.6 mm, n. scale bar 0.3 mm; o-p. *Exesilla dextra* (Saurin, 1959); Station TH 108A, o. scale bar 0.6 mm, p. scale bar 0.25 mm.

spire whorls moderately convex, with the periphery at the abapical one-third, sutures impressed, 4) body whorl subcylindrical, roundly angular at the transition to the base that is very gently convex, 5) aperture oval, slightly twisted adapically, somewhat reflexed abapically, 6) sculpture of straight, opisthocline collabral ribs, slightly narrower than interspaces, 18 on the first whorl, 16 on subsequent ones; ribs and interspaces end abruptly at the transition to the base that is smooth.

Remarks

Chemnitzia sp. 1 (cf. Robba *et al.*, 2004, p. 212, pl. 31, fig. 3) is closely similar, differing only in that has somewhat slenderer shell and less numerous ribs (13 instead of 16).

Exesilla dextra (Saurin, 1959)

Fig. 25 o, p

1959 *Turbonilla dextra* Saurin, p. 259, pl. 6, fig. 13.

Distinguishing features are 1) turreted, nearly straight-sided shell attaining 3.52 mm in height, 2) protoconch umboniiform, of about 2 whorls, oblique and scarcely concealed by the first teleoconch whorl, 3) spire of 4.5 whorls, the first convex, subsequent ones flat-sided, very slightly constricted adapically and with rounded periphery at the abapical one-third, sutures impressed, 4) body whorl subcylindrical, 40% of total height, base convex, rather quickly tapering, 5) aperture oval, columellar fold weak, hardly visible from in front, 6) sculpture of prosocline collabral ribs, 16-17 throughout, narrower than interspaces, weakly nodose adapically, gradually attenuated over the base; faint, distant spiral grooves occur in the furrows between the ribs.

Distribution and habitat

Exesilla dextra was hitherto known from Vietnamese waters; the original material was recovered at 10 m depth.

Fossil records

None recorded.

Pyrgiscilla zetemia (Melvill, 1910)

Fig. 26 a-d

1910 *Turbonilla zetemia* Melvill, p. 192, pl. 5, fig. 13.

1959 *Pyrgiscilla zetemia* Saurin, p. 272, pl. 9, figs. 8, 9.

A single specimen 2.5 mm high, characterized by 1) turreted, very slightly cyrtocoid shell, 2) protoconch helicoid, of 2.75 smooth whorls, prostrate on the first teleoconch whorl, extending beyond the outline of this latter and coiled nearly at right angle to the teleoconch, 3) spire of 6 whorls, the first distinctly shouldered at the adapical one-fifth, subsequent ones convex with the periphery at

the abapical one-third, sutures impressed, 4) body whorl rather depressed, about 31% of total height, quickly contracted at the base that is almost flat, 5) aperture ovate-quadrangular, outer lip thin-edged, backed by a broad varix, columella somewhat reflexed and twisted adapically, 6) sculpture of 15 round-topped collabral ribs, as wide as one-half the intervening spaces and of 1 varix on the penultimate whorl; ribs and interspaces end abruptly shortly below the periphery; blunt approximate spirals occur in interspaces and over the base.

Remarks

The Thai shell perfectly conforms to the Vietnamese ones figured by Saurin (1959).

Distribution and habitat

Pyrgiscilla zetemia is distributed from the Gulf of Oman to Singapore and northward to Vietnam. It seems to be an upper sublittoral element dwelling on sandy substrates.

Fossil records

None recorded.

Pyrgiscus mumia (Adams, 1861)

Fig. 26 e, f

1861a *Chrysallida mumia* Adams, p. 45.

1906 *Turbonilla* (*Pyrgiscus*) *mumia* Dall & Bartsch, p. 343, pl. 17, fig. 1.

1938 *Turbonilla* (*Pyrgiscus*) *mumia* Nomura, p. 53, pl. 5, fig. 46.

1958 *Pyrgiscus* (*Pyrgiscus*) *mumia* Saurin, p. 81, pl. 4, figs. 11, 12.

1959 *Pyrgiscus mumia* Saurin, p. 269, pl. 9, fig. 3.

2000 *Pyrgiscus mumia* Hori in Okutani, p. 713, pl. 355, fig. 69.

Distinctive features are 1) elongate-conic, somewhat turreted, cyrtocoid shell attaining 3.3 mm in height, 2) protoconch helicoid, of 2 whorls, one-third immersed in the first teleoconch whorl and reaching (but not extending beyond) the outline of the latter, 3) spire whorls flatly convex, with very narrow subsutural shelf, suture shallowly impressed, 4) body whorl subcylindrical, 40% of total height, base quickly attenuated, 5) aperture small, subquadrangular, inner lip reflexed abapically, columellar fold deeply set, 6) sculpture of gently arched and slightly opisthocline collabral ribs nearly as wide as the intervening spaces, continuous to the base, 14-16 ribs occur on the first whorl, 20 on the fifth, 21-22 on subsequent ones; interspaces with even spiral cordlets, 5 on earlier whorls, 8-10 on later ones, 8-9 over the base.

Remarks

The shell may be more or less slender and the outline of the whorls more or less convex.

Distribution and habitat

Pyrgiscus mumia was so far known to range from Vietnam to Japan and Southern Korea. It was reported to occur on sandy mud (Hori in Okutani, 2000), in the upper sublittoral zone.

Fossil records

None recorded.

Pyrgiscus sp. Fig. 26 g-j

A single specimen 3.7 mm high, featured by 1) slenderly turreted, nearly straight-sided shell, 2) protoconch helicoid, of 2 smooth whorls, one-fifth immersed in the first teleoconch whorl and coiled at a right angle to it, 3) spire whorls convex, with very narrow subsutural shelf and the periphery slightly abapical to the middle, meeting at impressed sutures, 4) body whorl cup-shaped, about 25% of total height, rather quickly attenuated at the base, 5) aperture oval, rather small, inner lip somewhat reflexed adaxially, columella twisted adapically, 6) sculpture of collabral ribs and spiral grooves in the interspaces; the ribs, 15 on earliest whorls, 17 on the penultimate, are nearly flat-topped, as wide as one-half the intervening spaces, continuous and gradually thinner over the base; the spiral grooves, 7 on the first whorls, 12 on the penultimate and 22 on the body whorl, are narrow, shallow, rather distant and evenly spaced.

Remarks

The present form appears to be related to the Australian *Pyrgiscus rhabdoides* (Watson, 1886), but the latter differs in having higher whorls at least.

Zaphella tribulationis (Hedley, 1909) Fig. 26 k, l

1909 *Turbonilla tribulationis* Hedley, p. 450, pl. 42, figs. 79, 80.

1959 *Zaphella tribulationis* Laseron, p. 244, figs. 187-189.

Diagnostic characters are 1) elongate-conic, somewhat turreted, slightly cyrtocoid shell attaining 4.4 mm in height, 2) protoconch helicoid, of 2 whorls, one-third immersed in the first teleoconch whorl and reaching (but not extending beyond) the outline of the latter, 3) spire whorls flatly convex, with moderate subsutural shelf, somewhat constricted abapically, meeting at shallowly impressed sutures, 4) body whorl subcylindrical, 48% of total height, base nearly flat, bounded by a distinct angulation, 5) aperture rhomboid, inner lip reflexed abapically, 6) sculpture of protractively arched, slender collabral ribs, usually narrower than the intervening spaces, 16 on the first whorl, 19-20 on the penultimate, and of 2 spiral cords of the same strength of the

ribs, respectively over the shoulder and over the basal angulation; the ribs form elongate, raised tubercles on crossing the adapical spiral and are considerably finer over the subsutural shelf, override the basal spiral and vanish on upper base; intercostal spaces and base with fine spiral striation.

Remarks

The Thai specimens fully conform to the shell published by Laseron (1959) and depicted in his Fig. 189. It is of note that Laseron remarked that it "differs in detail from the type..... and more material is needed to decide if it is a distinct species".

Distribution and habitat

Zaphella tribulationis was hitherto known from Australian waters. Records were from the infralittoral zone.

Fossil records

None recorded.

Ordo CEPHALASPIDEA Superfamilia PHILINOIDEA Familia RETUSIDAE

Retusa sp. Fig. 26 m, n

Diagnostic characters are 1) slenderly conical-ovate, involute shell not exceeding 2.5 mm in height, 2) adapical umbilicus rather narrow and deep, showing the sunken apex of the spire and bounded by the rounded edge of the body whorl, 3) aperture as high as total height, narrow in the adapical three-fifths, with narrowly rounded and prominent upper rim, wider and oval abapically, outer lip thin-edged and gently arched forward, inner lip somewhat revolute toward a narrow and shallow umbilical depression, 4) sculpture of dense collabral threads crossed by even, shallow spiral grooves cutting the axials into short bars and giving the surface a rough aspect.

Remarks

The shell described from the Ogasawara Islands by Fukuda (1994) and referred to as *Retusa* sp. appears to be related, but is less attenuated abapically and has less dense axials. *Retusa concentrica* (Adams, 1855) differs in having subcylindrical, medially constricted shell.

Rhizorus sp. Fig. 26 o

Distinctive features are 1) convolute, slenderly fusiform, rather thick shell up to 3.8 mm in height, 2) adapical part gradually attenuated toward a sharply point-

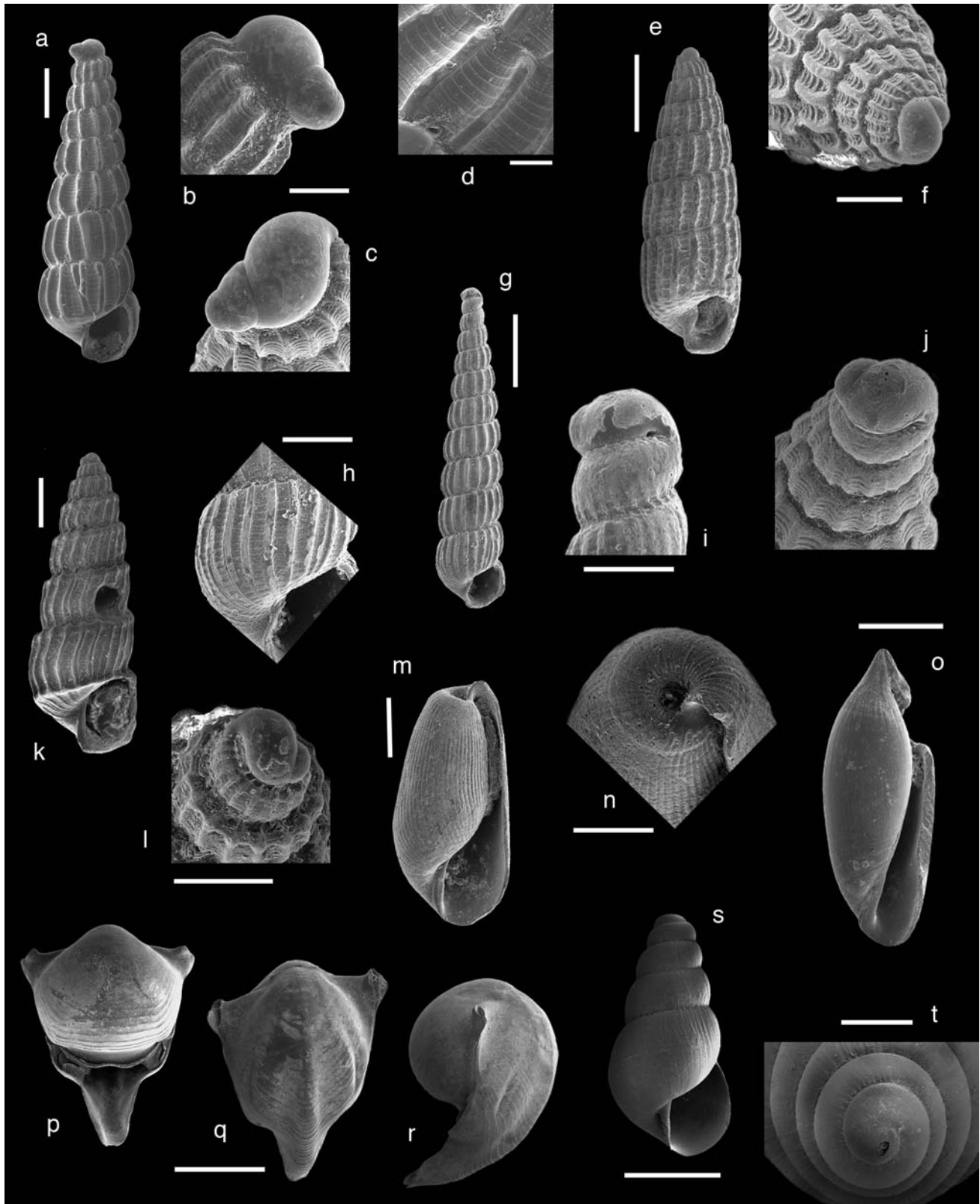


Fig. 26. **a-d.** *Pyrgiscilla zetemia* (Melvill, 1910); Station TH 161C, **a.** scale bar 0.4 mm, **b, c.** scale bars 0.15 mm, **d.** scale bar 0.1 mm; **e-f.** *Pyrgiscus mumia* (Adams, 1861); Station TH 108A, **e.** scale bar 0.5 mm, **f.** scale bar 0.2 mm; **g-j.** *Pyrgiscus* sp.; Station TH 158D, **g.** scale bar 0.8 mm, **h.** scale bar 0.3 mm, **i, j.** scale bar 0.2 mm; **k-l.** *Zaphella tribulationis* (Hedley, 1909); Station TH 108A, **k.** scale bar 0.6 mm, **l.** scale bar 0.2 mm; **m-n.** *Retusa* sp.; Station TH 158D, **m.** scale bar 0.5 mm, **n.** scale bar 0.3 mm; **o.** *Rhizorus* sp.; Station TH 158D; scale bar 1 mm; **p-r.** *Diacavolinia flexipes* Van der Spoel, Bleeker & Kobayasi, 1993; Station TH 159; scale bar 1.6 mm; **s-t.** *Lamellaxis clavulinus* (Potiez & Michaud, 1838); Station TH 42B, **s.** scale bar 2 mm, **t.** scale bar 0.5 mm.

ed, prominent apex, 3) greatest diameter about at the adapical one-third, 4) aperture as high as the total height, narrow adapically, gradually widening in the abapical one-half, outer lip thin edged, inner lip with a narrow band of callus at both ends, somewhat reflexed abapically, basal lip arched, 5) outer surface with adapi-

cal and abapical fine spiral grooves and thin adapical axial ridges.

Remarks

The shell from the Southern Gulf of Thailand, figured

by Swennen *et al.* (2001) and referred to as *Rhizorus fortis* (Thiele, 1925) appears to have identical shell shape, but seems devoid of adapical sculpture. *Rhizorus tokunagai* (Makiyama, 1927) is also related, but the shell is less slender, with slightly shorter apical spur and also lacks the adapical sculpture (cf. Horii in Okutani, 2000, pl. 372, fig. 19).

Ordo THECOSOMATA
Familia CAVOLINIIDAE
Subfamilia CAVOLINIINAE

Diacavolinia flexipes

Van der Spoel, Bleeker & Kobayasi, 1993

Fig. 26 p-r

1971 *Cavolinia longirostris* forma *flexipes* Van der Spoel, p. 16, figs. 15, 16, 19, 21.

1993 *Diacavolinia flexipes* Van der Spoel, Bleeker & Kobayasi, p. 147, pl. 2, fig. 30; text-fig. 24.

1995 *Diacavolinia flexipes* Bosch, Dance, Moolenbeek & Oliver, p. 182, fig. 844.

2001 *Diacavolinia flexipes* Swennen, Moolenbeek, Ruttanadakul, Hobbink, Dekker & Hajisamae, p. 141, fig. 515.

Several empty shells were obtained from dredgings in the deeper part of the Northern Gulf of Thailand. Distinctive characters are 1) shell inflated, subtriangular in outline, attaining 8 mm in length, 2) dorsal side moderately convex, with 3 broad and rounded longitudinal folds, the median one longer extending over the prominent gutter-like rostrum, 3) ventral side hemispheric, with 7-8 mid-anterior low transverse ridges, lip distinctly everted, 4) lateral spines bent upward, moderately long and grooved.

Remarks

We concur with Swennen *et al.* (2001) in considering still unclear the relationships of the present taxon with *Diacavolinia longirostris* (Lesueur in De Blainville, 1821). Should it result to be actually distinct, the name *flexipes*, originally proposed with infrasubspecific rank, is to be changed being unavailable (ICZN, 1999, art. 45.5). The subsequent use by Van der Spoel *et al.* (1993) does not validate it (ICZN, 1999, art. 45.6.4.1).

Distribution and habitat

Diacavolinia flexipes ranges from the Red Sea to the Andaman Sea (Van der Spoel *et al.*, 1993) and the Gulf of Thailand (Swennen *et al.*, 2001). It is an holoplanktonic species whose shells deposit on the seafloor after death or are, sometimes, beached.

Fossil records

None recorded.

Ordo EUPULMONATA
Subordo STYLOMMATOPHORA
Superfamilia ACHATINOIDEA
Familia SUBULINIDAE

Lamellaxis clavulinus (Potiez & Michaud, 1838)

Fig. 26 s, t

1952 *Opeas clavulinum* van Benthem Jutting, p. 381, fig. 59.

1998 *Lamellaxis clavulinus* Solem in Beesley *et al.*, p. 1088, fig. 17.47 C.

Distinguishing characters are 1) thin, turreted, blunt-tipped shell up to 12 mm in height, 2) spire whorls convex, meeting at impressed sutures, 3) body whorl oval, 63% of total height, base regularly convex with narrow umbilical chink, 4) aperture rhomboid, rather small, pointed adapically and rounded abapically, outer lip sharp, columella straight, distinctly reflected over the umbilical chink, merging abapically into the basal lip, 5) outer surface with dense axial wrinkles crenulating the adapical suture.

Remarks

Lamellaxis gracilis (Hutton, 1834) is closely related, but differs in having slenderer shell and less convex whorls.

Distribution and habitat

Lamellaxis clavulinus was originally described from the Bourbon Islands. It appears to have been later introduced throughout the tropics (Australia, Indonesia, Japan and Hawaii) by humans and was recently recorded from greenhouses in Europe and America. The species is a terrestrial element; records from shallow marine deposits refer to shell transported during the rainy season.

Fossil records

Holocene of Thailand (personal data).

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Appendix

Full list of species recovered in the Gulf of Thailand study areas; T: type-material in BMNH examined; BM: relevant material in BMNH examined; HBC: recovered from the Holocene Bangkok Clay (Lower Central Plain

of Bangkok, inland of Phetchaburi coast); PHE: Phetchaburi area (intertidal and sublittoral); PPH: Pak Phanang Bay; L: live specimens; D: dead shells; 2002: covered in Robba *et al.* (2002); 2004: covered in Robba *et al.* (2004); PR: covered in present paper.

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Nucula (Nucula) paulula</i> Adams, 1856			•	LD				•
<i>Nucula (Nucula) sp. 1</i>					D			•
<i>Nuculoma layardi</i> (Adams, 1856)	•		•	LD		•		
<i>Nuculana (Jupiteria) puellata</i> (Hinds, 1843)	•		•	LD	LD	•		
<i>Nuculana (Scaeolea) mauritiana</i> (Sowerby, 1833)			•	LD	D		•	
<i>Portlandia japonica</i> (Adams & Reeve, 1850)		•		D		•		
<i>Yoldia (Yoldia) belcheri</i> (Hinds, 1843)	•		•	LD		•		
<i>Perna viridis</i> (Linnaeus, 1758)				LD		•		
<i>Septifer bilocularis</i> (Linnaeus, 1758)				D		•		
<i>Modiolus (Modiolus) elongatus</i> (Swainson, 1821)	•			D		•		•
<i>Modiolus (Modiolus) metcalfei</i> (Hanley, 1844)	•			LD		•		
<i>Modiolus (Modiolus) philippinarum</i> (Hanley, 1844)	•		•	D		•		
<i>Modiolus (Modiolus) plumescens</i> (Dunker, 1868)			•	D			•	
<i>Stavelia sp.</i>				LD			•	
<i>Arcuatula arcuatula</i> (Hanley, 1844)	•		•	LD	L	•		
<i>Musculista japonica</i> (Dunker, 1856)	•			D		•		
<i>Musculista senhousia</i> (Benson, 1842)	•			LD		•		
<i>Musculus nanus</i> (Dunker, 1856)				D				•
<i>Botula cinnamomea</i> (Gmelin, 1791)				D		•		•
<i>Arca (Arca) navicularis</i> Bruguière, 1789		•		D	D	•		
<i>Arca (Arca) ventricosa</i> Lamarck, 1819				D				•
<i>Barbatia (Barbatia) foliata</i> (Forsskål, 1775)				D	D	•		
<i>Barbatia (Barbatia) signata</i> (Dunker, 1868)				LD		•		•
<i>Hawaiarca bistrigata</i> (Dunker, 1853)	•		•	D		•		
<i>Trisidos semitorta</i> (Lamarck, 1819)				LD		•		
<i>Trisidos tortuosa</i> (Linnaeus, 1758)			•	LD		•		
<i>Anadara ferruginea</i> (Reeve, 1844)	•		•	D	LD	•		
<i>Anadara granosa</i> (Linnaeus, 1758)		•		LD	LD	•		
<i>Anadara oblonga</i> (Philippi, 1849)			•	LD		•		
<i>Anadara sp.</i>			•			•		
<i>Scapharca clathrata</i> (Reeve, 1844)				D			•	
<i>Scapharca crebricostata</i> (Reeve, 1844)	•			D		•		
<i>Scapharca inaequivalvis</i> (Bruguière, 1789)		•	•	LD	D	•		
<i>Scapharca indica</i> (Gmelin, 1791)		•	•	LD		•		
<i>Anadarinae sp. 1</i>				D			•	
<i>Anadarinae sp. 2</i>				D			•	
<i>Cucullaea labiata</i> (Lightfoot, 1786)				D		•		
<i>Cucullaea sp.</i>				D			•	
<i>Sheldonella lateralis</i> (Reeve, 1844)	•			LD		•		
<i>Striarca aceraea</i> (Melvill & Standen, 1899)			•	D			•	
<i>Striarca symmetrica</i> (Reeve, 1844)	•		•	LD		•		

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Didimacar tenebrica</i> (Reeve, 1844)	•		•	D		•		
<i>Estellacar galactodes</i> (Benson, 1842)					LD			•
<i>Estellacar olivacea</i> (Reeve, 1844)	•		•	D	LD	•		
<i>Scelidionarca pectunculiformis</i> (Dunker, 1866)	•		•			•		
<i>Verilarca (Verilarca) sinensis</i> (Thiele & Jaeckel, 1931)			•	LD		•		
<i>Verilarca (Spinearca) mortenseni</i> (Lyngø, 1909)				D		•		
<i>Pteria breviaalata</i> (Dunker, 1872)		•		D		•		
<i>Pinctada radiata</i> (Leach, 1814)		•		LD		•		
<i>Malleus (Malleus) albus</i> Lamarck, 1819		•		D		•		
<i>Malleus (Malvufundus) regula</i> (Forsskål, 1775)		•		D		•		
<i>Vulsella vulsella</i> (Linnaeus, 1758)			•	D		•		
<i>Isognomon isognomum</i> (Linnaeus, 1758)				D		•		
<i>Pinna bicolor</i> Gmelin, 1791				D		•		
<i>Atrina (Atrina) vexillum</i> (Born, 1778)				D		•		
<i>Atrina (Servatrina) pectinata</i> (Linnaeus, 1767)			•	D		•		
<i>Limaria (Limaria) basilanica</i> (Adams & Reeve, 1850)	•		•	D		•		
<i>Limaria (Limaria) fragilis</i> (Gmelin, 1791)			•	D		•		
<i>Hytissa hyotis</i> (Linnaeus, 1758)			•	D		•		
<i>Ostrea (Ostrea) denselamellosa</i> Lischke, 1869				D		•		
<i>Planostrea pestigris</i> (Hanley, 1845)	•		•	LD	D	•		
<i>Alectryonella haliotidaea</i> (Lamarck, 1819)				D		•		
<i>Dendostrea folium</i> (Linnaeus, 1758)			•	LD		•		
<i>Dendostrea rosacea</i> (Deshayes, 1836)			•	D	D	•	•	
<i>Crassostrea gigas</i> (Thunberg, 1793)			•			•		
<i>Saccostrea cucullata</i> (Born, 1778)			•	D	D	•		
<i>Plicatula (Plicatula) chinensis</i> Mörch, 1853			•	LD		•		
<i>Plicatula (Plicatula) muricata</i> Sowerby, 1873	•			D		•		
<i>Chlamys (Chlamys) senatoria</i> (Gmelin, 1791)			•			•		
<i>Chlamys (Argopecten) pelseneeri</i> (Dautzenberg & Bavay, 1912)			•	D		•		
<i>Complicachlamys wardiana</i> Iredale, 1939				D				•
<i>Excellichlamys histrionica</i> (Gmelin, 1791)				D				•
<i>Decatopecten plica</i> (Linnaeus, 1758)				D				•
<i>Decatopecten strangei</i> (Reeve, 1852)				D			•	
<i>Minnivola pyxidata</i> (Born, 1778)			•			•		
<i>Amusium pleuronectes</i> (Linnaeus, 1758)				D				•
<i>Spondylus barbatus</i> Reeve, 1856	•			D		•		
<i>Spondylus nicobaricus</i> Schreibers, 1793		•		D		•		
<i>Anomia acheus</i> Gray, 1850	•		•	D		•		
<i>Anomia chinensis</i> Philippi, 1848		•		D	D	•		
<i>Placuna placenta</i> (Linnaeus, 1758)		•	•	D		•		
<i>Chama asperella</i> Lamarck, 1819		•	•	LD		•		
<i>Pseudochama scutulina</i> Poutiers, 1981				D		•		
<i>Lucina (Luciniscia) venusta</i> Philippi, 1847			•	LD		•		
<i>Anodontia (Anodontia) edentula</i> (Linnaeus, 1758)			•	LD		•		
<i>Cardiolucina semperiana</i> (Issel, 1869)			•	LD		•	•	
<i>Eamesiella corrugata</i> (Deshayes, 1843)			•			•		

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Epicodakia pulchella</i> (Lyngø, 1909)				D		•		
<i>Loripes (Loripes) desideratus</i> (Smith, 1885)				D		•	•	
<i>Pillucina australis</i> Glover & Taylor, 2001			•	LD	D		•	
<i>Cycladicama oblonga</i> (Hanley, 1844)	•		•	D		•		
<i>Felaniella (Zemysia) conspicua</i> (Smith, 1885)	•		•	LD	D	•		
<i>Phlyctiderma amboinense</i> (Smith, 1885)	•		•	D		•		
<i>Phlyctiderma japonicum</i> (Pilsbry, 1895)				D		•		
<i>Aenictomya mirabilis</i> (Lyngø, 1909)				D				•
<i>Callomysia matsui</i> Habe, 1951				D		•		
<i>Curvemysella arcuata</i> (Adams, 1856)	•		•			•		
<i>Curvemysella paula</i> (Adams, 1856)	•		•	D		•		
<i>Eolepton crassum</i> (Yokoyama, 1927)				D				•
" <i>Erycina</i> " <i>lineata</i> (Lyngø, 1909)				D		•		
<i>Erycininae</i> sp.				D		•		
<i>Fastimysia</i> sp.				D				•
<i>Fronsella</i> sp.			•	D		•		
<i>Kellia laperousii</i> Deshayes, 1839				D		•		
<i>Kellia porculus</i> Pilsbry, 1904				D		•		
<i>Kellia</i> sp. 1			•	D		•		
<i>Kellia</i> sp. 2			•	D	D	•		
<i>Kellia</i> sp. 3			•	D		•		
<i>Kellia</i> sp. 4				D				•
<i>Kona oryzaeformis</i> Kuroda & Habe, 1971				D				•
<i>Lasaea</i> sp.				D				•
<i>Leiochasma</i> sp.				D		•		
<i>Marikellia elongata</i> (Lyngø, 1909)			•	D		•		
<i>Marikellia</i> sp.				D	D			•
<i>Melliteryx puncticulata</i> (Yokoyama, 1924)			•	D		•		
<i>Myllita (Myllita)</i> sp.			•				•	
<i>Mysella mutsuwanensis</i> (Yamamoto & Habe, 1959)				D		•		
<i>Mysella rudis</i> (Lyngø, 1909)			•	D		•		
<i>Mysella variabilis</i> (Lyngø, 1909)			•	D		•		
<i>Mysella</i> sp. 1			•	D		•		
<i>Mysella</i> sp. 2				D	D	•		
<i>Mysella</i> sp. 3			•	D	D	•		
<i>Mysella</i> sp. 4				D		•		
<i>Mysella</i> sp. 5				D			•	
<i>Mysella</i> sp. 6				D				•
<i>Nipponomysella subtruncata</i> (Yokoyama, 1927)			•	D	D			•
<i>Nipponomysella tanabensis</i> Habe, 1960				D				•
<i>Parvikellia</i> sp.			•	D		•		
<i>Pseudopythina ariakensis</i> (Habe, 1959)			•	D		•		
<i>Pseudopythina venusta</i> (Lyngø, 1909)			•	D		•		
<i>Pseudopythina</i> sp.			•	D	D	•		
<i>Pseudopythina</i> sp. 1				D				•
<i>Scintillula</i> sp.			•	D	D	•		

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Tellimya</i> sp. 1			•	D	LD	•		
<i>Tellimya</i> sp. 2			•	D		•		
Galeommatidae sp.				D				•
<i>Micropolia</i> sp.			•				•	
<i>Basterotia</i> ? sp.			•				•	
<i>Carditella (Carditellona) pulchella</i> Lyngø, 1909				LD		•		
<i>Choniocardia (Carditellopsis) pusilla</i> (Lyngø, 1909)				D		•		
<i>Bathytormus radiatus</i> (Sowerby, 1825)		•	•	LD		•		
<i>Vepricardium coronatum</i> (Spengler, 1799)			•	LD		•		
<i>Vepricardium sinense</i> (Sowerby, 1840)	•		•	D		•		
<i>Acrosterigma impositum</i> (Sowerby, 1840)	•			D		•		
<i>Vasticardium fidele</i> (Vidal, 1992)				D				•
<i>Afrocardium richardi</i> (Audouin, 1826)				D		•		
<i>Fulvia hungerfordi</i> (Sowerby, 1901)	•		•	LD		•		
<i>Mactra (Mactra) luzonica</i> Deshayes, 1854	•		•	LD	D	•		
<i>Mactra (Mactra) violacea</i> Gmelin, 1791		•		D		•		
<i>Mactra</i> sp.				D	D	•		
<i>Macrinula dolabrata</i> (Deshayes, 1854)			•				•	
<i>Lutraria (Lutrophora) complanata</i> (Gmelin, 1791)		•	•			•		
<i>Heterocardia gibbosula</i> Deshayes, 1854	•		•	D		•		
<i>Meropesta pellucida</i> (Gmelin, 1791)		•	•	LD		•		
<i>Raeta (Raetellops) pulchella</i> (Adams & Reeve, 1850)		•	•	D	D	•		
<i>Cardilia semisulcata</i> (Lamarck, 1819)				D				•
<i>Solen corneus</i> Lamarck, 1818			•	D		•		
<i>Solen</i> sp.			•			•		
<i>Cultellus lacteus</i> (Spengler, 1794)			•	D	LD	•		
<i>Siliqua minima</i> (Gmelin, 1791)			•	LD	LD	•		
<i>Tellina (Angulus) emarginata</i> (Sowerby, 1825)	•		•	D		•		
<i>Tellina (Angulus) vestalis</i> Hanley, 1844	•		•	D		•		
<i>Tellina (Arcopella) casta</i> Hanley, 1844	•			D		•		
<i>Tellina (Arcopella) isseli</i> Adams, 1871				D				•
<i>Tellina (Cadella) obtusalis</i> Deshayes, 1854				D				•
<i>Tellina (Cadella) semen</i> Hanley, 1844		•	•	LD		•		•
<i>Tellina (Cadella) smithi</i> Lyngø, 1909				D				•
<i>Tellina (Cadella)</i> sp.				D				•
<i>Tellina (Clathrotellina) carnicolor</i> Hanley, 1846	•			D		•		
<i>Tellina (Clathrotellina) pretium</i> (Salisbury, 1934)				L			•	
<i>Tellina (Macomona) australis</i> Deshayes, 1854		•	•	LD		•		
<i>Tellina (Moerella) nitens</i> Deshayes, 1854	•		•	LD		•		
<i>Tellina (Moerella) pallidula</i> Lischke, 1871			•	LD	D	•		
<i>Tellina (Moerella) valtonis</i> Hanley, 1844		•	•	D	D	•		
<i>Tellina (Pinguitellina) pinguis</i> Hanley, 1844	•		•	D	D	•		
<i>Tellina (Semelanguis) sp.</i>				LD		•		
<i>Tellina (Serratina) capsoides</i> Lamarck, 1818		•	•	LD		•		
<i>Tellina (Tellinanguis) aethiopica</i> Thiele & Jaekel, 1931			•	D		•		
<i>Tellina (Tellinides) timorensis</i> Lamarck, 1818			•	D		•		

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Tellina (Tellinides) vernalis</i> Hanley, 1844			•			•		
<i>Tellina (Tellinides) sp.</i>			•	D	D	•		
<i>Arcopagia pudica</i> (Hanley, 1844)		•	•	LD	D	•		
<i>Arcopagia yemenensis</i> (Melvill, 1898)	•		•	D	D	•		
<i>Dallitellina spengleri</i> (Gmelin, 1791)			•			•		
<i>Macoma (Pinguimacoma) cygnus</i> (Hanley, 1844)	•		•	D		•		
<i>Macoma (Pinguimacoma) languida</i> (Smith, 1885)	•		•	D		•		
<i>Macoma (Pinguimacoma) sp.</i>			•	D		•		
<i>Macoma (Psammacoma) fallax</i> Bertin, 1878			•	LD	D	•		
<i>Exotica (Exotica) sp.</i>			•	D	D	•		
<i>Macalia bruguieri</i> (Hanley, 1844)				D				•
<i>Psammotreta (Pseudometis) praerupta</i> (Salisbury, 1934)			•	LD		•		
<i>Psammotreta (Tellinimactra) edentula</i> (Spengler, 1798)			•	D		•		
<i>Pulvinus micans</i> (Hanley, 1844)	•			LD		•		
<i>Semele carnicolor</i> (Hanley, 1847)	•			D		•		
<i>Semele sinensis</i> Adams, 1853		•	•	D		•		
<i>Iacra sp.</i>			•			•		
<i>Leptomya sp.</i>			•	D	LD	•		
<i>Spondervilia bisculpta</i> (Gould, 1861)			•				•	
<i>Theora (Theora) lata</i> (Hinds, 1843)	•		•	LD	D	•		
<i>Gari (Gari) simplex</i> (Sowerby, 1894)		•	•	D	D	•		
<i>Gari (Gari) truncata</i> (Linnaeus, 1767)				D				•
<i>Gari (Psammotaena) elongata</i> (Lamarck, 1818)				D		•		
<i>Soletellina diphos</i> (Linnaeus, 1771)			•			•		
<i>Solecortus exaratus</i> (Philippi, 1849)		•	•	D		•		
<i>Azorinus abbreviatus</i> (Gould, 1861)			•			•		
<i>Donax faba</i> Gmelin, 1791			•	LD		•	•	
<i>Donax incarnatus</i> Gmelin, 1791			•	D	D	•		
<i>Donax nitidus</i> Deshayes, 1854	•		•	D	D	•		
<i>Donax semigranosus</i> Dunker, 1877		•	•	D		•		
<i>Trapezium (Neotrapezium) sublaevigatum</i> (Lamarck, 1819)			•				•	
<i>Alveinus ojanus</i> (Yokoyama, 1927)			•	LD	D	•		
<i>Corbicula fluminea</i> (Müller, 1774)			•				•	
<i>Polymesoda (Geloina) bengalensis</i> (Lamarck, 1818)			•			•		
<i>Periglypta puerpera</i> (Linnaeus, 1771)				D		•		
<i>Anomalocardia (Anomalodiscus) squamosa</i> (Linnaeus, 1758)		•		D		•		
<i>Placamen calophylla</i> (Philippi, 1836)		•	•	D		•		
<i>Placamen chloroticum</i> (Philippi, 1849)			•			•		
<i>Timoclea (Timoclea) lionota</i> (Smith, 1885)	•			D		•		
<i>Timoclea (Timoclea) siamensis</i> (Lyngé, 1909)				D		•		
<i>Timoclea (Chioneryx) scabra</i> (Hanley, 1844)	•		•	LD	D	•		
<i>Timoclea (Glycydonta) recognita</i> (Smith, 1885)				D			•	
<i>Sunetta (Cyclosunetta) contempta</i> Smith, 1891	•		•	D		•		
<i>Gafrarium dispar</i> (Dillwyn, 1817)		•		D		•		
<i>Circe scripta</i> (Linnaeus, 1758)				D				•
<i>Dorisca melvilli</i> (Lyngé, 1909)				LD	D	•		

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Dosinia cretacea</i> (Reeve, 1850)	•		•	D		•		
<i>Dosinia dautzenbergi</i> Fischer-Piette & Delmas, 1967			•	D		•		
<i>Dosinia derupta</i> Römer, 1860	•		•	D	D	•		
<i>Dosinia dilecta</i> Adams, 1855	•		•	D		•		
<i>Dosinia trailli</i> Adams, 1855	•		•	D		•		
<i>Dosinia trigona</i> (Reeve, 1850)		•	•	D		•		
<i>Dosinia tumida</i> (Gray, 1838)		•	•	LD	D	•		
<i>Dosinia</i> sp.			•				•	
<i>Pitar</i> (<i>Costellipitar</i>) <i>manillae</i> (Sowerby, 1851)	•			LD	LD	•		
<i>Pitar</i> (<i>Pitarina</i>) <i>striatus</i> (Gray, 1838)			•	D		•		
<i>Callista</i> (<i>Costacallista</i>) <i>erycina</i> (Linnaeus, 1758)			•				•	
<i>Lioconcha</i> (<i>Lioconcha</i>) <i>fastigiata</i> (Sowerby, 1851)	•		•	D		•		
<i>Lioconcha</i> (<i>Sulcilioconcha</i>) sp.			•			•		
<i>Irus</i> (<i>Irus</i>) <i>macrophyllus</i> (Deshayes, 1853)	•		•	LD		•		
<i>Marcia hiantina</i> (Lamarck, 1818)		•	•	D		•		
<i>Marcia recens</i> (Dillwyn, 1817)			•	LD		•		
<i>Paphia</i> (<i>Paphia</i>) <i>undulata</i> (Born, 1778)		•	•	LD	D	•		
<i>Paphia</i> (<i>Protapes</i>) <i>gallus</i> (Gmelin, 1791)		•	•	LD		•		
<i>Meretrix meretrix</i> (Linnaeus, 1758)		•	•	D		•		
<i>Glauconome chinensis</i> Gray, 1828	•			D	D	•		
<i>Glauconome</i> sp.			•			•		
<i>Cryptomya</i> (<i>Venatomya</i>) sp.			•	D		•		
<i>Sphenia perversa</i> Blanford, 1867	•			D	D	•		
<i>Corbula</i> (<i>Corbula</i>) <i>fortisulcata</i> (Smith, 1878)	•		•			•		
<i>Corbula</i> (<i>Corbula</i>) <i>scaphoides</i> Hinds, 1843	•		•	D		•		
<i>Corbula</i> (<i>Anisocorbula</i>) <i>crassa</i> Reeve, 1843	•			D		•		
<i>Corbula</i> (<i>Anisocorbula</i>) <i>modesta</i> Hinds, 1843	•		•	D		•		
<i>Corbula</i> (<i>Anisocorbula</i>) <i>solidula</i> Hinds, 1843		•	•	LD	D	•		
<i>Corbula</i> (<i>Caryocorbula</i>) <i>lineata</i> Lyngø, 1909			•	D		•		
<i>Corbula</i> (<i>Notocorbula</i>) <i>monilis</i> Hinds, 1843	•			LD		•		
<i>Corbula</i> (<i>Notocorbula</i>) <i>tunicata</i> Hinds, 1843				D				•
<i>Potamocorbula laevis</i> (Hinds, 1843)					LD			•
<i>Lentidium</i> ? sp.				D	D	•		
<i>Gastrochaena</i> (<i>Gastrochaena</i>) <i>cuneiformis</i> Spengler, 1783	•			D		•		
<i>Eufistulana agglutinans</i> (Deshayes, 1854)				D				•
<i>Pholas</i> (<i>Monothyra</i>) <i>orientalis</i> Gmelin, 1791			•	D		•		
<i>Barnea</i> (<i>Anchomasa</i>) <i>dilatata</i> (Souleyet, 1843)	•		•			•		
<i>Barnea</i> (<i>Anchomasa</i>) <i>manilensis</i> (Philippi, 1847)	•		•			•		
<i>Zirfaea subconstricta</i> (Yokoyama, 1924)				D				•
<i>Martesia</i> (<i>Martesia</i>) <i>striata</i> (Linnaeus, 1758)			•	D		•		•
<i>Pholadidea</i> sp.			•			•		
Teredinidae sp.				D	D	•		
<i>Periploma</i> (<i>Periploma</i>) <i>indicum</i> Melvill, 1898	•		•	D		•		
<i>Agriodesma navicula</i> (Adams & Reeve, 1850)			•			•		
<i>Pandora</i> (<i>Frenamya</i>) <i>elongata</i> (Carpenter, 1864)	•			D		•		
<i>Cardiomya</i> (<i>Cardiomya</i>) <i>singaporensis</i> (Hinds, 1843)	•			D		•		

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Dentalium variabile</i> Deshayes, 1825		•	•	LD	D		•	
<i>Paradentalium hexagonum</i> (Gould, 1859)		•		LD			•	
<i>Episiphon subrectum</i> (Jeffreys, 1883)		•	•	LD			•	
<i>Dischides prionotus</i> (Watson, 1879)		•	•	LD			•	
<i>Emarginula undulata</i> Melvill & Standen, 1903	•			D			•	
<i>Emarginula</i> sp.				D			•	
<i>Scutus emarginatus</i> (Philippi, 1825)				D			•	
<i>Diodora quadriradiata</i> (Reeve, 1850)	•		•	D			•	
<i>Hybochelus cancellatus</i> (Krauss, 1848)			•	D	D		•	
<i>Pagodatrochus</i> sp.				D			•	
<i>Umbonium vestiarium</i> (Linnaeus, 1758)			•				•	
<i>Ethalia</i> sp.				LD			•	
<i>Ethminolia</i> sp.			•	LD	D		•	
<i>Cyclostremiscus (Miralabrum)</i> sp.				D				•
<i>Daronia</i> sp.			•	D			•	
<i>Leucorhynchia</i> sp.				D			•	
<i>Neritina violacea</i> (Gmelin, 1791)		•		D			•	
<i>Phenacolepas newtoni</i> (Sowerby, 1894)				D				•
<i>Plesiothyreus</i> sp.			•				•	
<i>Filopaludina (Filopaludina) sumatrensis</i> (Dunker, 1852)					D			•
<i>Pila ampullacea</i> (Linnaeus, 1758)				D			•	
<i>Cerithium balteatum</i> Philippi, 1848		•	•	LD	D		•	
<i>Bittium</i> sp. 1				D				•
<i>Bittium</i> sp. 2				D				•
<i>Alaba hungerfordi</i> Sowerby, 1894			•				•	
<i>Turritella terebra</i> (Linnaeus, 1758)				D			•	
<i>Haustator (Kurosoia) cingulifer</i> (Sowerby, 1825)			•	D				•
<i>Tenagodus (Tenagodus) anguinus</i> (Linnaeus, 1758)				D				•
<i>Cerithidea cingulata</i> (Gmelin, 1791)			•	D	D		•	
<i>Cerithidea obtusa</i> (Lamarck, 1822)		•	•				•	
<i>Melanoides jugicostis</i> (Hanley & Theobald, 1876)			•	D			•	
<i>Melanoides tuberculata</i> (Müller, 1774)		•	•	D	D		•	•
<i>Sermyla riqueti</i> (Grateloup, 1840)			•		LD		•	
<i>Tarebia granifera</i> (Lamarck, 1822)					LD			•
<i>Scaliola glareosa</i> Adams, 1862				D	D			•
<i>Scaliola</i> sp.				D	D			•
<i>Cerithidium cerithinum</i> (Philippi, 1849)			•	D			•	
<i>Finella pupoides</i> Adams, 1860	•			D			•	
<i>Finella purpureoapicata</i> Preston, 1905	•		•	D			•	
<i>Finella</i> sp.				D	D		•	
<i>Finella</i> sp. 1				D				•
<i>Littoraria (Littorinopsis) intermedia</i> (Philippi, 1846)	•		•	D			•	
<i>Littoraria (Palustorina) melanostoma</i> (Gray, 1839)	•			D			•	
<i>Barleeia angustata</i> (Pilsbry, 1901)			•				•	
<i>Alvania (Alvania) novarensis</i> (Frauenfeld, 1867)	•		•	LD			•	
<i>Lucidestea</i> sp.			•	D	D		•	

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Rissoina (Rissoina) sp.</i>				D				•
<i>Rissoina (Phosinella) clathrata</i> Adams, 1851	•			D			•	
<i>Stosicia annulata</i> (Dunker, 1860)			•	D			•	
<i>Iravadia (Iravadia) ornata</i> Blanford, 1867				D	D		•	
<i>Iravadia (Iravadia) tuberculata</i> Brandt, 1974			•				•	
<i>Iravadia (Iravadia) sp. 1</i>				D	D		•	
<i>Iravadia (Iravadia) sp. 2</i>				D			•	
<i>Iravadia (Fairbankia) bombayana</i> (Blanford, 1868)			•	D				•
<i>Iravadia (Fairbankia) rohdei</i> (Brandt, 1968)			•	D				•
<i>Iravadia (Pseudonoba) aristaei</i> (Melvill, 1912)	•		•	D	LD		•	
<i>Iravadia (Pseudonoba) sp. 1</i>			•	LD			•	
<i>Iravadia (Pseudonoba) sp. 2</i>			•	D	D		•	
<i>Iravadia (Pseudonoba) sp. 3</i>				D	D		•	
<i>Iravadia (Pseudonoba) sp. 4</i>			•		D		•	
<i>Lantauia taylori</i> Ponder, 1994			•	D	D		•	
<i>Manningiella sp.</i>				D			•	
<i>Assimineia (Assimineia) spiralis</i> Brandt, 1974				D				•
<i>Assimineia (Assimineia) zilchi</i> Brandt, 1974			•					•
<i>Assimineia (Ovassimineia) obtusa</i> Watterbled, 1886			•		D		•	
<i>Assimineia (Sculptassimineia) sp.</i>			•				•	
<i>Assimineia (Sphaerassimineia) brevicula</i> (Pfeiffer, 1854)	•		•	D			•	
<i>Truncatella guerinii</i> Villa & Villa, 1841				D				•
<i>Taheitia sp.</i>			•					•
<i>Gabbia wykoffi</i> (Brandt, 1968)			•				•	
<i>Circulus cinguliferus</i> (Adams, 1850)	•			D			•	
<i>Circulus mortoni</i> Ponder, 1994				D	L			•
<i>Circulus quadricarinatus</i> (Melvill & Standen, 1901)	•		•				•	
<i>Circulus sp. 1</i>			•	LD			•	
<i>Circulus sp. 2</i>				LD	D		•	
<i>Circulus sp. 3</i>			•		D		•	
<i>Circulus sp. 4</i>				D				•
<i>Cochliolepis sp.</i>			•	D			•	
<i>Morchiella sp.</i>				D			•	
<i>Pseudoliotia pulchella</i> (Dunker, 1860)				D			•	
<i>Pseudoliotia sp.</i>				D				•
<i>Solariorbis sp.</i>				D	L		•	
<i>Teinostoma sp. 1</i>			•	D			•	
<i>Teinostoma sp. 2</i>				D			•	
<i>Teinostoma sp. 3</i>				D			•	
<i>Teinostoma sp. 4</i>			•	LD			•	
<i>Teinostoma sp. 5</i>			•				•	
<i>Teinostoma sp. 6</i>				D				•
<i>Tornus sp. 1</i>			•	D			•	
<i>Tornus sp. 2</i>			•	D			•	
<i>Stenothyra acuta</i> Brandt, 1974				D			•	
<i>Stenothyra glabrata</i> (Adams, 1851)		•	•				•	

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Stenothyra monilifera</i> (Benson, 1856)		•		D			•	
<i>Stenothyra polita</i> (Adams, 1851)		•	•	LD	D		•	
<i>Stenothyra</i> sp.			•	LD	L		•	
<i>Skeneopsis</i> sp.				D			•	
<i>Strombus (Doxander) vittatus vittatus</i> Linnaeus, 1758				D				•
<i>Vanikoro cancellata</i> (Lamarck, 1822)		•		D			•	
<i>Macromphalus thelacme</i> (Melville, 1904)	•		•	D			•	
<i>Macromphalus tornatilis</i> (Gould, 1859)				D			•	
<i>Macromphalus styliferinus</i> (Nevill, 1884)				D				•
<i>Macromphalus</i> sp.				D	D		•	
<i>Calyptrea extintorium</i> Lamarck, 1822			•	D			•	
<i>Calyptrea pellucida</i> (Reeve, 1859)	•		•	LD			•	
<i>Crepidula walshi</i> (Reeve, 1859)	•		•	LD			•	
<i>Xenophora (Xenophora) solaroides</i> (Reeve, 1845)				D				•
<i>Cypraea miliaris</i> Gmelin, 1791				D			•	
<i>Erronea pyriformis</i> (Gray, 1824)				D				•
<i>Primovula striatula traillii</i> (Adams, 1855)	•			D			•	
<i>Glossaulax didyma</i> (Röding, 1798)			•	D			•	
<i>Natica stellata</i> Hedley, 1913		•	•				•	
<i>Natica vitellus</i> (Linnaeus, 1758)			•	D			•	
<i>Paratectonatica tigrina</i> (Röding, 1798)			•	D			•	
<i>Notocochlis gualteriana</i> (Récluz, 1844)				D				•
<i>Tanea lineata</i> (Röding, 1798)			•	D			•	
<i>Sinum neritoideum</i> (Linnaeus, 1758)			•	D			•	
<i>Eunaticina papilla</i> (Gmelin, 1791)			•	D			•	
<i>Sigatica pomatiella</i> (Melville, 1893)				D			•	
<i>Semicassis (Semicassis) bisulcata</i> (Schubert & Wagner, 1829)					D			•
<i>Ficus variegatus</i> Röding, 1798					D			•
<i>Bufonaria rana</i> (Linnaeus, 1758)				D			•	
<i>Gyrineum pusillum</i> (Broderip, 1833)	•			D			•	
<i>Cymatium (Linatella) cutaceum</i> (Lamarck, 1816)				D			•	
<i>Metaxia</i> sp.				D				•
<i>Aclophora</i> sp.				D				•
<i>Aclophoropsis</i> sp.				D				•
<i>Bouchettriphora pallida</i> (Pease, 1870)				D			•	
<i>Cheirodonta</i> sp. 1				D				•
<i>Cheirodonta</i> sp. 2				D				•
<i>Inella</i> sp.				D				•
<i>Latitriphora</i> sp.				D			•	
<i>Mesophora</i> sp.				D				•
<i>Nanaphora</i> sp.			•	D			•	
<i>Nanaphora</i> sp. 1				D				•
<i>Obesula lucidula</i> (Hervier, 1897)				D				•
<i>Obesula</i> sp. 1				D				•
<i>Obesula</i> sp. 2				D				•
<i>Obesula</i> sp. 3				D				•

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Tetraphora</i> sp.				D				•
<i>Viriola corrugata</i> (Hinds, 1843)	•		•	D			•	
<i>Horologica</i> sp.				D				•
<i>Joculator marileutes</i> (Melvill & Standen, 1896)			•				•	
<i>Joculator</i> sp. 1				D			•	
<i>Joculator</i> sp. 2				D			•	
<i>Seila</i> (?) sp.				D				•
<i>Seila</i> (<i>Notoseila</i>) sp.				D				•
<i>Synthopsis</i> sp.				D			•	
<i>Tubercliopsis</i> sp.			•	D			•	
<i>Cerithiopsidella</i> sp.				D				•
<i>Epitonium</i> (<i>Epitonium</i>) <i>replicatum</i> (Sowerby, 1844)				D			•	
<i>Epitonium</i> (<i>Lamelliscala</i>) sp.			•				•	
<i>Epitonium</i> (<i>Nitidiscala</i>) <i>angustum</i> (Dunker, 1861)				D			•	
<i>Epitonium</i> (<i>Nitidiscala</i>) sp.			•				•	
<i>Epitonium</i> (<i>Papyriscala</i>) <i>imperiale</i> (Sowerby, 1844)	•			D			•	
<i>Epitonium</i> (<i>Papyriscala</i>) <i>robillardii</i> (Sowerby, 1894)			•	D			•	
<i>Epitonium</i> (<i>Parviscala</i>) <i>columba</i> Kilburn, 1985				D				•
<i>Epitonium</i> (<i>Parviscala</i>) <i>histicosum</i> (Jousseume, 1912)				D			•	
<i>Epitonium</i> (<i>Parviscala</i>) <i>townsendi</i> (Melvill & Standen, 1903)				D			•	
<i>Epitonium</i> (<i>Parviscala</i>) sp. 1				D			•	
<i>Epitonium</i> (<i>Parviscala</i>) sp. 2				D			•	
<i>Amaea</i> (<i>Amaea</i>) sp. 1			•				•	
<i>Amaea</i> (<i>Amaea</i>) sp. 2			•	D			•	
<i>Amaea</i> (<i>Acrilla</i>) <i>acuminata</i> (Sowerby, 1844)	•		•	D			•	
<i>Amaea</i> (<i>Filiscala</i>) <i>grossicingulata</i> (de Boury, 1912)				D			•	
<i>Opalia</i> (<i>Pliciscala</i>) <i>hidryma</i> (Melvill, 1899)				D				•
<i>Eulima bifascialis</i> (Adams, 1863)			•	LD			•	
<i>Eulima</i> sp.				D				•
<i>Eulitoma</i> sp.				D				•
<i>Hypermastus</i> sp.				D			•	
<i>Melanella</i> sp. 1			•				•	
<i>Melanella</i> sp. 2				D			•	
<i>Melanella</i> sp. 3				D			•	
<i>Niso venosa</i> Sowerby, 1895	•		•	D			•	
<i>Pyramidelloides mirandus</i> (Adams, 1861)				D				•
<i>Murex trapa</i> Röding, 1798		•	•	D			•	
<i>Ocenebrina xuthedra</i> (Melvill, 1893)	•			D			•	
<i>Ergalatax contracta</i> (Reeve, 1846)				D			•	
<i>Lataxienna blosvillei</i> (Deshayes, 1832)			•	D			•	
<i>Lataxienna fimbriata</i> (Hinds, 1844)				D				•
<i>Lataxienna</i> sp. 1				D			•	
<i>Lataxienna</i> sp. 2			•	D			•	
<i>Thais costata</i> (Blainville, 1832)			•	D			•	
<i>Thais lacera</i> (Born, 1778)			•	D			•	
<i>Thais rugosa</i> (Born, 1778)				D			•	

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<i>Stramonita javanica</i> (Philippi, 1848)			•	D	D		•	
<i>Stramonita malayensis</i> (Tan & Sigurdsson, 1996)			•	LD			•	
<i>Coralliophila (Coralliophila) rubrococcinea</i> Melvill & Standen, 1901				D				•
<i>Babelomurex fearnleyi</i> (Emerson & D'Attilio, 1965)				D			•	
<i>Babylonia areolata</i> (Link, 1807)					D			•
<i>Pseudoneptunea varicosa</i> (Kiener, 1840)		•	•	D			•	
<i>Cantharus (Pollia) sp.</i>				D				•
<i>Nassaria pusilla</i> (Röding, 1798)		•	•	D			•	
<i>Mitrella sp.</i>			•	LD			•	
<i>Mokumea divaricata</i> (Pilsbry, 1904)				D				•
<i>Seminella sp.</i>			•	LD			•	
<i>Zafra comistea</i> (Melvill, 1906)				D				•
<i>Zafra pumila</i> (Dunker, 1860)		•	•	LD	D		•	
<i>Nassarius (Aciculina) teretiussculus</i> (Adams, 1851)	•			LD			•	
<i>Nassarius (Niotha) obesus</i> (G. & H. Nevill, 1875)		•	•	D			•	
<i>Nassarius (Niotha) stolatus</i> (Gmelin, 1791)		•		D	D		•	
<i>Nassarius (Plicarcularia) pullus</i> (Linnaeus, 1758)		•		D			•	
<i>Nassarius (Telasco) sufflatus</i> (Gould, 1860)				D			•	
<i>Nassarius (Zeuxis) castus</i> (Gould, 1850)		•	•	LD	D		•	
<i>Nassarius (Zeuxis) celebensis</i> (Schepman, 1907)			•				•	
<i>Nassarius (Zeuxis) cf. clarus</i> (Marrat, 1877)			•	D			•	
<i>Nassarius (Zeuxis) crematus</i> (Hinds, 1844)		•		D			•	
<i>Nassarius (Zeuxis) foveolatus</i> (Dunker, 1847)		•	•	D			•	
<i>Nassarius (Zeuxis) idyllius</i> (Melvill & Standen, 1901)	•		•	D			•	
<i>Nassarius (Zeuxis) micans</i> (Adams, 1851)	•		•	D			•	
<i>Nassarius (Zeuxis) siquijorensis</i> (Adams, 1851)	•		•	D			•	
<i>Hemifusus elongatus</i> (Lamarck, 1822)			•				•	
<i>Hemifusus ternatanus</i> (Gmelin, 1791)				D			•	
<i>Pugilina cochlidium</i> (Linnaeus, 1758)			•	D			•	
<i>Cymbiola (Aulica) nobilis</i> (Lightfoot, 1876)					D			•
<i>Olivella spretoides</i> Yokoyama, 1922			•	D			•	
<i>Cryptospira tricincta</i> (Hinds, 1844)	•			D			•	
<i>Volvarina philippinarum</i> (Redfield, 1848)		•	•				•	
<i>Subcancilla interlirata</i> (Reeve, 1844)				D				•
<i>Vexillum (Costellaria) malcolmense</i> (Melvill & Standen, 1901)				D				•
<i>Cancellaria asperella</i> Lamarck, 1822				D				•
<i>Cancellaria elegans</i> Sowerby, 1822	•			D	D		•	•
<i>Cancellaria oblonga</i> Sowerby, 1825		•		D			•	
<i>Scalptia scalariformis</i> (Lamarck, 1822)		•	•	D			•	
<i>Epidirona multiseriata</i> (Smith, 1877)				D				•
<i>Turricula javana</i> (Linnaeus, 1767)			•	LD			•	
<i>Funa flavidula</i> (Lamarck, 1822)				D			•	
<i>Funa jeffreysi</i> (Smith, 1875)	•		•	D			•	
<i>Inquisitor latifasciatus</i> (Sowerby, 1870)	•		•	D			•	
<i>Inquisitor vulpionis</i> Kuroda & Oyama, 1971			•	D			•	
<i>Inquisitor sp. 1</i>			•	LD			•	

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Inquisitor</i> sp. 2				D			•	
<i>Maoritomella vallata</i> (Gould, 1869)			•	D			•	
<i>Tomopleura</i> sp.				D			•	
<i>Tylotiella</i> sp.				D			•	
<i>Ceritoturris thailandica</i> sp. n.				D				•
<i>Graciliclava costata</i> (Hedley, 1922)				D				•
<i>Graciliclava</i> sp.			•	D			•	
<i>Gingicithara cylindrica</i> (Reeve, 1846)	•			D			•	
<i>Gingicithara</i> sp.				D			•	
<i>Gingicithara</i> sp. 1				D				•
<i>Heterocithara</i> sp.				D			•	
<i>Ithythythara apicodenticulata</i> n. sp.				D				•
<i>Ithythythara funicostata</i> n. sp.				D				•
<i>Leiocithara</i> sp.			•	LD			•	
<i>Leiocithara</i> sp. 1				D				•
<i>Paraclathurella</i> sp. 1				D			•	
<i>Paraclathurella</i> sp. 2			•	D			•	
" <i>Paraclathurella</i> " <i>clothonis</i> Hedley, 1922			•	D	D		•	
<i>Pseudorhaphitoma bipyramidata</i> Hedley, 1922				D			•	
<i>Pseudorhaphitoma crudelis</i> Hedley, 1922				D			•	
<i>Pseudorhaphitoma drivasi</i> Kilburn, 1993				D			•	
<i>Pseudorhaphitoma fuscescens</i> (Thiele, 1925)				D			•	
<i>Pseudorhaphitoma heptagona</i> (Dunker, 1871)				D				•
<i>Pseudorhaphitoma</i> sp. 1				D			•	
<i>Pseudorhaphitoma</i> sp. 2				D			•	
<i>Pseudorhaphitoma</i> sp. 3				LD			•	
<i>Pseudorhaphitoma</i> sp. 4			•	LD			•	
<i>Pseudorhaphitoma</i> sp. 5				D				•
<i>Pseudorhaphitoma</i> sp. 6				D				•
<i>Etrema acricula</i> Hedley, 1922				D				•
<i>Etrema ditylota</i> (Melvill, 1912)	•		•	LD			•	
<i>Etrema spurca</i> (Hinds, 1843)				D				•
<i>Etrema</i> sp.				D			•	
<i>Etrema</i> sp. 1				D				•
<i>Hemilienardia</i> sp.			•				•	
<i>Neopleurotomoides</i> sp.				D				•
<i>Pseudoetrema fortilirata</i> (Smith, 1879)			•				•	
<i>Pseudoetrema</i> sp.				D				•
<i>Clathurellinae</i> sp.				D				•
<i>Antimitra celebensis</i> (Schepman, 1913)				D				•
<i>Hemidaphne axis</i> (Reeve, 1846)				D				•
<i>Kermia canistra</i> (Hedley, 1922)				LD			•	
<i>Kermia</i> sp.				D			•	
<i>Taranidaphne amphitrites</i> (Melvill & Standen, 1903)				D				•
<i>Tritonoturris</i> sp.				D			•	
<i>Vepracula echinulata</i> (Thiele, 1925)				D			•	

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Vepridaphne cestrum</i> (Hedley, 1922)				D				•
<i>Paradrillia inconstans</i> (Smith, 1875)			•				•	
<i>Paradrillia melvilli</i> Powell, 1969	•		•	D			•	
<i>Terebra bathyrhapse</i> Smith, 1875	•		•	D			•	
<i>Terebra miranda</i> (Smith, 1873)	•		•				•	
<i>Terebra tantilla</i> Smith, 1873	•		•	LD			•	
<i>Terebra textilis</i> Hinds, 1844				D				•
<i>Terebra tricineta</i> Smith, 1877	•		•	D			•	
<i>Duplicaria spectabilis</i> (Hinds, 1843)	•		•				•	
<i>Mathilda carystia</i> Melvill & Standen, 1903				D				•
<i>Architectonica perdix</i> (Hinds, 1844)			•	LD			•	
<i>Heliacus (Torinista) costatus</i> (Schepman, 1909)				D				•
<i>Pseudotorinia gemmulata</i> (Thiele, 1925)			•	D			•	
<i>Amathina oyamai oyamai</i> (Masuda & Noda, 1976)			•		D		•	
<i>Amathina tricarinata</i> (Linnaeus, 1767)				LD			•	
<i>Leucotina diana</i> (Adams, 1854)			•				•	
<i>Leucotina fulva</i> (Adams, 1851)	•		•				•	
<i>Odostomia bullula</i> Gould, 1861			•	D			•	
<i>Odostomia carinata</i> Adams, 1873	•		•	D			•	
<i>Odostomia eutropia</i> Melvill, 1899	•		•	D	D		•	
<i>Odostomia serenei</i> Saurin, 1959			•	D			•	
<i>Odostomia sublimpida</i> Yokoyama, 1920			•	D	D		•	
<i>Brachystomia treina</i> (Saurin, 1959)			•	D			•	
<i>Marginodostomia striatissima</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D			•	
<i>Ondina minutiovum</i> (Nomura, 1936)			•				•	
<i>Sinuatodostomia labunensis</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D			•	
<i>Sinuatodostomia somsaki</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004				D			•	
<i>Chrysallida foveata</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004				D			•	
<i>Chrysallida melvilli</i> (Dautzenberg & Fischer, 1906)			•	D			•	
<i>Chrysallida phanthietina</i> Saurin, 1958				D			•	
<i>Chrysallida phohaiensis</i> (Saurin, 1958)				D				•
<i>Chrysallida saurini</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D	D		•	
<i>Babella bartschi</i> (Dautzenberg & Fischer, 1906)				D			•	
<i>Besla canaensis</i> Saurin, 1959			•	D			•	
<i>Besla cossmanni</i> (Hornung & Mermod, 1924)				D			•	
<i>Besla dheeradijoki</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D	D		•	
<i>Besla</i> sp.				D			•	
<i>Egila curtisensis</i> Laseron, 1959				D			•	
<i>Hinemoa laxefuniculata</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D	D		•	
<i>Hinemoa</i> sp.				D	D		•	
<i>Kleinella</i> sp. 2			•	D	D		•	

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Miralda diadema</i> (Adams, 1860)				D				•
<i>Miralda franciscae</i> Saurin, 1958				D			•	
<i>Miralda scopulorum</i> (Watson, 1886)	•			D			•	
<i>Miralda senex</i> (Hedley, 1902)				D				•
<i>Miralda stupa</i> (Hori & Fukuda, 1999)				D				•
<i>Miralda</i> sp.				D				•
<i>Monotygma amoena</i> Adams, 1851			•	D			•	
<i>Monotygma pareximia</i> (Nomura, 1936)				D			•	
<i>Monotygma punctigera</i> (Adams, 1861)				D				•
<i>Monotygma speciosa</i> Adams, 1851			•	D			•	
<i>Monotygma</i> sp.				D			•	
<i>Morrisonietta spiralis</i> (Brandt, 1968)				D	D			•
<i>Mumiola tessellata</i> (Adams, 1863)			•	D			•	
<i>Numaegilina</i> sp.				D				•
<i>Oscilla jocosa</i> Melvill, 1904				D				•
<i>Polemicella aartseni</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D	D		•	
<i>Polemicella piscatorum</i> Saurin, 1959			•	D			•	
<i>Polemicella saurini</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•				•	
<i>Pyrgulina nigraerupis</i> Saurin, 1959				D				•
<i>Quirella humilis</i> (Preston, 1905)	•		•		D		•	
<i>Quirella lyngei</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D	D		•	
<i>Quirella</i> sp.				D			•	
<i>Salassia bicarinata</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004				D			•	
<i>Salassia germaini</i> (Dautzenberg & Fischer, 1906)			•	D			•	
<i>Cossmannica behainei</i> Saurin, 1959				D			•	
<i>Syrnola cinnamomea</i> (Adams, 1863)			•	D			•	
<i>Syrnola strigatula</i> (Adams, 1863)				D				•
<i>Syrnola vietnamica</i> Saurin, 1959			•	D			•	
<i>Costosyrnola cuabeina</i> Saurin, 1959				D			•	
<i>Costosyrnola culaopagi</i> Saurin, 1959				D			•	
<i>Costosyrnola thailandica</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D	D		•	
<i>Costosyrnola</i> sp.			•	D			•	
<i>Costosyrnola</i> sp. 1				D				•
<i>Puposyrnola basistriata</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D			•	
<i>Tiberia grimaudi</i> Saurin, 1959			•	D			•	
<i>Turbonilla holocenica</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	LD			•	
<i>Turbonilla</i> sp. 1			•	D			•	
<i>Turbonilla</i> sp. 2			•				•	
<i>Turbonilla</i> sp. 3			•				•	
<i>Chemnitzia abbotti</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004				D			•	

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Chemnitzia biangulata</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D			•	
<i>Chemnitzia crassa</i> (Nomura, 1936)			•	LD			•	
<i>Chemnitzia cummingi</i> (Hori & Okutani, 1997)				D				•
<i>Chemnitzia humilis</i> (Yokoyama, 1924)				D				•
<i>Chemnitzia langae</i> Saurin, 1959			•	D	D		•	
<i>Chemnitzia punctiperipherata</i> (Nomura, 1936)				D				•
<i>Chemnitzia nodai</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D	D		•	
<i>Chemnitzia plana</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004				D				
<i>Chemnitzia sandoi</i> Nomura, 1938			•	D			•	
<i>Chemnitzia</i> sp. 1				D			•	
<i>Chemnitzia</i> sp. 2				D			•	
<i>Chemnitzia</i> sp. 3				D				•
<i>Exesilla dextra</i> (Saurin, 1959)				D				•
<i>Exesilla laseroni</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D			•	
<i>Exesilla</i> sp.				D			•	
<i>Pyrgiscilla zetemia</i> (Melvill, 1910)				D				•
<i>Pyrgiscilla</i> sp.				D			•	
<i>Pyrgiscus erica</i> (Thiele, 1925)			•	D	D		•	
<i>Pyrgiscus mirandus</i> Saurin, 1959				D			•	
<i>Pyrgiscus mumia</i> (Adams, 1861)				D				•
<i>Pyrgiscus</i> sp.				D				•
<i>Pyrgolidium</i> sp.				D			•	
<i>Zaphella metula</i> (Adams, 1860)				D			•	
<i>Zaphella tenuicostata</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004				D			•	
<i>Zaphella tribulationis</i> (Hedley, 1909)				D				•
<i>Eulimella pyrgoidella</i> Saurin, 1959			•	D	D		•	
<i>Eulimella siamensis</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004				D			•	
<i>Eulimella thalensis</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004			•	D			•	
<i>Eulimella</i> sp. 1				D			•	
<i>Eulimella</i> sp. 2				D			•	
<i>Cingulina archimedeae</i> Melvill, 1896	•		•	D	D		•	
<i>Cingulina inaequalis</i> Saurin, 1958				D			•	
<i>Cingulina</i> sp.				D			•	
<i>Punctateon yamamurae</i> Habe, 1976			•				•	
<i>Pupa fumata</i> (Reeve, 1865)			•	LD			•	
<i>Ringicula (Ringiculina) gouldi</i> Robba, Di Geronimo, Chaimanee, Negri & Sanfilippo, 2004				D			•	
<i>Ringicula (Ringiculina) propinquans</i> Hinds, 1844			•	LD	D		•	
<i>Acteocina inconspicua</i> (Adams, 1872)			•	LD			•	
<i>Adamnestia modesta</i> (Thiele, 1925)			•	D	D		•	
<i>Adamnestia</i> sp.				D			•	

Species	T	BM	HBC	PHE	PPH	2002	2004	PR
<i>Decorifer longispiratus</i> (Yamakawa, 1911)				D			•	
<i>Decorifer</i> sp.			•	LD	D		•	
<i>Didontoglossa decoratoides</i> Habe, 1955				D			•	
<i>Tornatina gordonis</i> (Yokoyama, 1927)				D			•	
<i>Retusa concentrica</i> (Adams, 1855)				D			•	
<i>Retusa minima</i> (Yamakawa, 1911)				D			•	
<i>Retusa succincta</i> (A. Adams, 1862)			•	D	D		•	
<i>Retusa</i> sp.				D				•
<i>Pyrunculus</i> sp.			•	D			•	
<i>Rhizorus</i> sp.				D				•
<i>Philine</i> sp.				D			•	
<i>Haloa</i> sp.				D	D		•	
<i>Limulatys constrictus</i> Habe, 1952				D			•	
<i>Nipponatys volvulinus</i> (A. Adams, 1862)			•	LD			•	
<i>Diacavolinia flexipes</i> Van der Spoel, Bleeker & Kobayasi, 1993				D				•
<i>Salinator fragilis</i> (Lamarck, 1822)				D	D		•	
<i>Indoplanorbis exustus</i> (Deshayes in Bélanger, 1832)				D			•	
<i>Ellobium aurisjudae</i> (Linnaeus, 1758)			•				•	
<i>Cassidula nucleus</i> (Gmelin, 1791)			•				•	
<i>Melampus</i> sp.				D			•	
<i>Laemodonta siamensis</i> (Morelet, 1875)	•		•				•	
<i>Trochomorpha</i> sp.				D			•	
<i>Hemiplecta</i> sp.				D			•	
<i>Lamellaxis clavulinus</i> (Potiez & Michaud, 1838)			•					•