

The genus *Babylonia* revisited (Mollusca: Gastropoda: Buccinidae)

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In memoriam Koos den Hartog.

Gittenberger, E. & J. Goud. The genus *Babylonia* revisited (Mollusca: Gastropoda: Buccinidae). Zool. Verh. Leiden 345, 31.x.2003: 151-162, figs 1-24.— ISSN 0024-1652/ISBN 90-73239-89-3.
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Key words: Gastropoda; Buccinidae; *Babylonia*; Plio/Pleistocene; recent; taxonomy; new species; distribution.

Taxonomic and biogeographic data on *Babylonia* and *Zemiropsis*, published after the 1981 monograph on *Babylonia* by Altena & Gittenberger, are summarized and new data are added. *Babylonia* and *Zemiropsis* are characterized and considered most closely related genera. *Babylonia lani* spec. nov. and *Babylonia umbilifusca* spec. nov. are introduced as new to science. *Babylonia leonis* Altena & Gittenberger, 1972, described from pliocene-pleistocene deposits, is reported as an extant species. The enigmatic "*Babylonia*" *rosadoi* is considered a *Zemiropsis* species on the basis of both shell morphology and distribution.

Introduction

While revising the buccinid genus *Babylonia* Schlüter, 1838, Altena & Gittenberger (1981) distinguished 11 extant species, two of which polytypic with two subspecies each, and 12 fossil and extinct species. Six recent species are also known as miocene or younger fossils. Five fossil species are known from the Mediterranean region. The oldest *Babylonia* species are from eocene deposits in Italy. The genus apparently originated in the Tethys Sea and became extinct in the Mediterranean region after the Miocene. The three actually most common species, viz. *Babylonia areolata*, *B. japonica* and *B. spirata*, have continuous ranges. The other species have strikingly disjunct ranges or are known from only one or a few localities. Some of the obvious distributional disjunctions are partly removed by adding records of fossil occurrences to the map, indicating that extinctions have occurred in large areas. New records closing distributional gaps in the actual ranges of *Babylonia* species have not been published. Nearly all of the recent species once considered rare by Altena & Gittenberger (1981) still deserve that status. Only *B. feicheni*, dealt with by Altena & Gittenberger (1981) on the basis of the original description only, became much better known (Lan, 1999; Lan & Okutani, 2000). The range of *Babylonia angusta*, described after a single shell from "China" and two shells without data (Altena & Gittenberger, 1981: 16) is still unknown.

Here we present an annotated summary of the main taxonomic and biogeographic notes on *Babylonia* that were published after 1981, adding new data. We refrain from citing all references and illustrations, many of which are about ecological or physiological aspects. Additionally, two species are described as new to science, a third addition to the recent molluscan fauna concerns a species that was hitherto known from pliocene-pleistocene deposits only. One recently described, fossil species is listed with some doubt, on the basis of data in the literature only. This brings the number of

extant *Babylonia* species from 11 to 14 or 15 (if *B. habeii* is considered a separate species: see below), next to 13 fossil and extinct species.

An annotated check-list of the species in *Zemiropsis* Thiele, 1929, is also presented. In that genus, maybe the sister group of *Babylonia*, we have classified the enigmatic *B. rosadoi* Bozzetti, 1998, together with three species that are conchologically similar to each other, in particular in size and shape. For the molluscan collection of the National Museum of Natural History, Leiden, The Netherlands, the abbreviation RMNH is used.

Systematic part

Buccinidae Rafinesque, 1815

Babyloniinae Kuroda, Habe & Oyama, 1971

Kuroda et al. (1971: 250, 164) introduced the buccinid subfamily Babyloniinae. Later on, Goryachev (1987: 35) independently introduced the Babyloniidae as a new family, a taxon accepted with the same status by Harasewych & Kantor (2002). We refer to the latter authors for more details. On the one hand accepting a separate position for the genera involved and on the other hand preferring a more conservative use of the family status, we here classify *Babylonia* and *Zemiropsis* with the Babyloniinae at subfamily level, following Kuroda et al. (1971).

Opposite Altena & Gittenberger (1981), Harasewych & Kantor (2002) synonymized *Babylonia* and *Zemiropsis* because they could not find any diagnostic, anatomical character state. The medial, posterior, pedal tentacle, mentioned as such by Altena & Gittenberger (1981: 8) turned out to be present in all *Babylonia* species that could be investigated, although that structure can be recognized only in life, crawling snails. It cannot be considered a synapomorphy of *Babylonia* and *Zemiropsis* however, since it is also known to occur in for example Nassariidae (Kantor, in e-mail, 26.02.2003). *Babylonia* and *Zemiropsis* can be distinguished on the basis of the shell characters mentioned by Thiele (1929: 332) and Altena & Gittenberger (1981: 8), which are repeated below. The two taxa are clearly vicariant, with a large distributional gap, reaching along the East African coast from Mozambique to near the entrance of the Red Sea.

Babylonia Schlüter, 1838

Babylonia Schlüter, 1838: 18. Type species (Thiele, 1929: 312; Wenz, 1941: 1186): *Babylonia spirata* (L., 1758). *Babylonia* [sic] Okutani, 2000: 481, 1123.

Differentiating characters versus *Zemiropsis*.— Shell apex with numerous narrow whorls, acute. In frontal view, the columella and the lowest part of the palatal lip of the aperture are on a c. horizontal line; shell height 14.5-93 mm. Without a particular shell microsculpture.

Recent species ranging from Japan westward towards the Red Sea. There are no reliable records from along the East African coast (see Altena & Gittenberger, 1981: 9, fig. 15).

The earliest *Babylonia* species known are from the Eocene in Italy. From the Pliocene on, *Babylonia* is restricted to the Indo-Pacific ocean.

Babylonia areolata (Link, 1807)
(figs 1, 5-6)

Eburna chemnitziana Fischer von Waldheim, 1807: 178.

Notes.— Ivanov & Kantor (1991: 85) studied the holotype of *Eburna chemnitziana* from “Ceylon”, kept in the Zoological Museum of Moscow University (ZMUM N L-360). The shell measures 59.0 × 37.7 mm. They conclude that *Babylonia areolata* may be either a junior or a senior synonym of *Eburna chemnitziana*, in conformaty with ICZN Article 21.3.2 accepting 31.xiii.1807 as day of publication for both nominal taxa. To maintain the prevailing usage of the name *Babylonia areolata* we here give priority to *Buccinum areolatum* Link, 1807.

Babylonia feicheni Shikama, 1973
(figs 3, 9-10)

Babylonia feicheni Shikama, 1973: 7, pl. 2 figs 13-14; Altena & Gittenberger, 1981: 20, pl. 2 fig. 4 [= Shikama, 1973: figs 13-14]. Lan, 1999: 55, fig. 1 [figuring 7 shells]. Lan & Okutani, 2000. Thach, 2002: 10, fig. 21, 11.

Notes.— Shikama (1973) based the description of this species on a single specimen, which got lost (Lan & Okutani, 2000: 261). Altena & Gittenberger (1981) dealt with it on the basis of only the original description. Recently, Lan (1999) reported the rediscovery of *B. feicheni* and Lan & Okutani (2000) gave a detailed description with coloured photographs of it on the basis of four specimens, one of which was selected as neotype from “off Nha Trang, South Vietnam”. This is still the only accurate locality known for this species. The National Museum of Natural History, Leiden, acquired two shells of *B. feicheni*, trawled at 40 m depth (Dr Thach, personal communication) and Thach (2002: 11) reports it from 80 m depth.

The species can easily be recognised by the narrow, obliquely concave zone below the suture, the four rows of single, more or less interconnected spots and the widely open, white umbilicus with a knobbed band.

Babylonia formosae (Sowerby [III], 1866)

Notes.— Liu & Chiu (1998) have argued that *Babylonia formosae habei* Altena & Gittenberger, 1981, should be considered a separate species next to *B. formosae*. Allozyme and morphological data are reported to support that view. As long as there are no clear data on reproductive isolation under natural conditions, the status of these taxa cannot be decided upon objectively.

Babylonia lani spec. nov.
(figs 2, 7-8)

Babylonia areolata forma *austraoceanensis* Lan, 1997: 25-27, pls 1, 2; 2000: 4, pls 1, 2 (= 1997: pls 1, 2) — “holotype” in Academia Sinica, Taipei, Taiwan: ASIZ199701. Swennen et al. (2001: 128, 181, fig. 426). Invalid name (ICZN Article 15.2).

Babylonia areola [sic] (Link, 1807); Kosuge et al., 1998: 76, pl. 23 figs 3-6.



Figs 1-4. *Babylonia* spec. 1, *B. areolata* (Link, 1807), Taiwan, T. C. Lan don. (shell height 53.5 mm); 2, *B. lani* spec. nov., holotype (RMNH 85872), Gulf of Thailand, E. off peninsular Malaysia, trawled at 10-20 m, Somwang Patanakanthin don. (shell height 44.7 mm); 3, *B. feicheni* Shikama, 1973, Vietnam, off Nha Trang, trawled at 40 m, vii.2000, Dr Thach don. (shell height 46.8 mm; operculum length 23.4 mm); 4, *B. leonis* Altena & Gittenberger, 1972, Indonesia, SW. off S Sumatra, trawled at 10-20 m, Somwang Patanakanthin don. (shell height 49.9 mm).

Material.— Gulf of Thailand, E. off peninsular Malaysia, trawled at 10-20 m, Somwang Patanakanthin don. (RMNH 96452/holotype & 85872/10 paratypes).

Diagnosis.— Shell with three rows of single large dots; the initial teleoconch whorls with a narrow, shallow sutural canal, which gradually changes into a slanting shoulder on the body whorl.

Description.— Shell buccinoid, with over $7\frac{1}{2}$ whorls (apex eroded in all shells of the type series); aperture half the total shell height or somewhat higher. Body whorl slightly flattened both above and below the periphery. Initial teleoconch whorls with a shallow, concave, sutural canal, which changes in a slanting shoulder on the body whorl. Apical whorls whitish; the following ones with yellowish-brown spots on a white background, covered by a thin, filthy, light yellowish periostracum, which forms a dense row of irregular, short, radially arranged outgrowths on the growth-lines at the margin of the sutural canal and shoulder. The spots are usually far apart from each other.

Outer lip without an anal notch (in apical view). Inner lip with a prominent umbilical notch; its parietal half is a thick, protruding, white callus, whereas the contrasting columellar half is not thickened at all. Umbilicus clearly open but not very wide, at the upper and left side surrounded by a raised fasciole, covered by the yellowish periostracum. The fasciole is as broad as the white umbilicus or somewhat broader. The operculum is missing in all specimens of the type series.

In the type series, the largest shell is 50.2 mm high and 28.5 mm broad. The holotype measures 44.7×28.0 mm.

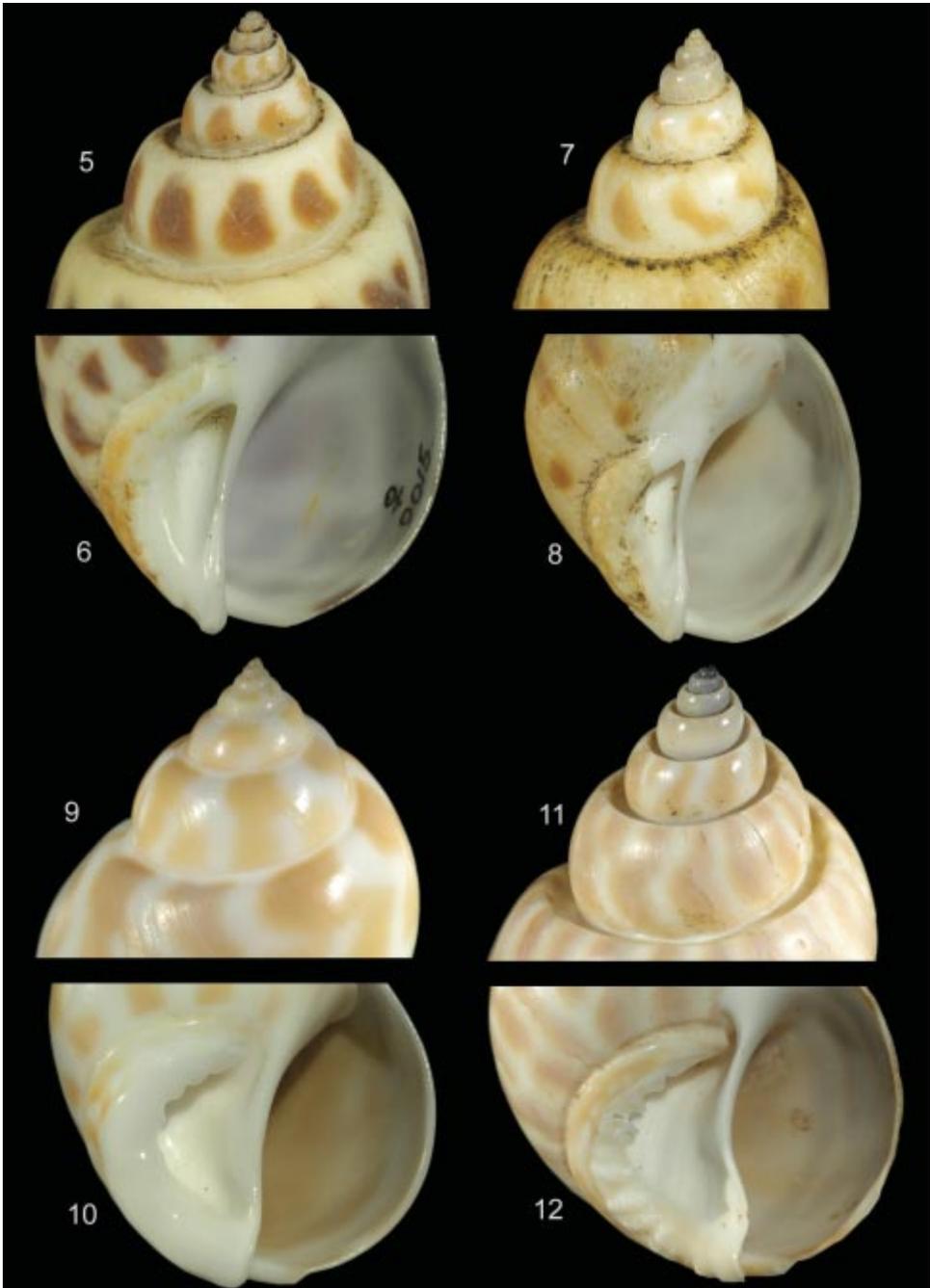
Distribution.— According to Lan (1997: 25) this species is known from “the South China Sea, Gulf of Siam and occasionally from the Phuket Is., the Andaman Sea in a small amount”.

Notes.— Despite the similarity in colour pattern and several other characters, like general shape, umbilical structure and periostracum, shells intermediate between *B. lani* and *B. areolata* have not been reported in the literature and are unknown also to us. More in general we found that the structure of the sutural canal or shoulder is a very stable character in *Babylonia* species. Taking also the distributional data into account, we consider this taxon a separate species.

Swennen et al. (2001: 128) mention that they found in Thailand only the forma *austraoceanensis* described by Lan (1997). In their description however, they seem to refer to *B. areolata*, since “Suture channeled” applies unreservedly to that species only.

Kosuge et al. (1998: 76) report *B. areolata* from the coast of Thailand and mention that the species is very variable there in colour and in colour pattern. They refer to shells which have “no colour bands and entirely white with yellow periostracum”, a “rather slender shell shape and narrow umbilical canal”, which might be given sub-specific rank. This is probably a colour form of *B. lani*.

Derivatio nominis.— With much pleasure we dedicate this species to Mr. T. C. Lan (Taipei), the first author who called attention to this taxon.



Figs 5-12. *Babylonia* spec., apex and umbilicus of the shells figured in figs 1-4. 5-6, *B. areolata* (Link, 1807); 7-8, *B. lani* spec. nov., holotype (RMNH 85872); 9-10, *B. feicheni* Shikama, 1973; 11-12, *B. leonis* Altena & Gittenberger, 1972.

Babylonia leonis Altena & Gittenberger, 1972
(figs 4, 11-12)

Notes.— In the ‘Key to the Recent species’ published by Altena & Gittenberger (1981), *Babylonia leonis* is missing since that species was only known as a fossil initially. The three recent shells that are considered conspecific with the fossil ones here, are probably subadult. The relatively fragile outer lip is broken in all specimens and the inner lip has little callus formation. In the fossil shells, in particular in the obviously fully grown holotype, the inner lip has a heavy callus with a deep umbilical notch. With c. $7\frac{3}{4}$ whorls, the recent shells measure 44.4×27.2 , 45.6×29.6 , and c. 50.0×33.9 mm. The two fossil specimens known have about the same number of whorls but are somewhat smaller, i.e. 40×28 mm (holotype) and 33×22 mm (paratype). Taking the intraspecific variability of the better known *Babylonia* species into account, these differences are not considered species specific. The fossil and the recent shells are very similar in colour pattern and general shape, with a globular body whorl, a very prominent sutural canal with a raised margin and a nearly horizontal base, and a knobbed band along the widely open umbilicus.

Babylonia leonis is most similar to *B. borneensis* (Sowerby [III], 1864). It is the fifth Recent *Babylonia* species with a knobbed band along the umbilicus. It differs from *B. borneensis* by the colour and the colour pattern of the shell, i.e. by the four rows of more or less clearly interconnected, pale brown, single spots, on the body whorl. In *B. leonis* the whorls are more convex than in *B. borneensis* and, consequently, the body whorl is much lower. The white umbilicus is widely open; it is surrounded at the upper and left side by a white, knobbed band and a fasciole which is nearly white or partly coloured with pale brown spots. The apex of the shell is violet.

The fossil records of this species are from the Pliocene of Papua and New Guinea (Altena & Gittenberger, 1981: 43), far away from the seas SW. off S. Sumatra, Indonesia, where these Recent shells were collected by Thai trawlers at 10-20 m depth (Mr. Somwang Patanakanthin, Phuket, Thailand, personal communication).

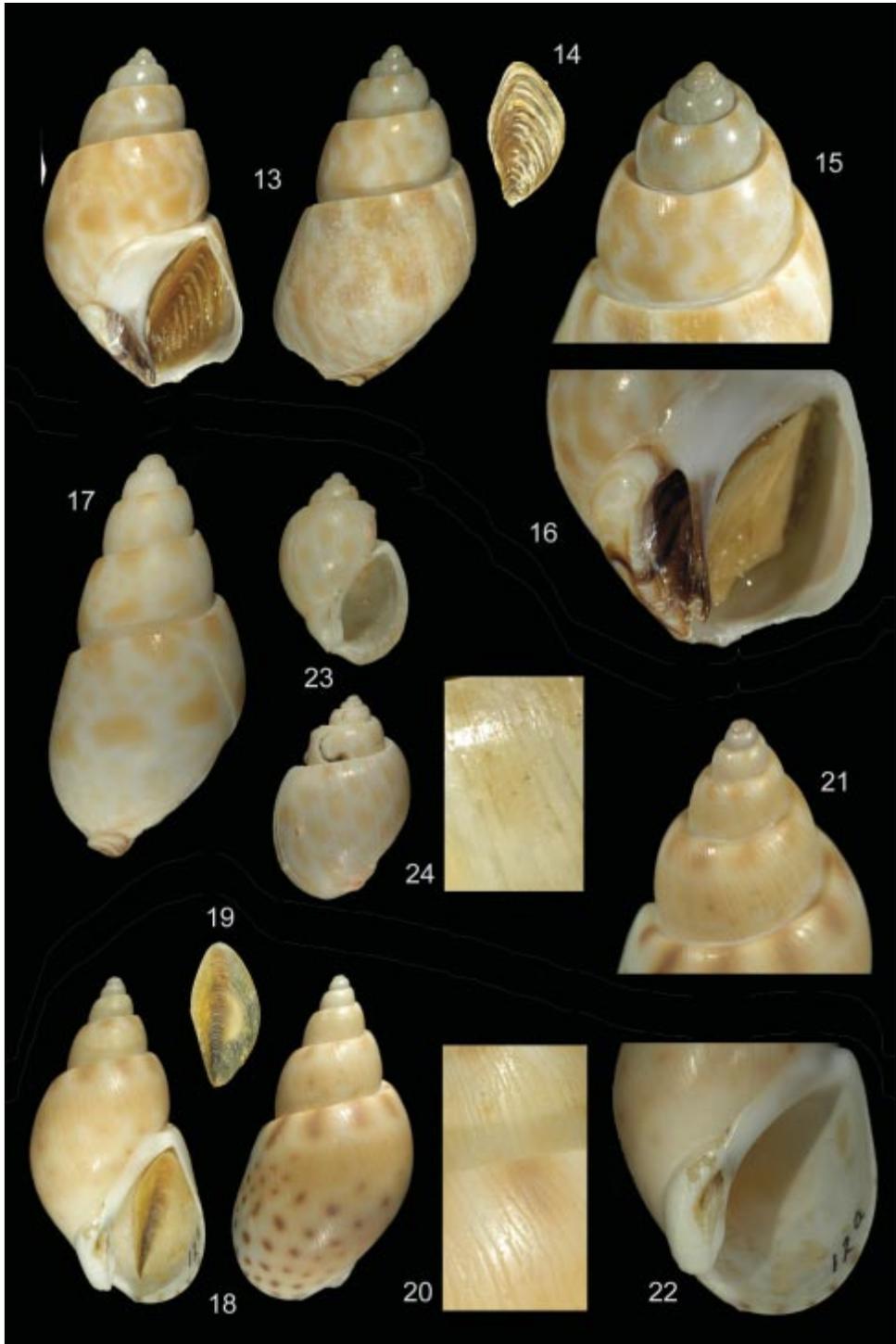
Babylonia perforata (Sowerby [III], 1870)

Notes.— Kosuge et al. (1998: 76) report this rare species, hitherto known from the Taiwan Hai Hsia only (Altena & Gittenberger, 1981: 33), from “the coast of Thailand”, without further details.

Babylonia precedentalis Hu & Tao, 1998

Babylonia precedentalis Hu & Tao, 1998: 215, pl. 1 figs 8, 12, 14 “Tangenshan sandstone (upper Miocene), Chia-Hsian county, Kaohsiung Hsien, Taiwan”.

Notes.— *Babylonia precedentalis* from the Miocene of Taiwan, is based on two nearly complete shells, the largest one measuring 3.7×2.2 cm; it is said to differ from other *Babylonia* species “by its separate inner lip plate, and slightly slender and higher shell body” (Hu & Tao, 1998: 215). After the original description and figures only, we cannot decide upon the status of this nominal taxon.



Babylonia spirata (L., 1758)

Buccinum spiratum var. *alborubra* Spalowsky, 1795: 39, pl. 6 fig. 4. To be added to synonymy (Kabat, 1996: 249).

Notes.— Bosch et al. (1995) have synonymized *Babylonia spirata* and *B. valentiana*, without giving arguments substantiating their view. We do not see good reasons to deviate from Altena & Gittenberger (1981) and consider *B. spirata spirata* and *B. spirata valentiana* subspecies with an area of overlap and hybridization along the Arabian coast. Bosch et al. (1995: 126, fig. 512) illustrate four specimens of *B. spirata*, three of which representing the nominate subspecies and one (below, left) *B. spirata valentiana*.

Babylonia umbilifusca spec. nov.
(figs 13-17)

Babylonia pintado; Bosch, Dance, Moolenbeek & Oliver, 1995: 126, fig. 511. Not *B. pintado* Kilburn, 1971.

Material (paratypes, unless stated otherwise).— **Oman**: Masirah Island, a shell known from photographs (Bosch et al., 1995: 126, fig. 511 [in dorsal and in frontal view]) & two heavily damaged (apertural part) shells (Zoological Museum, Amsterdam); holotype, c. 100 km SW. of Masirah Island, 19°32.74'N 58°10.40'E, dredged at 45-50 m, Dr. G. Oliver leg., 14.x.1994 (National Museum of Wales).

Diagnosis.— Shell slender conical, with a prominent sutural canal; umbilicus dark brown.

Description.— Shell high-conical, more slender than the other *Babylonia* species. Holotype with nearly 7 whorls; the number of whorls in the paratypes is unknown as the apices are heavily eroded. Aperture clearly lower than half the total shell height. Body whorl strongly flattened above the periphery and moderately convex towards the shell base; the older whorls increasingly more convex towards the apex. Teleoconch whorls with a prominent sutural canal, with a nearly horizontal base and a raised margin, becoming somewhat shallower close to the apertural border. Apical whorls light grey. In the four paratypes, the body whorl has a subsutural and a peripheral row of single large, orange-brown spots and in between and below the periphery a zone with many much smaller dots; in the holotype the dots in the four zones are partially, irregularly interconnected, obscuring the regular pattern seen in the paratypes. A periostracum is virtually absent.

Outer lip damaged in all shells. The inner lip is also damaged in all specimens, but its structure can be described conditionally. It has a slight umbilical notch; the parietal

◀ Figs 13-24. *Babylonia umbilifusca* spec. nov. [13-17] and *Zemiropsis* spec. [18-24]. 13-17, *B. umbilifusca* spec. nov., holotype, shell [13] with details of its apex [15] and base [16], and operculum [14], Oman, c. 100 km SW. of Masirah Island, 19°32.74' N 58°10.40' E, dredged at 45-50 m, Dr G. Oliver leg., 14.x.1994 (National Museum of Wales) (shell height 44.5 mm; operculum length 20.9 mm) and paratype [17], Oman, Masirah Island, beached, J. Bryan leg., 1998 (Zoological Museum, Amsterdam) (shell height 53.0 mm); 18-22, *Z. pintado* (Kilburn, 1971), shell [18] with details of sculpture [20, × 2], apex [21] and base [22], S. Africa, off Natal (shell height 45.1 mm); 23-24, *Z. rosadoi* (Bozzetti, 1998), shell [23] with detail of sculpture [24, × 6], Mozambique, Inhambane, Quissico (25°20'S 34°55'E), at 125-135 m (shell height 17.1 mm). Photographs by J. Goud, Leiden.

part, measuring slightly less than half the apertural height, is formed by a moderately thick, white callus, whereas the contrasting dark brown columellar half is not thickened. Umbilicus clearly open, brown with still darker streaks along the growth lines, at the upper and left side surrounded by a raised fasciole, with some crescent dark brown lines. Operculum with about ten, lamellar ridges, which are even higher and more widely spaced than those in *B. areolata*.

The largest shell known, without apical whorls, is 55 mm high (Bosch et al., 1995: 126). The holotype, the only specimen with intact apical whorls, but with a broken shell base, measures 44.5 × 25.6 mm.

Distribution.— Off the coast of Oman, near Masirah Island (paratypes) and c. 100 km SW. of that island (holotype).

Notes.— Bosch et al. (1995: 126, fig. 511) described and illustrated a shell from the island of Masirah off the Oman coast as "*Babylonia*" *pintado*. Kilburn (e-mail, 9.05.2003) called our attention to the figure of this "somewhat different" alleged *B. pintado*. In the beached shells, the apices are heavily worn and, consequently, were described as "domed" (Bosch et al., 1995: 126). In the figured beached specimen (fig. 17) the apex shows a hole, i.e. the columellar canal became visible because the uppermost whorls are lacking. This increased the similarity to the *Zemiropsis* species.

Zemiropsis Thiele, 1929

Zemiropsis Thiele, 1929: 332. Type species, by original designation: *Zemiropsis papillaris* (Sowerby [I], 1825).

Shell apex with few broad whorls, domed. In frontal view, the columella is shortened compared to the palatal apertural lip, which reaches further down; shell height 17-48 mm. There may be a microsculpture of irregular, incised, radial lines (most clearly so in *Z. pintado* and *Z. rosadoi*).

Species ranging from False Bay, SE. of Cape Town in the Cape Province, South Africa, to southern Mozambique.

No fossil records.

Zemiropsis papillaris (Sowerby [I], 1825)

Eburna papillaris G.B. Sowerby [I], 1825: xxii (without locality).

Babylonia papillaris; Kilburn, 1971: 486, fig. 2; Hayes, 1994: 36, fig. 2 [photograph of a life animal, showing the colourfull soft parts of the snail]; Steyn & Lussi, 1998: 110, 111, fig. 440.

Distribution.— South Africa, Cape Province, "from False Bay east to about the Umtata river in Transkei. It lives in 25-100 m" (Kilburn, e-mail, 9.05.2003).

Zemiropsis pintado (Kilburn, 1971) (figs 18-22)

Babylonia pintado Kilburn, 1971: 486-489, figs 3, 7C, E; Steyn & Lussi, 1998: 110, 111, fig. 441.

Distribution.— Allopatric with *Z. papillaris* in SE. Africa, Natal, from "northern/

eastern Transkei to southern Mozambique"; it may live "in sandpockets among rocks in 12-20 m" (Kilburn, e-mail, 9.v.2003).

Zemiropsis pulchrelineata (Kilburn, 1973)

Babylonia pulchrelineata Kilburn, 1973: 566-568, fig. 9c, d "east of Durban in 150 fathoms".

Distribution.— South Africa, Natal, also dredged "off southern Zululand in 160-340 m" (Kilburn, e-mail, 9.05.2003).

Zemiropsis rosadoi (Bozzetti, 1998)
(figs 23-24)

Babylonia rosadoi Bozzetti, 1998: 27, 2 figs (frontal and dorsal view, respectively).

Distribution.— Mozambique, Inhambane, Quissico (25°20'S 34°55'E); at 125-135 m (after Bozzetti, 1998).

Notes.— *Zemiropsis rosadoi* differs from the other three *Zemiropsis* species by its small size (H 17-21 mm) and the general shape, which is more like *Babylonia*. The columellar and the palatal lip of the aperture reach about equally far down in the figured holotype. In the paratype that we could study the lowest part of the apertural inner lip is missing, so that our figure 23 is misleading as far as the shell base structure is concerned. The broad apical whorls are characteristic for *Zemiropsis*. The "thick and weak axial growth striae" (Bozzetti, 1998: 30) (fig. 24) remind of the sculpture of fresh specimens of *Z. pintado*. Finally, by its occurrence off Mozambique the range of *Z. rosadoi* is linked to that of the three undisputed *Zemiropsis* species.

Acknowledgements

We thank Dr J. van Aartsen (Dieren), and Dr Chung-Hung Hu and Dr Hsi-Jen Tao (Taipei), for their assistance in tracing important literature. We are particularly grateful to Mr S. P. Dance (Carlisle), Dr Y. I. Kantor (Moscow), Dr R. N. Kilburn (Pietermaritzburg), and Mr T. C. Lan (Taipei), who provided highly relevant data on *Babylonia* and *Zemiropsis* species, and to Mr R.G. Moolenbeek (Amsterdam) and Dr G. Oliver (Cardiff) who sent us material of an unknown *Babylonia* species in loan for study.

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