Tertiary and Quaternary fossil pyramidelloidean gastropods of Indonesia

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Key words – Gastropoda, Pyramidelloidea, taxonomy.
The pyramidelloidean gastropods newly collected from one stratigraphic section and two spot localities in the Rembang anticlinorium (Middle Miocene, northeastern Java) are described and those of various ages in the collections of the Naturalis Biodiversity Center in Leiden are reviewed. A total of 111 species are covered in this paper; another 22 taxa dealt with by previous authors, of which the material was not available, are briefly commented on in an appendix. The "Rembangian" (Middle Miocene) assemblage consists of 89 species. Four are identified as formerly described species, namely *Leucotina speciosa* (Adams), *Megastomia regina* (Thiele), *Exesilla dextra* (Saurin) and *Exesilla splendida* (Martin); 52 are proposed as new; most of the others almost certainly represent previously undescribed species, but cannot be named because of inadequate material. *Parodostomia jogjacartensis* (Martin), *Parodostomia vandijki* (Martin) and *Pyramidella nanggulanica* Finlay, described from the Eocene deposits of Java, seem to be restricted to that epoch. The Neogene fauna appears to be composed almost entirely of extinct species. Only *Leucotina speciosa* (Adams), *Megastomia regina* (Thiele), *Longchaeus turritus* (Adams), *Pyramidella balteata* (Adams), *Exesilla dextra* (Saurin) and *Nisiturris alma* (Thiele) are still present in modern Indo-West Pacific faunas. Most Neogene species seem to be endemic of the Indonesian Archipelago; relationships with other West Pacific fossil faunas have been noted for only a few taxa. The relevance of shell characters in generic recognition, namely the protoconch type, the course and/or the inner lirations of the outer lip, and the sculpture (when present), are significant characters. None of them is genus-diagnostic in itself, but their combination distinguishes the various genera. On this basis, genera are revised and include only those species sharing the relevant characters of their respective type species. The new genera *Bulimoscilla*, *Nisipyrgiscus*, *Turbolidium* and *Bulicingulina* are introduced.

Contents

Introduction

The present paper attempts to provide an overview of the Tertiary and Quaternary pyramidelloidean gastropods of Indonesia. The aims of this study are to describe the material newly collected from "Rembangian" (Middle Miocene) deposits of the Rembang area in northeastern Java, and to review the material dealt with by previous authors and presently available in the collections of the Naturalis Biodiversity Center in Leiden.

Fossil pyramidelloideans were described or simply recorded from units of various age at several locations throughout Indonesia (Boettger, 1883; Martin, 1884, 1905, 1906, 1911, 1916, 1926, 1928, 1931; Schepman, 1907; Tesch, 1920; Fischer, 1927; Oostingh, 1935, 1941; van Regteren Altena, 1942; Wissema, 1947; Beets, 1941, 1981, 1984, 1986). In order to provide a framework of Indonesian Tertiary and Quaternary pyramidelloideans, the available material (27 taxa) considered by the cited authors has been incorporated in this study and reviewed. The material which was not examined, being presently unavailable (22 taxa), is listed and, whenever possible, briefly commented in the appendix. *Turbonilla samarangana* Martin, 1884 (from an unnamed Early Miocene bed of Ngembak Borehole B) is excluded, having been removed from the Pyramidelloidea and referred to the genus *Thiara* Röding, 1798, of the Thiaridae, Cerithioidea (see Leloux & Wesselingh, 2009).

The "Rembangian" molluscs have been dealt with in several papers (Martin, 1891-1906, 1900, 1907, 1912, 1919; Haanstra & Spiker, 1932; Wanner & Hahn, 1935; Pannekoek, 1936; Robba, 1996) in which a total of 226 species are considered, belonging to a number of taxonomic groups apart from the pyramidelloideans. Quite possibly, pyramidelloideans were present, but have been overlooked because of their small size. The pyramidelloideans described in the present paper were recovered from one stratigraphic section and two spot localities (see the following chapter) in the Rembang anticlinorium, between the towns of Rengel and Pamotan. Field work was carried out during three scientific missions, during 1984-1992. The whole material was obtained by sieving from bulk samples. This procedure yielded a great number of specimens representing a total of 89 pyramidelloidean species. Of these, four are identified as formerly described species (from deposits other than the "Rembang Beds"), 52 are proposed as new, and most of the others almost certainly represent previously undescribed species, but more, better preserved material is required in order to establish their identity and to name them. These new findings expand the number of species in the "Rembangian" mollusc-fauna to over 300.

Few pyramidelloidean species have been described from the Eocene deposits of Indonesia (Java) and seem to be restricted to that epoch. The Neogene fauna, as obtained from previous papers, appears to be composed almost entirely of extinct species. This might depend on the fact that the Pyramidelloidea have been hitherto dealt with only occasionally, mostly as a result of fortuitous findings. However, the large Rembangian assemblage does not contradict this evidence since only three species in it, *Leucotina speciosa* (Adams, 1853), *Megastomia regina* (Thiele, 1925) and *Exesilla dextra* (Saurin, 1959), are still present in modern Indo-West Pacific faunas. Most Neogene species seem to be endemic to the Indonesian Archipelago (or to a specific island) and very scarce relationships have been noted with other West Pacific fossil faunas, such as those of the Philippines, Taiwan and Japan. This is in contrast with data concerning the Miocene representatives of other molluscan superfamilies of Indonesia, the Tonnoidea among others (see Beu, 2005).

Localities

Most of the pyramidellids dealt with in the present paper were collected by the author from "Rembangian" (Middle Miocene) deposits belonging to the Tawun Formation, at three locations in the Sedan-Tuban area (northeastern Java): Kali Rebjong

Section, locality RMG 2 and Sumberan. The Kali Rebjong Section, named after the homonymous stream (kali in East Javanese), is exposed on the right bank of Kali Rebjong, between the villages of Ngandang and Karas, southwest of the town of Sedan. It is about 11 m thick and is composed, from bottom to top, of biocalcarenite, fine-grained sand (sample RMG 3), silt (sample RMG 5), and clay and 'marl' (sample RMG 6). The recovered planktonic foraminifers establish a basal N9 zonal assignment indicating a Late Langhian age. At locality RMG 2, between the villages of Ngandang and Gesikan, a 4.7 m-thick section is exposed on the east side of Kali Ngegot. The pyramidellids were collected from the clayey 'marl' forming the mid-lower part (4 m). The planktonic foraminiferal assemblage is referable to Zone N8 and denotes an Early Langhian age. The third sampling site is located east of the village of Sumberan where a small cliff exposes about 2 m of fine-grained sand rich in molluscs. The planktonic foraminiferal assemblage again indicates a basal N9 zonal assignment and a Late Langhian age. For further details on the mentioned localities, see Robba (1996).

The locality data for the Indonesian fossil material of former workers (Beets, 1941, 1981, 1984, 1986; Boettger, 1883; Fischer, 1927; Martin, 1884, 1905, 1906, 1911, 1916, 1926, 1928, 1931; Oostingh, 1935, 1941; van Regteren Altena, 1942; Schepman, 1907; Tesch, 1920; Wissema, 1947) reviewed in the main text or considered in the appendix were not detailed in several papers by the cited authors, especially in those published by Martin. Whenever possible, the localities are revised here with information from van den Hoek Ostende *et al*. (2002), Beu (2005) and Leloux & Wesselingh (2009). Otherwise, the original descriptions of the localities are reported as such, eventually complemented with data from museum labels.

Taxonomic relevance of shell characters

Traditionally, shell characters provided the basis for pyramidelloidean taxonomy and were extensively used to assign species to the various genera. Attempts involving biology, soft-part anatomy or molecular data have been made only recently (Robertson, 1978; Ponder, 1987; Hori & Tsuchida, 1995; Wise, 1996, 2000; Schander *et al*., 1999b, 2003; Dinapoli *et al*., 2011). Dealing with fossil material, the generic classification must rely upon shell characters such as protoconch type, teleoconch shape, whorls outline, sutures, umbilical opening, columellar structures, course and inner structures of the outer lip, and sculpture. The relevance of these characters in generic recognition is discussed below.

Protoconch – The mostly smooth larval shell is markedly heterostrophic in the Pyramidellidae and in several Amathinidae; it is only slightly so in the genus *Amathina* of the Amathinidae. Two primary elements can be used to characterize the protoconch: the shape; and the protoconch angle, that is, the angle at which the protoconch axis is oriented to that of the teleoconch. These two characters combined allow us to denote the protoconch types.

The shape exhibits little intraspecific variation (van Aartsen, 1981, 1987a; Bouchet, 1989; van der Linden & Eikenboom, 1992; van Aartsen *et al*., 1998), but Micali (1994) documented a gradual change from Pliocene through Recent in *Turbonilla striatula*. The following basic models can be distinguished.

- Umboniiform: *Umbonium*-like, variably inflated, lenticular protoconch, ordinarily of 1.5-2.5 whorls, with definitely flat spire or nearly so. It corresponds to type A-I (planorbid) of van Aartsen *et al*. (1998). Examples of umboniiform protoconchs occur in *Leucotina*, *Egilina*, *Longchaeus*, *Otopleura*, *Pyramidella*, *Puposyrnola*, *Cossmannica*, *Tiberia*, *Bartschella*, *Pyrgiscus* and *Koloonella*.
- Helicoid: *Helix*-like, multispiral (2-3 whorls) larval shell, with rather inflated last whorl, low to moderately prominent, bluntly tipped spire not extending beyond the outline of the first teleoconch whorl in most species. It corresponds to type A-II of van Aartsen *et al*. (1998). The helicoid protoconch occurs commonly in the pyramidellids. Among the genera covered in the present paper, it characterizes *Megastomia*, *Odostomia*, *Babella*, *Besla*, *Liamorpha*, *Linopyrga*, *Menesthella*, *Mumiola*, *Polemicella*, *Waikura*, *Costosyrnola*, *Syrnola*, *Tibersyrnola*, *Asmunda*, *Exesilla*, *Turbolidium*, *Turbonilla*, *Bacteridiella* and *Eulimella*.
- Bulimoid: *Bulimus*-like, often exceeding 3 whorls, with conical, prominent and rather pointed spire extending beyond the adapical suture (often beyond the outline) of the first teleoconch whorl. The bulimoid protoconch was included in type A-II by van Aartsen *et al*. (1998). Examples are provided by *Bulimoscilla*, *Nisipyrgiscus*, *Nisiturris* and *Bulicingulina*.

The amplitude of the protoconch angle, measured according to van Aartsen (1981), varies greatly from less than 90° to more than 160°. Values can be grouped into three intervals (see van der Linden & Eikenboom, 1992; Schander, 1994; van Aartsen *et al*., 1998).

1. Protoconch angle ranging from less than 90° to approximately 120°; the protoconch (umboniiform, helicoid or bulimoid) lies across the first teleoconch whorl, may be variably sunken into the latter, but always shows its apical whorl. This is the type A of van der Linden & Eikenboom (1992) and van Aartsen *et al*. (1998).
2. Protoconch angle ranging from 130° to approximately 160°: the protoconch (umboniiform or helicoid) is obliquely immersed in the first teleoconch whorl; the greatest part of it is still observable, but the apical whorl is fully concealed or very slightly visible. This case corresponds to type B of van der Linden & Eikenboom (1992) and van Aartsen *et al*. (1998). Examples are offered by *Egilina* and by some *Odostomia* species.
3. Protoconch angle greater than 160° to almost 180°: the larval shell is completely tilted downward and immersed into the adapical part of the teleoconch; only its last whorl is observable. This distinctly intorted protoconch conforms to type C of van der Linden & Eikenboom (1992) and van Aartsen *et al*. (1998). Examples are found, among others, in the species of *Brachystomia*, *Parodostomia*, *Chrysallida*, *Egila*, *Hinemoa*, *Levipyrgulina*, *Pyrgulina* and *Strioturbonilla*.

While protoconch characters have been extensively used in defining the pyramidelloidean species, their significance in generic recognition has often been neglected or questioned. Many earlier authors (Dall & Bartsch, 1904, 1906 1909; Bartsch, 1909, 1912, 1955; Nomura, 1939; Saurin, 1958, 1959) described the protoconch of the species they dealt with whenever possible, but did not use it to characterize genera. They often as-

sembled species with quite different larval shells in a genus. A unique remarkable exception concerns *Nisiturris*, which was differentiated from *Turbonilla* on the basis of its 'pupoid' protoconch (Dall & Bartsch, 1906). Other workers (Laws, 1937a-d, 1938, 1939, 1940b, 1941; Laseron, 1951, 1959; Fretter *et al*., 1986) regarded the protoconch as genus-diagnostic in some instances, or as one of the important characters to be considered in assigning a given species to a genus. In particular, the type of larval shell was used to distinguish *Finlayola* from *Syrnola* (Laws, 1937d), *Terelimella* from *Eulimella* (Laws, 1938) and *Bartrumella* from *Linopyrga* (Laws, 1941). Fretter *et al*. (1986) assumed the protoconch angle as being "an extremely useful help in identification" of genera. It is recalled here that Robertson (1978), who relied upon biological characters in pyramidellid systematics, strongly criticized the use of conchological similarities for the assignment of species to a genus. However, he retained the teleoconch size and the protoconch in defining *Fargoa* and his new genus *Boonea*. Differences in protoconch shape were also correlated with planktotrophic or non-planktotrophic type of larval development and, thence, treated as taxonomically irrelevant (cf. Beu & Maxwell, 1990; Wise, 1996). This opinion and the still fluid state of pyramidellid taxonomy seem to have induced later authors to refrain from attributing any explicit significance to the protoconch in separating the genera (Peñas & Rolán, 1997, 1998, 1999a, 2010; van Aartsen *et al*., 1998, 2000; Hori & Fukuda, 1999; Hori *et al*., 2002; Pimenta & Absalão, 2004). However, Schander & Sundberg (2001) concluded that empirical evidence does not support dismissing shell characters (protoconch included) in gastropod systematics.

The size of the embryonic shell or Protoconch I (diameter of the first whorl) and the number of protoconch whorls are the primary elements associated with the type of larval development, that is, non-planktotrophic larvae have a paucispiral shell with large first whorl, whereas planktotrophic ones construct a multispiral shell with small first whorl (cf. Robertson, 1971; Shuto, 1974; Marshall, 1978; Bouchet & Waren, 1980, 1986; Jablonski & Lutz, 1983; Bouchet, 1989). Conversely, the protoconch shape appears to be scarcely affected by the kind of larval development, a given basic configuration remaining virtually unchanged at the varying number of whorls. Pertinent examples are provided among others by the Cerithiopsidae (Marshall, 1978), the Triphoridae (Marshall, 1983) and the Ficidae (Waren & Bouchet, 1990). I concur with Bouchet & Waren (1980), who remarked that "the difference between direct and planktotrophic development must be smaller than the difference (and taxonomical importance at the supraspecific level) between two different larval shells of the same type of development". Bouchet (1990, p. 75), discussing the use of the turrid protoconch as a supraspecific character, stated that "the consequence of the genus concept advocated here is that paucispiral protoconchs should only be compared with paucispiral protoconchs, and multispiral protoconchs with multispiral protoconchs".

In the case of pyramidelloideans, a three-whorled helicoid protoconch is considered to differ significantly from an also three-whorled umboniiform protoconch and much relevance in generic recognition is accorded to such a difference. Details of the shape and the number of whorls are of use in separating species within a genus. Further, markedly different values of the protoconch angle likely reflect phylogeny (Schander *et al*., 2003) and are suitable for supraspecific discrimination. This implies that species, otherwise closely similar, but respectively with an intorted larval shell or with the protoconch coiled at a right angle to the axis of the teleoconch, are not to be assigned to

the same genus. An example is found within the odostomiine taxa: the intorted protoconch provides the basis for separating *Brachystomia* from *Odostomia*, which possesses a helicoid larval shell coiled nearly at right angle to the teleoconch (see comments on genera, below).

As can be seen from the preceding part of this section, neither the shape of the larval shell nor the protoconch angle are, in themselves, genus-specific since comparable shapes and/or values of the protoconch angle do occur in several genera. The basic principle followed herein is that species belonging to a given genus must have morphologically similar larval shells (regardless of the number of whorls) and values of the protoconch angle invariably falling within one of the intervals cited above. It is concluded that the protoconch type is a relevant element, which, combined with other significant teleoconch characters (see below), allows consistent generic recognition. The conclusion is supported by the frequent use of such combinations in characterizing genera belonging to gastropod taxa other than the pyramidelloideans. Examples among others are provided by the Turritellidae (Marwick, 1957; Kotaka, 1959), the Columbellidae (Jung, 1989), the Cancellariidae (Beu & Maxwell, 1987), the Turridae (Shuto, 1969; Bernasconi & Robba, 1984), the Architectonicidae (Robertson, 1973) and the Mathildidae (Bieler, 1995).

Teleoconch shape – Besides the limpet-like teleoconch of some amathinids, the pyramidelloidean teleoconch is coiled and varies from multiwhorled, narrowly turriculate (*Pyramidella*, *Syrnola*, *Turbonilla*, *Eulimella*) to ovate or ovate-conical with fewer whorls (Odostomiinae, Chrysallidinae) to depressed trochiform (*Pseudoskenella*). The shape of the teleoconch appears to be a scarcely significant character. It may serve to distinguish broad groups of species having elongate, definitely tall-spired teleoconchs (currently included in the Pyramidellinae, Sayellinae, Syrnolinae, Turbonillinae, Eulimellinae and Cingulininae) from those possessing shorter teleoconchs with a comparatively lower spire (such as those assigned to the Odostomiinae, Chrysallidinae and Odostomellinae). I concur with Laseron (1959) who considered the shape "as additional rather than of primary generic importance". Wise (1996) did not incorporate the teleoconch shape into the set of characters used for his phylogenetic analysis of the pyramidellid taxa.

Whorl outline and suture – The whorls may be flat, gently convex to convex, angular in the middle or at the periphery, or slightly constricted medially in some species. A variously developed shoulder slope may be present as well as a peripheral angulation. The profile of the whorls has rarely been used in characterizing genera since similar or identical outlines do occur in a number of species of quite different taxonomic placement. Dall & Bartsch (1904) regarded the presence/absence of a variably strong shoulder among the characters useful to recognize some genera such as *Pyrgisculus*, *Pyrgiscus*, *Dunkeria*, *Elodiamea*, *Odostomella*, *Salassia*, *Ivara*, *Evalina* and *Spiroclimax*. A similar approach was followed also by Nomura (1939). Laseron (1959) introduced the new genera *Parodostomia*, *Exesilla*, *Zonella* and *Instarella*, and considered them distinctive because of the angular periphery, the medially constricted whorls and the median angulation of the latter two (separated on the basis of presence/absence of a suprasutural spiral cord), respectively. The suture is often impressed, less commonly adpressed or grooved. Currently, scarce generic significance has been accorded to it. From the most

recent literature, it appears that the considered characters have been used in species recognition, but are of minor relevance at the genus level and are regarded herein as additional characters only in some instances.

Umbilical opening – Teleoconchs of pyramidelloideans are mostly imperforate or exhibit a narrow umbilical chink. A well formed umbilicus occurs in some odostomiine and pyramidelline species. The presence/absence of an umbilical opening was taken into account in defining some genera of the Pyramidellinae and Tiberiinae (Dall & Bartsch, 1904; Nomura, 1939; Saurin, 1958, 1959) and sometimes regarded as genus-specific. Actually, species included in the same genus may either be imperforate or have a chink or a more widely open umbilicus. Nevertheless, the presence (or absence) of an umbilical cavity may be a useful character provided that all the species included in a genus possess it. In particular, it serves to distinguish the imperforate species of *Cossmannica* from those of *Tiberia*, which have an open umbilicus.

Columellar structures – These consist of one to three folds that wind up the columella. These plaits, weak to strong and prominent, are present in most Chrysallidinae and Odostomiinae, in the Pyramidellinae, Sayellinae and Syrnolinae. The Pyramidellinae and the Tiberiinae have two or three columellar folds, whereas members of the other subfamilies have only one. The columellar fold is mostly absent in the Turbonillinae, Eulimellinae and Cingulininae in which the columella is smooth or twisted adapically where a slight swelling is noted. Apart from the cursory use at the subfamily level, the columellar structures (presence/absence, strength) are occasionally significant in generic recognition and, if so, only as an additional character. As an example, the closely similar *Exesilla* and *Turbonilla*, distinguished primarily on the basis of their larval shells (respectively, umboniiform and helicoid), are also separated in that the former possess a weak, but distinct, columellar fold, which does not occur in the species of *Turbonilla*.

Course and inner structures of the outer lip – The course of the outer lip, reflected by the growth lines, exhibits a moderate variability, from straight to gently arched or sinuous and, in terms of direction, may be orthocline, prosocline or, less commonly, opisthocline. The growth lines are easily observable on smooth teleoconchs, but less so when the teleoconch surface is sculptured. The direction of the outer lip was disregarded by most authors. Only Fretter *et al*. (1986) and van Aartsen (1987a) considered this character important in assigning species to genera, but ultimately they used it only to discriminate species. Actually, two types of outer lip direction often co-occur in a genus (e.g., orthocline and prosocline in *Odostomia*), thus the considered character appears to be of very little significance. Conversely, the course of the outer lip can be genus-diagnostic in some instances. As an example, the well marked subsutural sinuation of the outer lip distinguishes *Sinuatodostomia* from the other odostomiine genera.

The inner side of the outer lip may be either smooth or have teeth or spirally directed ribs. The possession of inner ribs was variously interpreted by authors. Sometimes this character was considered in itself adequate for supraspecific distinction. As examples, it was adopted to differentiate *Evelynella* from *Odostomia* (Laws, 1940b), *Megastomia* from *Odostomia* (Saurin, 1959; van Aartsen, 1987a; Peñas & Rolán, 1999a),

Parodostomia from *Eulimastoma* (Corgan, 1971), *Puposyrnola* from *Nesiodostomia* (Corgan, 1972) and *Yoshishigea* from *Turbonilla* (Hori & Fukuda, 1999). Conversely, some workers remarked that the inner ribbing neither occurs in (or is missing from) all the species currently assigned to a given genus (see comments on *Eulimella* provided by van Aartsen *et al*., 2000, p. 3), nor is it a constant element within a species (cf. Fretter *et al*., 1986; van Aartsen *et al*., 2000). The circumstance led van Aartsen *et al*. (2000, p. 9) to conclude that "this character cannot be used in most cases". Wise (1996) did not use "the palatals located immediately inside the aperture" as characters because they are "undeveloped and depend on the age of the snail". From the above, the taxonomic relevance of the inner structures of the outer lip would be open to doubt. Actually, the inner spirals of the outer lip are a complex character and exhibit different kinds of development. Corgan (1972) noted that, in the Pacific species of *Puposyrnola*, the inner spirals "do not normally extend into the aperture but they are probably present on the penultimate and earlier whorls". The converse occurs in several species of *Megastomia*, which show the inner ribbing only within the aperture of adult specimens (see Peñas & Rolán, 1999a). Whatever the development type of the inner spirals, they appear to be (when present) a stable character of a species even if not always easy to detect. This being stated, the inner ribs of the outer lip are herein regarded as a valuable character for generic recognition provided that all the species included in a given genus possess it (as in *Megastomia* and *Parodostomia*) and share at least another significant character such as the type of protoconch.

Sculpture – The teleoconch surface varies from smooth to variously sculptured (collabral ribs, spiral cords and threads, or a combination of both axials and spirals). A faint spiral microstriation may occur as well. Many authors (Sacco, 1892; Dall & Bartsch, 1904; Nomura, 1936, 1937, 1938, 1939; Laws, 1937a-c, 1941; Laseron, 1951, 1959; Saurin, 1958, 1959; Fretter *at al*., 1986) accorded basic importance to the sculpture (absence, presence and type) in classifying the pyramidelloideans. Sometimes they used minor sculptural characters as distinguishing elements of supraspecific taxa (e.g., Sacco, 1892). Other workers considered the sculpture irrelevant in separating genera. In particular, Peñas & Rolán (1999a), relying upon characters other than the sculpture, included in *Odostomia* or *Megastomia* (smooth-shelled or faintly spirally grooved) the species up to that time assigned to *Odetta* or *Menestho* on the basis of their teleoconchs with pronounced spiral sculpture. Actually, it appears that several groups of species do exist that exhibit a basic sculptural arrangement, the various species in the group being separable from one another on account of moderate variations of that arrangement or of other morphological details. Should other significant characters be recurrent (e.g., the protoconch), the group can represent a genus and the sculptural framework be one of the distinguishing characters even if not necessarily genus-diagnostic in itself. As an example, the chrysallidine genus *Liamorpha* includes species with a helicoid protoconch, and a quite distinctive sculpture of robust spiral cords and nodulose collabral ribs commonly restricted to the adapical half of the whorls. The presence/absence of basal spirals is to be considered with much caution since it is a distinguishing character mostly at the species level; in this respect, it is also worthy of note that in some species the basal spirals may develop only on later whorls. I concur with van Aartsen (1981, p. 63) and van Aartsen & Wesselingh (2000, p. 169) in considering barely relevant such

sculptural details as the abrupt end of the interspaces between the axials or the presence of a subsutural swelling or cord. Likewise, no importance is accorded to the faint spiral grooves that may occur in ordinarily smooth-shelled genera such as *Odostomia* or *Megastomia*. Finally, I think that Corgan (1971) had convincingly shown that the spiral microstriation "cannot be reasonably cited as evidence of genus-level distinction".

Concluding remarks – From the above review of characters, it appears that ordinarily none of them is genus-diagnostic in itself. Nevertheless, the protoconch type, the course and/or the inner lirations of the outer lip, and the sculpture (if any) are concluded to be significant distinguishing characters. The combination of two or more of them allows us to denote unambiguously the various genera covered in this paper, intended in the sense of van Aartsen *et al*. (1998), that is, as "morphologically well-defined groups of species". This may be a simplistic approach, but a pragmatic one since characters other than those of the shell (protoconch and teleoconch) are not available in the fossil record. Unlike van Aartsen *et al*. (1998), who adopted a quite broad concept of supraspecific taxa, genera are herein meant more strictly to include only those species sharing the relevant characters of respective type species (see comments on genera in the systematic account). Table 1 shows the characters that are necessary and/or sufficient for the identification of the genera considered in the present paper.

Systematic palaeontology

Remarks -- A traditional (basically typological) classification is followed herein. The suprageneric arrangement is that adopted by Schander *et al*. (1999a).

The studied material is housed in the Naturalis Biodiversity Center, Leiden (RGM in the following). Abbreviations for other institutions are: BMNH, the Natural History Museum, London; ZMB, Museum für Naturkunde der Humboldt-Universität, Berlin; and MNHN, Muséum National d'Histoire Naturelle, Paris, France.

The measurement of the protoconch diameter was made following Micali (1994) and Peñas & Rolán (1999a). The angular measurements are according to Cox (1960) and the related symbols are: AP, apical angle; MSA, mean spiral angle; the term spiral angle (SA) is used when apical angle and mean spiral angle are virtually coincident. The sutural slope (SS) is the angle formed by the suture and a line perpendicular to the teleoconch axis.

Table 1. Summary of relevant (boldfaced and solid circles) and additional (italics and open circles) characters, which combined allow generic recognition. Symbols in the second column are: U = umboniiform; H = helicoid; B = bulimoid. Figures in the third column refer to angular ranges listed in the text (1 = type A; 2 = type B; 3 = type C).

	PROTOCONCH		TELEOCONCH							
	shape	angle	shape	whorls outline	suture	umbilical opening	columellar ridge/s	outer lip course	outer lip inner ridges	sculpture
AMATHINIDAE										
Leucotina	**U**	**2**					*weak to absent*		**absent**	●
ODOSTOMIINAE										
Megastomia	**H**	**1**					*prominent*		**present**	*mostly absent*
Odostomia	H	**1**					*strong*		**absent**	
Parodostomia		**3**		○	○		*prominent*		**present**	*absent*
CHRYSALLIDINAE										
Babella	**H**	**1**			○		*prominent*		**absent**	●
Besla	H	**1**					*present*			●
Bulimoscilla	B	**1**				*absent*	*present*		**present**	●
Chrysallida		**3**	○				*weak to absent*		**absent**	●
Egila		**3**		○	○	*present*	*present*		**absent**	●
Egilina	U	**2**	○	○	○		*strong*			●
Hinemoa		**3**					*weak*		**absent**	●
Levipyrgulina		**3**				*absent*	*present*			●
Liamorpha	H	**1**		○	○		*strong*			●
Linopyrga	H	**1**					*present*		**absent**	●
Menesthella	H	**1**					*present*			●
Mumiola	**H**	**1**				*absent*	*strong*			●
Polemicella	**H**	**1**					*strong*			●
Pyrgulina		**3**					*weak to absent*			●
Strioturbonilla		**3**	○				*absent*		**absent**	●
Waikura	**H**	**1**	○			*absent*	*present*			●
PYRAMIDELLINAE										
Longchaeus	**U**	**1**		○	○		*3 ridges*		**present**	●
Otopleura	**U**	**1**		○		*absent*	*3 ridges*		**present**	●
Pyramidella	**U**	**1**		○		*present*	*3 ridges*			**absent**

Syrnolinae							
Costosyrnola	**H**	**1**			*strong*		**present**
Puposyrnola	**U**	**1**			*present*		**absent**
Syrnola	**H**	**1**			*strong*	**absent**	**absent**
Tibersyrnola	**H**	**1**			*strong*	**present**	**absent**
Tiberiinae							
Cossmannica	**U**	**1**		**absent**	*2-3 ridges*		*absent*
Tiberia	**U**	**2**		**present**	*2-3 ridges*		*absent*
Turbonillinae							
Asmunda	**H**	**1**	○	*absent*	*absent*	**absent**	●
Bartschella	**U**	**1**	○	*absent*	*absent*	**absent**	●
Exesilla	**H**	**1**		*absent*	*weak*		●
Nisipyrgiscus	**B**	**1**		*absent*	*weak*	**absent**	●
Nisiturris	**B**	**1**		*absent*	*absent*	**absent**	●
Pyrgiscus	**U**	**1**		*absent*	*weak to absent*		●
Turbolidium	**H**	**1**		*absent*	*absent*	*absent*	●
Turbonilla	**H**	**1**		*absent*	*absent*		●
Eulimelinae							
Bacteridiella	**H**	**1**		*absent*	*absent*	*absent*	*absent*
Eulimella	**H**	**1**		*absent*	*weak to absent*		*absent*
Koloonella	**U**	**1/2**		*absent*	*absent*	**absent**	*absent*
Cingulininae							
Bulicingulina	**B**	**1**		*absent*	*absent*		●

Superfamily Pyramidelloidea Gray, 1840
Family Amathinidae Ponder, 1987
Genus *Leucotina* Adams, 1860a

Type species – *Leucotina niphonensis* Adams, 1860a, p. 407 (= *Monoptygma casta* Adams, 1853) by monotypy. The identity of *Leucotina casta* was thoroughly discussed by Beu (2004, p. 225).

Remarks – Ponder (1987, p. 33) regarded *Leucotina* as "probably amathinid". Subsequently, Hori & Tsuchida (1995) demonstrated that *Leucotina* is a member of the pyramidelloidean family Amathinidae Ponder, 1987. The diagnostic characters of *Leucotina* can be summarized as follows: protoconch umboniiform, variably globose, two-whorled, obliquely immersed, tip hindered or scarcely exposed from the first teleoconch whorl; teleoconch ovate to elongate-ovate, whorls moderately convex, sutures impressed; base convex, umbilical chink narrow to indistinct; outer lip smooth within; columellar ridge weak to indistinct; and sculpture of spiral cords throughout, intervening grooves with collabral riblets producing a punctate appearance. *Adelactaeon* Cossmann, 1895 (type species *Tornatella papyraceus* Basterot, 1825), was considered a junior synonym of *Leucotina* (van Aartsen & Hori, 2006). Actually, *Adelactaeon* is closely similar to *Leucotina* in terms of teleoconch shape and sculptural characters, but the species currently assigned to it possess a clearly intorted protoconch and a better developed columellar ridge (see van Aartsen *et al*., 1998). According to Beu (2004), *Myonia* Adams, 1860a, is a synonym of *Leucotina*, whereas it is synomyzed with *Adelacteon* by Schander *et al*. (1999a).

Leucotina rebjongensis sp. nov.
Pl. 1, figs. 1, 2.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606811 (Pl. 1, fig. 1).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606812 (1; Pl. 1, fig. 2), RGM 606813 (31).

Derivation of name – From the stream (Kali in East Javanese) Rebjong along which the layer that yielded the fossils crops out.

Preservation – The material consists of variously preserved, juvenile specimens composed of the larval shell and 1-3 teleoconch whorls.

Diagnosis – *Leucotina* species with umboniiform protoconch obliquely immersed in first teleoconch whorl. Teleoconch slenderly oval, whorls gently convex, base with nar-

row, but distinct, umbilical chink. Columellar fold weak, deeply set. Sculpture of spiral cords, 6 on spire whorls, 5-7 over base; interspaces with prosocline collabral riblets.

Description – Protoconch umboniiform, rather globose, of about 2 whorls, obliquely lying on first teleoconch whorl and slightly more than half immersed in it, small flat apex barely visible or fully concealed; diameter 0.20 mm. Teleoconch slenderly oval with cyrtoconoid spire, AP 48°; whorls moderately convex with very narrow subsutural shelf; sutures impressed, SS 9°. Last whorl oval, about 75% of total height, base convex, gradually tapering, with narrow umbilical chink. Aperture oval, angular adapically, somewhat expanded abapically; outer lip arched, gently prosocline, showing external sculpture within and with wavy edge; parietal wall coated with thin callus; columellar lip bent toward umbilical area; one weak and quite deeply set fold, not visible from in front, at adapical end of columella. Spire whorls sculptured with 6 flat-topped spiral cords, two adapical ones unequal, more closely spaced and appearing slightly later than others (Pl. 1, figs. 1b, 2b); 5-7 spirals on base starting from level of suture, those on lower base narrower and more rounded; interspaces nearly as wide as cords, crossed by narrow, prosocline axial riblets, which override cords on some specimens; axial riblets and spiral cords enclose rather regular, depressed, quadrangular areas.

Remarks – The present new species appears to agree with the concept of *Leucotina* adopted by Beu (2004). However, since it differs in several respects from *Leucotina casta* (Adams, 1853), type species of *Leucotina*, it is assigned to this genus only provisionally. There is no fossil *Leucotina* species with which *L. rebjongensis* sp. nov. can be compared. The extant species *Leucotina digitalis* (Dall & Bartsch, 1906) appears to be closely similar in teleoconch shape and sculpture, but differs in having a more oblique and more deeply immersed larval shell, a better-developed columellar ridge and axials that are opisthocline instead of prosocline. The Recent Japanese species *Leucotina adamsi* Kuroda & Habe *in* Kuroda *et al*., 1971, is also similar, but is distinguished because of its one-whorled protoconch and its somewhat different teleoconch shape. *Leucotina padangensis* Thiele, 1925, is another related species recovered from the sea off Padang (Sumatra). Examination of the holotype (ZMB/Moll 108533) has shown that *L. padangensis* differs from *L. rebjongensis* in having a clearly smaller, more deeply immersed protoconch, a more inflated teleoconch, a virtually closed umbilical chink and broader spirals separated by very narrow furrows.

Leucotina speciosa (Adams, 1853)

Pl. 1, figs. 3-6.

1853 *Monoptygma speciosa* Adams, p. 223.
1925 *Leucotina (Adelactaeon) sundaica* Thiele, p. 292, pl. 18, fig. 6 (new synonym).
2004 *Monotygma speciosa* Adams: Robba *et al*., p. 186, pl. 26, fig. 7.
2004 *Leucotina speciosa* (Adams): Beu, p. 231, fig. 25E.

Type material – The holotype of *Monoptygma speciosa* (BMNH 1968328), from Baclayon, Philippines, was excellently illustrated by Beu (2004, fig. 25E). Lectotype of *Leucotina (Adelactaeon) sundaica* Thiele (here designated): the specimen figured by Thiele (1925, pl. 18, fig. 6) and refigured herein (Pl. 1, fig. 3), ZMB/Moll 108534, Indian Ocean,

Recent; 1 paralectotype, ZMB/Moll 108535a, Padang (Sumatra), Recent (Pl. 1, fig. 4); 1 paralectotype, ZMB/Moll 108535b, Padang (Sumatra), Recent. The preservation is fair.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606814 (4), RGM 606815 (1; Pl. 1, fig. 5), RGM 606816 (1; Pl. 1, fig. 6). All specimens are juvenile including the larval shell and 3-4 teleoconch whorls.

Other material examined – Material referred to as *Monotygma speciosa* by Robba *et al*. (2004), northern Gulf of Thailand, Recent (106 specimens in Università di Milano Bicocca).

Description – Protoconch umboniiform rather globose, of 2 whorls, with small, nearly flat apex and broad second whorl; protoconch obliquely lies on first teleoconch whorl and is about one-third immersed in it; protoconch angle approximately 125°, diameter 0.23 mm. Teleoconch slenderly turreted, spire conical, AP 24°; whorls moderately convex with very narrow subsutural shelf; sutures impressed, SS 13°. Last whorl oval, about 55% of total height, base convex, imperforate. Aperture elongate-oval, angular adapically, outer lip arched, gently prosocline, showing external sculpture within, edge wavy; columella straight, slightly twisted adapically. Spire whorls sculptured with 4-5 narrow, markedly elevated, nearly flat-topped spiral cords each as wide as half an interspace; base with 6 spirals gradually becoming narrower and more approximate downward; interspaces with distant, thin, prosocline collabral riblets, which override spirals in some specimens; axial riblets and spiral cords enclose rather regular, depressed, rectangular areas.

Remarks – The "Rembangian" material agrees with the figure of the holotype of *Leucotina speciosa* published by Beu (2004). The syntypes of *Leucotina sundaica* Thiele, 1925, in ZMB, except for a slightly greater diameter of the earlier spire whorls, do not show any significant difference from *L. speciosa*. Accordingly, Thiele's species is regarded here as a junior synonym of *L. speciosa*. The Pliocene to Recent western Pacific species *Leucotina amoena* (Adams, 1853) is closely similar in teleoconch shape, but differs in having the spire whorls sculptured with 6-7 broad, low, ribbon-like spirals separated by quite narrow interspaces made punctate by the occurrence of dense axial riblets.

Distribution – *Leucotina speciosa* is distributed from the eastern Indian Ocean to the Gulf of Thailand and the Philippines at present. Records from Australian waters possibly refer to *Leucotina amoena* and need to be confirmed. According to Beu (2004), the species probably occurs throughout the western Pacific. Holocene occurrences were reported from Thailand. The present one is the first record of Miocene specimens.

Family Odostomiidae Pelseneer, 1928
Subfamily Odostomiinae Pelseneer, 1928
Genus *Megastomia* Monterosato, 1884

Type species – *Odostomia conspicua* Alder, 1850, by original designation (Monterosato, 1884, p. 94). *Odostomia conspicua* is characterised by its helicoid protoconch lying across

the first teleoconch whorl, its prominent columellar fold and the outer lip bearing palatal ridges.

Remarks – *Megastomia* was regarded either as a subgenus of *Odostomia* Fleming, 1813 (Saurin, 1959; van Aartsen, 1987a; van Aartsen *et al*., 1998), or as a distinct genus (Peñas & Rolán, 1999a; Hori, 2000). Comparing the respective type species, it appears that *Megastomia* differs from *Odostomia* in that it has an outer lip with inner spiral lirations, a character that does not occur in *Odostomia*. As already noted (see the chapter on taxonomic relevance of shell characters), the inner ribs of the outer lip are herein regarded as a valuable attribute in generic recognition. It is worthy to recall that Schander *et al*. (2003, p. 249), on the basis of molecular data, demonstrated that *Megastomia* is distinct from *Odostomia*. According to Schander *et al*. (1999a), *Stomega* Dall & Bartsch, 1904, and *Evelynella* Laws, 1940, are synonyms of *Megastomia*.

***Megastomia gradata* sp. nov.**
Pl. 1, fig. 7.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606817 (Pl. 1, fig. 7).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606818 (4).

Derivation of name – From Latin *gradatus* = stepped, with reference to the stepped outline of the spire.

Preservation – The material consists of rather well preserved juvenile and adult specimens.

Diagnosis – Protoconch helicoid, multispiral, lying across first teleoconch whorl. Spire with stepped outline because of distinctly shouldered whorls. Base short, convex, perforated. Outer lip with 7 weak inner spiral riblets. Columellar ridge thin, markedly oblique. Outer surface bearing one obsolescent spiral cord at shoulder, one peripheral shallow spiral groove and spiral microstriation.

Description – Protoconch helicoid, of 2.5 whorls, with moderately prominent and rather blunt-topped spire; protoconch lies across first teleoconch whorl, very slightly extending beyond adapical suture of latter, in which it is one third immersed; demarcation from teleoconch marked by thickened lip; diameter 0.21 mm. Teleoconch elongate-oval, with cyrtoconoid spire, AP 45°, MSA 39°; whorls gently convex, clearly shouldered, with moderately sloping subsutural shelf, spire outline stepped; sutures adpressed, SS 15°. Last whorl cylindrical-ovate, 65% of total height, with roundly angular periphery; base convex, short, with distinct umbilical chink. Aperture oval, somewhat

expanded abapically; outer lip with 7 weak inner spiral riblets ending far from peristome; columella with thin, markedly oblique, moderately prominent ridge close to its adapical end. Outer surface with one obsolescent spiral cord at shoulder, one peripheral, shallow spiral groove, and faint spiral microstriation throughout; growth lines uneven, somewhat flexuous, very slightly opisthocline.

Remarks – The present new species somewhat resembles the Holocene to Recent Indo-West Pacific species *Megastomia carinata* (Adams, 1873). The latter differs in having a more obtuse protoconch spire, markedly grooved later sutures and a peripheral cord instead of a groove.

Megastomia regina (Thiele, 1925) comb. nov.

Pl. 2, figs. 1-6.

1925 *Odostomia regina* Thiele, p. 282, pl. 15, fig. 16.
1942 *Odostomia (Odostomia) regina* Thiele: van Regteren Altena, p. 32, text-fig. 9.
1947 *Odostomia (Odostomia) regina* Thiele: Wissema, p. 80.
1994 *Odostomia (Odostomia) regina* Thiele: Skwarko & Sufiati, p. x4.
2004 *Odostomia serenei* Saurin: Robba *et al*., p. 165, pl. 23, fig. 1 [*non O. serenei* Saurin, 1959].

Type material – Lectotype of *Odostomia regina* Thiele (here designated): the specimen figured by Thiele (1925, pl. 15, fig. 16) and refigured herein (Pl. 2, fig. 1), ZMB/Moll 64068a, Padang (Sumatra), Recent; 1 paralectotype, ZMB/Moll 64068b, Padang (Sumatra), Recent (Pl. 2, fig. 2); 56 paralectotypes, ZMB/Moll 64068c, Padang (Sumatra), Recent. The other 85 syntypes do not meet the characters of *O. regina* and are excluded from the type lot (see remarks below). The preservation is fair on the whole.

Material examined – Kali Rebjong Section, level RMG 3: RGM 606819 (39); level RMG 5: RGM 606820 (1); level RMG 6: RGM 606821 (1; Pl. 2, fig. 3), RGM 606822 (1; Pl. 2, fig. 5), RGM 606823 (1; Pl. , fig. 6), RGM 606824 (336). Locality RMG 2: RGM 606825 (2). Sumberan: RGM 606826 (4). The material consists of variously preserved juvenile and adult specimens, most of them retaining the larval shell.

Other material examined – Specimen identified by Wissema (1947) as *Odostomia regina*: RGM 606801, Schroeder collection, locality 39, Nias Island (Sumatra), Pleistocene (Pl. 2, fig. 4); material referred to as *Odostomia serenei* by Robba *et al*. (2004): northern Gulf of Thailand, Recent (416 specimens in Università di Milano Bicocca).

Description – Protoconch helicoid, rather small, of 2 whorls, with bluntly rounded tip, very slightly oblique, half immersed in first teleoconch whorl; diameter averaging 0.18 mm. Teleoconch rather tall, conical-ovate, with nearly straight-sided spire, AP 40°, MSA 24°; whorls (up to 8) moderately depressed, shaped like a segment of a cone, with narrow, but distinct, subsutural shelf and angular periphery; earlier sutures adpressed, subsequent ones markedly grooved, SS 11°. Last whorl about 53% of total height, base short, convexly obconical, umbilical chink very narrow to obsolete. Aperture ovate-quadrangular, somewhat expanded at junction of outer lip and columella; outer lip orthocline, subangular, with 7-10 inner spiral riblets, which do not reach peristome; pari-

etal wall coated with moderately thick callus; columella with strong, sharp, nearly horizontal ridge at its adapical end. Outer surface with unevenly spaced growth lines forming wide, shallow subsutural sinuation; one very weak spiral cord may occur on both adapical and peripheral angulations; spiral microstriation noted throughout.

Remarks – Thiele's material in ZMB consists of one box with two small plastic capsules. The first capsule (registration number 64068) contains 2 syntypes; of these, one safely recognizable as that illustrated by Thiele is herein selected as the lectotype of *Odostomia regina* and is numbered ZMB/Moll 64068a; the other is a paralectotype and is numbered ZMB/Moll 64068b. The second capsule (unnumbered) contains 141 syntypes. Examination of these latter has shown that 56 syntypes perfectly conform to the lectotype; these paralectotypes are collectively numbered ZMB/Moll 64068c. The remaining 85 paralectotypes are quite unlike those forming the type lot and are excluded from it; they represent three different odostomiine species whose identification is beyond the purpose of this work.

The teleoconch of *Megastomia regina* appears to be rather variable with regard to the amplitude of the mean spire angle and to the outline of the periphery, which is sharply to roundly angular. The "Rembangian" specimens conform in all respects (protoconch and teleoconch) to the type lot; in particular, they fit in with the characters of those syntypes having a slender teleoconch with a distinctly angular periphery.

The Recent Indo-West Pacific species *Odostomia eutropia* Melvill, 1899, is strikingly similar, differing only in having grooved sutures throughout instead of only on later whorls, and the outer lip has 6 inner spiral riblets. Should *O. eutropia* prove to be conspecific with *M. regina*, the former name is the valid one since it has priority. Corgan (1971, p. 57) erroneously included *O. eutropia* in *Parodostomia* Laseron, 1959. Actually, the species of this genus have an intorted protoconch whereas that of *O. eutropia* is helicoid (cf. Robba *et al*., 2004, who examined the original material of Melvill's species in BMNH). *Odostomia (Megastomia) serenei* Saurin, 1959, was based on not fully grown specimens from Vietnamese waters. They somewhat resemble young specimens of *M. regina*, but exhibit a markedly stepped outline of the spire, because of their broader subsutural shelf, and have a greater mean spiral angle.

Distribution – *Megastomia regina* is distributed at present in the eastern Indian and western Pacific oceans, from the Arabian Gulf to Gulf of Thailand. Fossil occurrences are from Pleistocene deposits of Indonesia and from the Holocene of Thailand. The present one is the first record of Miocene specimens.

***Megastomia tawunensis* sp. nov.**

Pl. 3, fig. 1.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606827 (Pl. 3, fig. 1).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606828 (56); level RMG 5: RGM 606829 (5); level RMG 6: RGM 606830 (12). Locality RMG 2: RGM 606831 (1).

Derivation of name – The name refers to the Tawun Formation, which yielded the present new species.

Preservation – The material consists of variously preserved, mostly juvenile specimens.

Diagnosis – Protoconch helicoid, multispiral, lying across first teleoconch whorl. Spire nearly straight-sided, with shouldered whorls. Base short, convex, perforated. Outer lip with 7-9 inner spiral riblets. Columellar ridge thin, slightly oblique. Outer surface bearing an obsolescent spiral cordlet both at both shoulder and periphery.

Description – Protoconch slenderly helicoid, of 2.5 whorls, with prominent, rather pointed spire; protoconch lies across first teleoconch whorl, extending beyond adapical suture of whorl, in which it is one third immersed; demarcation from teleoconch by thickened lip; diameter 0.23 mm. Teleoconch elongate-conical, with nearly straight-sided spire, AP 37°, MSA 23°; whorls shaped like a segment of a cone, shouldered, with narrow, subhorizontal subsutural shelf, contracted abapically; earlier sutures adpressed, subsequent ones moderately grooved, SS 12°. Last whorl conical-ovate, 55% of total height, with angular periphery; base short, faintly convex, with very narrow umbilical chink. Aperture oval, somewhat expanded abapically; outer lip with 7-9 thin inner spiral riblets ending far from peristome; columella with thin, slightly oblique, moderately prominent ridge close to its adapical end. Outer surface with obsolescent thin spiral cordlet both at shoulder and at periphery; growth lines uneven, somewhat flexuous, distinctly opisthocline.

Remarks – *Megastomia tawunensis* has some similarity to *Megastomia gradata* sp. nov. It differs from *M. gradata* in its larval shell with a more elevated, rather pointed spire extending well beyond adapical suture of first teleoconch whorl, its nearly flat-sided spire, its shorter base, its less oblique columellar ridge, its more opisthocline growth lines and its periphery bearing a quite weak spiral cordlet instead of a groove.

***Megastomia* sp.**

Pl. 3, fig. 2.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606832 (1). A juvenile specimen with the outer lip broken, but otherwise well preserved.

Description – Protoconch small, helicoid, of about 2 whorls, with bluntly rounded and scarcely prominent tip, obliquely lying across first teleoconch whorl and half immersed in it; diameter 0.16 mm. Teleoconch of 3.25 whorls, spire conical, SA 37°; whorls nearly flat-sided, with very narrow subsutural shelf; sutures adpressed, SS 7°. Last whorl 67% of total height, with angular periphery; base obconical, imperforate. Aperture rhomboidal, rather broad, somewhat expanded at junction of outer lip and colu-

mella; outer lip angular, with 4 adapical inner spiral riblets not reaching peristome; columellar lip concave, bent toward teleoconch axis, with prominent, sharp, nearly horizontal adapical ridge. Sculpture of one blunt cord bounding subsutural shelf and distant, fine grooves throughout; 4 grooves soon increasing to 6 occur on first whorl, 9 on last whorl and many on base; growth lines uneven, orthocline, coarser on crossing subsutural cord.

Remarks – This "Rembangian" specimen is unlike any known *Megastomia* species and likely belongs to a previously undescribed species. However, I refrain from proposing a new species on the basis of a single, not fully grown specimen. *Megastomia* sp. somewhat resembles the Recent western Atlantic species *Megastomia ruris* Peñas & Rolán, 1999a, which has a distinctly cyrtoconoid teleoconch with gently convex whorls, a well arched outer lip bearing 7 inner spiral riblets and a weaker columellar ridge.

Genus *Odostomia* Fleming, 1813

Type species – According to van Aartsen (1987a), the type species is *Turbo plicatus* Montagu, 1803, by subsequent designation (Gray, 1847, p. 159). *Turbo plicatus* was excellently described and/or illustrated by Fretter *et al*. (1986) and van Aartsen (1987a).

Remarks – According to Schander *et al*. (1999a), *Odontostoma* Turton & Kingston, 1830, *Monoptaxis* Clark *in* Jeffreys, 1867, *Ptychostomon* Locard, 1886, *Turritodostomia* Sacco, 1892, and *Harvella* Dall & Bartsch, 1909, are synonyms of *Odostomia*; *Odontostomia* Jeffreys, 1839, and *Odontostomia* Philippi, 1849, are unjustified emendations; *Odostonia* Gray, 1825, *Odostoima* Folin, 1885, *Odostemia* Bavay, 1898, and *Odostoma* Winckworth, 1932, are errors for *Odostomia*.

Cyclodostomia Sacco, 1892, was created as a subgenus of *Odontostomia* Jeffreys, 1839, on the basis of the Tortonian species *Odontostomia (Cyclodostomia) mutinensis* and *Odontostomia (Cyclodostomia) cingulata*, both of Sacco (1892, p. 628). Subsequently, the former species was selected as the type of *Cyclodostomia* by Verrill & Bush (1900, p. 533). Since Sacco (1892, p. 625) also proposed *Odontostomia (Macrodostomia) bismichaelis* var. *mutinensis*, which has page priority, Corgan & van Aartsen (1998) renamed the type species *Odostomia italiana*. Examination of the holotype of *O. mutinensis* in Museo di Geologia e Paleontologia dell'Università di Torino (BS.035.06.001) has shown that this species shares all the characters of *Odostomia*, a poorly defined, broad and low subsutural cord being the unique distinguishing character. As already noted by van Aartsen & Wesselingh (2000), this element is not considered adequate to warrant consistent generic separation. Thence, *Cyclodostomia* is herein regarded as another synonym of *Odostomia*. On the basis of the characters of *Turbo plicatus* and *Odostomia italiana*, the distinguishing characters of *Odostomia* can be summarized as follows: protoconch helicoid, lying across the first teleoconch whorl and coiled at right or slightly greater angle to the teleoconch axis; variably tall, ovate-conical teleoconch with flat to moderately convex whorls, sutures impressed or grooved, with blunt subsutural margining in some species; umbilicus wanting or a narrow chink; prominent columellar ridge; interior of outer lip smooth; exterior smooth, with spiral microstriation and/or few spiral grooves in some species; and growth lines orthocline to prosocline.

Odostomia sp. 1

Pl. 3, figs. 3, 4.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606833 (1; Pl. 3, fig. 3), RGM 606834 (1; Pl. 3, fig. 4), RGM 606835 (6). The material consists of variously damaged juvenile and adult specimens.

Description – Protoconch helicoid, of 2.75 whorls, with prominent, rather blunt-topped spire and inflated last whorl; it lies across first teleoconch whorl and extending beyond adapical suture of first whorl, in which one third is immersed; demarcation from teleoconch by reflexed lip; diameter 0.20 mm. Teleoconch elongate-oval, with rather elevated cyrtoconoid spire, AP 35°, MSA 26°; whorls gently convex, low, gradually enlarging; sutures impressed, SS 11°. Last whorl oval, about 60% of total height, with rounded periphery; base convex, gradually tapering, with very narrow umbilical chink. Aperture oval, height approximately twice width; outer lip broken, smooth inside; columella with thin, sharp, markedly oblique, moderately prominent ridge close to adapical end. Outer surface with faint peripheral groove and uneven, slightly flexuous, orthocline growth lines.

Remarks – The present material is strikingly similar to *Odostomia subcalcarea* Oostingh, 1941, and may well belong to this species. Oostingh based *O. subcalcarea* on a specimen from Miocene deposits near Palembang (Sumatra). He listed his new species (p. 22) and illustrated it (pl. 1, fig. 5) without any description. From Oostingh's figure, it is impossible to obtain any reliable information on the protoconch of *O. subcalcarea*. The original specimen, probably in the Geological Museum, Bandung (F. Wesselingh, pers. comm. 2008), is unavailable. In these circumstances, I refrain from any assignment to species.

Odostomia sp. 2

Pl. 3, fig. 5.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606836 (1). A juvenile specimen lacking the protoconch and with the outer lip broken.

Description – Protoconch missing. Teleoconch solid, ovate-conical, of approximately 3 whorls; spire broadly conical, SA 50°; whorls moderately convex, low, increasing rapidly in diameter and with narrow, gently sloping subsutural shelf; sutures adpressed, SS 8°. Last whorl rather globose with subangular periphery; base broad, short, slightly convex, narrowly perforated. Aperture nearly as wide as high; outer lip broken, with no trace of inner riblets; columellar ridge rather thin, sharp and prominent. Outer surface with weak peripheral cord; growth lines slightly arched adapically, gently prosocline.

Remarks – The present specimen, which seems to be devoid of palatal riblets, is assigned to *Odostomia* Fleming, 1813, with some reservation because of the lack of the protoconch. From the apical view, it seems that the latter could be helicoid, and it is

certainly not intorted. The Recent Japanese species *Odostomia daruma* Nomura, 1938, is the most similar in teleoconch characters, but was reported to have an intorted protoconch and a rounded, smooth periphery.

Genus *Parodostomia* Laseron, 1959

Type species – *Odostomia compta* Brazier, 1877, by original designation (Laseron, 1959, p. 200).

Remarks – Laseron (1959) stated that *Parodostomia* has a smooth, *Odostomia*-like teleoconch "angled at the periphery, and with deeply channeled sutures". Further, commenting on the type species, he noted that all specimens have a single, generally strong columellar fold and "are striated within the outer margin of the aperture". Corgan (1971) reviewed *Parodostomia* and ranked it as a subgenus of *Eulimastoma* Bartsch, 1916, since both possess an intorted protoconch and basically similar teleoconch characters. He distinguished *Parodostomia* from *Eulimastoma* because of its "spiral sculpture on the interior of the outer lip", a character that is absent in species of *Eulimastoma*. Laseron's taxon is herein regarded as a full genus, characterized primarily by its intorted larval shell with concealed apex and by the presence of palatal ribs. The angular periphery and the grooved sutures are considered to be additional characters. *Parodostomia* was hitherto known only from modern faunas of Australia. Corgan (1971) expanded its distribution to Pakistan since he erroneously included *Odostomia eutropia* Melvill, 1899, in *Parodostomia*, but Melvill's species belongs in *Megastomia* Monterosato, 1884 (see remarks on *Megastomia regina*). *Brachystomia* Monterosato, 1884, also has an intorted protoconch, but differs in lacking the palatal ribs.

Parodostomia bifuniculata sp. nov.

Pl. 4, fig. 1.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606837 (Pl. 4, fig. 1).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606838 (5).

Derivation of name – From Latin *bi-*, short for *bis* = twice, and *funiculus* = cordlet, with reference to the adapical and peripheral cordlets.

Preservation – The material consists of mostly well-preserved juvenile and adult specimens.

Diagnosis – Protoconch intorted. Spire elevated, nearly straight-sided, whorls narrowly shouldered and contracted abapically. Base rather short, convex, perforated.

Outer lip with 7-9 inner spiral threads. Columellar ridge rather thin and prominent. Outer surface with 2 weak spiral cordlets, respectively adapical and peripheral; uneven, coarse, slightly prosocline growth markings and fine spiral microstriation occur throughout.

Description – Protoconch intorted, only its last whorl showing at top of spire; demarcation from teleoconch by weak, but distinct, rim (Pl. 4, fig. 1c); diameter 0.24 mm. Teleoconch conical, with elevated, nearly straight-sided spire, AP 38°, MSA 26°; whorls shaped like a segment of a cone, shouldered, with narrow, gently concave subsutural shelf, suddenly contracted below periphery; sutures increasingly deeply grooved down teleoconch, SS 11°. Last whorl conical-ovate, about 58% of total height, with angular periphery; base rather short, convexly obconical, with distinct umbilical chink. Aperture oval, slightly expanded abapically; outer lip regularly arched, with 7-9 internal spiral threads ending far from peristome; parietal lip coated with a moderately thick callus; inner lip bent toward umbilical depression, merging adapically into rather robust, oblique, moderately prominent ridge. Outer surface with 2 weak spiral cordlets, one peripheral, one somewhat broader at shoulder; faint spiral microstration and coarse, very slightly prosocline growth markings occur throughout.

Remarks – There is no previously described *Parodostomia* species with which the present one can be compared satisfactorily. *Parodostomia sartonoi* sp. nov. (see below) is similarly shaped, but is readily distinguished because of its sharper, more prominent columellar ridge and by lacking the two spiral cordlets.

***Parodostomia sartonoi* sp. nov.**
Pl. 4, figs. 2, 3.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606839 (Pl. 4, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606840 (1); level RMG 5: RGM 606841 (1); level RMG 6: RGM 606842 (1, Pl. 4, fig. 3), RGM 606843 (15). Locality RMG 2: RGM 606844 (2).

Derivation of name – The species is named after the late Prof. S. Sartono of ITB, Bandung, who provided invaluable assistance during fieldwork.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – Protoconch intorted. Spire straight-sided, with slightly shouldered whorls. Base short, nearly obconical, perforated. Outer lip with 4-6 internal spiral

threads. Columellar ridge sharp and prominent. Outer surface with barely visible, orthocline growth lines and faint spiral microstriation.

Description – Protoconch intorted, only its last whorl showing at top of spire; demarcation from teleoconch by distinct lip (Pl. 4, fig. 3b); diameter 0.22 mm. Teleoconch conical, with moderately elevated, straight-sided spire, SA 29°; whorls shaped like a segment of a cone, shouldered, with narrow, gently sloping subsutural shelf, suddenly contracted below periphery; sutures increasingly deeply grooved down teleoconch, SS 11°. Last whorl conical-ovate, about 65% of total height, with angular periphery very slightly overhanging base; base short, convexly obconical, with deep umbilical chink. Aperture rhomboidal, somewhat expanded at junction of outer lip and columella; outer lip with 4-6 internal spiral threads ending far from peristome; columella with thin, moderately oblique, prominent ridge close to its adapical end. Outer surface spirally microstriated throughout, with faint, orthocline, straight growth lines.

Remarks – The Holocene to Recent southeast Asian species *Odostomia (Brachystomia) treina* Saurin, 1959, is the most closely similar, differing in having slightly convex whorls, earlier sutures adpressed instead of grooved, a D-shaped aperture and a more robust columellar ridge. The Recent Vietnamese species *Odostomia (Megastomia) gestroides* Saurin, 1958, is also similar, but has significantly greater spiral angle. Both *O. treina* and *O. gestroides* are herein referred to *Parodostomia*.

***Parodostomia teresae* sp. nov.**
Pl. 4, figs. 4, 5.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606845 (Pl. 4, fig. 4).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606846 (1, Pl. 4, fig. 5), RGM 606847 (30).

Derivation of name – The species is named for my wife Teresa.

Preservation – The material consists of mostly well preserved juvenile and adult specimens.

Diagnosis – Protoconch intorted. Teleoconch elongate-oval; spire slightly cyrtoconoid, with narrowly shouldered, very gently convex whorls. Base rather short, convex, perforated. Outer lip with 4-5 deeply set mid-adapical internal spiral threads, followed in some specimens by 1-2 shorter abapical ones. Columellar ridge sharp, moderately prominent. Outer surface shining, with exceedingly fine, orthocline growth lines and faint spiral microstriation.

Description – Protoconch intorted, its last whorl visible at top of spire, showing remnants of spiral threads; demarcation from teleoconch by distinct rim (Pl. 4, fig. 4b); diameter 0.22 mm. Teleoconch elongate-ovate, with rather elevated, slightly cyrtoconoid spire, AP 40°, MSA 25°; whorls shaped like a segment of a cone, very gently convex, shouldered, with narrow, subhorizontal, slightly concave subsutural shelf, contracted below periphery; sutures asymmetrically grooved, SS 10°. Last whorl conical-ovate, 63% of total height, with rounded to subangular periphery; base rather short, convexly obconical, with narrow umbilical chink. Aperture oval, somewhat expanded abapically; outer lip with 4-5 deeply set internal spiral threads, followed by 1-2 shorter abapical ones in some specimens; parietal lip coated with a thin callus; columella with rather sharp, moderately prominent, oblique ridge close to its adapical end. Outer surface spirally microstriated throughout, with fine, orthocline, straight growth lines.

Remarks – The slightly cyrtoconoid spire with smaller mean spiral angle, the shorter last whorl and the rounded periphery readily distinguish the present species from *Parodostomia sartonoi* sp. nov., described above.

Parodostomia sp.

Pl. 5, fig. 1.

Material examined – Kali Rebjong Section, level RMG 3: RGM 606848 (1, Pl. 5, fig. 1), RGM 606849 (1). Sumberan: RGM 606850 (1). The material consists of three not fully grown specimens, two of them with the outer lip broken.

Description – Protoconch intorted, rather small, only its last whorl visible at top of spire; demarcation from teleoconch by distinct rim; diameter 0.17 mm. Teleoconch broadly conical-ovate, with slightly cyrtoconoid spire, AP 46°, MSA 32°; whorls very gently convex, shouldered and with very narrow, subhorizontal subsutural shelf, contracted below periphery; sutures asymmetrically grooved, SS 14°. Last whorl oval, 67% of total height, with rounded or subangular periphery; base rather short, convex, with small umbilical chink. Aperture oval; outer lip regularly arched, with 6 interior spiral riblets not reaching peristome; parietal lip coated with moderately thick callus; columellar ridge strong and prominent, scarcely oblique. Outer surface with faint spiral microstriation and uneven, very slightly prosocline growth lines.

Remarks – The present specimens likely belong to an unnamed *Parodostomia* species, but the few specimens available prevent a reliable decision in this respect. They exhibit some resemblance to *Parodostomia teresae* sp. nov., described above, but this species has a significantly larger protoconch, a more slender teleoconch with smaller angular measurements and a different configuration of the palatal riblets.

Subfamily Chrysallidinae Saurin, 1958
Genus *Babella* Dall & Bartsch, 1906

Type species – *Turbonilla (Babella) caelatior* Dall & Bartsch, 1906, p. 347 (new name for *Parthenia caelata* Adams, 1863, secondary homonym of *Turbonilla caelata* Gould, 1861), by original designation.

Remarks – On the basis of the type species and of others closely similar to it, the characters of *Babella* can be defined as follows: protoconch helicoid, with variably prominent spire, lying across the first teleoconch whorl and one-third to half immersed in it; conical-ovate, somewhat turreted teleoconch with deeply grooved sutures; umbilicus wanting or a faint chink; outer lip devoid of internal spirals; columellar ridge sharp and prominent; sculpture of strong collabral ribs ending abruptly well above suture, 1 robust suprasutural cord, 1-3 primary basal cords and occasional minor spirals in between the sutures; and growth lines orthocline. The protoconch type combined with the sculptural characters distinguishes *Babella* from the other chrysallidine genera. *Babelis* Melvill, 1910, is an error for *Babella*.

***Babella* sp. 1**
Pl. 5, fig. 2.

Material examined – Kali Rebjong Section, level RMG 3: RGM 606851 (1; Pl. 5, fig. 2), RGM 606852 (6). The material consists of juvenile specimens comprising the larval shell and the first two teleoconch whorls.

Description – Protoconch helicoid, of 3 whorls, with inflated last whorl and prominent spire extending beyond adapical suture of first teleoconch whorl, in which protoconch is one third immersed; protoconch angle about 90°, diameter 0.19 mm. Teleoconch conical-ovate with cyrtoconoid spire, AP 34°; whorls shaped like a segment of a cone, shouldered, with very slightly convex sides; sutures deeply channeled, SS 12°. Last whorl oval, large, with angular periphery; base rather short, nearly obconical, imperforate. Aperture oval; outer lip smooth within; columella concave, with moderately prominent, slightly oblique, thin, sharp fold at its adapical end (middle of inner lip). Sculpture of 18 thick, gently prosocline collabral ribs, each nearly as wide as one concave interspace, forming obsolete nodes over shoulder, ending abruptly on peripheral (suprasutural) spiral cord, which is weaker than ribs; interspaces with exceedingly fine spiral threads; base with 2 closely spaced spiral cords (uppermost at level of suture) followed by 2 weaker ones below.

Remarks – The present specimens are similar to that figured by Laseron (1959, figs. 104, 105) and referred to as *Babella caelata* (Adams, 1863). The protoconch (fig. 105) seems to be identical, but in the Australian specimen a groove intervenes between the abapical end of the ribs and the suprasutural spiral cord. *Babella bartschi* (Dautzenberg & Fischer, 1906) lacks the groove separating the ribs from the suprasutural cord, but differs in details of the sculpture and its protoconch has the spire shorter than that of the Indonesian specimens. These latter likely represent a new species, but their very early growth stage prevents naming it.

***Babella* sp. 2**
Pl. 5, figs. 3, 4.

Material examined – Kali Rebjong Section, level RMG 3: RGM 606853 (1; Pl. 5, fig. 3), RGM 606854 (1; Pl. 5, fig. 4), RGM 606855 (1); level RMG 5: RGM 606856 (1). The material

consists of juvenile specimens comprising the larval shell and the first two teleoconch whorls.

Remarks – Compared to *Babella* sp. 1, these specimens differ in having more distinct spiral threads in the intercostal spaces and only one upper basal spiral cord followed by several fine spiral threads down the base. They may either belong to a distinct species or constitute a variation of *Babella* sp. 1. However, more, better material is necessary in order to reach a reliable decision in this respect. Two specimens are figured herein for future reference.

Genus *Besla* Dall & Bartsch, 1904

Type species – *Odostomia (Chrysallida) convexa* Carpenter, 1857, by original designation (Dall & Bartsch, 1904, p. 10).

Remarks – On the basis of the type species, of *Odostomia (Besla) excolpa* Bartsch, 1912, and of the species herein assigned to *Besla*, the distinguishing characters of the genus can be summarized as follows: protoconch helicoid, lying across the first teleoconch whorl and one-fourth to half immersed in it; teleoconch elongate-ovate, with variably convex whorls, sutures impressed; base rounded, umbilical chink very narrow to indistinct; outer lip smooth within, or with interior spiral riblets in some species; columellar ridge distinct to strong; sculpture of variably sinuous collabral ribs continuous over the base, and of abapical and basal spiral cordlets; and growth lines nearly orthocline. *Besla* resembles *Linopyrga* Laws, 1941, in several respects, but the latter taxon is spirally sculptured throughout. I do not concur with van Aartsen *et al*. (2000) in considering *Besla* as a synonym of *Parthenina* Bucquoy *et al*., 1883, since the species included in the latter genus have a quite different, clearly intorted protoconch. A number of Indo-West Pacific species, previously assigned to *Besla* (cf. Saurin, 1959; Robba *et al*., 2004), have an intorted larval shell and deserve a different generic allocation.

Besla tawunensis sp. nov.

Pl. 5, fig. 5; Pl. 6, fig. 1.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606857 (Pl. 5, fig. 5; Pl. 6, fig. 1).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606858 (3).

Derivation of name – The name refers to the Tawun Formation, which yielded the present new species.

Preservation – The material is rather well preserved.

Diagnosis – *Besla* species with depressed-helicoid protoconch lying across first teleoconch whorl and half immersed in it. Teleoconch elongate-oval, moderately high-spired; whorls gently convex, shouldered; sutures impressed. Base convex, imperforate. Aperture oval, outer lip smooth within, columellar fold thin. Sculpture of slender, sinuous collabral ribs continuous over the base, and of abapical and basal spiral cords.

Description – Protoconch depressed-helicoid, apparently of 2 whorls, with broad last whorl and low, blunt apex half concealed by first teleoconch whorl; protoconch angle slightly greater than 90°; diameter 0.19 mm. Teleoconch elongate-oval, with moderately high, slightly cyrtoconoid spire, AP 37°, MSA 17°; first whorl convexly conical with angular periphery at abapical one fourth, subsequent ones gently convex, with narrow shoulder slope, periphery about midway between sutures; sutures impressed, SS 15°. Last whorl oval, 60% of total height, rather tall, subangular at level of suture; base convex, imperforate. Aperture oval, moderately produced abapically; outer lip thin, with broad, shallow subsutural sinuation, smooth within; columella weakly concave, with thin, slightly prominent, markedly oblique fold at its adapical end; parietal wall coated with thin callus. Sculpture of collabral ribs, and of suprasutural and basal spiral cords. Ribs, 19 on first whorl, 27-30 on last whorl, are slender, flexuous, each nearly as wide as one flat interspace, finer and denser behind outer lip, continuous over base, gradually attenuated to umbilical area. Cords, 1 on first whorl, 2 on second, and 4 (fourth, at level of suture, slightly coarser than remainder) on last whorl, markedly thinner than ribs; that on angular periphery of first whorl lying in between ribs, those on subsequent whorls overriding ribs; 7 spirals on base also override ribs and become increasingly finer downward.

Remarks – The west American *Odostomia (Besla) excolpa* Bartsch, 1912, appears to be the most closely related species, differing in having somewhat more convex whorls, a stronger columellar fold, 3 spiral cords throughout and only 4 basal spirals.

***Besla unicincta* sp. nov.**
Pl. 6, figs. 2, 3.

Holotype – Kali Rebjong Section, level RMG 3: RGM 606859 (Pl. 6, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606860 (1; Pl. 6, fig. 3), RGM 606861 (10); level RMG 6: RGM 606862 (1).

Derivation of name – From Latin *unus* = one, and *cinctus* (participle of *cingere*) = encircled, with reference to the single abapical spiral cord.

Preservation – The material consists of rather well preserved, mostly adult specimens.

Diagnosis – *Besla* species with helicoid protoconch lying across first teleoconch whorl and half immersed in it. Teleoconch elongate-oval, moderately high-spired; whorls very gently convex with subangular periphery; sutures deeply impressed. Base convex, imperforate. Aperture oval, outer lip with inner spiral riblets, columellar fold thin. Sculpture of slender collabral ribs continuous over base, single abapical cord and fine basal threads; spiral microstriation occurs between sutures.

Description – Protoconch helicoid, of 2.5-2.75 whorls, with apex tangential to, but not extending beyond, adapical suture of first spire whorl, about half immersed in first teleoconch whorl, coiled nearly at right angle to teleoconch axis; diameter 0.20 mm. Teleoconch elongate-oval, with moderately high, slightly cyrtoconoid spire, AP 33°, MSA 25°; whorls gently convex, clearly shouldered, with subangular periphery at abapical one fourth, suddenly constricted below it; sutures deeply impressed (nearly channeled), SS 13°. Last whorl oval, 67% of total height, with roundly angular periphery; base rather short, convex, imperforate. Aperture oval, subauriform in some specimens, scarcely produced abapically; outer lip thin, rather sharp-edged, with 6 thin, deeply set internal spiral riblets; inner lip straight to broadly angular, with thin, sharp, moderately oblique submedian fold; parietal wall coated with rather thick callus. Sculpture of slender collabral ribs, 20 throughout, each half the width of one flat interspace, forming weak nodes slightly projecting above shoulder, continuous over base, gradually attenuated to umbilical area; one thin spiral cord, not overriding ribs, around periphery; base with fine, dense spiral threads; faint, distant spiral microgrooves present between sutures.

Remarks – *Besla unicincta* sp. nov. does not compare to any *Besla* species described so far. The single spiral cord on the periphery of the whorls readily distinguishes it.

***Besla* sp.**
Pl. 6, fig. 4.

Material examined – Kali Rebjong Section, level RMG 3: RGM 606863 (1). A damaged juvenile specimen.

Description – Protoconch rather small, depressed-helicoid, of about 2 whorls, slightly oblique, with short, blunt spire and large last whorl, apex partly concealed by first teleoconch whorl; diameter 0.16 mm. Teleoconch broadly oval, apparently short-spired, AP 60°; whorls shaped like a segment of a cone, with gently convex sides and angular periphery at abapical one third; sutures deeply impressed. Last whorl inflated; base convex with faint umbilical chink. Aperture oval, somewhat produced at junction of inner and basal lips; outer lip arched, smooth within; columella with moderate adapical fold. Sculpture of straight collabral ribs, 17 on last whorl (second whorl), each half the width of one interspace, continuous over base, where they are gradually attenuated; 1 spiral cord lies on peripheral angulation of whorls forming slight nodes on crossing ribs; 7 spirals occur over base starting from level of suture; fine spiral microgrooves present on first teleoconch whorl.

Remarks – The present specimen is characterised by its rather inflated teleoconch with a wide apical angle. There seem to be no *Besla* species with which it can compare.

Bulimoscilla gen. nov.

Type species – *Bulimoscilla stefanoi* sp. nov.

Derivation of name – The name of the genus reflects the fact that it is characterised by the combination of a bulimoid protoconch and an *Oscilla*-like teleoconch.

Diagnosis – Protoconch bulimoid, exceeding 3 whorls in most species, with prominent, pointed spire projecting beyond outline of first teleoconch whorl. Teleoconch turreted, with variably prominent, conical spire, whorls flat-sided, sutures adpressed, base short to very short, imperforate. Aperture ovate-quadrangular, outer lip with internal riblets, columellar fold thick, low. Sculpture of raised spiral cords, 3 per whorl, interspaces with axial threads, base spirally corded or smooth.

Remarks – The two "Rembangian" species described below are characterised by their bulimoid protoconch and by a turreted teleoconch sculptured with prominent spiral cords. Similar teleoconch characters occur in the chrysallidine genera *Hinemoa* Oliver, 1915, *Menesthella* Nomura, 1939, and *Oscilla* Adams, 1861. However, the species belonging to *Hinemoa* have a basically different, clearly intorted larval shells; those of *Menesthella* invariably possess a helicoid, low-spired protoconch and a prominent, variably strong columellar fold; and those confidently assigned to *Oscilla* have an oblique protoconch with the apex partly or fully concealed by the first teleoconch whorl (type B of van Aartsen *et al*., 1998). *Pseudoscilla* Boettger, 1901, also has a turreted shell with prominent spiral cords, but the species of this genus have protoconchs that are almost intorted, and their teleoconchs lack the columellar fold (see Peñas & Rolán, 1999b; Sosso *et al*., 2009). The species belonging in *Cingulina* Adams, 1860b, have a helicoid, low-spired protoconch and also lack the columellar fold. It is apparent that a possible allocation of the considered species under any one of the cited genera would be forced and unsatisfactory. Consequently, the new genus *Bulimoscilla* is proposed herein. Its multispiral, bulimoid protoconch constitutes the main diagnostic character. The thick, low columellar fold, which is unlike that of the other cited genera, is an additional distinguishing character.

Bulimoscilla florianae sp. nov.

Pl. 6, figs. 5-7.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606864 (Pl. 6, fig. 5).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606865 (8), level RMG 6: RGM 606866 (1; Pl. 6, fig. 6), RGM 606867 (1; Pl. 6, fig. 7), RGM 606868 (31).

Derivation of name – The species is named for my daughter-in-law Floriana.

Preservation – The material consists of variously preserved, juvenile and adult specimens.

Diagnosis – Chrysallidine species with bulimoid protoconch exceeding 3 whorls. Teleoconch turreted, with conical spire; whorls flat-sided; sutures adpressed. Base very short, obconical, imperforate. Aperture ovate-quadrangular, outer lip with palatal riblets, columellar fold squat. Sculpture of 3 equidistant, prominent spiral cords between sutures, interspaces with axial threads, base smooth.

Description – Protoconch bulimoid, of 3.25 whorls, with pointed spire extending beyond outline of first teleoconch whorl, in which protoconch is one fourth immersed; protoconch angle about 90°; diameter 0.23 mm. Teleoconch turreted, with elevated, conical spire, SA 27°; whorls shaped like a segment of a cone, moderately tall, straight-sided; sutures adpressed, SS 12°. Last whorl 53% of total height; base very short, flatly obconical, imperforate. Aperture ovate-quadrangular, rather wide; outer lip following subangular course, with 5 internal spiral riblets in largest specimens, abapical-most at level of basal lip; columella concave, reflected, thickly callous, with squat, oblique fold (low bulge in frontal view) near its adapical end; parietal wall coated with thin callus. Sculpture of 3 prominent, subequally spaced spiral cords appearing immediately, adapical one subsutural, lowermost at abapical one third of whorl height, slightly thinner than others in some specimens; fourth cord present on angular periphery of last whorl (at level of suture), followed abapically by a groove; interspaces with thin, straight axial threads; base smooth.

Remarks – Thiele (1925, p. 132) described *Oscilla fallax* from off Sumatra (south of Nias Island). I have examined the holotype of *O. fallax* (ZMB/Moll 63994) and can state that it fully agrees with the characters of the new genus *Bulimoscilla*. *Oscilla fallax* closely resembles *Bulimoscilla florianae* because of its similarly shaped teleoconch with 3 spiral cords per whorl, but is readily distinguished from *B. florianae* in having a smaller protoconch, stronger spirals with narrower interspaces (narrower than the cords) and a mid-basal cord (absent in *B. florianae*).

***Bulimoscilla stefanoi* sp. nov.**

Pl. 7, fig. 1.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606869 (Pl. 7, fig. 1).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606870 (1), level RMG 6: RGM 606871 (20).

Derivation of name – The species is named for my son Stefano.

Preservation – The material consists of variously preserved, juvenile and adult specimens.

Diagnosis – Chrysallidine species with bulimoid protoconch exceeding 3 whorls. Teleoconch turreted, with conical spire; whorls flat-sided; sutures adpressed. Base short, gently convex, imperforate. Aperture ovate-quadrangular, outer lip with palatal riblets, columellar fold squat. Sculpture of 3 equidistant, prominent spiral cords, the adapical one more elevated, interspaces with axial threads, base spirally corded.

Description – Protoconch bulimoid, of 3.25 whorls, slightly ascending, with pointed spire extending beyond outline of first teleoconch whorl, in which protoconch is one fourth immersed; diameter 0.21 mm. Teleoconch turreted, with elevated, conical, somewhat stepped spire, SA 19°; whorls subcylindrical, rather tall, straight-sided; sutures adpressed, SS 10°. Last whorl ovate-cylindrical, 53% of total height; base short, obconical in young specimens, gently convex in later growth stages, imperforate. Aperture ovate-quadrangular, slightly produced abapically; outer lip with 4 thin inner spiral riblets; columella concave, reflected, thickly callous, with squat, oblique fold (obtuse bulge in frontal view) near its adapical end; parietal wall coated with thin callus. Sculpture of 3 prominent, subequally spaced spiral cords appearing immediately, adapical one subsutural, soon becoming slightly more prominent than others, giving spire a stepped appearance; lowermost at abapical one third; fourth cord tends to emerge from abapical suture on later whorls and marks periphery of last whorl; one weaker cord present on uppermost base, followed in fully grown specimens by 4 others decreasing in strength downward; interspaces with thin, straight axial threads.

Remarks – The present species is close to *Bulimoscilla florianae* sp. nov. described above. It differs from *B. florianae* primarily in its sculptured base (that of *B. florianae* is smooth); other distinctive elements are the smaller spiral angle (19° instead of 27°), the comparatively longer, gently convex base and the slightly more slender spirals.

Genus *Chrysallida* Carpenter, 1856

Type species – *Chemnitzia communis* Adams, 1852, by original designation (see van Aartsen *et al*., 2000, p. 20).

Remarks – Schander (1994, p. 15) pointed out that *Chrysallida* has "shells with strong axial ribs, crossed by more or less prominent spiral keels between the sutures; base occasionally with spiral cords or threads, but commonly weak axial sculpture; protoconch of type B or C; columellar fold more or less developed". Van Aartsen *et al*. (2000) assigned to *Chrysallida s.s*. species having intorted protoconch, oval to elongate teleoconch, columellar fold weak or absent, sculpture of collabral ribs and spiral cords nearly of

equal strength, and the base only spirally sculptured. On this basis and considering the type species (*C. communis*), which was described and illustrated by Turner (1956, p. 39, pl. 10, fig. 5), the distinguishing characters of *Chrysallida* are: intorted protoconch; rissoid teleoconch; columellar ridge weak or wanting; and sculpture of collabral ribs and spiral cords nearly of the same strength. Most species of *Chrysallida* are strongly sculptured, with the ribs forming nodes on crossing the spirals; the ribs tend to fade away over the base.

***Chrysallida reticulata* sp. nov.**
Pl. 7, fig. 2.

Holotype – Kali Rebjong Section, level RMG 3: RGM 606872 (Pl. 7, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606873 (5).

Derivation of name – From Latin *reticulatus* = forming a network, with reference to the reticulated sculpture.

Preservation – The material consists of well preserved, mostly adult specimens.

Diagnosis – *Chrysallida* species with intorted protoconch. Teleoconch elongate-oval, with slightly cyrtoconoid spire; whorls gently convex; sutures broadly grooved. Base convex, imperforate in adult specimens. Aperture oval, outer lip with crenulated edge, smooth within, columellar fold very weak to indistinct. Sculpture of thin collabral ribs and coarser spiral cords forming a reticulate pattern of rectangles.

Description – Protoconch intorted, only its last 1.5 whorls visible at top of spire; diameter 0.20 mm. Teleoconch small, elongate-oval (*Manzonia*-like), with moderately elevated, slightly cyrtoconoid spire, AP 40°, MSA 20°; first whorl with angular periphery slightly abapical to middle of whorl, subsequent ones gently convex, clearly shouldered, suddenly contracted abapically; sutures broadly grooved, SS 12°. Last whorl oval, about 70% of total height; base convex, with distinct umbilical chink in juvenile specimens, imperforate in fully grown ones. Aperture oval, markedly oblique, peristome thin, somewhat detached adapically; outer lip arched, its edge crenulated by spirals, smooth within; inner lip nearly straight, smooth or with very slight median bulge; parietal wall coated with moderately thick callus. Sculpture of collabral ribs and spiral cords forming a reticulate pattern of rectangles. Ribs, 20-21 on first whorl, 17-20 on last whorl, are thin, straight, slightly prosocline, each about half width of one interspace, attenuated or vanishing on base, form variably prominent (sometimes pointed) nodes on crossing spirals. Spiral cords stronger than ribs, 3 occur on first whorl, fourth emerges from abapical suture by second whorl, soon reach-

ing same strength as others, and another 3 are present on base, that on upper base at level of suture, lowermost weaker than other two; fine spiral threads occur on shoulder slope of some specimens.

Remarks – The present new species exhibits a remarkable similarity to several east Atlantic, Atlantic-Mediterranean or Mediterranean (Recent and/or fossil) species, such as *Rissoa excavata* Philippi, 1836, *Folinella ghisottii* van Aartsen, 1984, *Chrysallida gubbiolii* Peñas & Rolán, 1998, *Folinella holthuisi* van Aartsen *et al*., 1998, *Chrysallida jordii* Peñas & Rolán, 1998, *Folinella moolenbeeki* van Aartsen *et al*., 1998, and *Folinella spinosula* Micali, 1992. *Rissoa excavata* was assigned either to *Chrysallida* Carpenter, 1856, or to *Folinella* Dall & Bartsch, 1904, by most recent workers (see Micali, 1992; van Aartsen *et al*., 1998; Peñas & Rolán, 1998). All have an intorted protoconch, and a rissoid teleoconch sculptured with spiral cords that override collabral ribs enclosing quadrangular pits and forming nodes at the intersections. Of these, the Recent east Atlantic species *F. moolenbeeki* is the most similar to *C. reticulata* sp. nov. in teleoconch shape, but differs in details of the protoconch, and in having a broader aperture with a thick peristome, and 2 spirals per whorl. The species listed above appear to be quite unlike the illustration of *Amoura anguliferens* De Folin *in* De Folin & Périer, 1873, type species of *Folinella* (cf. De Folin & Périer, 1873, p. 205, pl. 9, fig. 1), whereas they fully agree with the characters of *Chrysallida*. On the basis of its type species, *Folinella* is more similar to *Numaegilina* Nomura, 1938, or *Paregila* Laseron, 1951 (likely a synonym of *Numaegilina*), than to *Chrysallida*.

Genus *Egila* Dall & Bartsch, 1904

Type species – *Odostomia (Parthenia) lacunata* Carpenter, 1857, by original designation (Dall & Bartsch, 1904, p. 11).

Remarks – The characters of the genus can be defined as follows: intorted protoconch; ovate-conical, turreted teleoconch with grooved sutures; narrow but distinct umbilical chink; outer lip devoid of inner spirals; weak to prominent columellar ridge; collabral ribs overriding a single peripheral cord, continuous to the base that bears a variable number of spiral cordlets or threads; and growth lines orthocline. The space between the peripheral and the uppermost basal spiral cords may either be markedly concave as in the type species and in *Egila poppei* (Dall & Bartsch, 1909), or much less so to flattish as in some Australian species (cf. Laseron, 1959, p. 220) and in those described herein. *Egila* has similarity to *Babella* Dall & Bartsch, 1906, and to *Egilina* Dall & Bartsch, 1906, in teleoconch shape, but is distinguished from both by its clearly intorted protoconch and the collabral ribs extending over the base.

Egila garudai sp. nov.

Pl. 7, figs. 3, 4.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606874 (Pl. 7, fig. 3).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606875 (1); level RMG 6: RGM 606876 (1; Pl. 7, fig. 4), RGM 606877 (7).

Derivation of name – From *Garuda*, the Hindu divinity symbol of Indonesia.

Preservation – The material consists of rather well preserved, juvenile and adult specimens.

Diagnosis – Protoconch intorted. Teleoconch elongate-oval, with slightly cyrtoconoid spire; whorls nearly flat-sided, contracted both adapically and abapically; sutures grooved. Base convex, with very narrow umbilical chink. Aperture oval, outer lip smooth within, columellar fold prominent, moderately thin. Sculpture of strip-like collabral ribs continuous to base, 1 peripheral cord and basal cordlets.

Description – Protoconch intorted, only its last 1.25 whorls visible at top of spire; diameter averaging 0.22 mm. Teleoconch small, elongate-oval, with moderately elevated, slightly cyrtoconoid spire, AP 43°, MSA 21°; whorls shaped like a segment of a cone, nearly flat-sided, distinctly shouldered, with angular periphery at abapical one fourth; sutures grooved, SS 11°. Last whorl oval, about 61% of total height; base convex, gradually attenuated, with very narrow, but distinct, umbilical chink. Aperture oval, with hint of broad, shallow abapical channel; outer lip arched, moderately thick, smooth within; inner lip also curved, callused, with prominent, rather thin submedian fold. Sculpture of collabral ribs, 1 spiral cord on periphery, base with spirals. Ribs 17-19 throughout, straight, slightly prosocline, each markedly narrower than one flat interspace, forming weak nodes on crossing shoulder, overriding spirals, gradually attenuated down base to umbilical area. Peripheral cord equal in strength to collabral ribs; upper basal spiral cordlet starts to emerge from abapical suture by second whorl; 6 cordlets present on base, gradually becoming finer and more closely spaced downward, uppermost separated from peripheral cord by wider, flattish interval.

Remarks – The Recent Australian species *Egila univestis* and *Egila curtisensis*, both of Laseron (1959), are closely similar to *Egila garudai* sp. nov., but have a weaker columellar fold, fewer ribs and different basal sculpture. *Parthenina brusinai* Cossmann, 1921 (herein regarded to belong in *Egila*), seems to be the east Atlantic and Mediterranean, Recent counterpart of *E. garudai*, differing from it in having a weaker, more deeply set columellar fold and the ribs vanishing on the uppermost base.

Genus *Egilina* Dall & Bartsch, 1906

Type species – *Parthenia mariella* Adams, 1860b, by original designation (Dall & Bartsch, 1906, p. 354).

Remarks – The synonymy with *Partulida* Schaufuss, 1869, and *Spiralinella* Chaster, 1901, suggested by Schander *et al*. (1999a) on the authority of Cossmann (1921), seems

untenable because of the remarkable difference between *P. mariella* and *Turbo spiralis* Montagu, 1803, which is the type species of both *Partulida* and *Spiralinella*. In fact, *P. mariella* is distinguished from *T. spiralis* (see Fretter *et al*., 1986, for a good illustration of *T. spiralis*) by its protoconch being obliquely immersed instead of clearly intorted, its more distinctly conical teleoconch with flattened whorls, its deeply grooved suture, its more prominent columellar ridge and its collabral ribs being nodulose adapically, interconnected abapically by a suprasutural spiral cord. The larval shell, the prominent columellar fold and the sculptural characters are the most relevant distinguishing elements of *Egilina* (see also Hori & Fukuda, 1999). *Miraldella* Bartsch, 1955, is closely similar to *Egilina*. On the basis of *Miralda (Miraldella) gordonae* Bartsch, 1955 (p. 79, pl. 16, fig. 3), type species of *Miraldella* by original designation, it appears that *Miraldella* differs from *Egilina* only by having the base devoid of spirals. This character seems insufficient for generic separation and *Miraldella* likely is a synonym of *Egilina*.

***Egilina karasensis* sp. nov.**
Pl. 7, fig. 5.

Holotype – Kali Rebjong Section, level RMG 3: RGM 606878 (Pl. 7, fig. 5).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606879 (5).

Derivation of name – The name refers to the village of Karas, which is the type locality.

Preservation – The material consists of variously preserved juvenile specimens.

Diagnosis – An *Egilina* species with obliquely immersed protoconch. Teleoconch conical-ovate, whorls flattened, with angular periphery, sutures grooved. Base convex, imperforate. Aperture oval, outer lip smooth within, columellar fold prominent, deeply set. Sculpture of collabral ribs, nodulose at both ends, terminating abruptly at periphery where connected by one spiral cord; base with subperipheral furrow followed by spiral cords.

Description – Protoconch rather small, obliquely immersed, only its last half whorl projecting above first teleoconch whorl, apex fully immersed in first teleoconch whorl; diameter 0.18 mm. Teleoconch conical-ovate, spire nearly straight-sided, MSA 28°; whorls shaped like a segment of a cone, flattened, with slight shoulder, periphery angular, close to abapical suture; sutures grooved, SS 6°. Last whorl oval, about 70% of total height; base convex, imperforate. Aperture oval; outer lip arched, smooth within; columellar fold prominent, deeply set. Sculpture of collabral ribs, 1 peripheral and some basal spiral cords. Ribs, 15 on first whorl, 18 on last whorl (which is transitional

from the second to third whorl), straight, moderately prosocline, each slightly wider than half width of one interspace, nodulose at shoulder, abruptly terminating as distinct nodules at periphery, where interconnected by one spiral cord. Base with 4 spiral cords decreasing in strength downward, uppermost separated from peripheral one by rather deep furrow. Microscopic spiral threads present on first teleoconch whorl in some specimens.

Remarks – Several species assigned to *Egilina* were described from south-east Asian waters (Saurin, 1958, 1959). Of these, only *E. babellina* Saurin, 1958, seems actually to belong to *Egilina*. It differs from *Egilina karasensis* sp. nov. in having more numerous ribs extending into the upper basal furrow and 8 rather than 4 basal spirals. The Japanese species *Egilina katoeae* Hori & Fukuda, 1999 is distinguished by its somewhat narrower teleoconch with a perfectly conical spire, its deeper and broader sutural grooves, and in having 1 spiral cord on the uppermost base followed below by fine spiral lirae.

Genus *Hinemoa* Oliver, 1915

Type species – *Hinemoa punicea* Oliver, 1915, p. 531, by original designation.

Remarks – On the basis of *Hinemoa punicea* and of other Australian species most closely related to it (*Odostomia gumia* Hedley, 1909, *Odostomia laquearia* Hedley, 1909, *Hinemoa sternerea* Laseron, 1959), the diagnostic characters of *Hinemoa* can be defined as follows: protoconch intorted, only its last whorl visible at the top of the spire; teleoconch conical-ovate, spire straight-sided, sutures adpressed; base obconical or flatly convex, imperforate or with slight umbilical chink; outer lip indented, smooth within; columellar ridge very weak; and sculpture of raised, robust spiral cords throughout, interspaces smooth or with oblique axial striation. Some new species ascribed to *Hinemoa* by Laseron (1959) seem to have the protoconch quite unlike that of the type species (e.g., *Hinemoa rubra* Laseron, 1959) or exhibit a strong columellar ridge (e.g., *Hinemoa duplex* Laseron, 1959). These taxa likely deserve a different generic assignment.

Hinemoa sp.
Pl. 8, fig. 1.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606880 (1; Pl. 8, fig. 1), RGM 606881 (1). Two well preserved juvenile specimens.

Description – Protoconch intorted, rather small, only its last whorl visible at top of spire; diameter 0.18 mm. Teleoconch broadly biconical, with straight-sided spire, SA 47°; whorls flattened, with subangular periphery at abapical one third, moderately contracted below periphery; sutures faint, adpressed, SS 8°. Last whorl large; base short, nearly obconic, with faint umbilical chink. Aperture oval, slightly produced abapically; outer lip with crenulated edge, smooth within; columellar fold weak, hardly visible from in front; parietal lip coated with thin callus. Sculpture of 3 prominent, equidistant, robust spiral cords, adapical one immediately subsutural, weaker on first whorl, but soon reaching same strength as others; abapical one marking periphery; interspaces

deeply concave, with strongly prosocline axial threads; base with 4 spiral cords, uppermost at level of suture, lowermost bounding umbilical chink.

Remarks – The examined specimens seem unlike any three-corded *Hinemoa* species, primarily because of their quite broadly open spiral angle. They likely represent a new species, but additional material is required to assess them.

Genus *Levipyrgulina* Laws, 1941

Type species – *Levipyrgulina sulcata* Laws, 1941, p. 17, by original designation.

Remarks – The genus was introduced to accommodate two fossil species from New Zealand, characterized by: a paucispiral, nearly intorted protoconch; a slender, moderately elevated teleoconch with weakly convex whorls meeting at impressed sutures; base convex, imperforate; columellar ridge distinct, deeply set; and outer surface with collabral ribs vanishing shortly abapical to the periphery, spiral sculpture absent. It is of note that the apex of the protoconch may be partially visible or fully immersed in the first teleoconch whorl. A subsutural ridge is present in some species. *Levipyrgulina* differs from similar chrysallidine genera primarily in lacking spiral sculpture. The East Atlantic species *Chrysallida gitzelsi* van Aartsen *et al*., 2000, possibly belongs here.

***Levipyrgulina levisculpta* sp. nov.**
Pl. 8, figs. 2, 3.

Holotype – Kali Rebjong Section, level RMG 3: RGM 606882 (Pl. 8, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606883 (1; Pl. 8, fig. 3), RGM 606884 (2).

Derivation of name – Form Latin *levi-*, short for *leviter* = weakly, and *sculptum* (participle of *sculpo*) = sculptured, with reference to the weakness of the collabral ribs.

Preservation – The material is rather well preserved.

Diagnosis – Protoconch obliquely immersed, nearly intorted. Teleoconch pupoid, whorls gently convex, with adapical constriction producing a broad subsutural margin, sutures shallowly impressed. Base convex, imperforate. Aperture oval, outer lip smooth within, columellar fold deeply set. Sculpture of weak, broad collabral ribs vanishing immediately abapical to periphery; no spiral sculpture present.

Description – Protoconch rather small, obliquely immersed, only its last half-whorl projecting above first teleoconch whorl, apex half hidden; diameter 0.17 mm. Teleoconch

pupoid, spire slightly cyrtoconoid, AP 23°, MSA 12°; whorls moderately convex, constricted adapically, then flaring to form broad, low subsutural margin, rounded periphery at abapical one third; suture shallowly impressed, SS 16°. Last whorl ovate-cylindrical, about 60% of total height; base convex, imperforate. Aperture teardrop-shaped; outer lip straight, arched abapically, merging into broadly curved basal lip, smooth within; columellar fold moderately prominent, deeply set. Teleoconch weakly sculptured with obsolescent collabral ribs, approximately 20 per whorl, each markedly wider than one interspace, expanding downwards, vanishing just abapical to periphery; ribs tend to fade away on last whorl; whole surface with dense, very slightly prosocline growth markings.

Remarks – The present taxon differs markedly from the other known *Levipyrgulina*. *Levipyrgulina marginata* Laws, 1941, has a narrower teleoconch with fewer (14 on penultimate whorl), thin, sharply elevated collabral ribs. *Levipyrgulina sulcata* Laws, 1941, has a conical, stepped spire with rather flat whorls and fewer collabral ribs (about 15 on penultimate whorl).

Genus *Liamorpha* Pilsbry, 1898

Type species – *Lia decorata* De Folin *in* De Folin & Perrier, 1873, by monotypy (see van Aartsen, 1984).

Remarks – Pilsbry (1898, p. 323) proposed *Liomorpha* as a replacement name for *Lia* De Folin *in* De Folin & Perrier, 1873, which was preoccupied. Schander *et al*. (1999a, p. 150) regarded Pilsbry's original spelling *Liomorpha* as a *lapsus calami* and considered *Liamorpha* to be the correct spelling. As there is no evidence of an inadvertent error in the original publication (International Commission on Zoological Nomenclature, 1999, Article 32.5.1), *Liamorpha* is actually an unjustified emendation. However, Schander *et al*. (1999a) also noted that *Liomorpha* was disregarded subsequent to its introduction, whereas *Liamorpha* is in prevailing usage and has been attributed to the publication of the original spelling. In this case, the name *Liamorpha* is to be preserved (International Commission on Zoological Nomenclature, 1999, Article 33.3.1) and is adopted here.

From a review of the literature, it appears that there is a considerable number of small crysallidine species occurring sparsely in world seas, which have ovate to elongate-ovate teleoconchs with distinctly shouldered whorls, a strong columellar ridge, and sculpture of robust spiral cords and of nodulose collabral ribs, restricted to the adapical half of the whorls in most species. The apical characters are discrepant, as some species possess a helicoid protoconch, whereas others have an intorted one. However, all currently are assigned to the genus *Miralda* Adams, 1863. The type species of *Miralda* is *Parthenia diadema* Adams, 1860c, by subsequent designation (Schander *et al*., 1999a). *Parthenia diadema* was the first species listed under *Miralda* by Adams (1863, p. 3) in proposing the genus. According to van Aartsen *et al*. (1998, p. 11), a possible type specimen (BMNH 1878.1.28.348, Adams collection) of *P. diadema* has "an intorted top and teeth at the inside of the outer lip". The same authorities reported that the type species of *Liamorpha* and the related *Liamorpha elegans* (de Folin *in* de Folin & Périer, 1870) have a helicoid protoconch. Consequently, it seems reasonable to divide the species mentioned

above into two lots on the basis of their protoconch type. Those having a helicoid larval shell are assigned to *Liamorpha*, whereas those possessing an intorted protoconch are better accommodated in *Miralda*. Two more points should be noted. Firstly, the specimens described and illustrated by Dall & Bartsch (1906, p. 356, pl. 17, fig. 2) and referred to as *Odostomia* (*Miralda*) *diadema* Adams, 1860c, are neither Adams' species, nor belong to *Miralda*. They represent a *Liomorpha* species, in that were reported to have a helicoid protoconch. Secondly, the synonymy of *Lia* (consequently of *Liamorpha*) with *Miralda*, proposed by Dall & Bartsch (1909, p. 176) and agreed upon by van Aartsen (1984), is rejected. Instead, I concur with van Aartsen (1984) in considering *Ividia* Dall & Bartsch, 1904, as a synonym of *Miralda*.

***Liamorpha minuta* sp. nov.**
Pl. 8, figs. 4-6.

Holotype – Kali Rebjong Section, level RMG 3: RGM 606885 (Pl. 8, fig. 4).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606886 (1; Pl. 8, fig. 5), RGM 606887 (1; Pl. 8, fig. 6), RGM 606888 (6).

Derivation of name – From Latin *minutus* = small, with reference to the small size of the teleoconch.

Preservation – The material consists of mostly well preserved juvenile and adult specimens.

Diagnosis – Protoconch helicoid, slightly oblique, lying across first teleoconch whorl. Teleoconch elongate-oval with very slightly cyrtoconoid spire, whorls shaped like a segment of a cone, distinctly shouldered, sutures grooved. Base convex, imperforate. Aperture oval, outer lip with internal riblets, columellar fold moderately strong. Sculpture of robust, mid-adapical collabral ribs and spiral cords; base spirally corded.

Description – Protoconch helicoid, of 2.5 whorls, coiled nearly at right angles to teleoconch axis and one third immersed in first spire whorl; diameter 0.20 mm. Teleoconch small, hardly exceeding 1.2 mm in height, with moderately elevated, very slightly cyrtoconoid spire, MSA 29°; whorls shaped like a segment of a cone, with angular shoulder and narrow, gently sloping subsutural shelf, contracted below periphery, which is placed at abapical one fourth; sutures grooved, SS 17°. Last whorl oval, about 70% of total height; base convex, gradually tapering, imperforate. Aperture oval; outer lip rather thick, with 5 inner spiral riblets in adult specimens; inner lip callous, somewhat reflected abapically, with moderately strong, scarcely oblique submedian fold. Sculpture of rather robust collabral ribs and spiral cords; 16-18 ribs per whorl, nodulose over

shoulder, abruptly vanishing some distance from periphery; 1 cord of same strength as ribs appears on periphery at start of first teleoconch whorl; one thinner, overriding abapical end of ribs, develops shortly after or by second whorl; a third strong cord present on last whorl at level of suture, followed by 4 basal ones decreasing in strength downwards, lowermost bounding umbilical area; fine growth lines present in spiral interspaces.

Remarks – The Recent, east Atlantic and Mediterranean *Liamorpha elegans* (de Folin *in* de Folin & Périer, 1870) seems to be the most closely similar species. It differs from *L. minuta* in having a coarser spiral cord at the abapical end of the ribs and 2 (instead of 1) robust spirals below it (Hoenselaar & Moolenbeek, 1990). *Liamorpha minuta* is readily distinguished from *L. rembangensis* sp. nov. by its palatal riblets, its shoulder devoid of a spiral cord, its more elongate collabral ribs and the broader spiral interspaces without axial threads.

***Liamorpha rembangensis* sp. nov.**
Pl. 8, fig. 7.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606889 (Pl. 8, fig. 7).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606890 (1); level RMG 5: RGM 606891 (1); level RMG 6: RGM 606892 (13).

Derivation of name – The name refers to Oostingh's "Rembangian" stage whose stratotype is represented by the Tawun Formation that yielded the material.

Preservation – The material consists of rather well preserved juvenile specimens.

Diagnosis – Protoconch helicoid, slightly oblique, lying across first teleoconch whorl. Teleoconch ovate to elongate-oval with somewhat stepped spire, whorls very gently convex, distinctly shouldered, sutures grooved. Base convex, imperforate or with faint umbilical chink. Aperture oval, outer lip smooth within, columellar fold moderately strong. Sculpture of widely spaced spiral cords throughout, the two adapical cords interconnected by collabral ribs forming nodes at intersections; spiral interspaces abapical to second cord with thin axial threads.

Description – Protoconch small, helicoid, of 2.25 whorls, slightly oblique, one third immersed in first teleoconch whorl; protoconch angle 100°; diameter 0.17 mm. Teleoconch small, ovate to elongate-oval, with moderately cyrtoconoid, somewhat stepped spire, MSA 32°; whorls very gently convex, with angular shoulder and rather narrow, gently sloping subsutural shelf, moderately contracted abapically; suture weak, lying

in a concave groove, SS 9°. Last whorl ovate-cylindrical, 74% of total height; base convex, gradually tapering, imperforate or with faint umbilical chink in larger specimens. Aperture oval; outer lip thin, with crenulated edge, smooth within; inner lip callous, somewhat reflected abapically, with thick, moderately prominent submedian fold. Sculpture of rather robust, widely spaced spiral cords and equally strong collabral ribs; 3 cords per whorl, lying on shoulder, at adapical one third and at abapical one third; fourth cord present on last whorl at level of suture, followed by 5 basal ones decreasing in strength downward, lowermost bounding umbilical area; 17 ribs per whorl on most specimens, connecting upper and median cords, forming prominent nodes at intersections and giving the adapical part of whorls distinctive cog-like appearance; all concave spiral interspaces abapical to median cord bear thin axial threads, not continuous with ribs.

Remarks – Oostingh (1935, p. 63) described and illustrated *Menestho (Miralda) tegalensis* from Pliocene deposits of Java. The helicoid protoconch perpendicular to the teleoconch axis and the teleoconch characters of *M. tegalensis* fully support its assignment to the genus *Liamorpha*. Oostingh's species differs from *Liamorpha rembangensis* sp. nov. in having a conical-ovate teleoconch with a straight-sided spire and more closely spaced, coarser cords, the adapical and median ones appearing as spiral rows of strong bead-like nodes. The Recent Vietnamese species *Pyrgulina gemmifera* Dautzenberg & Fischer, 1906, is another similar *Liamorpha* species, differing in having the markedly stronger lower cord closer to the abapical suture (whereas it is at the abapical one third in *L. rembangensis*) and only 3 basal spiral cords.

***Liamorpha*? sp.**
Pl. 9, fig. 1.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606893 (1). An adult specimen lacking the earlier whorls and with the aperture badly damaged.

Description – Teleoconch turreted, with elevated, stepped spire, SA 30°; whorls subcylindrical, with angular shoulder and moderately wide, subhorizontal subsutural shelf, slightly contracted below periphery, which is placed at abapical one fourth; sutures thin, adpressed, SS 11°. Last whorl rather large, base obconical, imperforate. Aperture apparently oval without any trace of internal riblets, columellar ridge sharp and prominent. Sculpture of 4 broad, low spiral cords and collabral ribs; 2 closely spaced cords occur adapically, upper at shoulder; third broadest cord lies peripherally; fourth emerges from abapical suture; 21 ribs per whorl forming small nodes on crossing two adapical cords, quickly attenuated abapical to second spiral cord, replaced by more numerous axial threads below periphery; axials sinuous; base smooth.

Remarks – The present specimen is unlike any chrysallidine species described so far. The nodulose ribs restricted to the adapical part of the whorls suggest an assignment to either *Liamorpha* or *Miralda*. This specimen is tentatively placed under *Liamorpha* since its protoconch is unknown.

Genus *Linopyrga* Laws, 1941

Type species – *Odostomia rugata* Hutton, 1886, by original designation (Laws, 1941, p. 7). *Odostomia rugata* is a replacement name for *Odostomia* (*Parthenia*) *plicata* Hutton, 1884 (see Hutton, 1886, p. 353).

Remarks – The diagnostic characters of *Linopyrga* are as follows: protoconch helicoid, lying across the first teleoconch whorl, one third to half immersed in it; teleoconch ovate-conic to elongate-ovate, with flat-sided to gently convex whorls, sutures impressed; umbilical chink wanting or very narrow; outer lip smooth within; distinct columellar ridge; sculpture of collabral ribs gradually vanishing over the base, interspaces and base with spiral threads; and growth lines orthocline to gently prosocline. Laws, in discussing his new genus, put emphasis on the presence of a subsutural swelling. I concur with Laseron (1959) in considering this character of no generic significance. Actually, the subsutural swelling is quite poorly developed in *Linopyrga rugata* (cf. Beu & Maxwell, 1990, pl. 57, figs. k, l) and does not occur in the species herein assigned to this genus. About forty species have been included in *Linopyrga* subsequent to its introduction, but many of them have a different protoconch type, not helicoid as in *L. rugata*, and deserve a different generic allocation. *Linopyrga* is similar to *Bartrumella* Laws, 1940a, but the latter is distinguished primarily by its umboniiform larval shell (Laws, 1940a, p. 445).

Linopyrga gradata sp. nov.

Pl. 9, figs. 2, 3.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606894 (Pl. 9, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606895 (1; Pl. 9, fig. 3), RGM 606896 (9).

Derivation of name – From Latin *gradatus* = stepped, with reference to the stepped outline of the spire.

Preservation – The preservation is fair.

Diagnosis – Protoconch helicoid, slightly oblique, lying across first teleoconch whorl. Teleoconch ovate-conical with moderately elevated, stepped spire, whorls flat-sided, markedly shouldered, sutures deeply impressed. Base convex, imperforate. Aperture teardrop-shaped, outer lip smooth within, columellar fold low. Sculpture of widely spaced, thin collabral ribs, nodulose at shoulder, continuous over base where they gradually fade out; 1 peripheral spiral cordlet and fine, dense spiral threads present.

Description – Protoconch small, helicoid, of 2.75 whorls, slightly oblique, with rather prominent spire reaching, but not extending beyond, outline of first teleoconch whorl, in which protoconch is one third immersed; protoconch angle 100°; diameter 0.16 mm. Teleoconch small, ovate-conical, with moderately elevated, distinctly stepped spire, MSA 20°; whorls flat-sided, with angular shoulder and rather broad, gently sloping shoulder slope, somewhat constricted below shoulder, with angular periphery at abapical one fifth, moderately contracted below it; sutures deeply impressed, SS 6°. Last whorl ovate-cylindrical, about 41% of total height; base short, convex, imperforate. Aperture teardrop-shaped with shallow adapical sinuation; outer lip thin-edged, smooth within; inner lip callous, with low submedian fold. Sculpture of thin, straight or very gently arched collabral ribs, 16-17 per whorl, each markedly narrower than one interspace, forming nodes on crossing shoulder, continuous over base, where they gradually fade out downwards; ribs overridden throughout by fine, dense spiral threads and by 1 thin peripheral cordlet.

Remarks – The generic assignment is based on the protoconch and sculptural characters. *Linopyrga gradata* sp. nov. is unlike any *Linopyrga* species described so far. It exhibits a superficial resemblance to the Australian species *Turbonilla perscalata* Hedley, 1909, which has been included in *Linopyrga* by Laseron (1959, p. 227, fig. 124). *Linopyrga perscalata* also has gradate whorls, but differs from *Linopyrga gradata* in all other teleoconch characters.

***Linopyrga marcoi* sp. nov.**
Pl. 9, fig. 4.

Holotype – Kali Rebjong Section, level RMG 3: RGM 606897 (Pl. 9, fig. 4).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606898 (15).

Derivation of name – The species is named after Marco, one of my twin grandchildren.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – Protoconch helicoid, lying across first teleoconch whorl. Teleoconch turreted with elevated spire, whorls flat-sided, slightly contracted abapically, sutures impressed. Base convex, imperforate. Aperture oval, outer lip smooth within, columellar fold prominent. Sculpture of weakly sinuous collabral ribs, continuous onto base, where they gradually fade out; interspaces and base with spiral threads.

Description – Protoconch rather small, helicoid, of about 2 whorls, slightly oblique, one third immersed in first teleoconch whorl; apex short, blunt, scarcely hidden by first teleoconch whorl; diameter 0.18 mm. Teleoconch turreted, with elevated spire, which is slightly cyrtoconoid adapically, then straight-sided, AP 32°, MSA 11°; first whorl convex, subsequent ones flat-sided, with rounded periphery at abapical one fourth, moderately contracted below it; sutures impressed, SS 19°. Last whorl ovate-cylindrical, about 45% of total height; base convex, gradually attenuated, imperforate. Aperture teardrop-shaped; outer lip smooth within; columella straight, reflected, with prominent, rather sharp fold at adapical end; parietal wall coated with moderately thick callus. Sculpture of slightly flexuous to straight collabral ribs, 18-19 per whorl, each half width of one interspace, continuous over base, where they gradually fade out downwards; fine, rather evenly spaced spiral threads, weaker on adapical half of the whorls, present in costal interspaces throughout; basal spirals abapical to suture slightly coarser, overriding ribs.

Remarks – *Linopyrga marcoi* sp. nov. exhibits some resemblance only to *Linopyrga pseudorugata* (Marshall & Murdoch, 1921), which also has an elongated teleoconch. From the illustration of the neotype (Laws, 1941, fig. 10), it appears that *L. pseudorugata* differs in having a clearly cyrtoconoid, less tightly coiled spire (greater mean spiral angle), a broad subsutural margin, a weaker columellar plait and coarser, more closely spaced, distinctly prosocline collabral ribs.

***Linopyrga* sp. 1**
Pl. 9, fig. 5.

Material examined – Kali Rebjong Section, level RMG 3: RGM 606899 (1); level RMG 6: RGM 606900 (1; Pl. 9, fig. 5). Two well preserved juvenile specimens.

Remarks – The examined specimens are strikingly similar to *Linopyrga marcoi* sp. nov., but have a slightly larger protoconch (diameter 0.21 mm) with a more inflated last whorl and 16 ribs on the third whorl, suggesting a different rib development. They might be either a distinct species or merely an individual variation of *L. marcoi*. More material is needed in order to decide this question.

***Linopyrga* sp. 2**
Pl. 9, fig. 6.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606901 (1). A well preserved juvenile specimen.

Remarks – This single specimen exhibits much the same characters as *Linopyrga gradata* sp. nov., but differs from it in having a protoconch of 2.25 whorls (half a whorl fewer), a distinct umbilical chink, the aperture detached adapically (suggesting a change of the suture from impressed to channeled during growth), 19 ribs on the first whorl and a weaker peripheral cordlet. The half-whorl difference in protoconch whorls along with the presence of an umbilical chink seem to be reliable distinguishing charac-

ters, but formal description must await collection of additional material. According to Schander (pers. comm. 2011), the present specimen could belong in a genus other than *Linopyrga*. However, the growth stage prevents any reliable statement in this respect and the examined specimen is provisionally assigned to *Linopyrga*.

Genus *Menesthella* Nomura, 1939

Type species – *Menestho (Menesthella) tarukiensis* Nomura, 1939, p. 144, by original designation.

Remarks – *Menesthella* was based only on the type species and, obviously, its diagnosis focuses on the characters of the latter. The original diagnosis reads "shell small, broadly conic, imperforate; surface marked by strong, equally spaced spiral cords, and fine axial growth-lines between sutures; periphery of last whorl sulcate; base smooth; columellar fold strong". The protoconch of the type species was described as follows: "nuclear whorls at least 2, helicoid, about one half immersed in the first of later turns". From Nomura's text (pp. 126 and 144), it appears that the author accorded much importance to the grooved periphery of the last whorl and to the smooth base as distinguishing elements of *Menesthella*, whereas he totally neglected the larval shell, which is regarded here as highly significant. As already noted in the section on the taxonomic relevance of shell characters, the presence or absence of basal spirals is a species-level character of minor or no bearing in generic separation. Accordingly, I see no reason to exclude species with a spirally sculptured base from *Menesthella* provided that they have a helicoid protoconch. Considering the species herein assigned to *Menesthella*, the diagnostic characters of the genus are summarized as follows: protoconch helicoid, lying across the first teleoconch whorl and partially immersed in it; teleoconch trochoid to somewhat turreted, spire straight-sided in most species, sutures adpressed, impressed in a few species; base short, flatly convex to convex, imperforate or with slight umbilical chink; outer lip smooth within or with palatal riblets; variably strong ridge present at the adapical end of the columella; sculpture of few, robust spiral cords or keels; base smooth or with spiral cords; and interspaces and base with axial lines or threads. The helicoid protoconch and the sculpture constitute the primary diagnostic elements.

Odetta de Folin *in* de Folin & Périer, 1870, also has an helicoid protoconch, but differs markedly in teleoconch habit and its sculpture consists of spiral grooves throughout. *Hinemoa* Oliver, 1915, resembles *Menesthella* in terms of teleoconch shape and sculptural characters, but has a clearly intorted larval shell. *Oscilla* Adams, 1861, deserves more extensive comments. The type species is *Monoptygma cingulata* Adams, 1861, by monotypy (Adams, 1861, p. 296); concerning the type species, see also the remarks by Iredale (1910, p. 54) and Schander *et al*. (1999a, p. 150). From the original description of *M. cingulata*, the teleoconch of *Oscilla* is seen to be closely similar to that of *Menesthella*. Unfortunately, the syntypes of *M. cingulata* are missing from both the type and general collections in BMNH (A. MacLellan, pers. comm. 2009). However, a review of the species confidently included in *Oscilla* shows that their larval shells conform to the type B of van Aartsen *et al*. (1998), that is, they are obliquely (protoconch angle ranging from 120° to approximately 160°), deeply immersed in the first teleoconch whorl

(see also van Aartsen *et al*., 1989; Buzzurro *et al*., 2001). Thus, the protoconch of type B distinguishes *Oscilla* from *Menesthella*, whose protoconch is coiled at a right angle, or nearly so, to the teleoconch axis. It follows that some species having the latter type of larval shell, previously assigned to *Oscilla*, are better allocated in *Menesthella* (see *Menesthella sumatrana* below). The characters that differentiate *Menesthella* from *Bulimoscilla* gen. nov., *Cingulina* Adams, 1860b, and *Pseudoscilla* Boettger, 1901, are pointed out under *Bulimoscilla* (see above).

***Menesthella bicarinata* sp. nov.**
Pl. 9, fig. 7; Pl. 10, fig. 1.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606902 (Pl. 9, fig. 7).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606903 (1; Pl. 10, fig. 1), RGM 606904 (5).

Derivation of name – From Latin *bi-*, short for *bis* = twice, and *carina* = keel, with reference to the sculpture of two spiral keels between the sutures.

Preservation – The material consists of well preserved, small, probably juvenile specimens.

Diagnosis – Protoconch helicoid, lying across first teleoconch whorl. Teleoconch oval, with somewhat stepped spire, whorls shouldered, nearly flat-sided, sutures adpressed. Base short, convex to obconical, with faint umbilical chink. Aperture oval, outer lip smooth within, columellar fold prominent. Sculpture of 2 sharp spiral keels, another one on periphery of last whorl, and 4 basal cords; interspaces with axial threads.

Description – Protoconch rather small, helicoid, of 2.5 whorls, coiled at right angle to teleoconch axis, with blunt spire not extending beyond outline of first teleoconch whorl, in which protoconch is about one third immersed; diameter 0.18 mm. Teleoconch slenderly oval, of about 3 whorls, with moderately stepped spire, MSA 24°; whorls subcylindrical, distinctly shouldered, with gently sloping shoulder slope; sutures weak, impressed, SS 15°. Last whorl ovate-cylindrical, about 70% of total height; base short, convex to obconical, with very slight umbilical chink. Aperture oval, moderately produced abapically; outer lip regularly arched, narrowly curved abapically to meet inner lip, smooth within; columella concave, markedly reflected, with prominent, slightly oblique, variably sharp fold shortly below its adapical end; parietal wall coated with a thin callus. Sculpture of 2 subequal, sharp keels appearing at commencement of teleoconch, at shoulder (markedly enhancing it) and at abapical one third; another weaker keel emerges from abapical suture and extends around periphery of last whorl; 4 spiral

cords on base, decreasing in strength downward, 2 abapical appearing some distance from inner lip; very thin, straight axial threads present in concave spiral interspaces and on base.

Remarks – The present species superficially resembles those of *Pseudoscilla* Boettger, 1901, but the species of this genus have quite different larval shells. The two sharp spiral keels per spire whorl readily separate *Menesthella bicarinata* sp. nov. from the other species of *Menesthella*, which invariably have three robust spiral cords per whorl.

***Menesthella javanensis* sp. nov.**
Pl. 10, figs. 2, 3.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606905 (Pl. 10, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606906 (1; Pl. 10, fig. 3), RGM 606907 (3).

Derivation of name – The name refers to the location of the type locality in the Island of Java.

Preservation – Except for the broken outer lip, the specimens are reasonably preserved.

Diagnosis – Protoconch helicoid, lying across first teleoconch whorl. Teleoconch conical, turreted, with rather elevated, stepped spire, whorls nearly flat-sided, sutures adpressed. Base short, flatly convex, imperforate. Aperture subquadrangular, outer lip with inner spiral riblets, columellar fold prominent. Sculpture of moderately strong spiral cords, 3 between sutures, 4 on last whorl; interspaces with axial threads, base with faint axial striation.

Description – Protoconch helicoid, of 2.75 whorls, coiled at right angle to teleoconch axis, with blunt spire not extending beyond outline of first teleoconch whorl, in which protoconch is about one third immersed; diameter 0.21 mm. Teleoconch conical, turreted, with rather elevated, stepped spire, SA 26°; whorls shaped like a segment of a cone, with narrow, slightly concave shoulder slope; sutures thin, adpressed, SS 10°. Last whorl about 56% of total height; base flatly convex, very short, imperforate. Aperture subquadrangular; outer lip angled abapically to meet basal lip, with 4 thin, mid-adapical inner spiral riblets ending far from peristome; columella straight, markedly reflected, with prominent, slightly oblique, sharp fold at adapical end; parietal wall coated with thin callus. Sculpture of 3 moderately strong spiral cords appearing simultaneously after a small fraction of first whorl, which bears vestigial collabral riblets,

subsutural and intermediate ones more closely spaced and of same strength, lowermost slightly weaker than others, lying some distance from abapical suture; fourth cord also thinner, present at periphery of last whorl (at level of suture); thin axial threads following a reverse-S course occur in interspaces; base with rather coarse axial striation.

Remarks – The present species agrees perfectly with the characters of *Menesthella* Nomura, 1939, because of its helicoid protoconch, its spiral cords, and the unsculptured base. *Menesthella javanensis* sp. nov. is similar to *M. matteoi* sp. nov. described below, but differs from it by having a slightly smaller spiral angle, narrower spiral cords, a different course of the axial threads and a smooth base (*M. matteoi* has an uppermost basal cord). *Menesthella* sp. (see below) is also similar, but is distinguished from *M. javanensis* by its markedly wider spiral angle, its coarser spiral cords, the adapical two more closely spaced and its base sculptured with 6 spiral cords.

***Menesthella matteoi* sp. nov.**
Pl. 10, figs. 4, 5.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606908 (Pl. 10, fig. 4).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606909 (1; Pl. 10, fig. 5), RGM 606910 (24).

Derivation of name – The species is named after Matteo, the other of my twin grandchildren.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – Protoconch helicoid, lying across first teleoconch whorl. Teleoconch conical, turreted, with rather elevated spire, whorls flat-sided, sutures adpressed. Base short, flatly convex, imperforate. Aperture subquadrangular, outer lip with inner spiral riblets, columellar fold prominent. Sculpture of 3 strong spiral cords; interspaces and base with faint axial striation.

Description – Protoconch helicoid, of 2.25-2.50 whorls, coiled at right angle to teleoconch axis, with short, blunt spire extending slightly beyond adapical suture of first teleoconch whorl, in which protoconch is about half immersed; diameter 0.26 mm. Teleoconch conical, turreted, with rather elevated, straight-sided spire, SA 30°; whorls shaped like a segment of a cone, with flat sides; sutures hardly visible, very weak, adpressed, SS 7°. Last whorl about 34% of total height; base flatly convex, very short, imperforate. Aperture subquadrangular; outer lip thin-edged, anguled abapically to meet

basal lip, with 5, thin, inner spiral riblets ending far from peristome; columella short, concave, markedly reflected, with prominent, subhorizontal, rather thick fold at adapical end; parietal wall coated with thin callus. Sculpture of 3 subequally spaced, broad, prominent spiral cords appearing simultaneously on second quarter of first whorl (first quarter smooth), subsutural and intermediate cords of same strength, lowermost slightly weaker than others, lying some distance from abapical suture; fourth cord, also strong, present on periphery of last whorl (at level of suture), followed by one narrow groove and one low uppermost basal cord; interspaces and base with faint axial striation.

Remarks – The shell shape combined with the single upper basal spiral cord constitute the main distinguishing characters of *Menesthella matteoi* sp. nov. The relationships of *M. matteoi* sp. nov. with *M. javanensis* sp. nov. have already been discussed (see above). *Menesthella matteoi* exhibits some resemblance to *M. sumatrana* (Thiele, 1925), but differs from it in having a straight-sided instead of cyrtoconoid spire, coarser spiral cords and only one basal spiral.

Menesthella sumatrana (Thiele, 1925) comb. nov.

Pl. 10, figs. 6, 7.

1925 *Oscilla sumatrana* Thiele, p. 131, pl. 17, fig. 10.
1947 *Miralda (Oscilla) sumatrana* (Thiele): Wissema, p. 79, pl. 3, fig. 94.

Type material – Lectotype of *Oscilla sumatrana* Thiele (here designated): the specimen figured by Thiele (1925, pl. 17, fig. 10) and refigured herein (Pl. 10, fig. 6), ZMB/Moll 63996, Nias Island, Sumatra, Recent; 3 paralectotypes, ZMB/Moll 64080a, Padang, Sumatra, Recent. The other 3 syntypes do not agree with the characters of *O. sumatrana* and are excluded from the type lot (see remarks below). The type specimens are rather well preserved.

Other material examined – The specimen identified by Wissema (1947) as *Miralda sumatrana*: RGM 606802, Schroeder collection, Nias Island (Sumatra), locality 39, Pleistocene (Pl. 10, fig. 7). Except for the incomplete larval shell, the preservation is fair.

Description – Protoconch globose-helicoid, of about 2 whorls, with short, blunt spire, coiled nearly at right angle to teleoconch, one third immersed in first whorl of teleoconch; diameter 0.20 mm. Teleoconch turreted with moderately elevated, slightly cyrtoconoid spire, AP 32°, MSA 21°; earlier whorls shaped like a segment of a cone, later whorls subcylindrical; suture faintly incised, very fine line, SS 9°. Last whorl ovate-cylindrical, about 45% of total height, with subangular periphery; base gently convex, quickly attenuated, imperforate. Aperture ovate-triangular, expanded abapically; outer lip nearly vertical, orthocline, with 5 deeply set inner spiral riblets, the two adapical stronger; columella somewhat bent adaxially, with stout fold at adapical end. Sculpture of 3 robust spiral cords appearing after first quarter of teleoconch whorl, abapical one slightly narrower on earlier whorls, equal in strength to others on later whorls; interspaces with very fine axial threads, abapical broader than adapical one; base with

strong spiral cord at level of suture, followed by 5 less prominent ones decreasing in strength downwards; umbilical area smooth.

Remarks – Thiele's material in ZMB consists of two boxes each with one small plastic capsule. The first capsule (registration number ZMB/Moll 63996) contains 1 syntype, which is safely recognizable as that illustrated by Thiele and is herein selected as the lectotype of *Oscilla sumatrana*. The second capsule (registration number ZMB/Moll 64080) contains 6 syntypes. Examination of these latter has shown that 3 syntypes perfectly conform to the lectotype; these are paralectotypes and are collectively numbered ZMB/Moll 64080a. The remaining 3 specimens (which nevertheless are paralectotypes under the Code) differ from those in the type lot in having a significantly larger protoconch, a straight-sided teleoconch with greater spiral angle and a weaker columellar fold. They (collectively numbered ZMB/Moll 64080b) are similar to *Oscilla fallax* Thiele, 1925. The helicoid protoconch coiled nearly at a right angle to the teleoconch supports the assignment of the present species to the genus *Menesthella* Nomura, 1939. The Pleistocene specimen identified by Wissema (1947) as *Miralda sumatrana* proved to be conspecific with the lectotype of Thiele's species.

Distribution – *Menesthella sumatrana* seems to be restricted to Sumatra and surrounding islands, ranging in time from Pleistocene to Recent.

***Menesthella* sp. nov.**
Pl. 10, fig. 8.

1986 *Miralda (Oscilla)* aff. *M. (O.) sumatrana* (Thiele): Beets, p. 106.
1994 *Miralda (Oscilla)* aff. *sumatrana* (Thiele): Skwarko & Sufiati, p. x2.

Material examined – The specimen referred to as *Miralda* aff. *sumatrana* by Beets (1986): RGM 315136, BPM collection, Vogelkop (Bird's Head Peninsula, West Irian Jaya), Klasaman Formation, Late Pliocene. The protoconch is abraded and only partly observable, and the outer lip is broken.

Description – Protoconch apparently globose-helicoid. Teleoconch narrowly turreted, with rather elevated spire, which is cyrtoconoid adapically, straight-sided in mid-abapical part; whorls subcylindrical; sutures faint, adpressed. Last whorl ovate-cylindrical, about 55% of total height, with subrounded periphery; base convex, rather long, gradually tapering, with exceedingly narrow, very shallow umbilical chink (virtually imperforate). Aperture apparently narrow, sharply angular adapically; outer lip smooth within; columella bent adaxially, with strong, scarcely oblique adapical fold. Sculpture of 3 rather flat-topped spiral cords, adapical one stronger, each interspace with opisthocline axial threads, one additional spiral cordlet appearing by third whorl; base with 6 subequal upper spiral cords, most adapical (peripheral) cord at level of suture, 1 median stronger, winding up columella; 4 weaker abapical ones; main spiral cords somewhat nodulous, those on base strongly so.

Remarks – The examined specimen does not conform to the characters of *Oscilla sumatrana* Thiele, 1925, primarily because of its narrower teleoconch, its outer lip devoid

of inner spiral riblets, and its markedly different basal sculpture. Beets (1986) was right in considering the present species as new; however, more material is required before it can be named. The assignment to *Menesthella* Nomura, 1939, is made with some reservation because of the poorly preserved larval shell; the other characters fit those of the genus.

***Menesthella* sp.**
Pl. 10, fig. 9.

Material examined – Kali Rebjong Section, level RMG 3: RGM 606911 (1); level RMG 6: RGM 606912 (1; Pl. 10, fig. 9). Two rather poorly preserved juvenile specimens.

Description – Protoconch rather small, helicoid, apparently of slightly more than 2 whorls, coiled nearly at right angle to teleoconch, about half immersed in first teleoconch whorl; diameter approximately 0.17 mm. Teleoconch conical, spire straight-sided, SA 38°; whorls shaped like a segment of a cone with flat sides; sutures hardly visible, very fine, adpressed, SS 10°. Last whorl about 65% of total height; base very short, slightly concave, with broad, very low spiral inflation encircling faint umbilical chink. Aperture subquadrangular; outer lip broken, smooth within; columella short, markedly reflected, with prominent, sharp, subhorizontal fold at adapical end; parietal wall coated with thin callus. Sculpture of strong spiral cords, 2 appearing at commencement of first teleoconch whorl, one subsutural, second at abapical one third; subsutural cord beginning to be subdivided by longitudinal groove on second quarter of second whorl, soon changing into 2 twin cords of equal strength to abapical one; fourth strong cord present on last whorl at level of suture; interspaces and base with fine, orthocline axial threads.

Remarks – The present specimens are characterized by their peculiar sculpture and basal characters. They almost certainly represent a previously undescribed species, but more, better preserved material is required in order to name it.

Genus *Mumiola* Adams, 1863

Type species – *Monoptygma spirata* Adams, 1853, by subsequent designation (Schander *et al*., 1999a, p. 150).

Remarks – On the basis of the type species and of the other two taxa (*Mumiola reticosa* Adams, 1863, *Mumiola tesselata* Adams, 1863) originally listed under *Mumiola* by Adams (1863), the genus can be characterised as follows: protoconch helicoid, lying across the first teleoconch whorl and about half immersed in it; teleoconch elongate-ovate, whorls flat-sided to gently convex, sutures impressed; base convex, imperforate; outer lip with inner spiral ribs in most species; columellar ridge rather strong; outer surface with spiral cords and collabral ribs forming nodes at the intersections; and growth lines orthocline with slight adapical sinuation. The sculpture of collabral ribs and spiral cords nearly of the same strength, forming a reticulate pattern, constitutes the main distinguishing character of *Mumiola*. Similar sculptural characters occur in

some species of *Chrysallida* Carpenter, 1856, but this genus is characterised by a clearly intorted larval shell and by a weak to indistinct columellar ridge.

***Mumiola* sp. 1**
Pl. 11, fig. 1.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606913 (1). A rather well preserved juvenile specimen comprising the protoconch and 2.5 teleoconch whorls.

Description – Protoconch small, helicoid, of 2 whorls, coiled nearly at right angles to teleoconch axis, with blunt apex extending very slightly beyond outline of first teleoconch whorl, in which protoconch is about half immersed; diameter 0.13 mm. Teleoconch oval, with moderately elevated, slightly cyrtoconoid spire, AP 33°; whorls flatly convex, with very narrow subsutural shelf, suddenly contracted at abapical one fifth; sutures impressed, SS 10°. Last whorl ovate-cylindrical, about 70% of total height; base convex, rather short, imperforate. Aperture oval, outer lip arched, without internal riblets (likely not yet developed), columellar fold thick. Sculpture of spiral cords and overriding collabral ribs; 3 cords appear at commencement of teleoconch, fourth developing on second whorl in between adapical and median ones, soon reaching same strength as others; fifth present on last whorl at level of suture, followed by 4 weaker basal ones; 19 ribs per whorl throughout, forming prominent, rounded nodes on crossing spiral cords, gradually fading on base.

Remarks – The present specimen is unlike the other west Pacific species of *Mumiola* because of its different development of the spirals. It likely represents a new species, but more material including adult specimens is required before it can be named.

***Mumiola* sp. 2**
Pl. 11, fig. 2.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606914 (1). A juvenile specimen lacking the protoconch and with the aperture badly damaged.

Description – On basis of scar at top of spire, protoconch apparently helicoid. Teleoconch oval with cyrtoconoid spire, AP 42°; whorls shaped like a segment of a cone, with gently convex sides, angular shoulder, very narrow subsutural shelf and angular periphery at abapical one fourth; sutures impressed. Last whorl broadly oval, base convex, imperforate. Aperture apparently oval, outer lip arched, without internal riblets (likely not yet developed), columellar ridge sharp, prominent. Sculpture of collabral ribs and overriding spiral cords forming reticulate pattern with small nodes at intersections; 19 ribs per whorl throughout, each half width of one interspace, gradually weakening on base; cords slightly weaker than ribs, 3 per whorl, situated at shoulder, whorl centre and periphery; base with nodulose cord nearly of same strength as others at level of suture, and 5 markedly finer, rather distant, apparently smooth cords on mid-lower part.

Remarks – The present specimen has a shape and sculpture that agree with the characters of both *Mumiola* and *Chrysallida* Carpenter, 1856. It is assigned to *Mumiola* primarily on the basis of its strong columellar ridge, which is weakly developed or indistinct in species of *Chrysallida*. The growth stage and the poor preservation hinder any comparison to species.

Genus *Polemicella* Saurin, 1959

Type species – Saurin (1959, p. 242), in creating the new genus *Polemicella*, simply wrote "pour les formes du groupe de *Pyrgulina polemica* Melvill (1911 [=1910])". This does not constitute designation of the type species (International Commission on Zoological Nomenclature, 1999, Article 67.5.1 of the Code). *Pyrgulina polemica* was subsequently and validly designated the type species of *Polemicella* by Schander *et al*. (1999a, p. 150). It is recalled that the correct date of publication for *P. polemica* is 1910.

Remarks – Distinguishing characters of the genus are: protoconch helicoid, lying across the first teleoconch whorl and about half immersed in it; teleoconch elongate-ovate, whorls gently convex with distinct subsutural shelf, sutures adpressed to impressed; base convex, umbilical chink faint to absent; outer lip with inner spiral lirations in most species; columellar ridge strong; sculpture of collabral ribs continuous onto the base, one peripheral spiral cord and, in a few species, also an adapical one; and growth lines nearly orthocline. The single peripheral spiral readily distinguishes *Polemicella* from *Besla* Dall & Bartsch, 1904, and *Linopyrga* Laws, 1941, which also have a helicoid protoconch as well as a rather similar teleoconch shape.

Polemicella sp.

Pl. 11, fig. 3.

Material examined – Kali Rebjong Section, level RMG 3: RGM 606915 (1). A specimen with the aperture badly damaged, but otherwise well preserved.

Description – Protoconch helicoid, of slightly more than 2 whorls, with globose last whorl and short, blunt spire, coiled nearly at right angle to teleoconch axis, one third immersed in first teleoconch whorl; diameter 0.19 mm. Teleoconch somewhat turreted, with elevated, slightly cyrtoconoid spire, AP 47°, MSA 21°; first whorl convex, subsequent ones increasingly less so, with angular shoulder and narrow, subhorizontal subsutural shelf; earlier sutures adpressed, later ones impressed, SS 13°. Last whorl ovate-cylindrical, about 54% of total height; base convex, rather rapidly attenuated, imperforate. Aperture apparently ovate-quadrangular; outer lip thick, smooth within; columellar ridge strong. Sculpture of very slightly sinuous, somewhat opisthocline collabral ribs, 17 per whorl, each as wide as one interspace, continuous onto base; 2 spiral cords present between ribs, one on shoulder forming weak, nodulose subsutural margin, other cord narrower, at periphery, appearing by penultimate whorl; entire surface bearing fine spiral microstriation.

Remarks – The present specimen is close to *Pyrgulina polemica* Melvill, 1910 (type species of *Polemicella*), in teleoconch shape and sculpture. However, Melvill's taxon

differs in having a markedly stepped spire outline, a more strongly beaded shoulder and in lacking the spiral microstriation. The Vietnamese and Thai species *Polemicella aartseni* Robba *et al*., 2004, *Polemicella piscatorum* Saurin, 1959, and *Polemicella saurini* Robba *et al*., 2004, are readily distinguished because of their differently shaped teleoconchs, with a distinctly conical spire.

Genus *Pyrgulina* Adams, 1863

Type species – *Chrysallida casta* Adams, 1861, by subsequent designation (Dall & Bartsch, 1904, p. 11).

Remarks – The distinguishing characters of *Pyrgulina* can be summarized as follows: protoconch intorted; teleoconch elongate-conical to subcylindrical, somewhat turreted, whorls convex, with narrow, but distinct, subsutural shelf in some species, sutures impressed in most species; base convex, imperforate or with a narrow umbilical chink; outer lip smooth within, with inner spiral riblets in some species; columellar ridge weak to indistinct; sculpture of collabral ribs continuous onto the base, overridden by spiral cordlets or threads, narrower than the ribs in most species, more raised in the interspaces, markedly weaker or obsolescent on crossing the ribs; and growth lines barely discernible, parallel to the ribs. *Pyrgulina* differs from *Chrysallida* Carpenter, 1856, primarily by its overall weaker sculpture. In most species, the spirals override the ribs in *Pyrgulina*, whereas they are overridden by the ribs in *Chrysallida*.

Pyrgulina micalii sp. nov.

Pl. 11, figs. 4, 5.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606916 (Pl. 11, fig. 4).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606917 (1; Pl. 11, fig. 5), RGM 606918 (3).

Derivation of name – The species is named after Pasquale Micali, Italian malacologist who extensively dealt with pyramidellid molluscs.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – Protoconch intorted. Teleoconch ovate-conical with nearly straight-sided spire, whorls gently convex below roundly angular shoulder, sutures shallowly impressed. Last whorl broadly oval, base convex, imperforate or with exceedingly narrow umbilical chink. Aperture oval, outer lip smooth within, columellar fold very weak to

indistinct. Sculpture of collabral ribs continuous onto base, overridden by thin spiral cordlets.

Description – Protoconch intorted, loosely coiled, only last whorl visible at top of spire; diameter 0.21 mm. Teleoconch small, ovate-conical, with moderately elevated, nearly straight-sided, stepped spire, SA 59°; whorls with roundly angular shoulder and narrow, subhorizontal subsutural shelf, gently convex below shoulder, slightly contracted abapically; sutures shallowly impressed, SS 6°. Last whorl broadly oval, 53% of total height in adult specimens; base convex, imperforate or with narrow umbilical chink. Aperture narrowly oval with thick peristome; outer lip smooth within; inner lip thinly callous, columellar fold very weak to indistinct. Sculpture of collabral ribs and overriding thin spiral cordlets; 17 ribs on first whorl, 19 on last whorl; ribs straight, very gently prosocline, each equal in width to one interspace, continuous to umbilical area, gradually weakening on lower base; 4 spiral cords on first whorl, 4-5 on last whorl, evenly spaced, each one third width of one rib, obsolescent on crossing ribs (cords seem to be restricted to costal interspaces, but actually are not); base with 12 spirals, uppermost at level of suture, 6 on lowermost base remarkably finer; flat spiral band developing on shoulder by second whorl, giving the adapical end of ribs a knobbed appearance.

Remarks – The Recent, east Atlantic *Chrysallida pinguis* Peñas & Rolán, 1998 (herein transferred to *Pyrgulina*), seems to be the sole similar species. It differs in having more flattened whorls, 3 instead of 4-5 spirals in between the sutures, and fewer collabral ribs.

***Pyrgulina wesselinghi* sp. nov.**
Pl. 11, figs. 6, 7.

Holotype – Kali Rebjong Section, level RMG 3: RGM 606919 (Pl. 11, fig. 6).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606920 (1; Pl. 11, fig. 7), RGM 606921 (5).

Derivation of name – The species is named after Frank Wesselingh (Naturalis Biodiversity Center, Leiden) who helped with the loan of much relevant material.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – Protoconch intorted. Teleoconch turreted with slightly cyrtoconoid spire, whorls moderately convex, expanded at shoulder, sutures impressed to slightly

channeled. Last whorl ovate-cylindrical, base convex with narrow umbilical chink. Aperture oval, outer lip smooth within, columellar fold weak, but distinct. Sculpture of distant collabral ribs continuous onto base, overridden by narrow spiral cordlets.

Description – Protoconch intorted, loosely coiled, only its last whorl visible at top of spire; diameter 0.24 mm. Teleoconch elongate-oval, somewhat turreted, with elevated, slightly cyrtoconoid, stepped spire, AP 30°, MSA 19°; whorls moderately convex, rather expanded at roundly angular shoulder, gradually contracted abapically; sutures impressed, slightly channeled on last whorl, SS 18°. Last whorl ovate-cylindrical, 60% of total height; base convex, rather short, umbilical chink narrow, wider in young specimens. Aperture narrowly oval, with thick peristome; outer lip smooth within; columella concave, with deeply set, weak, but distinct, fold at adapical end; parietal wall coated with thin callus. Sculpture of collabral ribs and overriding spiral cordlets; 16 ribs on first whorl, 15 on last whorl; ribs straight, very gently prosocline, each markedly narrower than one interspace, continuous onto base where they gradually weaken; 6-7 spirals on first whorl, 10-11 on last whorl, evenly spaced, thin, obsolescent on crossing the ribs; base with 5-6 spirals increasingly narrower downwards.

Remarks – The Recent Vietnamese species *Pyrgulina nigraerupis* Saurin, 1959, is closely similar, but was reported to have a more distinct columellar fold and only 12 collabral ribs per whorl. The Recent, East Indian *Pyrgulina pirinthella* Melvill, 1910, is another similar species. On the basis of the illustration of the holotype (in BMNH) and descriptive remarks published by Buzzurro & Nofroni (1995), it appears that Melvill's species differs in lacking the columellar fold, in having coarser, more numerous ribs and in having the base devoid of spirals.

***Pyrgulina* sp. 1**
Pl. 11, fig 8; Pl. 12, fig. 1.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606922 (1, Pl. 12, fig. 1), RGM 606923 (1, Pl. 11, fig. 8), RGM 606924 (1). The specimens (1 juvenile and 2 adult) are rather well preserved.

Description – Protoconch intorted, rather loosely coiled, only its last whorl visible at top of spire; diameter 0.22 mm. Teleoconch turreted, subcylindrical, with elevated, straight-sided spire, SA 11°; whorls moderately convex, obscurely shouldered, slightly broader adapically than abapically; sutures impressed, SS 12°. Last whorl ovate-cylindrical, 50% of total height; base convex, rather short, imperforate. Aperture oval, with thick peristome; outer lip smooth within; columella concave, slightly reflected, sharply twisted adapically; parietal wall coated with thin callus. Sculpture of collabral ribs and overriding spiral cordlets; 14 ribs per whorl, straight, each markedly narrower than one interspace, weakly nodulose at shoulder, fading out over upper base; 12 spirals on first whorl, about 20 on last whorl, low, flat-topped, separated by narrow grooves, obsolescent on crossing ribs; shoulder slope and lower base smooth; microsculpture of spiral rows of granules.

Remarks – The present specimens exhibit some resemblance to the Recent, east Atlantic species *Chrysallida (Pyrgulina) kempermani* van Aartsen *et al*., 2000. The latter differs in having a narrow, but prominent, columellar fold, more numerous, markedly prosocline ribs and only 7-8 spirals. These "Rembangian" specimens likely represent a previously undescribed species, but naming it requires more material.

***Pyrgulina* sp. 2**
Pl. 12, fig. 2.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606925 (1). A juvenile, rather well preserved specimen.

Description – Protoconch intorted, its last whorl nearly as wide as first teleoconch whorl; diameter 0.24 mm. Teleoconch cylindrical, with moderately elevated, straight-sided spire, SA 4°; whorls convex, obscurely shouldered, with periphery midway between sutures; sutures impressed, SS 18°. Last whorl ovate-cylindrical, 62% of total height; base convex, imperforate. Aperture D-shaped; outer lip arched, smooth within; inner lip straight, thinly callous; columellar fold indistinct. Sculpture of collabral ribs and overriding spiral cordlets; about 30 ribs per whorl, thin, slightly flexuous, prosocline, each nearly equal in width to one interspace, continuous onto base; 12 spirals between shoulder and abapical suture, much thinner than ribs, somewhat attenuated on crossing them; base with 4 adapical spiral cordlets followed downwards by increasingly fine threads.

Remarks – *Pyrgulina* sp. 2 is rather similar to *Pyrgulina* sp. 1, but is readily distinguished from it by having a more cylindrical teleoconch with a smaller spiral angle, more convex whorls, and twice as many collabral ribs.

***Pyrgulina* sp. 3**
Pl. 12, fig. 3.

Material examined – Kali Rebjong Section, level RMG 5: RGM 606926 (1); level RMG 6: RGM 606927 (1; Pl.. 12, fig. 3). Except for the damaged outer lip, the preservation is fair.

Description – Protoconch obliquely intorted, loosely coiled, only its last whorl exposed at top of spire; diameter 0.23 mm. Teleoconch elongate-oval, with moderately elevated, stepped spire, SA 29°; whorls convex, with rather wide, gently sloping subsutural shelf, angular shoulder and periphery slightly below the middle; sutures impressed, SS 15°. Last whorl oval, about 80% of total height; base convex, rather long, with very narrow umbilical depression. Aperture oval, rather high, produced abapically; outer lip smooth within; columellar fold very weak, deeply set. Sculpture of thin collabral ribs and overriding spiral cordlets forming rectangular network; 18 ribs on first whorl, 20 on second (last) whorl; ribs prosocyrt, each a quarter width of one interspace, continuous onto base; spirals nearly equal in strength to ribs, slightly attenuated on crossing them, 7 present between sutures, adapical one at shoulder, 8 on base starting from level of suture.

Remarks – *Pyrgulina* sp. 3 exhibits a striking resemblance to the Recent Vietnamese species *Chrysallida castleraghensis* Saurin, 1959. According to the original description of *C. castleraghensis* (Saurin, 1959, p. 253), it seems that minor sculptural details constitute the sole difference. However, a decision about their relationships requires the direct examination of Saurin's material, probably in the Oceanographic Institute of Nha Trang, Vietnam, and presently unavailable.

***Pyrgulina* sp. 4**
Pl. 12, fig. 4.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606928 (1; Pl. 12, fig. 4), RGM 606929 (1). Two rather well preserved juvenile specimens.

Description – Protoconch rather small, obliquely intorted, only its last whorl exposed at top of spire; diameter 0.18 mm. Teleoconch oval, with moderately prominent, conical spire, AP 44°; whorls slightly convex, with very narrow subsutural shelf and periphery at abapical one third; sutures impressed, channeled toward aperture, SS 12°. Last whorl broadly oval, about 75% of total height; base convex, rather short, with distinct umbilical opening. Aperture small, regularly oval, peristome detached adaxially; outer lip smooth within; no columellar fold present. Sculpture of collabral ribs and overriding low spiral cordlets; 18 ribs per whorl, straight, each equal in width to one interspace, continuous onto base, where they cease abruptly at border of umbilical area; spirals much thinner than ribs, markedly attenuated on crossing them; 12 present between sutures, about 20 on last whorl.

Remarks – The present specimens conform to the characters of *Pyrgulina*, but differ from the other species of this genus by their open umbilicus. Further material including adult shells possibly will demonstrate that they have other relationship.

Genus *Strioturbonilla* Sacco, 1892

Type species – *Odostomia sigmoidea* Jeffreys, 1884 (= *Odostomia sigmoidea* Monterosato, 1880) by original designation (Sacco, 1892, p. 676).

Remarks – The distinguishing characters of *Strioturbonilla* can be summarized as follows: protoconch intorted, only its last whorl or part of it visible at the top of the spire; teleoconch turreted, straight-sided or nearly so, whorls convex, sutures impressed; base convex, imperforate or with faint umbilical chink; outer lip smooth within; columellar ridge indistinct; and sculpture of collabral ribs gradually fading out on the base, and of exceedingly fine spiral striations throughout.

Strioturbonilla, originally proposed as a subgenus of *Turbonilla* Risso, 1826, was correctly allocated in the Chrysallidinae by Schander *et al*. (1999a) because of its intorted protoconch. Sacco (1892), when introducing *Strioturbonilla*, primarily relied upon the sculptural characters and disregarded the larval shell. This led him to include in *Strioturbonilla* some species, such as *Strioturbonilla plicatuloastensis* Sacco, 1892, and *Chemnitzia densecostata* Philippi, 1844, which exhibit quite different protoconch characters (see Fer-

rero Mortara *et al*., 1984, pl. 13) and are to be included in the Turbonillinae. The species ascribed to *Strioturbonilla* by Dall & Bartsch *in* Arnold (1903, pp. 270-272) do not belong to Sacco's taxon since they were said to have a helicoid protoconch coiled at right angle to the teleoconch axis. According to Schander *et al*. (1999a), these species may represent an "unnamed turbonillid genus". *Parthenina* Bucquoy *et al*., 1883, is similar to *Strioturbonilla*, but is distinguished from it by having the spirals (threads or incised lines) restricted to the peripheral part of the whorls and the base devoid of spiral sculpture, or nearly so.

***Strioturbonilla rebjongensis* sp. nov.**
Pl. 12, fig. 5.

Holotype – Kali Rebjong Section, level RMG 3: RGM 606930 (Pl. 12, fig. 5).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606931 (7).

Derivation of name – From the stream (Kali in East Javanese) Rebjong along which the layer that yielded the present specimens crops out.

Preservation – The material consists of rather well preserved juvenile and adult specimens.

Diagnosis – *Strioturbonilla* species with intorted protoconch. Teleoconch turreted, moderately high-spired; whorls convex, with periphery at abapical one fourth; sutures impressed. Base convex, imperforate. Aperture oval, outer lip smooth within, columella twisted adapically. Sculpture of straight collabral ribs gradually fading out over base, and of numerous, very fine spiral striae.

Description – Protoconch intorted, rather small, only its last half whorl visible at top of spire; diameter 0.18 mm. Teleoconch turreted, with moderately tall, slightly cyrtoconoid spire, MSA 12°; whorls convex, with slight subsutural margining, periphery at abapical one fourth; sutures impressed, SS 18°. Last whorl oval, about 60% of total height; base convex, imperforate. Aperture oval; outer lip arched, smooth within; inner lip with moderate callus reflected abapically over umbilical area; columella weakly concave, slightly twisted adapically. Sculpture of straight, orthocline collabral ribs, 18 on first whorl, 23-25 on last whorl, as wide as interspaces, more closely spaced on last quarter of whorl, gradually thinning on base; whole surface with fine, rather dense spiral striae, which override ribs, and become more distinct between periphery and abapical suture.

Remarks – The obliquely sunken protoconch, the subcylindrical teleoconch and the ribs that are straight instead of sinuous distinguish *Strioturbonilla rebjongensis* sp. nov. from *S. sigmoidea* (Monterosato, 1880). The Recent West African *Chrysallida parasigmoidea*

Schander, 1994, has a similar shell shape, but differs from *S. rebjongensis* by having a taller aperture, the outer lip with a distinct anal sinus, the collabral ribs ending abruptly at the periphery of the last whorl, and by lacking the spiral striation. There seems to be no Indo-Pacific species with which *S. rebjongensis* can be compared.

Genus *Waikura* Marwick, 1931

Type species – *Waikura torques* Marwick, 1931, p. 109, by original designation. The type species was illustrated by Marwick (1931, pl. 11, figs. 212, 213), Laws (1941, fig. 26) and Fleming (1966, pl. 144, figs. 1733, 1734).

Remarks – The genus is characterized by: protoconch helicoid, lying across the top of the spire, the small, blunt apex partly concealed by the first teleoconch whorl; teleoconch *Odostomia*-like, stout to slender, spire flat-sided, variably stepped, sutures impressed; base convex, umbilical chink obsolete; outer lip spirally ribbed or smooth within; columellar ridge distinct; outer surface with collabral ribs, nodulose subsuturally and quickly fading out downward, spiral sculpture absent or consisting of one peripheral groove or thread; and growth lines orthocline. The sculpture is the primary distinguishing character of *Waikura*. The genus was hitherto recorded only from Neogene deposits of New Zealand.

Waikura lawsi sp. nov.

Pl. 12, figs. 6-8.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606932 (Pl. 12, fig. 6).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 5: RGM 606933 (1); level RMG 6: RGM 606934 (1; Pl. 12, fig. 7), RGM 606935 (1; Pl. 12, fig. 8), RGM 606936 (23).

Derivation of name – The species is named for C.R. Laws who contributed substantially to the knowledge of pyramidellid molluscs.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – *Waikura* species with helicoid protoconch. Teleoconch *Odostomia*-like, rather high-spired; first whorl gently convex, subsequent ones flat, slightly constricted medially; sutures impressed. Last whorl with angular periphery, base convex, short, imperforate or with faint chink. Aperture teardrop-shaped, outer lip with thin palatal riblets, columellar ridge prominent. Sculpture of collabral ribs, nodulose subsuturally, vanishing between abapical one third and suture; base smooth.

Description – Protoconch helicoid, rather small, of 2 whorls, obliquely lying across first teleoconch whorl and about half immersed in it; protoconch angle 107°; diameter 0.18 mm. Teleoconch conical-ovate, with rather tall, straight-sided spire, SA 25°; first whorl gently convex, subsequent ones flat, with moderate subsutural margining, slightly constricted at about halfway between sutures, somewhat contracted abapically; sutures impressed, SS 9°. Last whorl about 65% of total height, conical-ovate, with angular periphery; base short, convexly obconical, imperforate or with faint umbilical chink. Aperture teardrop-shaped, sharply angular adapically, rounded and slightly produced abapically; outer lip straight above periphery, then broadly arched, with 5-6 thin, deeply set inner spiral riblets; columella concave, with prominent, scarcely oblique ridge at its adapical end; parietal lip coated with a thin callus. Sculpture of straight, orthocline collabral ribs, 16-19 per whorl, each as wide as or slightly broader than one interspace, nodulose on subsutural margining, dying out shortly above abapical suture; base smooth.

Remarks – Some specimens differ slightly from the holotype in having a narrower teleoconch with a smaller spiral angle (18°), but conform otherwise. The teleoconch shape and the smooth, angular periphery readily distinguish *Waikura lawsi* sp. nov. from the other described species of the genus.

***Waikura* sp.**
Pl. 13, figs. 1, 2.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606937 (1; Pl. 13, fig. 1), RGM 606938 (1; Pl. 13, fig. 2). Except for the broken outer lip, the specimens are well preserved.

Description – Protoconch helicoid, of slightly less than 2 whorls, coiled at right angles to teleoconch axis, lying across first spire whorl and about one third immersed in it; diameter 0.20 mm. Teleoconch small, turreted, subcylindrical, with tall, telescoped, straight-sided spire, SA 16°; whorls flat, with angular shoulder and distinct, gently sloping subsutural shelf, very slightly contracted abapically; sutures impressed, SS 12°. Last whorl ovate-cylindrical, about 53% of total height, with rounded or roundly angular periphery; base rather short, convexly obconical, imperforate. Aperture teardrop-shaped, sharply angular adapically, rounded and slightly produced abapically; outer lip straight above periphery, then broadly arched, smooth within; columella concave, with prominent, oblique ridge close to its adapical end; parietal lip coated with very thin callus. Sculpture of straight, orthocline collabral ribs, 15 on first whorl, 16-17 on last whorl, each as wide as or slightly narrower than one interspace, forming prominent, rather pointed nodes on shoulder, gradually attenuated downward, dying out about midway between sutures; base smooth; faint spiral microstriation present throughout.

Remarks – The present specimens are readily distinguished from all the other *Waikura* species because of their slender, subcylindrical teleoconch. They almost certainly represent an undescribed species, but more material is required in order to name it.

Family Pyramidellidae Gray, 1840
Subfamily Pyramidellinae Gray, 1840
Genus *Longchaeus* Mörch, 1875

Type species – *Pyramidella punctata* Schubert & Wagner, 1829, by subsequent designation (Dall & Bartsch, 1904, p. 4). It is of note that the name *punctata* of Chemnitz is invalid (cf. Laseron, 1959); it was made available by Schubert & Wagner (1829). Thus, the type species is to be cited as *Pyramidella punctata* Schubert & Wagner, 1829.

Remarks – I concur with Schander *et al*. (1999a) in considering *Wingenella* Laseron, 1959, a synonym of *Longchaeus*. *Pharcidella* was introduced by Dall (1889) on the basis of the new species *Pyramidella (Pharcidella) folinii* (type species of *Pharcidella* by monotypy). According to Dall (1889, p. 334), *P. folinii* is "a genuine *Longchaeus* with strong transverse plaits or ribs across the whorls, a peripheral sulcus, and the other characters as in *Longchaeus*". Thus, the collabral ribs are the unique character distinguishing *Pharcidella* from *Longchaeus*. Considering the descriptions and illustrations of the species currently assigned to *Pharcidella* such as *Pyramidella (Pharcidella) hastata* (Adams, 1854), *Pyramidella (Pharcidella) moffati* Dall & Bartsch, 1906, *Pyramidella (Pharcidella) panamensis* Dall & Bartsch, 1909, and *Longchaeus (Pharcidella) calesi* Bartsch, 1955, it appears that the ribs are far from being a stable character since they can be obsolescent or defined merely by stronger growth markings. In these circumstances, *Pharcidella* is herein regarded as another synonym of *Longchaeus*.

Distinguishing characters of *Longchaeus* are: protoconch umboniiform, variably globose, of 1.5-2.5 whorls, lying on the first teleoconch whorl and partially immersed in it; teleoconch turreted, whorls short, shaped like a segment of a cone in most species, crenulated subsuturally in many species, sutures well incised to clearly grooved; base convex to roundly obconical, narrowly umbilicate or imperforate, with fasciole of variable strength; outer lip with interior teeth or spiral ribs; columella solid, with 3 ridges, the adapical one stronger, less oblique than the other two, in most species merging into the fasciole that encircles the umbilical area; outer surface smooth or with distinct to obsolete collabral ribs; and peripheral furrow always present. The peripheral furrow readily separates *Longchaeus* from *Pyramidella* Lamarck, 1799.

Longchaeus junghuhni (Martin, 1906) comb. nov.
Pl. 13, fig. 3.

1906 *Pyramidella (s. str.) junghuhni* Martin, p. 321, pl. 45, fig. 744.
1931 *Pyramidella junghuhni* Martin: van der Vlerk, p. 261.
1994 *Pyramidella (Pyramidella) junghuhni* Martin: Skwarko & Sufiati, p. x7.
2002 *Pyramidella (Pyramidella) junghuhni* Martin: van den Hoek Ostende *et al*., p. 81.
2009 *Pyramidella junghuhni* Martin: Leloux & Wesselingh, p. 42, pl. 83, figs. 14, 15.

Type material – Holotype of *Pyramidella junghuhni* Martin: the specimen figured by Martin (1906, pl. 45, fig. 744) and refigured herein (Pl. 13, fig. 3), RGM 11488, Junghuhn locality O (Java), Cilanang Formation, Preangerian (Middle Miocene). The holotype lacks the protoconch and the earlier spire whorls, and has the aperture badly damaged.

Description – Teleoconch broadly conical-ovate; spire straight-sided, apparently short, SA 50°; whorls shaped like a depressed segment of a cone, quickly enlarging, with quite narrow, adaxially sloping subsutural shelf, very gently convex sides and slight abapical contraction; sutures somewhat channeled, SS 7°. Last whorl broadly oval, with rounded periphery; base convex, short, with prominent fasciole encircling small umbilical opening. Outer lip broken, showing remnants of 5 spirally elongate inner teeth; columellar lip largely covered by matrix, apparently reflected to hide (completely or partially?) umbilicus, bearing 3 parallel, moderately oblique ridges approximately of same strength; adapical one more prominent and aligned with fasciole. Outer surface with uneven, orthocline growth markings and traces of spiral microstriation; shallow furrow present on periphery of last whorl.

Remarks – The poor preservation of the holotype makes the comparison of the present species with *Longchaeus karangensis* (Martin, 1905) quite unsatisfactory. *Longchaeus junghuhni* seems to differ from *L. karangensis* by its stouter teleoconch with a greater spiral angle, its rounded periphery and its sutures being channeled instead of grooved. It is not unlikely that additional, better-preserved material could prove that *L. junghuhni* is a synonym of *L. karangensis*.

Distribution – *Longchaeus junghuhni* is known only by the holotype.

***Longchaeus karangensis* (Martin, 1905) comb. nov.**
Pl. 13, figs. 4, 5.

1905 *Pyramidella (s. str.) karangensis* Martin, p. 271, pl. 40, fig. 651.
1911 *Pyramidella karangensis* Martin: Martin-Icke, p. 47.
? 1922 *Pyramidella* sp. Dickerson, pl. 4, fig. 12.
1931 *Pyramidella karangensis* Martin: van der Vlerk, p. 261.
1942 *Pyramidella (Pyramidella) fastigium* (Adams): van Regteren Altena, p. 33 (not *Obeliscus fastigium* Adams, 1855).
? 1978 *Pyramidella* sp. Popenoe & Kleinpell, pl. 11, fig. 149.
? 1982 *Pyramidella (Longchaeus)* sp. Kanno *et al*., p. 123, pl. 19, figs. 12a, b.
1994 *Pyramidella (Pyramidella) fastigium* (Adams): Skwarko & Sufiati, p. x6 (not *Obeliscus fastigium* Adams, 1855).
1994 *Pyramidella (Pyramidella) karangensis* Martin: Skwarko & Sufiati, p. x7.
2002 *Pyramidella (Pyramidella) karangensis* Martin: van den Hoek Ostende *et al*., p. 81.
2009 *Pyramidella karangensis* Martin: Leloux & Wesselingh, p. 41, pl. 83, figs. 2, 3.

Type material – Holotype of *Pyramidella karangensis* Martin: the specimen figured by Martin (1905, pl. 40, fig. 651) and refigured herein (Pl. 13, fig. 4), RGM 11484, Cilintung (Java), Cilanang Formation, Preangerian (Middle Miocene). The holotype of *P. karangensis* lacks the protoconch and the earlier spire whorls, and has the aperture badly damaged.

Other material examined – The specimen identified by van Regteren Altena (1942) as *Pyramidella (Pyramidella) fastigium*: RGM 606803, Mijnwezen collection, River Solo near Bangoenredjo Kidoel (East Java), sample M 260, Sonde Formation, Late Pliocene (Pl. 13, fig. 5). The protoconch is missing and the outer lip is broken.

Description – Teleoconch pyriform, thick, with gently cyrtoconoid spire, MSA about 40°; whorls shaped like depressed segment of cone, rather quickly enlarging, with very gently convex sides, contracted abapically; sutures asymmetrically grooved, SS 8°. Last whorl broadly oval, about 46% of total height, with subangular periphery; base convex, short, with prominent fasciole encircling small umbilical opening. Outer lip regularly arched, with 8 spirally elongate inner teeth; columellar lip reflected toward umbilicus, bearing 3 prominent, parallel, moderately oblique ridges, adapical one stronger at level of fasciole, forming broad angle with it. Outer surface spirally microstriated and with uneven, orthocline growth markings; shallow peripheral furrow present on later whorls.

Remarks – The specimen dealt with by van Regteren Altena (1942) is quite unlike *Obeliscus fastigium* Adams, 1855. Actually, *O. fastigium* (syntype, BMNH 20090239, Cuming collection, Loay, Bohol Island, Philippines, Recent; Pl. 13, fig. 6) differs markedly in that it has a shorter last whorl devoid of any peripheral furrow and belongs in the genus *Pyramidella* Lamarck, 1799. Altena's specimen appears to be indistinguishable from the holotype of *Longchaeus karangensis* and is herein included in this species. The fossil specimens from the Philippines illustrated by Dickerson (1922) and Popenoe & Kleinpell (1978) as *Pyramidella* sp., and that figured by Kanno *et al*. (1982) as *Pyramidella* (*Longchaeus*) sp., seem to agree with the characters of *L. karangensis*. Since these specimens have not been examined, I refrain from a definitive decision about their relationships with Martin's species and include them with doubt in the above synonymy. *Longchaeus karangensis* exhibits some resemblance to *Longchaeus menadensis* (Schepman, 1907), but the latter is distinguished by its narrower, turreted teleoconch and the somewhat different configuration of the columellar ridges.

Distribution – *Longchaeus karangensis* was recovered from Middle Miocene and Late Pliocene deposits of Java. The possible occurrence in the Late Miocene and Pliocene units of the Philippines needs to be confirmed.

***Longchaeus menadensis* (Schepman, 1907) comb. nov.**

Pl. 13, figs. 7-9.

1907 *Obeliscus menadensis* Schepman, p. 192, pl. 12, figs. 4, 4a.
1916 *Pyramidella* (*s. str.*) *kelirensis* Martin, p. 257, pl. 3, figs. 78, 79 [new synonym].
1931 *Pyramidella kelirensis* Martin: van der Vlerk, p. 261.
1931 *Pyramidella menadensis* Schepman: van der Vlerk, p. 261.
1994 *Pyramidella menadensis* (Schepman): Skwarko & Sufiati, p. X4.
1994 *Pyramidella (Pyramidella) kelirensis* Martin: Skwarko & Sufiati, p. x7.
2002 *Pyramidella (Pyramidella) kelirensis* Martin: van den Hoek Ostende *et al*., p. 81.
2009 *Pyramidella kelirensis* Martin: Leloux & Wesselingh, p. 41, pl. 83, figs. 4-9.

Type material – Holotype of *Obeliscus menadensis* Schepman: the specimen figured by Schepman (1907, pl. 3, fig. 4, 4a) and refigured herein (Pl. 13, fig. 7), RGM 107584, Kayuragi (North Sulawesi), Quaternary. Lectotype of *Pyramidella kelirensis* Martin (here designated): the specimen figured by Martin (1916, pl. 3, fig. 78) and refigured herein (Pl. 13, fig. 8), RGM 11486, Kembang Sokkoh (Java), West Progo Group, Early Miocene; 1

paralectotype: the specimen figured by Martin (1916, pl. 3, fig. 79) and refigured herein (Pl. 13, fig. 9), RGM 11487, Ciangsana (Java), Njalindung Formation, Middle Miocene. Another syntype of *P. kelirensis* (RGM 46974, same locality as the lectotype) was not examined. None of the type specimens retains the protoconch.

Description – Teleoconch turreted, with moderately elevated, slightly cyrtoconoid spire, AP 47°, MSA 27°; whorls depressed, shaped like segment of cone, with very gently convex sides, contracted abapically; sutures asymmetrically grooved, SS 13°. Last whorl oval, approximately 50% of total height; base convex, regularly tapering, with narrow umbilical chink bounded by prominent fasciole. Aperture rather narrow, nearly D-shaped, with slight, but distinct, abapical canal; outer lip arched, with 6-7 quite deeply set, spirally elongate inner teeth, the median ones markedly stronger; parietal lip coated with very thin callus; columella forming very broad angle with parietal lip, bearing 3 prominent ridges, adapical one stronger, less oblique, merging into fasciole. Outer surface spirally microstriated, with slightly prosocline, uneven growth markings; shallow, flat-bottomed peripheral furrow present on later whorls.

Remarks – The peripheral groove on the otherwise smooth teleoconch suggests the assignment to the genus *Longchaeus* Mörch, 1875. Close examination of the type material of *Obeliscus menadensis* and *Pyramidella kelirensis* has shown that no significant differences exist between these two nominal species. Consequently, *P. kelirensis* is herein regarded as a junior synonym of *O. menadensis*. There seems to be no fossil or Recent Indo-Pacific species of *Longchaeus* with which the present one can be compared.

Distribution – *Longchaeus menadensis* is known only by the above type specimens. As determined herein, it is a long-lasting species so far known only from Indonesia and distributed from Early Miocene to Quaternary.

***Longchaeus schepmani* sp. nov.**
Pl. 13, figs. 10-12.

Holotype – Sumberan: RGM 606939 (Pl. 13, fig. 10).

Type locality – Sumberan near Tuban, Central Java.

Type horizon – Tawun Formation: fine sand exposed east of the village of Sumberan. Zone N 9, Late Langhian.

Paratypes – Sumberan: RGM 606940 (1, Pl. 13, fig. 11), RGM 606941 (1, Pl. 13, fig. 12), RGM 606942 (3).

Derivation of name – The species is named for M.M. Schepman who contributed to the knowledge of Indonesian fossil molluscs.

Preservation – The material consists of variously preserved juvenile and adult specimens with diagnostic characters clearly observable.

Diagnosis – Protoconch umboniiform, paucispiral, lying on top of first teleoconch whorl. Spire elevated, straight-sided, of many depressed whorls crenulated adapically and with angular periphery; sutures grooved. Base short, convex, imperforate. Outer lip with 4-5 spirally elongated inner teeth. Columella with 3 ridges. Outer surface bearing obsolescent collabral riblets.

Description – Protoconch umboniiform, globose, of about 2 whorls, slightly oblique, with scarcely prominent apex, lying on first teleoconch whorl and one-third to half immersed in it; diameter 0.25 mm. Teleoconch turreted, with elevated, straight-sided spire, SA 18°-25°; whorls markedly depressed, shaped like a segment of a cone, crenulated subsuturally, quickly contracted below angular periphery; sutures distinctly grooved, SS 8°. Last whorl conical-ovate, with angular periphery. Base convex, short, imperforate, with spiral depression bounding broad, low fasciole. Aperture subquadrangular; outer lip arched, with 4-5 spirally elongate interior teeth, median ones stronger; columella with 3 ridges, adapical one more prominent and less oblique than other 2, which are parallel and rather closely spaced. Sculpture of uneven, slightly opisthocline, very low, broad collabral riblets, obsolescent or obsolete over most of teleoconch surface, thinner, but distinct, on base in most specimens; thin axials present within sutural groove; spiral furrow just below periphery becomes increasingly clear during growth; faint spiral microstriation present throughout.

Remarks – *Longchaeus schepmani* sp. nov. exhibits moderate variability in the amplitude of the spiral angle. The species is closely similar to the Pliocene to Recent species *Longchaeus turritus* (Adams, 1855), from which it differs in having a significantly smaller and less oblique protoconch, a more sharply pointed spire, a less pronounced peripheral furrow, and clear *Pharcidella*-like collabral sculpture.

Longchaeus turritus (Adams, 1855)

Pl. 14, figs. 1-4.

1855 *Obeliscus turritus* Adams, p. 807, pl. 171, fig. 17.
1855 *Obeliscus teres* Adams, p. 807, pl. 171, figs. 31, 32 (new synonym).
1859 *Pyramidella pratii* Bernardi, p. 386, pl. 13, fig. 1 (new synonym).
1886 *Pyramidella* (*Longchaeus*) *sulcata* Adams: Tryon, p. 301 (in part), pl. 72, figs. 82 (*teres*), 83 (*pratii*), not figs. 79-81 [= *Obeliscus sulcatus* Adams, 1855].
1886 *Pyramidella* (*Longchaeus*) *turrita* Adams: Tryon, p. 301, pl. 72, figs. 84, 85.
1907 *Obeliscus teres* Adams: Schepman, p. 192.
1909 *Pyramidella* (*Longchaeus*) *turrita* Adams: Schepman, p. 242.
1920 *Pyramidella teres* Adams: Tesch, p. 63, pl. 132, figs. 196a, b.
1928 *Pyramidella* spec. 1 Martin, pp. 6, 16.
1931 *Pyramidella teres* Adams: van der Vlerk, p. 261.
1931 *Pyramidella* spec. 1 Martin: van der Vlerk, p. 261.
1935 *Pyramidella* (*Pyramidella*) *teres* Adams: Nomura, p. 222, pl. 10, fig. 27.
1947 *Pyramidella* (*Longchaeus*) *turrita* Adams: Wissema, p. 82, pl. 3, fig. 97.
1959 *Longchaeus pratii* Bernardi: Saurin, p. 225.
1968 *Longchaeus teres* (Adams): Habe, p. 133, pl. 41, fig. 39.
1972 *Pyramidella sulcata* Adams: Cernohorsky, p. 200 (in part), pl. 57, figs. 2, 2a (not *Obeliscus sulcatus* Adams, 1855).

1986 *Pyramidella teres* (Adams): Springsteen & Leobrera, p. 284, pl. 81, fig. 7.
1994 *Pyramidella teres* Adams: Skwarko & Sufiati, p. x5.
1994 *Pyramidella* sp. 1 Martin: Skwarko & Sufiati, p. x5.
2000 *Longchaeus teres* (Adams): Hori, p. 703, pl. 350, fig. 4.

Type material – The type lot (two syntypes) of *Obeliscus turritus* Adams: BMNH 20090238, Cuming collection, Abrolhos Islands, northern Western Australia, Recent (Pl. 14, fig. 1). The type lot (four syntypes) of *Obeliscus teres* Adams: BMNH 1996489, Cuming collection, Panay Island, Philippines, Recent (Pl. 14, fig. 2). All specimens are fairly well preserved.

Other material examined – The specimen identified by Schepman (1907) as *Obeliscus teres*: RGM 107583, Fennema collection, Kajoe Ragi, Manado (Sulawesi), Quaternary. The specimen identified by Wissema (1947) as *Pyramidella (Longchaeus) turrita*: RGM 606804, Schroeder collection, Nias Island (Sumatra), locality 39, Pleistocene (Pl. 14, fig. 3). Both specimens lack the protoconch and the earliest spire whorls. The specimen recorded by Martin (1928) as *Pyramidella* spec. 1: RGM 606805, Aceh (Sumatra), Late Miocene (Pl. 14, fig. 4). A juvenile specimen retaining the larval shell.

Description – Protoconch large, umboniiform, rather globose, of about 2 whorls, obliquely lying on first teleoconch whorl and half immersed in it; diameter 0.43 mm. Teleoconch conical-turreted, with elevated, straight-sided spire, SA 21°; whorls markedly depressed, shaped like segment of cone, crenulated subsuturally, quickly contracted below angular periphery; sutures markedly grooved, SS 7°. Last whorl conical-ovate, approximately 33% of total height, with angular periphery. Base convex, short, imperforate, with a shallow spiral depression bounding the broad, low fasciole. Aperture ovate-quadrangular, rather narrow, with distinct abapical canal; outer lip arched, with 4-5 deeply set, spirally elongate inner teeth, median ones stronger; columella with 3 ridges, adapical one merging into the fasciole, more prominent and less oblique than other 2, which are parallel and rather closely spaced. Outer surface spirally microstriated, with opisthocyrt growth lines somewhat sinuous on base; well impressed spiral furrow present just below periphery, becoming increasingly clear on middle and later whorls.

Remarks – The three Indonesian specimens are closely similar to one another and fully match the characters of *Pyramidella pratii* Bernardi, 1859. Tryon (1886) considered *Obeliscus tessellatus* Adams, 1855, *Obeliscus monilis* Adams, 1855, *Obeliscus teres* Adams, 1855, and *Pyramidella pratii* Bernardi, 1859, to be synonyms of *Obeliscus sulcatus* Adams, 1855. This species concept was agreed upon by later workers (cf. Cernohorsky, 1972; Hori, 2000). Tryon's interpretation appears to be quite broad and is untenable because it assembles forms belonging to different genera. Actually, *O. sulcatus* (three syntypes, BMNH 20090237, Cuming collection, Tahiti, Recent; Pl. 14, fig. 5), *O. tessellatus* (three syntypes, BMNH 1996490, Cuming collection, Masbate Island, Philippines, Recent; Pl. 15, fig. 1) and *O. monilis* are close to one another, and may be synonyms. The absence of a peripheral groove points to their assignment to the genus *Pyramidella* Lamarck, 1799. The other species, *O. teres* and *P. pratii*, along with *Obeliscus turritus*, possess a distinct to strong peripheral groove and belong in *Longchaeus* Mörch, 1875.

Since no clear difference is discernible between *O. teres*, *P. pratii* and *O. turritus*, they are herein considered to be conspecific. As first reviser, I select the name *Obeliscus turritus* as the valid name since it has date priority on *Pyramidella pratii* and page priority on *Obeliscus teres*. The Australian species *Wingenella eburnea* and *Wingenella pricena*, both of Laseron, 1959, are possibly further synonyms.

Longchaeus turritus, as determined herein, exhibits considerable variability in whorl outline, breadth of the grooved sutures and strength of the peripheral furrow. It is notable that the palatal teeth are not always observable within the aperture since they develop at intervals (as can be clearly seen in broken shells), in conformity with growth halts.

Distribution – *Longchaeus turritus* ranges at present throughout the Indo-West Pacific. Fossil records are from the Pliocene Byoritu Beds of Taiwan (sub *Pyramidella teres*), and from Pliocene and Quaternary deposits of Indonesia.

Genus *Otopleura* Fischer, 1885

Type species – *Voluta auriscati* Holten, 1802, by monotypy (see Schander *et al*., 1999a, p. 152).

Remarks – I concur with Schander *et al*. (1999a) in considering *Aphalista* Laseron, 1959, to be a junior synonym of *Otopleura*. The characters of *Otopleura* can be summarized as follows: protoconch umboniiform, rather globose; teleoconch oval to elongate-oval with convex whorls, sutures impressed; last whorl oval, base convex, imperforate and with moderate fasciole; outer lip with deeply set inner teeth; inner lip coated with a callus shield, columella with 3 ridges, the adapical one more prominent; and sculpture of collabral ribs, nodulose or spinose subsuturally in many species, interspaces with variously developed spirals or smooth. The prominent sculpture is the primary distinguishing character of *Otopleura*.

Otopleura djunggranganensis (Martin, 1916)

Pl. 15, fig. 2.

1916 *Pyramidella (Otopleura) djunggranganensis* Martin, p. 258, pl. 3, fig. 80.
1931 *Pyramidella djunggranganensis* Martin: van der Vlerk, p. 261.
1994 *Pyramidella (Otopleura) djunggranganensis* Martin: Skwarko & Sufiati, p. X6.
2002 *Pyramidella (Otopleura) djunggranganensis* Martin: van den Hoek Ostende *et al*., p. 81.
2009 *Otopleura djunggranganensis* Martin: Leloux & Wesselingh, p. 41, pl. 82, figs. 11-14.

Type material – Lectotype of *Pyramidella djunggranganensis* Martin (here designated): the specimen figured by Martin (1916, pl. 3, fig. 80) and refigured herein (Pl. 15, fig. 2), RGM 11491, Gunung (Mount) Spolong (Java), West Progo Group, Early Miocene. The lectotype is abraded with the outer lip broken. Another syntype (RGM 46971, a paralectotype) recorded by Martin from the same locality was not examined.

Description – Teleoconch elongate-oval, with elevated, cyrtoconoid spire, AP 43°; whorls very slightly convex; sutures adpressed, SS 13°. Last whorl bowl-shaped, about

32% of total height, gradually tapering, base imperforate; fasciole not observable. Aperture badly damaged; outer lip broken, exposing 6 inner spiral ridges; parietal lip coated with moderate callus; columella with 3 subparallel folds, adapical one stronger and more prominent. Sculpture of broad, low, slightly opisthocyrt collabral ribs, 32 per whorl throughout, not nodulose subsuturally, continuous and somewhat flexuous over base; interspaces very narrow and shallow with no trace of spirals.

Remarks – The protoconch of the lectotype is worn; according to the original description, it should be small, comprised of one whorl. *Otopleura djunggranganensis* exhibits an overall similarity to the Pleistocene and Recent, Indo-Pacific species *Otopleura mitralis* (Adams, 1855). Cernohorsky (1972) remarked that *O. mitralis* is variable in terms of both shape and sculpture. Its ribs may be as many as 31, are not nodulose subsuturally and the interspaces are either smooth or with spirals. On this basis, *O. djunggranganensis* is possibly conspecific with *O. mitralis*, but a decision in this respect requires that additional, better-preserved material of Martin's species be examined.

Distribution – *Otopleura djunggranganensis* is so far known only by the type material.

Otopleura reticulata (Martin, 1905)

Pl. 15, figs. 3, 4.

1905 *Pyramidella (Otopleura) reticulata* Martin, p.271, pl. 40, figs. 652, 653.
1908 *Pyramidella reticulata* Martin: Martin, p. 9.
1919 *Pyramidella reticulata* Martin: Martin, p. 101.
1931 *Pyramidella reticulata* Martin: van der Vlerk, p. 261.
1942 *Pyramidella (Otopleura) reticulata* Martin: van Regteren Altena, p. 34, text-fig. 10.
1994 *Pyramidella (Otopleura) reticulata* Martin: Skwarko & Sufiati, p. x6.
2002 *Pyramidella (Otopleura) reticulata* Martin: van den Hoek Ostende *et al*., p. 82.
2009 *Otopleura reticulata* Martin: Leloux & Wesselingh, p. 41, pl. 82, fig. 15; pl. 83, fig. 1.

Type material – Lectotype of *Pyramidella reticulata* Martin (here designated): the specimen figured by Martin (1905, pl. 40, fig.) and refigured herein (Pl. 15, fig. 3), RGM 11490a, Sonde (Java), Sonde Formation, Late Pliocene; 1 paralectotype (Pl. 15, fig. 4) , RGM 11490b, Sonde (Java), Sonde Formation, Late Pliocene. Both specimens are incomplete.

Other material examined – The specimens identified by van Regteren Altena (1942) as *Pyramidella (Otopleura) reticulata*: RGM 46401 (3), Cosijn collection, River Solo northwest of Padasmalang (Java), sample M 251, Sonde Formation, Late Pliocene; RGM 606806 (6), Mijnwezen collection, River Solo near Sonde (Java), samples M 257 (5) and M 258 (1), Sonde Formation, Late Pliocene. Most specimens have the outer lip broken and none retains the larval shell.

Description – Teleoconch elongate-oval, with elevated, moderately cyrtoconoid spire, AP 43°, MSA 32°; whorls gently convex, with exceedingly narrow, horizontal or inward-sloping subsutural shelf; sutures adpressed to slightly channeled, SS 10°. Last whorl bowl-shaped, about 50% of total height, gradually tapering, with moderate

fasciole encircling umbilical depression; imperforate. Aperture auriform, rather narrow, with distinct abapical sinuation; outer lip regularly arched, with 7 spirally elongate, deeply set inner teeth, median ones stronger; inner lip coated with callus shield; columella with 3 folds of nearly equal breadth, adapical one subhorizontal and more prominent than other 2, which are oblique and closely spaced. First two whorls nearly smooth, subsequent ones sculptured with slightly opisthocyrt collabral ribs, each as broad as one intervening furrow, nodulose subsuturally, continuous and somewhat flexuous over base; interspaces with spiral cords; 21-22 ribs occur on each earlier whorl, 27-29 on penultimate; spirals develop by fifth whorl and increase from 3-4 to 6-7 during growth, 15-18 present on last whorl. Reticulate sculpture replaced by chevron pattern and/or irregular wrinkles on last half whorl of fully grown specimens.

Remarks – The Recent, Australian species *Otopleura australis* Laseron, 1959, is similarly shaped, but differs primarily in having a broader aperture and ribs that are not nodulose subsuturally. It is of note that Cernohorsky (1972) regarded Laseron's species as a synonym of *Otopleura mitralis* (Adams, 1855).

Distribution – *Otopleura reticulata* is so far known only from Late Pliocene deposits of Java.

Genus *Pyramidella* Lamarck, 1799

Type species – *Trochus dolabratus* Linnaeus, 1758, by monotypy (see Schander *et al*., 1999a).

Remarks – Concerning the validity of the name *Pyramidella*, see the discussion in van Aartsen *et al*. (1998, p. 5). *Pyramidellida* Bartsch, 1917, is a typing error for *Pyramidella* and *Pyramidellus* Montfort, 1810, is a synonym of *Pyramidella* (Schander *et al*., 1999a). Laseron (1959, p. 188) proposed the new genus *Urambella* with the new species *Urambella ballerina* as type species. Cernohorsky (1972) and van Aartsen *et al*. (1998) noted that *U. ballerina* along with the other species described by Laseron under *Urambella* are synonyms of *Helix terebellum* Müller, 1774 (= *Trochus dolabratus* Linnaeus, 1758). This being accepted, *Urambella* is a junior synonym of *Pyramidella* in that has the same type species. Moreover, the distinctive characters explicitly or implicitly pointed out for *Urambella* by Laseron perfectly conform to those of *Pyramidella*. Consequently, *Urambella* is herein considered to be a junior synonym of *Pyramidella*.

The distinguishing characters of *Pyramidella* can be summarized as follows: protoconch umboniiform, rather globose, variably immersed in the first teleoconch whorl; teleoconch conical-turreted, with rather elevated spire, whorls flat-sided to moderately convex, sutures impressed to grooved; last whorl oval, rounded or angular at the periphery, base convex, umbilicate, fasciole weak to absent; outer lip with interior teeth or ribs, or smooth within; columella hollow, with 3 ridges, the adapical one more prominent; and outer surface faintly microstriated and with growth lines in many species.

Pyramidella balteata (Adams, 1855)

Pl. 15, fig. 5.

1855 *Obeliscus balteatus* Adams, p. 809, pl. 171, fig. 25.
1886 *Pyramidella balteata* Adams: Tryon, p. 300, pl. 72, fig. 69.
1910 *Pyramidella balteata* Adams: Cossmann, p. 71, pl. 5, fig. 3.
1928 *Pyramidella* spec. 2 Martin, p. 7.

Type material – Not seen. The type lot consists of 2 syntypes and a fragment of a third (BMNH 20090240, Cuming collection, Cagayan, Mindanao Island, Philippines, Recent).

Other material examined – The specimen recorded as *Pyramidella* spec. 2 by Martin (1928): RGM 606807, Aceh (Sumatra), Late Miocene. A not fully grown specimen retaining the larval shell.

Description – Protoconch umboniiform, of about 2 whorls, slightly oblique, half immersed in first teleoconch whorl. Teleoconch conical-turreted, with rather elevated, straight-sided spire, SA 30°; whorls flatly convex with subangular periphery close to abapical suture; sutures distinctly grooved, SS 7°. Last whorl about 50% of total height, angular at periphery. Base convex, with small, circular umbilical opening; fasciole absent. Aperture subquadrangular; outer lip with 5 spirally elongate inner teeth, median ones stronger; columella with 3 oblique, parallel folds, adapical one markedly prominent, other 2 closely spaced and increasing in weakness downward. Outer surface somewhat abraded with no trace of spiral microstriation; growth lines apparently orthocline.

Remarks – I obtained a photograph of the type lot, but the represented specimens are nearly at natural size and hardly suitable for a comparison. However, the Sumatran fossil conforms in all respects to the descriptions and illustrations of Adams' species in the above synonymy and seems not to be discrepant from the photograph of the syntypes. It is of note that the very weak abapical fold of the columella was often overlooked and this led some workers to include the present species in the genus *Tiberia* Monterosato, 1875.

Distribution – *Pyramidella balteata* is reported to range at present in the tropical Indo-West Pacific, from the Red Sea to the Philippines. According to Dunker (1882), it is also present in Japanese waters. Fossil occurrences are in Late Miocene rocks of Indonesia (Sumatra) and Pliocene deposits of India.

Pyramidella nanggulanica Finlay, 1927

Pl. 15, figs. 6, 7.

1884 *Pyramidella* (*Obeliscus*) *polita* Martin, p. 159, pl. 8, figs. 154, 154° (junior primary homonym of *P. polita* Johnston, 1880).
1914 *Pyramidella* (*s. str.*) *polita* Martin: Martin, p. 176, pl. 6, figs. 170-170c.
1927 *Pyramidella nanggulanica* Finlay, p. 502 [replacement name for *Pyramidella polita* Martin].
1931 *Pyramidella polita* Martin: van der Vlerk, p. 261.
1984 *Pyramidella polita* Martin: Zacchello, pl. 1, fig. 7.

1994 *Pyramidella* (*Pyramidella*) *nanggulanica* Finlay: Skwarko & Sufiati, p. x7.
2002 *Pyramidella* (*Pyramidella*) *nanggulanica* Finlay: van den Hoek Ostende *et al*., p. 81.
2009 *Pyramidella nanggulanica* Finlay: Leloux & Wesselingh, p. 42, pl. 83, figs. 10, 11.

Type material – Lectotype of *Pyramidella (Obeliscus) polita* Martin (here designated): the specimen figured by Martin (1884, pl. 8, figs. 154, 154a) and refigured herein (Pl. 15, fig. 6), RGM 11479, Yogyakarta (Java), Nanggulan Formation, Middle Eocene; 1 paralectotype, RGM 11482, Kali Puru near Yogyakarta (Java), Nanggulan Formation, Middle Eocene, 5 paralectotypes, RGM 11483, Kali Puru near Yogyakarta (Java), Nanggulan Formation, Middle Eocene, 1 paralectotype, RGM 11483a, Kali Puru near Yogyakarta (Java), Nanggulan Formation, Middle Eocene (Pl. 15, fig. 7). All specimens are incomplete, but the diagnostic characters are observable.

Description – Protoconch umboniiform, rather globose, of 2 whorls, obliquely lying on first teleoconch whorl and about half immersed in it; diameter 0.27 mm. Teleoconch conical-turreted, with elevated, straight-sided or very slightly cyrtoconoid spire, MSA 20°; whorls markedly depressed, shaped like segment of cone, contracted below angular to roundly angular periphery; sutures shallowly grooved, SS 9°. Last whorl cup-shaped, about 40% of total height, rapidly tapering below periphery. Base convex, with narrow umbilical chink encircled by broad, flattened fasciole bounded abaxially by one spiral furrow. Aperture damaged, apparently subquadrangular, with distinct abapical canal; outer lip bearing 3-4 inner spiral riblets, some specimens (holotype) with shorter ones in between each pair; columella with 3 thin ridges, adapical one merging into fasciole, much more prominent and less oblique than other 2, which are parallel and rather closely spaced. Outer surface with faint spiral microstriation and very slightly opisthocline growth lines.

Remarks – Finlay (1927, p. 502) replaced Martin's name *Pyramidella polita* with *P. nanggulanica*, the name *P. polita* being preoccupied by Johnston (1880, p. 34). Martin (1914) noted that *Pyramidella polita* is closely similar to the European species *Pyramidella calvimontensis* Deshayes, 1862. Later, Zacchello (1984) considered *P. polita* to be identical to *P. calvimontensis*. From the figure of *P. calvimontensis* published by Zacchello (1984, fig. 6 in the explanation to pl. 1), Deshayes' species seems strikingly similar to *P. nanggulanica* and the two may well be conspecific. However, a decision in this respect must be based on the comparison of respective type specimens. Should *P. nanggulanica* actually be a synonym of *P. calvimontensis*, the latter name would be the valid one.

Distribution – *Pyramidella nanggulanica* is so far restricted to the Middle Eocene of Java (Zacchello, 2001; Leloux & Wesselingh, 2009).

***Pyramidella* sp.**
Pl. 15, fig. 8.

1941 *Pyramidella (Pyramidella)* spec. indet. Beets, p. 63.

Material examined – The specimen recorded as *Pyramidella* (*Pyramidella*) spec. indet. by Beets (1941): RGM 312358, Leupold collection, Mangkalihat Peninsula (eastern Kali-

mantan), basal Menkrawit Beds, Preangerian (Middle Miocene). The specimen lacks the protoconch and earlier teleoconch whorls.

Description – Teleoconch turreted, with rather elevated, slightly cyrtoconoid spire, MSA 22°; whorls gently convex, slowly increasing in diameter, with periphery at abapical one fourth; sutures impressed, SS 13°. Last whorl oval, approximately 46% of total height, regularly tapering below periphery. Base convex, with subcircular umbilicus; fasciole absent. Aperture damaged, apparently subquadrangular; outer lip bearing 4 inner teeth decreasing in strength downwards; inner lip bent toward the umbilicus; columella with 3 ridges, adapical one separated from parietal lip by broad spiral depression overhanging umbilicus, much more prominent and slightly less oblique than other 2, which are parallel and rather closely spaced. Outer surface with faint spiral microstriation and uneven, very slightly prosocline growth lines.

Remarks – The present specimen cannot be related to any known pyramidelline species and apparently represents an undescribed taxon. However, the single, incomplete specimen so far available does not constitute a suitable basis for naming it.

Family Syrnolidae Saurin, 1958
Subfamily Syrnolinae Saurin, 1958
Genus *Costosyrnola* Laws, 1937d

Type species – *Costosyrnola tabulata* Laws, 1937d, p. 313, by original designation.

Remarks – *Costosyrnola* shares all the characters of *Syrnola*, but is distinguished from the latter in that its species are sculptured with collabral ribs, which abruptly vanish adapical to or at the periphery of the whorls. Several species are provided with palatal riblets. The genus was introduced to accommodate Early Miocene species from New Zealand. Subsequently, it proved to be represented in Holocene deposits of Thailand and in modern Southeast Asian environments.

***Costosyrnola bataviana* (Martin, 1884) comb. nov.**
Pl. 15, fig. 9.

1884 *Pyramidella (Obeliscus) bataviana* Martin, p. 160, pl. 8, fig. 155.
1931 *Pyramidella bataviana* Martin: van der Vlerk, p. 261.
1994 *Pyramidella bataviana* Martin: Skwarko & Sufiati, p. x4.
2002 *Pyramidella bataviana* Martin: van den Hoek Ostende *et al*., p. 82.
2009 *Pyramidella bataviana* Martin: Leloux & Wesselingh, p. 42, pl. 83, figs. 12, 13.

Type material – Holotype of *Pyramidella bataviana* Martin: RGM 11489, Batavia Borehole IV (Java), 130-134 m, Pliocene. The last three whorls of a badly worn shell.

Description – Teleoconch turreted, spire apparently somewhat cyrtoconoid; whorls flat-sided, moderately high, sutures shallowly impressed. Last whorl ovate-cylindrical, roundly angular at periphery; base convex with narrow umbilical chink. Outer lip broken, with 3 inner riblets decreasing in strength downwards; columella straight, bent

adaxially, with a single, strong, ascending ridge close to its adapical end. Outer surface showing remnants of opisthocline ribs.

Remarks – The single columellar ridge and the collabral sculpture provide the basis for the assignment of Martin's species to the genus *Costosyrnola* Laws, 1937d. The quite poor preservation prevents any comparison with other syrnoline species.

Distribution – *Costosyrnola bataviana* is known only by the holotype.

***Costosyrnola rebjongensis* sp. nov.**
Pl. 15, fig. 10; Pl. 16, figs. 1-4.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606943 (Pl. 15, fig. 10).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606944 (7); level RMG 6: RGM 606945 (1; Pl. 16, fig. 1), RGM 606946 (1; Pl. 16, fig. 2), RGM 606947 (1; Pl. 16, fig. 3), RGM 606948 (1; Pl. 16, fig. 4), RGM 606949 (34).

Derivation of name – From the stream (Kali in East Javanese) Rebjong along which the layer that yielded the fossils crops out.

Preservation – The material consists of variously preserved juvenile and adult specimens, all with the outer lip broken.

Diagnosis – Protoconch globose-helicoid, slightly oblique, one third to half immersed in first teleoconch whorl. Teleoconch turreted with straight-sided spire, whorls flat or very gently convex with narrow subsutural shelf, sutures shallowly impressed. Base convex, imperforate. Outer lip with 3 palatal riblets; columellar ridge strong, oblique. Sculpture of straight, slightly opisthocline collabral ribs vanishing at periphery of last whorl.

Description – Protoconch globose-helicoid, of 2.5 quickly enlarging whorls, with depressed spire, slightly oblique, one third to half immersed in first teleoconch whorl, small, flat apex fully or partly visible; diameter 0.23 mm. Teleoconch *Turbonilla*-like, slender, spire elevated, straight-sided or nearly so, SA averaging 18°; whorls flat to flatly convex, with subangular shoulder and very narrow subsutural shelf, faintly constricted medially in some specimens, slightly contracted abapically; sutures shallowly impressed, SS 16°. Last whorl ovate-cylindrical, averaging 45% of total height, with rounded periphery; base convex, rather short, imperforate. Aperture ovate-quadrangular; outer lip thick, with 3 deeply set, short palatal riblets (observable only in fully grown specimens) each ending in a moderately prominent tooth; columella straight,

reflected adaxially, markedly twisted medially and with one strong, oblique ridge close to its adapical end; parietal lip coated with thin callus. Sculpture of straight, moderately opisthocline collabral ribs, 16-21 per whorl throughout, slightly raised above shoulder, suddenly vanishing at periphery of last whorl or shortly below; interspaces of variable width, from as broad as one rib to twice the width of one rib; base smooth; faint spiral microgrooves are present in most specimens.

Remarks – The present new species is moderately variable in teleoconch shape (gradual transition from slender to somewhat broader forms) and whorls outline (from flat, in some specimens slightly constricted medially, to feebly convex). The median twist of the columella, more obvious in larger specimens, produces a markedly oblique swelling on the inner lip feigning an additional weak fold. Actually, drilled shells exposing the columella show that it is uniplicate. The Holocene and Recent *Costosyrnola thailandica* Robba *et al*., 2004, appears to be the most closely related species, but differs in having a more exsert protoconch and less numerous collabral ribs.

***Costosyrnola* sp.**
Pl. 16, fig. 5.

Material examined – Sumberan: RGM 606950 (1). A slightly worn specimen lacking the protoconch.

Description – Teleoconch turriculate; spire elevated, cyrtoconoid in the adapical one third, then straight-sided, AP 35°, MSA 14°; whorls rather high, flatly convex, faintly contracted both adapically and abapically; sutures shallowly impressed, SS 18°. Last whorl ovate-cylindrical, about 42% of total height, with rounded periphery; base convex, with very shallow and narrow umbilical depression. Aperture ovate-quadrangular, slightly produced at junction of basal and inner lips; outer lip thick, with 5 mid-adapical inner riblets decreasing in strength downwards; columella straight, with a massive, stout fold at its adapical end. Sculpture of gently arched, orthocline collabral ribs, 18 on earlier whorls, 22 on last whorl, each twice as broad as one interspace, suddenly vanishing at periphery; base smooth.

Remarks – There seems to be no closely related *Costosyrnola* species as the prominent columellar ridge, and the whorls contracting both adapically and abapically, are unique characters. The present form is likely new, but additional better-preserved material is needed in order to name it.

Genus *Puposyrnola* Cossmann, 1921

Type species – The Eocene, European species *Auricula acicula* Lamarck, 1804, by original designation (Cossmann, 1921, p. 229).

Remarks – On the basis of the original description and comments, and of the remarks provided by Corgan (1972), the diagnostic characters of *Puposyrnola* can be defined as follows: protoconch umboniiform, paucispiral, rather globose, obliquely immersed, its

flat apex partly visible or hindered by the first teleoconch whorl; teleoconch thick, cyrtoconoid, distinctly pupiform in many species, whorls feebly convex, suture impressed; base convex, imperforate or with faint umbilical chink; outer lip spirally ribbed or smooth within; parietal lip coated with rather thick callus; columellar ridge distinct to strong; and outer surface with fine, orthocline or slightly prosocline growth lines crossed by a spiral microstriation in many species. *Puposyrnola* is distinguished from *Syrnola* Adams, 1860a, by its umboniiform, markedly less prominent protoconch. The pupiform shape is an additional element and does not necessarily occur in all species.

***Puposyrnola karasensis* sp. nov.**
Pl. 16, fig. 6.

Holotype – Kali Rebjong Section, level RMG 3: RGM 606951 (Pl. 16, fig. 6).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606952 (6); level RMG 6: RGM 606953 (7).

Derivation of name – The name refers to the village of Karas, which is the type locality.

Preservation – The material consists of rather well preserved juvenile and adult specimens.

Diagnosis – Protoconch umboniiform, paucispiral, oblique, half immersed in first teleoconch whorl. Spire cyrtoconoid, whorls very gently convex with exceedingly narrow subsutural shelf. Base convex, imperforate. Outer lip with 2 weak interior riblets. Inner lip coated with moderately thick callus. Columellar ridge thin, markedly oblique. Outer surface with slightly prosocline growth lines.

Description – Protoconch umboniiform, rather globose, of 1.5 rapidly enlarging whorls, obliquely lying on first teleoconch whorl and half immersed in it; small, flat apex partly visible; diameter 0.22 mm. Teleoconch turreted-pupoid, with rather elevated, moderately cyrtoconoid spire, AP 32°, MSA 16°; whorls slightly convex, with very narrow, horizontal subsutural shelf, somewhat contracted abapically; sutures adpressed, SS 11°. Last whorl oval, about 48% of total height, with rounded periphery; base convex, rather short, with narrow umbilical depression (virtually imperforate). Aperture teardrop-shaped; outer lip with 2 weak, distant, deeply set inner riblets; inner lip coated with moderately thick callus bent adaxially over columella; columellar ridge markedly oblique, thin, made stout by callus cover. Outer surface with fine, slightly prosocline growth lines and remnants of faint spiral microstriation.

Remarks – The Recent Vietnamese species *Puposyrnola micrembryon* Saurin, 1959, appears to be the most closely similar species, differing in having a somewhat stouter teleoconch with taller last whorl and more numerous palatal riblets.

Genus *Syrnola* Adams, 1860a

Type species – *Syrnola gracillima* Adams, 1860a, p. 405, by monotypy.

Remarks – The type material of *S. gracillima* is unavailable and possibly lost (van Aartsen, 1994; van Aartsen *et al*., 2000). Therefore, the identity of the genus relies upon the short diagnoses of *Syrnola* and of *S. gracillima* published by Adams, and upon the comments on *Syrnola* provided by its author. On this basis, van Aartsen *et al*. (2000, p. 19) used *Syrnola* to accommodate species "characterised by very slender shells….with smooth whorls and a prominent columellar tooth". The generic concept of van Aartsen *et al*. (2000) is adopted herein and the distinguishing characters of *Syrnola* are expanded as follows: protoconch globose-helicoid, with depressed spire and blunt apex, of 2.5 whorls in most species, prominent and erect; teleoconch turreted, whorls numerous, flat-sided, weakly convex or slightly overhanging abapically, suture impressed or shallowly grooved; base convex to flatly convex, imperforate or with narrow umbilical chink; outer lip smooth within; columella with prominent adapical ridge; and outer surface unsculptured, bearing straight, orthocline or slightly prosocline growth lines crossed by a spiral microstriation in most species. Species currently included in *Syrnola*, but having the outer lip lirate internally are better allocated in *Tibersyrnola* Laws, 1937d. *Finlayola* Laws, 1937d, resembles *Syrnola*, but is distinguished by its umboniiform protoconch lying obliquely on the first teleoconch whorl, whereas that in the species of *Syrnola* is helicoid. I do not concur with Beu & Maxwell (1990, p. 390), who considered this difference "not in itself an adequate reason for supraspecific distinction" and regarded *Finlayola* as a synonym of *Syrnola*.

Syrnola imminens sp. nov.

Pl. 16, fig. 7.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606954 (Pl. 16, fig. 7).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606955 (3).

Derivation of name – From Latin *immineo* = overhang, with reference to the overhanging whorls.

Preservation – The material consists of rather well preserved specimens.

Diagnosis – Protoconch globose-helicoid, multispiral, erect, scarcely concealed by first teleoconch whorl. Spire elevated, slightly cyrtoconoid, whorls flat-sided, distinctly overhanging. Last whorl rounded at periphery, base convex, with narrow umbilical chink. Aperture ovate-quadrangular, outer lip smooth within, columellar ridge moderately prominent, oblique. Outer surface with straight, orthocline growth lines.

Description – Protoconch globose-helicoid, of 2.5 rapidly enlarging whorls, with scarcely prominent, blunt apex, coiled nearly at right angles to teleoconch, somewhat broader than first whorl of teleoconch and only slightly immersed in it; diameter 0.20 mm. Teleoconch slenderly turriculate, with elevated, slightly cyrtoconoid spire, AP 20°, MSA 10°; whorls flat-sided, moderately bulging at abapical one fifth and overhanging; sutures impressed, SS 11°. Last whorl ovate-cylindrical, about 38% of total height, with rounded periphery; base convex, rather long, with narrow, shallow umbilical chink. Aperture ovate-quadrangular; outer lip smooth within; parietal lip coated with broad, thin film of callus; columella slightly reflected, with moderately prominent, oblique ridge at adapical end. Outer surface with uneven, straight, orthocline growth lines and remnants of faint spiral microstriation.

Remarks – *Syrnola imminens* sp. nov. is characterised by its short, distinctly overhanging teleoconch whorls. The Recent New Zealand species *Syrnola menda* Finlay, 1926, also has slightly overhanging whorls, but differs from *S. imminens* in having a markedly narrower teleoconch. *Syrnola imminens* is somewhat reminiscent of *Finlayola* species in terms of teleoconch shape and overhanging whorls (see Laws, 1937d), but those species have an umboniiform protoconch.

***Syrnola turbinolonga* sp. nov.**
Pl. 17, fig. 1.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606956 (Pl. 17, fig. 1).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606957 (5).

Derivation of name – From Latin *turbinatus* = conical, and *longus* = elongate, with reference to the conical, elongate shape of the teleoconch.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – Protoconch globose-helicoid, multispiral, erect, scarcely concealed by first teleoconch whorl. Spire conical, elevated, whorls flat-sided. Last whorl with angu-

lar periphery, base convex, imperforate. Aperture ovate-quadrangular, outer lip smooth within, columellar ridge rather strong, oblique. Outer surface with straight, slightly prosocline growth lines.

Description – Protoconch rather small, globose-helicoid, of 2.5 quickly enlarging whorls, with scarcely prominent, blunt apex, coiled nearly at right angle to teleoconch, somewhat broader than first whorl of teleoconch and only slightly immersed in it; diameter 0.19 mm. Teleoconch conical-turreted, with elevated, faintly cyrtoconoid spire, AP 25°, MSA 18°; whorls flat-sided; sutures impressed, SS 15°. Last whorl ovate-conical, approximately 45% of total height, with angular periphery; base convex, rather short, imperforate. Aperture ovate-quadrangular; outer lip smooth within; columella slightly reflected, with rather strong, oblique ridge close to adapical end. Outer surface with fine, straight, slightly prosocline growth lines and remnants of faint spiral microstriation.

Remarks – *Syrnola turbinolonga* sp. nov. is characterised by its protoconch being slightly broader than the diameter of the first spire whorl and its conical teleoconch with an angular periphery to the last whorl. There seem to be no named species with which the present one can be compared. *Syrnola vietnamica* and *Syrnola celestae*, both of Saurin (1959), are similarly shaped, but have palatal riblets and belong in the genus *Tibersyrnola* Laws, 1937d.

***Syrnola* sp.**
Pl. 17, fig. 2.

Material examined – Kali Rebjong Section, level RMG 3: RGM 606958 (1). A slightly damaged juvenile specimen.

Description – Protoconch damaged, helicoid, rather globose, apparently of slightly more than 2 whorls, with scarcely prominent, blunt-topped spire and inflated last whorl; lying across first teleoconch whorl and about one third immersed in it; diameter 0.20 mm. Teleoconch pupoid, with moderately elevated, markedly cyrtoconoid spire, AP 35°, MSA 14°; whorls flatly convex, with very narrow subsutural shelf, earlier ones enlarging rapidly; sutures impressed, SS 10°. Last whorl ovate-cylindrical, about 45% of total height, with rounded periphery; base convex, rather short, imperforate. Aperture oval, produced abapically; outer lip broken, smooth inside; inner lip coated with moderately thick callus; columella reflected, with one moderately prominent adapical fold made stout by callus cover. Outer surface bearing orthocline growth lines.

Remarks – The pupoid teleoconch of the present specimen resembles that of some New Zealand and Vietnamese species of *Puposyrnola* Cossmann, 1921, and would suggest an allocation under this genus. However, species of *Puposyrnola* possess a paucispiral, umboniiform protoconch, whereas the present specimen has a globose-helicoid larval shell of more than 2 whorls. The protoconch character firmly indicates assignment to *Syrnola* Adams, 1860a, despite the teleoconch shape.

Genus *Tibersyrnola* Laws, 1937d

Type species – *Syrnola semiconcava* Marshall & Murdoch, 1923, by original designation (Laws, 1937d, p. 309).

Remarks – *Tibersyrnola* was introduced by Laws (1937d) to accommodate Burdigalian and Pleistocene New Zealand species, which "have all the characters of *Syrnola*, but in addition the outer lip is strongly lirate internally". The latter character is herein regarded as of valuable generic significance.

Tibersyrnola awaajensis (Wissema, 1947) comb. nov.

Pl. 17, fig. 3.

1947 *Syrnola (Puposyrnola) awaajensis* Wissema, p. 80, pl. 3, fig. 95.

Type material – Holotype of *Syrnola awaajensis* Wissema: RGM 606808, Schroeder collection, locality 39, Nias Island (Sumatra), Pleistocene. The holotype lacks the protoconch and the earliest spire whorls.

Description – Teleoconch thick, narrowly turreted, with about 7 whorls preserved. Spire elevated, straight-sided, SA 14°; whorls rather low, sutures shallowly impressed, SS 9°. Last whorl moderately tall, with rounded periphery; base convex, imperforate. Aperture apparently oval; outer lip broken, revealing 6 inner spiral riblets (5 in the original description); columella concave, with one strong, oblique ridge close to adapical end. Outer surface with fine, dense, orthocline growth lines crossed by faint spiral microstriation; also one faint spiral groove occurs about midway between sutures.

Remarks – The teleoconch of Wissema's species appears to be strikingly similar to that of *Syrnola semiconcava* Marshall & Murdoch, 1923, type species of *Tibersyrnola* (cf. Marshall & Murdoch, 1923, p. 122, pl. 13, fig. 5; Laws, 1937d, p. 310, fig. 17). The number of palatal riblets (6 in *S. awaajensis*, 3 in *S. semiconcava*) seems to be the sole difference. However, in the absence of information on the protoconch of *S. awaajensis*, any decision about the relationships between these species must await the collection of other, better-preserved material of *S. awaajensis*.

Distribution – *Tibersyrnola awaajensis* is known only by the holotype.

Tibersyrnola sp.

Pl. 17, fig. 4.

1911 *Pyramidella* spec. 2 Martin, pp. 35, 47.

Material examined – Two specimens recorded as *Pyramidella* spec. 2 by Martin (1911): RGM 11492, Martin collection, Cilanang, Preangerian (Middle Miocene). They lack the protoconch and the earlier teleoconch whorls.

Description – Teleoconch stoutly turreted, with apparently elevated, straight-sided spire, SA 30°; whorls very gently convex, slightly contracted both adapically and abapically; sutures impressed, SS 6°. Last whorl conical-ovate, with roundly angular periphery; base convex, with narrow umbilical chink. Aperture damaged, apparently ovate-quadrangular; outer lip with 5 interior spiral riblets, adapical-most weak and short, subsequent one strongest, others decreasing in strength downwards; parietal lip coated with thin callus; columella straight, with prominent, oblique, rather thin ridge close to adapical end. Outer surface with faint spiral microstriation and fine, opisthocline growth lines.

Remarks – The examined specimens, characterized by their rather stout teleoconch, seem unlike any fossil or Recent syrnolid species, as all others have a narrower teleoconch. They likely represent a new species, but do not constitute a suitable basis to name it because of their rather poor preservation. The assignment of the present form to the genus *Tibersyrnola* is based on the single columellar ridge and the presence of palatal riblets.

Subfamily Tiberiinae Saurin, 1958
Genus *Cossmannica* Dall & Bartsch, 1904

Type species – *Pyramidella clandestina* Deshayes, 1861, by original designation (Dall & Bartsch, 1904, p. 6).

Remarks – Dall & Bartsch (1904) introduced *Cossmannica* and just listed its main characters. From their subsequent monograph (Dall & Bartsch, 1909, p. 17), it appears that *Cossmannica* is a replacement name for *Diptychus* Cossmann, 1888, which is a junior homonym of *Diptychus* Milne-Edwards, 1880 (Crustacea). The latter is in turn predated by *Diptychus* Steindachner, 1866 (fishes). *Cossmannica* is characterised by: protoconch umboniiform, variably globose; teleoconch cyrtoconoid, with moderately elevated spire, whorls very gently convex, sutures impressed; base convex, imperforate; outer lip with inner spiral riblets or smooth within; columella with 2-3 ridges, the adapical one well developed, the others weak to obsolescent; and outer surface unsculptured, bearing straight, orthocline growth lines crossed by a spiral microstriation in most species. The absence of the umbilicus distinguishes *Cossmannica* from *Tiberia* Monterosato, 1875, species of which have a distinct, deep umbilical opening. Schander *et al*. (1999a, p. 152) questioned any assignment of *Cossmannica* to subfamilies. Considering its close similarity to *Tiberia*, I see no reason to exclude it from the Tiberiinae.

Cossmannica sp.
Pl. 17, fig. 5.

Material examined – Sumberan: RGM 606959 (1). A fairly well preserved juvenile specimen.

Description – Protoconch umboniiform, rather globose, of about 2 whorls, slightly oblique, half immersed in first teleoconch whorl; diameter 0.24 mm. Teleoconch somewhat turreted, cyrtoconoid, with moderately elevated spire, AP 45°, MSA 24°; whorls

flat-sided, with narrow subsutural shelf and subangular periphery close to abapical suture; earlier sutures adpressed, subsequent ones shallowly grooved, SS 9°. Last whorl ovate-cylindrical, about 53% of total height, with roundly angular periphery; base nearly obconical, imperforate. Aperture subquadrangular; outer lip smooth within; inner lip coated with thin callus; columella short, with 3 markedly oblique folds, adapical one rather strong, winding down base, others very weak. Outer surface with uneven, orthocline growth markings and faint spiral microstriation.

Remarks – The present form somewhat resembles the Recent Vietnamese species *Cossmannica behainei* Saurin, 1959, but the latter was reported to have only 2 columellar folds and 3 palatal riblets.

Genus *Tiberia* Monterosato, 1875

Type species – Monterosato (1875, pp. 5, 31) introduced *Tiberia* as a subgenus of *Pyramidella* Lamarck, 1799, and explicitly designated his species *Pyramidella minuscula* as the type species. It is of note that *P. minuscula*, originally proposed by Monterosato (1872, p. 40) and subsequently just quoted by the same author (1874, p. 265), is a *nomen nudum*. The name *Pyramidella minuscula* was later validated by Monterosato (1880, p. 224). Accordingly, the type species is *Pyramidella minuscula* Monterosato, 1880 (see also van Aartsen & Corgan, 1996; van Aartsen *et al*., 1998; Schander *et al*., 1999a). The type species was discussed and illustrated by Di Geronimo (1973).

Remarks – According to Schander *et al*. (1999a), *Tiberia* Jeffreys, 1884, and *Tiberiola* Cossmann, 1900, are synonyms of *Tiberia* Monterosato, 1875. On the basis of the type species and of the other surely congeneric species (*Tiberia micalii* Peñas & Rolán, 1997; *T. minusculoides* van Aartsen *et al*., 1998; *T. octaviana* Di Geronimo, 1973), the characters of *Tiberia* can be summarized as follows: protoconch umboniiform, variably globose, obliquely lying on the first teleoconch whorl; teleoconch small in most species, somewhat turreted, with moderately elevated spire, whorls gently convex to straight-sided, sutures impressed; base convex, with narrow, deep umbilical opening; outer lip smooth within, or with inner spiral riblets in some species; columella with 2-3 ridges, the adapical one well developed, the other(s) weak to obsolescent; and outer surface bearing fine, variously oriented growth lines, which are crossed by a spiral microstriation in some species. As already noted, the deep umbilicus distinguishes *Tiberia* from *Cossmannica* Dall & Bartsch, 1904.

Tiberia sp.

Pl. 17, fig. 6.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606960 (1). A rather well preserved juvenile specimen.

Description – Protoconch umboniiform, rather globose, of about 1.5 whorls, obliquely lying on first teleoconch whorl, one fourth immersed in it; diameter 0.23 mm. Teleoconch low-turreted, with conical, moderately elevated spire, SA 26°; whorls flat-sided,

with narrow, gently sloping subsutural shelf and angular periphery close to abapical suture; sutures shallowly grooved, SS 15°. Last whorl conical-ovate, 60% of total height, with angular periphery; base roundly obconical, with rather narrow, deep umbilical chink. Aperture ovate-quadrangular; outer lip smooth within; columella straight and short, with 2 markedly oblique folds, adapical one less so, rather strong and prominent; abapical one weaker, merging into basal lip. Outer surface bearing fine, dense, very slightly prosocline growth lines, somewhat coarser on base.

Remarks – The major characters of the described specimen (protoconch type, open umbilical chink and columellar folds) support the assignment to the genus *Tiberia* Monterosato, 1875. The present form seems unlike any other *Tiberia* species dealt with in the literature and likely represents a new species, which, however, requires more material to be named. It has a superficial resemblance to the Recent Vietnamese *Tiberia grimaudi* Saurin, 1959, but *T. grimaudi* has a shorter base and 3 palatal riblets.

Family Turbonillidae Bronn, 1849
Subfamily Turbonillinae Bronn, 1849
Genus *Asmunda* Dall & Bartsch, 1904

Type species – *Chemnitzia turrita* Adams, 1852, by original designation (Dall & Bartsch 1904, p. 9).

Remarks – On the basis of the type species (cf. Dall & Bartsch, 1909; Turner, 1956) and of those confidently assigned to *Asmunda*, the distinguishing characters of the genus can be summarized as follows: protoconch helicoid, of 2-3 whorls, lying across the first teleoconch whorl and slightly immersed in it; teleoconch turriculate, straight-sided or slightly cyrtoconoid, whorls moderately convex with distinct subsutural shelf, sutures impressed to slightly channeled; last whorl angular at the periphery, base flatly convex, imperforate; outer lip smooth within; columella straight to scarcely twisted adapically; sculpture of collabral ribs interconnected adapically, ending abruptly against a peripheral spiral cord, which in most specimens is observable only on the last whorl; and mid-adapical part of base with thin axials vanishing at the level of a variably distinct, blunt, spiral inflation. The peripheral spiral and the basal characters distinguish *Asmunda* from the other turbonilline taxa. *Zaphella* Laseron, 1959, appears not to differ significantly from *Asmunda* in terms of both larval shell and teleoconch characters. Thus, it is herein regarded as a synonym of *Asmunda*.

***Asmunda rebjongensis* sp. nov.**
Pl. 17, fig. 7.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606961 (Pl. 17, fig. 7).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606962 (21). Locality RMG 2: RGM 606963 (1).

Derivation of name – From the stream (Kali in East Javanese) Rebjong along which the layer that yielded the bulk of the type specimens crops out.

Preservation – The material consists of variously preserved, juvenile and adult specimens.

Diagnosis – Protoconch helicoid, multispiral, lying across first teleoconch whorl. Teleoconch turriculate, with very slightly cyrtoconoid spire; whorls gently convex, with distinct shoulder and adaxially sloping, narrow subsutural shelf; sutures shallowly channeled. Last whorl angular at periphery; base flatly convex, short, imperforate. Outer lip smooth within; columella slightly twisted adapically. Sculpture of slightly sinuous collabral ribs interconnected subsuturally, abruptly vanishing against a peripheral spiral cord; mid-upper base with fine axials.

Description – Protoconch rather small, helicoid, of 2.5 whorls, coiled nearly at right angles to teleoconch axis, with prominent, blunt-topped spire extending beyond adapical suture of first spire whorl, in which protoconch is about one fourth immersed; diameter 0.16 mm. Teleoconch turriculate, with elevated, slightly cyrtoconoid spire, AP 31°, MSA 16°; whorls gently convex, with rather sharp shoulder and inward-sloping shoulder slope, contracted below periphery, which is placed at abapical one fourth; sutures shallowly channeled, SS 17°. Last whorl cup-shaped, about 45% of total height, with angular periphery; base rather short, flatly convex, imperforate. Aperture ovate-quadrangular, somewhat produced at junction of basal and inner lips; outer lip arched, smooth within; columella slightly concave, slightly twisted adapically. Sculpture of moderately sinuous, gently opisthocline collabral ribs, 16-17 on first whorl, 24-25 on last whorl, separated by interspaces each half width of one rib; ribs interconnected by one low spiral cord at shoulder, rising into weak nodes above shoulder, abruptly fading away against peripheral spiral cord, which is observable only on last whorl; fine spiral grooves present on adapical half of first whorl; mid-upper base with fine axial riblets vanishing at level of broad, blunt spiral inflation developed on fully grown shells.

Remarks – *Asmunda rebjongensis* sp. nov. is similar to *Turbonilla tribulationis* Hedley, 1909. However, the latter differs in having a low-spired protoconch not extending beyond the adapical suture of the first teleoconch whorl, a distinctly stepped spire, impressed instead of channeled sutures, less numerous ribs on the last whorl, and stronger adapical and peripheral spirals. It also seems to lack the mid-base spiral inflation occurring in *A. rebjongensis*. The Sumatran *Turbonilla ludovica* Thiele, 1925, is another allied species. Examination of the syntypes (MZB/Moll 64106) has shown that *T. ludovica* is much more similar in protoconch and teleoconch characters to *T. tribulationis* than to *Asmunda rebjongensis* sp. nov., but shares with *A. rebjongensis* the well-developed mid-basal spiral inflation.

Genus *Bartschella* Iredale, 1916

Type species – *Chemnitzia (Dunkeria) subangulata* Carpenter, 1857, by original designation (Iredale, 1916, p. 36).

Remarks – *Bartschella* was introduced by Iredale (1916, p. 36) as a new genus "for the group *Dunkeria*, Dall & Bartsch, 1909", not *Dunkeria* Carpenter, 1857. The type species of *Bartschella* was thoroughly described by Carpenter (1857, p. 434) and by Dall & Bartsch (1909, p. 124), who also illustrated one of the original specimens (Dall & Bartsch, 1909, pl. 12, fig. 11). On this basis, the characters of *Bartschella* can be summarized as follows: protoconch umboniiform, globose, of 2-2.5 whorls, with barely prominent apex; teleoconch elongate-ovate, whorls convex, angular adapically and with well-developed shoulder slope, suture impressed; base convex, imperforate; outer lip smooth within; columella slightly twisted adapically; and sculpture of narrow collabral ribs gradually fading out over the base, crossed by spiral cords nearly of the same strength, forming a reticulate pattern. The larval shell, the shouldered whorls and the reticulate sculpture constitute the primary diagnostic characters. The latter two characters readily distinguish species of *Bartschella* from those of *Pyrgiscus*, which have a similar globose protoconch.

Bartschella karasensis sp. nov.

Pl. 18, figs. 1, 2.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606964 (Pl. 18, fig. 1).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606965 (6); level RMG 6: RGM 606966 (1, Pl. 18, fig. 2).

Derivation of name – The name refers to the village of Karas, which is the type locality.

Preservation – The material consists of variously preserved juvenile and adult specimens retaining the protoconch.

Diagnosis – Protoconch umboniiform, rather globose, well exsert. Teleoconch turreted, with stepped spire; whorls gently convex, markedly shouldered, sutures impressed. Base convex, imperforate. Outer lip smooth within; columella twisted adapically. Sculpture of thin collabral ribs overridden by slightly weaker spiral cords forming a reticulate pattern; base with fine spirals.

Description – Protoconch umboniiform, rather globose, of 2.5 rapidly expanding whorls, well exsert, very slightly oblique, scarcely immersed in first teleoconch whorl;

diameter 0.21 mm. Teleoconch turreted, with moderately elevated, distinctly stepped spire, SA 18°; whorls rather high, gently convex, angled approximately at adapical one sixth, with rather broad shoulder slope, slightly contracted abapically; sutures shallowly and widely impressed, SS 17°. Last whorl cylindrical-ovate, 50% of total height, with rounded periphery; base convex, rather short, imperforate. Aperture oval; outer lip regularly arched, smooth within; columella slightly concave, moderately twisted adapically. Sculpture of narrow, slightly sinuous collabral ribs, 21-25 on first whorl, 19 on last whorl, with interspaces each one third width of one rib; gradually vanishing on lower base; ribs overridden by 6-7 slightly weaker spiral cords, most adapical over shoulder, forming reticulate pattern; one additional spiral cord develops on shoulder slope of some specimens by second whorl; base with many spirals, increasing in fineness downwards.

Remarks – To my knowledge, *Bartschella karasensis* sp. nov. is the first Indo-West Pacific species assignable to *Bartschella*. Among the American representatives of *Bartschella*, *B. subangulata* Carpenter, 1857 (type species of the genus), exhibits some similarity to *B. karasensis*, but the latter is readily distinguished by its exsert protoconch, its different development of the collabral ribs and its more numerous spiral cords.

Genus *Exesilla* Laseron, 1959

Type species – *Exesilla sulcata* Laseron, 1959, p. 216, by original designation.

Remarks – The genus is herein used to accommodate species characterised by a rather large, helicoid protoconch with scarcely prominent, blunt apex and by the presence of a weak, but distinct, ridge at the adapical end of the columella. The "more or less medially indented" teleoconch whorls, regarded by Laseron as a distinctive character, seem to be of minor importance. The outer lip is provided with palatal riblets in some species. *Exesilla* is closely similar to *Turbonilla* Risso, 1826, but the species of the latter genus have a helicoid protoconch with a rather prominent spire and lack the columellar ridge.

Exesilla dextra (Saurin, 1959)
Pl. 18, fig. 3.

1959 *Turbonilla dextra* Saurin, p. 259, pl. 6, fig. 13.
2007 *Exesilla dextra* (Saurin): Robba *et al*., p. 72, figs. 25 o, p.

Type material – In MNHN (C. Schander, pers. comm. 2011), not seen.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606967 (1). A rather well preserved juvenile shell.

Other material examined – The material referred to as *Exesilla dextra* by Robba *et al*. (2007): northern Gulf of Thailand, Recent (1 specimen in Università di Milano Bicocca).

Description – Protoconch helicoid, of 2.5 rapidly expanding whorls, with scarcely prominent, blunt spire and depressed last whorl; lying obliquely on first teleoconch whorl, in which it is about one fourth immersed; diameter 0.20 mm. Teleoconch elongate-oval, with rather elevated, slightly cyrtoconoid spire, AP 22°, MSA 12°; whorls gently convex, slightly constricted at adapical one third, with rounded periphery at abapical one fourth, moderately contracted below it, very slightly overhanging; sutures impressed, SS 14°. Last whorl cup-shaped, about 45% of total height; base convex, imperforate. Aperture oval; outer lip smooth within; parietal lip coated with moderately thick callus; columella reflected, with weak, deeply set fold close to adapical end. Sculpture of slightly prosocline collabral ribs, 16 per whorl throughout, each narrower than one interspace, weakly nodulose adapically, gradually fading out over lower base. Faint, distant spiral microgrooves also present.

Remarks – The fossil specimen dealt with herein has slightly narrower, less prosocline ribs, which are more weakly nodular subsuturally, but otherwise conforms to the characters of *Turbonilla dextra* Saurin, 1959, in all details and is considered to belong to this species. The protoconch characters, the slight constriction of the whorls and the weak, but distinct, columellar fold firmly point toward its assignment to *Exesilla* Laseron, 1959.

Distribution – *Exesilla dextra* was hitherto known only from modern environments of the northwest Pacific. This is the first Miocene record.

***Exesilla langhiana* sp. nov.**
Pl. 18, figs. 4-6.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606968 (Pl. 18, fig. 4).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606969 (1, Pl. 18, fig. 5), RGM 606970 (1, Pl. 18, fig. 6), RGM 606971 (10).

Derivation of name – The name refers to the Langhian age of the type horizon.

Preservation – The material consists of variously preserved, juvenile and adult specimens.

Diagnosis – Protoconch globose-helicoid, exsert. Teleoconch turreted, with straight-sided spire; earlier whorls convex, subsequent ones flat-sided, sutures impressed. Base short, moderately convex, imperforate. Outer lip smooth within; columella with thin, scarcely prominent adapical fold. Sculpture of straight, narrow collabral ribs, each narrower than one interspace, suddenly stopping at periphery of last whorl; base smooth except for axial striae.

Description – Protoconch globose-helicoid, of 2.5 quickly expanding whorls, with scarcely prominent, obtuse spire, coiled at about 110° to teleoconch, one fifth immersed in first whorl of teleoconch; diameter 0.19 mm. Teleoconch turriculate, with elevated, straight-sided spire, SA 18°; earlier 1-2 whorls convex, subsequent ones flat-sided, slightly constricted in the middle, somewhat contracted both adapically and abapically; sutures shallowly impressed, SS 15°. Last whorl cylindrical-ovate, about 40% of total height, with rounded periphery; base moderately convex, rather short, imperforate. Aperture ovate-quadrangular, produced abapically; outer lip straight, orthocline, smooth within; basal lip U-shaped; columella also straight, moderately reflected, with thin, scarcely prominent, markedly oblique fold close to adapical end; parietal lip coated with thin callus. Sculpture of straight, orthocline collabral ribs, 19-21 on first whorl, 14 on last whorl, each twice the width of an intervening furrow, somewhat attenuated medially (in both breadth and prominence), stopping abruptly at periphery; interspaces with feeble but distinct subsutural groove and distant microgrooves; base smooth except for axial striae.

Remarks – *Exesilla langhiana* sp. nov. is strikingly similar to *Exesilla sulcata* Laseron, 1959 (type species of *Exesilla*), in terms of protoconch type and teleoconch shape, but *E. sulcata* differs in having 16 ribs per whorl throughout, and the ribs are broader and closer together.

Exesilla nodosa (Martin, 1884) comb. nov.

Pl. 18, fig. 7.

1884 *Turbonilla nodosa* Martin, p. 161, pl. 8, fig. 156.
1931 *Turbonilla nodosa* Martin: van der Vlerk, p. 261.
1994 *Turbonilla nodosa* Martin: Skwarko & Sufiati, p. x9.
2002 *Turbonilla nodosa* Martin: van den Hoek Ostende *et al*., p. 82.
2009 *Turbonilla nodosa* Martin: Leloux & Wesselingh, p. 42, pl. 84, figs. 3, 4.

Type material – Holotype of *Turbonilla nodosa* Martin: the specimen figured by Martin (1884, pl. 8, fig. 156) and refigured herein (Pl. 18, fig. 7), RGM 11495, Gresik Borehole (Java), 201 m, Early Miocene. Only the last 4.5 whorls are preserved.

Description – Teleoconch turreted, with moderately elevated, straight-sided spire, SA 28°; whorls nearly flat-sided, with weak, blunt subsutural margining, very slightly constricted at adapical one third, somewhat contracted abapically; sutures impressed, SS 10°. Last whorl cylindrical-ovate, with subangular periphery; base convex, short, with faint umbilical chink. Aperture subquadrangular; outer lip smooth within; parietal lip coated with thin callus; columella bent over umbilical area, with weak, oblique fold close to adapical end. Sculpture of straight, gently opisthocline collabral ribs, 18 on first preserved whorl, 19 on last whorl, each slightly narrower than an intervening furrow, raising into nodes on subsutural margining, stopping abruptly just adapical to periphery; base with uneven axial markings; remnants of spiral microstriation present.

Remarks – The slight constriction of the whorls, the weak columellar fold and the sculptural characters suggest that Martin's species belongs to the genus *Exesilla* Laseron, 1959. However, this assignment is made with much hesitation, since the larval shell is unknown. The Recent Sumatran species *Turbonilla gisela* Thiele, 1925, is closely similar in teleoconch shape and sculpture, but has fewer ribs and there are remnants of very fine, distant spiral grooves in the interspaces. The holotype of *T. gisela* (ZMB/Moll 64015) has a type B larval shell with hidden apex denoting a generic assignment other than to *Turbonilla*.

Distribution – *Exesilla nodosa* is known only by the holotype.

***Exesilla splendida* (Martin, 1884) comb. nov.**
Pl. 18, figs. 8, 9.

1884 *Turbonilla splendida* Martin, p. 161, pl. 8, fig. 157.
1931 *Turbonilla splendida* Martin: van der Vlerk, p. 261.
1994 *Turbonilla splendida* Martin: Skwarko & Sufiati, p. x9.
2002 *Turbonilla splendida* Martin: van den Hoek Ostende *et al*., p. 82.
2009 *Turbonilla splendida* Martin: Leloux & Wesselingh, p. 42, pl. 84, figs. 9, 10.

Type material – Holotype of *Turbonilla splendida* Martin: the specimen figured by Martin (1884, pl. 8, fig. 157) and refigured herein (Pl. 18, fig. 8), RGM 11494, Batavia Borehole IV (Java), 130-134 m, Pliocene. Only the last 4.5 whorls are preserved.

Material examined – Kali Rebjong Section, level RMG 3: RGM 606972 (1; Pl. 18, fig. 9), RGM 606973 (2). Two specimens are incomplete.

Description – Protoconch globose-helicoid, of 2.5-2.75 whorls, with depressed spire, coiled nearly at right angle to teleoconch and about one fourth immersed in first whorl of teleoconch; diameter 0.22 mm. Teleoconch slenderly turriculate with elevated, straight-sided spire, SA 12°; whorls moderately high, nearly flat-sided, slightly constricted in the middle, somewhat contracted both adapically and abapically; sutures impressed, SS 11°. Last whorl cylindrical-ovate, about 33% of total height, with rounded periphery; base convex, rather short, imperforate. Aperture subquadrangular; outer lip straight, orthocline, with 3 median inner riblets and 2 weaker basal ones; parietal lip coated with thin callus; columella also straight, slightly bent adaxially, with moderate, markedly oblique fold close to adapical end. Sculpture of straight, orthocline collabral ribs, 20-21 per whorl throughout, each as wide as one interspace, somewhat attenuated subsuturally, fading out just abapical to periphery; base with axial striae.

Remarks – *Exesilla splendida* fully matches the characters of the genus *Exesilla* Laseron, 1959. *Exesilla splendida* somewhat resembles *E. sulcata* Laseron, 1959 (type species of *Exesilla*), but the teleoconch of *E. sulcata* has fewer whorls for a given height and only 16 collabral ribs per whorl.

Distribution – *Exesilla splendida* was hitherto known from Pliocene deposits of Java. It is herein recorded for the first time in the Miocene (Late Langhian) of Indonesia.

***Exesilla striata* sp. nov.**
Pl. 19, fig. 1.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606974 (Pl. 19, fig. 1).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606975 (7).

Derivation of name – From Latin *striatus* = striate, with reference to the distinct spiral microgrooves.

Preservation – The material consists of variously preserved, mostly juvenile specimens.

Diagnosis – Protoconch globose-helicoid. Teleoconch turreted, with straight-sided spire; whorls flat-sided, very slightly constricted at adapical one third; sutures impressed. Base short, moderately convex, imperforated. Outer lip smooth within; columella with thin, deeply set adapical fold. Sculpture of slightly sinuous, narrow collabral ribs, each markedly narrower than an interspace, gradually vanishing on lower base; whole surface with faint spiral microgrooves.

Description – Protoconch globose-helicoid, of 2.5 rapidly expanding whorls, with scarcely prominent, blunt spire and inflated last whorl, slightly oblique, about one fourth immersed in first teleoconch whorl; diameter 0.21 mm. Teleoconch turreted, with rather elevated, nearly straight-sided spire, SA 10°; whorls flat-sided, slightly constricted at adapical one third, with rounded periphery at abapical one fourth and moderately contracted below it; sutures impressed, SS 12°. Last whorl cup-shaped, about 45% of total height; base short, convex, imperforate. Aperture oval; outer lip arched, smooth within; columella reflected, with narrow, deeply set fold close to adapical end; parietal lip coated with thin callus. Sculpture of slightly flexuous, orthocline collabral ribs, 18-19 on first whorl, 15-16 on fourth to sixth whorls (sixth is last whorl), each one third to half width of one interspace, slowly widening downward, gradually fading out over lower base; faint, distant spiral microgrooves present in interspaces and on base.

Remarks – The present species is close to *Exesilla dextra* (Saurin, 1959), but differs from it by its less oblique protoconch with a markedly more globose last whorl, its flat-sided instead of gently convex spire whorls, its different development of the collabral ribs (*E. dextra* has 16 ribs per whorl throughout), which are orthocline instead of prosocline, and its more distinct spiral microstriation.

Genus *Nisipyrgiscus* gen. nov.

Type species – *Nisipyrgiscus javanensis* sp. nov.

Derivation of name – The name of the genus reflects the fact that it combines the characters of *Nisiturris* (protoconch) and *Pyrgiscus* (overall teleoconch shape and sculpture).

Diagnosis – Protoconch bulimoid, of about 3 whorls, with prominent, pointed spire projecting beyond the adapical suture of the first teleoconch whorl. Teleoconch elongate-ovate to turriculate with slightly convex whorls, suture impressed, base rapidly attenuated and imperforate. Aperture small, ovate-quadrangular, interior of outer lip smooth, columella straight, with a weak, oblique, deeply set fold. Sculpture of collabral ribs that either stop abruptly at periphery of the last whorl or fade away over upper base, interspaces and base with spiral cordlets.

Remarks – Four "Rembangian" species exhibit a distinctive combination of characters that do not fit satisfactorily into any pyramidelline genus. They have a *Nisiturris*-like protoconch lying across the first spire whorl and a teleoconch basically conforming to that of *Pyrgiscus* species. The presence of a distinct columellar fold constitutes an additional distinguishing character. The deeply set columellar fold is scarcely visible in apertural view, but is clearly visible in broken or drilled shells. The new genus *Nisipyrgiscus* differs from *Nisiturris* Dall & Bartsch, 1906, primarily by its spiral sculpture, which is invariably absent from species of *Nisiturris*. The multispiral, bulimoid protoconch easily distinguishes *Nisipyrgiscus* from *Pyrgiscus* Philippi, 1841, which has a globose larval shell with definitely flat spire. The species of *Striarcana* Laws, 1937d, *Planpyrgiscus* Laws, 1937d, and *Gispyrella* Laws, 1937d, are also spirally sculptured, but have umboniiform protoconchs and lack the columellar fold. Several Indo-Pacific species assigned to *Turbonilla*, *Pyrgiscus* or *Pyrgiscilla* (herein considered to be synonym of *Pyrgiscus*) likely belong in the present new genus (*Turbonilla gonzaloi* Peñas & Rolán, 2010; *T. pachypleura* Melvill, 1910; *T. zetemia* Melvill, 1910; *Pyrgiscus quangae* Saurin, 1959; *Pyrgiscilla cylindrica* Saurin, 1959; *P. inaequistriata* Saurin, 1959; and *P. pellucida* Saurin, 1959, among others).

***Nisipyrgiscus filicinctus* sp. nov.**
Pl. 19, fig. 2.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606976 (Pl. 19, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606977 (4).

Derivation of name – From Latin *filum* = thread, and *cintus* = surrounded, with reference to the fine spiral sculpture.

Preservation – The material consists of rather well preserved juvenile and adult specimens.

Diagnosis – Protoconch bulimoid, multispiral, lying across first teleoconch whorl. Teleoconch turreted, with straight-sided spire; whorls convex, sutures impressed. Base flatly convex, very short, imperforate. Outer lip smooth within. Columellar fold very weak, deeply set. Sculpture of collabral ribs, 18 on first whorl, 16 on last whorl; interspaces broader than ribs, crossed by numerous, even spiral threads; base with fine spiral threads.

Description – Protoconch bulimoid, of 2.75 whorls, coiled nearly at right angle to teleoconch axis, with inflated last whorl and prominent spire extending well beyond adapical suture of first teleoconch whorl, in which protoconch is about one fourth immersed; diameter 0.22 mm. Teleoconch turreted, with elevated, straight-sided spire, SA 13°; whorls convex, with periphery at abapical one third; sutures impressed, SS 13°. Last whorl depressedly oval, about 37% of total height, with narrowly rounded periphery; base very short, flatly convex, imperforate. Aperture ovate-quadrangular; outer lip sharply curved peripherally, smooth within; columella straight, with oblique, very weak, deeply set fold at adapical end. Sculpture of gently arched, slightly opisthocline collabral ribs, 18 on first whorl, 16 on last whorl, each about half width of one intervening furrow, gradually fading out over upper base; interspaces with regular, evenly spaced spiral threads, 8-9 per whorl throughout, most adapical (subsutural) somewhat stronger; base with spiral threads, those on mid-lower part finer to subobsolescent.

Remarks – The present new species is characterized by its protoconch with a prominent spire, its convex whorls and its sculptural characters. The Recent, Indo-West Pacific species *Turbonilla zetemia* Melvill, 1910, belongs to *Nisipyrgiscus* gen. nov. and is the most closely similar species. It differs from *Nisipyrgiscus filicinctus* sp. nov. in having *Chemnitzia*-like ribs and interspaces stopping abruptly at the periphery of the last whorl, whereas the ribs extend onto the base, fading out over the central area of the base, in *N. filicinctus* sp. nov.

***Nisipyrgiscus javanensis* sp. nov.**
Pl. 19, figs. 3, 4.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606978 (Pl. 19, fig. 3).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606979 (1, Pl. 19, fig. 4), RGM 606980 (8); level RMG 5: RGM 606981 (1); level RMG 6: RGM 606982 (13).

Derivation of name – The name refers to the location of the type locality in the Island of Java.

Preservation – The material consists of mostly well preserved juvenile and adult specimens.

Diagnosis – Protoconch bulimoid, multispiral, lying across first teleoconch whorl. Teleoconch small, turreted, with nearly straight-sided spire; whorls gently convex, sutures impressed. Base convex, short, imperforate. Outer lip smooth within. Columellar fold weak, deeply set. Sculpture of collabral ribs, 15-16 on last whorl; interspaces broader than ribs, crossed by well spaced spiral cordlets; base finely spirally corded.

Description – Protoconch small, bulimoid, of 2.75 whorls, coiled nearly at right angle to teleoconch axis, with inflated last whorl and prominent spire extending beyond adapical suture of first teleoconch whorl, in which protoconch is about one fourth immersed; diameter 0.15 mm. Teleoconch small, slenderly turreted, with rather elevated, nearly straight-sided spire, AP 23°, MSA 12°; whorls gently convex, with very narrow subsutural shelf, slightly contracted abapically; sutures impressed, SS 9°. Last whorl ovate-cylindrical, 40-48% of total height depending on growth stage, with rounded periphery; base short, convex, imperforate. Aperture ovate-quadrangular, somewhat produced abapically; outer lip slightly opisthocline, regularly arched, smooth within; columella nearly straight, with oblique, weak, deeply set fold at adapical end. Sculpture of slightly sinuous collabral ribs, 18-19 on first whorl, 15-16 on last whorl, each narrower than one intervening furrow, quickly fading out over upper base; interspaces with 5-8 unevenly spaced spiral cordlets per whorl, most adapical over shoulder and somewhat stronger; base with fine spiral cordlets decreasing in strength downwards. Remnants of spiral microstriation occur throughout.

Remarks – The present new species is characterized by its narrow, subcylindrical teleoconch, its gently convex whorls, and its sculptural characters. The Recent Vietnamese species *Pyrgiscilla cylindrica* Saurin, 1959, belongs in *Nisipyrgiscus* gen. nov. and is the most closely similar species. It differs from *N. javanensis* sp. nov. in having fewer collabral ribs (12 per whorl) and more numerous spiral cordlets (10 per whorl, whereas the cordlets are 5-8 in *N. javanensis*).

***Nisipyrgiscus* sp. 1**
Pl. 19, figs. 5, 6.

Material examined – Kali Rebjong Section, level RMG 6: RGM 606983 (1, Pl. 19, fig. 5), RGM 606984 (1, Pl. 19, fig. 6), RGM 606985 (1). The material consists of rather well preserved juvenile specimens.

Description – Protoconch bulimoid, of 2.75 whorls, with inflated last whorl and prominent spire extending slightly beyond adapical suture of first teleoconch whorl, obliquely lying across the latter (protoconch angle about 75°) and nearly one fourth immersed in it; diameter 0.19 mm. Teleoconch minute, slenderly turreted, with rather elevated, straight-sided spire, SA 10°; whorls gently convex, faintly shouldered, somewhat constricted adapically and slightly contracted abapically; sutures impressed, SS 13°. Last whorl ovate-cylindrical, about 43% of total height, with rounded periphery; base short, moderately convex, imperforate. Aperture teardrop-shaped; outer lip with slight subsutural sinuation, smooth within; columella reflected, nearly straight, with oblique, weak, deeply set fold close to adapical end. Sculpture of slightly opisthocline

collabral ribs, 15-17 on first whorl, 16-19 on last whorl, each markedly narrower than one intervening furrow, forming small nodes at shoulder, fading out over upper base; interspaces with spiral cordlets, 2-3 on earlier whorls, 4-5 on last whorl; base with fine spiral cordlets decreasing in strength downwards.

Remarks – The present form seems nearly constant in its characters, though some variability is noted with regard to the slenderness of the teleoconch, and the number of both axial ribs and spiral cordlets. *Nisipyrgiscus* sp. 1 can be compared only with *Nisipyrgiscus javanensis* sp. nov. (see above), which has a closely similar teleoconch shape. *Nisipyrgiscus* sp. 1 is readily distinguished from *N. javanensis* by its significantly larger protoconch coiled at an angle of about 110° to the teleoconch axis, its adapically constricted whorls and its ribs ending in nodes at the shoulder. The Recent species *Turbonilla theresa* Thiele, 1925, described from Sumatran waters, is superficially similar. However, examination of its holotype (ZMB/Moll 64105) has shown that *T. theresa* differs markedly from *Nisipyrgiscus* sp. 1 in having a shorter protoconch spire, a stronger subsutural row of bead-like nodes and weaker spirals. I am very doubtful whether *T. theresa* belongs in *Nisipyrgiscus*. The considered "Rembangian" specimens likely represent a new species, but more material is required in order to name it.

***Nisipyrgiscus* sp. 2**
Pl. 19, fig. 7.

Material examined – Kali Rebjong Section, level RMG 5: RGM 606986 (1). A rather well preserved juvenile specimen.

Description – Protoconch small, bulimoid, of 2.75 whorls, coiled nearly at right angle to teleoconch axis, with prominent spire extending beyond adapical suture of first teleoconch whorl, in which protoconch is about one fourth immersed; diameter 0.17 mm. Teleoconch minute, oval; spire moderately elevated, with slight, but distinctly stepped, outline, AP 33°; whorls gently convex, with very narrow, gently sloping subsutural shelf; sutures adpressed, SS 13°. Last whorl broadly oval, over 60% of total height, with rounded periphery; base short, moderately convex, imperforate. Aperture ovate-quadrangular; outer lip smooth within; columella reflected, nearly straight, with oblique, very weak, deeply set fold at adapical end. Sculpture of gently arched, opisthocline collabral ribs, 16 per whorl throughout, each slightly narrower than one intervening furrow, quickly fading out over upper base; interspaces with mid-abapical spiral cordlets, 2 on first whorl, 4 on last whorl; base with fine spiral cordlets decreasing in strength downward.

Remarks – The small shell at an early growth stage prevents any reliable comparison with named species.

Genus *Nisiturris* Dall & Bartsch, 1906

Type species – *Turbonilla (Nisiturris) crystallina* Dall & Bartsch, 1906, p. 342, by original designation.

Remarks – *Nisiturris*, introduced as a subgenus of *Turbonilla* Risso, 1826, is herein regarded as a full genus. It is distinguished from the other turbonilline taxa primarily by its peculiar multispiral, bulimoid protoconch with a prominent, pointed spire projecting beyond the adapical suture of the first teleoconch whorl. The larval shell either may be coiled at a right angle to the teleoconch, may be obliquely ascending (angle smaller than 90°) or can be obliquely prostrate (angle greater than 90°). The sculpture, identical to that of *Chemnitzia* d'Orbigny, 1839, as interpreted by various authors (cf. Dall & Bartsch, 1904, 1909; Beu & Maxwell, 1990; Robba *et al*., 2004, 2007) is another significant character. Several species assigned to *Chemnitzia* or *Turbonilla* (*Chemnitzia obliqua* Saurin, 1959; *C. trinquieri* Saurin, 1959; *Turbonilla anfraconvex* Peñas & Rolán, 2010; *T. angustissima* Melvill, 1904; *T. darnleyensis* Brazier, 1877; *T. diezi* Peñas & Rolán, 1997; *T. fluminensis* Pimenta & Absalão, 2004; *T. melvilli* Dautzenberg, 1913; *T. fernandezantoni* Peñas & Rolán, 2010; *T. obliquastructionis* Peñas & Rolán, 2010; *T. ryalli* Peñas & Rolán, 1997, among others) actually belong in *Nisiturris* and expand the distribution of the genus, which appears to be widespread in modern seas.

***Nisiturris alma* (Thiele, 1925) comb. nov.**
Pl. 19, fig. 8; Pl. 20, fig. 1.

1925 *Turbonilla alma* Thiele, p. 288, pl. 17, figs. 20, 20a.
1928 *Turbonilla* spec. 1 Martin, pp. 6, 15.
1931 *Turbonilla* spec. 1 Martin: van der Vlerk, p. 261.
1994 *Turbonilla* spec. 1 Martin: Skwarko & Sufiati, p. x10.

Type material – Holotype of *Turbonilla alma* Thiele, 1925: the specimen figured by Thiele (1925, pl. 17, figs. 20, 20a) and refigured herein (Pl. 19, fig. 8), ZMB/Moll 64095, Padang (Sumatra), Recent.

Other material examined – One of the two specimens recorded by Martin (1928) as *Turbonilla* spec. 1: RGM 606809, Aceh (Sumatra), Late Miocene (Pl. 20, fig. 1). Only the last four whorls are preserved.

Description – Protoconch bulimoid, of about 3 whorls, coiled nearly at right angle to teleoconch axis, with rather inflated last whorl and prominent spire extending beyond the outline of first teleoconch whorl, in which protoconch is scarcely immersed; diameter 0.25 mm. Teleoconch slenderly turriculate, with elevated, straight-sided spire, SA 17°; whorls moderately convex, height about one half diameter, faintly shouldered, slightly contracted both adapically and abapically; sutures impressed, SS 12°. Last whorl ovate-cylindrical, about 28% of total height, with roundly angular periphery; base very short, flatly convex, imperforate. Aperture ovate-quadrangular, height slightly greater than width; outer lip gently arched, more so to merge into basal lip, smooth within; columella nearly straight, moderately reflected, twisted adapically. Sculpture of very slightly opisthocline collabral ribs, 20 per whorl throughout, each nearly as wide as one interspace; ribs and interspaces stop abruptly at periphery; base smooth except for growth markings.

Remarks – The observable characters of Martin's Pliocene specimen agree with those of *Turbonilla alma* Thiele, 1925. The bulimoid larval shell and the absence of spiral sculpture provide the basis for the assignment of *T. alma* to the genus *Nisiturris* Dall & Bartsch, 1906.

Distribution – *Nisiturris alma* is so far known from the Sumatran area (Indonesia), where it ranges in time from Late Miocene to Recent.

***Nisiturris columellaris* sp. nov.**
Pl. 20, figs. 2, 3.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606987 (Pl. 20, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 5: RGM 606988 (1); level RMG 6: RGM 606989 (1, Pl. 20, fig. 3), RGM 606990 (8).

Derivation of name – From Latin *columellaris* = shaped like a small column, with reference to the slender subcylindrical teleoconch.

Preservation – The material consists of variously preserved juvenile specimens.

Diagnosis – Protoconch bulimoid, multispiral, lying across first teleoconch whorl and distinctly ascending. Teleoconch slender, subcylindrical, with straight-sided spire; whorls flatly convex; sutures shallowly impressed. Base convex, short, imperforate. Outer lip smooth within; columella straight, twisted adapically. Sculpture of slightly opisthocline collabral ribs ending abruptly at periphery of last whorl; interspaces and base smooth.

Description – Protoconch bulimoid, of about 3 whorls, coiled at 70° to teleoconch axis, with rather large last whorl and prominent spire extending well beyond adapical suture of first teleoconch whorl, in which protoconch is about one fourth immersed; diameter 0.21 mm. Teleoconch slender, subcylindrical, with elevated, straight-sided spire, SA 7°; whorls flatly convex, faintly shouldered, slightly contracted at abapical one fourth; sutures impressed, SS 15°. Last whorl ovate-cylindrical, about 40% of total height, with rounded periphery; base short, convex, imperforate. Aperture ovate-quadrangular; outer lip gently arched, more so to merge into basal lip, smooth within; columella nearly straight, moderately reflected, twisted adapically. Sculpture of slightly opisthocline collabral ribs, 16-18 per whorl throughout, each almost half width of one interspace, somewhat nodulose at shoulder on earliest whorls; ribs and interspaces stop abruptly just abapical to periphery; base smooth except for growth markings.

Remarks – The present new species is closely similar to *Nisiturris rembangensis* sp. nov. (see below), but is readily distinguished from it by having a less expanded last protoconch whorl, a narrower, subcylindrical teleoconch with smaller mean spiral angle and a different development of the ribs.

***Nisiturris karasensis* sp. nov.**
Pl. 20, figs. 4, 5.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606991 (Pl. 20, fig. 4).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 606992 (2); level RMG 6: RGM 606993 (1, Pl. 20, fig. 5), RGM 606994 (5).

Derivation of name – The name refers to the village of Karas, which is the type locality.

Preservation – The material consists of variously preserved juvenile specimens.

Diagnosis – Protoconch bulimoid, multispiral, prostrate on first teleoconch whorl. Teleoconch slender, turreted, with straight-sided spire; whorls convex; sutures impressed. Base short, flatly convex, imperforate. Outer lip smooth within; columella slightly twisted adapically. Sculpture of orthocline to gently opisthocline collabral ribs ending abruptly at periphery of last whorl; interspaces and base smooth.

Description – Protoconch bulimoid, of 3.25 whorls, coiled at about 110° to teleoconch axis, with inflated last whorl and prominent, rather pointed spire touching adapical suture of first teleoconch whorl and extending beyond it; protoconch almost completely exposed at top of spire; diameter 0.22 mm. Teleoconch slender, turreted, with elevated, straight-sided spire, SA 11°; whorls convex, with periphery about midway between sutures, which are impressed, SS 14°. Last whorl cup-shaped, about 47% of total height, subangular at level of suture; base short, flatly convex, imperforate. Aperture ovate-quadrangular; outer lip arched, more so where merging into basal lip, smooth within; columella moderately reflected, slightly twisted adapically. Sculpture of bluntly topped, orthocline to gently opisthocline collabral ribs; 18-19 ribs on first whorl, 15 on third (last) whorl, not reaching adapical suture, each rib as wide as one interspace or slightly narrower; ribs and interspaces stop abruptly at basal angulation; base smooth except for growth markings.

Remarks – *Nisiturris karasensis* sp. nov. is characterised primarily by its prostrate protoconch with sharply pointed spire. It resembles *Nisiturris rembangensis* sp. nov. (see below) in teleoconch shape and sculpture, but is readily distinguished from the latter

by its protoconch coiled at 110° instead of 67° to the teleoconch axis and its basal angulation. The Recent Vietnamese *Chemnitzia obliqua* Saurin, 1959 (herein transferred to *Nisiturris*), is another allied species differing in having less numerous (ordinarily 12), coarser ribs. Outside the Indo-Pacific, the West African *Turbonilla* sp. (Peñas & Rolán, 1997, figs. 31-33) is similar, but has a differently shaped larval shell (cf. fig. 33) and lacks the basal angulation.

***Nisiturris obliquecostata* sp. nov.**
Pl. 20, figs. 6, 7.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606995 (Pl. 20, fig. 6).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606996 (1, Pl. 20, fig. 7), RGM 606997 (9).

Derivation of name – From Latin *oblique* = obliquely, and *costatus* = ribbed, with reference to the markedly opisthocline ribs.

Preservation – The material consists of variously preserved mostly juvenile specimens.

Diagnosis – Protoconch bulimoid, multispiral, noticeably ascending. Teleoconch slenderly turreted, with straight-sided spire; whorls gently convex; sutures impressed. Base short, moderately convex, imperforate. Outer lip smooth within; columella slightly twisted adapically. Sculpture of markedly opisthocline collabral ribs ending abruptly at periphery of last whorl; interspaces and base smooth.

Description – Protoconch moderately large, bulimoid, of 3.5 whorls, coiled at about 65° to teleoconch axis, with inflated last whorl and prominent, rather pointed spire extending well beyond adapical suture of first teleoconch whorl; larval shell almost completely exposed at top of spire; diameter 0.28 mm. Teleoconch slender, turreted, with elevated, straight-sided spire, SA 11°; whorls convex, with exceedingly narrow subsutural shelf, periphery at abapical one third; sutures impressed, SS 17°. Last whorl cup-shaped, about 46% of total height, with rounded periphery; base short, moderately convex, imperforate. Aperture ovate-quadrangular; outer lip arched, more so at junction with basal lip, smooth within; columella moderately reflected, slightly twisted adapically. Sculpture of slightly sinuous collabral ribs, 14 per whorl throughout, each half to quarter width of one interspace, increasingly opisthocline during growth; ribs and interspaces stop abruptly at periphery of last whorl; base smooth except for growth markings.

Remarks – The present species is similar to *Nisiturris karasensis* sp. nov. (see above) in teleoconch shape, but differs from it by having a markedly smaller protoconch angle (65° instead of 110°) and less numerous, more definitely opisthocline collabral ribs.

***Nisiturris piccolii* sp. nov.**
Pl. 20, figs. 8, 9.

Holotype – Kali Rebjong Section, level RMG 6: RGM 606998 (Pl. 20, fig. 8).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 606999 (1, Pl. 20, fig. 9), RGM 607000 (10).

Derivation of name – The species is named after the late Prof. Giuliano Piccoli (University of Padova), comrade of many geological missions to Indonesia.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – Protoconch bulimoid, multispiral, lying across first teleoconch whorl, moderately ascending. Teleoconch turriculate, with very slightly cyrtoconoid spire; whorls convex, overhanging; sutures impressed. Base convex, short, imperforate. Outer lip smooth within; columella straight. Sculpture of collabral ribs ending abruptly at periphery of last whorl; interspaces and base smooth.

Description – Protoconch bulimoid, of 3 whorls, coiled at 70° to teleoconch axis, with rather large last whorl and prominent spire extending well beyond adapical suture of first teleoconch whorl, in which protoconch is about one fourth immersed; diameter 0.19 mm. Teleoconch turriculate, with elevated, very slightly cyrtoconoid spire, AP 21°, MSA 14°; whorls convex, rather depressed, overhanging, with roundly angular periphery at abapical one fourth, rapidly contracted abapically; sutures impressed, SS 12°. Last whorl cup-shaped, about 35% of total height, with subrounded periphery; base short, convex, imperforate. Aperture oval, somewhat produced abapically; outer lip slightly opisthocline, regularly arched, smooth within; columella straight, moderately reflected. Sculpture of collabral ribs, 17-18 on first whorl, 17-19 on last whorl, each one third width of one interspace, interconnected adapically by one subsutural spiral thread, gradually broadening downwards; ribs and interspaces stop abruptly a little abapical to periphery; base smooth except for growth markings.

Remarks – The described specimens are characterized primarily by their bulimoid, ascending protoconch and their rather depressed, overhanging whorls. *Nisiturris crystallina* Dall & Bartsch, 1906, the type species of *Nisiturris*, is the most closely similar

species, but differs from *N. piccolii* sp. nov. in having the periphery of the whorls about midway between the sutures, a shorter base, and more robust, arched instead of straight collabral ribs separated by narrower interspaces.

***Nisiturris rembangensis* sp. nov.**
Pl. 21, fig. 1.

Holotype – Kali Rebjong Section, level RMG 6: RGM 607001 (Pl. 21, fig. 1).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 607002 (18).

Derivation of name – The name refers to Oostingh's "Rembangian" stage whose stratotype is represented by the Tawun Formation, which yielded the material.

Preservation – The material consists of variously preserved juvenile specimens retaining the larval shell.

Diagnosis – Protoconch bulimoid, multispiral, lying across first teleoconch whorl and clearly ascending. Teleoconch slenderly turriculate, with straight-sided spire; whorls gently convex; sutures impressed. Base convex, short, imperforate. Outer lip smooth within; columella twisted adapically. Sculpture of rather distant collabral ribs ending abruptly just abapical to periphery of last whorl; interspaces and base unsculptured.

Description – Protoconch bulimoid, of slightly more than 3 whorls, coiled at 67° to teleoconch axis, with rather large last whorl and prominent spire extending well beyond adapical suture of first teleoconch whorl, in which protoconch is about one fourth immersed; diameter 0.23 mm. Teleoconch slenderly turriculate, with elevated, straight-sided spire, SA 10°; whorls convex, with rounded periphery at abapical one third, rather quickly contracted abapically; sutures impressed, SS 16°. Last whorl cup-shaped, about 40% of total height, with rounded periphery; base short, convex, imperforate. Aperture ovate-quadrangular, slightly produced at junction of basal and inner lips; outer lip arched, moderately opisthocline, smooth within; columella gently curved, reflected, twisted adapically. Sculpture of very slightly opisthocline collabral ribs, each one third width of one interspace, forming small subsutural nodes on first whorl, interconnected adapically by one fine subsutural spiral thread on subsequent whorls; 18 ribs on first whorl, 15-16 on fifth (last) whorl; ribs and interspaces stop abruptly a little abapical to periphery; base smooth except for rather coarse growth markings.

Remarks – *Nisiturris rembangensis* sp. nov. closely resembles the Recent Sumatran species *Turbonilla susanna* Thiele, 1925, in protoconch characters and teleoconch shape.

Examination of a syntype (ZMB/Moll 64031) of *T. susanna* shows that this species differs in having a greater spiral angle, more convex whorls with the periphery about midway between the sutures, coarser, less numerous ribs and broader interspaces with fine spiral threads. The latter character supports the assignment of Thiele's species to *Nisipyrgiscus* gen. nov.

***Nisiturris supramarginata* sp. nov.**
Pl. 21, figs. 2, 3.

Holotype – Kali Rebjong Section, level RMG 6: RGM 607003 (Pl. 21, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 607004 (4); level RMG 6: RGM 607005 (1, Pl. 21, fig. 3), RGM 607006 (10).

Derivation of name – From Latin *supra* = above, and *marginatus* = margined, with reference to the distinct subsutural margining of the whorls.

Preservation – The material consists of variously preserved juvenile and adult specimens, most retaining the larval shell.

Diagnosis – Protoconch bulimoid, multispiral, lying across first teleoconch whorl, moderately ascending. Teleoconch slenderly turriculate, with straight-sided spire; whorls rather depressed, gently convex, with weak subsutural margining; sutures impressed. Base convex, short, imperforate. Outer lip smooth within; columella slightly twisted adapically. Sculpture of rather distant collabral ribs fading out rapidly over uppermost base; interspaces and mid-lower base unsculptured.

Description – Protoconch bulimoid, of 3.5 whorls, coiled at about 80° to teleoconch axis, with prominent, blunt-topped spire extending beyond adapical suture of first teleoconch whorl, in which protoconch is scarcely immersed; diameter 0.19 mm. Teleoconch narrowly turriculate, with elevated, straight-sided spire, SA 9°; whorls gently convex, slightly constricted adapically to form weak, but distinct, subsutural margining, contracted below periphery, which is placed at abapical one third and slightly overhanging; sutures impressed, SS 14°. Last whorl cup-shaped, about 35% of total height, with rounded periphery; base rather short, convex, imperforate. Aperture ovate-quadrangular, slightly produced abapically; outer lip arched, smooth within; columella straight, reflected, twisted adapically. Sculpture of straight to slightly sinuous, moderately opisthocline collabral ribs, 14 per whorl throughout in most specimens, each narrower than one interspace; ribs and interspaces fading away rapidly over uppermost base; base smooth except for growth markings.

Remarks – *Nisiturris supramarginata* sp. nov. is characterized by the subsutural margining of the whorls, and by the termination of ribs and interspaces, which fade away rapidly over uppermost base. The Recent species *Turbonilla fernandezantoni* Peñas & Rolán, 2010, described from the Solomon Islands, has a bulimoid protoconch and belongs in *Nisiturris*. *Nisiturris fernandezantoni* is similar to *N. supramarginata*, but differs from it by having a more ascending, 2.5-whorled protoconch, a wider spiral angle, more convex whorls and 12 instead of 14 collabral ribs per whorl.

***Nisiturris* sp.**
Pl. 21, fig. 4.

Material examined – Sumberan: RGM 607007 (1, Pl. 21, fig. 4), RGM 607008 (1). The specimens are incomplete.

Description – Protoconch damaged, large, clearly bulimoid, of at least 3 whorls, coiled nearly at right angles to teleoconch axis, with rather broad last whorl and prominent spire extending beyond adapical suture of first teleoconch whorl; protoconch about one fourth immersed in first teleoconch whorl; diameter 0.43 mm. Teleoconch turriculate, with elevated, straight-sided spire, SA 14°; whorls convex, moderately depressed, with periphery placed about midway between sutures, which are impressed, SS 14°. Last whorl cup-shaped, approximately 35% of total height, transition to base angular; base very short, almost flat, imperforate. Aperture subquadrangular; outer lip rather thick, slightly opisthocline, smooth within; parietal lip coated with thin callus; columella straight, slightly twisted. Sculpture of moderately opisthocline collabral ribs, 25 on first whorl, 16 on last whorl, each slightly narrower than one interspace, gently broadening downwards; ribs and interspaces stop abruptly at transition to base; base smooth except for growth markings.

Remarks – *Nisiturris* sp. is close to *Nisiturris alma* (Thiele, 1925) from which it differs in having a significantly greater protoconch (nearly twice the diameter) and different number of ribs (*N. alma* has 20 ribs per whorl throughout). It somewhat resembles *Nisiturris piccolii* sp. nov. in general teleoconch shape, but is distinguished from *N. piccolii* by its protoconch, which is coiled at a right angle to the teleoconch axis, its strongly convex whorls with a median instead of abapical periphery, its flatter base bounded by an angulation and its different development of the collabral ribs. The similarly shaped and sculptured species *Turbonilla diezi* Peñas & Rolán, 1997, described from west African waters, differs in having a significantly smaller, prostrate protoconch and 16 collabral ribs per whorl throughout.

Genus *Pyrgiscus* Philippi, 1841

Type species – *Melania rufa* Philippi, 1836, by subsequent designation (Dall *in* Arnold, 1903, p. 274). *Melania rufa* is conspecific with *Pyramis crenatus* Brown, 1827 (van Aartsen, 1981; Fretter *et al*., 1986).

Remarks – According to Schander *et al*. (1999a), *Ortostelis* Aradas & Maggiore, 1841 (*Orthostelis* Philippi, 1844, and *Orthostelis* Paetel, 1875, are errors for *Ortostelis*), and *Pyr-*

gostelis Monterosato, 1884, have the same type species as *Pyrgiscus* and are synonyms of it. Laws (1937c) introduced the new genus *Pyrgiscilla* to include species that fully conform to the characters of *Pyrgiscus*, but have ribs and interspaces ending abruptly at the periphery of the last whorl. He selected *Turbonilla (Strioturbonilla) chattonensis* Marwick, 1929, as type species of *Pyrgiscilla*. From Marwick's thorough description and quite informative illustration of *T. chattonensis* (Marwick, 1929, p. 920, figs. 52, 53, 57, 61), it appears that this species, except for the base devoid of axials, shares all the relevant protoconch and teleoconch characters with *Melania rufa*. Van Aartsen (1981, p. 63) considered "the abrupt closure of the interspaces between the axial ribs" as not being "a good character". In the opinion of the present author, the cited character may serve to distinguish species, but has no significance at the genus level. Accordingly, *Pyrgiscilla* is herein regarded as another synonym of *Pyrgiscus*.

On the basis of the type species and of those confidently assigned to *Pyrgiscus*, the distinguishing character of the genus can be summarized as follows: protoconch umboniiform, rather globular, of 2-2.5 rapidly expanding whorls, the apex very slightly protruding or not protruding at all; teleoconch turriculate, whorls moderately convex to straight-sided, suture impressed; base imperforate; interior of the outer lip smooth in some species, with variably robust teeth or riblets in other species; columella nearly straight, slightly twisted adapically, with a weak fold in some species; and sculpture of collabral ribs (either continuous onto the base or stopping at the periphery of the last whorl), interspaces with spiral cordlets or narrow bands, base with spirals of various strength.

***Pyrgiscus apiciglobosus* sp. nov.**
Pl. 21, fig. 5.

Holotype – Kali Rebjong Section, level RMG 3: RGM 607009 (Pl. 21, fig. 5).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 607010 (6); level RMG 6: RGM 607011 (5).

Derivation of name – From Latin *apex* = tip, and *globosus* = globular, with reference to the inflated protoconch.

Preservation – The material consists of variously preserved, mostly juvenile specimens.

Diagnosis – Protoconch umboniiform, globular, scarcely immersed. Teleoconch turreted, subcylindrical, with straight-sided spire; whorls flat-sided, sutures shallowly impressed. Base short, moderately convex, imperforate. Outer lip with 3 thin, interior spiral riblets; columella with very weak adapical fold. Sculpture of straight collabral ribs,

slightly narrower than interspaces, gradually fading out over upper base; interspaces and base with low spiral cordlets.

Description – Protoconch umboniiform, large and globular, of 2.75 rapidly expanding whorls, with flat spire, coiled nearly at right angle to teleoconch, one fourth immersed in first whorl of teleoconch; diameter 0.35 mm. Teleoconch slenderly turreted, with elevated, straight-sided spire, SA 10°; whorls flat-sided, very slightly constricted in the middle; sutures shallowly impressed, SS 17°. Last whorl ovate-cylindrical, about 50% of total height, with rounded periphery; base short, moderately convex, imperforate. Aperture ovate-quadrangular, slightly produced abapically; outer lip straight, orthocline, with 1 adapical and 2 basal, deeply set inner spiral riblets, observable only in larger specimens; columella moderately reflected, with very weak, markedly oblique fold at adapical end. Sculpture of straight, orthocline collabral ribs, 18-19 per whorl throughout, each about half width of one interspace, gradually fading out over upper base; interspaces and base with low spiral cordlets, separated by variably narrow, shallow grooves, finer to indistinct on lowermost base.

Remarks – The large, globular protoconch, the subcylindrical teleoconch, the flat-sided whorls and the 3 palatal riblets readily distinguish *Pyrgiscus apiciglobosus* sp. nov. from the other *Pyrgiscus* species described so far. The Recent South Pacific species *Turbonilla hebridarum* Peñas & Rolán, 2010, agrees with the characters of *Pyrgiscus* and is herein assigned to this genus. *Pyrgiscus hebridarum* somewhat resembles *P. apiciglobosus*, but is separated from it by having a less globular, significantly smaller protoconch, a narrower teleoconch with slightly cyrtoconoid instead of straight-sided spire, no columellar fold and the outer lip devoid of interior spiral riblets.

***Pyrgiscus dentatus* sp. nov.**
Pl. 21, fig. 6.

Holotype – Kali Rebjong Section, level RMG 3: RGM 607012 (Pl. 21, fig. 6).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 607013 (6); level RMG 6: RGM 607014 (1).

Derivation of name – From Latin *dentatus* = provided with teeth, with reference to the robust palatal teeth.

Preservation – The material consists of juvenile specimens, generally with damaged outer lip.

Diagnosis – Protoconch umboniiform, rather globular, scarcely immersed. Teleoconch turreted, with straight-sided spire; whorls flat-sided with very narrow subsutural shelf,

sutures shallowly impressed. Base short, moderately convex, imperforate. Outer lip with 4 inner spiral riblets, each ending in a prominent tooth; columella with very weak, obtuse adapical fold. Sculpture of collabral ribs, narrower than interspaces, gradually fading out over upper-mid base; interspaces and base with low spiral cordlets.

Description – Protoconch umboniiform, rather globular, of 2.5 rapidly expanding whorls, with flat spire, coiled nearly at right angles to teleoconch and one fourth immersed in first whorl of teleoconch; diameter 0.26 mm. Teleoconch turreted, with elevated, straight-sided spire, SA 14°; whorls flat-sided, with very narrow subsutural shelf, slightly contracted abapically; sutures shallowly impressed, SS 13°. Last whorl ovate-cylindrical, about 50% of total height, with rounded periphery; base short, convex, imperforate. Aperture ovate-quadrangular, slightly produced abapically; outer lip straight, orthocline, with 4 interior spiral riblets, each ending in a raised, elongate tooth well inside peristome; columella reflected, with very weak, obtuse fold at adapical end; parietal lip coated with thin callus. Sculpture of slightly flexuous, very gently opisthocline collabral ribs, 17 on first whorl, 19 on fifth (last) whorl, each slightly narrower than one interspace, gradually fading out over upper-mid base; interspaces with 5-7 narrow spiral cordlets not overriding ribs; base also with spiral cordlets, those on uppermost base coarser, others increasingly finer downwards.

Remarks – *Pyrgiscus dentatus* sp. nov. appears to be closely similar to *Pyrgiscus apiciglobosus* sp. nov. (see above). *Pyrgiscus apiciglobosus* is readily distinguished from *P. dentatus* by its significantly larger, more globular protoconch, its narrower teleoconch with a smaller spiral angle, its distinctive location and number (3 instead of 4) of palatal riblets, which lack the final tooth, and in details of the sculpture. The syntypes (ZMB/Moll 64109) of the Recent Sumatran species *Turbonilla irma* Thiele, 1925, agree with the characters of *Pyrgiscus*. Thiele's species is similar to *P. dentatus* in terms of teleoconch shape, but differs from it in having a significantly larger protoconch, less numerous ribs (14 instead of 19 on the fifth whorl) and more closely spaced spiral cordlets, which are twice numerous as those of *P. dentatus*.

***Pyrgiscus junghuhni* (Martin, 1906) comb. nov.**

Pl. 21, fig. 7.

1906 *Turbonilla junghuhni* Martin, p. 322, pl. 45, fig. 745.
1931 *Turbonilla junghuhni* Martin: van der Vlerk, p. 261.
1994 *Turbonilla junghuhni* Martin: Skwarko & Sufiati, p. x8.
2002 *Turbonilla junghuhni* Martin: van den Hoek Ostende *et al*., p. 82.
2009 *Turbonilla junghuhni* Martin: Leloux & Wesselingh, p. 42, pl. 84, figs. 1, 2.

Type material – Holotype of *Turbonilla junghuhni* Martin: the specimen figured by Martin (1906, pl. 45, fig. 745) and refigured herein (Pl. 21, fig. 7), RGM 11497, Junghuhn locality K, western part of Cidamar (Java), Miocene. A specimen lacking the protoconch, but otherwise rather well preserved.

Description – On basis of scar at top of spire, protoconch apparently umboniiform. Teleoconch turriculate, with elevated, very slightly cyrtoconoid spire, AP 26°, MSA 15°;

whorls rather high, flatly convex, with an exceedingly narrow, subhorizontal subsutural shelf; sutures adpressed, SS 10°. Last whorl cylindrical-ovate, approximately 32% of total height, with rounded periphery; base convex, imperforate. Aperture ovate-quadrangular, filled with matrix; outer lip orthocline, straight adapically then arched in mid-abapical part, apparently smooth within (no grooves on partly exposed internal mould); columella bent adaxially, distinctly twisted at its adapical end. Sculpture of low, unevenly spaced collabral ribs, 21 per whorl throughout, narrower subsuturally, fading out on upper base; except for smooth adapical band, narrow, shallow spiral grooves present in interspaces and on base; lowermost base smooth.

Remarks – The present species is assigned to *Pyrgiscus* only provisionally. The Japanese species *Pyrgiscus miyakoensis* (Nomura, 1939) attains the same size and seems to be the most closely similar species, differing in having a narrower teleoconch and more numerous collabral ribs.

Distribution – *Pyrgiscus junghuhni* is known only by the holotype.

Pyrgiscus martini **comb. nov., nom. nov.**
Pl. 22, fig. 1.

1884 *Turbonilla scalaris* Martin, p. 162, pl. 8, fig. 158.
1931 *Turbonilla scalaris* Martin: van der Vlerk, p. 261.
1994 *Turbonilla scalaris* Martin: Skwarko & Sufiati, p. x9.
2002 *Turbonilla scalaris* Martin: van den Hoek Ostende *et al*., p. 82.
2009 *Turbonilla scalaris* Martin: Leloux & Wesselingh, p. 42, pl. 84, figs. 5, 6.

Type material – Holotype of *Turbonilla scalaris* Martin: the specimen figured by Martin (1884, pl. 8, fig. 158) and refigured herein (Pl. 22, fig. 1), RGM 11496, Ngembak Borehole B (Semarang area, Java), 104-112 m, Early Miocene. Except for the damaged protoconch, the preservation is fair.

Description – Protoconch apparently small, umboniiform. Teleoconch elongate-oval, with moderately elevated, slightly cyrtoconoid spire, AP 42°, MSA 22°; whorls rather high, nearly flat-sided, clearly shouldered, with narrow, subhorizontal subsutural shelf producing stepped outline; sutures adpressed, SS 14°. Last whorl cylindrical-ovate, 55% of total height, with rounded periphery; base convex, rather short, imperforate. Aperture elliptical, somewhat produced abapically; outer lip regularly arched, smooth within; parietal lip coated with thin callus; columella bent adaxially, with weak, markedly oblique fold close to adapical end. Sculpture of straight, orthocline collabral ribs, 19 on earlier whorls, 21 on last whorl, each half width of one interspace, ending in low nodes at shoulder and fading out over lower base; interspaces with even spiral cordlets, 5 on first whorls, 7 on last whorl, 5 on mid-upper base; lowermost base smooth.

Remarks – Philippi (1836) introduced *Melania scalaris*, which is a primary homonym of *Melania scalaris* Spix *in* Wagner, 1827. Van Aartsen (1987b) noted that "the correct name for Philippi's species becomes *Turbonilla (Pyrgiscus) jeffreysi* (Jeffreys, 1848), not

Forbes & Hanley as sometimes cited". From the assignment of *M. scalaris* Philippi to *Pyrgiscus*, the name *Pyrgiscus scalaris* Martin is a secondary homonym of *M. scalaris* Philippi (International Commission on Zoological Nomenclature, 1999, Article 57.3.1). Consequently, the new replacement name *Pyrgiscus martini* is proposed herein. The Recent West Pacific species *Pyrgiscus mumia* (Adams, 1861) is the most closely similar species, differing in having a narrower teleoconch with fewer ribs on earlier whorls.

Distribution – *Pyrgiscus martini* is known only by the holotype.

***Pyrgiscus* sp. 1**
Pl. 22, figs. 2, 3.

Material examined – Kali Rebjong Section, level RMG 5: RGM 607015 (1; Pl. 22, fig. 2), RGM 607016 (1; Pl. 22, fig. 3); level RMG 6: RGM 607017 (1). The material consists of rather well preserved juvenile specimens comprising the larval shell and the first 3 teleoconch whorls.

Description – Protoconch umboniiform, rather small, of 2.25 rapidly expanding whorls, with flat spire, coiled nearly at right angle to teleoconch and one fourth immersed in first teleoconch whorl; diameter 0.18 mm. Teleoconch turreted, subcylindrical, with elevated, straight-sided spire, SA 11°; whorls flat-sided, distinctly constricted medially and slightly contracted both adapically and abapically; sutures impressed, SS 13°. Last whorl ovate-cylindrical, slightly more than 50% of total height, with rounded periphery; base convex, imperforate. Aperture oval; outer lip smooth within; columella reflected, with weak, deeply set adapical fold; parietal lip coated with a rather thick callus. Sculpture of straight, orthocline collabral ribs, 16 per whorl throughout, each equal in width to one interspace, gradually fading out over base; interspaces and base with narrow spiral cordlets, 7 increasing to 9 on spire whorls.

Remarks – The very early growth stage of the specimens in hand precludes any comment about the similarity to the various *Pyrgiscus* species dealt with in the literature.

***Pyrgiscus* sp. 2**
Pl. 22, figs. 4, 5.

Material examined – Kali Rebjong Section, level RMG 6: RGM 607018 (1; Pl. 22, fig. 4). Locality RMG 2: RGM 607019 (1; Pl. 22, fig. 5). Sumberan: RGM 607020 (2). The material consists of adult specimens lacking the protoconch and part of the spire whorls.

Description – Teleoconch turriculate, apparently of many whorls, with elevated, straight-sided spire, SA 10°; whorls flat-sided, somewhat depressed, distinctly constricted above middle and slightly contracted both adapically and abapically; sutures shallowly impressed, SS 14°. Last whorl ovate-cylindrical, with broadly rounded periphery; base convex, imperforate. Aperture oval; outer lip with 2 adapical and 2 abapical inner spiral riblets; columella reflected, with distinct, thin, markedly oblique adapical fold; parietal wall coated with thin film of callus. Sculpture of straight, orthocline

collabral ribs, 17 on first preserved whorl, 21 on last whorl, each one third width of one interspace, narrower at level of submedian constriction, gradually fading out over base; interspaces and base with narrow spiral cordlets, 11 increasing to 13 on later spire whorls, more than 10 gradually becoming narrower downward on base.

Remarks – The present specimens are unlike any spirally sculptured turbonilline species and likely represent an undescribed species, but more, better preserved material is needed in order to name it. The protoconch being unknown, the generic assignment is made with some reservation.

Turbolidium gen. nov.

Type species – *Turbonilla (Strioturbonilla) schroederi* Wissema, 1947.

Derivation of name – The name of the genus reflects the fact that it combines characters of *Turbonilla* (protoconch) and *Pyrgolidium* (sculpture).

Diagnosis – Protoconch helicoid, of 2-2.5 whorls, coiled nearly at right angles to teleoconch axis, with moderately prominent, obtuse spire, blunt apex tangential to adapical suture of first teleoconch whorl or very slightly projecting beyond it. Teleoconch elongate-oval to turriculate, with variably convex whorls, sutures impressed. Last whorl narrowly or broadly oval; base rather quickly tapering, imperforate. Aperture small, ovate-quadrangular to oval; interior of outer lip smooth, columella gently arched, scarcely twisted adapically. Sculpture of collabral ribs that either stop abruptly at periphery of last whorl or fade away on upper-mid base; interspaces with 1-3 variously placed spiral cordlets and spiral microgrooves in some species; base with or without spirals.

Remarks – Monterosato (1884, p. 89) introduced *Pyrgolidium* and designated *Chemnitzia internodula* Wood, 1848, as type species. *Turbonilla rosea* Monterosato, 1877, subsequently indicated as the type species of *Pyrgolidium* by Dall & Bartsch (1904), is a junior synonym of *C. internodula* (Micali & Ghisotti, 1981; Carrozza & Nofroni, 1993). The type species of *Pyrgolidium* was illustrated excellently by Peñas & Rolán (1997, figs. 103-105) and commented on by Micali & Ghisotti (1981). From these references, it appears that *C. internodula* is similar to *Turbonilla schroederi* in having 1-2 spiral cordlets, but possesses an umboniiform, rather globose protoconch obliquely lying on the first teleoconch whorl; it is thus markedly different from the helicoid one of Wissema's species. Since *T. schroederi* does not fit in satisfactorily with the characters of any other pyramidelloidean genus, I am forced to create the new genus *Turbolidium*, whose distinguishing characters are intermediate between those of *Turbonilla* Risso, 1826, and those of *Pyrgolidium*. The teleoconch of *Turbolidium schroederi* exhibits a superficial resemblance to that of *Trabecula jeffreysiana* Monterosato, 1884, type species of the chrysallidine genus *Trabecula* Monterosato, 1884. However, *Trabecula jeffreysiana* differs markedly from *Turbolidium schroederi* by having a type B protoconch (*T. schroederi* has a type A larval shell) and the teleoconch devoid of spiral sculpture. These characters clearly

distinguish *Turbolidium* from *Trabecula*. The species *Turbonilla unilirata* Bush, 1899, *Tragula unilirata* Saurin, 1959, *Turbonilla franciscoi* Peñas & Rolán, 1997, *Turbonilla qenenoji* Peñas & Rolán, 2010, and *Pyrgiscilla* sp. illustrated by Robba *et al*. (2004) belong in *Turbolidium* gen. nov.

***Turbolidium schroederi* (Wissema, 1947) comb. nov.**
Pl. 22, fig. 6.

1947 *Turbonilla (Strioturbonilla) schroederi* Wissema, p. 81, pl. 3, fig. 96.

Type material – Holotype of *Turbonilla schroederi* Wissema: the specimen figured by Wissema (1947, pl. 3, fig. 96) and refigured herein (Pl. 22, fig. 6), RGM 606810, Schroeder collection, Nias Island (Sumatra), locality 39, Pleistocene. The specimen is fairly well preserved.

Description – Protoconch rather small, helicoid, of 2 whorls, coiled nearly at right angles to teleoconch axis, with bluntly rounded apex tangential to adapical suture of first teleoconch whorl, in which protoconch is about one third immersed; diameter 0.19 mm. Teleoconch elongate-oval, somewhat turreted, with elevated, slightly cyrtoconoid spire, AP 36°, MSA 18°; whorls convex, with periphery at abapical one third; sutures impressed, SS 15°. Last whorl oval, about 25% of total height; base rather short, convex, imperforate. Aperture ovate-quadrangular, somewhat produced at junction of basal and inner lips; outer lip smooth within; columella moderately reflected, scarcely twisted adapically. Sculpture of slightly flexuous collabral ribs, orthocline on earlier whorls, gently opisthocline on later ones; 19 ribs on first whorl, 17 on last whorl, each narrower than one interspace, abruptly reduced in width at level of suture, fading out over mid base; interspaces with distant spiral microgrooves and abapical spiral cordlets, 1 on earlier whorls, second one emerging from suture by third whorl, third visible on last whorl at level of suture; mid-lower base smooth.

Remarks – The sculpture is the most relevant character of Wissema's species. The Recent Vietnamese species *Tragula unilirata* Saurin, 1959, appears to be similar, but differs in having a single abapical spiral cordlet and 3 basal spirals.

Distribution – *Turbolidium schroederi* is so far known only by the holotype.

Genus *Turbonilla* Risso, 1826

Type species – Risso (1826) listed and briefly described three species under *Turbonilla*, that is, *Turbonilla plicatula* Risso, 1826, *Turbonilla costulata* Risso, 1826, and *Turbonilla gracilis* (Philippi, 1844). Subsequently, Herrmannsen (1852, p. 136) designated *T. costulata* as the type species of *Turbonilla*. Dall & Bartsch (1904, p. 4), evidently unaware of Herrmannsen's designation, invalidly selected as type species *T. plicatula* (the first listed by Risso) and renamed it *Turbonilla typica* since they thought that the name *plicatula* was preoccupied. *Turbonilla costulata* is regarded as a junior synonym of *Turbo lacteus* Linnaeus, 1758 (Monterosato, 1884; Schander *et al*., 1999a).

Remarks – Van Aartsen (1981, p. 75) demonstrated that *Melania campanellae* Philippi, 1836, type species by monotypy of *Chemnitzia* d'Orbigny, 1839, is another junior synonym of *Turbo lacteus*. On this basis, *Chemnitzia* is a synonym of *Turbonilla*. The intercostal spaces stopping abruptly at the periphery of the last whorl, previously considered to be the distictive character of *Chemnitzia* (Dall & Bartsch, 1904; Laws, 1937b; Laseron, 1959), by themselves appear to be of little generic significance. Species showing this character may belong either to *Nisiturris* or to *Turbonilla* depending on the protoconch type (multispiral, bulimoid, with prominent, pointed spire projecting beyond the outline of the first teleoconch whorl in *Nisiturris*; helicoid, with shorter, obtuse spire in *Turbonilla*). According to Schander *et al*. (1999a), *Cyrtoturbonilla* Nordsieck, 1972, and *Variturbonilla* Nordsieck, 1972, are further synonyms of *Turbonilla*.

***Turbonilla karasensis* sp. nov.**
Pl. 22, figs. 7, 8.

Holotype – Kali Rebjong Section, level RMG 6: RGM 607021 (Pl. 22, fig. 7).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 607022 (1; Pl. 22, fig. 8), RGM 607023 (7).

Derivation of name – The name refers to the village of Karas, which is the type locality.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – Protoconch helicoid, with rather elevated, blunt-topped spire. Teleoconch turriculate, with nearly straight-sided spire; whorls convex; sutures impressed. Base short, almost flat, imperforate. Aperture markedly produced abapically; outer lip smooth within; columella straight, scarcely twisted adapically. Sculpture of very slightly opisthocline collabral ribs, each half width of one interspace, abruptly stopping at periphery of last whorl; base smooth.

Description – Protoconch rather small, helicoid, of 2.25 whorls, with moderately prominent, blunt-topped spire extending beyond adapical suture of first teleoconch whorl, in which protoconch is one fifth immersed; protoconch angle about 90°; diameter 0.17 mm. Teleoconch turriculate, with elevated, nearly straight-sided spire, AP 22°, MSA 13°; whorls convex, with rounded periphery at abapical one fourth, slightly overhanging in some specimens; sutures impressed, SS 13°. Last whorl cup-shaped, about 37% of total height, with roundly angular periphery; base short, almost flat, imperforate. Aperture ovate-quadrangular, markedly produced abapically; outer lip

gently arched, smooth within; columella straight, only slightly twisted adapically; parietal lip coated with a thin callus. Sculpture of flat-topped, slightly opisthocline collabral ribs, 13-14 per whorl throughout, each half width of one interspace; ribs and interspaces stop abruptly at periphery of last whorl; base smooth except for growth markings.

Remarks – *Turbonilla karasensis* sp. nov. superficially resembles *Nisiturris rembangensis* sp. nov., described above. *Turbonilla karasensis* is readily distinguished from *N. rembangensis* primarily by its significantly smaller, helicoid protoconch of 2.25 whorls (that of *N. rembangensis* is bulimoid, of more than 3 whorls); moreover, *N. rembangensis* has differently developed, more numerous collabral ribs.

Turbonilla sindangbaranensis Martin, 1906
Pl. 23, fig. 1.

1906 *Turbonilla sindangbaranensis* Martin, p. 322, pl. 45, fig. 746.
1931 *Turbonilla sindangbaranensis* Martin: van der Vlerk, p. 261.
1994 *Turbonilla sindangbaranensis* Martin: Skwarko & Sufiati, p. x9.
2002 *Turbonilla sindangbaranensis* Martin: van den Hoek Ostende *et al*., p. 82.
2009 *Turbonilla sindangbaranensis* Martin: Leloux & Wesselingh, p. 42, pl. 84, figs. 7, 8.

Type material – Holotype of *Turbonilla sindangbaranensis* Martin: the specimen figured by Martin (1906, pl. 45, fig. 746) and refigured herein (Pl. 23, fig. 1), RGM 11498, Junghuhn locality K, western part of Cidamar (Java), Miocene. The specimen is incomplete and badly worn.

Remarks – Nothing can be added to Martin's description because of the poor state of preservation of the holotype. The assignment of *T. sindangbaranensis* to the genus *Turbonilla* Risso, 1826, made by former authors is retained herein provisionally, since the generic characters are not visible.

Distribution – The species is known only by the holotype.

Turbonilla tawunensis sp. nov.
Pl. 23, fig. 2.

Holotype – Kali Rebjong Section, level RMG 6: RGM 607024 (Pl. 23, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 607025 (12).

Derivation of name – The name refers to the Tawun Formation that yielded the present new species.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – Protoconch helicoid, blunt-spired. Teleoconch slenderly turreted, with nearly straight-sided spire; whorls flat-sided, slightly constricted medially; sutures impressed. Base convex, imperforate. Outer lip smooth within; columella straight, slightly twisted adapically. Sculpture of gently opisthocline collabral ribs, each equal to or slightly narrower in width than one interspaces, fading out over base; whole surface with distinct axial microfolds.

Description – Protoconch helicoid, of 2.5 whorls, with large, depressed last whorl and blunt spire leaning against adapical suture of first teleoconch whorl; protoconch angle approximately 110°; diameter 0.20 mm. Teleoconch narrowly turreted with elevated, nearly straight-sided spire, AP 25°, MSA 12°; first whorl convex, subsequent ones flat-sided, with very narrow subsutural shelf, slightly constricted in the middle, moderately contracted abapically; sutures impressed, SS 16°. Last whorl ovate-cylindrical, about 40% of total height; base convex, imperforated. Aperture ovate-quadrangular, somewhat produced abapically; outer lip straight, smooth within; columella also straight, reflected, slightly twisted adapically; parietal lip coated with callus. Sculpture of straight, gently opisthocline collabral ribs, 17 on first whorl, 14-15 on last whorl, each equal to or slightly narrower than width of one interspace, somewhat narrower medially, slowly widening downward, fading out over upper or mid base; distinct axial microfolds present throughout.

Remarks – *Turbonilla tawunensis* sp. nov. is reminiscent of *Exesilla* because of the median constriction of the whorls, but the protoconch shape and the absence of a columellar fold firmly point toward the assignment to *Turbonilla*. The Recent South Pacific species *T. sanjuani* Peñas & Rolán, 2010, has similarly shaped teleoconch with median constriction of the whorls, but is distinguished from *T. tawunensis* by its collabral ribs fading out suddenly at the periphery of the last whorl (the ribs extend to upper or mid base in *T. tawunensis*).

***Turbonilla* sp. 1**
Pl. 23, fig. 3.

Material examined – Kali Rebjong Section, level RMG 3: RGM 607026 (1; Pl. 23, fig. 3), RGM 607027 (2). All specimens are juvenile, damaged to varying degrees.

Description – Protoconch rather small, helicoid, of 2.25 whorls, with blunt apex tangential to adapical suture of first teleoconch whorl, in which protoconch is scarcely immersed; protoconch angle about 100°; diameter 0.18 mm. Teleoconch turreted, moderately slender, with straight-sided spire, SA 10°; first whorl convex, subsequent ones flat-sided, somewhat constricted medially and slightly contracted abapically; sutures shallowly impressed, SS 13°. Last whorl ovate-cylindrical, approximately 50% of total height, with rounded periphery; base convex, rather short, imperforate. Aperture elongate-oval, produced abapically; outer lip smooth within; columella moderately reflect-

ed, clearly twisted; parietal lip coated with thin callus. Sculpture of slightly opisthocline collabral ribs, 19 on first whorl, 17 on fifth (last) whorl, broader than interspaces, fading out over upper base.

Remarks – These "Rembangian" specimens seem not to fit satisfactorily with the characters of any *Turbonilla* species described in the literature. They likely represent a new species, but must await the recovery of better-preserved specimens.

***Turbonilla* sp. 2**
Pl. 23, fig. 4.

Material examined – Kali Rebjong Section, level RMG 6: RGM 607028 (1; Pl. 23, fig. 4), RGM 607029 (4). The material consists of rather well preserved juvenile specimens.

Description – Protoconch helicoid, of 2.25 whorls, with short, blunt spire extending slightly beyond adapical suture of first teleoconch whorl, in which protoconch is scarcely immersed; protoconch angle about 100°; diameter 0.18 mm. Teleoconch turreted, with slightly cyrtoconoid, somewhat stepped spire, AP 30°, MSA 18°; first two whorls convex, subsequent ones increasingly less so, distinctly shouldered and with narrow, gently sloping subsutural shelf; sutures impressed, SS 10°. Last whorl oval, about 50% of total height, with rounded periphery; base convex, rather short, imperforate. Aperture elongate-oval, produced abapically; outer lip smooth within; columella reflected, clearly twisted; parietal lip coated with thin callus. Sculpture of slightly opisthocline collabral ribs, each equal in width to one interspace, stopping abruptly at periphery of last whorl; ribs obsolescent on first half whorl, 19 present on subsequent whorl, 14 on fourth and fifth (last) whorl; base with uneven growth markings.

Remarks – The present form differs from the closely similar *Turbonilla* sp. 1 (see above) by having a greater spiral angle, more distinctly shouldered whorls and a different development of collabral ribs; moreover, the ribs stop abruptly at the periphery, whereas those of *Turbonilla* sp. 1 fade away over the upper base.

Subfamily Eulimellinae Saurin, 1958
Genus *Bacteridiella* Saurin, 1959

Type species – *Bacteridiella filiformis* Saurin, 1959, p. 275, by monotypy.

Remarks – Saurin (1959, p. 274) described his new genus quite succinctly as having a very small, cylindrical, smooth teleoconch with a very large protoconch. He also pointed out that *Bacteridiella* resembles *Bacteridium* Thiele, 1931 (*sic*) [=1929], but differs in that it lacks the spiral striation of the latter. Actually, these taxa can be distinguished from one another primarily by the markedly different characters their larval shells. *Bacteridiella* possesses a depressed-helicoid, exsert protoconch of 2.5-3 whorls, whereas the species of *Bacteridium* Thiele, 1929, have a helicoid, curl-like protoconch of 1.5 whorls (cf. Schander, 1994; Pimenta & Absalão, 2001). The protoconch of *Bacteridiella* was said to be "volumineux". It hardly exceeds 0.30 mm in diameter, but appears to be very large

since it is always higher than the first teleoconch whorl and often extends beyond the sides of the latter (see Pl. 23, figs. 5b, 6a). The absence of spiral striation mentioned by Saurin is disregarded here as a diagnostic character (see the chapter on taxonomic relevance of shell characters). Schander (1994, text-fig. 16) illustrated a specimen in MNHN reported to be the holotype of *B. filiformis*. Saurin (p. 276) based *B. filiformis* on three specimens and did not make any holotype designation. Only one syntype of *B. filiformis* is present in MNHN and the other two are probably lost (C. Schander, pers. comm. 2011). That of Schander (1994) would be a lectotype designation (International Commission on Zoological Nomenclature, 1999, Recommendation 73F). Van Aartsen *et al*. (2000, p. 16) remarked that the 'holotype' figured by Schander (1994) does not conform to the illustrations of *B. filiformis* published by Saurin (1959, pl. 9, figs. 18, 19) and, for this reason, they preferred not to use the generic name *Bacteridiella*. Since *B. filiformis* was clearly defined by Saurin (1959) and considering the type fixation made by Schander for this species, I do not see any reason to avoid the use of *Bacteridiella*, which is a valid genus. Saurin's genus was erroneously cited as *Bacteridella* by Schander (1994) and Peñas & Rolán (1997). *Bacteridiella* is readily differentiated from *Eulimella* Forbes & MacAndrew, 1846, and from *Zonella* Laseron, 1959, by having a markedly exsert, depressed-helicoid protoconch ("sub-planorbiforme" according to Saurin), whereas that (also helicoid) of the other two genera is scarcely exsert and has a more prominent spire.

***Bacteridiella saurini* sp. nov.**
Pl. 23, figs. 5, 6.

Holotype – Kali Rebjong Section, level RMG 6: RGM 607030 (Pl. 23, fig. 5).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 607031 (2); level RMG 6: RGM 607032 (1; Pl. 23, fig. 6), RGM 607033 (6).

Derivation of name – The species is named after E. Saurin who extensively dealt with the pyramidellid gastropods of Vietnam and Thailand.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – *Bacteridiella* species with well exsert, depressed-helicoid protoconch larger than first teleoconch whorl and scarcely immersed in it. Teleoconch very slender, turreted, with elevated, straight-sided spire; whorls convex with slight subsutural margining, overhanging; sutures impressed. Base convex, imperforate. Aperture oval, outer lip smooth within, inner lip concave. Outer surface with slightly flexuous, prosocline growth lines.

Description – Protoconch exsert, depressed-helicoid, of 2.5 whorls, with large, widely and deeply umbilicate last whorl, scarcely prominent, blunt spire, coiled nearly at right angles to teleoconch axis, higher and broader than first teleoconch whorl in which it is only slightly immersed; diameter 0.24 mm. Teleoconch very small, narrowly turreted, with elevated, straight-sided spire, SA 8°. Whorls rather high, convex, with flat, but distinct, subsutural margining and rounded periphery at abapical one third, clearly overhanging; sutures rather oblique, impressed, SS 18°. Last whorl oval, 40% of total height, with broadly rounded periphery; base convex, gradually tapering, imperforate. Aperture oval, slightly produced abapically; outer lip gently arched, smooth within; columella concave, narrowly reflected. Outer surface with barely visible, slightly flexuous, prosocline growth lines.

Remarks – The present new species is similar to *Bacteridiella filiformis* Saurin, 1959 (type species of *Bacteridiella*), from which it differs in having the protoconch extending beyond the sides of the first teleoconch whorl and a flat band marginating the adapical suture (absent in *B. filiformis*). The east Atlantic specimens referred to as *Eulimella monolirata* de Folin *in* de Folin & Périer, 1874, by Peñas & Rolán (1997, figs. 212-215) are even more closely similar, but have a significantly larger protoconch. According to van Aartsen *et al*. (2000), it is unlikely that these Atlantic specimens belong to De Folin's species, which was described from Hong Kong waters and has a prominent, rounded subsutural cord. *Bacteridiella gofasi* Schander, 1994, another east Atlantic species, is similarly shaped, but is spirally grooved.

Genus *Eulimella* Forbes & MacAndrew, 1846

Type species – The authorship and the type designation of *Eulimella* were thoroughly discussed by van Aartsen (1988, p. 173) who concluded that the genus "should be cited as *Eulimella* Forbes & MacAndrew, 1846, with type species *Eulima macandrei* Forbes, 1844 by original designation". This conclusion is followed here. *Eulimella macandrei* is currently regarded as a junior synonym of *Melania scillae* Scacchi, 1835 (Fretter *et al*., 1986; Warén, 1991; van Aartsen, 1994; van Aartsen *et al*., 2000).

Remarks – Distinguishing characters of *Eulimella* are: protoconch helicoid, of 2.5 smooth whorls in most species, coiled at right angles to the teleoconch or slightly tilted downwards; teleoconch slender, turriculate, straight-sided or almost so, whorls flat or moderately convex, suture impressed; base rather quickly tapering, imperforate; outer lip smooth within, with inner spiral ribs in a few species; columella slightly twisted adapically or with a weak fold; and outer surface with straight, orthocline or very gently prosocline growth lines that may be crossed by spiral microstriation. *Eulimella* superficially resembles *Syrnola* Adams, 1860a, but has a somewhat different larval shell and lacks the strong columellar ridge characteristic of *Syrnola*.

Laseron (1959, p. 248) introduced *Zonella* to include *Odostomia* (*Turbonilla*?) *amoebaea* Watson, 1886 (designated as type species), and *Eulimella coacta* Watson, 1886. From Laseron's diagnosis, and from the descriptions and excellent illustrations provided by Watson for these two species (Watson, 1886, p. 495, pl. 33, fig. 1; p. 498, pl. 33, fig. 4), it appears that *Zonella* differs from *Eulimella* by its variably prominent subsutural spiral

cord and the blunt angulation of the whorls (more obvious in the type species). As remarked in the chapter on taxonomic relevance of shell characters, these are not deemed to have any generic significance. Accordingly, *Zonella* is regarded here as a synonym of *Eulimella*, with which it shares the same protoconch type. Schander *et al*. (1999a, p. 155) considered *Zonella* to be a synonym of *Visma* Dall & Bartsch, 1904, which also has a subsutural spiral cord. Should this be correct, *Visma* would be another synonym of *Eulimella*. *Instarella* Laseron, 1959, described as being "like *Zonella*, with the whorls medially carinate, but without the spiral keel", also has a helicoid protoconch (Laseron, 1959, fig. 212) and is another synonym of *Eulimella*. *Erilimella* Forbes & MacAndrew, 1846, is a printing error for *Eulimella* (Schander *et al*., 1999a).

***Eulimella latemarginata* sp. nov.**
Pl. 23, fig. 7; Pl. 24, fig. 1.

Holotype – Kali Rebjong Section, level RMG 6: RGM 607034 (Pl. 23, fig. 7).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 607035 (1; Pl. 24, fig. 1), RGM 607036 (31).

Derivation of name – From Latin *late* = widely, and *marginatus* = provided with a margin, with reference to the broad subsutural margining of the whorls.

Preservation – The material consists of variously preserved, mostly adult specimens.

Diagnosis – Protoconch helicoid obliquely lying across first teleoconch whorl. Teleoconch turreted, slender, with elevated, nearly straight-sided spire; whorls convex, constricted immediately abapical to broad, low subsutural margin; sutures impressed. Base convex, imperforate. Aperture oval, outer lip smooth within, columella twisted, with slight adapical inflation. Outer surface with straight, orthocline growth lines.

Description – Protoconch helicoid, of 2.25 whorls, with short, blunt spire prostrate on first teleoconch whorl and slightly extending beyond adapical suture of first teleoconch whorl; protoconch angle approximately 110°; diameter 0.17-0.20 mm. Teleoconch narrowly turreted, with elevated, nearly straight-sided spire, AP 21°, MSA 12°. First two whorls gently convex, subsequent ones more so, with low, broad subsutural margin, clearly constricted below it and suddenly contracted abapically; sutures impressed, SS 12°. Last whorl ovate-cylindrical, 41% of total height, with broadly rounded periphery; base convex, rather short, imperforate. Aperture oval, rather narrow, slightly produced abapically; outer lip gently arched, smooth within; columella reflected, twisted, with weak adapical bulge; parietal lip coated with rather thick, slightly expanded callus. Outer surface with uneven, straight, orthocline growth lines.

Remarks – The whorls shaped like a low vase with a flaring lip and the broad subsutural margin are the most distinctive characters of *Eulimella latemarginata* sp. nov. *Odostomia amoebaea* Watson, 1886 (type species of *Zonella* Laseron, 1959), is closely similar, but differs in having medially carinate whorls.

***Eulimella lawsi* sp. nov.**
Pl. 24, figs. 2, 3.

Holotype – Kali Rebjong Section, level RMG 6: RGM 607037 (Pl. 24, fig. 2).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 6: RGM 607038 (1; Pl. 24, fig. 3), RGM 607039 (5).

Derivation of name – The species is named after C.R. Laws who extensively dealt with the pyramidellid gastropods.

Preservation – The material consists of variously preserved, mostly juvenile specimens.

Diagnosis – *Eulimella* species with helicoid protoconch lying across first teleoconch whorl and one fourth immersed in it. Teleoconch turreted, subcylindrical, with elevated, slightly cyrtoconoid spire; whorls flat-sided with exceedingly narrow subsutural shelf; sutures impressed. Base convex, imperforate. Aperture narrowly oval, outer lip smooth within, columella with weak adapical fold. Outer surface with straight, very slightly prosocline growth lines.

Description – Protoconch small, helicoid, of 2.25 whorls, with short, blunt spire prostrate on first teleoconch whorl and slightly extending beyond adapical suture of first teleoconch whorl; protoconch angle approximately 100°; diameter 0.16 mm. Teleoconch narrowly turreted, subcylindrical, with elevated, slightly cyrtoconoid spire, AP 26°, MSA 10°. Whorls rather high, flat-sided, with extremely narrow, subhorizontal subsutural shelf, very slightly contracted abapically; sutures impressed, SS 14°. Last whorl ovate-cylindrical, 48% of total height, with broadly rounded periphery; base convex, imperforate. Aperture oval, rather narrow, somewhat produced abapically; outer lip gently arched, smooth within; columella reflected, with weak, oblique fold at its adapical end; parietal lip coated with callus. Outer surface with uneven, straight, very slightly prosocline growth lines.

Remarks – The protoconch characters combined with the subcylindrical teleoconch shape and the weak columellar fold readily distinguish *Eulimella lawsi* sp. nov. from other *Eulimella* species.

***Eulimella rembangensis* sp. nov.**
Pl. 24, figs. 4, 5.

Holotype – Kali Rebjong Section, level RMG 3: RGM 607040 (Pl. 24, fig. 4).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 3 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 607041 (1; Pl. 24, fig. 5), RGM 607042 (10).

Derivation of name – The name refers to Oostingh's "Rembangian" stage whose stratotype is represented by the Tawun Formation that yielded the material.

Preservation – The material consists of variously preserved juvenile specimens.

Diagnosis – *Eulimella* species with helicoid protoconch lying across first teleoconch whorl and one fourth immersed in it. Teleoconch very narrowly turreted, with elevated, straight-sided spire; whorls with rounded periphery at abapical one fourth, distinctly overhanging. Base convex, imperforate. Aperture ovate-quadrangular, outer lip smooth within, columella moderately twisted. Outer surface with straight, orthocline growth lines.

Description – Protoconch rather small, helicoid, of 2.25 whorls, coiled at right angles to teleoconch axis, with moderately prominent, blunt-topped spire extending slightly beyond adapical suture of first adult whorl, in which protoconch is one fourth immersed; diameter 0.17 mm. Teleoconch slenderly turreted with elevated, straight-sided spire, SA 11°. Whorls gently convex, with very slight subsutural margin, bulging at abapical one fourth, distinctly overhanging; sutures thin, impressed, SS 14°. Last whorl oval, about 40% of total height, with rounded periphery; base convex, rather short, imperforate. Aperture ovate-quadrangular, somewhat produced abapically; outer lip smooth within; columella reflected, moderately twisted. Outer surface smooth, with faint, straight, orthocline growth lines.

Remarks – *Eulimella rembangensis* sp. nov. exhibits a close similarity to *Eulimella thalensis* described from Holocene and Recent deposits of Thailand by Robba *et al*. (2004). However, *E. rembangensis* is readily distinguished from *E. thalensis* by its significantly smaller protoconch with ovate (not depressed) last whorl and more prominent spire, its narrower teleoconch with lower whorls and its growth lines, which are orthocline instead of prosocline. *Eulimella venusta* Melvill, 1904, is also similar, but differs in having the periphery of the whorls distinctly angular instead of rounded (cf. Bosch *et al*., 1995, fig. 808).

***Eulimella* sp. 1**
Pl. 24, fig. 6; Pl. 25, fig. 1.

Material examined – Kali Rebjong Section, level RMG 3: RGM 607043 (1; Pl. 24, fig. 6), RGM 607044 (1; Pl. 25, fig. 1). Two juvenile specimens with the outer lip broken.

Description – Protoconch rather small, helicoid, of 2 whorls, with short, blunt spire, obliquely lying on first teleoconch whorl and about one fourth immersed in it; diameter 0.18 mm. Teleoconch thick, turreted, with moderately cyrtoconoid spire, AP 35°. Whorls conical, flat-sided, very slightly contracted abapically; sutures shallowly impressed, SS 11°. Last whorl conical-ovate with rounded periphery; base convex, imperforate. Aperture apparently ovate-quadrangular; outer lip smooth within; columella with very weak adapical fold. Outer surface with straight, prosocline growth lines.

Remarks – The material does not allow a reliable comparison with other species. A superficial resemblance is noted only to *Eulimella* sp. 1 described from the Gulf of Thailand by Robba *et al*. (2004), but that form has a significantly larger, markedly globular larval shell.

***Eulimella* sp. 2**
Pl. 25, fig. 2.

Material examined – Kali Rebjong Section, level RMG 3: RGM 607045. A juvenile specimen of 3.5 post-larval whorls, with the outer lip broken.

Description – Protoconch small, helicoid, of 2.25 whorls, with short, blunt spire slightly extending beyond adapical suture of first teleoconch whorl, in which protoconch is one third immersed; protoconch angle about 90°; diameter 0.15 mm. Teleoconch narrowly turreted, with straight-sided spire, AP 10°. Whorls convex, with raised subsutural cord, constricted below it and suddenly contracted abapically; sutures impressed, SS 12°. Last whorl ovate-cylindrical, with broadly rounded periphery; base convex, rather short, imperforate. Aperture apparently ovate-quadrangular; outer lip smooth within; columella twisted. Outer surface with uneven, orthocline growth lines.

Remarks – The present specimen is closely similar to *Eulimella latemarginata* sp. nov. (see above), but differs in having a smaller protoconch angle (90° instead of 110°) and the subsutural margin consisting of a raised cord instead of a low broad band.

Genus *Koloonella* Laseron, 1959

Type species – *Eulimella moniliformis* Hedley & Musson, 1891, by original designation (Laseron, 1959, p. 246).

Remarks – Besides *E. moniliformis*, Laseron (1959) included in the present genus his new species *Koloonella capricornia*, *Koloonella tenuis* and *Koloonella* sp. (left unnamed, but likely new), along with *Eulimella laxa* Watson, 1886, and *Eulimella subtilis* Watson, 1886.

From Laseron's remarks, and the excellent illustrations of *E. laxa* and *E. subtilis* published by Watson (1886, pl. 33, figs. 6 and 5, respectively), it appears that *Koloonella* is broadly similar to *Eulimella* Forbes & MacAndrew, 1846, in terms of teleoconch characters, but has a quite different larval shell. In fact, *Koloonella* species are distinguished by their rather inflated, umboniiform protoconch of 2.25-3 whorls, variably exsert, oblique in many species, with flat spire or nearly so. A number of east Atlantic species currently assigned to *Eulimella* (*E. calva* Schander, 1994, *E. ignorabilis* Peñas & Rolán, 1997, and *E. buijsi* van Aartsen *et al*., 2000, among others) possess an umboniiform, variably inflated larval shell and belong in *Koloonella*.

***Koloonella rebjongensis* sp. nov.**
Pl. 25, figs. 3, 4.

Holotype – Kali Rebjong Section, level RMG 6: RGM 607046 (Pl. 25, fig. 3).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 607047 (1); level RMG 6: RGM 607048 (1; Pl. 25, fig. 4), RGM 607049 (6).

Derivation of name – From the stream (Kali in Indonesian) Rebjong along which the layer that yielded the fossils crops out.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – *Koloonella* species with slightly oblique, inflated umboniiform protoconch one fifth immersed in first teleoconch whorl. Teleoconch slenderly turreted, with elevated, straight-sided spire; whorls flat-sided, contracted abapically and slightly overhanging. Base convex, rather short, imperforate. Aperture ovate-quadrangular, outer lip smooth within, columella distictly twisted. Outer surface with slightly flexuous, orthocline growth lines and faint spiral microstriation.

Description – Protoconch umboniiform, of 2.25 whorls increasing rapidly in diameter, with flat spire and broad, inflated last whorl, slightly oblique, one fifth immersed in first teleoconch whorl; protoconch angle approximately 100°; diameter 0.28 mm. Teleoconch turreted, narrowly coiled, with elevated, straight-sided spire, SA 7°. Whorls moderately long, first gently convex, subsequent ones flat-sided, with rounded periphery at abapical one fourth, contracted below it and slightly overhanging; sutures fine, shallowly impressed, SS 9°. Last whorl ovate-cylindrical, about 45% of total height, with broadly rounded periphery; base convex, rather short, imperforate. Aperture ovate-quadrangular, somewhat produced abapically; outer lip smooth within; columella slightly reflected and distinctly twisted. Outer surface smooth, with scarcely detect-

able, very fine, gently flexuous, orthocline growth lines; quite faint, spiral microstriation present throughout.

Remarks – *Koloonella rebjongensis* sp. nov. is closely similar to *Eulimella subtilis* Watson, 1886, but has a slightly oblique protoconch (that of *E. subtilis* is coiled at right angles to the teleoconch axis), a narrower teleoconch with shorter whorls of slower increase in diameter and a shorter last whorl. Among the East Atlantic species matching the characters of *Koloonella*, some resemblance is noted only with *Eulimella variabilis* de Folin *in* de Folin & Périer, 1870, whose teleoconch, however, is not as slender as that of *K. rebjongensis*.

Subfamily Cingulininae Saurin, 1959
Genus *Bulicingulina* gen. nov.

Type species – *Bulicingulina rembangensis* sp. nov.

Derivation of name – The name of the genus reflects the combination of a *Cingulina*-like teleoconch and a bulimoid protoconch.

Diagnosis – Cingulinine genus with bulimoid protoconch of at least 3 whorls, with prominent, pointed spire projecting beyond adapical suture of first teleoconch whorl. Teleoconch turriculate, straight-sided, whorls conical, suture faint, very slightly impressed. Base flat, very short, imperforate. Aperture rather small, ovate-quadrangular, inner side of outer lip smooth, columella distinctly twisted. Sculpture of strong, prominent spiral cords, interspaces with axial threads; base smooth.

Remarks – The type species exhibits a distinctive combination of characters that does not fit satisfactorily with the description of any cingulinine genus. It has a bulimoid, multispiral larval shell (shaped like that of *Nisiturris* and *Nisipyrgiscus*) and a teleoconch conforming in all respects to that of the species confidently assigned to the genus *Cingulina* Adams, 1860b. There seems to be neither a detailed description nor a reliable figure of *Cingulina circinata* Adams, 1860b, type species of *Cingulina* by monotypy (Adams, 1860b, p. 414). However, from the descriptions and illustrations of *Cingulina cingulata* (Dunker, 1860) published by Dall & Bartsch (1906, p. 344, pl. 21, fig. 1) and by Hori & Iizumi (1997, p. 42, pl. 4, figs. 6, 7, 14), and of *Cingulina isseli* (Tryon, 1886) published by van Aartsen & Carrozza (1983, p. 38, fig. 1) and by van Aartsen (1994; p. 91, fig. 7), it appears that the protoconch of *Cingulina* is helicoid with a very short, blunt spire, and is obliquely prostrate on the first teleoconch whorl. Thus, the different shape and the orientation of the larval shell distinguish the new genus *Bulicingulina* (protoconch bulimoid coiled at right angle to the teleoconch axis) from *Cingulina* (protoconch helicoid, blunt-spired, downward-inclined). Further, the species of *Cingulina* have teleoconchs that are not as narrow and straight-sided as that of *Bulicingulina*, have a convex instead of flat base, and possess a weak, deeply set columellar fold. Examples of the latter character are provided by *C. aglaia* Bartsch, 1915, *C. cingulata*, *C. isseli* and *C. inamuragasakiensis* Nomura, 1938, among others. The teleoconchs of *Polyspirella* Carpenter *in* Gould, 1861, and *Paracingulina* Nomura, 1936, are similar to that of *Bulicingulina*, but these

genera differ markedly in that they possess an umboniiform protoconch. *Bulicingulina* somewhat resembles the chrysallidine genera *Oscilla* Adams, 1861, *Hinemoa* Oliver, 1915, and *Menesthella* Nomura, 1939, which also bear strong spiral cords, but their species have different types of protoconchs (respectively of type B, intorted, helicoid, coiled at right angle to the teleoconch) and a variably developed columellar fold.

***Bulicingulina rembangensis* sp. nov.**
Pl. 25, figs. 5, 6.

Holotype – Kali Rebjong Section, level RMG 6: RGM 607050 (Pl. 25, fig. 5).

Type locality – Karas near Sedan, Central Java.

Type horizon – Tawun Formation: level RMG 6 of Kali Rebjong Section. Zone N 9, Late Langhian.

Paratypes – Kali Rebjong Section, level RMG 3: RGM 607051 (1; Pl. 25, fig 6), RGM 607052 (6); level RMG 6: RGM 607053 (2).

Derivation of name – The name refers to Oostingh's "Rembangian" stage whose stratotype is represented by the Tawun Formation that yielded the material.

Preservation – The material consists of variously preserved juvenile and adult specimens.

Diagnosis – Cingulinine species with multispiral, bulimoid protoconch coiled nearly at right angle to teleoconch, one fifth immersed in first whorl of teleoconch. Teleoconch turriculate, with straight-sided spire; whorls flat-sided. Base flat, very short, imperforate. Aperture ovate-quadrangular, outer lip smooth within, columella distinctly twisted. Sculpture of strong spiral cords, 3 to the whorl; interspaces with thin axial threads; base smooth.

Description – Protoconch bulimoid, of 3.25 whorls increasing gradually in diameter, with prominent, pointed spire extending well beyond adapical suture of first teleoconch whorl, in which protoconch is one fifth immersed; protoconch angle approximately 90°; diameter 0.25 mm. Teleoconch turriculate, narrowly conical, with elevated, straight-sided spire, SA 13°. Whorls flat-sided, conical, increasing slowly in diameter; sutures faintly incised, very shallowly impressed, SS 8°. Last whorl conical-ovate, about 38% of total height, with angular periphery; base flat, very short, imperforate. Aperture ovate-quadrangular, scarcely produced abapically; outer lip smooth within; columella straight, slightly reflected, distinctly twisted, without fold. Sculpture of strong, prominent spiral cords, 3 per whorl, adapical (subsutural) one slightly weaker than other two, which are of same strength; a fourth cord tends to emerge from abapical suture; interspaces concave, with thin axial threads, which are orthocline both adapically and abapically, opisthocline in somewhat broader median interspace; base smooth, bounded by fourth cord, the less strong, lying at level of suture.

Remarks – The teleoconch of *Bulicingulina rembangensis* sp. nov. exhibits a considerable resemblance to that of *Cingulina* sp. described by Robba *et al*. (2004, p. 224, pl. 33, fig. 7) from the Gulf of Thailand. *Cingulina* sp. differs only in that its slightly weaker cord is median instead of adapical as in *B. rembangensis*. However, nothing can be safely stated about the relationships between these two taxa, the protoconch of *Cingulina* sp. being unknown.

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Appendix

This section records several Indonesian fossil pyramidellids cited or described by former workers, whose material was not available to me. Taxa are listed following the taxonomic order adopted in the main text; the names are those originally used by the various authors. For newly proposed species, names are followed by that of the author and date in bold as in main text. In all other instances, the author to be referred to and the date of the paper. Whenever possible, taxa are commented on briefly, and an attempt is made to revise their generic assignment.

Odontostoma ptychochilum Boettger, 1883

1883 *Odontostoma ptychochilum* Boettger, p. 47, pl. 2, fig. 12.

Material – One specimen (holotype) from Seluma, South Sumatra, Lower Palembang Beds, Preangerian (Middle Miocene). Location unknown (F. Wesselingh, pers. comm. 2008).

Remarks – On the basis of the description and illustration published by its author, the species likely belongs in the genus *Megastomia* Monterosato, 1884.

Odontostomia jogjacartensis Martin, 1931

1931 *Odontostomia jogjacartensis* Martin, p. 43, pl. 6, fig. 9.

Material – One specimen (holotype) from Kali Puru, Nanggulan, Yogyakarta Province, Java, upper part of Nanggulan Formation; the age is late Middle Eocene (see Grandesso, 2001). Probably in Geological Museum, Bandung (F. Wesselingh, pers. comm. 2008).

Remarks – Martin (1931) described the species as having the protoconch "klein und ohrartig" (small and shaped like an ear). On this basis, the protoconch is inferred to be intorted, with only its last whorl exposed at the top of the spire. Further, Martin stated that the outer lip has interior spiral riblets. These characters point toward the assignment of *O. jogjacartensis* to the genus *Parodostomia* Laseron, 1959.

Odontostomia vandijki Martin, 1931

1931 *Odontostomia van-dijki* Martin, p. 43, pl. 6, fig. 8.
non 1984 *Odostomia vandijki* Martin: Zacchello, pl. 1, fig. 22.
? 2001 *Odostomia vandijki* (Martin): Zacchello, p. 49.
? 2001 *Odostomia vandijki* Martin: Zamparini, p. 54.

Material – Three syntypes from Kali Puru, Nanggulan, Yogyakarta Province, Java, upper part of Nanggulan Formation; the age is late Middle Eocene (see Grandesso, 2001). Probably in Geological Museum, Bandung (F. Wesselingh, pers. comm. 2008).

Remarks – The intorted protoconch and the presence of palatal riblets indicate that this species also belongs to the genus *Parodostomia* Laseron, 1959. According to the figures published by Martin (1931, pl. 6, figs. 8, 9), *O. vandijki* appears to differ from *O. jogjacartensis* by its oval, more elongate teleoconch, its taller, slightly cyrtoconoid spire (that of *O. jogjacartensis* is clearly conical, straight-sided) and its less expanded last whorl. The shell identified by Zacchello (1984) as *Odostomia vandijki* seems to have a helicoid protoconch and a last whorl with a subangular periphery, characters that differentiate it from Martin's species. The presence of palatal riblets being proved, this shell would be better allocated to a species (undescribed ?) of *Megastomia* Monterosato, 1884.

Odostomia (Odostomia) regina Thiele *in* van Regteren Altena, 1942

1942 *Odostomia (Odostomia) regina* Thiele: van Regteren Altena, p. 32, text-fig. 9.

Material – One specimen from sample M 278, south of the village of Sumberdadi, Java, Pucangan Formation, Pleistocene. Should be present in RGM, but not found (F. Wesselingh, pers. comm. 2008).

Remarks – On the basis of the quite clear figure published by van Regteren Altena (1942), the considered shell appears to agree with the characters of *Odostomia regina* and is included in the synonymy of it. Thiele's species belongs in the genus *Megastomia* Monterosato, 1884 (see main text).

Odostomia subcalcarea Oostingh, 1941

1941 *Odostomia subcalcarea* Oostingh, p. 22, pl. 1, fig. 5.

Material – One specimen (holotype) from Kungkilanbesar near Palembang, South Sumatra, Lower Telisa Beds, Early Miocene. Probably in Geological Museum, Bandung (F. Wesselingh, pers. comm. 2008).

Remarks – The species was not described in the original paper and its illustration (Oostingh, 1941, pl. 1, fig. 5) fails to clarify some most relevant characters (protoconch, presence/absence of palatal riblets). Consequently, the generic assignment made by Oostingh is adopted with much reservation. *Odostomia subcalcarea* is commented on in the main text (see remarks on *Odostomia* sp. 1).

Odostomia sp. 1 *in* Martin,1928

1928 *Odostomia* spec. 1 Martin, p. 6.

Material – Three specimens from Aceh, Sumatra, Late Miocene. Should be present in RGM, but not found (F. Wesselingh, pers. comm. 2008).

Remarks – *Odostomia* spec. 1 is recorded here without any comment since Martin (1928) simply listed it.

Odostomia sp. 2 *in* Martin,1928

1928 *Odostomia* spec. 2 Martin, p. 6.

Material – One specimen from Aceh, Sumatra, Late Miocene. Should be present in RGM, but not found (F. Wesselingh, pers. comm. 2008).

Remarks - *Odostomia* spec. 2 is recorded here without any comment since Martin (1928) simply listed it.

Odostomia sp. 3 *in* Martin, 1928

1928 *Odostomia* spec. 3 Martin, pp. 6, 15.

Material – One specimen from Aceh, Sumatra, Late Miocene. Should be present in RGM, but not found (F. Wesselingh, pers. comm. 2008).

Remarks – From the quite scant descriptive notes provided by Martin (1928, p. 15), it appears that this specimen has the earlier teleoconch whorls sculptured with oblique collabral ribs. This character is consistent with the assignment to a species (probably undescribed) of the genus *Siogamaia* Nomura, 1936, which was included in the subfamily Chrysallidinae by Laws (1941) and Schander *et al*. (1999a).

Menestho (Miralda) tegalensis Oostingh, 1935

1935 *Menestho (Miralda) tegalensis* Oostingh, p. 63, text-fig. 3.

Material – Holotype and 11 paratypes from locality 180, Kali Glagah near Bumiaju, Java, Kaliglagah Formation, Pliocene. Probably in Geological Museum, Bandung (F. Wesselingh, pers. comm. 2008).

Remarks – Oostingh's species is commented on in the main text and assigned to the genus *Liamorpha* Pilsbry, 1898 (see remarks on *Liamorpha rembangensis* sp. nov.).

Miralda (Oscilla) sp. aff. *M. (O.) faceta* (Melvill, 1904) *in* Beets, 1981, 1984

1981 *Miralda (Oscilla)* aff. *faceta* (Melvill): Beets, p. 17.
1984 *Miralda (Oscilla)* aff. *faceta* (Melvill): Beets, p. 54.

Material – One specimen (RGM 312031) from Tapian Langsat, East Kalimantan, lower part of Gelingseh Beds, Preangerian (Beets, 1981); 1 specimen (RGM 315206) from Mandul Island, northeastern Kalimantan, Preangerian (Beets, 1984). The two specimens were considered conspecific by Beets (1984). Material not found (F. Wesselingh, pers. comm. 2008).

Remarks – Beets (1981) described and commented on the Tapian Langsat shell. From Beets' text, it appears that the considered specimens have a helicoid protoconch of 2.75

whorls, coiled at a right angle to the teleoconch axis. The protoconch and the described teleoconch characters conform to those of the genus *Menesthella* Nomura, 1939. These Preangerian specimens seem to be closer to *Menesthella sumatrana* (Thiele, 1925) than to Melvill's species (see *M. sumatrana* in the main text).

Pyramidella (Longchaeus) sp. *in* Oostingh, 1935

1935 *Pyramidella (Longchaeus)* sp.; Oostingh, p. 63.

Material – One specimen from locality 176, Cipamali near Bumiaju, Java, Kaliglagah Formation, Pliocene. Probably in Geological Museum, Bandung (F. Wesselingh, pers. comm. 2008).

Remarks – On the basis of the brief descriptive remarks provided by Oostingh (1935), the considered specimen might belong in *Longchaeus turritus* (Adams, 1855).

Pyramidella (Otopleura) sp. 3 *in* Martin, 1928

1928 *Pyramidella (Otopleura)* spec. 3; Martin, pp. 7, 16.

Material – One specimen from Aceh, Sumatra, Late Miocene. Should be present in RGM, but not found (F. Wesselingh, pers. comm. 2008).

Remarks – The presence of columellar folds and of strong collabral ribs supports the assignment to the genus *Otopleura* Fischer, 1885. In the absence of information on other characters, no relationships with other species can be inferred.

Pyramidella sp. aff. *P. bataviana* K. Martin *in* Tesch, 1920

1920 *Pyramidella* aff. *bataviana* Martin: Tesch, p. 64, pl. 131, fig. 189.

Material – One specimen from sample M XVI, Noil Noni, Timor, Pliocene. Location unknown (F. Wesselingh, pers. comm. 2008).

Remarks – Tesch (1920) noted that this specimen has a single columellar plait, palatal riblets and a smooth surface, characters that are consistent with its assignment to an unidentified species of the genus *Tibersyrnola* Laws, 1937d. Shuto (1969) considered the shell from Timor conspecific with *Syrnola brunnea* (Adams, 1855), but this species has a more distinctly conical shell with a greater spiral angle. *Pyramidella bataviana* Martin, 1884, belongs in *Costosyrnola* Laws, 1937d (see main text).

Pyramidella teres Adams *in* Tesch, 1920

1920 *Pyramidella teres* Adams: Tesch, p. 63, pl. 132, fig. 196.

Material – Apparently more than one specimen from locality M IV between Noil Noni and Pene, Timor, Pliocene. Location unknown (F. Wesselingh, pers. comm. 2008).

Remarks – This material is included in the synonymy of *Longchaeus turritus* (see main text).

Pyramidella sp. aff. *P. terebellum* Müller *in* Tesch, 1920

1920 *Pyramidella* aff. *terebellum* Müller: Tesch, p. 64, pl. 131, fig. 189.

Material – One specimen from locality M VII, Noil Besi between Kapan and Pene, Timor, Pliocene. Location unknown (F. Wesselingh, pers. comm. 2008).

Remarks – According to the figure and the brief descriptive remarks published by Tesch (1920), the fossil shell from Timor seems not to differ significantly from the characters of *Pyramidella dolabrata* (Linnaeus, 1758). *Helix terebellum* Müller, 1774, is a synonym of *Trochus dolabratus* Linnaeus, 1758 (see van Aartsen *et al*., 1998).

Pyramidella (Pyramidella) sp. *in* van Regteren Altena, 1942

1942 *Pyramidella (Pyramidella)* spec. van Regteren Altena, p. 33.

Material – One specimen from sample M 53, Kali Garutan, Java, Pucangan Formation, Pleistocene. Sample present, but specimen missing from RGM (F. Wesselingh, pers. comm. 2008).

Remarks – Since van Regteren Altena (1942) did not provide any descriptive information about this specimen, the assignment to the genus *Pyramidella* Lamarck, 1799, is retained with doubt.

Pyramidella sp. 1 *in* Martin, 1911

1911 *Pyramidella* spec. 1 Martin, pp. 11, 21.

Material – One specimen from Ciangsana, Java, Preangerian. Location unknown (F. Wesselingh, pers. comm. 2008).

Remarks – *Pyramidella* sp. 1 is recorded here without comment since Martin (1911) simply listed it.

Pyramidella sp. 1 *in* Martin, 1926

1926 *Pyramidella* spec. 1 Martin, p. 9.

Material – One specimen from Cijurey near Cirebon, Java, Pliocene. Probably in Geological Museum, Bandung (F. Wesselingh, pers. comm. 2008).

Remarks – Except for the presence of 3 dark spiral bands, no other shell characters were cited by Martin (1926). Probably the assignment to the genus *Pyramidella* Lamarck, 1799, is correct.

Pyramidella sp. 2 *in* Martin, 1926

1926 *Pyramidella* spec. 2 Martin, p. 9.

Material – One specimen from Cijurey near Cirebon, Java, Pliocene. Probably in Geological Museum, Bandung (F. Wesselingh, pers. comm. 2008).

Remarks – This form was said to have 2 spiral grooves between the sutures.

Syrnola sp. *in* Martin, 1928

1928 *Syrnola* spec. Martin, p. 7.

Material – Three specimens from Aceh, Sumatra, Late Miocene. RGM 041/08, not seen.

Remarks - Syrnola spec. is recorded here without comment since Martin (1928) simply listed it.

Turbonilla (Pyrgostelis) malayana Fischer, 1927

1927 *Turbonilla (Pyrgostelis) malayana* Fischer, p.51, pl. 212, fig. 16.

Material – One specimen (holotype) from Ceram Island, Moluccas Archipelago, Pliocene. Location unknown (F. Wesselingh, pers. comm. 2008).

Remarks – Fischer (1927) provided a thorough description of the teleoconch. The cited characters conform to those of *Pyrgostelis* Monterosato, 1884, which is a synonym of *Pyrgiscus* Philippi, 1841 (cf. Schander *et al*., 1999a). However, the protoconch being unknown, the assignment to *Pyrgiscus* is made with some reservation. Fischer's species appears to be close to *Pyrgiscus* sp. 2 (see main text) and additional material of both forms might prove that they are conspecific.

Turbonilla sp. 2 *in* Martin, 1928

1928 *Turbonilla* spec. 2 Martin, p. 6.

Material – One specimen from Aceh, Sumatra, Late Miocene. Should be present in RGM, but not found (F. Wesselingh, pers. comm. 2008).

Remarks - Turbonilla spec. 2 is recorded here without comment since Martin (1928) simply listed it.

Turbonilla sp. 3 *in* Martin, 1928

1928 *Turbonilla* spec. 3 Martin, p. 6.

Material – One specimen from Aceh, Sumatra, Late Miocene. Should be present in RGM, but not found (F. Wesselingh, pers. comm. 2008).

Remarks – *Turbonilla* spec. 3 is recorded here without comment since Martin (1928) simply listed it.

Plate 1

Fig. 1. *Leucotina rebjongensis* sp. nov. Holotype, RGM 606811, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm).

Fig. 2. *Leucotina rebjongensis* sp. nov. Paratype, RGM 606812, Kali Rebjong Section, level RMG 6, "Rembangian". a, lateral view of shell (bar = 0.20 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Leucotina speciosa* (Adams, 1853). Lectotype of *Leucotina sundaica* Thiele, 1925, ZMB/Moll 108534, Indian Ocean, Recent. a, apertural view of shell (bar = 0.50 mm); b, apical whorls showing protoconch-teleoconch transition (bar = 0.10 mm).

Fig. 4. *Leucotina speciosa* (Adams, 1853). Paralectotype of *Leucotina sundaica* Thiele, 1925, ZMB/Moll 108535a, Padang (Sumatra), Recent. Protoconch (bar = 0.10 mm).

Fig. 5. *Leucotina speciosa* (Adams, 1853). RGM 606815, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm).

Fig. 6. *Leucotina speciosa* (Adams, 1853). RGM 606816, Kali Rebjong Section, level RMG 6, "Rembangian". Apical view of protoconch (bar = 0.10 mm).

Fig. 7. *Megastomia gradata* sp. nov. Holotype, RGM 606817, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

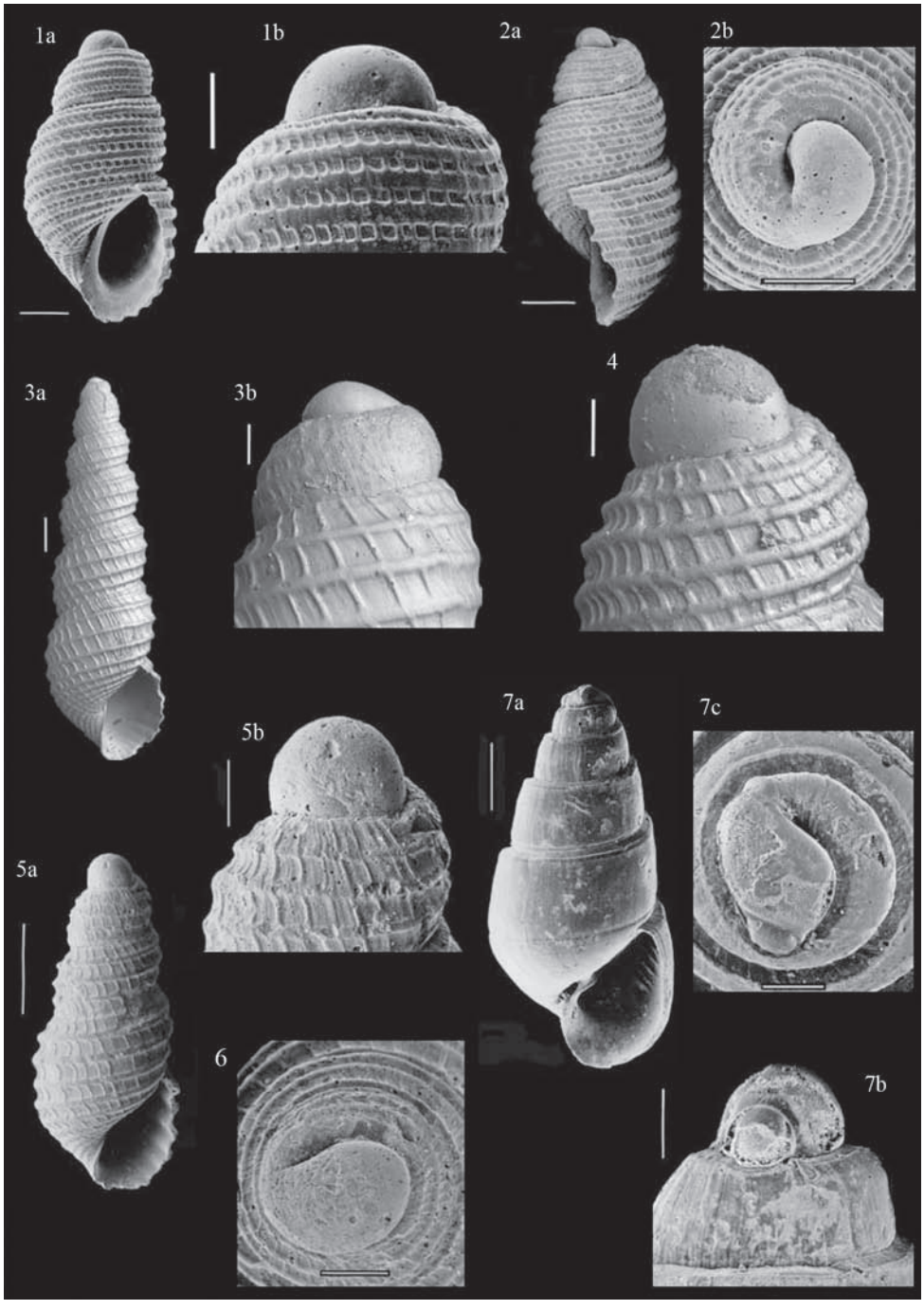
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Plate 2

Fig. 1. *Megastomia regina* (Thiele, 1925). Lectotype, ZMB/Moll 64068a, Padang (Sumatra), Recent. a, apertural view of shell (bar = 0.50 mm); b, protoconch (bar = 0.10 mm).

Fig. 2. *Megastomia regina* (Thiele, 1925). Paralectotype, ZMB/Moll 64068b, Padang (Sumatra), Recent. Apertural view of shell (bar = 0.50 mm).

Fig. 3. *Megastomia regina* (Thiele, 1925). RGM 606821, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 1 mm); b, lateral view of shell (bar = 1 mm); c, protoconch (bar = 0.10 mm).

Fig. 4. *Megastomia regina* (Thiele, 1925). Specimen identified as *Odostomia regina* by Wissema (1947), RGM 606801, Nias Island, locality 39, Pleistocene. Apertural view of shell (bar = 0.50 mm).

Fig. 5. *Megastomia regina* (Thiele, 1925). RGM 606822, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 6. *Megastomia regina* (Thiele, 1925). RGM 606823, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.40 mm).

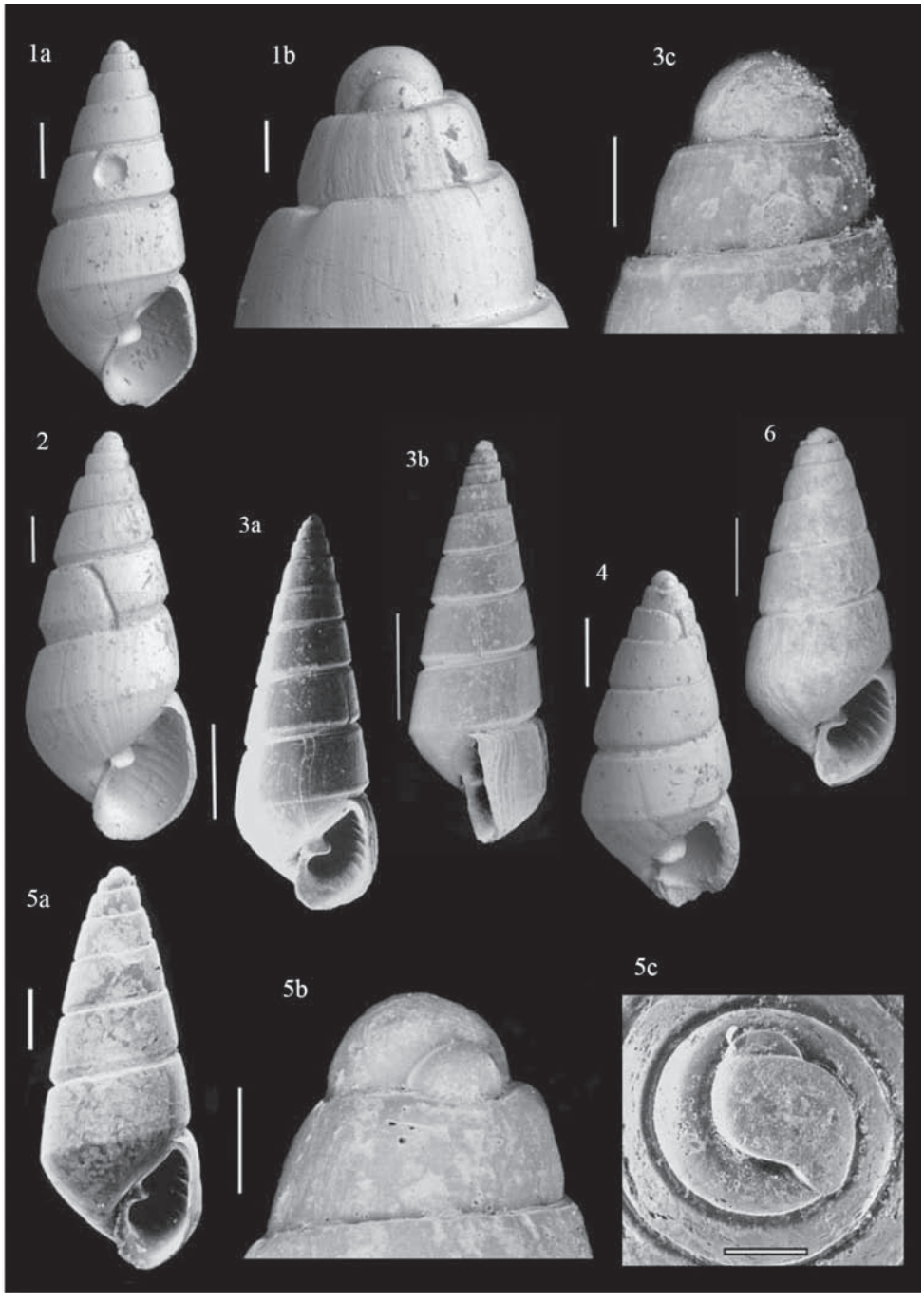
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Plate 3

Fig. 1. *Megastomia tawunensis* sp. nov. Holotype, RGM 606827, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 2. *Megastomia* sp. RGM 606832, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Odostomia* sp. 1. RGM 606833, Kali Rebjong Section, level RMG 6, "Rembangian". a, lateral view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Odostomia* sp. 1. RGM 606834, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, lateral view of protoconch (bar = 0.10 mm).

Fig. 5. *Odostomia* sp. 2. RGM 606836, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.40 mm).

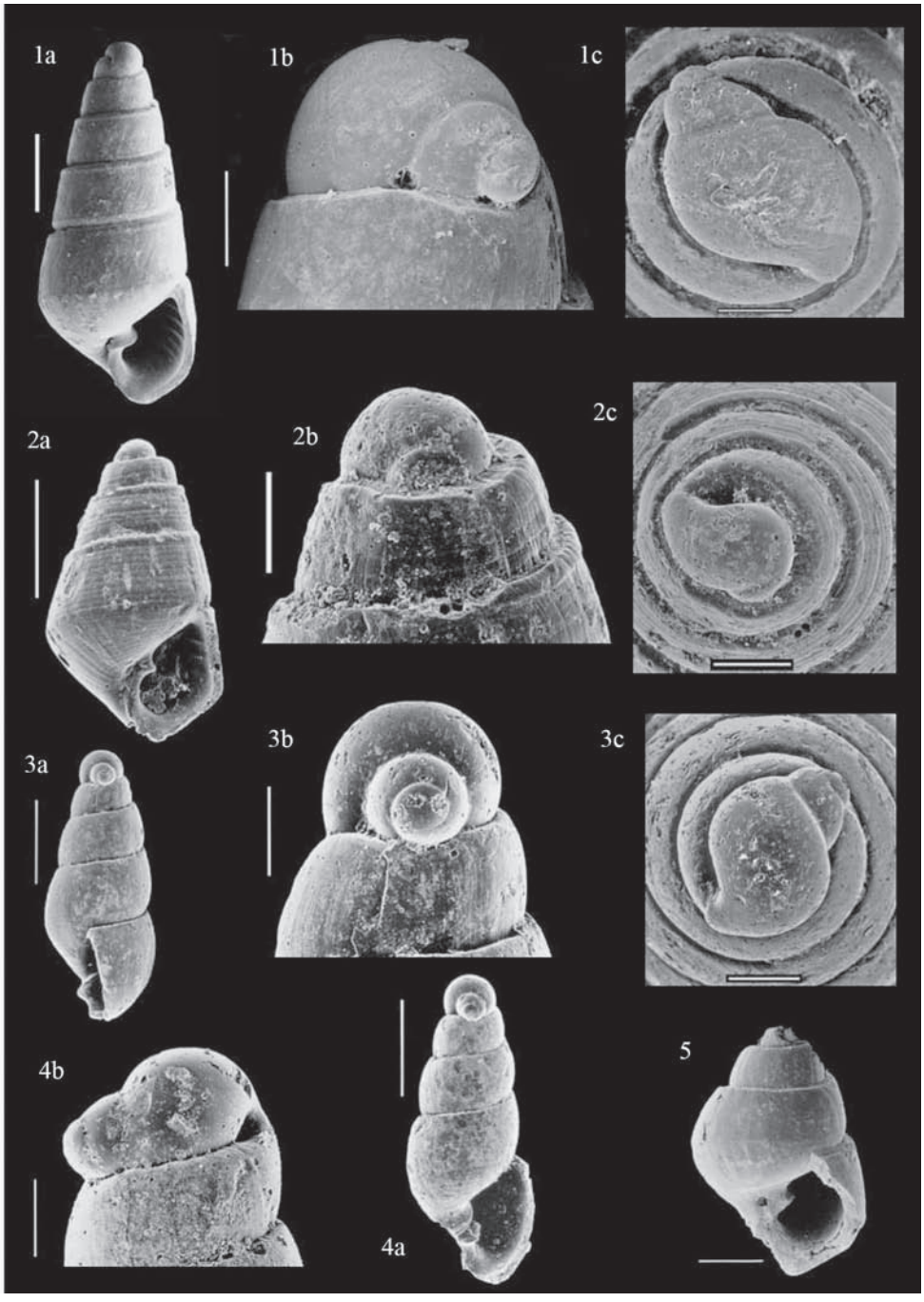
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Plate 4

Fig. 1. *Parodostomia bifuniculata* sp. nov. Holotype, RGM 606837, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, lateral view of shell (bar = 0.40 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 2. *Parodostomia sartonoi* sp. nov. Holotype, RGM 606839, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, lateral view of shell (bar = 0.40 mm); c, apical whorls showing protoconch-teleoconch transition (bar = 0.10 mm); d, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Parodostomia sartonoi* sp. nov. Paratype, RGM 606842, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Parodostomia teresae* sp. nov. Holotype, RGM 606845, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, apical whorls showing protoconch-teleoconch transition (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 5. *Parodostomia teresae* sp. nov. Paratype, RGM 606846, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, lateral view of shell (bar = 0.40 mm).

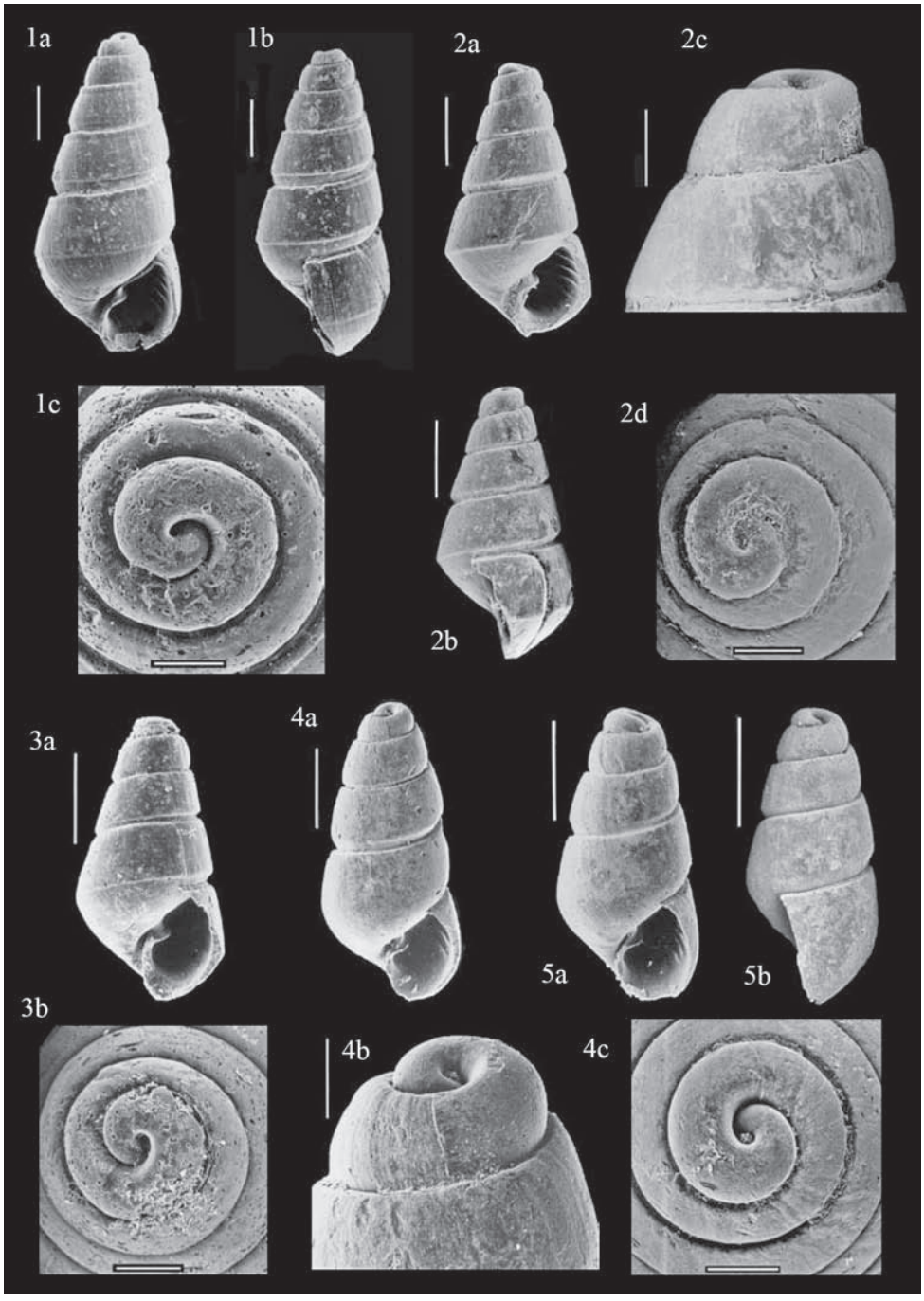
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Plate 5

Fig. 1. *Parodostomia* sp. RGM 606848, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, lateral view of shell (bar = 0.40 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 2. *Babella* sp. 1. RGM 606851, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Babella* sp. 2. RGM 606853, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm); c, lateral view of protoconch (bar = 0.10 mm); d, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Babella* sp. 2. RGM 606854, Kali Rebjong Section, level RMG 3, "Rembangian". Apertural view of shell (bar = 0.10 mm).

Fig. 5. *Besla tawunensis* sp. nov. Holotype, RGM 606857, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm).

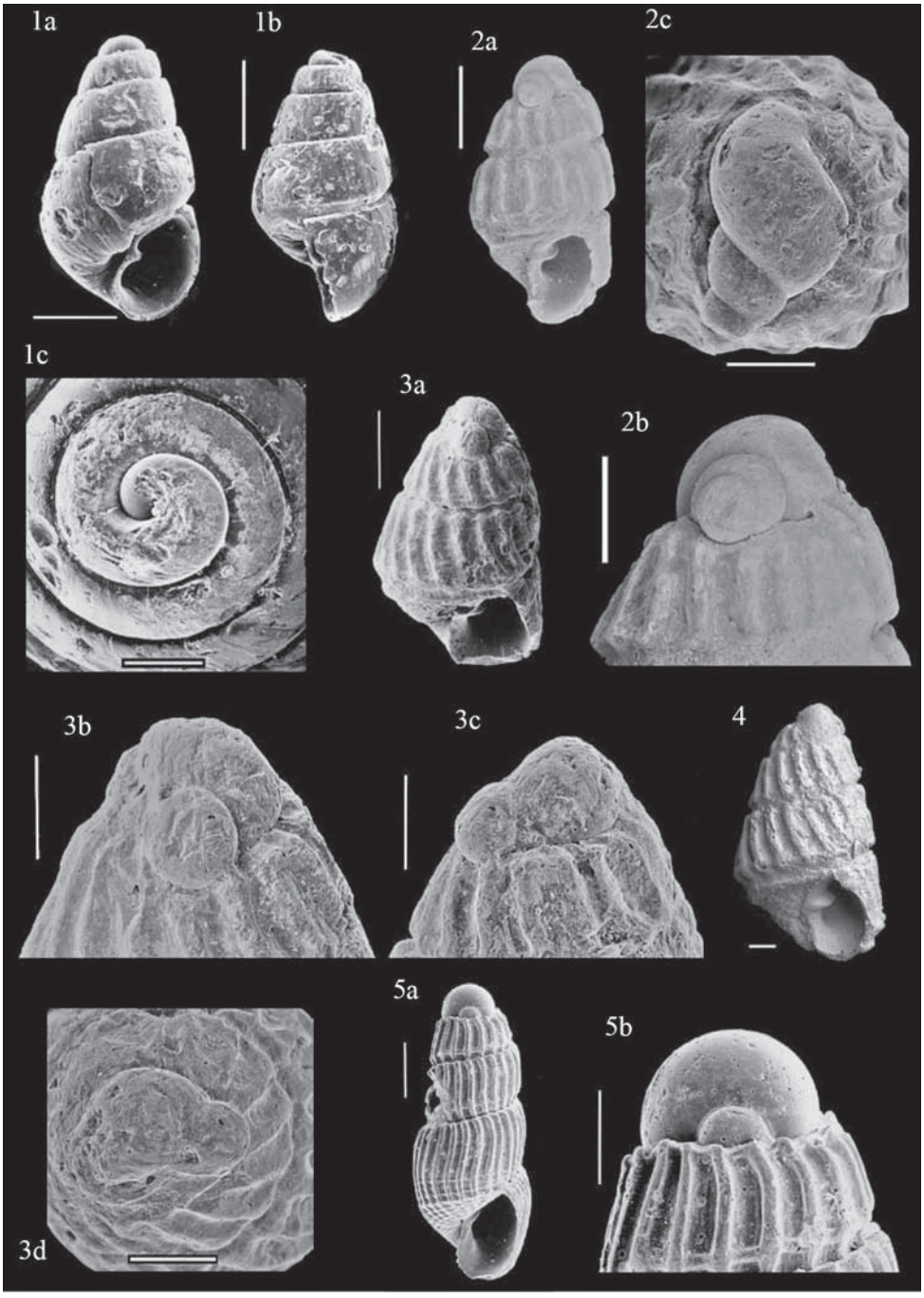
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Plate 6

Fig. 1. *Besla tawunensis* sp. nov. Holotype, RGM 606857, Kali Rebjong Section, level RMG 6, "Rembangian". a, lateral view of shell (bar = 0.20 mm); b, lateral view of protoconch (bar = 0.10 mm).

Fig. 2. *Besla unicincta* sp. nov. Holotype, RGM 606859, Kali Rebjong Section, level RMG 3, "Rembangian". Apertural view of shell (bar = 0.20 mm).

Fig. 3. *Besla unicincta* sp. nov. Paratype, RGM 606860, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, lateral view of shell (bar = 0.20 bn mm); c, protoconch (bar = 0.10 mm); d, apical view of protoconch (bar = 0.10 mm); e, lateral view of protoconch (bar = 0.10 mm).

Fig. 4. *Besla* sp. RGM 606863, Kali Rebjong Section, level RMG 3, "Rembangian". Apertural view of shell (bar = 0.10 mm).

Fig. 5. *Bulimoscilla florianae* sp. nov. Holotype, RGM 606864, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.50 mm).

Fig. 6. *Bulimoscilla florianae* sp. nov. Paratype, RGM 606866, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 7. *Bulimoscilla florianae* sp. nov. Paratype, RGM 606867, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm).

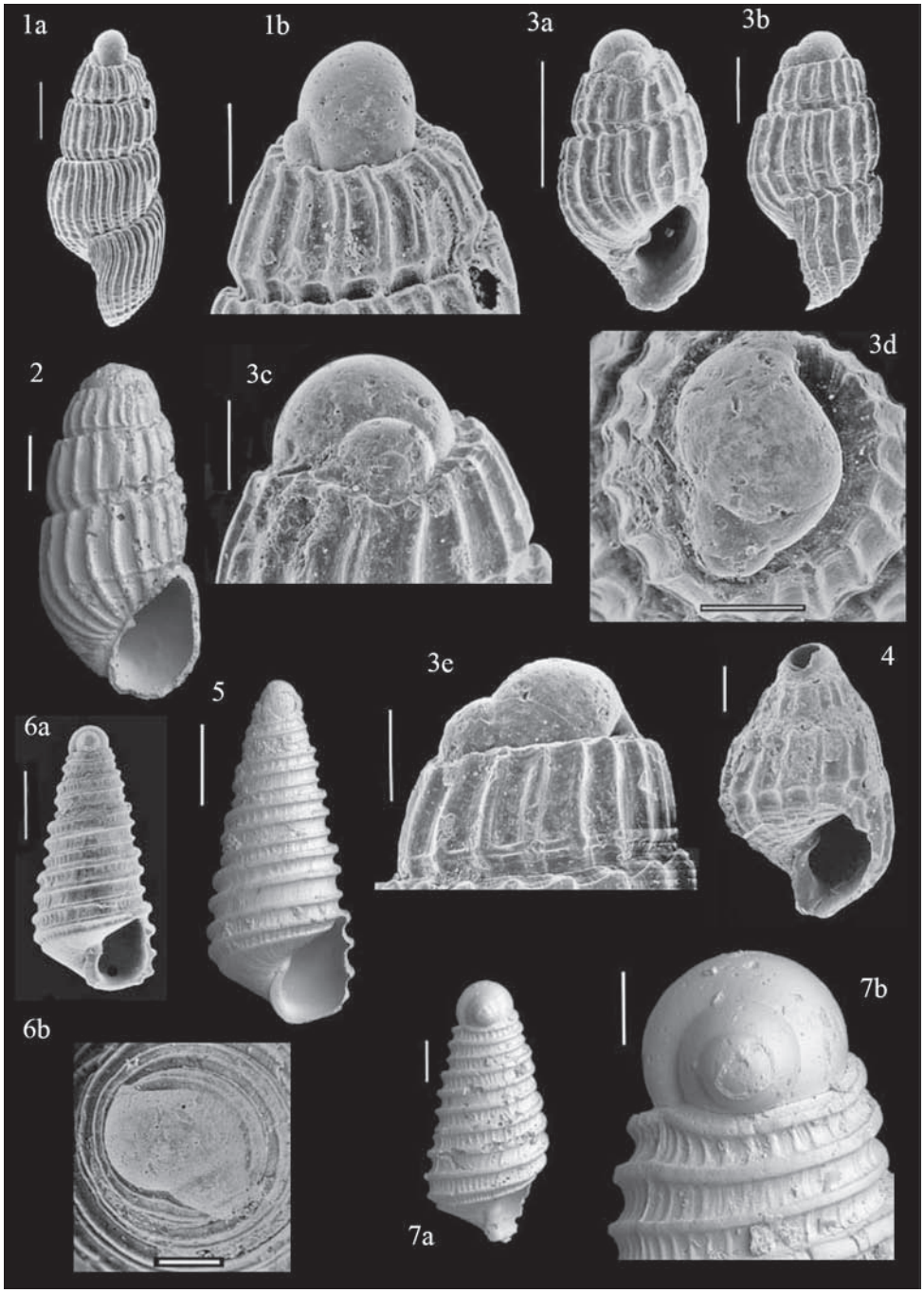
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Plate 7

Fig. 1. *Bulimoscilla stefanoi* sp. nov. Holotype, RGM 606869, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm)

Fig. 2. *Chrysallida reticulata* sp. nov. Holotype, RGM 606872, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Egila garudai* sp. nov. Holotype, RGM 606874, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.20 mm).

Fig. 4. *Egila garudai* sp. nov. Paratype, RGM 606876, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, apical view of protoconch (bar = 0.10 mm); c, lateral view of protoconch (bar = 0.10 mm).

Fig. 5. *Egilina karasensis* sp. nov. Holotype, RGM 606878, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.10 mm); b, apical view of protoconch (bar = 0.10 mm); c, lateral view of protoconch (bar = 0.10 mm).

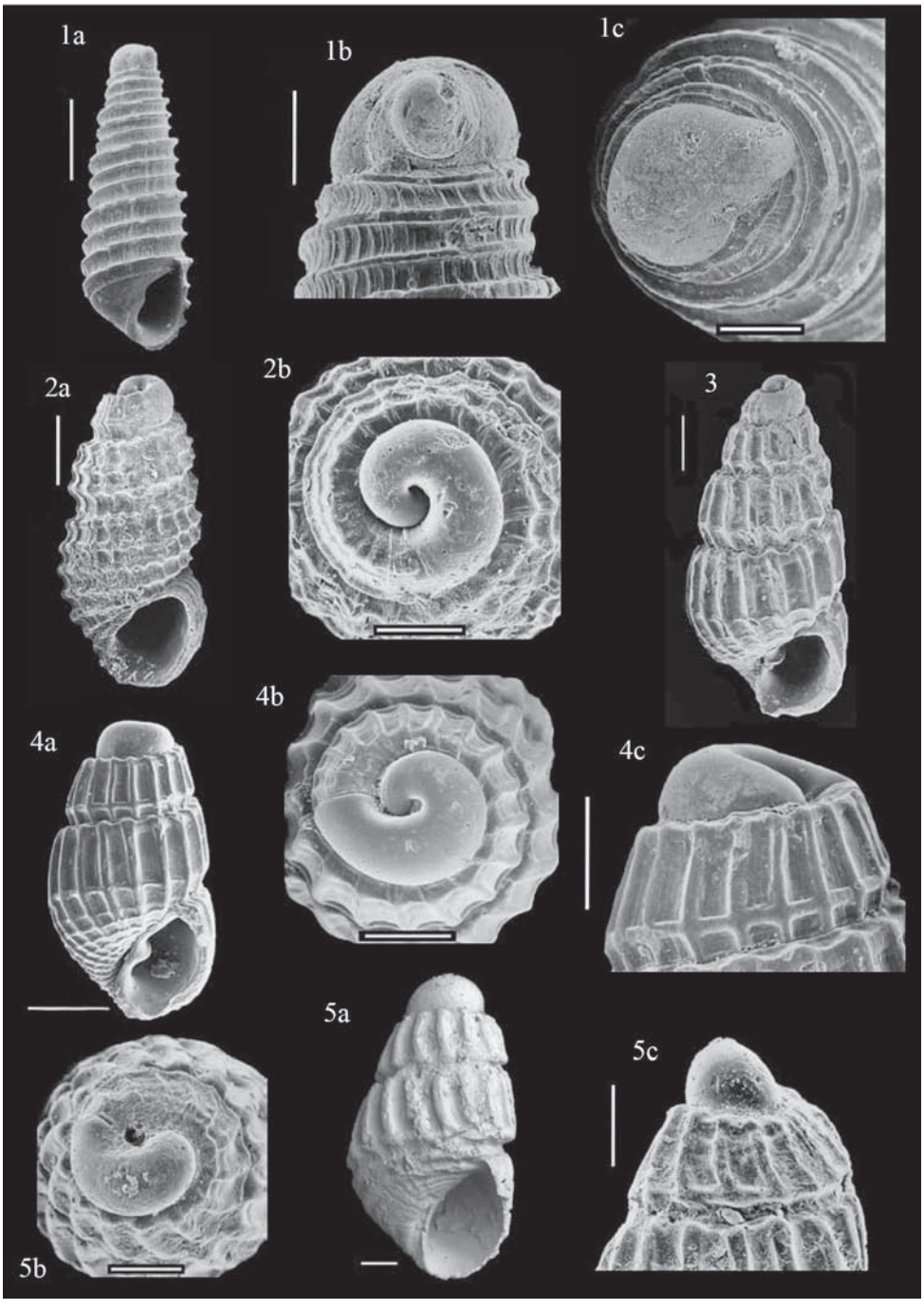
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Plate 8

Fig. 1. *Hinemoa* sp. RGM 606880, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, apical view of protoconch (bar = 0.10 mm); c, lateral view of protoconch (bar = 0.10 mm).

Fig. 2. *Levipyrgulina levisculpta* sp. nov. Holotype, RGM 606882, Kali Rebjong Section, level RMG 3, "Rembangian". Apertural view of shell (bar = 0.40 mm).

Fig. 3. *Levipyrgulina levisculpta* sp. nov. Paratype, RGM 606883, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Liamorpha minuta* sp. nov. Holotype, RGM 606885, Kali Rebjong Section, level RMG 3, "Rembangian". Apertural view of shell (bar = 0.20 mm).

Fig. 5. *Liamorpha minuta* sp. nov. Paratype, RGM 606886, Kali Rebjong Section, level RMG 3, "Rembangian". a, lateral view of shell (bar = 0.10 mm); b, protoconch (bar = 0.05 mm).

Fig. 6. *Liamorpha minuta* sp. nov. Paratype, RGM 606887, Kali Rebjong Section, level RMG 3, "Rembangian". Lateral view of protoconch (bar = 0.05 mm).

Fig. 7. *Liamorpha rembangensis* sp. nov. Holotype, RGM 606889, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

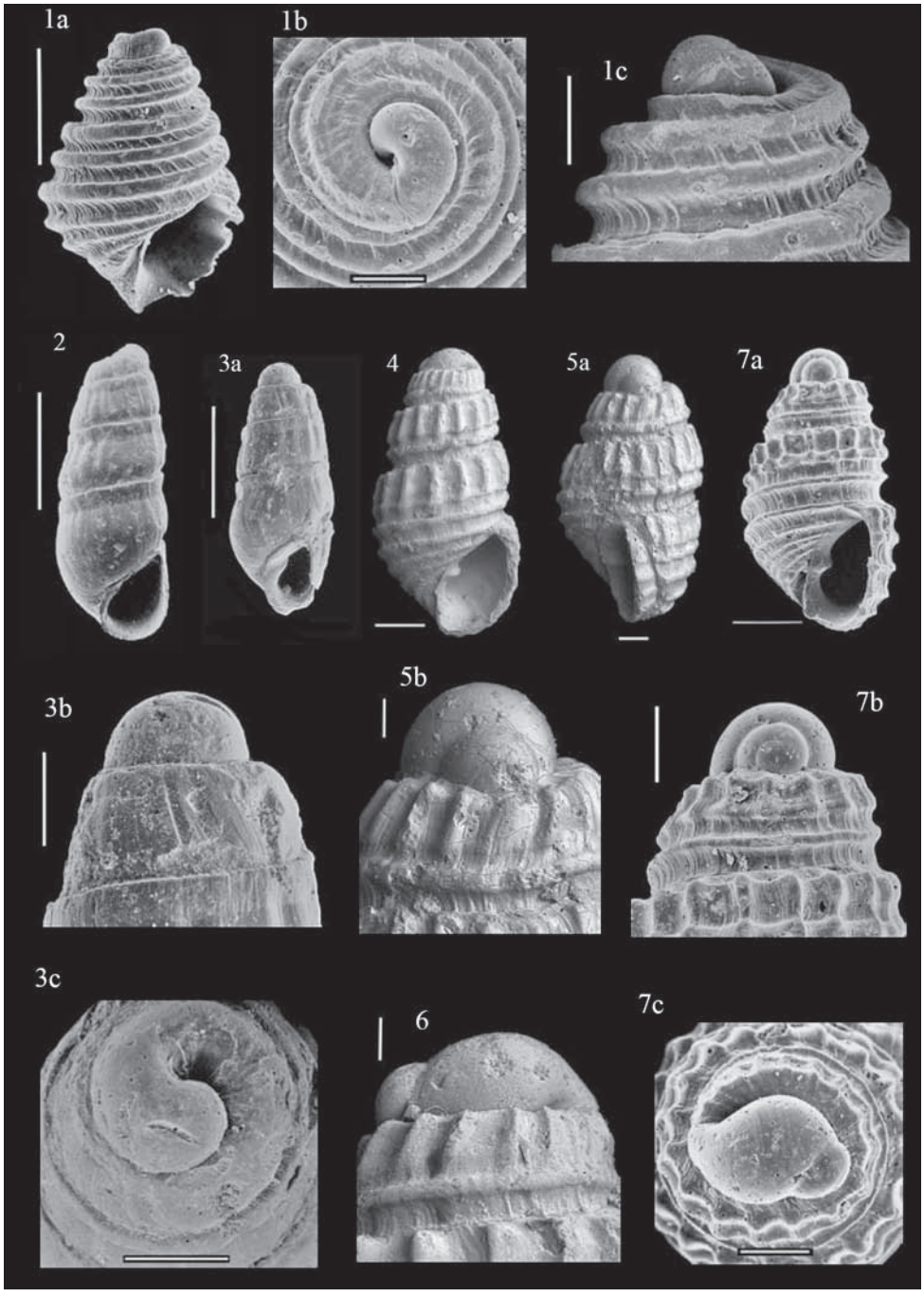
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Plate 9

Fig. 1. *Liamorpha?* sp. RGM 606893, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.20 mm).
Fig. 2. *Linopyrga gradata* sp. nov. Holotype, RGM 606894, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.20 mm).
Fig. 3. *Linopyrga gradata* sp. nov. Paratype, RGM 606895, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).
Fig. 4. *Linopyrga marcoi* sp. nov. Holotype, RGM 606897, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, lateral view of protoconch (bar = 0.10 mm); d, apical view of protoconch (bar = 0.10 mm).
Fig. 5. *Linopyrga* sp. 1. RGM 606900, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, lateral view of protoconch (bar = 0.04 mm); c, apical view of protoconch (bar = 0.10 mm).
Fig. 6. *Linopyrga* sp. 2. RGM 606901, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.10 mm); b, lateral view of protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).
Fig. 7. *Menesthella bicarinata* sp. nov. Holotype, RGM 606902, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.20 mm).

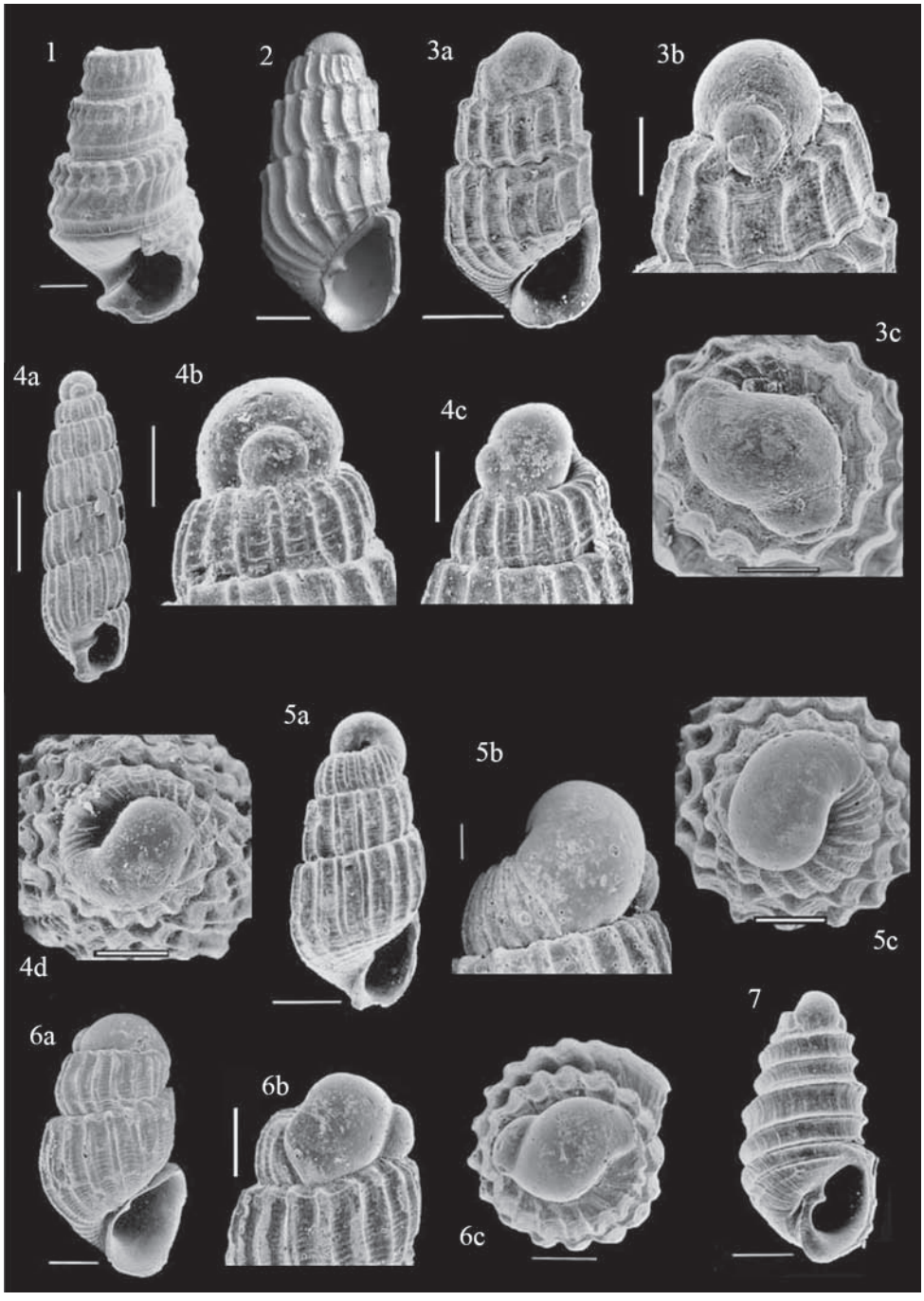
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Plate 10

Fig. 1. *Menesthella bicarinata* sp. nov. Paratype, RGM 606903, Kali Rebjong Section, level RMG 6, "Rembangian". Apical view of protoconch (bar = 0.10 mm).
Fig. 2. *Menesthella javanensis* sp. nov. Holotype, RGM 606905, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.50 mm).
Fig. 3. *Menesthella javanensis* sp. nov. Paratype, RGM 606906, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm).
Fig. 4. *Menesthella matteoi* sp. nov. Holotype, RGM 606908, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, lateral view of protoconch (bar = 0.10 mm).
Fig. 5. *Menesthella matteoi* sp. nov. Paratype, RGM 606909, Kali Rebjong Section, level RMG 6, "Rembangian". a, abapertural view of shell (bar = 0.25 mm); b, protoconch (bar = 0.25 mm); c, oblique apical view of protoconch (bar = 0.25 mm).
Fig. 6. *Menesthella sumatrana* (Thiele, 1925). Lectotype of *Oscilla sumatrana* Thiele, 1925, ZMB/Moll 63996, Nias Island, Recent. a, apertural view of shell (bar = 0.50 mm); b, protoconch (bar = 0.10 mm).
Fig. 7. *Menesthella sumatrana* (Thiele, 1925). Specimen identified as *Miralda sumatrana* by Wissema (1947), RGM 606802, Nias Island, locality 39, Pleistocene. Apertural view of shell (bar = 0.50 mm).
Fig. 8. *Menesthella* sp. nov. Specimen referred to as *Miralda* aff. *sumatrana* by Beets (1986), RGM 315136, Vogelkop (West Irian Jaya), Klasaman Formation, Late Pliocene. Apertural view of shell (bar = 0.50 mm).
Fig. 9. *Menesthella* sp. RGM 606912, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, lateral view of protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

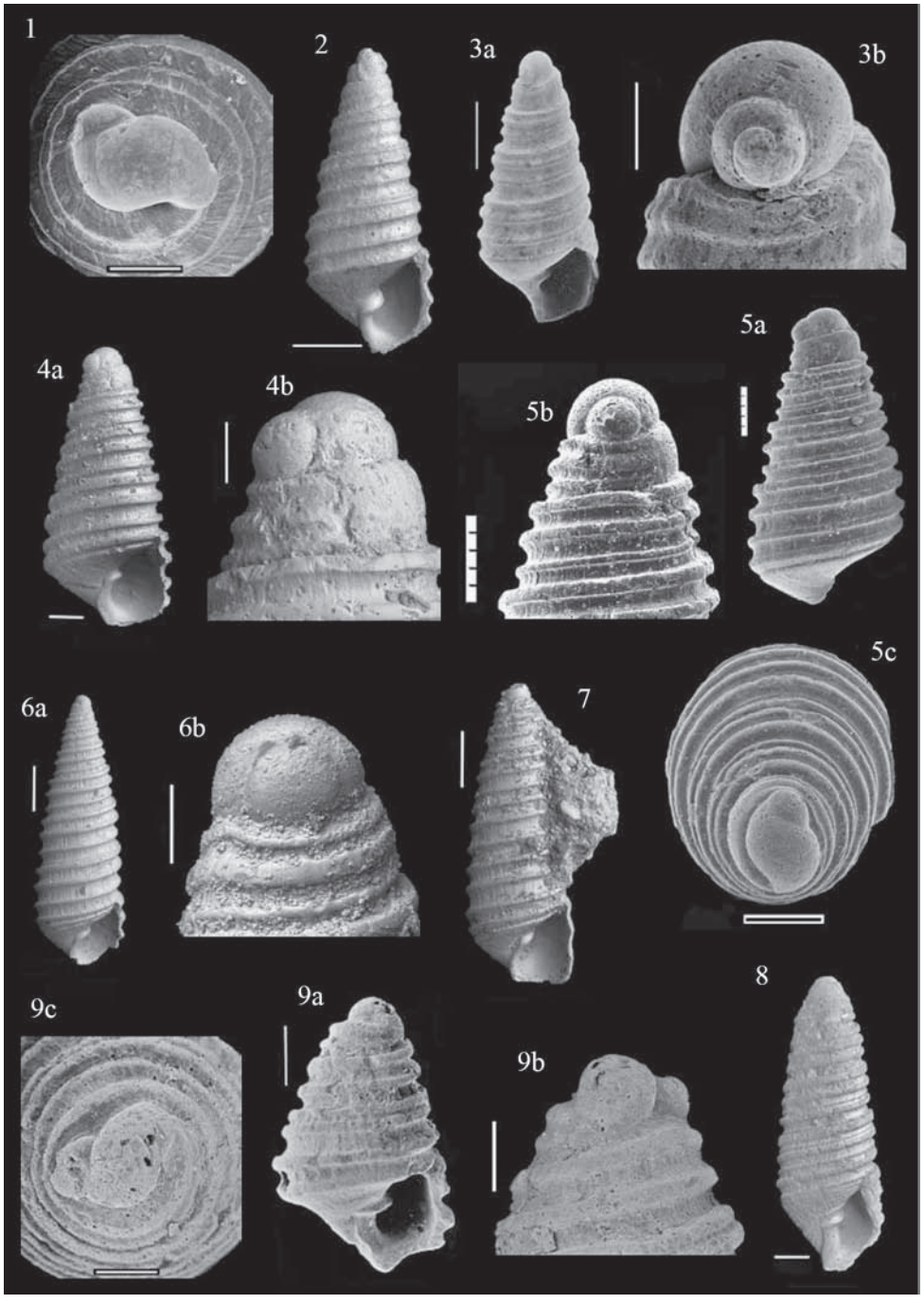
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Plate 11

Fig. 1. *Mumiola* sp. 1. RGM 606913, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.10 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 2. *Mumiola* sp. 2. RGM 606914, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.20 mm).

Fig. 3. *Polemicella* sp. RGM 606915, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Pyrgulina micalii* sp. nov. Holotype, RGM 606916, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.20 mm).

Fig. 5. *Pyrgulina micalii* sp. nov. Paratype, RGM 606917, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.10 mm); b, lateral view of shell (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 6. *Pyrgulina wesselinghi* sp. nov. Holotype, RGM 606919, Kali Rebjong Section, level RMG 3, "Rembangian". Apertural view of shell (bar = 0.20 mm).

Fig. 7. *Pyrgulina wesselinghi* sp. nov. Paratype, RGM 606920, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.10 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 8. *Pyrgulina* sp. 1. RGM 606923, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, oblique apical view of protoconch (bar = 0.10 mm).

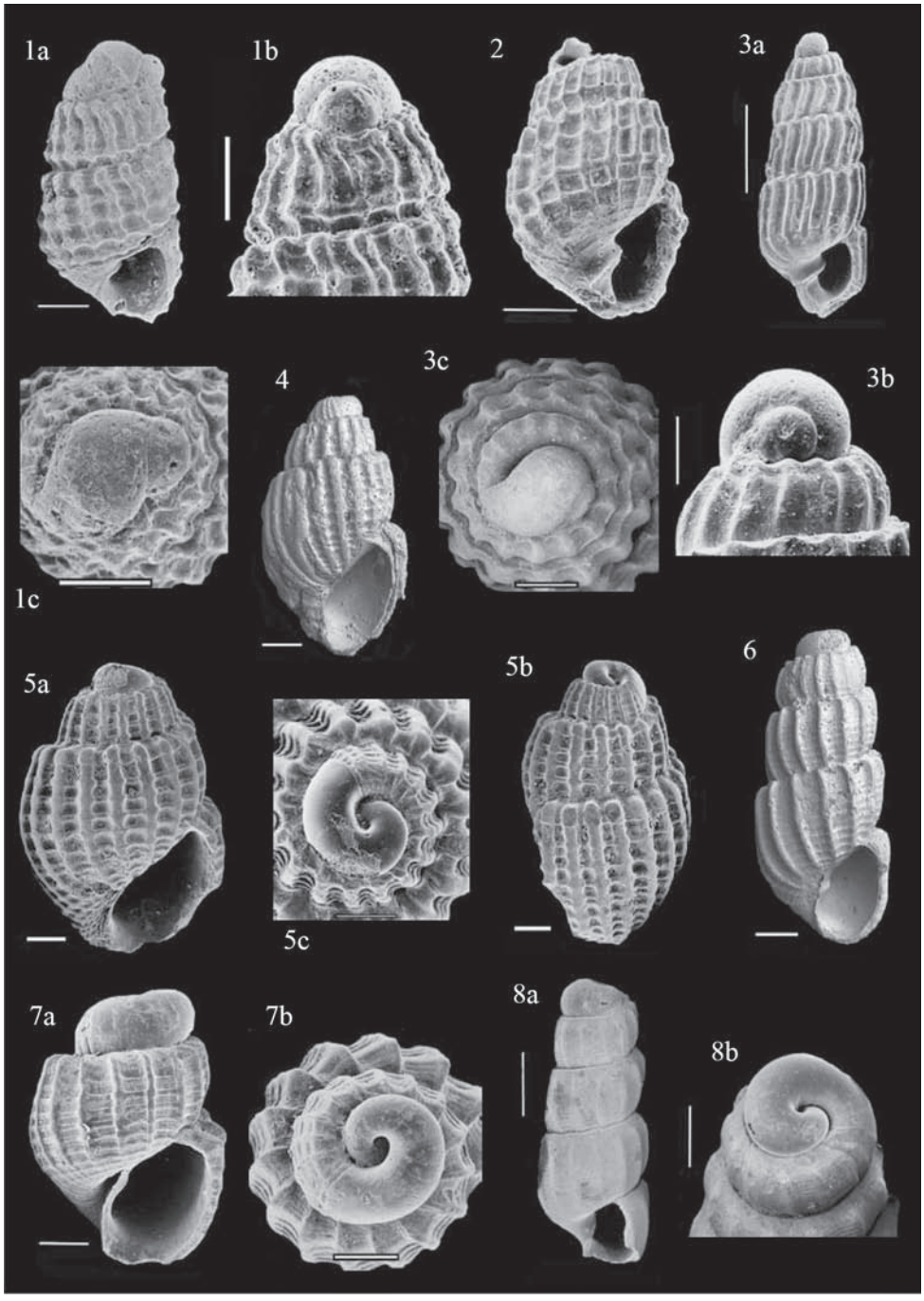
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Plate 12

Fig. 1. *Pyrgulina* sp. 1. RGM 606922, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.20 mm).

Fig. 2. *Pyrgulina* sp. 2. RGM 606925, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Pyrgulina* sp. 3. RGM 606927, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, lateral view of protoconch showing transition to teleoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Pyrgulina* sp. 4. RGM 606928, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 5. *Strioturbonilla rebjongensis* sp. nov. Holotype, RGM 606930, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, detail of spiral sculpture (bar = 0.04 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 6. *Waikura lawsi* sp. nov. Holotype, RGM 606932, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 7. *Waikura lawsi* sp. nov. Paratype, RGM 606934, Kali Rebjong Section, level RMG 6, "Rembangian". a, lateral view of shell (bar = 0.50 mm); b, protoconch (bar = 0.10 mm).

Fig. 8. *Waikura lawsi* sp. nov. Paratype, RGM 606935, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.50 mm).

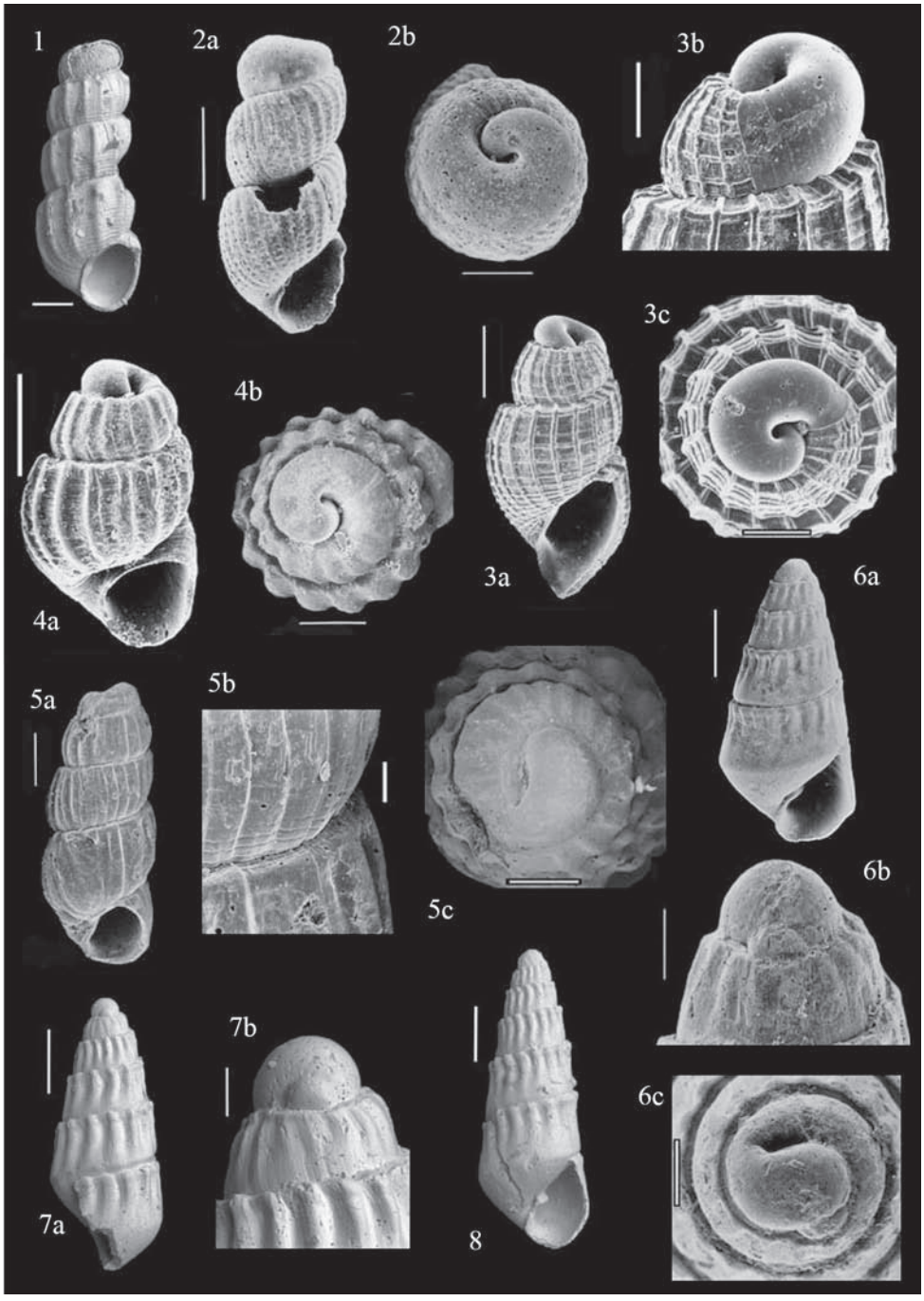
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Plate 13

Fig. 1. *Waikura* sp. RGM 606937, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.50 mm); b, detail of sculpture (bar = 0.10 mm).
Fig. 2. *Waikura* sp. RGM 606938, Kali Rebjong Section, level RMG 6, "Rembangian". Abapertural view of shell (bar = 0.25 mm).
Fig. 3. *Longchaeus junghuhni* (Martin, 1906). Holotype of *Pyramidella junghuhni* Martin, RGM 11488, Junghuhn locality O (Java), Cilanang Formation, Preangerian. Apertural view of shell (bar = 5.0 mm).
Fig. 4. *Longchaeus karangensis* (Martin, 1905). Holotype of *Pyramidella karangensis* Martin, RGM 11484, Cilintung (Java), Cilanang Formation, Preangerian. Apertural view of shell (bar = 5.0 mm).
Fig. 5. *Longchaeus karangensis* (Martin, 1905). Specimen identified as *Pyramidella fastigium* by van Regteren Altena (1942), RGM 606803, East Java, sample M 260, Sonde Formation, Late Pliocene. Apertural view of shell (bar = 5.0 mm).
Fig. 6. *Pyramidella fastigium* (Adams, 1855). Syntype of *Obeliscus fastigium* Adams, BMNH 20090239, Loay (Bohol Island, Philippines), Recent. Apertural view of shell (bar = 5.0 mm).
Fig. 7. *Longchaeus menadensis* (Schepman, 1907). Holotype of *Obeliscus menadensis* Schepman, RGM 107584, Kayuragi (North Sulawesi), Quaternary. Apertural view of shell (bar = 5.0 mm).
Fig. 8. *Longchaeus menadensis* (Schepman, 1907). Lectotype of *Pyramidella kelirensis* Martin, 1916, RGM 11486, Kembang Sokkoh (Java), West Progo Group, Early Miocene. Apertural view of shell (bar = 5.0 mm).
Fig. 9. *Longchaeus menadensis* (Schepman, 1907). Paralectotype of *Pyramidella kelirensis* Martin, 1916, RGM 11487, Ciangsana (Java), Njalindung Formation, Middle Miocene. Apertural view of shell (bar = 10.0 mm).
Fig. 10. *Longchaeus schepmani* sp. nov. Holotype, RGM 606939, Sumberan, "Rembangian". a, apertural view of shell (bar = 2.5 mm); b, detail of sutural areas (bar = 0.5 mm).
Fig. 11. *Longchaeus schepmani* sp. nov. Paratype, RGM 606940, Sumberan, "Rembangian". a, protoconch (bar = 0.25 mm); b, oblique apical view of protoconch (bar = 0.25 mm).
Fig. 12. *Longchaeus schepmani* sp. nov. Paratype, RGM 606941, Sumberan, "Rembangian". Lateral view of shell showing low and broad collabral riblets (bar = 1.0 mm).

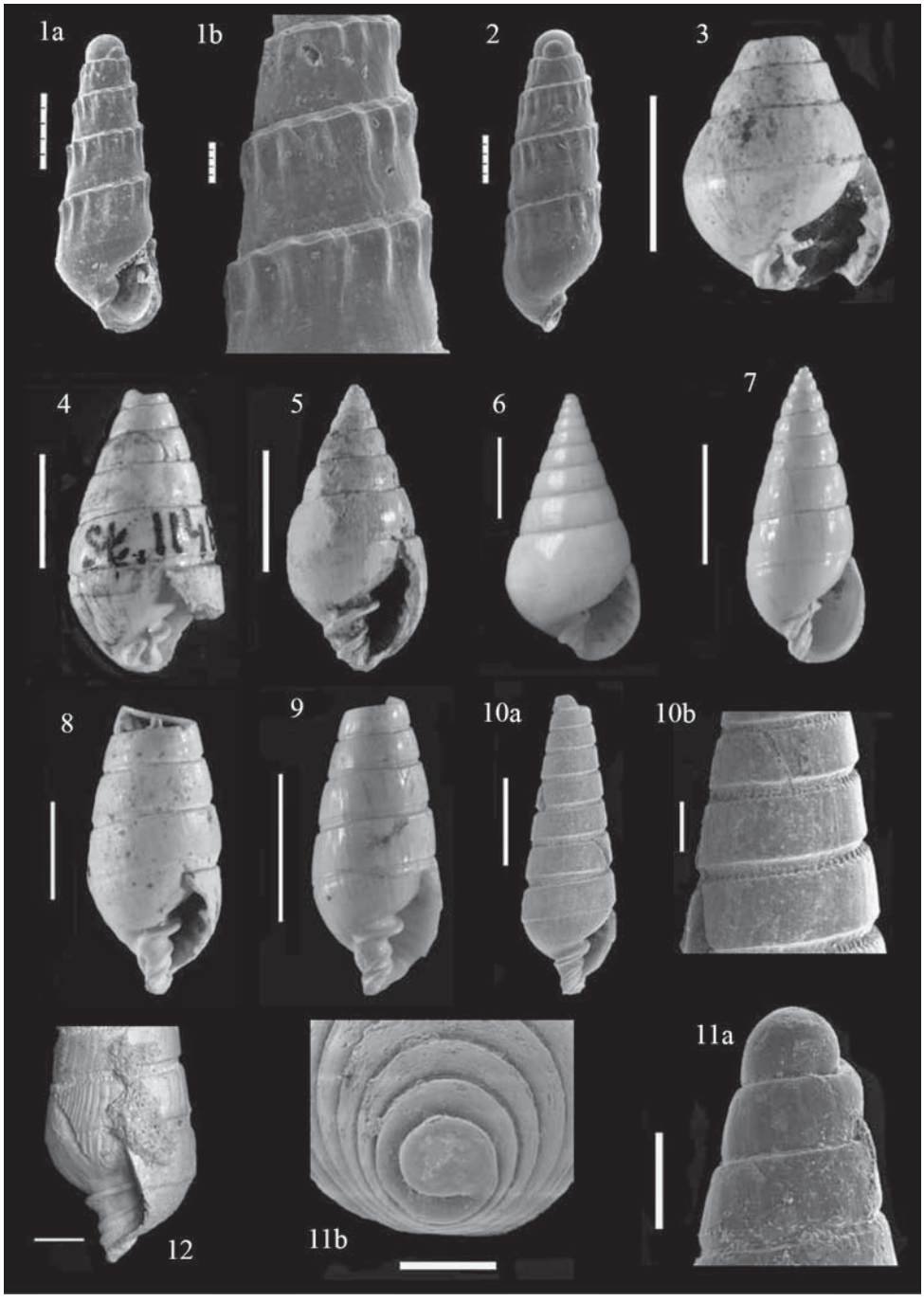
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Plate 14

Fig. 1. *Longchaeus turritus* (Adams, 1855). Type lot (2 syntypes) of *Obeliscus turritus* Adams, BMNH 20090238, Albrochos Island (North Australia), Recent. Apertural view of shells (bars = 5.0 mm).
Fig. 2. *Longchaeus turritus* (Adams, 1855). Type lot of *Obeliscus teres* Adams, 1855, BMNH 1996489, Panay Island (Philippines), Recent. Apertural view of shells (scale 5.0 mm).
Fig. 3. *Longchaeus turritus* (Adams, 1855). Specimen identified as *Pyramidella turrita* by Wissema (1947), RGM 606804, Nias Island, locality 39, Pleistocene. Apertural view of shell (bar = 5.0 mm).
Fig. 4. *Longchaeus turritus* (Adams, 1855). Specimen recorded as *Pyramidella* spec. 1 by Martin (1928), RGM 606805, Aceh (Sumatra), Late Miocene. Earlier whorls and protoconch (bar = 0.20 mm).
Fig. 5. *Obeliscus sulcatus* Adams, 1855. Type lot (3 syntypes), BMNH 20090237, Tahiti, Recent. Apertural and abapertural view of shells (scales 10.0 mm).

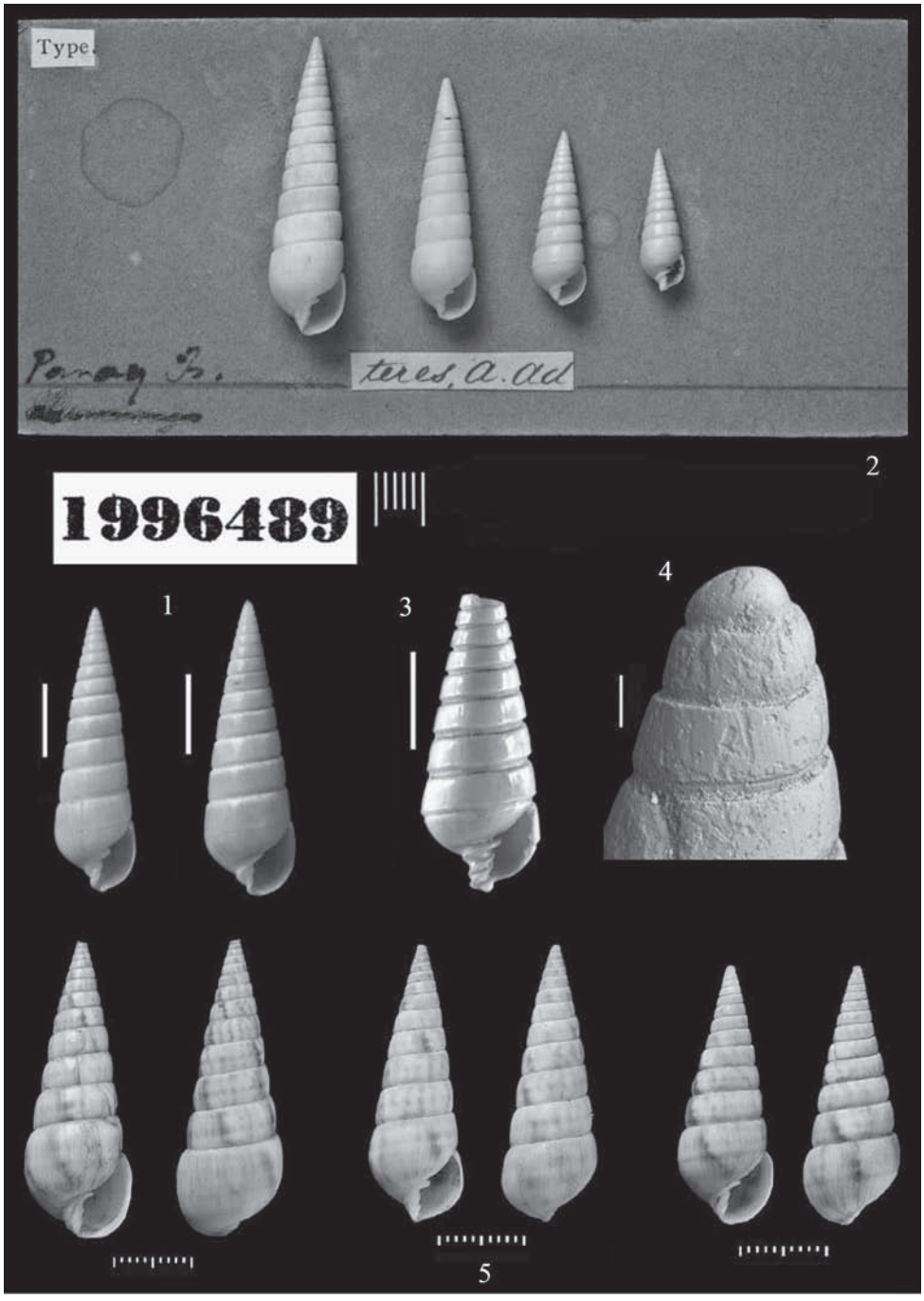
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Plate 15

Fig. 1. *Obeliscus tessellatus* Adams, 1855. Type lot, BMNH 1996490, Masbate Island (Philippines), Recent. Apertural and abapertural view of shells (scale 5.0 mm).
Fig. 2. *Otopleura djunggranganensis* (Martin, 1916). Lectotype of *Pyramidella djunggranganensis* Martin, RGM 11491, Gunung Spolong (Java), West Progo Group, Early Miocene. Apertural view of shell (bar = 5.0 mm).
Fig. 3. *Otopleura reticulata* (Martin, 1905). Lectotype of *Pyramidella reticulata* Martin, RGM 11490a, Sonde (Java), Sonde Formation, Late Pliocene. Apertural view of shell (bar = 5.0 mm).
Fig. 4. *Otopleura reticulata* (Martin, 1905). Paralectotype of *Pyramidella reticulata* Martin, RGM 11490b, Sonde (Java), Sonde Formation, Late Pliocene. Apertural view of shell (bar = 5.0 mm).
Fig. 5. *Pyramidella balteata* (Adams, 1855). Specimen recorded as *Pyramidella* spec. 2 by Martin (1928), RGM 606807, Aceh (Sumatra), Late Miocene. Apertural view of shell (bar = 0.50 mm).
Fig. 6. *Pyramidella nanggulanica* Finlay, 1927. Lectotype of *Pyramidella polita* Martin, 1884, RGM 11479, Yogyakarta (Java), Nanggulan Formation, Middle Eocene. Apertural view of shell (bar = 5.0 mm).
Fig. 7. *Pyramidella nanggulanica* Finlay, 1927. Parlectotype of *Pyramidella polita* Martin, 1884, RGM 11483a, Yogyakarta (Java), Nanggulan Formation, Middle Eocene. Earlier whorls and protoconch (bar = 0.10 mm).
Fig. 8. *Pyramidella* sp. Specimen recorded as *Pyramidella* spec. indet. by Beets (1941), RGM 312358, Mangkalihat Peninsula (Eastern Kalimantan), basal Menkrawit Beds, Preangerian. Apertural view of shell (bar = 0.50 mm).
Fig. 9. *Costosyrnola bataviana* (Martin, 1884). Holotype of *Pyramidella bataviana* Martin, RGM 11489, Batavia Borehole IV (Java), 130-134 m, Pliocene. Apertural view of shell (bar = 0.50 mm).
Fig. 10. *Costosyrnola rebjongensis* sp. nov. Holotype, RGM 606943, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.50 mm).

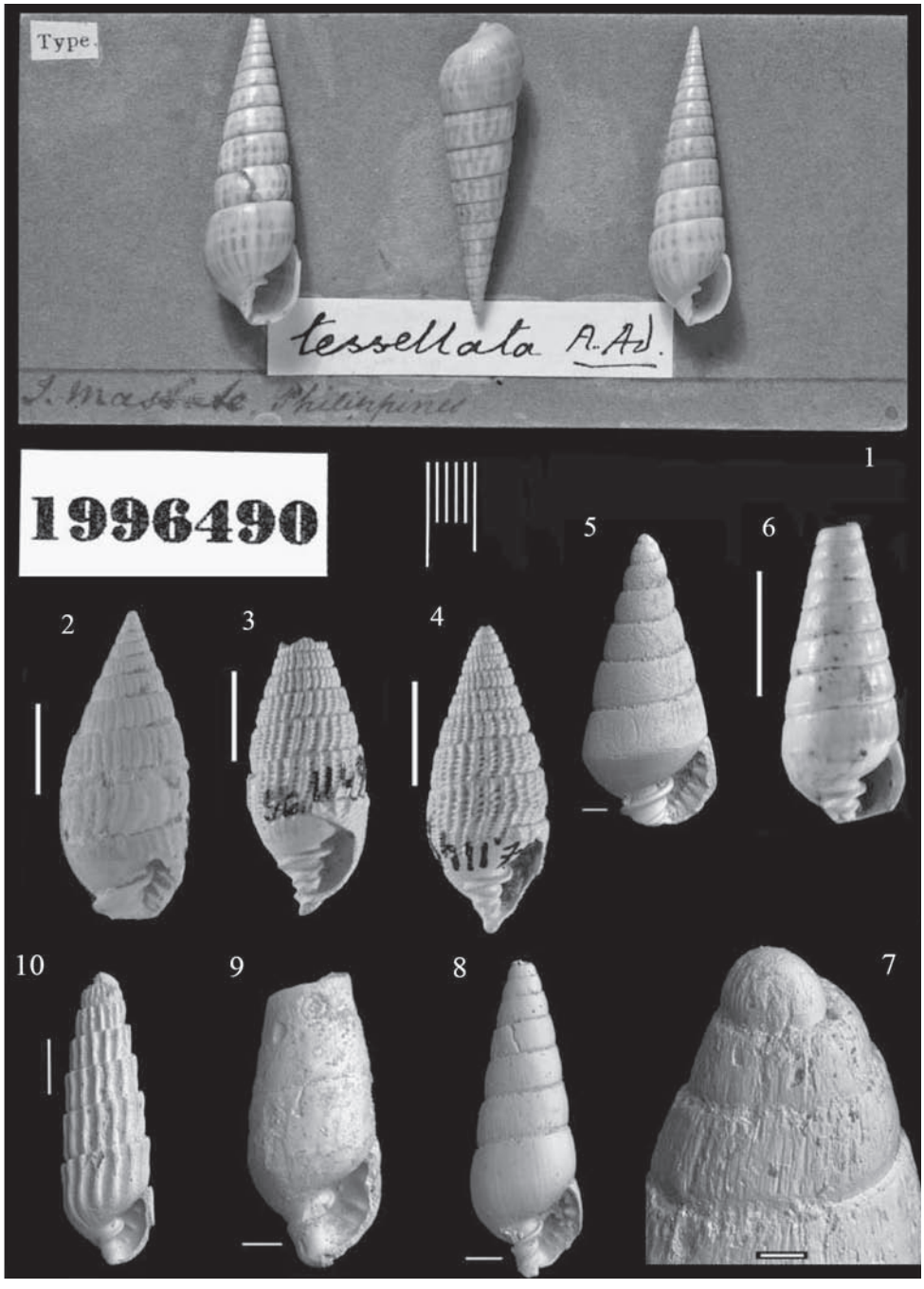
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Plate 16

Fig. 1. *Costosyrnola rebjongensis* sp. nov. Paratype, RGM 606945, Kali Rebjong Section, level RMG 6, "Rembangian". a, lateral view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm).

Fig. 2. *Costosyrnola rebjongensis* sp. nov. Paratype, RGM 606946, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Costosyrnola rebjongensis* sp. nov. Paratype, RGM 606947, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.50 mm).

Fig. 4. *Costosyrnola rebjongensis* sp. nov. Paratype, RGM 606948, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm).

Fig. 5. *Costosyrnola* sp. RGM 606950, Sumberan, "Rembangian". Apertural view of shell (bar = 0.50 mm).

Fig. 6. *Puposyrnola karasensis* sp. nov. Holotype, RGM 606951, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 7. *Syrnola imminens* sp. nov. Holotype, RGM 606954, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, lateral view of protoconch (bar = 0.10 mm); d, apical view of protoconch (bar = 0.10 mm).

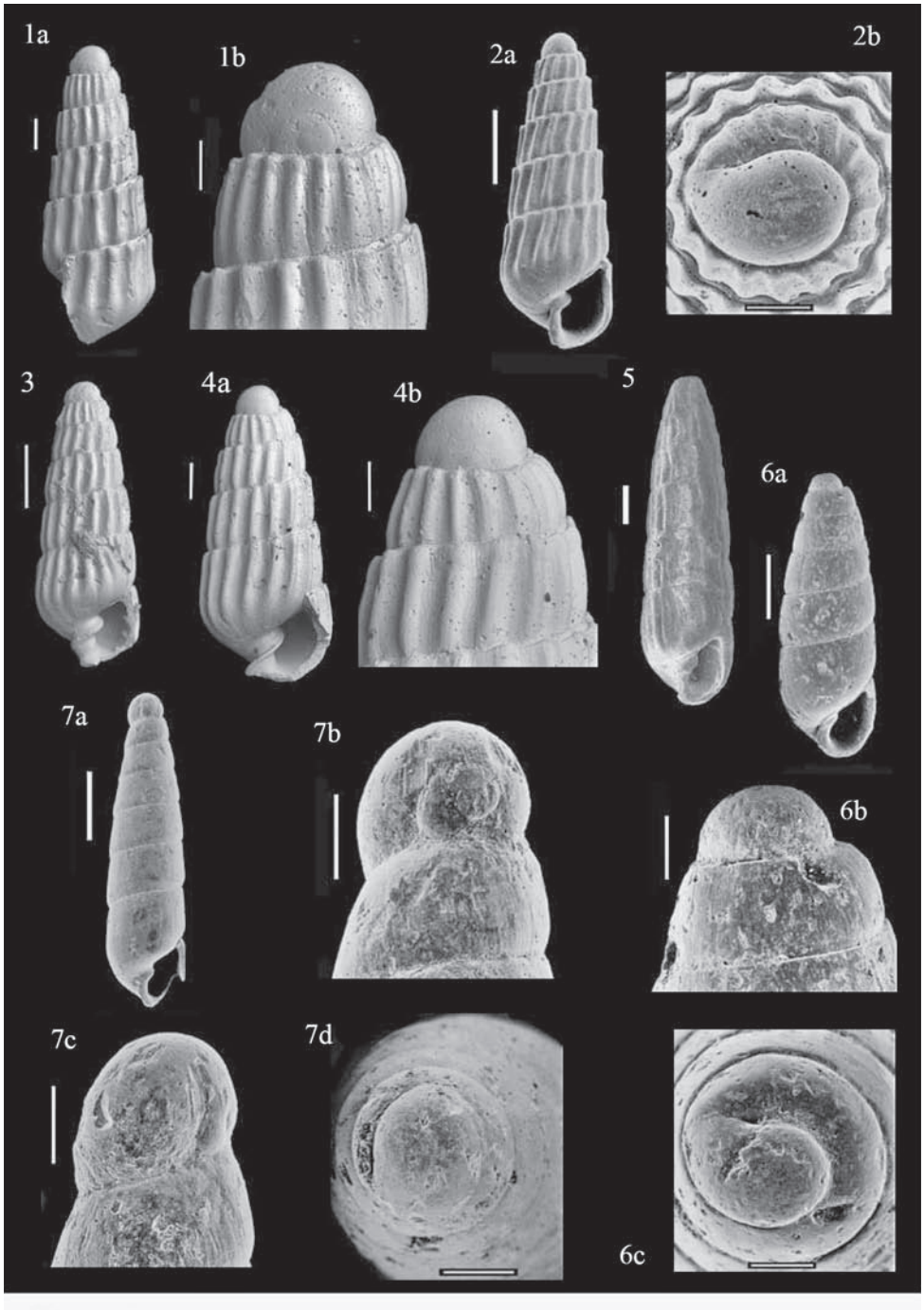
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Plate 17

Fig. 1. *Syrnola turbinolonga* sp. nov. Holotype, RGM 606956, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, oblique apical view of protoconch (bar = 0.10 mm).

Fig. 2. *Syrnola* sp. RGM 606958, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Tibersyrnola awaajensis* (Wissema, 1947). Holotype of *Syrnola awaajensis* Wissema, RGM 606808, Nias Island, locality 39, Pleistocene. Apertural view of shell (bar = 0.50 mm).

Fig. 4. *Tibersyrnola* sp. Specimens recorded as *Pyramidella* spec. 2 by Martin (1911), RGM 11492, Cilanang (Java), Preangerian. a, apertural view of specimen RGM 11492a (bar = 0.50 mm); b, apertural view of specimen RGM 11492b (bar = 0.50 mm).

Fig. 5. *Cossmannica* sp. RGM 606959, Sumberan, "Rembangian". a, apertural view of shell (bar = 0.50 mm); b, oblique apical view of protoconch (bar = 0.25 mm).

Fig. 6. *Tiberia* sp. RGM 606960, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 7. *Asmunda rebjongensis* sp. nov. Holotype, RGM 606961, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, lateral view of protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm); d, apical whorls showing protoconch-teleoconch transition (bar = 0.10 mm).

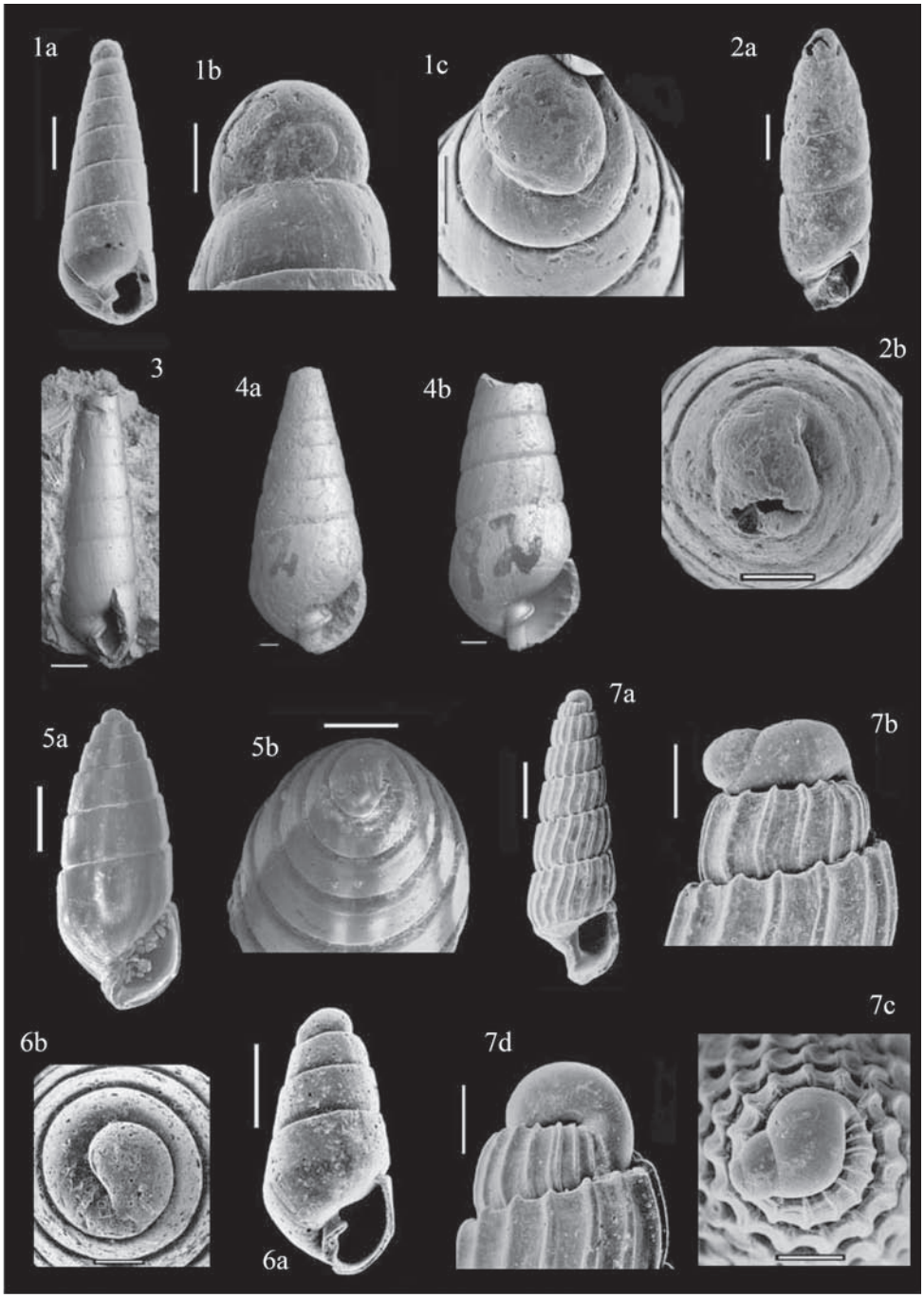
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Plate 18

Fig. 1. *Bartschella karasensis* sp. nov. Holotype, RGM 606964, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, lateral view of protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 2. *Bartschella karasensis* sp. nov. Paratype, RGM 606966, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm).

Fig. 3. *Exesilla dextra* (Saurin, 1959). RGM 606967, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, apical whorls showing protoconch-teleoconch transition (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Exesilla langhiana* sp. nov. Holotype, RGM 606968, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.50 mm).

Fig. 5. *Exesilla langhiana* sp. nov. Paratype, RGM 606969, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.50 mm).

Fig. 6. *Exesilla langhiana* sp. nov. Paratype, RGM 606970, Kali Rebjong Section, level RMG 6, "Rembangian". Protoconch (bar = 0.10 mm).

Fig. 7. *Exesilla nodosa* (Martin, 1884). Holotype of *Turbonilla nodosa* Martin, RGM 11495, Gresik Borehole (Java), 201 m, Early Miocene. Apertural view of shell (bar = 0.50 mm).

Fig. 8. *Exesilla splendida* (Martin, 1884). Holotype of *Turbonilla splendida* Martin, RGM 11494, Batavia Borehole IV (Java), 130-134 m, Pliocene. Apertural view of shell (bar = 0.50 mm).

Fig. 9. *Exesilla splendida* (Martin, 1884). RGM 606972, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

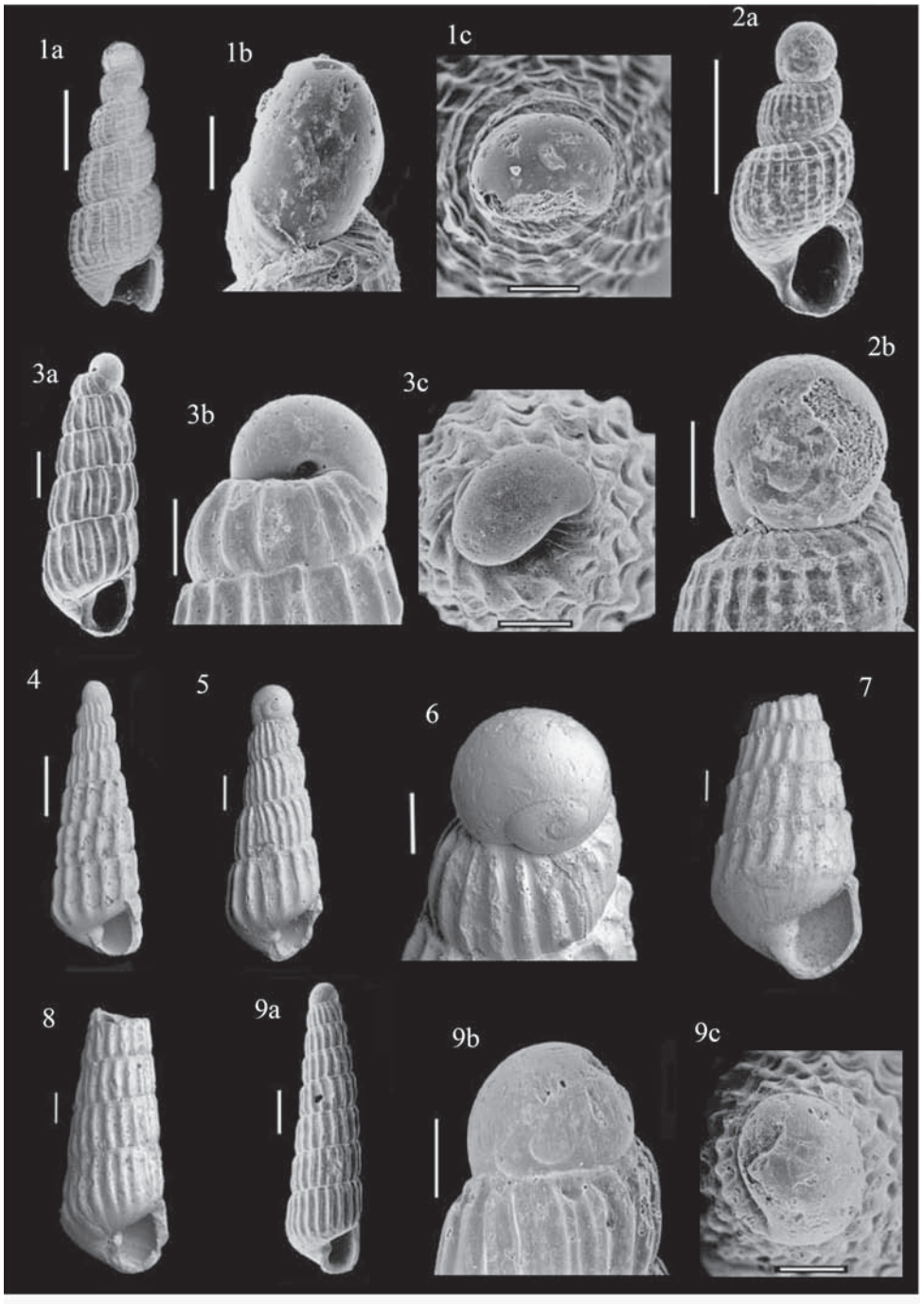
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Plate 19

Fig. 1. *Exesilla striata* sp. nov. Holotype, RGM 606974, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 2. *Nisipyrgiscus filicinctus* sp. nov. Holotype, RGM 606976, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, lateral view of protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Nisipyrgiscus javanensis* sp. nov. Holotype, RGM 606978, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, detail of basal sculpture (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Nisipyrgiscus javanensis* sp. nov. Paratype, RGM 606979, Kali Rebjong Section, level RMG 3, "Rembangian". Protoconch (bar = 0.10 mm).

Fig. 5. *Nisipyrgiscus* sp. 1. RGM 606983, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 6. *Nisipyrgiscus* sp. 1. RGM 606984, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.50 mm).

Fig. 7. *Nisipyrgiscus* sp. 2. RGM 606986, Kali Rebjong Section, level RMG 5, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 8. *Nisiturris alma* (Thiele, 1925). Holotype of *Turbonilla alma* Thiele, ZMB/Moll 64095, Padang (Sumatra), Recent. a, apertural view of shell (bar = 0.50 mm); b, protoconch (bar = 0.10 mm).

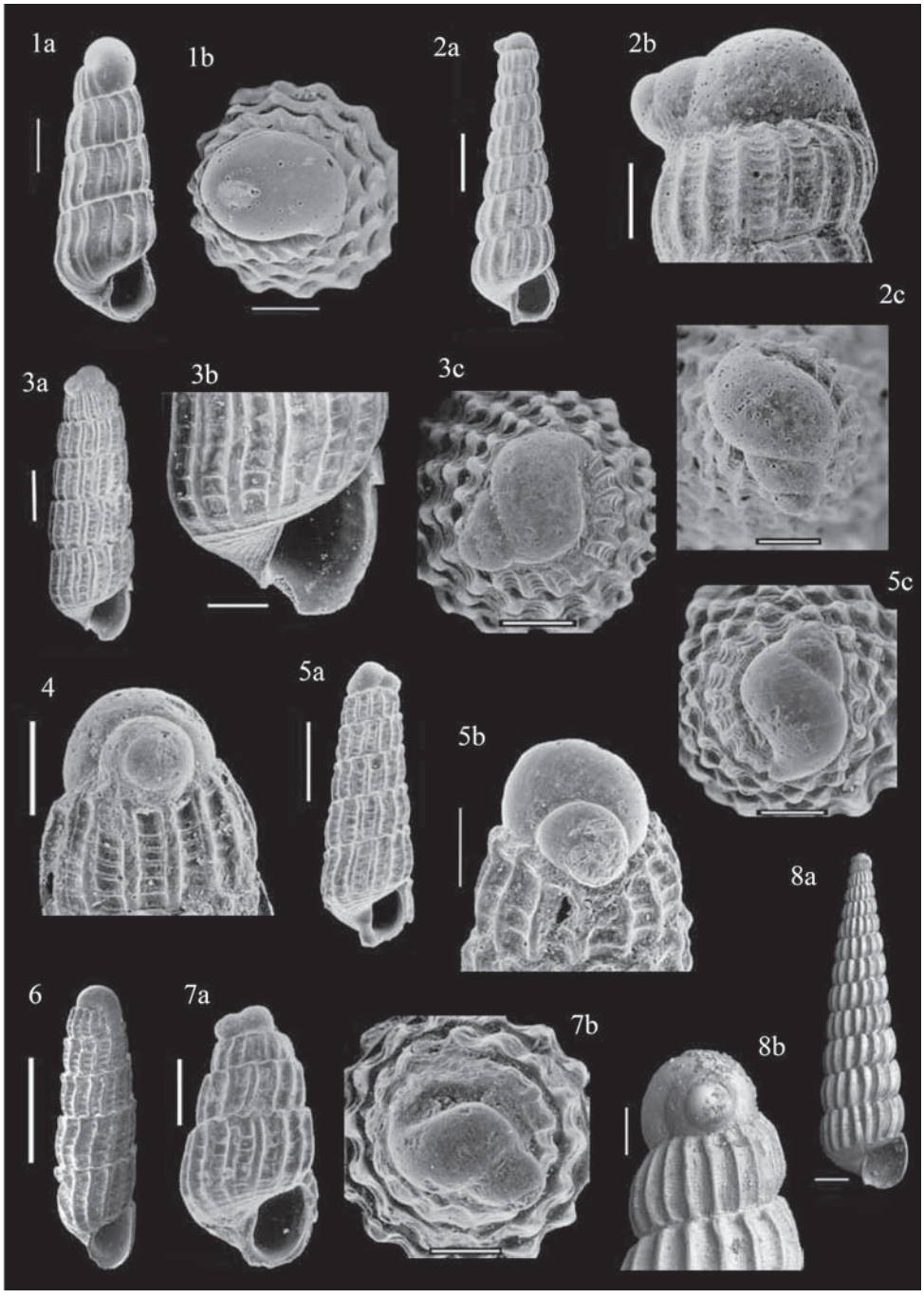
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Plate 20

Fig. 1. *Nisiturris alma* (Thiele, 1925). Specimen recorded as *Turbonilla* spec. 1 by Martin (1928), RGM 606809, Aceh (Sumatra), Late Miocene. Apertural view of shell (bar = 0.50 mm).

Fig. 2. *Nisiturris columellaris* sp. nov. Holotype, RGM 606987, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm).

Fig. 3. *Nisiturris columellaris* sp. nov. Paratype, RGM 606989, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Nisiturris karasensis* sp. nov. Holotype, RGM 606991, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 5. *Nisiturris karasensis* sp. nov. Paratype, RGM 606993, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.40 mm).

Fig. 6. *Nisiturris obliquecostata* sp. nov. Holotype, RGM 606995, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm).

Fig. 7. *Nisiturris obliquecostata* sp. nov. Paratype, RGM 606996, Kali Rebjong Section, level RMG 6, "Rembangian". a, lateral view of shell (bar = 0.25 mm); b, abapertural view of shell (bar = 0.25 mm); c, oblique apical view of protoconch (bar = 0.25 mm).

Fig. 8. *Nisiturris piccolii* sp. nov. Holotype, RGM 606998, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.40 mm).

Fig. 9. *Nisiturris piccolii* sp. nov. Paratype, RGM 606999, Kali Rebjong Section, level RMG 6, "Rembangian". a, lateral view of protoconch (bar = 0.10 mm); b, apical view of protoconch (bar = 0.10 mm).

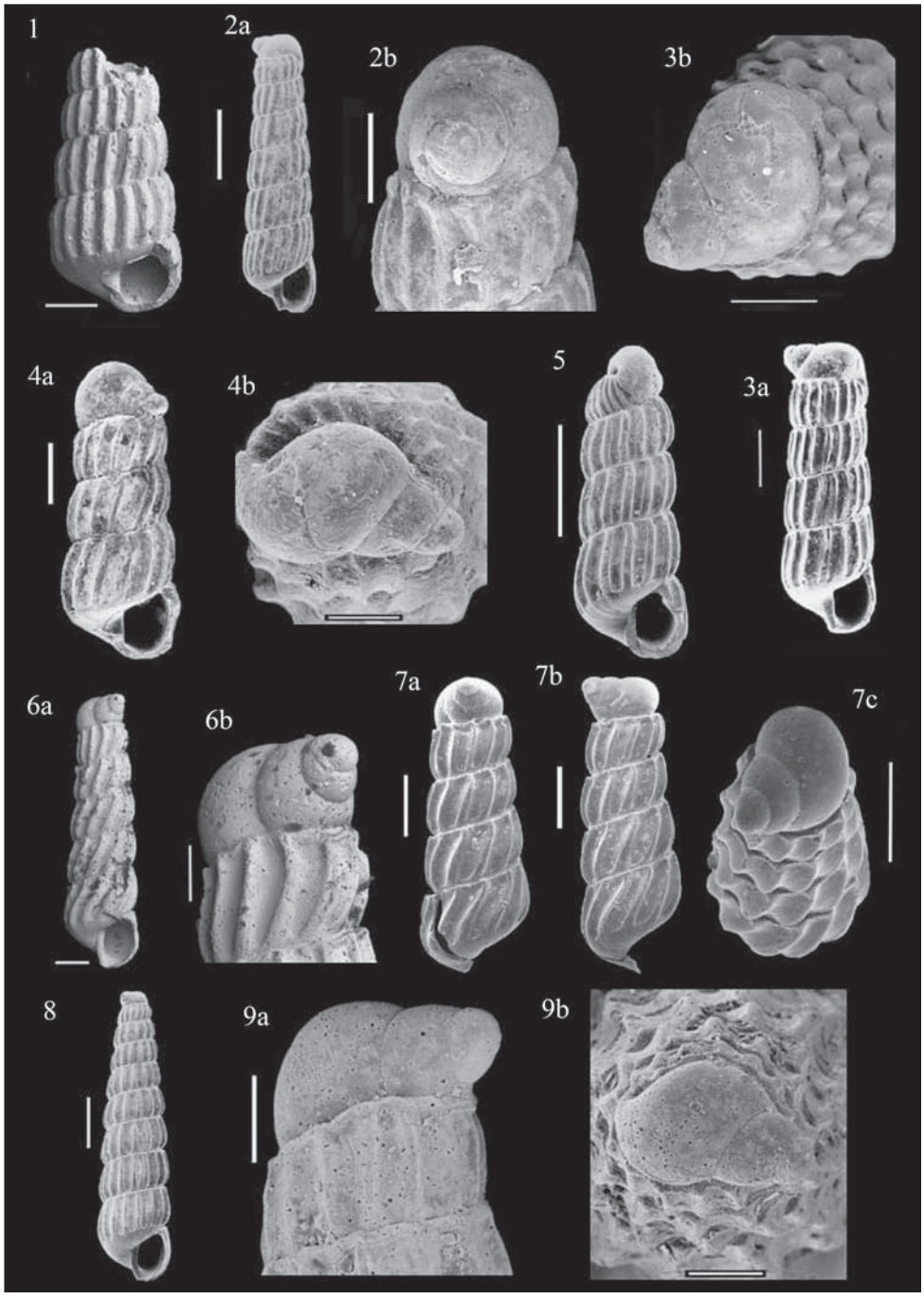
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Plate 21

Fig. 1. *Nisiturris rembangensis* sp. nov. Holotype, RGM 607001, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, lateral view of protoconch (bar = 0.10 mm); d, apical view of protoconch (bar = 0.10 mm).

Fig. 2. *Nisiturris supramarginata* sp. nov. Holotype, RGM 607003, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, lateral view of protoconch (bar = 0.10 mm).

Fig. 3. *Nisiturris supramarginata* sp. nov. Paratype, RGM 607005, Kali Rebjong Section, level RMG 6, "Rembangian". a, protoconch (bar = 0.10 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Nisiturris* sp. RGM 607007, Sumberan, "Rembangian". a, apertural view of shell (bar = 1.0 mm); b, protoconch (bar = 0.25 mm); c, lateral view of protoconch (bar = 0.25 mm).

Fig. 5. *Pyrgiscus apiciglobosus* sp. nov. Holotype, RGM 607009, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 6. *Pyrgiscus dentatus* sp. nov. Holotype, RGM 607012, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 7. *Pyrgiscus junghuhni* (Martin, 1906). Holotype of *Turbonilla junghuhni* Martin, RGM 11497, western part of Cidamar (Java), Junghuhn locality K, Miocene. Apertural view of shell (bar = 0.50 mm).

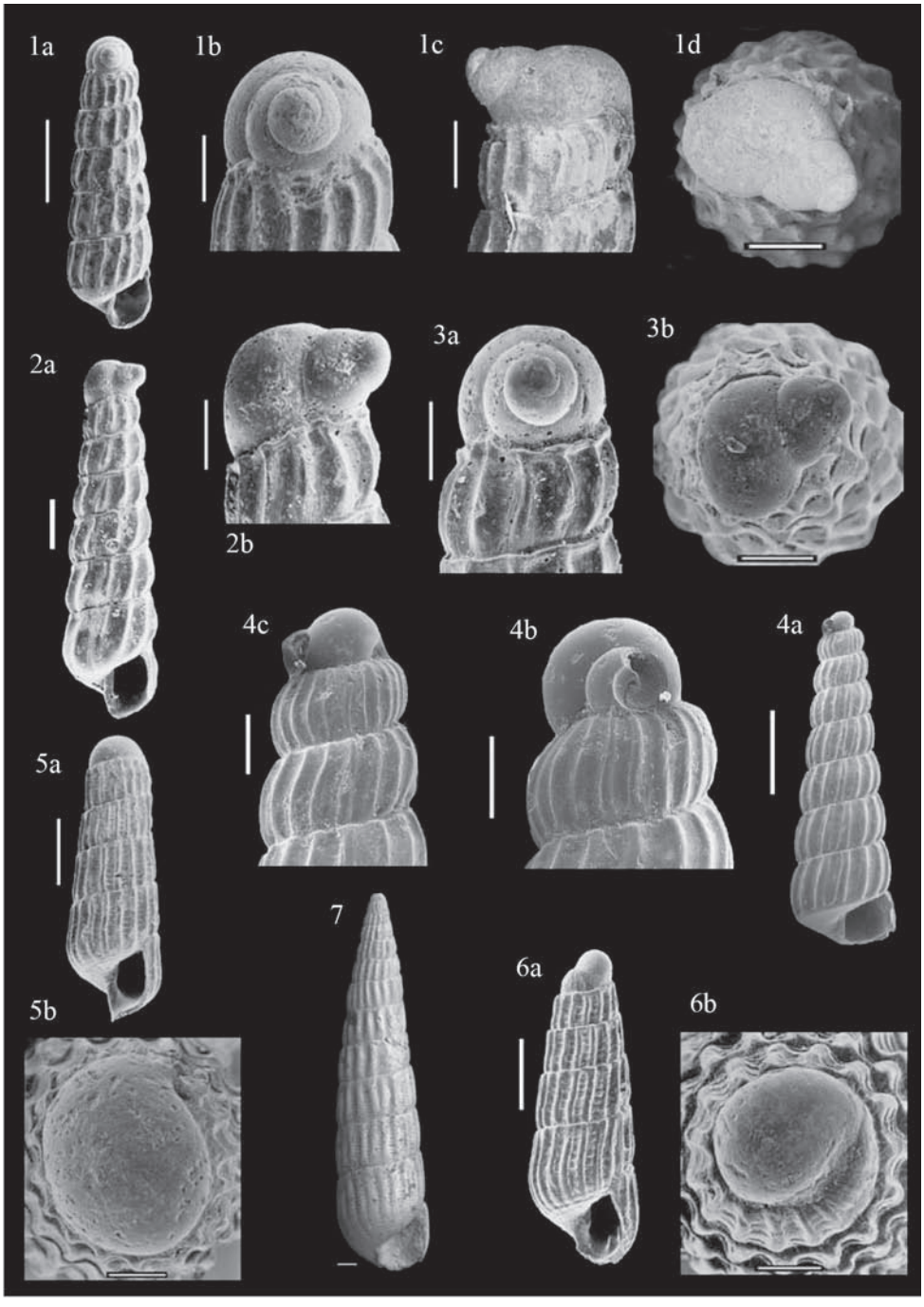
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Plate 22

Fig. 1. *Pyrgiscus martini* nom. nov. Holotype of *Turbonilla scalaris* Martin, 1884, RGM 11496, Ngembak (Java), Borehole B, 104-112 m, Early Miocene. a, apertural view of shell (bar = 0.50 mm); b, earlier whorls and protoconch (bar = 0.10 mm).

Fig. 2. *Pyrgiscus* sp. 1. RGM 607015, Kali Rebjong Section, level RMG 5, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm).

Fig. 3. *Pyrgiscus* sp. 1. RGM 607016, Kali Rebjong Section, level RMG 5, "Rembangian". a, protoconch (bar = 0.10 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Pyrgiscus* sp. 2. RGM 607018, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 1.0 mm).

Fig. 5. *Pyrgiscus* sp. 2. RGM 607019, Locality RMG 2, "Rembangian". Apertural view of shell (bar = 0.50 mm).

Fig. 6. *Turbolidium schroederi* (Wissema, 1947). Holotype of *Turbonilla schroederi* Wissema, RGM 606810, Nias Island, locality 39, Pleistocene. a, apertural view of shell (bar = 0.50 mm); b, earlier whorls and protoconch (bar = 0.10 mm); c, lateral view of protoconch (bar = 0.10 mm).

Fig. 7. *Turbonilla karasensis* sp. nov. Holotype, RGM 607021, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm); d, apical whorls showing protoconch-teleoconch transition (bar = 0.10 mm).

Fig. 8. *Turbonilla karasensis* sp. nov. Paratype, RGM 607022, Kali Rebjong Section, level RMG 6, "Rembangian". Protoconch (bar = 0.10 mm).

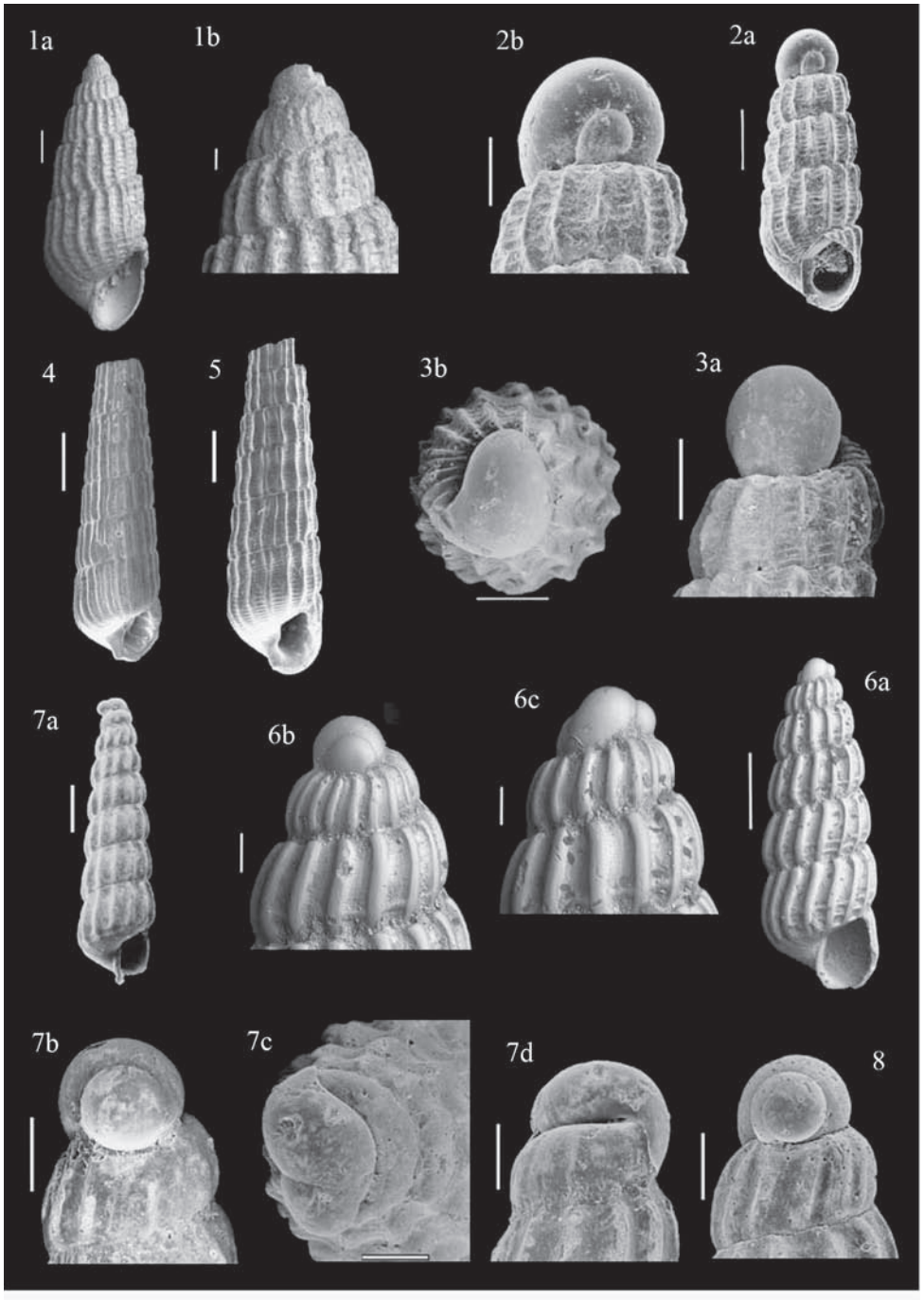
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Plate 23

Fig. 1. *Turbonilla sindangbaranensis* Martin, 1906. Holotype, RGM 11498, western part of Cidamar (Java), Junghuhn locality K, Miocene. Apertural view of shell (bar = 0.50 mm).

Fig. 2. *Turbonilla tawunensis* sp. nov. Holotype, RGM 607024, Kali Rebjong Section, level RMG 6, "Rembangian". a, lateral view of shell (bar = 0.40 mm); b, detail of axial microfolds (bar = 0.04 mm); c, protoconch (bar = 0.10 mm); d, lateral view of protoconch (bar = 0.10 mm).

Fig. 3. *Turbonilla* sp. 1. RGM 607026, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, lateral view of protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 4. *Turbonilla* sp. 2. RGM 607028, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, oblique apical view of protoconch (bar = 0.10 mm).

Fig. 5. *Bacteridiella saurini* sp. nov. Holotype, RGM 607030, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm).

Fig. 6. *Bacteridiella saurini* sp. nov. Paratype, RGM 607032, Kali Rebjong Section, level RMG 6, "Rembangian". a, lateral view of shell (bar = 0.40 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 7. *Eulimella latemarginata* sp. nov. Holotype, RGM 607034, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm).

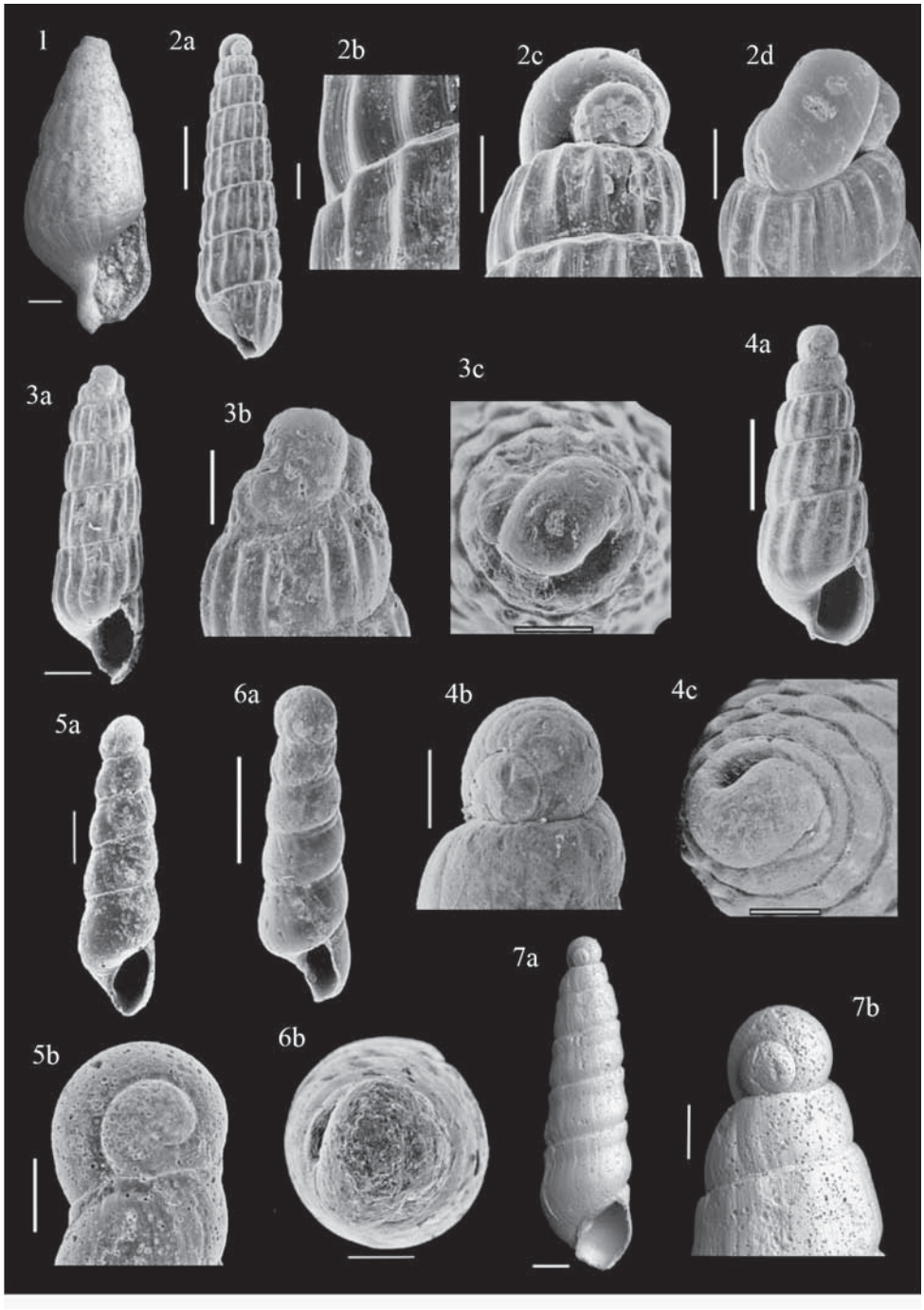
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Fig. 1. *Eulimella latemarginata* sp. nov. Paratype, RGM 607035, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, apical view of protoconch (bar = 0.10 mm).

Fig. 2. *Eulimella lawsi* sp. nov. Holotype, RGM 607037, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, lateral view of protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Eulimella lawsi* sp. nov. Paratype, RGM 607038, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm).

Fig. 4. *Eulimella rembangensis* sp. nov. Holotype, RGM 607040, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm); c, lateral view of protoconch (bar = 0.10 mm).

Fig. 5. *Eulimella rembangensis* sp. nov. Paratype, RGM 607041, Kali Rebjong Section, level RMG 3, "Rembangian". Apical view of protoconch (bar = 0.10 mm).

Fig. 6. *Eulimella* sp. 1. RGM 607043, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.50 mm); b, earlier whorls and protoconch (bar = 0.10 mm).

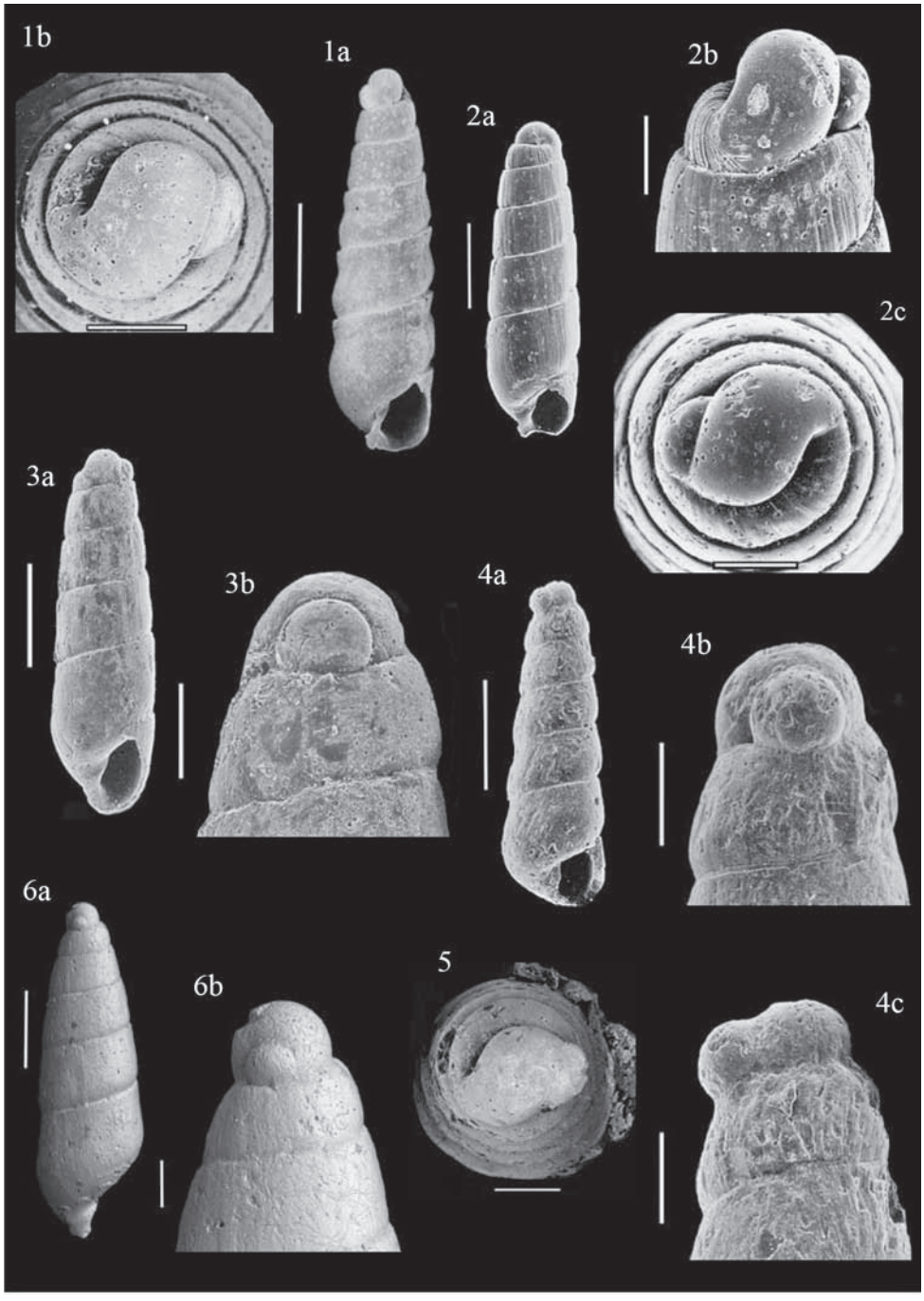
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Fig. 1. *Eulimella* sp. 1. RGM 607044, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, oblique apical view of protoconch (bar = 0.10 mm).

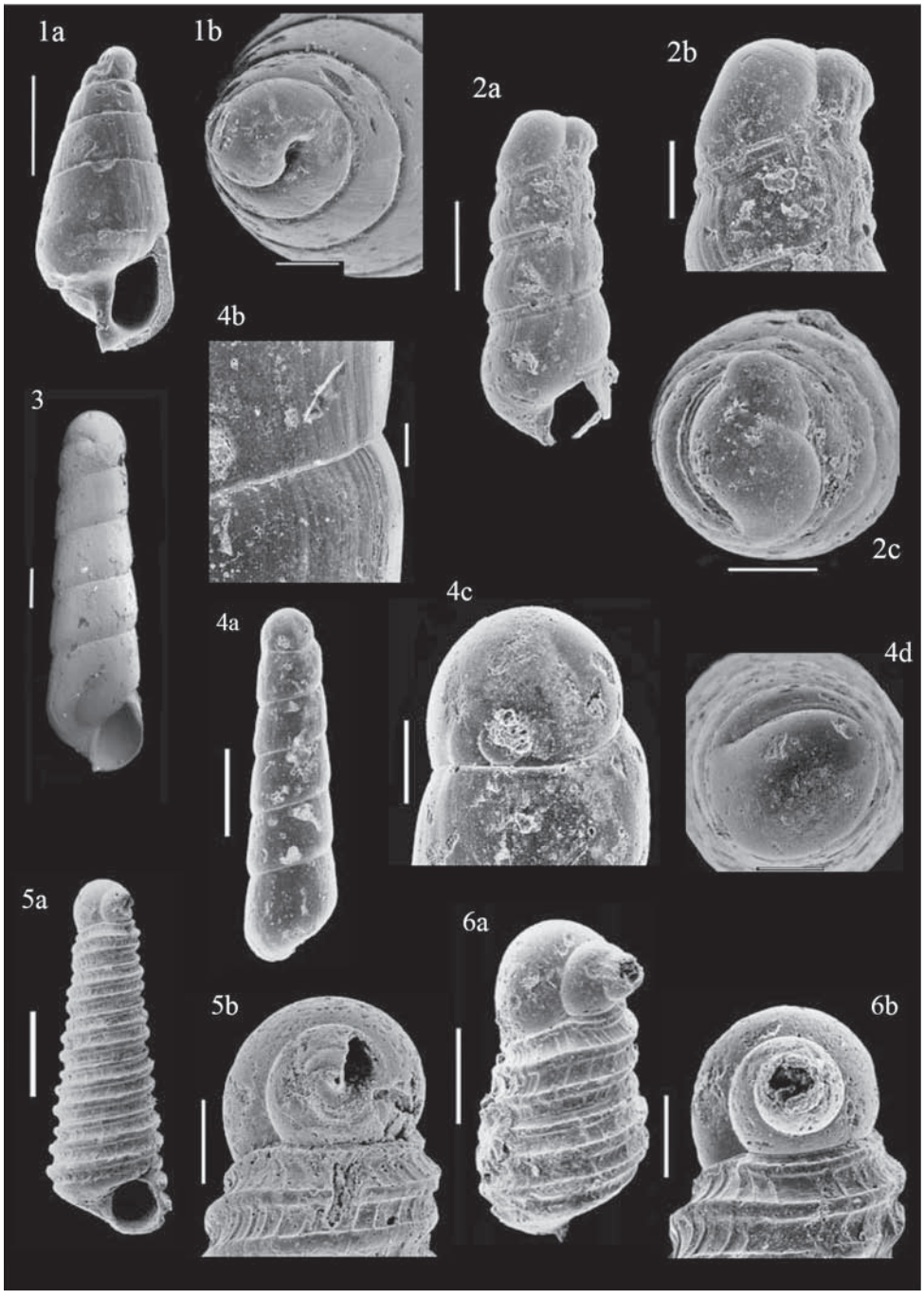
Fig. 2. *Eulimella* sp. 2. RGM 607045, Kali Rebjong Section, level RMG 3, "Rembangian". a, apertural view of shell (bar = 0.20 mm); b, lateral view of protoconch (bar = 0.10 mm); c, apical view of protoconch (bar = 0.10 mm).

Fig. 3. *Koloonella rebjongensis* sp. nov. Holotype, RGM 607046, Kali Rebjong Section, level RMG 6, "Rembangian". Apertural view of shell (bar = 0.20 mm).

Fig. 4. *Koloonella rebjongensis* sp. nov. Paratype, RGM 607048, Kali Rebjong Section, level RMG 6, "Rembangian". a, abapertural view of shell (bar = 0.40 mm); b, detail of shell surface (bar = 0.04 mm); c, protoconch (bar = 0.10 mm); d, apical view of protoconch (bar = 0.10 mm).

Fig. 5. *Bulicingulina rembangensis* sp. nov. Holotype, RGM 607050, Kali Rebjong Section, level RMG 6, "Rembangian". a, apertural view of shell (bar = 0.40 mm); b, protoconch (bar = 0.10 mm).

Fig. 6. *Bulicingulina rembangensis* sp. nov. Paratype, RGM 607051, Kali Rebjong Section, level RMG 3, "Rembangian". a, abapertural view of shell (bar = 0.20 mm); b, protoconch (bar = 0.10 mm).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