THE GENUS *BABYLONIA* (PROSOBRANCHIA, BUCCINIDAE)

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With 19 text-figures and 11 plates

CONTENTS

INTRODUCTION

The members of the Ivory Shell genus *Babylonia* Schlüter, 1838, belonging to the Buccinidae, are characterized by more or less slender buccinoid shells, mostly ornamented with a beautiful colour-pattern. Some species, e.g. the type species *B. spirata*, have a conspicuous sutural canal (see pl. 8 figs. 1-3), resembling the spirally arranged staircase of the Babylonian Tower in certain old pictures (pl. 6 fig. 1). Some of the species are found in many collections, others are rarely seen. All Recent members of the genus are restricted to the Indo-Pacific region. The fossil *Babylonia* species are found in a more extensive area, including southern and central Europe.

The Recent species have been treated in the well known iconographies of the nineteenth century. Much later a short revision was given by Habe (1965), followed by comments on some species by Altena (1968).

It should be emphasized that we have concentrated on the Recent species in this monograph. Far less original research has been done on fossil taxa; many data have simply been taken from the literature here.

The present paper is published with great delay. It was first finished several years ago (1973) by its two authors, to be published in the journal "Indo-Pacific Mollusca". After Altena's death in 1976 and the discontinuation of the journal mentioned, the text has been updated and partly rewritten by the junior author. Therefore, not all opinions presented have been actually shared by both authors.

Genus characters

The dextral shell has up to about nine whorls and a more or less slender typical buccinoid shape with an acuminate apex. When the shell is held in upright position, the lowest point of the last whorl and the columellar base are situated at about the same horizontal line. Apart from the growth-lines and more delicate spiral lines, the surface is smooth. The height of adult shells varies from ca. 20 to 93 mm; the breadth comes to 50-70% of the height. A sutural canal is always present; in some species it is very conspicuous and developed along all the whorls, whereas it can be seen only on the third or fourth whorl and with the help of a hand-lens in others. The aperture has a small groove for the anus above and a large notch for the sipho below. The umbilicus varies from wide open to completely closed and is surrounded by a more or less raised fasciole which ends at one side in the callus on the last whorl and at the other side in the notch for the sipho.

A sinistral specimen is known of only one species (*B. japonica*).

The shell colour is white to orange-yellowish, with orange to brown spots; sometimes the colour-pattern is vaguely seen inside the aperture. In nearly all species the dark spots are principally arranged in four spiral rows. As the spots of a single or of different rows may be connected in various ways, horizontally or vertically, the arrangement in four rows may be obscured. In *B. kirana* the colour-pattern is nearly invisible. *B. areolata* is the only species with three rows of spots. The fossil species *B. gracilis* has an upper row of large spots and, on the remaining part of the shell, very many small spots, distributed regularly, without an arrangement in rows. The colour-pattern of the fossil species *B. pangkaensis* (pl. 7 figs. 5, 8) is similar, although not in all specimens studied.

Sexual dimorphism in shell structures could not be demonstrated so far.

The periostracum is brown to yellowish and very variable in thickness.

The brownish operculum (pl. 1) has an eccentric nucleus and many growth-lines, which are more or less accentuated by raised ridges in the various species. Sometimes a centric nucleus occurs (pl. 1 figs. 5, 6; Habe, 1965:

pl. 1 fig. 9; Altena, 1968: pl. 2 fig. 7). Having studied many opercula of *Babylonia* species, we can say that a concentric operculum is formed when the region of the nucleus has been damaged during the life of the animal. In a sample of 36 specimens of *B. spirata spirata*, collected near Jakarta, 7 specimens have a more or less centric operculum, demonstrating that this phenomenon is not very rare. A monstrosity with a combination of two small centric opercula is figured by Lan (1972: 19, two figs.; 1980: pl. 49 fig. 117).

The radula consists of about 40 rows of three teeth. The central tooth has

Figs. 1-11. Single rows of radulae of adult *Babylonia* (× 25); the total number of rows of the investigated specimen is indicated in brackets after its sex. 1, 2, *B. areolata* (Link), Taiwan (RMNH); 1, ♀ (>37); 2, ♂ (42). 3, 4, *B. formosae habei* subspec. nov., Taiwan (RMNH, paratypes); 3, ♀ (40); 4, ♂ (38). 5, 6, *B. japonica* (Reeve), Japan (RMNH); 5, ♀ (40); 6, ♂ (41). 7, *B. perforata* (Sowerby (II)), a few miles S of Kaohsiung, dredged at 30 fathoms (DMNH 27353), ♀ (40). 8-11, *B. spirata spirata* (L.); 8, Karachi, Pakistan (ANSP), ♀ (42); 9, Bombay Island, India (ANSP), ♀ (?); 10, 11, Indian Ocean (RMNH); 10, ♀ (45); 11, ♂ (36).

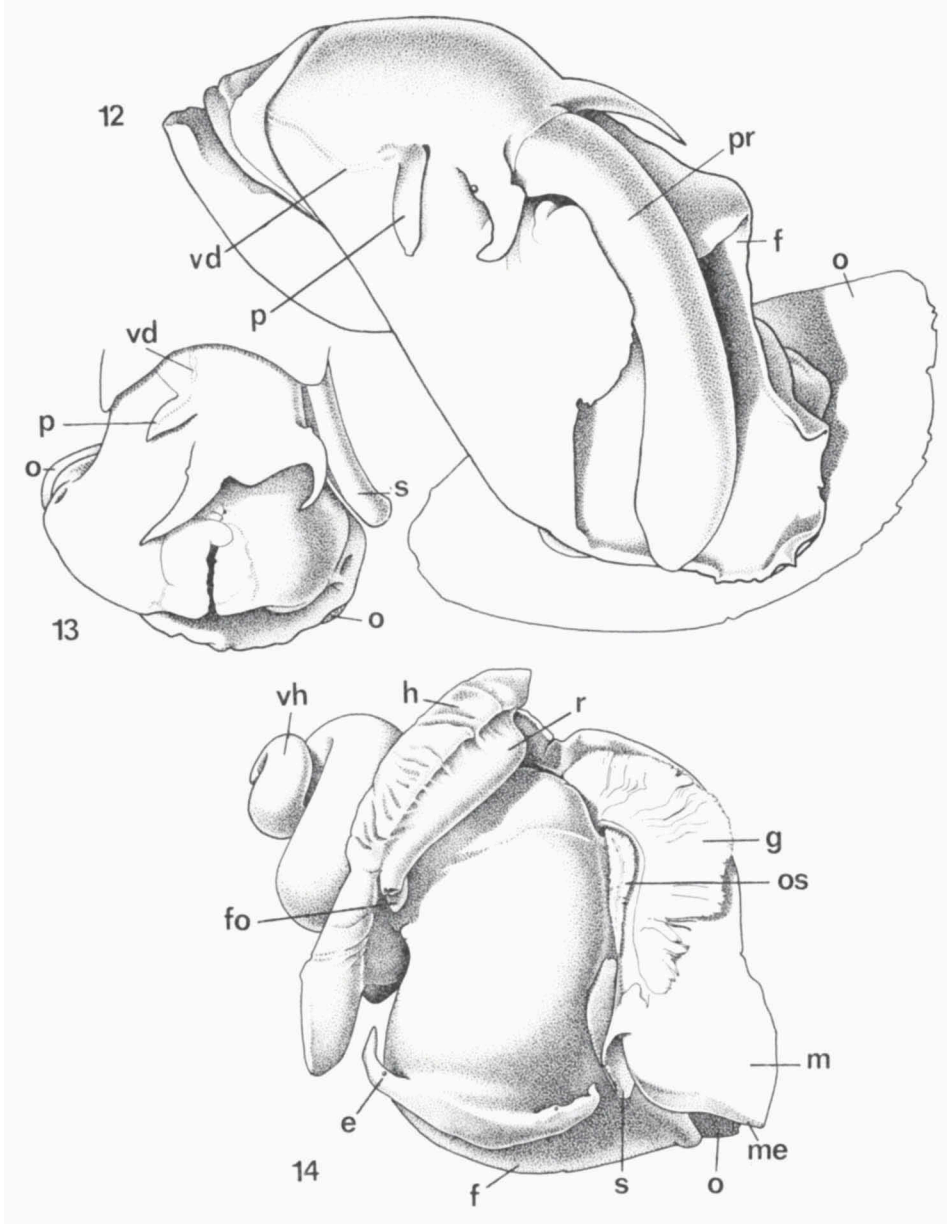
three long cusps in the middle and a short one at both sides. The laterals have two cusps, a short one on the inner and a long one on the outer side. Figs. 1-11 show single rows of the radulae of different species; specific differences are not obvious.

Some details of the soft parts of the animal are shown in figs. 12-14 and on pl. 2 (figs. 1, 2). At the end of the foot a pointed elongation, as present in *Zemiropsis* (pl. 2 fig. 3), is not developed. (See the description of *B. japonica*, however). In the literature (Eydoux & Souleyet, 1852: pl. 41 fig. 28) a living specimen of *B. spirata spirata* is figured with two short protuberances bordering the anterior edge of the foot (pl. 2 fig. 1); Kiener (1835: pl. 1 fig. 1 = Küster, 1860: pl. A fig. 5), however, figured the same subspecies without such protuberances in front. We also know a figure of a live *B. areolata* (Adams & Reeve, 1848: pl. 8 fig. 5 = pl. 2 fig. 2 in the present paper), showing that the foot of the animal has a colour-pattern similar to that of the shell. This is not seen in *B. spirata spirata*, nor in *B. japonica* (Adams, 1864: 142-143; Okutani & Takemura, 1967: 114, upper col. pl.) and *B. zeylanica* (see Dance, 1971: 135, fig. 7).

The tentacles are rather short in animals preserved in alcohol, but more slender in the living snails, and bear the eyes at weak enlargements not far from the base. In males there is a small and simple penis, situated behind the right tentacle. The proboscis is long. The exposed part of the animal may be spotted, as we see in *B. areolata*; in preserved specimens this pattern fades away.

Most Recent and fossil *Babylonia* species are easily recognizable after shell characters. Only two species are considered polytypic, both with some doubt (*B. formosae* and *B. spirata*). Obvious chronospecies are not known; *B. lamarcki* and *B. japonica* might be considered as such, however. Several species remained nearly unchanged for very long periods (see "Distribution"). As a whole, the pattern shown by the genus exemplifies the punctuational model of evolution, gaining popularity in recent literature (e.g. Stanley, 1979).

Some species-groups may be distinguished. I: *B. angusta* and *B. spirata*, having a sutural canal with a sloping base and an umbilicus without a knobbed band. II: *B. ambulacrum*, with a sutural canal with a nearly horizontal base and a raised margin; umbilicus without knobs. III: *B. borneensis* and *B. perforata*, having a sutural canal like *B. ambulacrum* and a knobbed band in the umbilical region. IV: *B. feicheni* and *B. zeylanica*, characterized by the absence of a conspicuous sutural canal on the body-whorl (as in V), a knobbed band in the umbilical region, and a very oblique attachment of the body-whorl to the penultimate whorl. V: *B. areolata* (?), *B. japonica*, *B.*



Figs. 12-14. Soft parts of *Babylonia*. 12, *B. areolata* (Link), ♂, with protruding proboscis; Taiwan (RMNH); × 2¼. 13, *B. spirata spirata* (L.), ♂; Indian Ocean (RMNH); × 3. 14, *B. formosae habei* subspec. nov., ♀; Taiwan (RMNH, paratype); × 1½. Abbreviations: e, eye; f, foot; fo, female opening; g, gill; h, hypobranchial gland; m, mantle; me, mantle edge; o, operculum; os, osphradium; p, penis; pr, proboscis; s, siphon; r, rectum; vd, vas deferens; vh, visceral hump. W.C.G. Gertenaar del.

formosae, B. kirana and *B. lutosa,* all without a conspicuous sutural canal on the body-whorl (as in IV), and without knobs in the umbilicus.

The fossil species suggest that the earliest *Babylonia* had a conspicuous sutural canal with a nearly horizontal base and a raised margin. Several of the fossil taxa are not known well enough, however.

Distribution

The genus *Babylonia* is represented from the Eocene on and may be considered a Tethyan element. The oldest forms are among the ca. five fossil species found in central and southern Europe in Eocene, Oligocene, and Miocene deposits; no species are known from Pliocene or younger strata in Europe. In the area of the present Indo-Pacific the oldest *Babylonia* species known are from Miocene deposits. The longevity of the species is conspicuous here. Three of the twelve Recent species are known from the Miocene on (*B. areolata, B. lutosa,* and *B. spirata*); one from the Pliocene on (*B. formosae*) and one from the Early Pleistocene on (*B. japonica*). Two closely related fossil species from Java lived at least from Miocene to Late Pleistocene times (*B. gracilis* and *B. pangkaensis*).

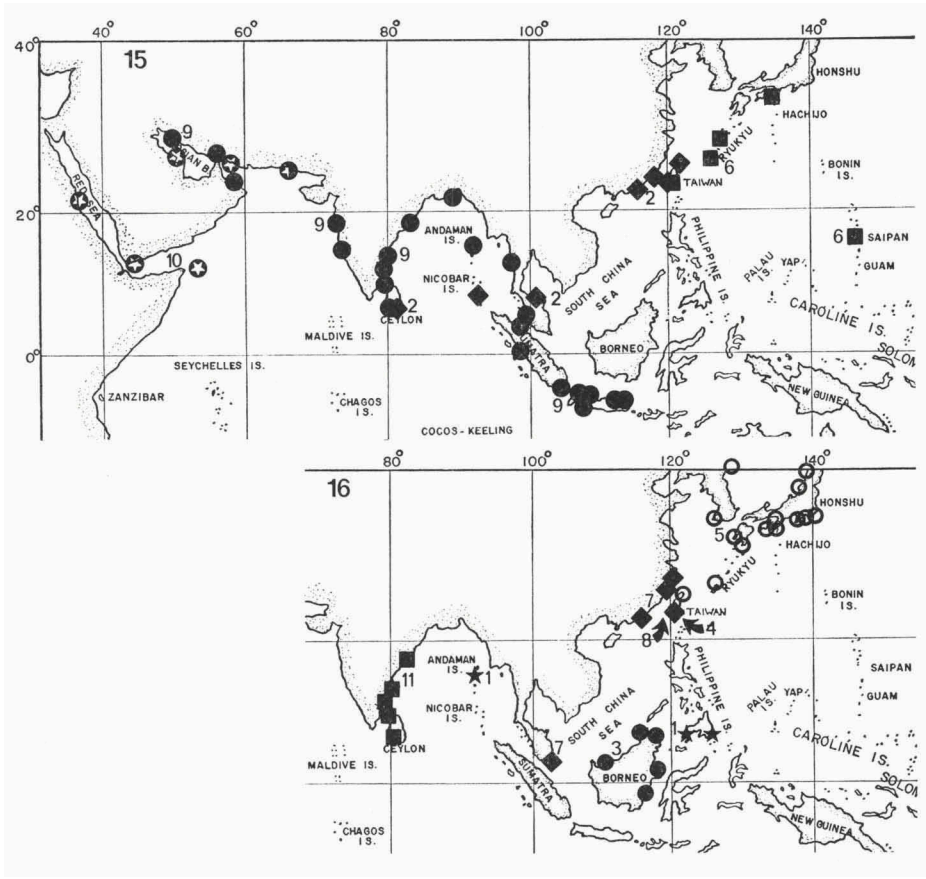
The twelve Recent species are confined to the Indo-Pacific region (figs. 15, 16), from the north-coast of the Indian Ocean along the western and central Indonesian archipelago (Java, Sumatra, Borneo) and the Philippine Islands to the Chinese and Japanese seas. The northernmost localities are Hamgyong in Korea and Akita in Japan, Honshu (*B. japonica*); Java (*B. spirata spirata*) marks the southern limit of the genus. In the west the Red Sea (?), Aden and Socotra (*B. spirata valentiana*) are situated in the marginal area of distribution. The Marianas or Ladrones Islands (*B. kirana*) constitute the easternmost region from where *Babylonia* is known.

Most records of fossil *Babylonia* in the Indo-Pacific are situated well within the area inhabited by the Recent species. Exceptions are *B. leonis* and *B.* cf. *ambulacrum,* which both have been reported from New Guinea.

In large areas not more than one or two *Babylonia* species are found. Only from Taiwan a considerably larger number of species is known: six.

Classification

Babylonia is most closely related to *Zemiropsis* Thiele, 1929, which is considered in recent literature to be merely a junior synonym, an opinion we do not share, however. In *Zemiropsis* the basal part of the outer lip comes clearly further down than the columellar base when the shell is held in upright position; the apex is blunt, not acuminate. There is a remarkable pointed elongation of the terminal part of the foot (pl. 2 fig. 3). *Zemiropsis* is con-



Figs. 15, 16. Distribution of Recent *Babylonia*. 1, *B. ambulacrum* (Sowerby (I)); 2, *B. areolata* (Link); 3, *B. borneensis* (Sowerby (III)); 4, *B. formosae* (Sowerby (II)), the arrow points to Taiwan; 5, *B. japonica* (Reeve); 6, *B. kirana* Habe; 7, *B. lutosa* (Lamarck); 8, *B. perforata* (Sowerby (II)), the arrow points to the Taiwan Hai Hsia; 9, *B. spirata spirata* (L.); 10, *B. spirata valentiana* (Swainson); 11, *B. zeylanica* (Bruguière). The very rare *B. angustus* spec. nov. and *B. feicheni* Shikama are not indicated because of the vagueness of the locality data.

fined to the Southern Hemisphere, where it covers a small area of distribution near the southeast-coast of Africa, separated by a large gap from Socotra, the nearest locality from where *Babylonia* is known. Fossil records of *Zemiropsis* are not known. *Zemiropsis* and *Babylonia* have the same type of radula, separating them from other Buccinidae. There is also a similarity in shell habitus. Taking the known data into consideration, however, we consider the taxa sufficiently different to be regarded as closely related, but separate genera.

The "section" *Peridipsaccus* was proposed by Rovereto (1900) for species with a closed umbilicus. As the umbilicus may be open or closed, with all intermediate stages in even the same subspecies (e.g. *B. spirata spirata*), *Peridipsaccus* is considered a junior synonym of *Babylonia*.

The following synonymy may be given:

Eburna Lamarck, 1822: 281 (not Lamarck, 1801).
Babylonia Schlüter, 1838: 18. Type species: *B. spirata* (L.).
Latrunculus Gray, 1847: 139. Type species: *B. spirata* (L.).
Peridipsaccus Rovereto, 1900: 168. Type species: *B. spirata valentiana* (Swainson).

Biology

There is little information on the biology of nearly all *Babylonia* species. Mostly we have at best some data about the depth at which empty shells or animals have been collected. Members of the genus are found from the tidal zone down to at least 100 m or "deep water". Only *B. japonica* is a better known species as the animal is used for food in Japan, where also toys are made from the shells.

We summarize the following information concerning *B. japonica* from Yoshihara (1957). The spawning season of the snails, which are commonly found in muddy sand, is from June to August. Adult females, being two or three years old and having shells of 6-7 cm in height, produce about 10-60 egg capsules with 27-50 eggs each (pl. 3 figs. 1, 2), i.e., ca. 500-2500 eggs are laid in one season. The animals may reach an age of more than five years. The sex ratio is 1 : 1. The snails are carnivores, and can be caught by using a basket made of bamboo (pl. 3 fig. 3) with a piece of fish used for bait. The bait is traced by the snails over a distance of five meters or more.

Hashimoto et al. (1967) studied the toxicity of *B. japonica*, as a toxin was found in these snails, which is very poisonous to men. In 1957 three of five patients died in Teradomari at the Japanese Sea coast of Honshu. The causative agent was found in the mid-gut gland of *B. japonica*. It could be demonstrated that the toxicity of male and female snails is about the same. There is a great deal of unexplained variability in toxicity between snails from different populations, and also between the animals at a single locality in different parts of the year. Because the toxin desintegrates when heated, there is no danger to eat the snails when they are well cooked. See also Shibōta & Hashimoto (1971) on purification of "the Ivory Shell Toxin".

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Abbreviations

The following abbreviations are used for institutions:

ANSP, Academy of Natural Sciences, Philadelphia; BC, Bureau of Mineral Resources, Geology and Geophysics, Canberra; BM, British Museum (Natural History), London; DMNH, Delaware Museum of Natural History, Greenville; GIU, Geologisch Instituut, Utrecht; IB, Institut Royal des Sciences Naturelles de Belgique, Brussels; LMP, Laboratoire de Malacologie, Paris; LT, Dr. C. C. Lin, University of Taiwan, Taipei; MCZ, Museum of Comparative Zoology, Cambridge, Massachusets; MZAA, Museum of Zoology, Ann Arbor; NMR, Natuurhistorisch Museum, Rotterdam; NMW, Naturhistorisches Museum, Vienna; RGML, Rijksmuseum van Geologie en Mineralogie, Leiden; RMNH, Rijksmuseum van Natuurlijke Historie, Leiden; SMF, Senckenberg Museum, Frankfurt am Main; UZMK, Universitetets Zoologisk Museum, Copenhagen; USNM, U.S. National Museum of Natural History, Washington; ZMA, Instituut voor Taxonomische Zoölogie (Zoölogisch Museum), Amsterdam.

In addition: h, height; b, breadth.

Key to the Recent species

1. With three rows of large reddish brown squarish spots on the last whorl (rarely three continuous bands): *areolata*.
— Different: 2.
2 (1). Very pale, the colour-pattern being nearly invisible; last whorl with a narrow shoulder, sometimes faintly canaliculate: *kirana* (see pl. 7 figs. 6, 7).
— (Partly) different: 3.
3 (2). At the beginning of the last whorl there is a very conspicuous sutural canal: 4.
— The beginning of the last whorl is at best shouldered or faintly canaliculate: 9.
4 (3). The canal has, especially clear on the penultimate whorl, a nearly horizontal base with a raised border: 5.
— The canal has a sloping base without a separate raised border: 7.
5 (4). Sutural canal becoming clearly narrower near the aperture; umbilicus without a knobbed spiral ridge: *ambulacrum*.
— Sutural canal not becoming clearly narrower near the aperture; umbilicus with a knobbed spiral ridge: 6.

6 (5). Shell up to 73 mm high; with four rows of single large spots, which are more or less connected on the last whorl: *perforata.*
— Shell up to 54 mm high; colour pattern different: *borneensis.*
7 (4). Sutural canal wide; whorls flattened above the periphery: *spirata* s.s.
— Sutural canal narrow; whorls rather convex and especially not flattened near the sutural canal: 8.
8 (7). Umbilicus completely closed; shell up to about 75 mm high (7 whorls): *spirata valentiana.*
— Umbilicus not closed; shell up to 37 mm high (7¼ whorls): *angusta.*
9 (3). Umbilicus with a conspicuous knobbed spiral ridge: 10.
— Umbilicus without a knobbed ridge: 11.
10 (9). Knobbed ridge violet; adult shells over 55 mm high: *zeylanica.*
— Knobbed ridge white; adult shells far less than 50 mm high: *feicheni.*
11 (9). Last whorl neither flattened nor clearly shouldered: *japonica.*
— Different: 12.
12 (11). Last whorl flattened in the middle, with a broad sloping shoulder: *lutosa.*
— Last whorl with a narrow horizontal shoulder or faintly canaliculate: *formosae*, with two subspecies (see descriptions).

RECENT SPECIES

Babylonia ambulacrum (Sowerby (I), 1825)
(fig. 17; pl. 4 figs. 10, 11; pl. 8 fig. 1; pl. 10 fig. 4)

Eburna ambulacrum Sowerby (I), 1825: xxii ("Java"). Sowerby (II), 1833: fig. 2; 1859: 70, pl. 215 fig. 8. Reeve, 1849: sp. 5, fig. 5. Küster, 1857: 82, pl. 65 figs. 6, 7. Tryon, 1881: 213, pl. 82 fig. 472.
Eburna spirata — Kiener, 1835: 7 (part.), pl. 1 fig. 2. Not *Buccinum spiratum* Linnaeus, 1758.
Eburna immaculata Jousseaume, 1883: 192, pl. 10 fig. 2 (no locality given).
Dipsaccus canaliculatus — Martin, 1895: 10 (part), pl. 16 fig. 227. Not *Nassa canaliculata* Schumacher, 1817.
Latrunculus canaliculatus — Nomura, 1935: 148. Not *Nassa canaliculata* Schumacher, 1817.
Babylonia canaliculata — Altena, 1950: 229. Not *Nassa canaliculata* Schumacher, 1817.
Babylonia ambulacrum — Kaicher, 1957: pl. 6 fig. 19. Dance, 1974: 143.
Babylonia pallida — Habe, 1965: 118 (part.), pl. 1 fig. 2. Not *Babylonia pallida* Hirase, 1934.

Diagnosis. — *B. ambulacrum* is characterized by the fairly wide sutural canal, which has a nearly horizontal base and a raised margin; the canal

becomes clearly narrower near the aperture (in adult shells). The brown spots on the last whorl come closer together than those of other *Babylonia* species with a comparable colour-pattern, except *B. angusta.*

Description. — Shell (pl. 4 figs. 10, 11; pl. 8 fig. 1; pl. 10 fig. 4) egg-shaped, usually not slender, with up to 7¾ whorls; aperture forming ca. $^3/_5$ of the total height. Sutural canal with a nearly horizontal base and a raised margin, changing gradually into a narrower and deeper canal with a sloping base near the aperture.

Outer lip of the aperture thickened inside at the apex; an anal notch is visible when the shell is examined from above. Callus of the inner lip with a central notch when the umbilicus is open; uppermost with a rib, which belongs to the anal groove and looks like a tooth in front view.

Umbilicus varying between fairly wide open and completely closed; at the upper and left side surrounded by a more or less raised fasciole, which is separated from the last whorl by a ridge, ending at the lower end of the outer lip. Inside the fasciole and separated from it by a more or less pronounced ridge, running to the end of the inner lip, a band occurs, which is mostly as broad as the fasciole and ends at the lower part of the inner lip. When the umbilicus is closed or nearly so, e.g., in specimens from deep water near Zamboanga, this band is much broader, however, and the callus of the inner lip is expanded further, without a notch, but with a shallow groove in the middle.

Initial whorls brown; the following with pale brown to greyish spots, close together or more or less connected, on a whitish background. Generally four bands are recognizable on the body-whorl. A first (upper) row of comparatively large spots is mostly distinguishable; these spots are sometimes more or less connected with rows of smaller rounded spots, constituting the second band, which may be transformed to zig-zag lines. The spots of the third band are often connected; they may be in contact also with the spots of the second and fourth band, which can be recognized because their spots are slightly smaller. Aperture and umbilicus whitish; fasciole and band bordering the umbilicus pale brown, or with patches in that colour.

Periostracum inconspicuous, brownish.

The shells are up to 50 mm high and 33 mm broad. Measurements of some specimens are given below:

? Mindanao Island, Pusan; ANSP: h. 50 mm; b. 33 mm; >7 whorls
Mindanao Island, Zamboanga, Sindagan; ANSP: h. 45 mm; b. 30 mm; 7¾ whorls
Andaman Islands; RMNH: h. 44 mm; b. 30 mm; >7 whorls
Andaman Islands; RMNH: h. 34 mm; b. 25 mm; 7¼ whorls
Mindanao Island, Zamboanga, Sindagan; ANSP: h. 41 mm; b. 29 mm; 7¼ whorls

Operculum without prominent growth-lines.

Radula and soft parts of the animal unknown.

Habitat. — We saw rather few specimens of *B. ambulacrum*. Most shells look very fresh, but lack data concerning the depth at which they had been found. The specimens from Zamboanga, Mindanao Island, have been dredged in "deep water".

Range (fig. 17). — Recent specimens are only known to us from the Andaman Islands and the Philippines. Therefore we doubt the Recent occurrence near Java, the type locality of the species, viz., in an area which may be considered comparatively well sampled for molluscs in the 20th century.

The records of fossil specimens (pl. 10 fig. 4) partly fill up the distributional gap shown by the whole of localities of live collected animals. *B. ambulacrum* is known from the Late Miocene, Pliocene and Pleistocene of Java, and the Pliocene of Taiwan, Aceh (Sumatra), and (?) the Sepik district of New Guinea. The single fossil specimen from New Guinea is in very bad condition and, therefore, not identifiable with certainty (Altena & Gittenberger, 1972: 469).

Nomenclature. — We could not trace the holotype of *E. ambulacrum*, once belonging to the Tankerville collection, which was sold in parts to various persons in 1825 (Dance, 1966: 142-145). The holotype of *E. imma-*

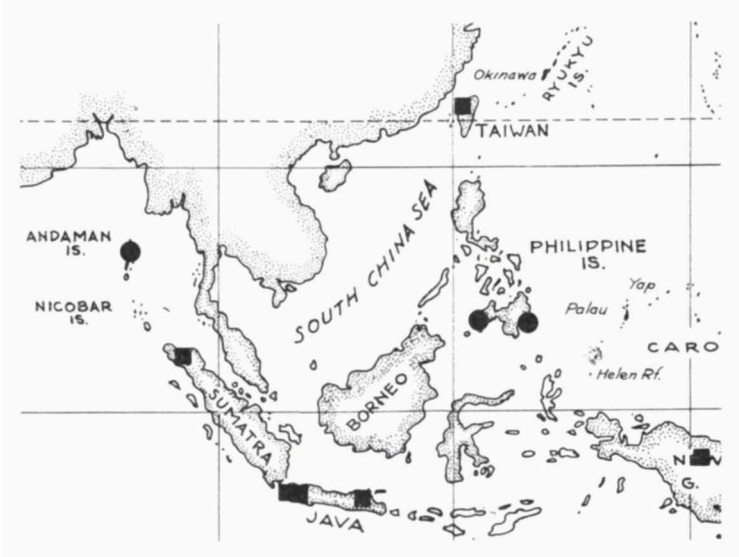

Fig. 17. Recent and fossil records for *B. ambulacrum* (Sowerby (I)), indicated by dots and squares respectively.

culata is in LMP; this nominal taxon is based upon an abnormal specimen without the brown spots, which are present in all other shells representing *B. ambulacrum* we have seen.

Records. — Andaman Islands: (BM, IB, RMNH); Port Blair (BM, USNM). Philippines: (MZAA, ZMA); Mindanao Island (ANSP, BM, RMNH); Sindagan, Zamboanga, Mindanao Island (ANSP); Basilan (Habe, 1965: 119, pl. 1 fig. 2); ? Pusan Point, Mindanao Island (labelled "Pusan, Formosa") (ANSP).

Fossil records. — Late Miocene: Tji Odeng (7°26'S 107°15'E) and Tji Tangkil (6°41'S 105°36'E), in Priangan (= Preanger), W Java (RGML). Pliocene: Bajah (6°55'S 106°15'E), in Bantam, W Java (RGML); Atjeh (= Aceh), Sumatra (RGML); (Finsch coast series) left bank of Marakabi Creek, ½ mile above Kami Creek, Sepik district, New Guinea (identification doubtful) (BC); (Byôritu beds) Sikô, Taiwan (Nomura, 1935: 149). Pleistocene: (Putjangan layers) Kendeng Mountains W of Surabaya, E Java (RGML).

Babylonia angusta spec. nov.
(pl. 6 figs. 2, 3; pl. 8 fig. 6)

Diagnosis. — *B. angusta* closely resembles *B. ambulacrum* in general shape and colour-pattern, differing conspicuously, however, in the structure of the sutural canal, which has a sloping base throughout.

Description. — Shell (pl. 6 figs. 2, 3; pl. 8 fig. 6) egg-shaped, with 7-7¼ whorls; aperture forming ca. $^3/_5$ of the total height. Sutural canal rather deep but narrow (narrower than in *B. ambulacrum*), with a sloping base along all the whorls.

Aperture with little callus formation, apart from that comparable to that of *B. ambulacrum*.

Umbilicus wide open; bordered at the upper and left side by a raised fasciole, which is separated from the last whorl by a ridge. Inside the fasciole and about equally broad as it, there is a band, running to the lower part of the inner lip.

The colouration of the shell is slightly different from what is seen in *B. ambulacrum*, i.e., the spots are not pale brown to greyish but more orange-brown, contrasting with a more whitish background colour.

The shells are rather small, up to 37 mm high and 24 mm broad. The measurements of the three specimens known are given below:

China; holotype UZMK: h. 36 mm; b. 24 mm; 7¼ whorls
No locality; paratype ISNB: h. 37 mm; b. 24 mm; 7¼ whorls
No locality; paratype ISNB: h. 34.5 mm; b. 24 mm; 7 whorls

Operculum without prominent growth-lines.

Radula and soft parts of the animal unknown.

Habitat. — Unknown.

Range. — The holotype is labelled "China". The paratypes are from an unknown locality.

Nomenclature. — The holotype is a specimen from the C. M. Steenberg collection, kept in the UZMK. Both paratypes are in ISNB.

Derivatio nominis. — Angustus, Latin for narrow, because of its narrow sutural canal.

Remarks. — Mainly because we found only little intraspecific variation in the structure of the sutural canal in *Babylonia*, we consider *B. angusta* a separate species. Additional material should be studied.

Babylonia areolata (Link, 1807)

(figs. 1, 2, 12, 18; pl. 1 fig. 1; pl. 2 fig. 2; pl. 4 figs. 2, 3; pl. 7 fig. 2; pl. 8 fig. 5; pl. 10 fig. 1)

[*Buccinum spiratum* Linnaeus, 1758: 739 (partim, see p. 36 of the present paper)].

Buccinum maculosum Röding, 1798: 115 (reference to Chemnitz, 1780: pl. 122 figs. 1120, 1121), type locality (after Chemnitz, 1780: 20) "...von den Nikobarischen Eylanden... aus den chinesischen Gewässern." (Nicobar Islands and Chinese Seas). Not *B. maculosum* Gmelin, 1791.

Buccinum areolatum Link, 1807: 125 (reference to Chemnitz, 1780: pl. 122 figs. 1120, 1121), type locality (after Chemnitz, 1780: 20) "...von den Nikobarischen Eylanden... aus den chinesischen Gewässern." (Nicobar Islands and Chinese Seas).

Ancilla maculata Perry, 1811: without pagination, pl. 31 fig. 5 (no locality given).

Eburna areolata — Lamarck, 1822: 282. Kiener, 1835: 6, pl. 2 fig. 3. Reeve, 1849: sp. 6, fig. 6. Adams & Reeve, 1848: 32, pl. 8 fig. 5. Küster, 1857: 79, pl. 65 fig. 2. Tryon, 1881: 212, pl. 82 fig. 476, pl. 83 fig. 525 (= Adams & Reeve, 1848: pl. 8 fig. 5). Yen, 1933: 20.

Eburna tessellata Swainson, 1823: without pagination, pl. 145 (Indian Ocean).

Eburna spirata — Sowerby (II), 1859: 70, pl. 215 fig. 4. Not *Buccinum spiratum* Linnaeus, 1758.

Eburna elata Yokoyama, 1923: 9, pl. 1 figs. 16, 17 (Suchian stage of the Kakegawa Pliocene, brook side crag north of Dainichi, 50 m NW of the entrance of the "overhill" path to Mori, village Ugari, Yamanashi, Sûchi district, Shizuoka Prefecture). Yokoyama, 1926: 317, 338; 1927: 333.

Babylonia spirata — Thiele, 1929: 312, fig. 345. Abbott, 1962: 83, text-fig. Not *Buccinum spiratum* Linnaeus, 1758.

Babylonia areolata — Kuroda, 1941: 116, pl. 2 fig. 17. Kuroda & Habe, 1952: 40. Kaicher, 1957: pl. 6 fig. 17. Shuto, 1962: 44, pl. 7 fig. 10. Habe, 1964: 97, pl. 31 fig. 19; 1965: 120, pl. 1 fig. 8. Lan, 1972: 19; 1980: 111, 115, pl. 49 fig. 117, pl. 51 fig. 129 (excellent col. phot.). Dance, 1974: 143, fig. Lindner, 1975: pl. 34 fig. 1.

Babylonia elata — Shikama, 1943: 243, pl. 40 fig. 5. Hatai & Nisiyama, 1952: 171. Makiyama, 1957: 1, pl. 9 figs. 16, 17 (= Yokoyama, 1923: pl. 1 figs. 16, 17). Shuto, 1961: 73; 1962: 43, pl. 6 figs. 7, 8, pl. 7 fig. 14, text-figs. 5, 6.

Babylonia aereolata [sic] — Oliver, 1975: 196, 197, fig.

Diagnosis. — *B. areolata* can easily be recognized by its colour-pattern. It is the only member of the genus with three broadly separated rows of dark spots; rarely the spots are connected, forming three bands.

Description. — Shell (pl. 4 figs. 2, 3; pl. 7 fig. 2; pl. 8 fig. 5; pl. 10 fig. 1) buccinoid, with up to 9¾ whorls; aperture ca. half the total height. Whorls with a rather broad but shallow sutural canal, which becomes a shoulder on the last whorl. A high conical malformation is figured by Lan (1980: pl. 51 fig. 129).

Outer lip of the aperture not clearly thickened inside; no notch for the anus is seen from above. Inner lip, with a notch for the umbilicus, consisting of a strong callus on the last whorl, and for a clearly longer part of the callus bordering the right side of the umbilicus; uppermost with a rib, marking the anal groove and looking like a tooth in front view.

Umbilicus wide open; at the upper and left side surrounded by a raised fasciole, which is separated from the body-whorl by a narrow ridge, running to the lowest point of the outer lip. Inside the fasciole a comparatively narrow band is seen, which runs to the lower end of the inner lip.

Initial whorls whitish; the following with reddish-brown spots on a white background. Three widely separated rows of spots are visible on the body-whorl, enabling easy identification of the species. We have seen two specimens in the collection of T. C. Lan (Taipei, Taiwan), in which the spots are horizontally connected, forming three homogeneous spiral bands (pl. 7 fig. 2). The fasciole and the band around the umbilicus are both white, like the umbilicus itself and the aperture.

Periostracum thin and yellowish, forming a row of irregular little pointed flaps along the outer edge of the sutural canal.

The shells are up to 93 mm high and 52 mm broad. Measurements of some specimens are given below:

Taiwan, ? off Anping; DMNH: h. >93 mm; b. 52 mm; 9¾ whorls
China, Canton; ANSP: h. 87 mm; b. 52 mm; 8 whorls
Hong Kong, S of Aap Li Chaau; ANSP: h. 78 mm; b. 47 mm; 7¾ whorls
Ceylon; ANSP: h. 73 mm; b. 41 mm; 7¾ whorls
Taiwan, off Anping; ANSP: h. 58 mm; b. 38 mm; 7¾ whorls
Hong Kong, S of Aap Li Chaau; ANSP: h. 53 mm; b. 36 mm; 7 whorls
Ceylon; ANSP: h. 53 mm; b. 33 mm; 7½ whorls

The operculum has clearly raised growth-lines (pl. 1 fig. 1).

A part of the radula is figured (figs. 1, 2).

The animal has been figured by Adams & Reeve (1848: pl. 8 fig. 5, = Tryon, 1881: pl. 83 fig. 525, = pl. 2 fig. 2 in the present paper). The authors emphasize the similarity between the colour-pattern of the shell and that of the animal itself. Five animals of *B. areolata* preserved in alcohol 70% (in RMNH) are not clearly spotted; the colour might have faded by preservation. Fig. 12 shows a ♂ snail with protruding proboscis.

Habitat. — According to Habe (1964: 97) the species is "Rather common on fine sandy bottom of 10-20 m." Adams & Reeve (1848: 32) mention a specimen dredged at 14 fathoms. S of Aap Li Chaau, Hong Kong, animals were collected at 20 fathoms depth.

Range (fig. 18). — From Ceylon and the Nicobar Islands through the Gulf of Siam, along the Vietnamese and Chinese coasts to Taiwan. The localities Yedo (= Tokyo) Bay and Philippines, both represented by a single specimen (in BM), need confirmation.

Fossil specimens (pl. 10 fig. 1) are known from the Late Miocene to Pliocene of S Honshu and Kyushu, Japan, i.e., from ca. 1200 km NE of the present range of the species.

Nomenclature. — The specimen figured by Chemnitz (1780: pl. 122 fig. 1120) is here designated as the lectotype of both *Buccinum maculosum* Röding, 1798, and *Buccinum areolatum* Link, 1807. We could not find a specimen matching this figure in UZMK. Type-specimens of *Ancilla maculata* Perry, 1811, and *Eburna tessellata* Swainson, 1823, could not be traced.

A specimen figured by Yokoyama (1923: pl. 1 fig. 17) is here selected as the lectotype of *E. elata*; this specimen corresponds perfectly with Recent material of *B. areolata*, as is demonstrated best by the photograph showing the sutural canal (pl. 10 fig. 1).

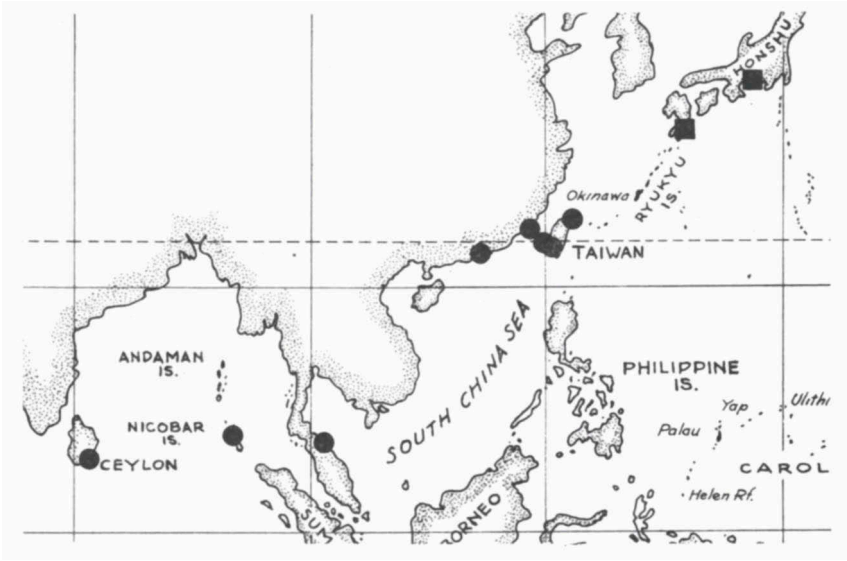

Fig. 18. Recent and fossil records for *B. areolata* (Link), indicated by dots and squares respectively.

Records. — Ceylon: (ANSP, BM, IB, MZAA, ZMA). Nicobar Islands: (Chemnitz, 1780: 20). Gulf of Siam: Songkhla (ANSP, USNM); Singora and Bangbest Bay (USNM); Sichol, Nakon Sutamarat (USNM); Pranouri (USNM). Vietnam: Song Trao (USNM); Annam (IB). China: (ANSP, NMR, RMNH, UZMK, ZMA); Hong Kong (DMNH); S of Aap Li Chaau, Hong Kong (ANSP); Canton, Kwangtung prov. (ANSP, IB); Amoy, Fukien prov. (Yen, 1933: 21). Taiwan: (RMNH, NMR); Keeling (= Chilung) (USNM); Penghu Liehtao Islands (= Pescadores I.) ("abundant", Dr. C. C. Lin in litt.); off Anping (ANSP); Takao (RMNH). Philippines: (BM). Japan: Yedo (= Tokyo) Bay (BM).

Fossil records. — Late Miocene: East-coast of Kyushu, ± 32° N (Shuto, 1962: 44). Late Miocene — Early Pliocene: Miyazaki Prefecture (Shuto, 1962: 43). Suchian Stage of Kakegawa Pliocene: brook side crag N of Dainichi, 50 m NW of the entrance of the "over-hill" path to Mori, village Ugari, Yamanashi, Sûchi district, Shizuoka Prefecture, 34°48'N 137°56'E (Yokoyama, 1923: 9).

Babylonia borneensis (Sowerby (III), 1864)

(fig. 16; pl. 4 figs. 12, 13; pl. 8 fig. 2)

Eburna borneensis Sowerby (III), 1864: without pagination, fig. 11 (no locality given). Sowerby (II), 1866: without pagination, pl. 291 fig. 14 (Borneo). Tryon, 1881: 212, pl. 82 fig. 464. Kobelt, 1881: 9, pl. 72 figs. 3, 4. Not *Eburna borneensis* sensu Chapman, 1918: 10 (= *B. leonis* Altena & Gittenberger, 1972).

Babylonia pallida — Habe, 1965: 118 (part.). Dance, 1974: 143 (part.), fig. Not *B. pallida* Hirase, 1934.

Babylonia borneensis — Altena, 1968: 182, pl. 1 figs. 6-8.

Diagnosis. — *B. borneensis* is one of the four Recent *Babylonia* species with a knobbed band along the umbilicus; it is much smaller than *B. perforata* and *B. zeylanica* and larger than *B. feicheni*. The species is easily distinguished by the sutural canal, which has a nearly horizontal base and a raised margin, becoming gradually wider to the aperture without changing its aspect.

Description. — Shell (pl. 4 figs. 12, 13; pl. 8 fig. 2) buccinoid, with up to 7½ whorls; aperture somewhat more than half the total height. Sutural canal conspicuous, with a nearly horizontal base and a raised margin; sometimes becoming less deep, but never narrower near the aperture.

Outer lip of the aperture hardly thickened above; an obsolete anal notch at best is seen when the shell is examined from above. Inner lip consisting of the callus on the last whorl and, for a slightly longer part, of the callus bordering the right side of the umbilicus; uppermost with a rib, which belongs to the anal groove and looks like a tooth in front view.

Umbilicus widely open; at the upper and left side surrounded by a raised fasciole, which is separated from the body-whorl by a narrow ridge, which ends at the lowest point of the outer lip. Inside the fasciole and more or less clearly separated from it by a narrow ridge, ending at the inner lip, a knobbed band runs to the lower part of the inner lip; looking into the umbilicus, this

band can easily be followed upwards (rarely the knobs are inconspicuous).

Initial whorls brownish; the following with brown-orange to dark brown (especially on the last whorl) spots on a whitish background. Mostly four bands of rather widely spaced spots are discernible at the body-whorl. A first (upper) band, consisting of the largest spots, is always present; the second and fourth band are mostly composed of smaller spots than the third (if not, then these three bands are not clearly distinguishable). Aperture, umbilicus and knobbed band white; fasciole mostly white with brown-orange dots.

Periostracum thin and yellowish.

The shells are up to 54 mm high and 37 mm broad. Measurements of some specimens are given below:

Sarawak, Sarikei; ANSP: h. 54 mm; b. 37 mm; 7 whorls
Sarawak, Sarikei; ANSP: h. 53 mm; b. 35 mm; >7 whorls
Br. N.-Borneo, NW of Kinabatangan River; ANSP: h. 45 mm; b. 27 mm; 7½ whorls
Balikpapan; RMNH: h. 44 mm; b. 28 mm; 7½ whorls

Operculum without raised growth-lines.

Radula and soft parts of the animal unknown.

Habitat. — We only know that a specimen was collected at 8 fathoms depth, 10 miles NW of Kinabatangan River, Br. N.-Borneo.

Range (fig. 16). — Only known from northern and eastern Borneo.

Nomenclature. — We here designate the specimen figured by Altena (1968: pl. 1 fig. 6) as lectotype of *E. borneensis*. Most probably this is one of the shells Sowerby described; it belongs to a sample of three specimens (BM 1967694; Borneo, Hugh Cuming leg.) and closely resembles Sowerby's original figure, differing, however, in the pattern of the brown spots.

Records. — Borneo: (IB, MZAA); Sarawak (BM, MZAA); Sarikei, Sarawak (ANSP); Tamjang Ara (= Tanjong Aru), Jesselton, Br. N.-Borneo (ANSP, USNM); 10 miles NW of Kinabatangan River, Br. N.-Borneo (ANSP, USNM); Domaring (= Dumaring) (USNM); Balikpapan (RMNH); beach at Balikpapan (ZMA).

Three young shells from Aden (BM, H. C. Dinshau leg.), originally classified with *B. borneensis* (see Altena, 1968: 182), on re-examination proved to belong to *B. spirata valentiana* because of the structure of the sutural canal.

Babylonia feicheni Shikama, 1973
(pl. 2 fig. 4)

Babylonia feicheni Shikama, 1973: 7, pl. 2 figs. 13, 14 (collected during "a trip of Taiwan").

Diagnosis. — *B. feicheni* is apparently the smallest of the four Recent *Babylonia* species with a knobbed band along the umbilicus. It differs from both *B. borneensis* and *B. perforata* by the absence of a conspicuous sutural

canal, from *B. zeylanica* by the white umbilicus and a more buccinoid, not slender conical shape, from *B. luzonensis* by the very oblique attachment of the body-whorl to the penultimate whorl.

Description. — Unfortunately we only know the original description and figures (pl. 2 fig. 4) of this species. Therefore, the zone along the suture cannot be described in detail. Shikama's original description and remarks are as follows:

"Shell small sized, trochiform, thick and lustrous. Spire turreted with 5 volutions of teleoconch. Protoconch small sized and dull coloured. Shoulder not angulated and whorl moderately inflated. Suture not deep, with narrow subsutural band. Shell surface milky white with irregular-shaped brown patches along axial direction. Aperture narrow, semicircular with smooth inner lip and shallow anterior canal. There is running a sharp keel along posterior end of inner lip. Umbo [= umbilicus] perforated. Fasciole carries 2 bands of inner and outer, the former of which has many white lamellated tubercles. Inner wall of umbo [= umbilicus] with a moderately inflated pad.

Holotype: An adult shell in the writer's collection, offered by Nakayasu; 33.6 mm high and 22.0 mm wide.

Remarks: This species is closely related to *zeylanica* Lam. but is distinguished from it by whitecoloured umbo [= umbilicus], inflated pad of inner wall of it, and by more depressed spire. Species *perforata* L. may also be close to this species by lamellated tubercles of fasciole band and inflated pad of inner wall of umbo [= umbilicus] but is separated from this species by sharply angulated subsutural band and browncoloured lamellated tubercles."

Range. — Apparently the species is described after a single shell, collected by Mr. K. Nakayasu while making "a trip of Taiwan" in September 1972 (Shikama, 1973: 1).

Nomenclature. — The holotype, belonging to the collection of the late Mr. Shikama, most probably is in the Kanagawa Prefectural Museum at Yokohama, where the Shikama collection is kept. It was not (yet) available for study.

Babylonia formosae (Sowerby (II), 1866)

Diagnosis. — *B. formosae* is characterized by the shape and colouring of the body-whorl, which is narrowly shouldered and not conspicuously flattened; the shells are not very pale and their colour-pattern is well discernible. The umbilicus is wide open.

Two subspecies may be distinguished, separated by a distributional gap and not connected, therefore (?), by intermediate populations.

Babylonia formosae formosae (Sowerby (II), 1866)
(pl. 5 figs. 4, 5, 10)

Eburna formosae Sowerby (II), 1866: without pagination, pl. 291 figs. 17, 18 ("Formosa"). Tryon, 1881: 211, pl. 82 fig. 475. Kobelt, 1881: 11, pl. 72 fig. 7.
Latrunculus formosus [sic] — Nomura, 1935: 149.
Babylonia formosae — Kuroda, 1941: 116, pl. 3 fig. 32. Kuroda & Habe, 1952: 40. Kira, 1959: 68, pl. 26 fig. 27; 1962: 75, pl. 27 fig. 27. Habe, 1965: 120, pl. 1 fig. 4. Oliver, 1975: 196, 197, fig.

Diagnosis. — *B. f. formosae* differs from *B. f. habei* by the more evenly rounded body-whorl with a slightly narrower shoulder; a shallow and inconspicuous sutural canal runs from the apical whorls beyond the beginning of the body-whorl, i.e., further than in *B. f. habei*. The spots on the body-whorl are more clearly contrasting with the light background than in *B. f. habei* and the colour-pattern is less irregular.

Description. — Shell (pl. 5 figs. 4, 5, 10) buccinoid, with up to 7½ whorls; aperture forming somewhat more than half the total height. A narrow shallow sutural canal with a raised margin runs from the initial whorls down to beyond the beginning of the body-whorl, which has a narrow nearly horizontal shoulder.

Outer lip of the aperture not clearly thickened inside; with an indistinct anal notch. Inner lip consisting of a heavy callus expanded on the last whorl and for a usually slightly longer part of the less conspicuously thickened callus which borders the right side of the umbilicus; uppermost with a rib, which belongs to the anal groove and looks like a tooth in front view.

Umbilicus wide open; at the upper and left side surrounded by a raised fasciole, which is separated from the body-whorl by a narrow ridge, running to the lowest point of the outer lip. Inside the fasciole a band occurs, which is about as broad as the fasciole at its lowest point, becoming clearly narrower upwards.

Initial whorls light violet to yellowish; the following with violet-brown spots, conspicuously contrasting with a yellowish to whitish background. Four bands occur in principle on the body-whorl: the first and the third band both consisting of a row of comparatively large spots, vertically elongate and more squarish, respectively; the second and the fourth band both are formed by a row of smaller spots. Spots of different bands are frequently connected vertically, not horizontally; the two upper bands may be combined to a single row of oblong spots. Fasciole and band around the umbilicus whitish to yellowish, with some violet-brown spots. Aperture and umbilicus white.

Periostracum rather thin, brownish.

The shells are up to 57 mm high and 35 mm broad. Measurements of some specimens are given below:

Taiwan; RMNH: h. 55.5 mm; b. 31 mm; 7½ whorls
Taiwan; ANSP: h. 47.5 mm; b. 30 mm; 7½ whorls
Taiwan, off Anping (= Ngan-ping); ANSP: h. 47 mm; b. 29 mm; 7½ whorls
Taiwan; ANSP: h. 43 mm; b. 28 mm; 7½ whorls

Operculum with slightly raised growth-lines.

Radula and soft parts of the animal unknown.

Habitat. — Kira (1962: 75) mentions this species from 5-10 fathoms depth. A sample from Taiwan Hai Hsia (ZMA) had been collected at 10 fathoms depth.

Range. — Known with certainty only from the northwest- to the southwest-coast of Taiwan. According to Dr. C. C. Lin (in litt., 1972): "... at SW coast mainly, sometimes in NW coast. We can easily get it from markets during December to February."

There is a fossil record for Taiwan: Pliocene, Byôritu beds (Nomura, 1935: 149).

Nomenclature. — We designate a shell in the British Museum (Natural History) as the lectotype of *E. formosae* (BM 79.2.26.110). Most probably this is the specimen figured by Sowerby (II) (1866: pl. 291 figs. 17, 18).

Records. — Taiwan: (ANSP, BM, RMNH); off Anping (= Ngan-ping) (ANSP); Takao (RMNH); Taiwan Channel (= Taiwan Hai Hsia) (ZMA).
Fossil record. — Pliocene (Byôritu beds): Taiwan (Nomura, 1935: 149).

Babylonia formosae habei subspec. nov.

(figs. 3, 4, 14; pl. 1 fig. 2; pl. 5 figs. 8, 9; pl. 7 fig. 1; pl. 8 fig. 4)

Babylonia lamarcki — Kuroda, 1939: 163. Not *Latrunculus lamarcki* Nomura, 1935.
Babylonia lutosa — Kuroda, 1941: 116, pl. 3 fig. 37. Oyama & Takemura, 1958: figs. 14, 15. Habe, 1965: 121 (part.), pl. 1 fig. 9. Habe & Kosuge, 1966: 59, pl. 21 fig. 27 (= Habe, 1965: pl. 1 fig. 9). Not *Eburna lutosa* Lamarck, 1822.

Diagnosis. — *B. formosae habei* differs from *B. formosae* s. str. by its somewhat more flattened whorls, with a slightly broader shoulder; the sutural canal is narrower and only discernible along ca. the first six whorls (pl. 5 figs. 8, 9; pl. 7 fig. 1; pl. 8 fig. 4). Moreover, the colour-pattern is more irregular and the spots are contrasting less clearly with the background colour.

Description. — Apart from the characters mentioned in the diagnosis, *B. formosae habei* comes very close to the nominate form. In our material the shells are slightly larger, up to 66 mm high and 40 mm broad, and have up to 8 whorls. Some measurements may follow:

Taiwan, Ilan; holotype Kuroda coll.: h. 66 mm; b. 40 mm; 8 whorls
Taiwan, Suao; paratype, Kuroda, 1941: pl. 3 fig. 37: h. ca. 64 mm; b. 39 mm; ? whorls
Taiwan; paratype RMNH: h. 57 mm; b. 34 mm; 7½ whorls
Taiwan, Suao; paratype RMNH: h. ca. 56 mm; b. 31 mm; ? whorls

Operculum with slightly raised growth-lines.

A part of the radula is figured (figs. 3, 4).

The soft parts of a female specimen are figured (fig. 14).

Habitat. — Unknown.

Range. — Known with certainty only from the northeast-coast of Taiwan. According to Dr. C. C. Lin (in litt., 1972): "We can get it sometimes from markets of Northern Taiwan during March to June. ...not common, only being found from Keelung to Suao Bay, NE Taiwan."

Remarks. — From the data supplied by Dr. C. C. Lin (in litt., 1972) we may conclude that the two subspecies of *B. formosae* are found at different markets in Taiwan, in different parts of the year; *B. formosae habei* is less common than the nominate race. It is unknown to what extent the habits of the local fishermen give rise to these differences.

In the literature *B. formosae habei* has been distinguished from *B. formosae* s. str. already. The subspecies has been confused mostly with *B. lutosa*, which differs clearly, however, by the broader sloping shoulder and the more strongly flattened body-whorl; in *B. lutosa* the umbilicus is usually narrower. Kuroda (1939: 163) considered *B. formosae habei* a variety of *B. lamarcki* and gave the following description (kindly translated from the Japanese by Drs. K. A. G. de Jong, Den Haag): Looks like *formosae*, but is bigger and the spots are less distinct; it is collected along the east-coast. According to Nomura (1935: 149), who reported both "*Latrunculus formosus*" and "*Latrunculus lamarcki*" from the Pliocene Byôritu beds of Taiwan, the latter is most similar to *B. japonica* (see p. 42).

Nomenclature. — The holotype is a specimen lent to us from the Kuroda-collection (in the National Science Museum, Tokyo) by Dr. T. Habe, to whom the subspecies is dedicated. Paratypes: three shells with operculum, figured by Kuroda (1941: pl. 3 fig. 37), Oyama & Takemura (1958: figs. 14, 15) and Habe (1965: pl. 1 fig. 9), respectively; a shell from Taiwan, Suao (RMNH 55001); a shell from Taiwan (RMNH 55004); five animals in alcohol from Taiwan (RMNH alc. 9009).

Records. — Taiwan: (Oyama & Takemura, 1957: explanation pl. *Metula Kanamurua Babylonia*; RMNH); Chilung (= Kilung, = Kelung, = Kiirun) (Kuroda, 1941: 116); Ilan (= Giran) (Kuroda, 1941: 116); Suao (= Suō, = Soo, = Suan, = Suow) (Kuroda, 1941: 116; RMNH).

Babylonia japonica (Reeve, 1842)
(figs. 5, 6, 16; pl. 1 fig. 3; pl. 3; pl. 5 figs. 3, 6, 7)

Eburna japonica Reeve, 1842: 200 ("...ad oras Japonicas"). Reeve, 1849: sp. 3, fig. 3. Küster, 1857: 84. Sowerby (II), 1859: 70, pl. 215 fig. 11. Adams, 1864: 140. Tryon, 1881: 211, pl. 82 fig. 463. Kobelt, 1881: 8, pl. 72 figs. 1, 2. Yokoyama, 1922: 57, pl. 2 fig. 20; 1926a: 370; 1927a: 394; 1927b: 440; 1927c: 166.
Latrunculus japonicus — Lamy, 1930: 225, pl. 2 fig. 4, pl. 3 fig. 4.
Babylonia japonica — Nomura, 1939: 256, pl. 13 (8) fig. 10a-b. Kuroda, 1941: 116. Habe, 1943: 70, pl. 4 fig. 1; 1965: 122, pl. 1 fig. 7; 1971: 77, 116, 137. Kuroda & Habe, 1952: 40. Oyama, 1952: 36. Yoshihara, 1957: 207. Kira, 1959: 69, pl. 26 fig. 29; 1962: 75, pl. 27 fig. 29. Hayasaka, 1961: 84, pl. 12 fig. 1. Hashimoto et al., 1967: 661. Okutani & Takemura, 1967: 113, 114 (upper phot.), 115 (fig. 7), 116. Kuroda, Habe & Oyama, 1971: 164, pl. 44 fig. 5. Dance, 1974: 143. Lindner, 1975: 178, pl. 34 fig. 2. Oliver, 1975: 196, 197, fig.

Diagnosis. — *B. japonica* can easily be recognized by the conical buccinoid shell with a narrow, only slightly indicated shoulder, a narrow umbilicus and a typical colour-pattern at the body-whorl, i.e., a first and a third band of large spots, strongly contrasting with the numerous small spots constituting the second and the fourth band.

Description. — Shell (pl. 5 figs. 3, 6, 7) conical buccinoid, with up to 8½ whorls; aperture forming ca. half the total height or somewhat more. At about the third and fourth whorl a very narrow sutural canal can be seen under magnification. The last whorl has an oblique narrow shoulder, which becomes indiscernible at the older whorls. A sinistral specimen is figured by Lamy (1930: pls. 2-3 fig. 4).

Outer lip of the aperture hardly thickened; when the shell is examined from above, a shallow anal notch is seen. Inner lip consisting of the heavy callus on the last whorl and for about an equal part of the callus bordering the right side of the umbilicus; an umbilical notch is present. There is a rib near the upper end of the inner lip, which marks the anal groove and looks like an indistinct tooth in front view.

Umbilicus open, but usually rather narrow; at the upper and left side surrounded by a slightly raised fasciole, which is separated from the body-whorl by a narrow ridge. Inside the fasciole, and generally not clearly separated from it, a comparatively narrow band occurs, on which the growth-lines reach their farthest point forward; inside this band another narrow band is seen, which is polished and not covered by the periostracum. Both bands are running next to each other to the lowest part of the inner lip.

Initial whorls whitish to violet; the following with brown spots on a whitish background. Usually four bands are clearly distinguishable at the body-whorl; the first and the third band both formed by a row of large spots, sharply contrasting with the numerous small spots constituting the

second and the fourth band. Only rarely the small spots of the second and those of the fourth band are fused to larger ones and, moreover, connected with the spots of the other two bands, thus obscuring the basic pattern of four bands. The fasciole and the two bands around the umbilicus have brown spots on a whitish background. The central part of the umbilicus and the aperture are white.

Periostracum rather thick, yellow-brown.

The shells are up to 89 mm high and 50 mm broad. Measurements of some specimens are given below:

Japan, Enoshima; RMNH: h. 89 mm; b. 49 mm; >8 whorls
Japan, Chiba Harbour; ANSP: h. 88 mm; b. 50 mm; >7 whorls
Ryukyu Islands; USNM: h. 82 mm; b. 46 mm; >7 whorls
Japan, Chiba Harbour; ANSP: h. 81 mm; b. 48 mm; >7 whorls
Japan, Tokyo Harbour; ANSP: h. 81 mm; b. 48 mm; 8½ whorls
Japan, Tokyo Harbour; ANSP: h. 77 mm; b. 44 mm; 8½ whorls

The operculum has slightly raised growth-lines (pl. 1 fig. 3).

A part of the radula is figured (figs. 5, 6).

Although *B. japonica* is in many respects by far the best known species of the genus, we could not find a recent description of the soft parts of the animal. Adams (1864: 142-143) gave the following account: "In this species the tentacles are ringed with red-brown, and speckled with light yellow; and the siphon is spotted with yellowish white, and irregularly banded with red-brown lines. The foot (long, large, thick, and fleshy, like that of *Buccinum*) is transversily banded with irregular red-brown lines and minutely spotted with pale yellow. The sole is also edged with pale yellow. At the caudal extremity of the foot there is a single conspicuous cylindrical terminal filament."

We did not see a "conspicuous cylindrical terminal filament" in the specimens of *B. japonica* preserved in alcohol we could study, nor did we see such a structure in any of the other *Babylonia* species of which alcohol material was available (*B. areolata, B. formosae, B. perforata, B. spirata*). The photograph published by Okutani & Takemura (1967: 114, upper phot.) does not give useful information concerning this point. Adams' intrigueing remark concerning the "terminal filament" deserved special attention, especially because of the shape of the caudal part of the foot described for *Zemiropsis* and thought to be typical for that genus (see p. 6 and pl. 2 fig. 3).

Remarks. — According to Habe (1965: 115) "The flesh of the Japanese ivory shell [*B. japonica*] is served for food and the shell is utilized in the manufacture of various toys. Therefore, this species is one of the important

whelks for fishery purposes in Japan. The fishermen catch this snail by the trap basket called "Baikago" [pl. 3 fig. 3], in which the fragments of faded meat are put." The snails should be well cooked before eating as they may contain a toxin desintegrating when heated (Hashimoto et al., 1967; Shibōta & Hashimoto, 1971). According to Habe (1971: 117) "The meat is dark brown and tough. It is not very tasty, but with soy sauce has a nice, fresh flavor."

Several papers deal with various aspects of *B. japonica*, e.g.: "Life history of Japanese ivory shell, *Babylonia japonica* (Reeve) and its propagation method" (Ino, 1950); "Age-determination of the *Babylonia japonica* (Reeve), an edible marine gastropod, basing on the operculum" (Kubo & Kondô, 1953); "Population studies on the Japanese ivory shell, *Babylonia japonica* (Reeve)" (Yoshihara, 1957). See also p. 10.

Habitat. — The species is "commonly found in muddy sand" (Yoshihara, 1957: 207). Kuroda, Habe & Oyama (1971: 164) mention it from sandy bottoms "between tide marks down to 50 m deep". According to Hayasaka (1961: 84) *B. japonica* is living "from the lowest tide mark to about 100 meters in depth.".

Range (fig. 16). — Known from Korea and China, and from Japan to Taiwan.

Also reported from the Japanese Pleistocene. See further sub *B. lamarcki*, p. 42.

Nomenclature. — One of three syntypes from the Cuming collection, probably the specimen figured by Reeve (1849: fig. 3), is designated as the lectotype of *B. japonica* (BM 19746).

Records. — Korea: Hamgyong (ANSP); Mokpo (ANSP). China: (Habe, 1965: 122). Japan: Akita (ANSP); Teradomari (Hashimoto et al., 1967: 661); Tokyo (ANSP, ZMA); Chiba (ANSP); Kominato (ANSP); Yokohama (ANSP); Kamakura (ANSP, MZAA); Enoshima (ANSP, RMNH); Kanagawa (RMNH); Sagami Bay (MZAA); Shizuoka (Hashimoto et al., 1967: 661); Nagoya (NMR); Kii (DMNH); Ashiya (RMNH, ZMA); Osaka (ANSP); Tosa (ANSP, DMNH, MZAA); Nagasaki (ZMA); Amakusa (Habe, 1965: 122); Kagoshima Bay (Habe, 1965: 122; MZAA); Miyazaki (ANSP); Ryukyu Islands (USNM). Taiwan: Taihoku-syū (Kuroda, 1941: 116).

Fossil records. — Pleistocene: Kyushu and Honshu, up to somewhat N of Tokyo (Yokoyama, 1922: 57; 1926: 370; 1927a: 394; 1927b: 440; 1927c: 166. Oyama, 1952: 36. Hayasaka, 1961: 84 and table opposite p. 24.

Babylonia kirana Habe, 1965

(fig. 15; pl. 7 figs. 6, 7)

Babylonia pallida Hirase, 1934: 74, pl. 104 fig. 9 (no locality given). Hirase & Taki, 1954: 104, pl. 104 fig. 8 right (= Hirase, 1934: pl. 104 fig. 9) (Ryukyu). Not *Ancilla pallida* Perry, 1811.

Babylonia pallida Kira, 1959: 69, pl. 26 fig. 28 ("Ryukyu Islands"); 1962: 75, pl. 27 fig. 28 (= Kira, 1959: pl. 26 fig. 28). Not *Ancilla pallida* Perry, 1811. Not *B. pallida* sensu Dance (1974: 143), = *B. borneensis*.

Babylonia kirana Habe, 1965: 119. Nomen novum for *B. pallida* Kira, 1959, not Perry, 1811.

Diagnosis. — *B. kirana* is characterized by the very pale spots, standing out vaguely against a whitish background. There is an inconspicuous, very narrow sutural canal and the body-whorl has a rounded, not a broad and sloping, shoulder.

Description. — Shell (pl. 7 figs. 6, 7) buccinoid, with more or less flattened sides and up to 7½ whorls; aperture forming $^3/_5$ to nearly half the total height. Initial whorls with a sharply delimited, very narrow sutural canal, changing into a rather narrow rounded shoulder along the body-whorl.

Outer lip of the aperture slightly thickened inside, at the topmost end; a small anal notch is seen in some specimens when examined from above. Inner lip with an umbilical notch; consisting of a heavy callus on the last whorl and for about the same part of the callus bordering the right side of the umbilicus. Near the upper end of the inner lip there is a rib, belonging to the anal groove and looking like a tooth in front view.

Umbilicus moderately to very narrow, completely closed only in a single specimen from Taiwan; at the upper and left side surrounded by a raised fasciole, which is separated from the body-whorl by a narrow ridge, running to the lowest point of the outer lip. The fasciole is more or less clearly separated from an inside band, which ends at the lowest part of the inner lip.

Initial whorls light violet to greyish; after about the beginning of the third whorl up to about the end of the fourth whorl, brown to orange-brown spots are clearly distinguishable on a whitish background. On the youngest whorls the spots are much paler, standing out less sharply against the background-colour. On the body-whorl four bands may be vaguely discernible: the spots of the first (upper) band are mostly not connected horizontally, but are vertically linked up with the nearly homogeneous second band; the third band is nearly homogeneous too, whereas a fourth band is hardly or not discernible. The fasciole and the band around the umbilicus may be spotted. The central part of the umbilicus and the aperture are white.

Periostracum rather thin and yellowish, covering the colour-pattern of the body-whorl.

The shells are up to 52 mm high and 31 mm broad. Measurements of some specimens are given below:

Ryukyu Islands; ANSP: h. 52 mm; b. 31 mm; 7½ whorls
Ryukyu Islands, Okinawa; USNM: h. 49 mm; b. 29 mm; 7¼ whorls
Ryukyu Islands; ANSP: h. 45 mm; b. 26 mm; 7½ whorls

Ryukyu Islands, Okinawa; USNM: h. 44 mm; b. 28 mm; 7¼ whorls
Marianas Islands, Saipan; ANSP: h. 39 mm; b. 25 mm; >6½ whorls
Marianas Islands, Saipan; ANSP: h. 37 mm; b. 25 mm; 7 whorls

Operculum without raised growth-lines.

Radula and soft parts of the animal unknown.

Habitat. — The specimens from the Marianas Islands were found at 2 fathoms depth. Kira (1959: 69) reported the species from a depth of 10 fathoms.

Range (fig. 15). — From southern Japan and the Ryukyu Islands to Taiwan and the Marianas or Ladrones Islands.

Nomenclature. — *B. pallida* Hirase, 1934, and *B. pallida* Kira, 1959, have been introduced independently for the same species and, therefore, are primary homonyms and synonyms. Habe (1965: 119) found the secondary homonym *B. pallida* (Perry, 1811) and introduced the new name *B. kirana.*

The specimen figured by Hirase (1934: pl. 104 fig. 9) is designated as the lectotype of *B. pallida* Hirase, 1934. This shell has been destroyed during the war (Hirase & Taki, 1954: xxi). The shell figured by Kira (1959: pl. 26 fig. 28) is designated as the lectotype of *B. pallida* Kira, 1959, and, consequently, of *B. kirana* Habe, 1965.

Records. — Japan: Kii (ANSP). Ryukyu Islands: (ANSP); Amami Ō shima (RMNH); Okinawa (USNM). Taiwan: (RMNH). Marianas Islands: Saipan (ANSP).

Babylonia lutosa (Lamarck, 1822)

(fig. 19; pl. 4 fig. 1; pl. 7 fig. 3; pl. 10 figs. 3, 5)

[*Buccinum spiratum* Linnaeus, 1758: 739 (partim, see p. 36 of the present paper)].
Eburna lutosa Lamarck, 1822: 282 (no locality given). Kiener, 1835: 6, pl. 3 fig. 6. Reeve, 1849: sp. 2, fig. 2. Küster, 1857: 83, pl. 65 fig. 8, pl. 70 fig. 3. Sowerby (II), 1859: 70, pl. 215 figs. 9, 10. Tryon, 1881: 211, pl. 82 fig. 465. Kobelt, 1881: 3, pl. 71 fig. 3. Vredenburg, 1921: 234, 271 ("*jutosa*"), 288. Vredenburg, 1923: 73.
Eburna pacifica Swainson, 1822: Appendix, 6 ("The South Seas"). Swainson, 1823: without pagination, pl. 146.
Eburna troschelii Kobelt, 1881: 3, pl. 71 figs. 1, 2 (no locality given).
Eburna protozeylanica Noetling, 1901: 310, pl. 20 figs. 11, 11a (Miocene of Kama, Burma).
Babylonia lutosa — Thiele, 1929: 312, fig. 344. Kaicher, 1957: pl. 6 fig. 15. Habe, 1965: 121 (part.). Oliver, 1975: 196, 197, fig.
Babylonia kozaiensis Nomura, 1939: 256, pl. 13 fig. 8a-b (Early Miocene of Kozai, 700 m E of Yamaguchi, Kozai-mura, Igu-gun, Miyagi Prefecture, NE Honshu, Japan). Nomura & Onisi, 1940: 192, pl. 19 fig. 1a-b. Hatai & Nisiyama, 1952: 171.
Babylonia kozaiensis kokozurana Nomura, 1939: 256, pl. 13 (8) fig. 9a-b (Late Miocene or Early Pliocene E of Kokozura, Nakosomachi, Iwaki-gun, Fukushima Prefecture, NE Honshu, Japan). Hatai & Nisiyama, 1952: 171.

Diagnosis. — *B. lutosa* is characterized by the large, slightly sloping

shoulder of the body-whorl, the flattened sides and the pale spots; its umbilicus is only narrowly open.

Description. — Shell (pl. 4 fig. 1; pl. 7 fig. 3; pl. 10 figs. 3, 5) buccinoid, with flattened sides and up to 8 whorls; aperture forming somewhat more than half the total height. Initial whorls with a very narrow sutural canal (hardly discernible without magnification), ending after about the fourth whorl. The body-whorl has a broad, slightly sloping shoulder, which becomes more oblique at the foregoing whorls, whereas the initial whorls are regularly rounded (apart from the narrow sutural canal).

Outer lip of the aperture thickened inside at the upper end; usually a little notch for the anus is seen when the shell is examined from above. Inner lip mostly with an umbilical notch; consisting of the heavy callus on the last whorl and for about the same part of the callus bordering the right side of the umbilicus (the latter may be bent down into the umbilicus and indented). Near the upper end of the inner lip there is a rib, belonging to the anal groove and looking like a tooth in front view.

Umbilicus open, but narrow to very narrow; at the upper and left side surrounded by a more or less indented, slightly raised fasciole, which is separated from the body-whorl by a narrow ridge, which ends at the lowest point of the outer lip. At the inner side, this fasciole is more or less clearly, sometimes by a ridge, separated from a band, which is broader than it and ends at the lowest part of the inner lip. The band mentioned is not always clearly separated from the more central part of the umbilicus, and in several specimens it fills up the entire surface between the fasciole and the callus of the inner lip.

Initial whorls whitish to grey; the following with pale reddish-brown to yellowish spots on a whitish background. On the last whorl four bands are recognizable. The large spots of the first (upper) band are separated from each other horizontally; they are vertically connected with the spots forming the second band, which are very variable in shape and may be combined in different ways, sometimes forming a nearly homogeneous band. The third band is separated from the adjoining ones by whitish zones; generally it consists of a row of squarish spots, more or less connected with each other. The fourth band looks like the second, but is narrower and somewhat paler in colour. Fasciole and band around the umbilicus yellowish with whitish parts. Aperture and the most central part of the umbilicus white.

Periostracum rather thick, yellowish.

The shells are up to 68 mm high and 43 mm broad. According to the literature, fossil specimens are smaller (as in *B. spirata)*. Measurements of some Recent specimens are given below:

China, Yenting; USNM: h. 68 mm; b. 43 mm; 8 whorls
Hong Kong, S of Aapli; ANSP: h. 66 mm; b. 36 mm; 7½ whorls
China; ANSP: h. 64 mm; b. 38 mm; 7½ whorls
China; UZMK: h. 63 mm; b. 39 mm; 6½ whorls
Hong Kong, Causeway Bay; DMNH: h. 60 mm; b. 38 mm; >6½ whorls
China; UZMK: h. 59 mm; b. 39 mm; 7½ whorls

Operculum with slightly raised growth-lines.

A part of the radula (middle and lateral tooth), not differing from the general pattern illustrated by figs. 1-11, has been figured by Thiele (1929: 312).

The soft parts of the animal are unknown.

Habitat. — We only know that a sample of twelve specimens has been dredged at 20 fathoms depth S of Aapl, Chaau, Hong Kong.

Range (fig. 19). — From Taiwan and the Chinese coast to Singapore. The localities Borneo and Ceylon need confirmation.

Following the opinions of Habe (1965: 121) and Vredenburg (1921: 271) we may say that fossil specimens are known from the Early Miocene and the Late Miocene or Early Pliocene of NE Honshu, Japan, and from the

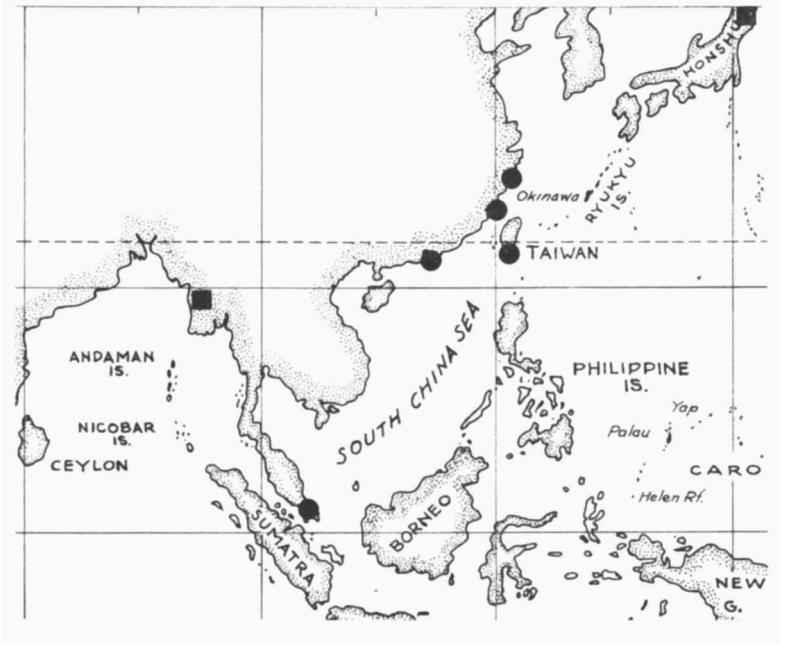

Fig. 19. Recent and fossil records for *B. lutosa* (Lamarck), indicated by dots and squares respectively.

Miocene of Burma. The former region is over 2000 km NE of the present range of the species, whereas the latter is situated an equal distance W of the well established actual range.

Nomenclature. — Lamarck (1822: 282) referred to a specimen figured by Bruguière (1816: pl. 401 fig. 4a-b), which is designated as the lectotype of *E. lutosa* here. The specimen figured by Swainson (1823: pl. 146) is designated as the lectotype of *E. pacifica.* The synonymy of *E. lutosa* and *E. pacifica* is obvious from the figures; both nominal taxa were introduced in the same year, 1822; priority is given to *E. lutosa. E. troschelii* has been based on a single abnormal specimen of *B. lutosa,* as has been suggested already by its author (Kobelt, 1881: 3). Vredenburg re-examined the original material of *E. protozeylanica* and emphasized (1921: 271) that this is at most a variety of *B. lutosa,* which is somewhat smaller than most specimens of the species. We see no reasons to disagree. The specimen figured by Noetling (pl. 20 figs. 11, 11a) is designated as the lectotype of *E. protozeylanica.* With some doubt we follow Habe (1965: 121) in considering *B. kozaiensis* (pl. 10 fig. 3) and *B. kozaiensis kokozurana* (pl. 10 fig. 5) synonyms of *B. lutosa.* Both taxa are based upon very few and badly preserved shells. For *B. kozaiensis* a height of "ca. 45 mm" is given, i.e., less than the height of a Recent adult *B. lutosa.* Further research is required.

Records. — China: (ANSP, DMNH, NMR, RMNH, UZMK, ZMA); Foochow (= Fu Chou), Fukien prov. (USNM); Yenting, Chekiang prov. (USNM); Hong Kong (ANSP, BM, MZAA, RMNH); dredged at Causeway Bay, Hong Kong (DMNH); S of Aapl, Chaau, Hong Kong (ANSP). Taiwan: (RMNH). Singapore: (MZAA). Borneo: (USNM). Ceylon: (USNM).

Fossil records. — Miocene: Kama and Prome, Burma (Vredenburg, 1923: 73). Early Miocene: Kozai, 700 m E of Yamaguchi, Kozai-mura, Igu-gun, Miyagi Prefecture, NE Honshu, 37°54'N 140°50'E. Late Miocene or Early Pliocene: E of Kokozura, Nakosomachi, Iwaki-gun, Fukushima Prefecture, NE Honshu, 36°51'N 140°47'E.

Babylonia perforata (Sowerby (II), 1870)
(fig. 7; pl. 7 fig. 4)

Eburna perforata Sowerby (II), 1870: 252, pl. 21 fig. 2 (no locality given). Tryon, 1881: 213, pl. 82 fig. 471. Kobelt, 1881: 11, pl. 72 fig. 8.
Babylonia zeylanica — Habe, 1965: 122 (partim). Not *Buccinum zeylanicum* Bruguière, 1789.
Babylonia perforata — Lan, 1980: 99, pl. 43 figs. 100, 101 [excellent col. phot.].

Diagnosis. — This rare species belongs to the group of four Recent *Babylonia*'s with a knobbed band around the umbilicus. It may be easily distinguished from *B. borneensis* by its larger dimensions, the vertically connected dark spots on the body-whorl and the sutural canal changing into a shoulder

near the aperture. *B. feicheni* and *B. zeylanica* are clearly differing too, in dimensions and shape, respectively, and by the lack of a conspicuous sutural canal along most of the whorls.

Description. — Shell (pl. 7 fig. 4) buccinoid, with up to 9 whorls; aperture somewhat less than half the total height. Sutural canal very conspicuous, with a nearly horizontal base and a raised margin, changing into almost a straight shoulder near the aperture.

Outer lip of the aperture thickened inside, outside with a narrow radial thickening; an anal notch is seen when the shell is examined from above. Inner lip consisting of the heavy callus expanded forward on the last whorl and for at least two-thirds of its length of the callus bordering the right side of the umbilicus; the anal groove is not very clearly separated from the rest of the aperture.

Umbilicus wide open; at the upper and left side surrounded by a raised fasciole which ends in the notch for the sipho. Inside the fasciole a conspicuously knobbed band runs to the lower part of the inner lip; looking into the umbilicus, this band can be easily followed upwards. On the callus at the right side of the umbilicus a more or less raised band occurs, which also may be followed upwards, spirally surrounding the umbilicus.

Initial whorls violet-brown; the following with brown spots on a whitish background. Because the spots are vertically connected, four bands are only indistinctly recognizable on the body-whorl. The aperture, the radial outer thickening of the outer lip and the umbilicus are white; the fasciole and the knobbed band around the umbilicus show brown patches.

Periostracum very thin and yellowish.

We could study only four shells, the largest being 73 mm high and 44 mm broad. Lan (1980: 99) mentions a specimen of 80 mm height. Measurements are given below:

Holotype, not full-grown; BM: h. 51.5 mm; b. 35 mm; 8 whorls
Taiwan, Kaohsiung; DMNH: h. 73 mm; b. 44 mm; 9 whorls
Taiwan Hai Hsia; coll. T. C. Lan (Taipei): h. 71.5 mm; b. 42 mm; ? whorls
Taiwan, Tainan; RMNH: h. 68 mm; b. 42.5 mm; 8½ whorls

Operculum without raised growth-lines, translucent.

A part of the radula is figured (fig. 7).

Habitat. — We only know the depth at which two of our four specimens have been dredged, 30 and 100 fathoms, respectively.

Range. — Only known from the Taiwan Hai Hsia. Dr. C. C. Lin reports (in litt., 1972): "...we can find it only from offshore of Kaohsiung rarely."

Nomenclature. — The holotype (monotype) is in BM (no. 79.2.26.111).

Records. — Taiwan: a few miles S of Kaohsiung, dredged at 30 fathoms (DMNH); off Taiwan, dredged at 100 fathoms depth (RMNH); Taiwan Hai Hsia (T. C. Lan, in litt. 1972); SW of Taiwan (Lan, 1980: 99).

Babylonia spirata (Linnaeus, 1758)

Diagnosis. — *B. spirata* is characterized by the presence of a conspicuous sutural canal, which has a sloping base without a separate raised border. A similar, but very narrow sutural canal is seen in *B. angusta*, which differs by its smaller dimensions, being up to 37 mm high, a less solid shell and a combination of characters (wide open umbilicus and very narrow sutural canal) not found in the very variable *B. spirata*. Two subspecies may be distinguished.

Babylonia spirata spirata (Linnaeus, 1758)

(figs. 8-11, 13, 15; pl. 1 figs. 4-6; pl. 2 fig. 1; pl. 4 figs. 4-6; pl. 6 figs. 4-6; pl. 8 fig. 3)

Buccinum spiratum Linnaeus, 1758: 739 ("M. Mediterraneo", which is incorrect as not a single Recent *Babylonia* species is found in the Mediterranean). This nominal taxon was stabilized by Altena (1968: 180) by the designation of a lectotype.
Ancilla pallida Perry, 1811: without pagination, pl. 31 fig. 3 ("New Holland").
Nassa canaliculata Schumacher, 1817: 224 (no locality given).
Eburna spirata — Lamarck, 1822: 281. Quoy & Gaimard, 1832: 458, pl. 31 figs. 10-13. Kiener, 1835: 7 (part.), pl. 1 fig. 1, pl. 3 fig. 5. Reeve, 1849: sp. 7, fig. 7. Eydoux & Souleyet, 1852: 611, pl. 41 figs. 28-30. Küster, 1857: 80, pl. 65 figs. 3, 5; 1860: pl. A fig. 5. Tryon, 1881: 212, pl. 82 figs. 466-468, pl. 84 fig. 526. Vredenburg, 1923: 73.
Eburna valentiana — Küster, 1857: 82 (part.), pl. 65 fig. 4. Not *E. valentiana* Swainson, 1822.
Eburna canaliculata — Sowerby (II), 1859: 69, pl. 215 figs. 2, 3.
Eburna semipicta Sowerby (II), 1866: without pagination, pl. 291 figs. 12, 13 (no locality given). Tryon, 1881: 212, pl. 82 fig. 470.
Eburna chrysostoma Sowerby (II), 1866: without pagination, pl. 291 figs. 15, 16 ("Ceylon"). Tryon, 1881: 212, pl. 82 fig. 469. Kobelt, 1881: 4, pl. 71 figs. 4, 5.
Eburna canaliculata var. *semipicta* — Kobelt, 1881: 10.
Dipsaccus canaliculatus — Martin, 1895: 103 (part.), pl. 16 figs. 224-226. Martin, 1928: 9. Van der Vlerk, 1931: 231 (part.). Haanstra & Spiker, 1932: 1313.
Latrunculus canaliculatus — Cossmann, 1903: 136. Oostingh, 1923: 115.
Babylonia canaliculata — Oostingh, 1939: 115. Altena, 1945: 147; 1950: 229. Abbott, 1962: 83, fig. Habe, 1965: 117 (part.). Tadjalli-Pour, 1974: 107, pl. 21 figs. 12, 13. Lindner, 1975: 178, pl. 34 fig. 3.
Babylonia (Babylonia) spirata — Wenz, 1941: 1186, fig. 3374.
Babylonia spirata — Hornell, 1951: 28, figs. 22, 23. Kaicher, 1957: pl. 6 fig. 20. Habe, 1965: 117, pl. 1 figs. 5, 6. Altena, 1968: 176, pl. 1 figs. 4, 5. Oliver, 1975: 196, 197, fig. Kirtisinghe, 1978: 81, pl. 47 fig. 1.

Diagnosis. — *B. spirata* s. str. is very variable. It may be recognized by the buccinoid shape with flattened sides above the periphery, combined with a very conspicuous sutural canal, which has a sloping base throughout. *B. spirata valentiana* is more egg-shaped, its whorls are more rounded and,

consequently, the sutural canal is narrower than in the nominate form.

Description. — Shell (pl. 4 figs. 4-6; pl. 6 figs. 4-6; pl. 8 fig. 3) buccinoid, with flattened sides above the periphery and up to more than 8 whorls; aperture forming more than half the total height. Sutural canal characteristic, comparatively broad and deep, with a sloping base; sometimes getting narrower near the aperture. In specimens from the Miocene to Pliocene of Java and from the Pliocene of Sumatra, we sometimes found a slightly narrower and shallower sutural canal as compared to the Recent form; in fossil specimens the margin of the canal may be less edged too (? worn).

Outer lip of the aperture slightly thickened above; a little anal notch is discernible when the shell is examined from above. Inner lip consisting of the heavy to very heavy callus on the last whorl and for an equal or slightly longer part of the equally strong callus bordering the right side of the umbilicus. When the umbilicus is not completely closed, the callus usually shows an umbilical notch. Near the upper end of the inner lip a rib is seen, which belongs to the anal groove and looks like a tooth in front view.

Umbilicus varying from wide open to completely closed; at the upper and left side surrounded by a slightly raised fasciole, which is separated from the body-whorl by a narrow ridge, running to the lowest point of the outer lip. Inside the fasciole there is a band, variable in width; when the umbilicus is closed or nearly so, it may be hardly or not distinguishable as such. Sometimes there is a ridge between the fasciole and the band, running to the lower end of the inner lip.

Initial whorls violet; the following with orange-brown spots on a whitish background. The colour-pattern is very variable, as the spots on the body-whorl are varying in size and shape to a considerable extent and may be combined to a variable degree in various ways, e.g., forming a zigzag pattern. Nevertheless, four bands are usually recognizable: a first (upper) band of large, oblong or moon-shaped spots; a second and a fourth band consisting of a larger number of smaller spots, with in between the larger spots of the third band. *E. semipicta* has been based on specimens in which only the second band is clearly developed. Fasciole and band around the umbilicus whitish with orange-brown spots. Umbilicus and aperture usually white. *E. chrysostoma* is based on specimens with a flesh-coloured aperture; most specimens belonging to this variety have been found near Ceylon. A shell without any trace of colour has been figured by Jonklaas (1976: 10).

Periostracum rather thick and felty, usually deciduous in collection material.

The shells are up to 80 mm high and 51 mm broad. Measurements of some specimens are given below:

unknown locality; UZMK: h. 80 mm; b. 50 mm; 8 whorls
Tranquebar; UZMK: h. 78 mm; b. 51 mm; 8½ whorls
Penang; LMP: h. 65 mm; b. 39 mm; 7¾ whorls
Java, Tandjung Periuk; RMNH: h. 53 mm; b. 33 mm; 8 whorls
Bombay; LMP: h. 48 mm; b. 32 mm; 7½ whorls
Java, Tandjung Periuk; LMP: h. 44 mm; b. 29 mm; 8 whorls

Fossil specimens have a colour-pattern not clearly different from that of Recent shells (Altena & Gittenberger, 1972: 468, pl. 1 fig. 2). They are comparatively small, however (as in *B. lutosa*). Among ca. 20 adult specimens in RGML the largest one is only 42 mm high.

Operculum (pl. 1 figs. 4-6) without raised growth-lines. See also p. 5.

A part of the radula is figured (figs. 8-11).

The anterior part of a male animal is figured (fig. 13). We found two rather contrasting figures of a live animal in the literature (Kiener, 1835: pl. 1 fig. 1 and Eydoux & Souleyet, 1852: pl. 41 fig. 28 = our pl. 2 fig. 1). See also p. 6.

Habitat. — *B. spirata spirata* has been reported from 0.5 to 1.5 m depth on a mud-bottom in the Java Sea E of the canal to Pasar Ikan near Jakarta, from 1.8 m depth at Galle Harbour, Ceylon, and from 9 to 11 m depth on sand, grit and shells SW of Suzeh in the Persian Gulf. The animals seem to avoid a rocky bottom. Several records are based on shells washed ashore, indicating that the snails are (also) living in shallow water.

Range (fig. 15). — From Madura, Java and Sumatra along the south-coast of Asia to Oman and the Persian Gulf. The localities Aden and Hong Kong need confirmation and are not indicated on fig. 15. See also the remarks.

Fossil specimens are known from the Late Miocene to Pliocene of Java, the Pliocene of Sumatra and Karikal (India) and the "Mekran Beds" of Baluchistan (Pakistan), all within the Recent range of the species. *B. spirata spirata* is also known from the Plio-Pleistocene of British North Borneo; apparently the species became extinct there.

Nomenclature. — The lectotype of *B. spiratum* Linnaeus was selected by Altena (1968: 180, pl. 1 fig. 4); it is the specimen marked "469" in the Linnean collection. *N. canaliculata* Schumacher was restricted by Altena (1968: 180) to Schumacher's first reference (1817: 224) and is, therefore, an objective synonym of *B. spiratum*. Both *Babylonia areolata* and *B. lutosa* were also found among the syntypes of *B. spiratum*, which made the selection of a lectotype particularly significant in this case (see Altena, 1968).

The originally figured specimen of *E. semipicta*, BM 79.2.26.112, is designated as the lectotype of that nominal taxon here. Type-specimens of *A. pallida* and *E. chrysostoma* could not be traced.

Küster (1857: 82, pl. 65 fig. 4) confused specimens of *B. spirata spirata* with a closed umbilicus with *B. spirata valentiana.*

Remarks. — With some doubt we consider *B. spirata* a polytypic species with two subspecies: the nominal race from the range mentioned before and *B. spirata valentiana,* living between Karachi and the Red Sea. This view is supported by the fact that intermediate forms with a completely closed umbilicus, a more or less rounded body-whorl and a sutural canal of variable width (pl. 6 figs. 4-6) are known from Karachi, where the two races meet. In addition we may say that *B. spirata valentiana* is most "typical", i.e., has the most strongly inflated whorls and the narrowest sutural canal, at its westernmost localities, suggesting some clinal variation in this taxon, reducing the morphological gap towards *B. spirata* s. str. in the east, where the distributional area of this second subspecies begins.

We should emphasize, however, that we have also seen both forms without intermediates in small samples from Karachi and Baba Island near Karachi (both in BM); a single *B. spirata* s. str. from Aden is present in BM (among many specimens of *B. spirata valentiana*). Apparently the two taxa are also living, at different localities, in the Gulf of Oman and maybe in the Persian Gulf. Therefore, the intermediate forms occurring near Karachi might also indicate an exceptional case of hybridization between otherwise good species.

As soon as more reliably labelled samples from the Persian Gulf and the Gulf of Oman are available, a better founded judgment concerning the nominal taxa involved will be possible.

Records. — Hong Kong: (BM). Madura: (RMNH). Java: Surabaya, beach (RMNH); Rembang, beach (RMNH); Tjirebon (= Cheribon, = Cirebon) (RMNH); Tandjung Periuk (= Tanjung Priok) (RMNH); mud coast E of the canal to Pasar Ikan, near Jakarta (RMNH); Thousand Islands N of Jakarta (ANSP); Tjilatjap (= Cilacap) (RMNH). Sumatra: Tandjong Tiram S of Kotaagung (ZMA); Belawan (RMNH); Tapanuli (ZMA). Andaman Islands: Port Blair (BM). Malayan peninsula: Penang (ANSP, DMNH, RMNH); Mergui (BM). India: Calcutta (RMNH); Waltair, Vizagapatam (ANSP); Madras (BM); Adyar near Madras (ZMA); Pondicherry (BM); Tranquebar (UZMK); Pamban (BM); Goa (USNM); Dona Paula, Goa (BM); Vengurla, N of Goa (USNM); Bombay (BM); sandy mud of Chow Patty beach, Bombay Isl. (ANSP); Back Bay, Bombay (USNM); Bandra, N of Bombay (DMNH, USNM). Ceylon: (ANSP, DMNH, MZAA, NMR, RMNH, UZMK, ZMA); Galle Harbour (ANSP); Mannar, beach (BM). Pakistan: Karachi (ANSP, BM); Baba Isl. near Karachi (BM). Persian Gulf: (BM); Buchehr (Tadjalli-Pour, 1974: 108); on sand, grit and shells, 4 mi. SW of Suzeh, Strait of Hormuz (UZMK); Hormuz Island (Tadjalli-Pour, 1974: 108). Arabian peninsula: Azaiba, Gulf of Oman (RMNH); from Salala to Rash-el-Khaima, Oman (ANSP); Muscat, Oman (USNM); Aden (BM).

Fossil records. — Late Miocene: Tji Odeng (7°26'S 107°15'E) and Palabuan Ratu (= Pelabuhanratu) (6°59'S 106°33'E), in Priangan (= Preanger), W Java (RGML).

Pliocene: Tji Djadjar, in Tjirebon (= Cheribon, = Cirebon), W Java (RGML); Bajah (6°55'S 106°15'E), in Bantam, W. Java (RGML); Bangkahulu (= Benkoelen, = Bengkulu), Sumatra (GIU); Atjeh (= Aceh), Sumatra (Martin, 1928: 9); Karikal, India (Cossmann, 1903: 136). Plio-Pleistocene (Togopi Formation): British North Borneo (BM). Mekran Beds: Karikal, India (Vredenburg, 1923: 73); Baluchistan, Pakistan (Vredenburg, 1923: 73). Early Pleistocene: Soemberringin, Java (Oostingh, 1939: 115).

Babylonia spirata valentiana (Swainson, 1822)
(fig. 15; pl. 4 figs. 7-9)

Eburna valentiana Swainson, 1822: 6 ("Red Sea"). Swainson, 1823: without pagination, pl. 144. Reeve, 1849: sp. 9, fig. 9. Küster, 1857: 82 (not pl. 65 fig. 4, = *B. spirata* s. str.).
Eburna spirata var. — Kiener, 1835: 8.
Eburna molliana Sowerby (II), 1859: 69, pl. 215 fig. 1 ("Persian Gulf").
Eburna valentiniana [sic] — Tryon, 1881: 213, pl. 82 fig. 473.
Eburna canaliculata var. *valentiana* — Kobelt, 1881: 10, pl. 72 figs. 5, 6.
Not *Latrunculus* (*Peridipsaccus*) *valentinianus* [sic] — Cossmann, 1901: pl. 8 fig. 23 (= *B. occlusa* Cossmann, 1903).
Babylonia (*Peridipsaccus*) *molliana* — Wenz, 1941: 1186, fig. 3375.
Babylonia canaliculata — Habe, 1965: 117 (part.), pl. 1 fig. 1. Oliver, 1975: 196, 197, fig. Not *Nassa canaliculata* Schumacher, 1817.
Babylonia valentiana — Altena, 1968: 181, pl. 2 figs. 1, 2. Dance, 1974: 143, fig.

Diagnosis. — *B. spirata valentiana* differs from the nominate subspecies by the more depressed shell, with more regularly rounded whorls, a narrower sutural canal and an umbilicus which is never wide open, but always closed or nearly so, whereas the umbilical fasciole is completely flattened. *B. angusta*, which also has a narrow sutural canal with a sloping base throughout, differs clearly by the wide open umbilicus.

Description. — Apart from the characters mentioned in the diagnosis, *B. spirata valentiana* comes close to the nominate form, also in its dimensions, differing slightly by a lower number of whorls. The shells (pl. 4 figs. 7-9) are up to 78 mm high and 52 mm broad. Some measurements are given below:

Karachi; ZMA: h. 78 mm; b. 51 mm; ? whorls
Karachi; DMNH: h. 75 mm; b. 52 mm; 7 whorls
Karachi; RMNH: h. 73 mm; b. 51 mm; 7 whorls
Aden, Kohrmaksar beach; ANSP: h. 52.5 mm; b. 36 mm; 7 whorls
Aden, Kohrmaksar beach; ANSP: h. 40 mm; b. 28 mm; 7 whorls

Radula and soft parts of the animal unknown.

Habitat. — Most specimens of *B. spirata valentiana* have been collected at the beach, suggesting that the subspecies lives (also) in comparatively shallow waters. At Hedjuff, Aden Harbour, animals have been collected at 20 to 30 feet depth. Near Jask the snails have been found in the tidal zone.

Range (fig. 15). — From the Red Sea, Aden and Socotra eastward to

Karachi; not along the southern border of the Gulf of Oman. Reported from the Persian Gulf; all recently collected material from there belongs to the nominate subspecies, however. See also the remarks on *B. spirata* s. str.

Fossil specimens are known from the Pleistocene of Aden.

Nomenclature. — The shell once belonging to the Bligh collection, described by Swainson, which is the holotype (monotype), is in BM (no. 1950.8.28.24).

E. molliana Sowerby (II), 1859, is an objective junior synonym of *E. valentiana* Swainson, 1822.

Remarks. — See the remarks on *B. spirata spirata.*

Records. — Red Sea (ANSP, BM, UZMK); near mouth of Enhima Wadi, Socotra (DMNH); between Suk and Habido, Socotra (BM); Aden (BM); Hedjuff, Aden (RMNH); Aden Harbour (RMNH); Kohrmaksar beach, Aden (ANSP, RMNH); Persian Gulf (BM, MZAA, UZMK, ZMA); Jask, northern border of the Gulf of Oman (UZMK); beach near Kunarak, Persia (RMNH); Karachi (ANSP, BM, DMNH, RMNH, ZMA); Baba Island near Karachi (BM).

Fossil records. — Pleistocene: Kohrmaksar Sands, Aden (NMR).

Babylonia zeylanica (Bruguière, 1789)
(fig. 16; pl. 5 figs. 1, 2)

Buccinum zeylanicum Bruguière, 1789: 264 ("l'ile de Ceylan").
Buccinum giratum Röding, 1798: 114, with reference to Chemnitz, 1780: pl. 122 fig. 1119, illustrating a specimen from "Trankebar" according to Chemnitz (1780: 16).
Eburna zeylanica — Lamarck, 1822: 281. Kiener, 1835: 3, pl. 2 fig. 4. Reeve, 1849: sp. 8, fig. 8. Küster, 1857: 79, pl. 65 fig. 1. Sowerby (II), 1859: 70, pl. 215 figs. 5, 6. Tryon, 1881: 211, pl. 82 figs. 461, 462.
Eburna zeylandica [sic] — Gray, 1847: 139.
Babylonia zeylanica — Hornell, 1951: 28. Habe, 1965: 122 (part.). Oliver, 1975: 196, 197, fig.
Babylonia zelandica [sic] — Abbott, 1962: 83, fig. Kirtisinghe, 1978: 81, pl. 47 fig. 2.
Babylonia zeylandica [sic] — Dance, 1971: 134, fig. 7; 1974: 144, fig.

Diagnosis. — *B. zeylanica* is easily recognizable by its somewhat conical shape, the distinctly knobbed violet band surrounding the umbilicus and the body-whorl without a sutural canal. Adult shells are over 55 mm high.

Description. — Shell (pl. 5 figs. 1, 2) conical, slender, with up to 8 whorls; aperture forming somewhat less than half the total height. At about the third whorl a very narrow sutural canal becomes discernible, continuing down to about the fifth whorl, after which it gradually changes into a vague shoulder. Close to its attachment to the penultimate whorl, the body-whorl is conspicuously curved upward (as in *B. feicheni*). At the last whorls there is a narrow ridge running along the suture; as is obvious near the aperture, this ridge is the uppermost part of the parietal callus.

Outer lip of the aperture slightly thickened above; a shallow anal notch is visible when the shell is examined from above. Callus of the inner lip

with an umbilical notch; somewhat less than half the length of the inner lip is formed by the callus on the last whorl. Anal groove marked by a rib, which looks like a tooth in front view.

Umbilicus wide open; at the upper and left side surrounded by a fasciole, which is bordered on both sides by narrow ridges, running down to the lower ends of outer and inner lip, respectively. Inside the more or less raised fasciole and little broader than it, a very distinctly knobbed band occurs, which ends at the lowest part of the inner lip.

Initial whorls dark violet-brown, changing into a pattern of light-brown spots on a whitish background on the following ones. Four bands are recognizable on the body-whorl: a first (upper) band with large spots, usually connected more or less with the much smaller spots of the uppermost row of the second band, which is composed of about three rows of small spots; the third band consists of rather large spots, whereas the fourth is characterized by two rows of small spots, which may be connected more or less. Aperture and umbilicus white, fasciole whitish with light-brown spots, which are in line with the lowest spots of the body-whorl. The knobbed band around the umbilicus is very conspicuously violet.

Periostracum thin and yellowish.

The shells are up to 76 mm high and 42 mm broad. Measurements of some specimens are given below:

Tranquebar; UZMK: h. 76 mm; b. 42 mm; >8 whorls
Tranquebar; UZMK: h. 75 mm; b. 39 mm; >8 whorls
Madras; DMNH: h. 66 mm; b. 36 mm; 8 whorls
Ceylon: RMNH: h. 65 mm; b. 35 mm; 8 whorls
Ceylon; DMNH: h. 61 mm; b. 33 mm; 8½ whorls

Operculum without raised growth-lines.

A living animal is figured by Dance (1971: 135, fig. 7).

Radula unknown.

Habitat. — Three more or less fresh-looking shells from the Winckworth collection (BM) suggest that *B. zeylanica* is not (only) living in deep water, because the specimens had been collected at Eliots Beach near Madras, Madras Beach and the pearl banks near Mannar, respectively. Further data are lacking.

Range (fig. 16). — Ceylon and the east-coast of India.

Nomenclature. — The specimen figured by Bruguière (1816: pl. 401 fig. 3), mentioned already 27 years earlier (Bruguière, 1789: 264), is designated as the lectotype of *Buccinum zeylanicum*. The shell figured by Chemnitz (1780: pl. 122 fig. 1119), which we could not trace in UZMK, is designated as the lectotype of *Buccinum giratum*.

Records. — India (east-coast): Gopalpur (BM); Eliots Beach, Madras (BM); Madras Beach (BM); Madras (BM, DMNH, RMNH); Tranquebar (UZMK). Ceylon: (ANSP, BM, DMNH, RMNH, UZMK, ZMA); Mannar (pearl banks) (BM).

Fossil non-European species

Babylonia gracilis (Martin, 1895)
(pl. 10 fig. 2)

Dipsaccus gracilis Martin, 1895: 103, pl. 16 figs. 229-229a (Pliocene of Tji Waringin, Java). Martin, 1911: 45; 1912: 165, 170. Van der Vlerk, 1931: 231; 1932: 110.
Babylonia gracilis — Altena, 1950: 230.

Diagnosis. — *B. gracilis* can easily be recognized by the slender shape in combination with a moderately broad, deep sutural canal with a horizontal base and a raised margin; it shares the conspicuous concave umbilical band with *B. pangkaensis*, which is less slender and has a narrower and shallower sutural canal.

Description. — Shell slender to very slender buccinoid, with up to over seven whorls; aperture forming more than half the total height. Sutural canal moderately broad, deep, with a horizontal base and a raised margin, not getting narrower near the aperture.

Outer lip of the aperture not clearly thickened; an anal notch is visible when the shell is examined from above. Inner lip consisting of the more or less heavy callus on the last whorl and for about the same or a slightly shorter part of the not conspicuously thickened callus bordering the right side of the umbilicus. Near the uppermost end of the inner lip there is no clear rib.

Umbilicus open but rather narrow; at the upper and left side surrounded by a strongly indented raised fasciole, which is separated from the last whorl by a strong ridge, running to the lowest part of the outer lip. Inside the fasciole and broader than it, a concave band with strong growth-lines is seen. The fasciole and the band are separated by a sharp angle.

In three specimens the former colour-pattern could be made partly visible with ultraviolet light (see Altena & Gittenberger, 1972). It proved to be rather aberrant for the genus: under an upper row of large spots many small or very small round spots are seen, distributed regularly, without any arrangement in rows.

The shells are up to 54 mm high and 28 mm broad. Measurements of some specimens are given below:

Pliocene, Tji Djurei; RGML: h. 54 mm; b. 28 mm; >6 whorls
Pliocene, Tji Djurei; RGML: h. 49 mm; b. 27 mm; >6 whorls
Pliocene, Tji Waringin, RGML (lectotype): h. 42 mm; b. 22 mm; >6 whorls
Young Tertiary, Subang; RGML: h. 37 mm; b. 18.5 mm; 6¼ whorls

Range. — Late Miocene to Pleistocene (Putjangan layers) of Java.

Nomenclature. — The specimen figured by Martin (1895: pl. 16 figs. 229, 229a) is designated as the lectotype; the shell is in RGML.

Remarks. — See the remarks on *B. pangkaensis* (p. 46).

Fossil records. — For the records, all on Java, we refer to the literature cited in our synonymy list.

Babylonia lamarcki (Nomura, 1935)
(pl. 10 fig. 6)

Latrunculus lamarcki Nomura, 1935: 149, pl. 8 fig. 28 (Pliocene Byôritu Beds of Wangwa, Taiwan).

Description (after Nomura, 1935: 149). — "Shell large, ovate in form, smooth, except for numerous, fine, growth lines. Whorls 9, convex, separated by impressed but not channeled sutures; spire conical, its apex acute; shoulder of each whorl roundedly angulate. Aperture ovate, somewhat widening below; columellar callous thick and heavy; outer lip regularly convex, but more or less flattened above. Umbilicus widely open, bounded behind by a broad and flexuously sculptured ridge; outer side of ridge, with a smooth cord running parallel to it. Length, 67 mm; diameter, ca. 42 mm.

The form of this species closely resembles that of *L. japonicus* (Reeve), but the umbilicus of the former is much wider than the latter; moreover the callous of the inner lip is heavier, and embryonal whorls are apparently smaller. *Latrunculus formosus* (Sowerby) is perhaps another similar species to the present fossil, but the shell has a much more distinctly angulate shoulder with narrowly channeled sutures."

Remarks. — Habe (1965: 121) lists *B. lamarcki* with the synonyms of *B. lutosa*; the latter differs, however, by having a broad sloping shoulder and more flattened sides. Judging *B. lamarcki* after the original description and figure (our pl. 10 fig. 6) only, a close relationship to *B. japonica* seems most probable to us. The two taxa, differing only in minor characters, might be considered chronospecies. As long as there is no additional material for study our views will remain very speculative. The colour-pattern of *B. lamarcki* should be investigated with ultraviolet light.

Nomenclature. — The holotype of this species is kept in the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan (reg. no. 53584).

Babylonia leonis Altena & Gittenberger
(pl. 9 figs. 1-3)

? *Eburna borneensis* — Chapman, 1918: 10. Not *E. borneensis* Sowerby (III), 1864.
Babylonia leonis Altena & Gittenberger, 1972: 469, pl. 2 figs. 5-6, pl. 3 figs. 7-8 (Pliocene Cape Possession Beds, between Yule Island and the Purari river, Papua).

Diagnosis. — *B. leonis* is characterized by a distinctly knobbed band around the umbilicus, a deep but narrow sutural canal with a raised margin, and a total height of the shell far below 50 mm.

Description. — Shell buccinoid, with up to somewhat more than eight whorls; aperture forming more than half the total height. Sutural canal deep and very narrow, with a nearly horizontal base and a raised margin.

Outer lip of the aperture clearly thickened above; when the shell is examined from above, a notch for the anus is visible. Inner lip with a very deep umbilical notch; consisting of a heavy callus, expanded far on the last whorl and for about the same length of a less thickened callus bordering the right side of the umbilicus. Near the uppermost end of the inner lip there is a rib, which belongs to the anal groove and looks like a blunt tooth in front view.

Umbilicus wide open, surrounded at the upper and left side by a fasciole which is divided in two parts by an indentation in the middle. Inside the fasciole and about as broad as it, a very conspicuously knobbed band is developed.

In one specimen the colour-pattern could be made visible with ultra-violet light. It is much like that of *B. perforata*, i.e., each of the four bands consists of a single row of spots, whereas vertical connections between the spots of different bands are present.

The shells are up to 40 mm high and 28 mm broad. Measurements of two well preserved specimens are given below:

Pliocene, Cape Possession, between Yule Island and the Purari river, Papua;
BC 12119 (holotype): h. 40 mm; b. 28 mm; 8 whorls
Pliocene, Wahu Creek between Animbe and Bombonemi, Sepik district, New Guinea;
BC 12128 (paratype): h. 33 mm; b. 22 mm; 7½ whorls

Range. — *B. leonis* is found outside the distributional area of the Recent *Babylonia* species in the Pliocene of Papua and New Guinea.

Nomenclature. — All type-material of the species is in BC.

Fossil records (after Altena & Gittenberger, 1972). — Pliocene: Cape Possession, between Yule Island and the Purari river, Papua; Yeri Yeri Creek, Maimai Dome, southern flank of the Toricelli Mts., New Guinea (3°44'S 142°23'E). Pliocene Coast Series: Ninab Creek above Iwanibuan Creek, and Wahu Creek between Animbe and Bombonemi, both in the Sepik district, New Guinea.

Babylonia luzonensis spec. nov.
(pl. 9 figs. 4-6)

Diagnosis. — *B. luzonensis* is characterized by the absence of a sutural canal in combination with a total height of the shell of less than 50 mm, a densely knobbed band around the umbilicus, and an uppermost part of the body-whorl being attached to the penultimate whorl at an angle of ca. 90°.

Description. — Shell conical buccinoid, with up to 7¾ whorls; aperture forming slightly more than half the total height. The initial three whorls are worn in all specimens. The following about two whorls show a narrow, nearly horizontal shoulder, clearly delimitated by an edge; at the younger whorls this edge gradually gets more rounded. The last whorl is attached to the penultimate one at an angle of ca. 90°; its uppermost part is certainly not bent upward.

Outer lip of the aperture not clearly thickened above; its upper part without an anal notch. Inner lip consisting of a rather thin callus on the last whorl and for a clearly longer part of the not conspicuously thickened callus bordering the right side of the umbilicus. Near the uppermost end of the inner lip a rib is seen, forming a part of the groove for the anus and looking like a tooth in front view.

Umbilicus wide open; at the upper and left side surrounded by a raised fasciole, separated from the body-whorl by a ridge, which runs to the lowest part of the outer lip. Inside the fasciole and separated from it by a ridge, a narrowly knobbed band occurs, which is about as broad as the fasciole or slightly narrower; at the lowest part of the shell the knobs get obsolete.

The colour-pattern could not be made visible with ultraviolet light.

The shells are up to over 45 mm high and 28 mm broad. Measurements of all specimens known are given below:

Left bank of the Ilarön, ½ hour above Gorön, Luzon, Philippine Islands;
RGML (holotype): h. 42 mm; b. 27 mm; 7¾ whorls
Same locality; RGML (paratype 1): h. ca. 41 mm; b. 25 mm; whorls ?
Same locality; RGML (paratype 2): h. 30.5 mm; b. 20 mm; whorls ?
Miri, Sarawak, Borneo; RGML (paratype 3): h. 45.5 mm; b. 28 mm; whorls ?

Range. — Unfortunately the stratigraphy of this fossil species from Luzon, Philippine Islands, and Sarawak, Borneo, is unknown (? Late Miocene).

Nomenclature. — All type-material is listed above.

Remarks. — *B. luzonensis* is most similar to the badly known Recent species *B. feicheni*. Judging from its original description and figure, the latter differs by the attachment of the body-whorl to the preceding one, which is as in *B. zeylanica*, i.e., the uppermost part of the last whorl is curved upward in *B. feicheni*. In addition, the parietal part of the inner lip of the aperture is shorter in *B. feicheni*, which also has more widely spaced and more conspicuous knobs around the umbilicus.

Fossil records. — See above.

Babylonia occlusa (Cossmann, 1903)
(pl. 11 fig. 1)

Latrunculus valentianus — Cossmann, 1901: 190, pl. 8 fig. 21. Not *Eburna valentiana* Swainson, 1822.
Latrunculus (*Peridipsaccus*) *occlusus* Cossmann, 1903: 137, pl. 5 fig. 25 (Pliocene of Karikal, India).
Babylonia (s.s.) *occlusa* — Glibert, 1963: 69.

Remarks. — We judge this species after the original description and figure of Cossmann (1903) and a syntype in IB.

B. occlusa closely resembles *B. spirata valentiana*, differing only in the narrower sutural canal, the slightly more elevated spire and a knobbed band inside the fasciole surrounding the closed umbilicus. *B. occlusa* is comparatively small, h. 30 mm and b. 21 mm (Cossmann, 1903: 138). A larger material should be studied.

Range. — Only known from Pliocene deposits at Karikal, India.

Babylonia pangkaensis (Martin, 1895)
(pl. 7 figs. 5, 8; pl. 11 fig. 2)

Dipsaccus pangkaënsis Martin, 1895: 102, pl. 16 figs. 228-228a, lectotype: Pliocene, Menengteng ravine, Java. Martin, 1911: 20. Van der Vlerk, 1931: 231; 1932: 111.
Babylonia pangkaënsis — Oostingh, 1935: 82, pl. 7 figs. 83-84; 1939: 115.
Babylonia pangkaensis — Altena, 1950: 230. Altena & Gittenberger, 1972: 468, pl. 1 figs. 3 (lectotype)-4.

Diagnosis. — *B. pangkaensis* has a very narrow sutural canal with a horizontal base and a raised margin at the penultimate whorl; its whorls are regularly rounded, and there is a broad concave band in the umbilical region. *B. gracilis* has about the same umbilicus, but differs clearly by the more slender shape and the broader and deeper sutural canal.

Description. — Shell buccinoid, with up to somewhat more than seven whorls; aperture forming clearly more than half the total height. Along the older whorls a very narrow sutural canal with a horizontal base and a raised margin is seen, changing into a canal with a sloping base at the body-whorl.

Outer lip of the aperture not clearly thickened; an anal notch is visible when the shell is examined from above. Inner lip consisting of the moderately heavy callus on the last whorl and for about the same part of the not conspicuously thickened callus bordering the right side of the umbilicus. Near the uppermost end of the inner lip a rib may be visible, forming a part of the anal groove.

Umbilicus wide open; at the upper and left side surrounded by a raised fasciole, which usually is strongly indented. The fasciole is separated from

the body-whorl by a strong ridge, running to the lowest point of the outer lip. Inside the fasciole and much broader than it, a concave band with strong growth-lines is present. The fasciole and this band are separated by a sharp angle.

In two specimens the colour-pattern could be made visible with ultra-violet light. In one of these (pl. 7 fig. 8) four bands are discernible: uppermost a row of large spots; a second band has about seven rows of horizontally long-drawn small spots, more or less clearly combined to spiral lines; a third band consists of about three irregular rows of slightly larger spots; the fourth band, which is badly visible, has smaller spots again. In the second specimen, the lectotype (pl. 7 fig. 5), the first band remained invisible, whereas the other three bands were hardly discernible as such, as they are gradually passing into each other.

The shells are up to 40 mm high and 26 mm broad. Measurements of some specimens are given below:

Pliocene, Menengteng ravine; RGML: h. 40 mm; b. 25 mm; >7 whorls
Idem (lectotype): h. 39 mm; b. 26 mm; 6¾ whorls
Idem: h. 38 mm; b. 24 mm; 7 whorls
Pliocene, Tjikeusik; RGML: h. 34 mm; b. 22 mm; 6¼ whorls

Range. — Early Miocene to Pleistocene (Putjangan layers) of Java.

Nomenclature. — The specimen figured by Martin (1895: figs. 228-228a), kept in RGML, was selected as the lectotype by Altena & Gittenberger (1972: 468).

Remarks. — The sympatric *B. pangkaensis* and *B. gracilis* have two exclusive derived character states in common (colour-pattern and umbilical region) and may be considered closely related. For millions of years they lived together near Java. Intermediate forms are not known.

Fossil records. — For the records, all on Java, we refer to the literature cited in our synonymy list.

Babylonia toyamaensis Tsuda, 1959

Babylonia toyamaensis Tsuda, 1959: 92, pl. 5 figs. 3a-b, 4 (Miocene Kurosedani Formation, Kashio, Toyama Prefecture, Japan).

Remarks. — We judge this species after the original description and figure of Tsuda (1959). Unfortunately the figure does not give much important details.

B. toyamaensis is the smallest member of the genus known; the following dimensions are given (in mm): h. 14.5, b. 8.8; h. 16.2, b. 11.3; h. 19.8, b. 13.2.

The following description is cited after Tsuda (1959: 92): "Shell small,

ovate, rather thin; spire elevated, acute, subequal to the height of the aperture, outline slightly concave. Apex globular, very small. Whorls about 8, roundly shouldered above; suture very distinct, slightly canaliculated. Bodywhorl round, the maximum of the diameter being in the middle portion. Aperture oval, angled above. Outer lip fractured in all specimens at hand. Inner lip thin, spreading widely with round edge over the upper half of parietal wall; an acute horizontal fold near the upper end stretches inwards. Umbilicus wide, deep and round when seen upwards. Surface smooth except for weak growth lines, and decorated with many dotted pattern."

B. toyamaensis and "*B. kozaiensis kokozurana*" (= *B. lutosa*) are sympatric.

Range. — Miocene of the Kurosedani Formation, Toyama Prefecture, Japan.

Fossil European species

All the European species of *Babylonia* are fossil. After Wenz (1941: 1186) they occur from the Oligocene to the Miocene. Glibert (1963: 69) mentions *B. caronis* from the Eocene of Ronca, Italy, however.

Very much work is still to be done on European fossil *Babylonia*. We do not know the colour-pattern of even a single species. Many nominal taxa have been vaguely described and figured, especially with respect to the important area of the sutural canal or shoulder and the umbilical region. We only give a selected bibliography, with short descriptions after literature data. Our grouping into species should be considered nothing more than a working hypothesis.

Babylonia apenninica (Bellardi, 1882)
(pl. 11 fig. 3)

Eburna apenninica Bellardi, 1882: 10, pl. 1 fig. 9a-b ("Miocene inferiore: Sassello-regione Capeto").

Latrunculus (*Latrunculus*) *appenninicus* [sic] — Rovereto, 1900: 168 (Oligocene, "Tongriano inferiore", of Sassello and Mioglia, N of Savona, Liguria, Italy).

Latrunculus apenninicus — Sacco, 1904: 61 (Oligocene, "Tongriano", of Mioglia, N of Savona, Liguria, Italy).

Description. — Shell buccinoid, with a narrow and deep sutural canal; aperture forming somewhat more than half the total height. Parietal and columellar part of the inner lip of the aperture about equally long. Umbilicus wide open.

Shells up to 23 mm high and 16 mm broad.

Range. — Oligocene (? and Miocene) of Sassello and Mioglia, N of Savona, Liguria, Italy.

Babylonia archambaulti (Meunier, 1880)
(pl. 11 fig. 10)

Buccinum archambaulti Meunier, 1880: 254, pl. 14 figs. 33, 34 (Oligocene, Stampian, of Pierrefitte, St. Hilaire, dép. Essonne, France). Cossmann & Lambert, 1884: 177, pl. 6 fig. 17a-b (Oligocene, Stampian, of Pierrefitte, dép. Essonne, France).

Notes and description. — The literature data concerning *Buccinum archambaulti* are rather confusing. Original material should be studied to investigate whether this nominal taxon belongs to *Babylonia.*

Meunier (1880) gave a short description and a poor figure of his species, after which it may be characterized as being globular buccinoid with a small conical spire and a conspicuous homogeneous inner lip of the aperture, closing the umbilicus completely; an umbilical fasciole may be recognized in the figure. The shell is said to be up to 19 mm high and 14 mm broad. Cossmann & Lambert (1884) gave a redescription and an additional figure; they emphasized the presence of a shoulder at the upper part of the whorls, delimitated by an angle, and gave larger dimensions for the shells, i.e., h. 32 mm, b. 22 mm.

Glibert & De Heinzelin Braucourt (1954: 368, 382, pl. 7 fig. 6) mentioned and figured "*Babylonia* (*Peridipsaccus*) *archambaulti*" from Early Oligocene deposits at Grimmertingen, Belgium. Nuttall & Cooper (1973: 205, 206, pl. 5 fig. 8a-b) figured the same species from Grimmertingen, calling it *Whitecliffia suturosa* (Nyst, 1836), not accepting the identification of Glibert & De Heinzelin Braucourt (1954). As *B. archambaulti* sensu Glibert & De Heinzelin Braucourt, 1954, has a conspicuous deep sutural canal, not mentioned nor figured by earlier authors, we also believe that Meunier (1880) did not describe this species. Having seen a specimen of the problematical species from Grimmertingen in RGML, we may say that this is not a *Babylonia* because of the conspicuous spiral sculpture in the umbilical region.

Range. — Only known from Oligocene, Stampian, deposits in the French dép. Essonne.

Babylonia brugadina (Grateloup, 1847) s.l.
(pl. 11 figs. 4-6, 9, 12)

Eburna spirata — Grateloup, 1834: 279 (Miocene of SW France: "Dax", "faluns jaunes libres de S. Paul", "aux environs de Bordeaux et à Rennes"); 1847: pl. 46 fig. 6 (no new localities). Not *Buccinum spiratum* Linnaeus, 1758.

Buccinum eburnoides Mathéron, 1843: 252, pl. 40 figs. 14-16. Not *Buccinum eburnoides* Grateloup, 1834.

Eburna brugadina Grateloup, 1847: pl. 46 fig. 11 (Early Miocene of Dax and Saubrigues, dép. Landes, France) .

Buccinum caronis — Hoernes, 1852: 139, pl. 12 figs. 1-3 (Miocene of the Vienna Basin). Pereira da Costa, 1866: 87, pl. 13 figs. 14-18 (Miocene, Tortonian, of Cacella (= Cacela Velha), Algarve, Portugal). Not *N.* [*assa*] *caronis* Brongniart, 1823.

Buccinum (*Eburna*) *brugadina* — Hoernes & Auinger, 1882: 116, pl. 15 figs. 24-26 ("Wienerbecken").

Eburna eburnoides — Bellardi, 1882: 11 (Middle Miocene: "Colli torinesi, Rio della Batteria, Villa Forzano, Baldissero-torinese, Termo-fourà, Valle Ceppi"). Not *Buccinum eburnoides* Grateloup, 1834.

Eburna derivata Bellardi, 1882: 11 (Late Miocene: "Colli tortonesi, St. Agatafossili, Stazzano").

Peridipsaccus eburnoides — Sacco, 1904: 61, pl. 15 figs. 4, 5 ("Colli torinesi"). Not *Buccinum eburnoides* Grateloup, 1834.

P. [*eridipsaccus eburnoides*] var. *angustata* Sacco, 1904: 61, pl. 15 fig. 6 ("Colli torinesi").

Peridipsaccus derivatus — Sacco, 1904: 61, pl. 15 figs. 7-9 ("Stazzano").

P. [*eridipsaccus*] *derivatus* var. *clausospirata* Sacco, 1904: 62, pl. 15 fig. 10 ("Stazzano").

P. [*eridipsaccus*] *derivatus* var. *angusticanaliculata* Sacco, 1904: 62, pl. 15 fig. 11 ("Stazzano").

Latrunculus (*Peridipsaccus*) *eburnoides* var. *umbilicosiformis* Roth von Telegd, 1914: 24, pl. 1 figs. 29-32 (Late Oligocene [Egerian] of Eger, Hungary).

Latrunculus (*Peridipsaccus*) *eburnoides* — Peyrot, 1926: 252, pl. 4 figs. 69-71 (Early Miocene, Burdigalian, of many localities in SW France).

Latrunculus (*Peridipsaccus*) *brugadinus* — Peyrot, 1926: 254, pl. 1 figs. 63-64 (Miocene, Tortonian, of Saubrigues, dép. Landes, France).

B. [*abylonia*] (*P.* [*eridipsaccus*]) *matheroni* Magne, 1942: 43. Nomen novum for *Buccinum eburnoides* Mathéron, 1842, not Grateloup, 1834.

Babylonia (*Peridipsaccus*) *brugadina* — Glibert, 1963: 69 (Miocene, Helvetian, of the "Collines de Turin"; Miocene, Tortonian, of Portugal, Italy and the Vienna Basin).

Babylonia eburnoides umbilicosiformis — Báldi & Steiniger, 1975: pl. 4 fig. 3 (Late Oligocene, Egerian, of Eger, Hungary), pl. 9 figs. 1, 2 (Late Oligocene, Egerian, of Máriahalom near Budapest, Hungary).

Notes and description. — Most probably we lumped together in the above list of synonymy more than a single species or subspecies. Future research has to clarify this. The structure of the inner lip of the aperture, which may be rather thin (pl. 11 fig. 4) or swollen (pl. 11 fig. 9) and that of the umbilical fasciole might be important systematically; the Portuguese material (Pereira da Costa, 1866: pl. 13 figs. 14-18) deserves special attention because of the very narrow sutural canal (the specimens figured are 35-47 mm high, i.e., much larger than *B. caronis*). The Portuguese shells have a thin inner lip. The variation in *B. brugadina* s.l. is comparable to some extent to what is seen in the Recent *B. spirata.*

For practical reasons we describe *B. brugadina* s.l. as follows: Shell very variable, buccinoid to egg-shaped, with more or less flattened sides above the periphery; aperture forming clearly more than half the total height. Sutural canal with a horizontal base and a raised margin, usually wider than in *B. caronis.* The inner lip is about equally broad over its entire length; it is

broadly expanded over the body-whorl, closing the umbilicus completely. Shells up to 60 mm high and 37 mm broad.

Range. — See the localities and the stratigraphy given in the synonymy list.

Babylonia caronis (Brongniart, 1823)
(pl. 11 figs. 7, 8)

N. [*assa*] *caronis* Brongniart, 1823: 64, pl. 3 fig. 10 (Eocene of Ronca, Torino, Italy).
[Not *Buccinum caronis* — Hoernes, 1852; Pereira da Costa, 1866].
Eburna caronis — Bellardi, 1882: 10, pl. 1 fig. 10a-b (Early Miocene: "Sassello-regione Capeto, Carcare, Cassinelle").
Peridipsaccus caronis — Sacco, 1904: 61 (Oligocene, Tongrian, of "Dego, Mioglia, Pareto, Squaneto"; ? Early Miocene, Aquitanian, of "Val S. Genesio sui Colli torinesi").
Babylonia (*Peridipsaccus*) *caronis* — Glibert, 1963: 69 (Eocene, ? of Ronca, Torino, Italy; Oligocene of Casinelle and San Gionini, Italy).
Babylonia corona [sic] — Mandruzzato, 1970: 275 (Oligocene of Laverda, Vicenza, Italy).

Description. — Shell buccinoid, with a narrow sutural canal; aperture forming clearly more than half the total height. As in the much larger *B. brugadina* s.l., the inner lip is about equally broad over its entire length and expanded as a whole over the body-whorl, closing the umbilicus completely. Shells up to 19 mm high and 13 mm broad.

Range. — *B. caronis* has been reported from Eocene, Oligocene and Early Miocene deposits in Italy.

Babylonia meridionalis (Seguenza, 1880)
(pl. 11 fig. 11)

Eburna meridionalis Seguenza, 1880: 106, pl. 11 figs. 22, 22a (Miocene, Tortonian, of Benestare, Reggio, Italy).
Eburna meridionalis var. *oblonga* Seguenza, 1880: 107 (found with the typical form).

Notes and description. — We only know the original description and figure of this taxon. According to the author *B. meridionalis* comes close to our *B. brugadina* s.l., differing most conspicuously, however, by the lack of a sutural canal, more inflated whorls, especially near the suture, and an inner lip which is less far expanded over the body-whorl. The following dimensions are given: h. 42 mm, b. 27 mm. The form *oblonga*, based upon a single specimen, is said to be "più allungata".

Range. — Only known from the Miocene, Tortonian, of Benestare, Reggio, Italy.

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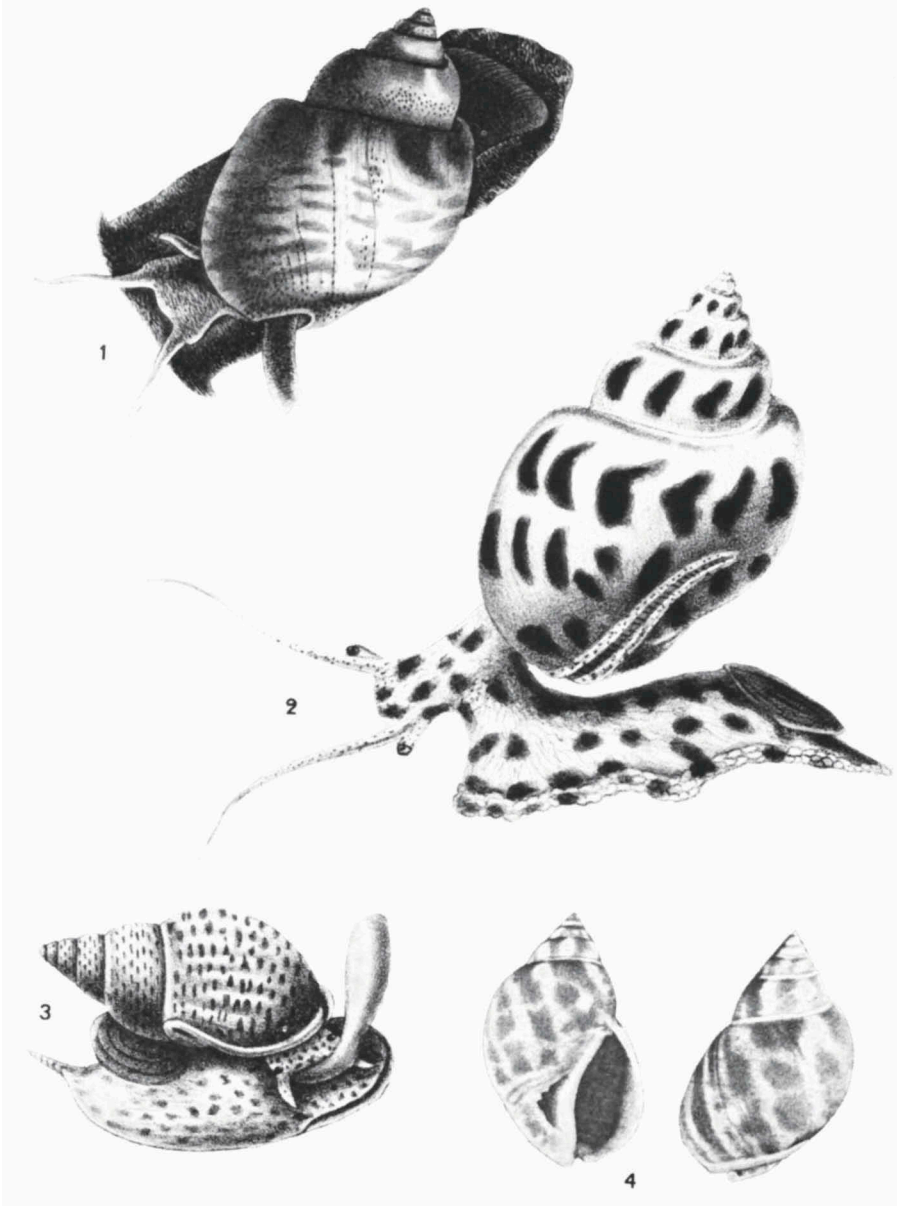
INDEX

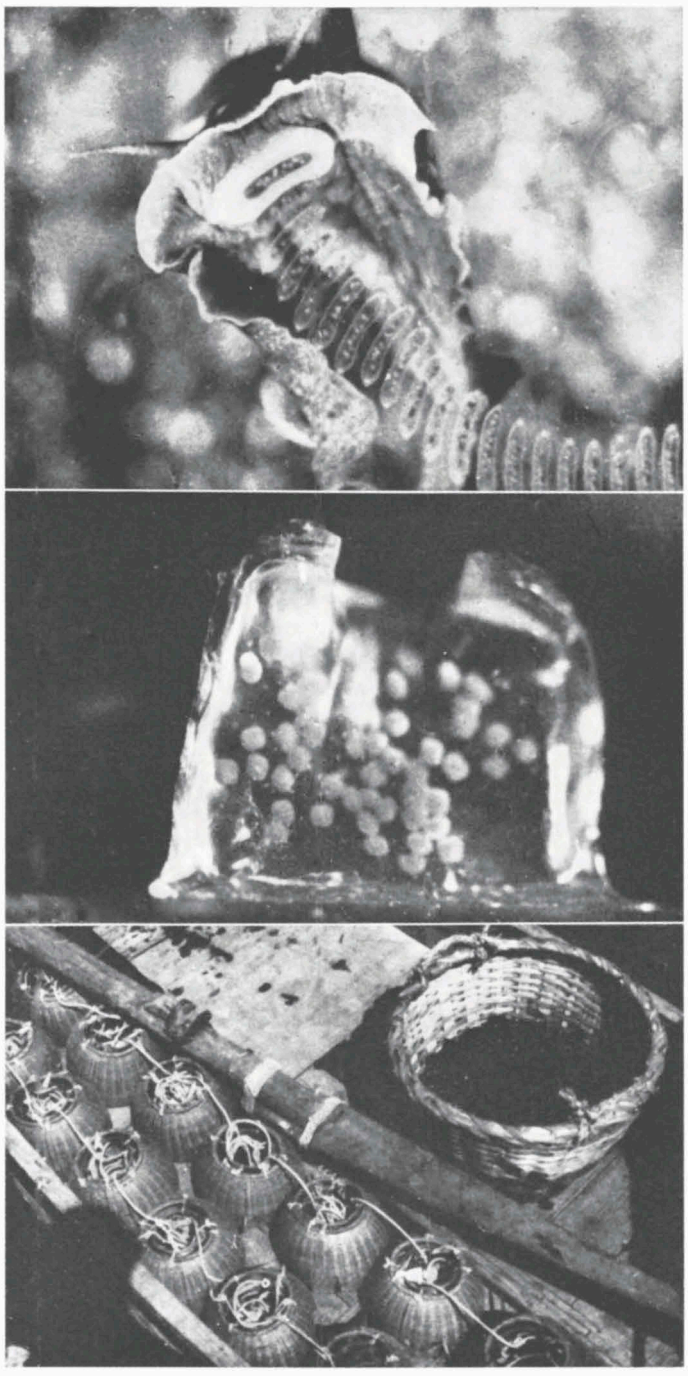
Synonyms in italics; page numbers in italics refer to citations in the synonymy.

PLATES

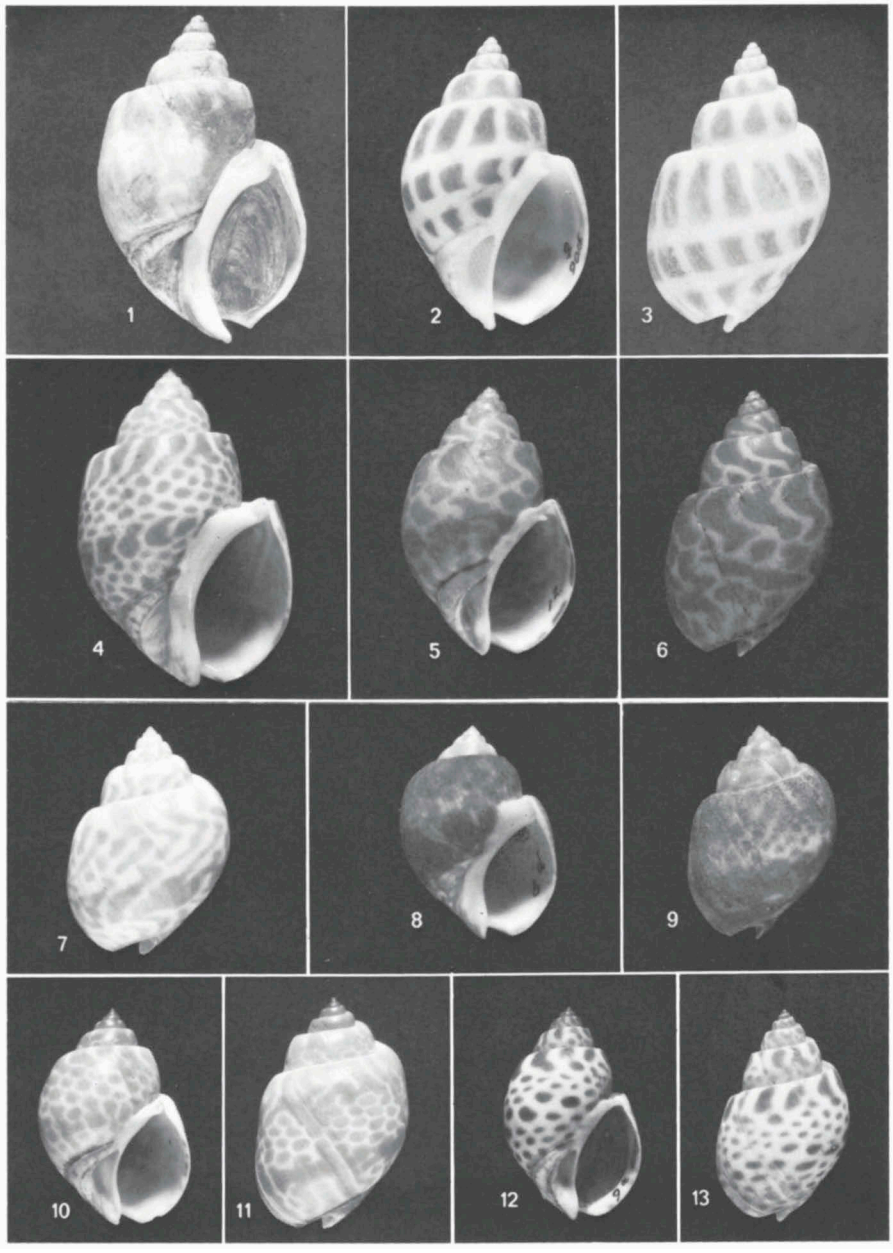
Figs. 1-6. Opercula of *Babylonia* spec. (× 2). 1, *B. areolata* (Link), Taiwan (RMNH 9015, T. C. Lan); 2, *B. formosae habei* subspec. nov., paratype, Taiwan (RMNH 9009, T. C. Lan); 3, *B. japonica* (Reeve), Japan (RMNH 9016, T. Habe); 4-6, *B. spirata spirata* (L.), E of the canal to Pasar Ikan, near Jakarta, Indonesia (RMNH 12, R. IJzerman). Figs. 5 and 6 show opercula with a centric nucleus (see text). Photographs by C. Hoorn.



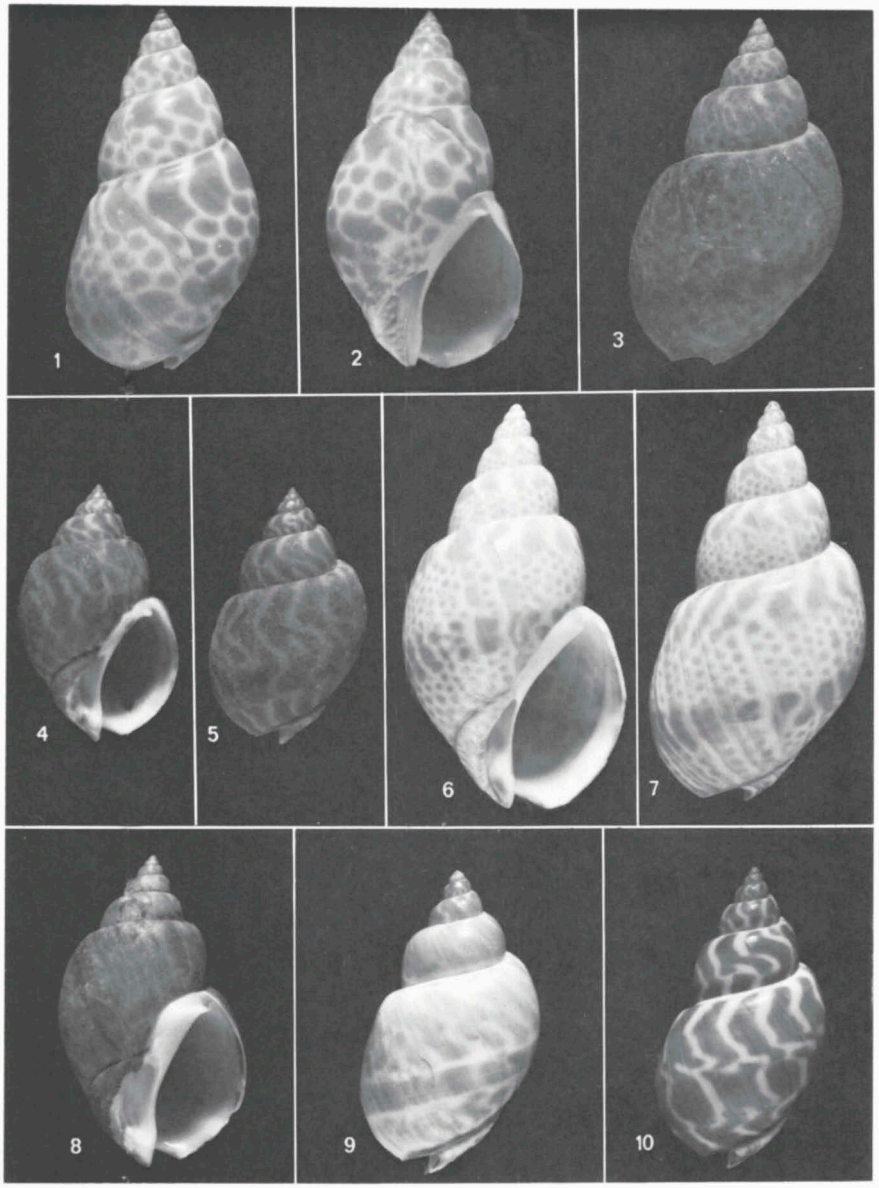
Figs. 1-3. Living *Babylonia* and *Zemiropsis*. 1, *B. spirata spirata* (L.), after Eydoux & Souleyet (1852: pl. 41 fig. 28); 2, *B. areolata* (Link), after Adams & Reeve (1848: pl. 8 fig. 5); 3, *Z. papillaris* (Sowerby), after Sowerby (III) (1902: pl. 2 fig. 3). Fig. 4. *Babylonia feicheni* Shikama, holotype, × 1 (after Shikama, 1973: pl. 2 figs. 13, 14).



Figs. 1-3. On *Babylonia japonica* (Reeve), after Yoshihara (1957: pl. 7 figs. C, D and B respectively). 1, Laying eggs in a glass container; 2, detail of an egg capsule; 3, baskets to catch the snails (a fish suspended in the basket is used for bait).



Figs. 1-13. *Babylonia* spec. (× 0.7). 1, *B. lutosa* (Lamarck), with periostracum, Taiwan (RMNH 3e, T. Habe); 2, 3, *B. areolata* (Link), with periostracum, Taiwan (RMNH 9015, T. C. Lan); 4-6, *B. spirata spirata* (L.); 4, without periostracum, Ceylon (RMNH 1d, J. Mulder); 5, 6, with periostracum, E of the canal to Pasar Ikan, near Jakarta, Java (RMNH 1z, R. IJzerman); 7-9, *B. spirata valentiana* (Swainson), with (figs. 8, 9) or without (fig. 7) periostracum, Kohrmaksar beach, Aden (RMNH 6d, Strengers & Nobel); 10, 11, *B. ambulacrum* (Sowerby (I)); 10, Andaman Islands (RMNH 8a, Sowerby & Fulton); 11, Mindanao, Philippines (RMNH 8c, T. Habe); 12, 13, *B. borneensis* (Sowerby (III)), Borneo (RMNH 9a, Sowerby & Fulton). Photographs by E. L. M. van Esch.



Figs. 1-10. *Babylonia* spec. (× 0.7). 1, 2, *B. zeylanica* (Bruguière), Ceylon (RMNH 4b, J. Mulder); 3, 6, 7, *B. japonica* (Reeve); 3, with periostracum, Japan (RMNH 9016, T. Habe); 6, 7, without periostracum, Tosa, Japan (DMNH 8230); 4, 5, 10, *B. formosae formosae* (Sowerby (II)); 4, 5, with periostracum, Taiwan (RMNH 7b, C. C. Lin); 10, without periostracum, Taiwan (RMNH 7d, T. Habe); 8, 9, *B. formosae habei* subspec. nov., paratypes with (fig. 8) and without (fig. 9) periostracum, Taiwan (RMNH 9009, T. C. Lan; RMNH 55004, T. Habe). Photographs by E. L. M. van Esch.

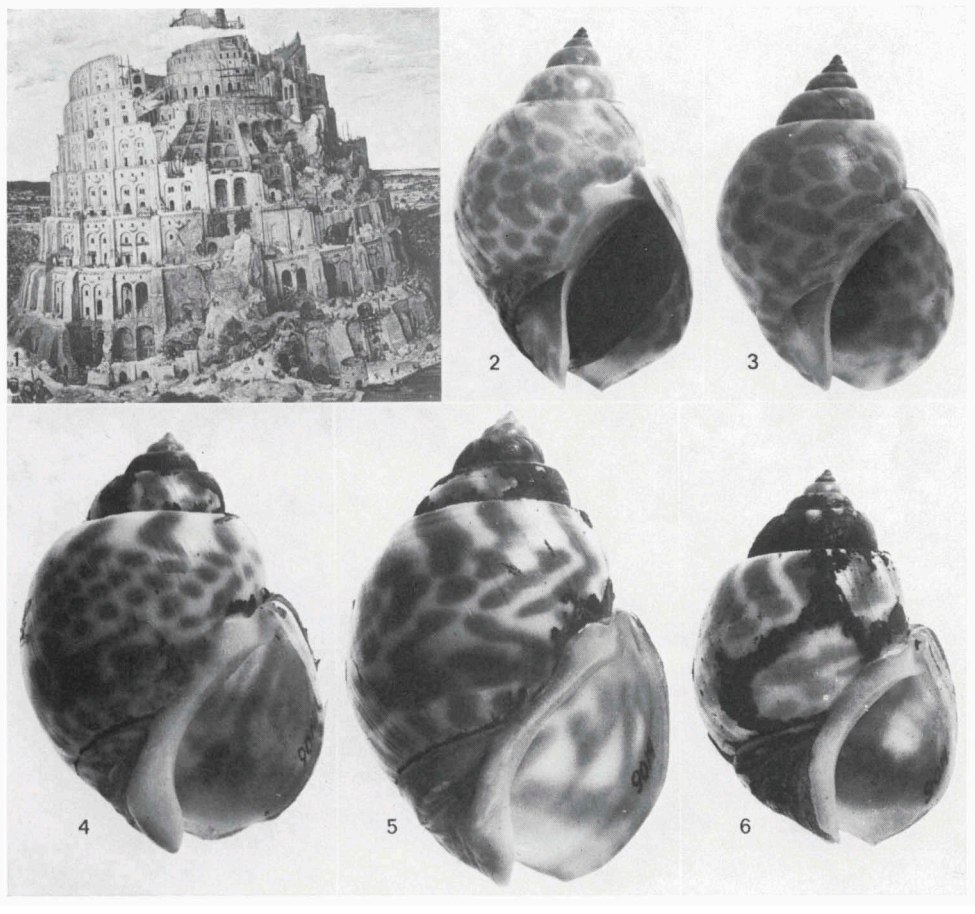
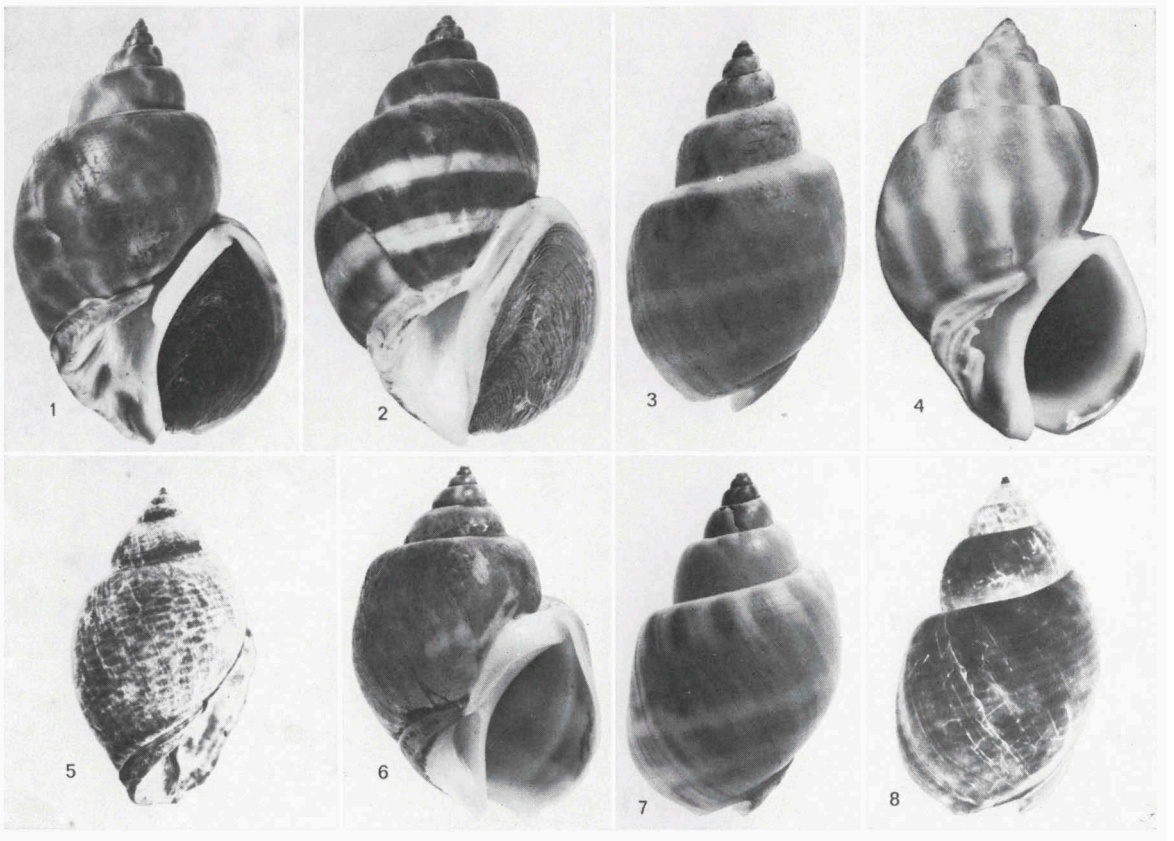
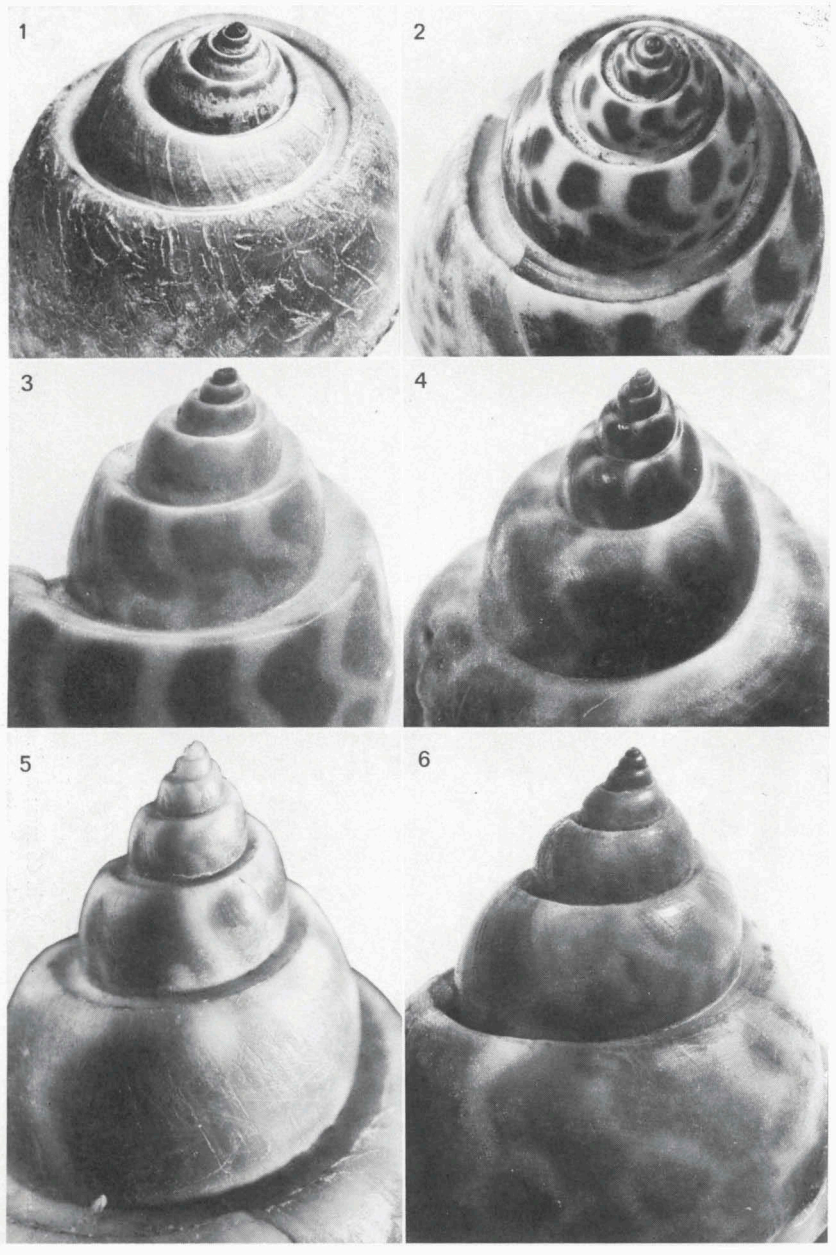


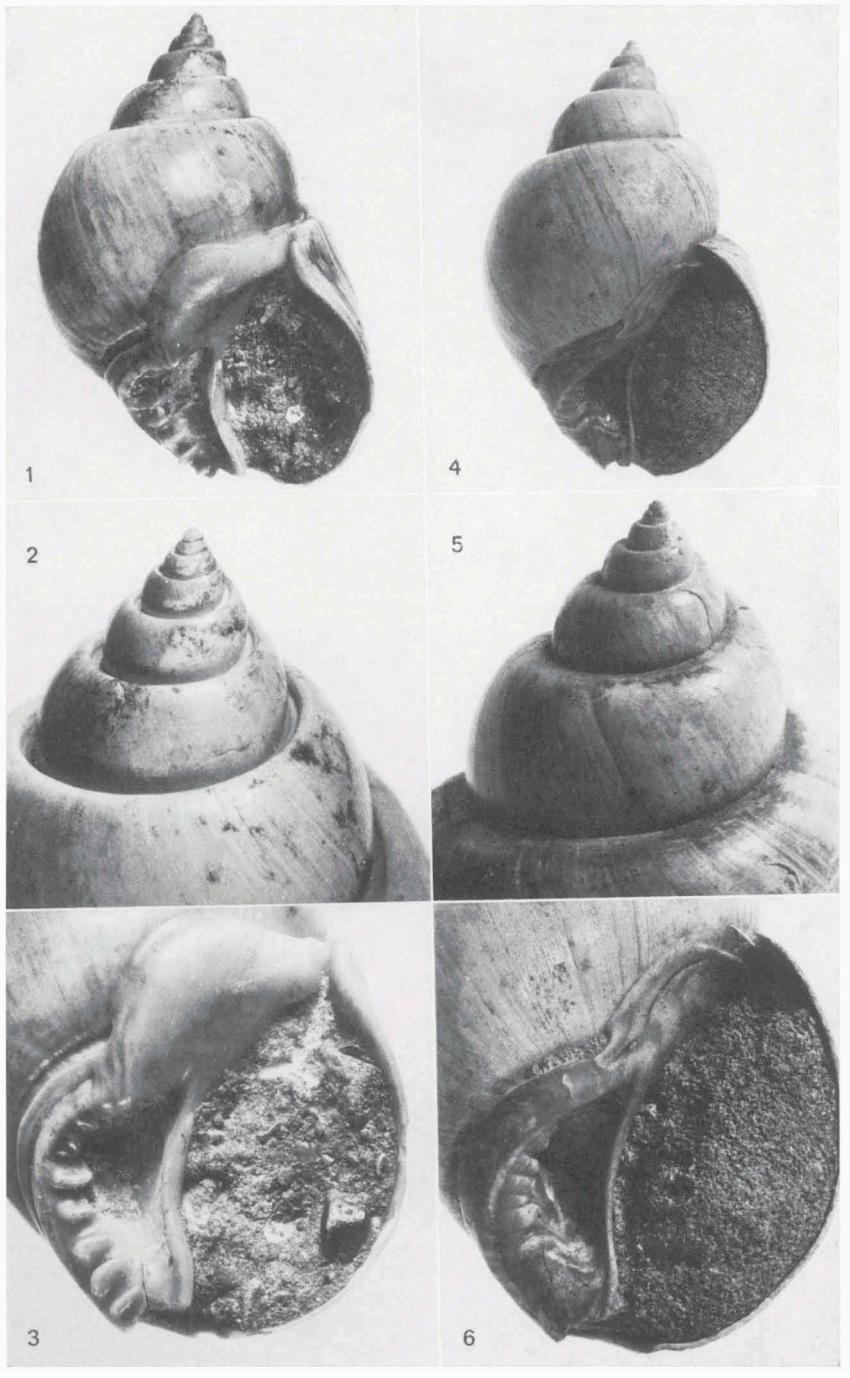
Fig. 1. The Babylonian Tower painted by Pieter Bruegel (1563). Figs. 2-6. *Babylonia* spec. 2, 3, *B. angusta* spec. nov., paratypes, locality unknown (IB), h. 37.3 and 34.6 mm respectively; 4-6, *B. spirata* (L.), Karachi, Pakistan (RMNH 9014, Mozammil Ahmed), specimens of a sample with typical *B. s. valentiana* (Swainson) (fig. 4), shells more resembling the nominate race (fig. 6) and intermediate forms (fig. 5), h. 60.8, 68.3, and 53.9 mm respectively. Photographs of shells by C. Hoorn.



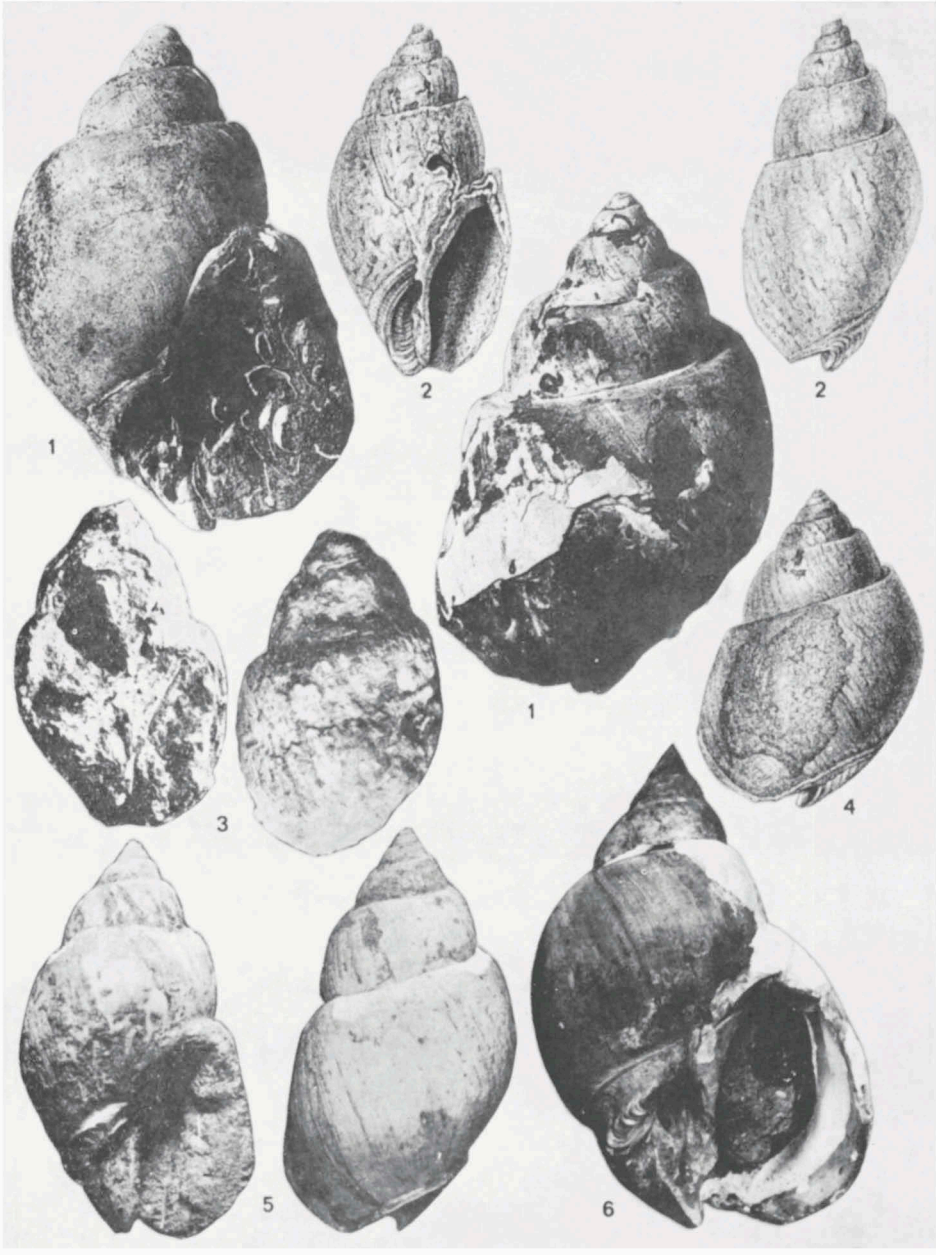
Figs. 1-8. *Babylonia* spec. 1, *B. formosae habei* subspec. nov., holotype, Ilan (= Giran), Taiwan (National Science Museum, Tokyo / Coll. Kuroda), h. 66 mm; 2, *B. areolata* (Link), a very rare variety with spiral bands, Taiwan (Coll. T. C. Lan, Taipei, Taiwan), h. 70.5 mm; 3, *B. lutosa* (Lamarck), juvenile specimen dredged at Causeway Bay, Hong Kong, [to be compared with an equally large *B. kirana* (fig. 7) (DMNH), h. 38.8 mm; 4, *B. perforata* (Sowerby (II)), dredged at 30 fathoms a few miles S of Koahsiung, Taiwan (DMNH), h. 72 mm; 5, 8, *B. pangkaensis* (Martin), lectotype and paralectotype seen in ultraviolet light, Pliocene of the Menengteng ravine, Java (RGML), h. 39.4 mm and 38.2 mm respectively; 6, 7, *B. kirana* Habe, Taiwan (RMNH 14a, T. Habe), h. 40.5 mm and 38.2 mm respectively. Photographs by C. Hoorn.



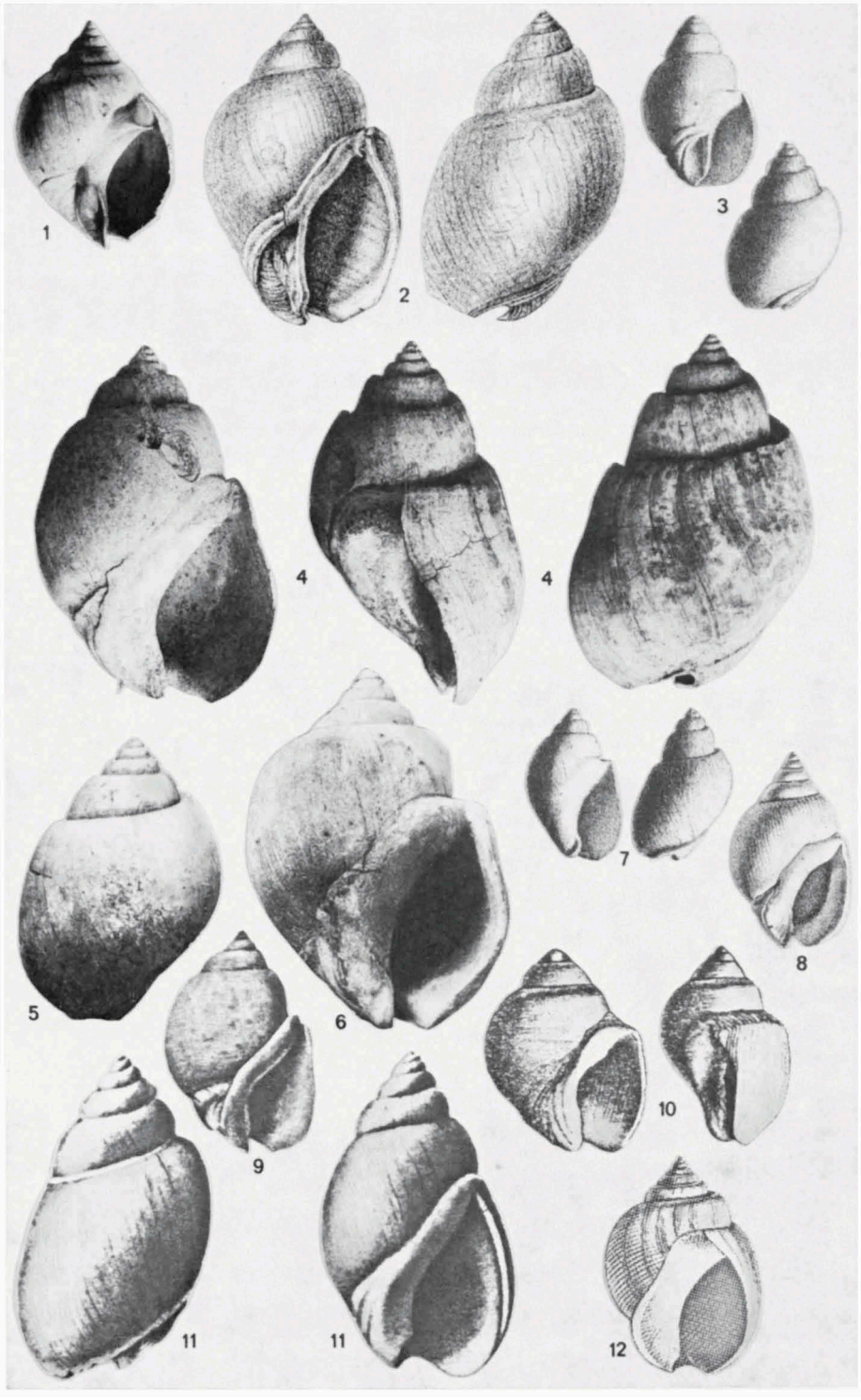
Figs. 1-6. The sutural canal in various *Babylonia* species. 1, *B. ambulacrum* (Sowerby (I)), Zamboanga, Mindanao Island, Philippines (ANSP 215647) (× 2½); 2, *B. borneensis* (Sowerby (III)), Sarikei, Sarawak, Borneo (ANSP 314099) (× 1½); 3, *B. spirata spirata* (L.), Ceylon (RMNH 1d) (× 2); 4, *B. formosae habei* subspec. nov., Ilan (= Giran), Taiwan (National Science Museum, Tokyo / Coll. Kuroda, holotype) (× 2); 5, *B. areolata* (Link), Taiwan (Coll. T. C. Lan, Taipei, Taiwan) (× 2½); 6, *B. angusta* spec. nov., unknown locality (IB, paratype) (× 3½). Photographs by C. Hoorn.



Figs. 1-6. Fossil *Babylonia*. 1-3, *B. leonis* Altena & Gittenberger, holotype, Pliocene of Cape Possession, Papua (BC), h. 39 mm; 4-6, *B. luzonensis* spec. nov., holotype, unknown stratigraphy, Gorön, Luzon, Philippine Islands (RGML), h. 42 mm. Photographs by C. Hoorn.



Figs. 1-6. Fossil *Babylonia*. 1, *B. areolata* (Link), Pliocene of Dainichi, Japan [= lectotype of *B. elata* (Yokoyama), after Yokoyama, 1923: pl. 1 fig. 17]; 2, *B. gracilis* (Martin), lectotype, Pliocene of Tji Waringin, Java [after Martin, 1895: pl. 16 figs. 229-229a]; 3, 5, *B. lutosa* (Lamarck), from Early Miocene of Kozai, Japan [= holotype of *B. kozaiensis* Nomura, after Nomura, 1939: pl. 13 fig. 8a-b] and Late Miocene or Early Pliocene of Kokozura, Japan [= lectotype of *B. kozaiensis kokozurana* Nomura, after Nomura, 1939: pl. 13 fig. 9a-b] respectively; 4, *B. ambulacrum* (Sowerby (I)), Late Miocene of Odeng, Java [after Martin, 1895: pl. 16 fig. 227]; 6, *B. lamarcki* (Nomura), holotype, Pliocene of Wanga, Taiwan [after Nomura, 1935: pl. 8 fig. 28].



For explanations p.t.o.

Figs. 1-12. Fossil *Babylonia*. 1, *B. occlusa* (Cossmann), syntype, Pliocene of Karikal, India [after Cossmann, 1903: pl. 5 fig. 25]; 2, *B. pangkaensis* (Martin), lectotype, Pliocene of the Menengteng ravine, Java [after Martin, 1895: pl. 16 figs. 228-228a]; 3, *B. apenninica* (Bellardi), syntype, Miocene of the Sassello region, N of Savona, Liguria, Italy [after Bellardi, 1882: pl. 1 fig. 9a-b]; 4-6, 9, 12, *B. brugadina* (Grateloup) s.l., from (A) Early Miocene, Burdigalian, of Saucats, S of Bordeaux, dép. Gironde, France [fig. 4: after Peyrot, 1926: pl. 4 figs. 69-71, "*Latrunculus* (*Peridipsaccus*) *eburnoides*"], (B) Late Miocene of Stazzano, Italy [figs. 5, 6: after Sacco, 1904: pl. 15 figs. 7, 8, "*Peridipsaccus derivatus*"], (C) Late Oligocene, Egerian, of Eger, Hungary [fig. 9: after Roth von Telegd, 1914: pl. 1 fig. 30, syntype of "*Latrunculus* (*Peridipsaccus*) *eburnoides* var. *umbilicosiformis*"], and (D) Early Miocene of Dax or Saubrigues, dép. Landes, France [fig. 12: after Grateloup, 1847: pl. 46 fig. 11, syntype of "*Eburna brugadina*"]; 7, 8, *B. caronis* (Brongniart), from the Miocene of the Sassello region, N of Savona, Liguria, Italy [after Bellardi, 1882: pl. 1 fig. 10a-b] and the Eocene of Ronca, Italy [syntype, after Brongniart, 1823: pl. 3 fig. 10]; 10, *B. archambaulti* (Meunier), Oligocene, Stampian, of Pierrefitte [after Cossmann & Lambert, 1884: pl. 6 fig. 17a-b]; 11, *B. meridionalis* (Seguenza), syntype, Miocene, Tortonian, of Benestare, Reggio, Italy [after Seguenza, 1880: pl. 11 figs. 22, 22a].