

A new subgenus including three new species of the genus *Vexillum* (Gastropoda: Costelariidae) from the central Indo-Pacific with remarks on *Vexillum* (*Pusia*) *semicostatum* (Anton, 1838)

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A new subgenus including three new species of the genus *Vexillum* (Gastropoda: Costellariidae) from the central Indo-Pacific with remarks on *Vexillum (Pusia) semicostatum* (ANTON, 1838)

Manfred Herrmann, Günter Stossier & Richard Salisbury

ABSTRACT

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A new subgenus *Vexillum (Protoelongata)* is described and separated from other *Vexillum* subgenera by shell characteristics and animal colouration. Radula characteristics are shown and links to the COI gene sequence of the type species, published in BOLD and GenBank, are given.

Four known species, *Vexillum (Protoelongata) corallinum* (REEVE, 1845) comb. nov., *V. (Protoelongata) bilineatum* (REEVE, 1845) comb. nov., *V. (Protoelongata) xerampelina* (MELVILL, 1895) comb. nov., and *V. (Protoelongata) loyaltyense* (HERVIER, 1897) comb. nov., and three new species *V. (Protoelongata) dekkersi* sp. nov., *V. (Protoelongata) rubrotaeniatum* sp. nov., and *V. (Protoelongata) heleneae* sp. nov. from different regions in the Indo-Pacific are assigned to this subgenus. The new species *V. (Protoelongata) dekkersi* sp. nov. is compared with *V. (Protoelongata) corallinum* comb. nov., *V. (Protoelongata) xerampelina* comb. nov. and *V. (Pusia) semicostatum* (ANTON, 1838). *V. (Protoelongata) rubrotaeniatum* sp. nov. is also compared with *V. (Protoelongata) corallinum* comb. nov. and *V. (Pusia) semicostatum*, but also differentiated from *V. (Pusia) luigiraybaudii* POPPE, GUILLOT DE SUDUIRAUT & TAGARO, 2006. *V. (Protoelongata) heleneae* sp. nov. is compared with *V. (Pusia) microzonias* (LAMARCK, 1811), *V. (Protoelongata) bilineatum* comb. nov., *V. (Pusia) geronimae* POPPE, TAGARO & SALISBURY, 2009 and also with *V. (Pusia) semicostatum*.

A lectotype for *V. (Pusia) semicostatum* is designated and two syntypes are excluded from the type lot.

Keywords: Gastropoda, Costellariidae, *Vexillum*, *Protoelongata*, new species, new subgenus, Philippines, Indonesia, Solomons, French Polynesia.

Kurzfassung: Eine neue Untergattung *Vexillum (Protoelongata)* wird beschrieben. Sie wird von anderen Untergattungen der Gattung *Vexillum* durch Schalencharakteristika und die Färbung des Tieres unterschieden. Die Radula wird demonstriert und

Links zu der COI Gensequenz der Typusart, veröffentlicht in BOLD und GenBank, werden genannt.

Vier bekannte Arten (*Vexillum (Protoelongata) corallinum* (REEVE, 1845) comb. nov., *V. (Protoelongata) bilineatum* (REEVE, 1845) comb. nov., *V. (Protoelongata) xerampelina* (MELVILL, 1895) comb. nov. und *V. (Protoelongata) loyaltyense* (HERVIER, 1897) comb. nov. sowie die drei neuen Arten *V. (Protoelongata) dekkersi* sp. nov., *V. (Protoelongata) rubrotaeniatum* sp. nov. und *V. (Protoelongata) heleneae* sp. nov. aus verschiedenen Regionen des Indopazifiks werden dieser Untergattung zugeordnet. Die neue Art *V. (Protoelongata) dekkersi* sp. nov. wird mit *V. (Protoelongata) corallinum* comb. nov., *V. (Protoelongata) xerampelina* comb. nov. und *V. (Pusia) semicostatum* (ANTON, 1838) verglichen. *V. (Protoelongata) rubrotaeniatum* sp. nov. wird auch mit *V. (Protoelongata) corallinum* comb. nov. und *V. (Pusia) semicostatum* verglichen, aber auch von *V. (Pusia) luigiraybaudii* POPPE, GUILLOT DE SUDUIRAUT & TAGARO, 2006 unterschieden. *V. (Protoelongata) heleneae* sp. nov. wird mit *V. (Pusia) microzonias* (LAMARCK, 1811), *V. (Protoelongata) bilineatum* comb. nov., *V. (Pusia) geronimae* POPPE, TAGARO & SALISBURY, 2009 und *V. (Pusia) semicostatum* verglichen.

Ein Lectotyp für *V. (Pusia) semicostatum* wird bestimmt und zwei Syntypen werden aus dem Typus-Lot ausgeschlossen.

Schlüsselbegriffe: Gastropoda, Costellariidae, *Vexillum*, *Protoelongata*, neue Art, neue Untergattung, Philippinen, Indonesien, Salomonen, Französisch-Polynesien.

Introduction

In the Costellariidae, the genus with the most numerous species is *Vexillum*. The separation into subgenera *Vexillum* s. str., *Costellaria*, *Pusia* and *Pusiolina* is not always accepted nowadays (Bouchet & al. 2012). By default, the authors continue to use the old taxonomic arrangement due to the lack of a better system. In Herrmann (2011) the difficulties of introducing a possible new taxonomic system for the Costellariidae were mentioned. The separation of *Vexillum* into additional subgenera is deemed necessary to help identify and define specific shell and animal characteristics which are currently lumped under the genus *Vexillum*. In the present paper we are introducing a new subgenus to separate a group of species from the subgenus *Pusia*. Several shell and animal characteristics are common to the members of this new subgenus but differ from *Pusia*, which currently has many different shell and animal types grouped under it.

At the end of the last century, *V. (Protoelongata) corallinum* comb. nov. was frequently misidentified as *V. (Pusia) semicostatum* (ANTON, 1838) e.g. by Pechar, Prior & Parkinson (1980), Springsteen & Leobrera (1986) and Okutani

(2000). The most famous book on Costellariidae identification of the last century was "Mitre Shells from the Pacific and Indian Oceans" written by Pechar, Prior and Parkinson (1980). Unfortunately, four different costellarid species on plate 54 were pictured as *Vexillum (Pusia) semicostatum* (ANTON, 1838). None of those images show the true *V. (P.) semicostatum*. This can easily be recognised when comparing those shells to the lectotype, designated in the present paper, in the museum in Dresden, Germany (Turner & Callomon 2001 and Schniebs 2003). Two shells (figs 1, 7) are *V. (P.) luigiraybaudii* POPPE, GUILLOT DE SUDUIRAUT & TAGARO, 2006. The other shells belong to the new subgenus *Protoelongata* described in this paper. One shell (fig. 4) is identified as *V. (Pr.) corallinum* (REEVE, 1845) comb. nov. as mentioned above, one shell (fig. 5) belongs to the new species *V. (Pr.) dekkersi* sp. nov. and the last two shells (figs 2,3) are *V. (Pr.) rubrotaeniatum* sp. nov. In this paper we will compare every new species of the new subgenus with *V. (P.) semicostatum* to avoid further confusion.

Abbreviations:

| | |
|--------------|---|
| ah | aperture height |
| comb. nov. | new combination (species shifted to subgenus <i>Protoelongata</i>) |
| subgen. nov. | new subgenus |
| sp. nov. | new species |

Institutions:

| | |
|---------|---|
| ANSP | The Academy of Natural Sciences of Drexel University, Philadelphia, USA |
| BOLD | Barcode of Life Data Systems, University of Guelph, Ontario, Canada |
| GenBank | Database of NCBI (National Center for Biotechnology Information), Bethesda, USA |
| MHNG | Muséum d'histoire naturelle de la Ville de Genève, Switzerland |
| MNHN | Muséum national d'Histoire naturelle, Paris, France |
| MS | Muzee Scheveningen (formerly Zeebiologisch Museum), The Netherlands |
| MTD | Staatliche Naturhistorische Sammlungen, Museum für Tierkunde Dresden, Germany |
| NHMUK | Natural History Museum, London, United Kingdom |
| NMBE | Naturhistorisches Museum der Burgergemeinde Bern, Switzerland |
| NMP | National Museum of the Philippines, Manila, Philippines |
| NMW | National Museum Wales, Cardiff, United Kingdom |
| SevIn | A.N.Severtzov Institute of Ecology and Evolution, Moscow, Russia |
| SMF | Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt am Main, Germany |

Private collections:

| | |
|-----|--|
| AMD | Aart Dekkers, Blokker, The Netherlands |
| EGS | Emmanuel Guillot de Suduiraut †, Lapu-Lapu City, Philippines |
| GS | Günter Stössier, Hamburg, Germany |
| JCM | Jean-Claude Martin, Nice, France |
| MB | Michel Boutet, Tahiti, French Polynesia |
| MC | Mitsuo Chino, Kawasaki, Japan |
| MH | Manfred Herrmann, Rosdorf, Germany |
| MM | Max Marrow, Beaumaris, Victoria, Australia |
| RAS | Richard A. Salisbury, Meridian, USA |
| RG | Robert Gourguet, Tahiti, French Polynesia |
| SG | Sandro Gori, Livorno, Italy |
| SIH | Shih I Huang, Taichung City, Taiwan (Republic of China) |
| TB | Ted Baer, Lutry, Switzerland |

Systematics

Superfamily: MURICOIDEA RAFINESQUE, 1815

Family: COSTELLARIIDAE MACDONALD, 1860

Genus: *Vexillum* RÖDING, 1798

Type species: By subsequent designation (Woodring 1928): *Vexillum plicatum* RÖDING, 1798 = *Voluta plicaria* LINNAEUS, 1758 = *Vexillum (Vexillum) plicarium* (LINNAEUS, 1758).

Recent distribution: Indo-Pacific.

Subgenus: *Protoelongata* subgen. nov.

Type species: *Vexillum (Protoelongata) dekkersi* sp. nov.

Recent distribution: Indo-Pacific.

Description

This new subgenus is characterized by an extremely elongated protoconch consisting of 3 to 5 small glassy whorls of nearly equal size. This elongated protoconch is found in all members of the group (Plate 1). The protoconch can be as long as 1.3 mm. This type of protoconch is indicative of a very long planktonic veliger stage. Indeed, species in this group seem to have a wide Indo-Pacific distribution. The very early teleoconch whorls of shells in this new subgenus have narrow, slightly convex whorls with fine axial ribs, these axial ribs

become obsolete on later whorls and completely absent on the adult whorls. All known members of this new subgenus have slender, elongated shells with an acuminate spire, often shiny and polished in appearance. The apertures are narrow with lirations which are often hard to see, sometimes recessed deep within the aperture. The outer lips are thin and smooth. Frequently the protoconch is missing.

The animals of the species (Figs 8–12, 16–20) in the subgenus *Protoelongata* subgen. nov. are black with a long siphon, which is spotted with small white or yellow dots. The eye stalks are black at the base but semitransparent and spotted with tiny white or yellow dots above the eyes. The eyes are large for a costellariid. The foot is black with streaks and spots of white or yellow along the margin. The sole of the foot is grey with a streaked yellow border.

Vexillum (Protoelongata) dekkersi sp. nov. is designated as type species of this subgenus. The radula (Figs 13–14) is about 400 µm long and 70 µm broad, and consists of 45 to 50 transverse rows of teeth, three teeth per row. The rachidian tooth bears three strong equal cusps on the anterior edge of its basal part, which is rather narrow with broad lateral flaps. Lateral teeth unicuspid, sickle-shaped.

The following species are transferred to this new subgenus:

Mitra corallina REEVE, 1845 = *Vexillum (Protoelongata) corallinum* (REEVE, 1845)
comb. nov.

Mitra xerampelina MELVILL, 1895 = *Vexillum (Protoelongata) xerampelina*
(MELVILL, 1895) **comb. nov.**

Mitra bilineata REEVE, 1845 = *Vexillum (Protoelongata) bilineatum* (REEVE, 1845)
comb. nov.

Mitra (Pusia) loyaltyensis HERVIER, 1897 = *Vexillum (Protoelongata) loyaltyense*
(HERVIER, 1897) **comb. nov.**

Discussion

The elongated protoconch is characteristic for the new subgenus. No other group in the Costellariidae has this type of protoconch. Most Costellariidae have a short multispiral, paucispiral or mammillate protoconch.

The animals of the new subgenus are black with small white dots, sometimes a few white streaks and a white or yellow margin at the foot. In contrast, the colouration of many *Costellaria* animals is a salt/pepper combination with grey and white, e.g. in the *Costellaria* type species *Vexillum (Costellaria) semifasciatum* (LAMARCK, 1811) or *V. (C.) sanguisuga* (LINNAEUS, 1758). But other combinations are also present: In *V. (C.) coronatum* (HELBLING, 1779) and *V. (C.)*

cookorum TURNER, GORI & SALISBURY, 2007 the animals are semitransparent with white dots and in *V. (C.) costatum* (GMELIN, 1791) and *V. (C.) acupictum* (REEVE, 1844) there are pink markings on the semitransparent animals. Other animals, such as in *V. (C.) rodgersi* SALISBURY & WOLFF, 2005 or *V. (C.) potieri* DRIVAS & JAY, 1989 show greenish brown markings. *V. (C.) micra* PILSBRY, 1921 also has a black animal like *Protoelongata* animals, but the eyestalks are different. In the new subgenus, the eyestalks are semitransparent above the eye, but in *V. (C.) micra* another black part with a white ring is present there. The animals of some *Pusia* species also show salt/pepper combinations, such as in *V. (P.) patriarchale* (GMELIN, 1791) or *V. (P.) kuiperi* TURNER, 2006, but often the colour of animals is similar to the colour of the shell, e.g. in *V. (P.) rubrum* (BRODERIP, 1836), *V. (P.) crocatum* (LAMARCK, 1811) and *V. (P.) recurvirostris* (SOWERBY III, 1908). Thus the animal colouration in *Protoelongata* is characteristic for this new subgenus and different from comparable subgenera.

The radula of the type species *Vexillum (Protoelongata) dekkersi* sp. nov. has only three cusps on the rachidian plate. Therefore, according to Cernohorsky (1970) it differs from those of *Vexillum plicarium* (LINNAEUS, 1758) and *Vexillum (Costellaria) semifasciatum* (LAMARCK, 1811) which are the type species of the genus *Vexillum* s. str. and the subgenus *Costellaria*. All pictured radulae of *Vexillum* s. str. and *Costellaria* species in Cernohorsky (1970) and Fedosov & Kantor (2010) bear at least 7, but often more than 10 cusps on the rachidian plate. The only pictured *Vexillum* s. str. species with three cusps in Cernohorsky (1970) is *V. (V.) isaoi* (KURODA & SAKURAI, 1959), which according to Robin (2013) is accepted as *V. (Tosapusia) isaoi* (KURODA & SAKURAI, 1959) and therefore belongs to another subgenus.

Plate 1: *Vexillum (Protoelongata)* subgen. nov., all figures 4.5 x

Fig. 1: *Vexillum (Protoelongata) dekkersi* sp. nov., paratype 1, Philippines, Bohol, Balicasag Island, collected 2000, 11.7 mm, MS 63760.

Fig. 2: *Vexillum (Protoelongata) bilineatum* (REEVE, 1845) comb. nov., Philippines, Cebu, dived 15–20 m, 20.6 mm, MH.

Fig. 3: *Vexillum (Protoelongata) xerampelina* (MELVILL, 1895) comb. nov., holotype, Arabian Sea, Yemen, Aden, 18.8 mm, ex coll. E.R. Shopland; J.C. Melvill, NMW.1955.158.00429 (coll. Melvill-Tomlin).

Fig. 4: *Vexillum (Protoelongata) rubrotaeniatum* sp. nov., paratype 9, Solomon Islands, Guadalcanal, Bonegi, collected Aug 1987 by F. Lorenz on rocks at night at 21 m, 13.8 mm, MH.

Fig. 5: *Vexillum (Protoelongata) corallinum* (REEVE, 1845) comb. nov., Philippines, Bohol, Balicasag Island, 73–88 m, 17.5 mm, ex coll. Steinke, MH.

Fig. 6: *Vexillum (Protoelongata) heleneae* sp. nov., holotype, Guam, Orote Point, Orote Cliffs, collected by R. Salisbury under a pile of rocks at 18 m, 7 Jan 1978, 17.2 mm, MNHN 27071.

Fig. 7: *Vexillum (Protoelongata) loyaltyense* (HERVIER, 1897) comb. nov., Philippines, Cebu, Mactan Island, Punta Engaño, collected 2009 by lumun lumun net at 25–50 m, 10.3 mm, MH.

Photos: Fig. 3 Harriet Wood (NMW), Fig. 6 Richard Salisbury, other photos Manfred Herrmann.



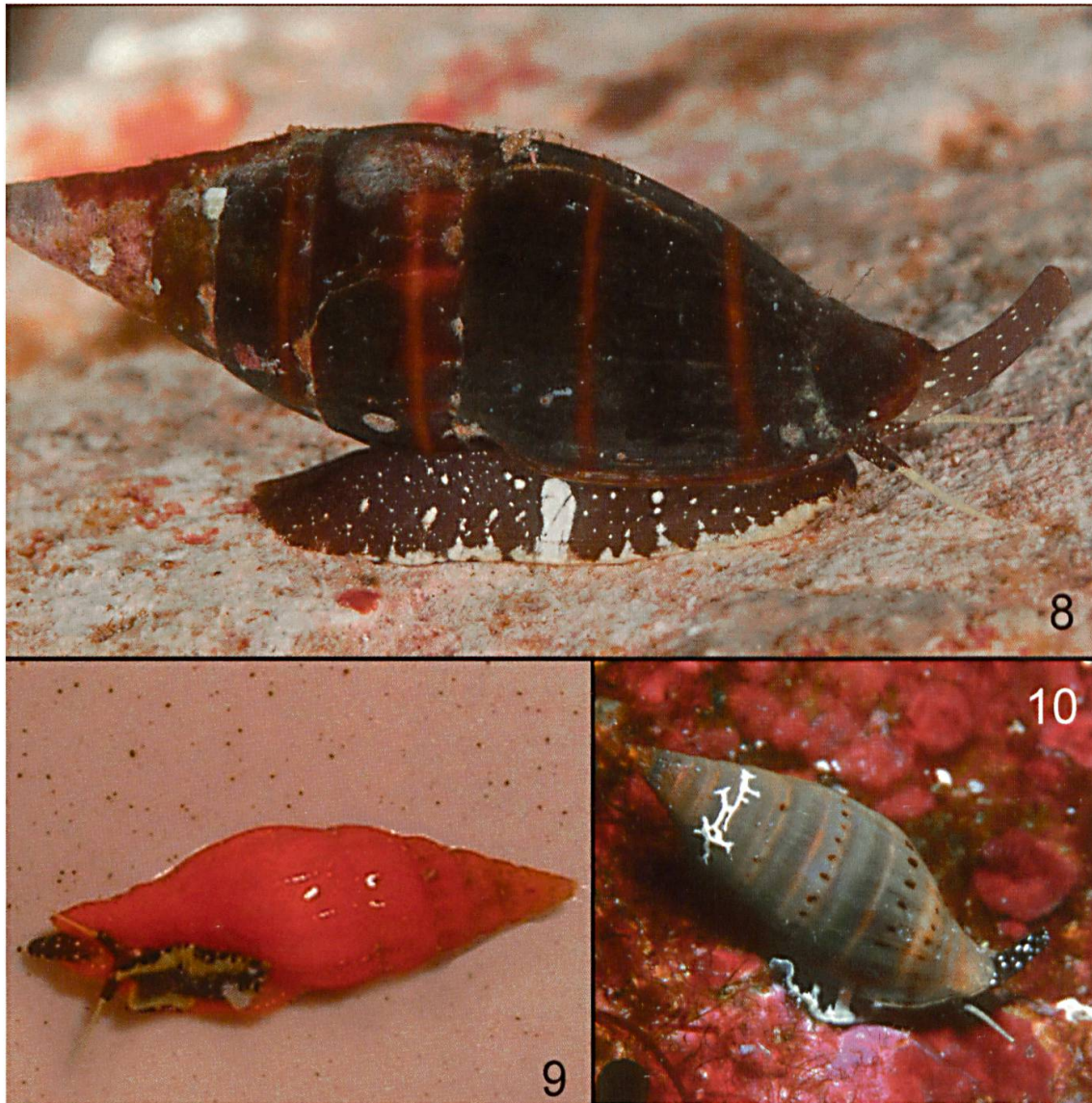


Plate 2: *Vexillum (Protoelongata)* subgen. nov.

Fig. 8: *Vexillum (Protoelongata) bilineatum* (REEVE, 1845) comb. nov., Guam, Agat Bay, Dadi Beach, collected by night dive at 9 m. Aquarium photo by Bob Abela.

Fig. 9: *Vexillum (Protoelongata) cf. xerampelina* (MELVILL, 1895) comb. nov., Japan, Okinawa, collected 2003. Photo by Shawn Miller.

Fig. 10: *Vexillum (Protoelongata) loyaltyense* (HERVIER, 1897) comb. nov., Marshall Islands, Kwajalein Atoll on lagoon pinnacle at ~ 18 m, collected by night dive and photographed by Jeanette Johnson.

The radula of *Vexillum (Pusia) microzonias* (LAMARCK, 1811), the type species of *Vexillum (Pusia)*, is not known to us. Some members of that subgenus such as *V. (Pusia) rubrum* (BRODERIP, 1836) or *V. (P.) cf. salisburyi* CERNOHORSKY, 1976 also have more than 10 cusps on the rachidian plate of their radula (Fedosov & Kantor 2010) (Fedosov & Kantor used the name *V. (P.) salisburyi*, but Salisbury (1984) demonstrated that this Philippine species is another undescribed taxon, therefore we use "cf." in this paper). Other *Pusia* members have radulae comparable to that of *V. (Protoelongata) dekkersi* sp. nov., for example *V. (P.) patriarchalis* (GMELIN, 1791) or *V. (P.) cavea* (REEVE,

1844), which are also illustrated in Cernohorsky (1970). Perhaps the variation is higher in this subgenus than in other subgenera, or further investigation will lead us to more differentiations and new genera or subgenera.

Further investigation must also verify whether the radula characteristic of *V. (Pr.) dekkersi* sp. nov. is specific for the type-species only or for all members of this subgenus.

Etymology: The subgeneric name combines the abbreviation "proto" with the Latin word "elongatus" (elongated). We use "proto" as abbreviation of protoconch, which derives from the female Latin word "concha" (shell) and therefore use the female form *Protoelongata*. The name refers to the characteristic elongated protoconch, not present in other genera/subgenera of the Costellariidae.

***Vexillum (Protoelongata) dekkersi* sp. nov.** (Figs 1, 11–14, 21–30)

Vexillum semicostatum – Pechar, Prior & Parkinson (1980): plate 54, fig. 5 [non (ANTON, 1838)]

Vexillum (Pusia) species – Guillot de Suduiraut (2000): p. 11, fig. 21.

Vexillum (Pusia) species 1110 – Guillot de Suduiraut (2009).

Description

Slender, fusiform shell, shiny, reaching about 14 mm in length, width averages 27–32% of length. Elongated protoconch consists of 5 conoidal whorls. Teleoconch consists of 6 to 7 slightly convex whorls. Spire outline straight, first two to three whorls with axial ribs, remaining ribs smooth with fine axial striae seen under magnification. Body whorl and penultimate whorl sometimes with weak axial folds. Aperture shorter than half the entire shell, lirate inside. Lip straight in posterior half, then recurved towards the siphonal fasciole. Siphonal canal short, wide and slightly recurved. Columella with 4 strong folds, decreasing in size anteriorly. Folds merge into spiral cords when leaving the columellar shield, becoming weak at the siphonal fasciole.

Colour pattern: Shell colour deep red to orange. Protoconch yellowish translucent, first two to three whorls changing from yellowish orange to deep red, columellar folds and aperture reddish orange.

Animal: Siphon black with many, equal sized white or yellow spots, animal body black, with white spots and streaks, especially along the margin of the foot; foot greyish purple underneath with yellow margin, base of eyestalk black with white spots, eyestalk thick with a large black eye at the base, the

upper portion of the eyestalk is semitransparent with fine white spots extending to the tip of the eyestalk.

Radula: see description of *Protoelongata* subgen. nov.

DNA: The sequence of the COI gene was analyzed in the MNHN and is registered in BOLD:

http://www.boldsystems.org/index.php/Public_BarcodeIndexNumber_Home;
BOLD Id: NEOGA265-10

and in GenBank:

<http://www.metalife.com/Genbank>; GenBank accession number: KF671189).

With this most commonly used barcode region, a segment of approximately 600 base pairs of the mitochondrial gene cytochrome oxidase I, it will be possible to compare other species with *V. (Protoelongata) dekkersi* sp. nov. in the future.

Holotype: Philippines, Bohol, Panglao Island, Catarman (9°36'N, 123°52'E), reef slope with caves at 4–30 m, collected 2004, 12.4 mm x 3.8 mm, MNHN 27068 (sequenced as IM-2007-30242, BOLD Id: NEOGA265-10, GenBank accession number of the COI barcode fragment: KF671189).

Paratype 1: Philippines, Bohol, Balicasag Island, collected 2000, 11.7 x 3.3 mm, ah: 4.8 mm, MS 63760; paratype 2: Philippines, Bohol, Panglao Island, Looc, 09°35.8'N, 123°44.6'E, reef wall, 20 m, collected 2004, 11.1 x 3.3 mm, ah: 5.5 mm, MNHN 27069; paratype 3: Philippines, Bohol, Panglao Island, Doljo Point, 09°35.6'N, 123°43.2'E, reef slope, 24–27 m, collected 2004, 11.0 x 3.1 mm, ah: 5.4 mm, MNHN 27070; paratype 4: Philippines, Bohol, Balicasag Island, 140 m in sand, 11.9 x 3.9 mm, ex TB, NMBE 519549; paratype 5: Philippines, Bohol, Balicasag Island, 140–160 m in sand, 11.8 x 3.4 mm, TB; paratype 6: Philippines, Bohol, Balicasag Island, tangle nets at 100 m, ex E. Guillot de Suduiraut, 11.0 mm, SG; paratype 7: Philippines, Bohol, Balicasag Island, nets, 10.2 x 3.4 mm, JCM 8491; paratypes 8–9: Philippines, Bohol, Balicasag Island, lumun lumun nets, collected 2006, juvenile (#8: 8.5 x 3.0 mm, ah: 3.5 mm; #9: 7.4 x 2.7 mm, ah: 3.1 mm), MH; paratypes 10–11: Philippines, Bohol, by tangle net of local fisherman, collected March 1997 (paratype 10: 11.0 mm x 3.4 mm, ah 5.0 mm; paratype 11: 10.3 mm x 3.0 mm, ah 4.1 mm) MC; paratype 12: Philippines, Cebu, Mactan Island, tangle nets, 12.5 x 3.5 mm, SIH; paratype 13: Philippines, Cebu, 11.4 x 3.4 mm, ah: 4.9 mm, GS; paratype 14: Philippines, Cebu, Mactan Island, Punta Engaño, tangle nets, 10.8 x 3.4 mm, ah: 4.8 mm, MH; paratype 15: Philippines, Cebu, Mactan Island, 60 m in sand, 14.0 x 4.7 mm, TB; paratype 16: Philippines, Cebu, Mactan Island, 50–120 m by net, 10.5 x 3.1 mm, AMD; paratypes 17–18: Philippines, Cebu, Mactan



Plate 3: *Vexillum (Protoelongata) dekkersi* sp. nov.

Figs 11–12: Philippines, Bohol, Panglao area, collected 2004. © MNHN.

Island, Punta Engaño, 100 m, from net fisherman, collected April 1980 (paratype 17: 10.5 mm x 3.2 mm; paratype 18: 10.4 mm x 3.1 mm) RAS; paratype 19: Philippines, Cebu, Mactan Island, Punta Engaño, shell nets at 60–200 m, 12.6 mm x 3.7 mm, ah 5.6 mm, MM; paratype 20: Philippines, Calitoban Island, 100 m, collected 2005, 10.5 x 3.2 mm, AMD; paratype 21: Philippines, Aliguay Island, trawled from 150–250 m, 12.7 x 3.7 mm, ah: 6.0 mm MH; paratype 22: Philippines, juvenile, 7.9 x 2.8 mm, ah: 3.7 mm, GS.

Additional material investigated: Shells from several other localities were also examined: Andaman Islands (ANSP), southern Japan (RAS), Guam (AMD, SG, RAS – Fig. 27), Palau (SG – Fig. 28), Indonesia (GS – Fig. 29), Solomon Islands (MNHN – Fig. 30, RAS), Marshall Islands (SG) and French Polynesia (MB – Fig. 26). Shells from Palau are very similar to the specimens from the Central Philippines, but sometimes swollen folds on the penultimate and body whorls are present. Shells from the other locations are more orange than red in comparison with Philippine ones and notably the shells from Guam and French Polynesia are broader at the shell periphery. At the moment we cannot be certain whether those characteristics of specimens from other locations are intraspecific or belong to distinct species. Therefore we have excluded those shells from the type lot.

Type locality: Philippines, Bohol, Panglao Island.

Distribution: This species lives in the Central Philippines (Bohol, Cebu, Ali-guay) in deep water (20 to 140 m depth). Shells have also been reported from the Andaman Islands, southern Japan, Guam, Palau, Indonesia (Celebes Sea), the Solomon and Marshall Islands, and French Polynesia (see "additional material investigated" above).

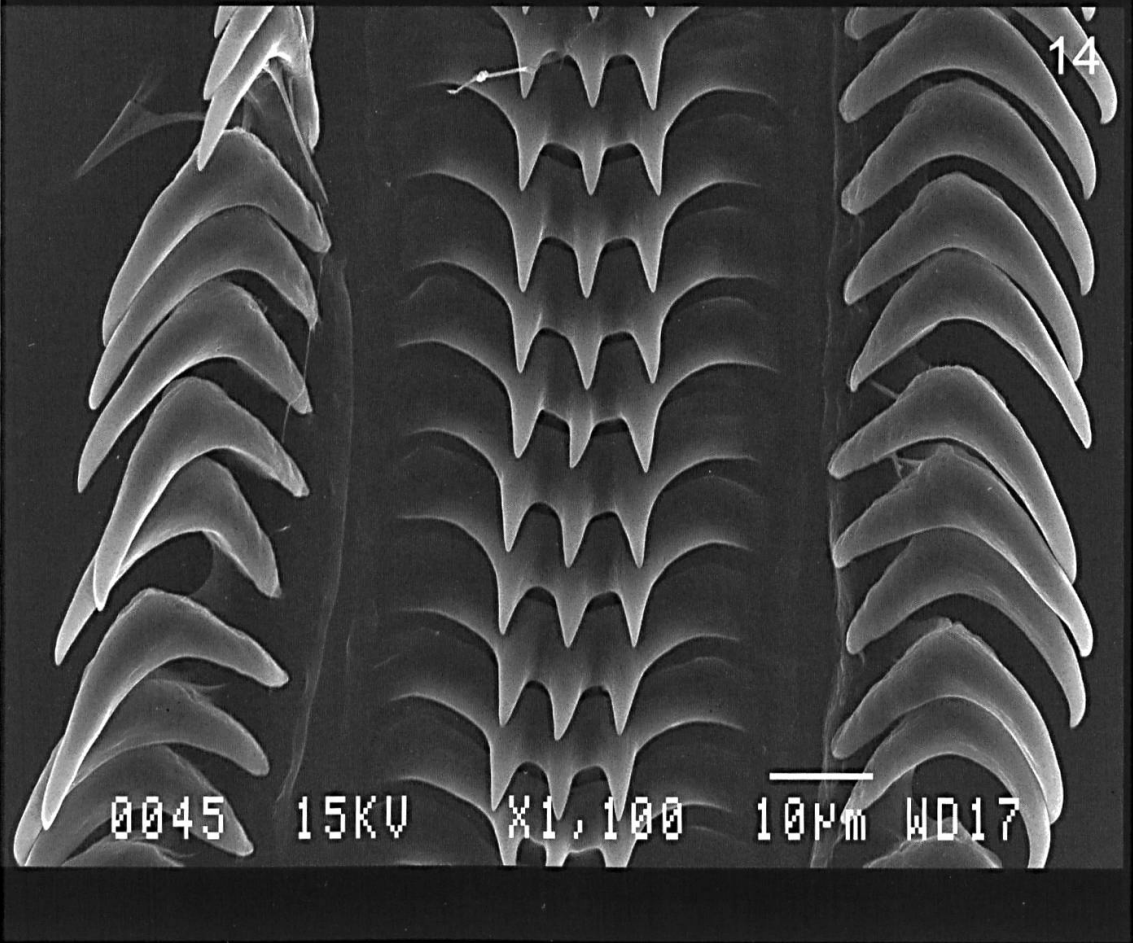
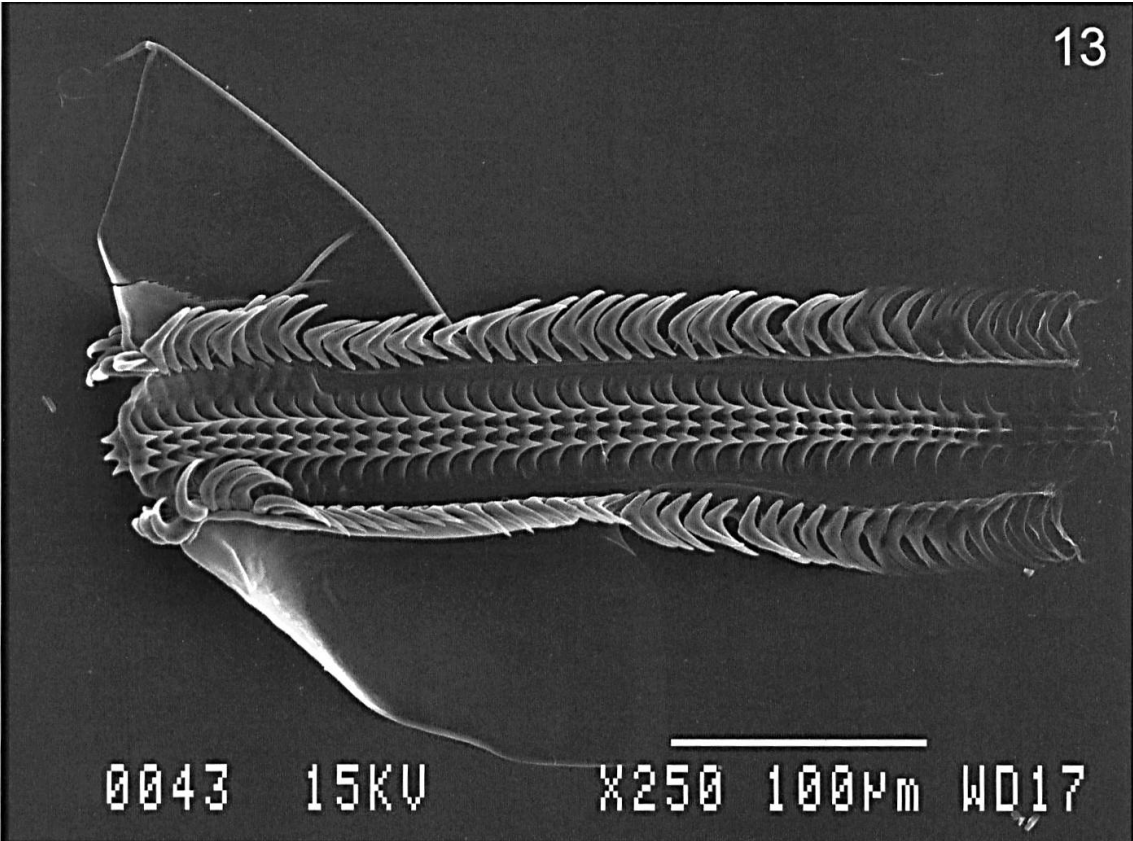
Etymology: This species is named in honour of Aart M. Dekkers, a good friend of the first author. He is interested in Strombidae, but also in Mitridae and Costellariidae. He is the author of *Vexillum maduranum* (2007), *V. john-wattsi* (2011), *V. croceorbis* (2013), *V. vangemerti* (2014) and further species together with the first and third authors. In the Muzee Scheveningen, he found the specimen which is now designated as paratype 1 of this new species, in a lot together with other red coloured Mitridae from Balicasag Island. He also loaned shells of *V. (Pr.) heleneae* sp. nov. and other undescribed species to the authors for further investigation.

Discussion

Vexillum (Pr.) dekkersi sp. nov. is similar to *V. (Pr.) corallinum* (REEVE, 1845) comb. nov. (Figs. 31–35). Both species are deep red with the first whorls coloured lighter yellowish to orange. *V. (Pr.) corallinum* is larger (up to 22 mm vs. 14 mm), all whorls are strongly ribbed axially and spiral striae are clearly visible in the interspaces, whereas the new species has smooth whorls. This new species lacks spiral striae, only axial striae are seen under magnifica-

Plate 4: *Vexillum (Protoelongata) dekkersi* sp. nov., holotype.

Figs 13–14: SEM radula. Photos by Alexander Fedosov (SevIn).



tion. The shell of *V. (Pr.) corallinum* is more biconical than fusiform. There are large white blotches on the lower part of the axial ribs on the spire whorls and on the periphery of the body whorl. The white blotches vanish together with the strong axial ribbing on the last half to third of the body whorl. The white blotches are never seen in *V. (Pr.) dekkersi* sp. nov.

Vexillum (Pr.) dekkersi sp. nov. is also closely related to *V. (Pr.) xerampelina* (MELVILL, 1895) comb. nov. (Figs 40–41). Both species have uniformly red to orange coloured shells. *V. (Pr.) xerampelina* differs from the new species because it is larger (20 mm vs. 14 mm), broader, has a slightly concave instead of straight spire outline, strong axial ribs on all whorls and fine spiral striae in the interspaces, which are missing in *V. (Pr.) dekkersi* sp. nov. The new species has a very slender, deep red and shiny shell, whereas the typical colour for *V. (Pr.) xerampelina* is orange and is seldom a dark red to brownish colour.

V. (Pr.) xerampelina was described from Aden and is found throughout the Red Sea and Indian Ocean. *V. (Pr.) dekkersi* sp. nov. seems to be limited in its distribution to the Philippine Islands. Other locations are uncertain.

The new species has been confused with *Vexillum (Pusia) semicostatum* (ANTON, 1838) (Figs 56–57), which differs from *V. (Pr.) dekkersi* sp. nov. in being brown in colour with large white spots on the later spire whorls and a narrow light peripheral band on the body whorl. The shell is more ovate and not as slender and the protoconch is paucispiral not elongated as is found in the new species and the new subgenus *Protoelongata*.

***Vexillum (Protoelongata) corallinum* (REEVE, 1845) comb. nov.**

(Figs 5, 15–16, 31–35)

Description

Slender, fusiform, nearly biconical shell, shiny, reaching about 22 mm in length. Elongated protoconch consists of at least three whorls. Teleoconch consists of 7 slightly convex whorls. Spire outline straight, first two to three whorls with distinct narrow axial ribs, remaining whorls with broad but flat axial ribs. Last third to half of body whorl often smooth. Whole shell covered with fine spiral striae. Aperture shorter than half the entire shell, lirate inside. Lip straight in posterior half, then recurved towards the siphonal fasciole. Siphonal canal short, narrow and slightly recurved. Columella with 4 strong folds, decreasing in size anteriorly. Folds merge into weak spiral cords when leaving the columellar shield.



Plate 5: *Vexillum (Protoelongata) corallinum* (REEVE, 1845) comb. nov.

Figs 15–16: Philippines, Bohol, Panglao area, collected 2004. © MNHN.

Colour pattern: Shell colour deep red, seldom orange. Protoconch yellowish translucent, first two to three whorls changing from yellowish orange to deep red without white markings. All remaining whorls regularly covered with white dots on the ribs in the anterior part of the whorls, often faded in the last half of the body whorl. Columellar folds greyish, aperture reddish orange.

Animal: Siphon black with many, equal-sized white or yellow spots, animal body black, with white spots, foot underneath greyish black with yellowish white margin, base of eyestalk black with white spots, eyestalk thick with a large black eye at the base, upper portion of the eyestalk semitransparent with fine white spots.

Holotype: NHMUK 1967727; 14.8 mm.

Type locality: Philippines, Masbate, found on the sand.

Distribution: Western Pacific from Japan (Okutani 2000) via the type locality Philippines and Malaysia (Coltro & Coltro 2013) to Papua New Guinea (Pechar & al. 1980), Queensland, Australia (this paper) and Vanuatu (Coltro & Coltro 2013).

Remarks: This species was put into synonymy with *Vexillum (Pusia) semicostatum* (ANTON, 1838) by different authors (Pechar & al. 1980 – plate 54, fig. 4; Springsteen & Leobrera 1986; Okutani 2000; Turner 2001), but is easy to distinguish from the latter species by the red-orange colour and the regular white dots only in the anterior part of the whorls.

***Vexillum (Protoelongata) bilineatum* (REEVE, 1845) comb. nov.**

(Figs 2, 8, 36–39)

Description

Ovate shell with acuminate spire, shiny, reaching about 22 mm in length. Elongated protoconch consists of 4 to 5 whitish, opaque, convex whorls. Teleoconch with 9 to 10 slightly convex whorls. Spire outline straight, first whorls smooth, body whorl and penultimate whorl often with weak axial folds. Aperture shorter than half the entire shell, lirate inside. Lip straight in posterior half, then recurved towards the siphonal fasciole. Siphonal canal short and nearly straight. Columella with 4 strong folds, decreasing in size anteriorly. Folds merge into weak spiral cords when leaving the columellar shield and cover the siphonal fasciole.

Colour pattern: Shell colour blackish brown, becoming lighter brown in faded shells, first three to four whorls grey-white. One yellow line at the periphery of the spire whorls, two yellow lines on body whorl, columellar folds greyish on dark columellar shield, aperture like outer shell.

Animal: Siphon black with many, equal-sized white spots, animal body black, with white spots and streaks and yellow margin, base of eyestalk black with white spots, eyestalk thick with a black eye at the base, upper portion of the eyestalk semitransparent with fine white spots.

Syntype 1/3: NHMUK 1888.1.9.20; 16.5 mm.

Type locality: unknown.

Distribution: Indo-Pacific from Réunion (Robin & Martin 2004) and Mauritius (Turner 1989) to the Maldives (Turner & al. 2007) and further to the Philippines (Poppe & al. 2008), Guam (Salisbury 1999) and Japan (Okutani 2000; fig. 82 *Pusia* sp.).

***Vexillum (Protoelongata) xerampelina* (MELVILL, 1895) comb. nov.**

(Figs 3, 40–41)

Description

Broad, cylindraceous shell with elongated spire, shiny, reaching about 20 mm in length. Teleoconch consists of 8 to 10 slightly convex whorls. Spire outline straight to slightly concave, 16 to 18 regularly positioned axial ribs on all whorls, sometimes flattened on dorsal side of body whorl, spiral striae on the whole shell. Suture well defined, slightly undulated. Aperture shorter than half the entire shell, lirate inside. Lip straight in posterior half, then recurved towards the siphonal fasciole. Siphonal canal short and slightly recurved. Columella with 4 strong folds, decreasing in size anteriorly and merging into spiral cords on the siphonal fasciole.

Colour pattern: Shell dark red to orange. Protoconch and first whorls sometimes darker, columellar folds greyish, columellar shield and aperture shell coloured.

Holotype: NMW.1955.158.00429 (coll. Melvill-Tomlin), ex coll. E.R. Shopland; J.C. Melvill; 18.8 mm.

Type locality: Arabian Sea, Yemen, Aden.

Distribution: From the Red Sea (Gulf of Aqaba) in the north (Wils & Verbinen 2002) via the Arabian Sea (Melvill 1895) and Mozambique to Réunion in the south (Robin & Martin 2004). The species is also reported from the western Pacific: Japan (Okutani 2000), Philippines (Schepmann 1911 – Figs 42–43) and Guam. Further investigation is necessary to prove whether those specimens also belong to this species or to a closely related one.

Remarks: This species was often put into synonymy with *Vexillum (Protoelongata) corallinum* (REEVE, 1845) comb. nov. (Okutani 2000) or *Vexillum (Pusia) semicostatum* (ANTON, 1838) (Turner 1989, 1997, 2001; Wils & Verbinen 2002), but is easy to distinguish from those species by the missing white dots.

***Vexillum (Protoelongata) loyaltiyense* (HERVIER, 1897) comb. nov.**

(Figs 7, 10, 44–47)

Description

Slender, fusiform shell, reaching about 13 mm in length. Elongated protoconch consists of 5 conoidal whorls. Teleoconch consists of 6 to 8 slightly convex whorls. Spire outline straight, body whorl with 16 to 18, and penultimate whorl with 18 to 22 axial ribs, with spiral threads in the interspaces or axial ribs only present on the first 2 to 3 whorls and remaining whorls smooth. Aperture shorter than half the entire shell, lirate inside. Lip straight in posterior half, then recurved towards the siphonal fasciole. Siphonal canal short, wide and nearly straight. Columella with 4 strong folds, decreasing in size anteriorly. Folds merge into spiral cords when leaving the columellar shield.

Colour pattern: Shell greyish brown. Protoconch yellowish with brown margin at posterior side or completely brown, spire whorls with a pale central line and dark spots at the suture, body whorl with two pale yellowish lines and two to three rows of dark spots, columellar folds greyish and aperture coloured as the outer shell.

Lectotype designation

The three syntypes mentioned by Hervier are not traceable in the MNHN nor in the Dautzenberg collection at the Institut Royal de Sciences Naturelles de Belgique, Brussels, where other types of the Hervier collection were deposited (Cernohorsky 1981). Therefore, we hereby designate the specimen that formed the basis for the type figure of *Mitra (Pusia) loyaltiyensis* HERVIER, 1897 (original description plate X, fig. 7) as lectotype of *Vexillum (Protoelongata) loyaltiyense* (HERVIER, 1897) (Fig. 46).

Type locality: New Caledonia, Loyalty Islands, Lifou (leg. Goubin).

Distribution: Subtidal zones of western Pacific from Japan in the north (Kubo 1997) via the Philippines (Cernohorsky 1981 – Figs 44–45, 47) and Guam (Robin & Martin 2004) to the Marshall Islands (Turner 1993 – Fig. 10) and southward to New Caledonia (Hervier 1897).

***Vexillum (Protoelongata) rubrotaeniatum* sp. nov.** (Figs. 4, 17–19, 48–51)

Vexillum semicostatum. – Pechar, Prior & Parkinson (1980): text page 9 (unpaginated, species list D), upper figure of live specimen, plate 54, figs. 2, 3 [non (ANTON, 1838)]

Vexillum semicostatum. – Richards (1989): page 4, picture "Costellariidae from Kimbe dredgings", [non (ANTON, 1838)]

Description

Slender, fusiform shell, reaching about 20 mm in length, width averages 31% of length. Fragile protoconch broken or missing in all shells studied. Teleoconch consists of 7 to 8 slightly convex whorls. Straight spire outline. First two to three whorls with fine axial ribs, remaining whorls with widely spaced axial folds. Whole shell covered with fine spiral threads. Aperture shorter than half the entire shell, lirate inside. Lip straight on posterior half, recurved towards the siphonal fasciole. Siphonal canal short, wide and slightly recurved. Columella with 4 strong folds, decreasing in size anteriorly.

Colour pattern: Shell colour yellowish to deep orange with darker orange or deep red spiral bands in the anterior third of the spire whorls and on the periphery of the body whorl. Often white spots present in the red bands in the area of the axial folds. Sometimes white spots are missing completely. Siphonal fasciole completely coloured like the darker bands. Columellar folds whitish on reddish columellar shield. Aperture coloured as the outer shell; yellowish to orange with darker bands.

Animal: Siphon and foot black with white spots with a yellow dot in the centre, white streaks along the margin, eye stalks black at the base with a translucent band in the middle, above the large eye the stalk is transparent with tiny white or yellow spots within.

Holotype: Papua New Guinea, New Ireland, Kavieng, Baudisson Bay, in rubble at 15–35 m, 15.0 mm x 4.5 mm, ex TB, NMBE 519550.

Paratype 1: Papua New Guinea, New Ireland, Kavieng, Baudisson Bay, in rubble at 15–35 m, 13.0 mm x 4.4 mm, GS; paratypes 2–3: Papua New Guinea, New Ireland, Djaul Island, night scuba under rubble at 12–15 m (paratype 2: 15.1 mm x 4.8 mm; paratype 3: 7.3 mm x 2.9 mm, juvenile) TB; paratypes 4–5: Papua New Guinea, Rabaul, Monument Nodup, collected 1977 by scuba at 40 m (paratype 4: 14.5 mm x 4.3 mm; paratype 5: 14.1 mm x 4.6 mm) TB; paratype 6: Papua New Guinea, New Ireland, Kavin Village (02°45'20"S, 150°44'20"E), on coral rubble at 26 m collected Nov 1996 by Sandro Gori, 15.1 mm x 5.0 mm, SG; paratype 7: Papua New Guinea, New Ireland, Djaul Island,

scuba on sand at 16 m, 14.6 mm x 4.9 mm, ah: 7.9 mm, SG; paratype 8: Papua New Guinea, Kimbe Harbor, dredged, 14.3 mm x 4.7 mm, JCM; paratype 9: Solomon Islands, Guadalcanal, Bonegi, on rocks at night at 70 ft collected Aug 1987, 13.8 mm x 4.5 mm, MH; paratype 10: Solomon Islands, Russell Group, by dive collected 1987 at 6 m, 15.4 mm x 4.6 mm, TB; paratypes 11–12: Solomon Islands, N'Gela Island (Florida Island), collected in sandy rubble at 12 m Sep 1983 by Del Stone (paratype 11: 15.3 mm x 5.1 mm, ah: 7.4 mm (worn), paratype 12: 15.9 mm x 5.5 mm, ah: 7.8 mm (outer lip broken)), RAS; paratype 13: Micronesia, Caroline Islands, Pohnpei Island, in airport dredgings, Dec 1968, 16.8 mm x 5.1 mm, ah: 7.9 mm, RAS; paratype 14: Marshall Islands, Kwajalein Atoll, Nell Island, on oceanside dropoff at 60 ft, in dead coral rubble, 19.7 mm x 5.5 mm, ah: 10.3 mm, SG; paratype 15: Marshall Islands, Kwajalein Atoll, dead collected in sand at 20 ft 1979, ex Andy Adams, 16.4 mm x 4.7 mm, ah: 7.3 mm, RAS; paratype 16: Marshall Islands, Kwajalein Atoll, dead collected in sand at 20 ft 1979, ex Andy Adams, 16.1 mm x 5.0 mm, ah: 7.1 mm, RAS; paratype 17: Marshall Islands, Kwajalein Atoll, dead collected in sand at 20 ft 1979, ex Andy Adams, 14.5 mm x 5.4 mm, ah: 7.0 mm (spire broken, worn), RAS; paratypes 18–20: Midway Island, Sand Island, dredged at 20–30 m Mar 1980, ex Pat Burgess (paratype 18: 16.0 mm x 4.9 mm; paratype 19: 17.6 mm x 5.6 mm; paratype 20: 15.7 mm x 4.9 mm), MH.

Type locality: Papua New Guinea, New Ireland, Kavieng, Baudisson Bay, in rubble at 15–35 m.

Distribution: Known from Papua New Guinea and the Solomon Islands in the south via the Caroline Islands, Guam and the Marshall Islands to the Midway Islands in the northeast; not known from other Hawaiian Islands.

Etymology: The specific name derives from the Latin words "ruber" (red) and "taenia" (band). The name refers to the characteristic red band of this new species.

Discussion

Vexillum (Protoelongata) rubrotaeniatum sp. nov. is similar to *V. (Pr.) corallinum* (REEVE, 1845) comb. nov. (Figs 31–35). Both species are about the same size and similarly coloured: red to orange with white markings. This new species is more slender, more fusiform than biconical and not uniformly coloured but yellowish to deep orange with typical deep red bands on all whorls and the siphonal fasciole. The white spots are not as large, have odd shapes and sometimes are completely missing.

The distribution also is different. *V. (Pr.) rubrotaeniatum* sp. nov. is known only from Guam, Caroline and Marshall Islands, Papua New Guinea and the



Plate 6: *Vexillum (Protoelongata) rubrotaeniatum* sp. nov.

Figs 17–18: Marshall Islands, Kwajalein Atoll, collected 2012. Photos by Jeanette Johnson.

Solomons, whereas *V. (Pr.) corallinum* comb. nov. is found from Japan to the Philippines and Malaysia, but also in Papua New Guinea, Queensland (Australia) and Vanuatu.

As mentioned in the introduction, *V. (Pr.) rubrotaeniatum* sp. nov. also has been confused with *V. (Pusia) semicostatum* (ANTON, 1838) (Figs 56–57), which differs from *V. (Pr.) rubrotaeniatum* sp. nov. in being uniform brown instead of orange with red bands, larger white blotches on the later spire

whorls and a broader, more ovate and smaller shell of about half the size. As mentioned before, the protoconch is paucispiral and not elongated.

V. (Pr.) rubrotaeniatum sp. nov. was also confused with the banded *V. (Pusia) luigiraybaudii* POPPE, GUILLOT DE SUDUIRAUT & TAGARO, 2006 (Figs 62–65), which is a larger and more obese species. Both species are slender and orange coloured. In *V. (P.) luigiraybaudii* the shell is ornamented with yellow or white bands instead of red bands with white dots as in *V. (Pr.) rubrotaeniatum* sp. nov. In *V. (P.) luigiraybaudii* the white bands are sometimes missing completely and the shells are then uniformly orange (Fig. 63). The shell is sculptured with widely spaced spiral grooves forming flat spiral cords. The spiral threads are missing and the siphonal canal is much more elongated. Also the aperture is longer than half the entire shell length.

***Vexillum (Protoelongata) heleneae* sp. nov.** (Figs. 6, 20, 52–55)

Vexillum microzonias (LAMARCK) 17.1 mm. Sulu Archipelago – Springsteen & Leobrera (1986), [non (LAMARCK, 1811)]

Vexillum (Pusia) species 18.8 mm. Kosrae Is., Carolina Is., – Guillot de Suduiraut (2009)

Description

Slender, shiny, fusiform shell, reaching about 20 mm in length, width averages 36% of length. Elongated protoconch of five milky white glassy whorls, embryonic whorl bulbous, 4 post-embryonic whorls barrel-shaped with convex outline, each whorl slightly larger than the previous one. Teleoconch consists of 8 to 9 slightly convex whorls. Early whorls often eroded, spire outline nearly straight, whorls slightly convex, fine axial ribs on 2nd and 3rd whorls, becoming weak on later spire whorls, then enlarging, becoming wider and rounded on the penultimate and body whorls, most whorls with microscopic axial growth lines, suture undulate and well defined. Body whorl shiny, with large rounded axial ribs which become obsolete on the lower body whorl, fasciole with 5 to 6 rounded spiral cords growing larger toward the base. Aperture shorter than half the entire shell, lirate inside. Lip smooth, gently curved, siphonal canal short. Columella with 4 strong folds, decreasing in size anteriorly.

Colour pattern: Shell shiny black, early whorls may be dark brown or rarely grey, with a faint yellow spiral line, later whorls black with the spiral line growing larger forming a band and turning white, on most specimens the white spiral band becomes a large fulvous spot where it crosses the axial ribs. On the



19



20

Plate 7: *Vexillum (Protoelongata)* species.

Fig. 19: *Vexillum (Protoelongata) rubrotaeniatum* sp. nov., Marshall Islands, Kwajalein Atoll. Photo by Scott Johnson with detail of elongated protoconch.

Fig. 20: *Vexillum (Protoelongata) heleneae* sp. nov., Marshall Islands, Kwajalein Atoll. Photo by Gloria & Kermit Pearson.

body whorl two distinct white spiral bands, the larger one located between the suture and aperture, another smaller, narrower, yellow or white spiral band below the periphery of the body whorl. Outer lip very thin and smooth, often reflects the colour pattern of the body whorl. Columellar folds whitish or grey. Aperture coloured as the outer shell; black with two white bands.

Animal: Siphon black with a scattering of small white spots, foot black with white triangular chevrons and white spots and streaks along the margin, eye stalks black at the base, above the eye the stalk is transparent with tiny white spots within.

Holotype: Guam, Orote Point, Orote Cliffs, collected by R. Salisbury under a pile of rocks at 18 m, 7 Jan 1978, 17.2 mm x 5.8 mm, ah 7.2 mm, MNHN 27071.

Paratype 1: type locality and data, 15.4 mm x 5.5 mm, ah 6.9 mm, RAS; paratypes 2–4: Guam, Orote Point, Orote Cliffs, collected by R. Salisbury under a huge pile of rubble at 12 m, 28 Apr 1979 (paratype 2: 16.5 mm x 5.9 mm, ah 7.8 mm; paratype 3: 16.4 mm x 6.3 mm, ah 7.5 mm; paratype 4: 16.0 mm x 5.7 mm, ah 7.3 mm), RAS; paratype 5: Guam, Orote Point, Orote Cliffs, collected by R. Salisbury under a huge pile of rubble at 12 m, 28 Apr 1979, 15.5 mm x 5.6 mm, ah 6.6 mm, ex RAS, NMBE 519551; paratype 6: Guam, Agat Bay, taken in coral sand at 18–20 m by dive by F. Schroeder May 2007, 19.2 mm x 6.6 mm, ah: 8.8 mm, MH; paratype 7: Guam, Agat Bay, in rubble at 35 ft, 18.6 mm x 6.4 mm, ah: 8.2 mm, GS; paratype 8: Guam, Piti Reef, ex coll. Antonio Nora, 18.9 mm, SG; paratype 9: Palau, Koror State, Ngerceu Island, Barnum Wall (07°04'52"N, 134°15'47"E), collected by night dive at 6 m by Sandro Gori 15 Nov 2009, 16.2 mm, SG; paratypes 10–11: Palau, Koror State, Ngemelis Island, Ferry Land (07°06'30"N, 134°14'29"E), collected by night dive at 15 m on oceanside dropoff in coralline caves by Sandro Gori (paratype 10: 16 Nov 2006, 17.5 mm; paratype 11: 12 Nov 2009, 14.8 mm), SG; paratype 12: Palau, Koror State, Ngemelis Island, German Wall (07°07'10"N, 134°16'07"E), collected by dive at 10 m by Sandro Gori 12 Nov 2009, 17.5 mm, SG; paratype 13: Palau, Koror State, collected by Andy Adams in rocks at 10 m, 19.4 mm x 6.7 mm, ah 7.6 mm, RAS; paratype 14: Micronesia, Caroline Islands, Yap, O'Keefe Pass (09°29'22"N, 138°07'58"E), collected by night dive at 18 m by Sandro Gori 08 Nov 2010, 15.8 mm, SG; paratype 15: Micronesia, Caroline Islands, Yap, Vertigo dropoff (09°35'40"N, 138°06'55"E), collected by dive at 35 m on oceanside dropoff by Sandro Gori 08 Nov 2010, 17.2 mm, SG; paratype 16: Micronesia, Caroline Islands, Kosrae, Shark Island (05°21'12"N, 162°56'44"E), collected by dive at 12 m by Sandro Gori 13 Nov 2007, 18.8 mm, SG; paratype 17: Marshall Islands, Kwajalein, Carlson Island, on oceanside dropoff at 15 m, in dead coral, night scuba, collected 1990, 16.9 x 5.6 mm, ah: 7.5 mm, MH; paratypes 18–19: Marshall Islands, Kwajalein, in ledges at night, 10–15 m (paratype 18: 17.0 mm x 6.3 mm, ah: 8.3 mm; paratype 19: 15.9 mm x 5.9 mm, ah: 7.9 mm), GS. paratype 20: Marshall Islands, Kwajalein, Carlson Island, on oceanside dropoff at 45 ft, in coral rubble pockets, night scuba, collected 1990, 16.6 x 5.4 mm, ah: 7.5 mm, AMD; paratype 21: Marshall Islands, Kwajalein Atoll, by diver, 18.2 x 6.2 mm, ah: 7.9 mm, AMD; para-

types 22–25: Marshall Islands, Kwajalein Atoll, collected 1968 in rubble at 7 m (paratype 22: 17.9 mm x 6.5 mm, ah 8.9 mm; paratype 23: 17.5 mm x 6.0 mm, ah 8.2 mm; paratype 24: 19.6 mm x 7.1 mm, ah 9.0 mm; paratype 25: 15.5 mm x 6.2 mm, ah 7.4 mm (immature)), ex Andy Adams collection, RAS; paratype 26: French Polynesia, Marquesas, Tahuata, 12.9 x 5.0 mm, ah: 6.0 mm, AMD; paratypes 27–28: French Polynesia, Society Islands, Tahiti, Toahotu, 1–3 m under dead coral, small sponges and shells, collected Aug 2006 by Gilbert Busson (paratype 27: 17.2 x 6.5 mm, ah: 8.1 mm; paratype 28: 15.9 x 6.2 mm, ah: 7.7 mm, subadult), TB; paratype 29: French Polynesia, Society Islands, Tahiti, Punaauia, collected 2012, 12.4 x 4.5 mm, TB; paratype 30: French Polynesia, Society Islands, Moorea, beach collected by Daniela Gori, 20.2 mm, SG; paratype 31: French Polynesia, Society Islands, Tahiti, Arue, collected 2009, outer slope of reef barrier lagoon, 25–30 m, 14.0 mm x 5.6 mm, ah 6.6 mm, RG 58.53A1; paratype 32: French Polynesia, Tuamotu, Makemo, collected 2009, outer slope of reef exterior, 30–40 m, 14.3 mm x 5.1 mm, ah 6.8 mm, MB 58.53A2.

Type locality: Marianas Islands, Guam, Orote Point, Orote Cliffs.

Distribution: From Palau in the west via Guam, the Federated States of Micronesia (Yap to the Caroline Islands) and the Marshall Islands to French Polynesia in the southeast.

Etymology: Named after H el ene Boutet, whose help in collecting a number of small species contributed to our knowledge of the gastropod fauna of French Polynesia.

Discussion

Vexillum (Protoelongata) heleneae sp. nov. has been confused with *Vexillum (Pusia) microzonias* (LAMARCK, 1811). A side-by-side comparison photo was taken with the lectotype of *Mitra microzonias* on the left and the new species on the right (Fig. 55). This new species is more slender, with 2 bands of colour on the body whorl, spire more slender and protoconch of a much different design.

This new species is most closely related to *Vexillum (Protoelongata) bilineatum* (REEVE, 1845) comb. nov. (Figs 36–39). It differs in having large fulvous spots on the axial ribs on the whorls, whereas in *V. (Pr.) bilineatum* two yellow spiral lines are present on the body whorl.

V. (Pr.) heleneae sp. nov. could also be confused with *Vexillum (Pusia) geronimae* POPPE, TAGARO & SALISBURY, 2009 (Figs 66–68). The latter differs from this new species in having a dark protoconch, no smooth whorls, but axial ribs also on the first whorls and strong spiral sculpture on the whole shell. The

colour pattern of *V. (Pr.) heleneae* sp. nov. is black with white spots while *V. (P.) geronimae* is brown with yellow and brown bands and a lighter siphonal fasciole.

The new species also is comparable to *Vexillum (Pusia) semicostatum* (ANTON, 1838) (Figs 56–57) because of the dark colour and white dots on the axial ribs, but the new species is about twice as large (~20 mm vs. 10 mm), more slender, the shell colour is black instead of brown, the first whorls are milky grey and the white flat dots are present regularly in the anterior half of the whorls, whereas in *V. (P.) semicostatum* the larger raised dots are not present on every axial rib but, when present, cover the entire rib.

***Vexillum (Protoelongata) species 1* (Figs 69–71)**

Vexillum semicostatum (ANTON, 1838) 12.6 mm. Madagascar – Robin & Martin (2004), plate C–28, fig. 2nd row, left [non (ANTON, 1838)]

Comments: This species so far is only known from Madagascar. Bob Abela took a photo of a live specimen during the Atimo Vatae expedition, organized by the MNHN to the south of Madagascar in 2010. The animal shows the typical colouration of the new subgenus *Protoelongata*. The shell is pictured in Robin & Martin (2004) and there are two worn specimens in the collection of the second author. Further investigation is necessary to verify the protoconch characteristics.

***Vexillum (Protoelongata) species 2* (Figs 72–73)**

Comments: So far only dead-collected specimens are known from Papua New Guinea collected by Sandro Gori, and from the Togian Islands, Sulawesi, Indonesia, collected by Peter Stahlschmidt. The shell characteristics including the elongated protoconch are characters that assign this species also to the new subgenus *Protoelongata*. This species is comparable to *V. (Pr.) loyaltyense*, but in contrast to a narrow white band at the periphery of the whorls, a broad band with a brown line in the middle is present in species 2.

Subgenus: *Pusia* SWAINSON, 1840

Type species by monotypy: *Mitra microzonias* LAMARCK, 1811

Recent distribution: Indo-Pacific.

***Vexillum (Pusia) semicostatum* (ANTON, 1838)** (Figs 56–58, 60)

Remarks: Three of four syntypes of this species were deposited in the MTD in the Anton collection. The largest one (MTD 3152/1) was pictured in Turner & Callomon (2001) as lectotype (fig. 10), but no formal designation was made. The other syntypes were not mentioned in that paper. The Costellariidae types in the Anton collection were presented by Schniebs (2003). Three syntypes are mentioned and again the largest one (8.7 mm x 4.8 mm) is pictured. When investigating these syntypes, the authors of the present paper identified the two smaller syntypes MTD 3152/2 (7.4 mm x 3.0 mm, Fig. 58) and MTD 3152/3 (5.9 mm x 2.7 mm, Fig. 60) as *Vexillum (Pusia) tusum* (REEVE, 1845). To avoid further confusion, we exclude those specimens from the type lot and designate the largest syntype (8.7 mm x 4.8 mm, Fig. 56) as lectotype of *Vexillum (Pusia) semicostatum* (ANTON, 1838).

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Poppe (Conchology, Inc.) for the holotype photos of *V. (P.) geronimae* and *V. (P.) luigiraybaudii*, Evelyn Guillot de Suduiraut for a paratype photo of *V. (P.) luigiraybaudii*, Hans Turner † for comparison photos with the lectotype of *V. (P.) microzonias*, Bob Abela, Virginie Heros (MNHN), Scott and Jeanette Johnson, Gloria and Kermit Pearson and Shawn Miller for live animal photos, Eike Neubert (NMBE) for helpful comments, Christian Kropf and Charles Huber (both NMBE) for editorship and final layout, and special thanks to John Wolff for type photos of *Mitra bilineata* and *Mitra corallina* and corrections of the English text.

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Species plates 8–19, Figs 21–73

Plate 8: *Vexillum (Protoelongata) dekkersi* sp. nov., all figures 6 x

Fig. 21: Holotype, Philippines, Bohol, Panglao Island, Catarman (9°36'N, 123°52'E), reef slope with caves at 4–30 m, collected 2004, 12.4 mm, MNHN 27068.

Fig. 22a–b: Paratype 1, Philippines, Bohol, Balicasag Island, collected 2000, 11.7 mm, MS 63760.

Figs 23–24: Paratype 8, Philippines, Bohol, Balicasag Island, lumun lumun nets, collected 2006, juvenile, 8.5 mm, MH (fig. 24 detail of elongated protoconch).

Fig. 25: Paratype 12, Philippines, Cebu, Mactan Island, tangle nets, 12.5 mm, SIH.

Photos: Fig. 21 Barbara Buge & Philippe Maestrati (MNHN), Fig. 25 Shih I Huang, other photos Manfred Herrmann.

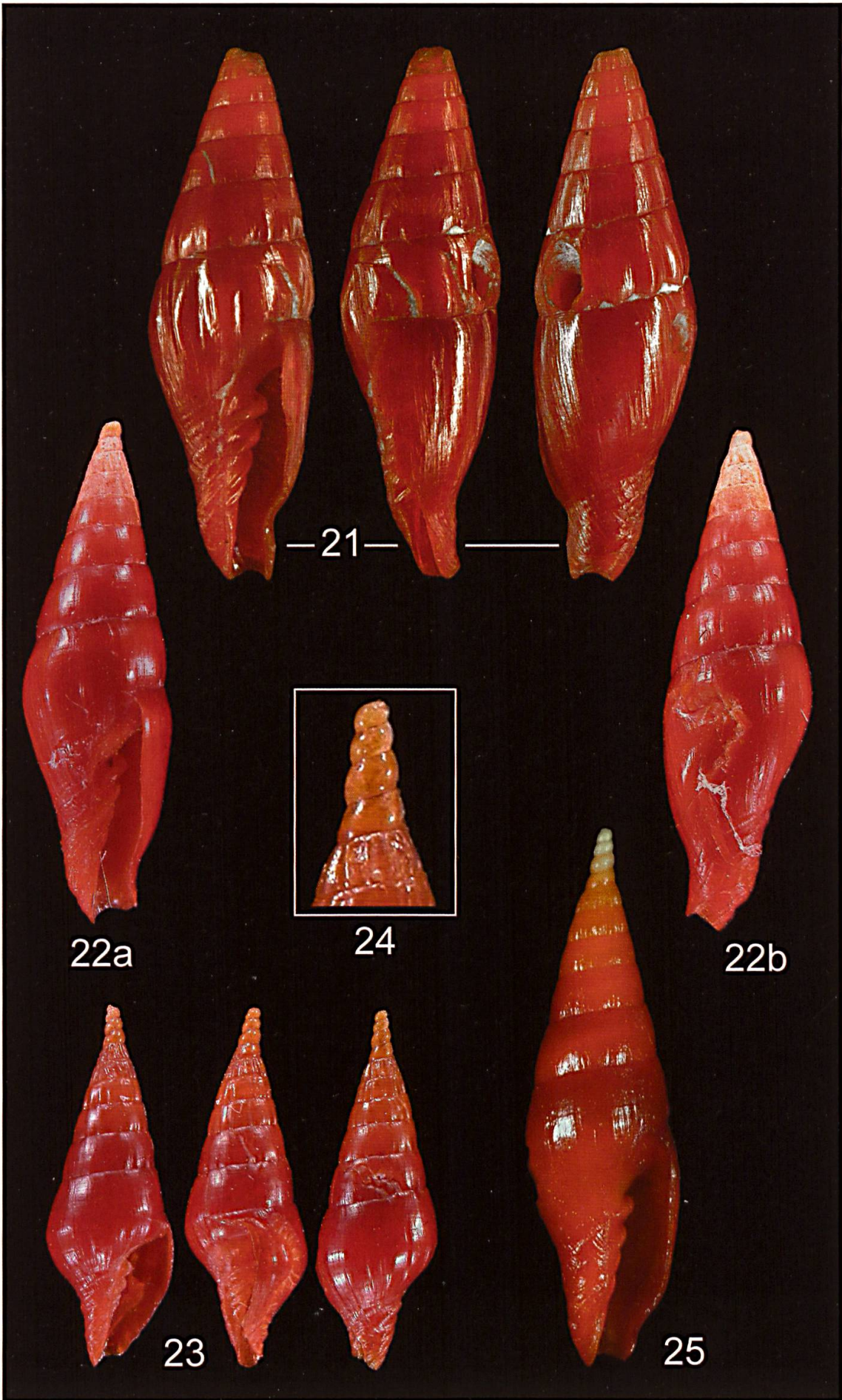


Plate 9: *Vexillum (Protoelongata) dekkersi* sp. nov., all figures 6 x

Fig. 26: French Polynesia, Society Islands, Tahiti, Arue, outer slope, 20–30 m, 10.9 mm, MB.

Fig. 27: Guam, Agat Bay, Anae Island, 14 m, under rocks in silt, collected Jan 1974 by Richard Salisbury, 14.1 mm, RAS.

Fig. 28: Palau, Koror State, Ngherceu Island, Barnum Wall, 6 m at night in oceanside dropoff coralline cave, scuba collected 15 Nov 2009 by Sandro Gori, SG.

Fig. 29: Indonesia, Celebes Sea, 01°22'21"N, 120°53'87"E, 8–40 m, 14.5 mm, GS.

Fig. 30: Solomon Islands, Campagne SALOMON 1, N/O "Alis", Station CP 1752 (9°06.9'S, 159°53.2'E), 896–912 m, collected 25 Sep 2001 by Bouchet/Dayrat/Warén, Richer IRD, MNHN.

Photos: Fig. 26 Philippe Bacchet, Fig. 27 Richard Salisbury, Fig. 28 Sandro Gori, other photos Manfred Herrmann.



Plate 10: *Vexillum (Protoelongata) corallinum* (REEVE, 1845) comb. nov., figures 4 x

Fig. 31: Holotype, Philippines, Masbate, found on the sands, 14.8 mm, NHMUK 1967727.

Figs 32–33: Juvenile Specimen, Philippines, Bohol, Balicasag, lumun lumun nets, collected 2006, 6.8 mm, MH (fig. 33 detail of first whorls with elongated protoconch, 12 x).

Fig. 34: Specimen, Philippines, Bohol, Balicasag Island, 73–88 m, 17.5 mm, ex coll. Steinke, MH.

Fig. 35: Specimen, Australia, Queensland, Credlin Reef, dived up Jul 1997 from reef slope at 8 m at night, 17.1 mm, MH.

Photos: Fig. 31 John Wolff, other photos Manfred Herrmann.

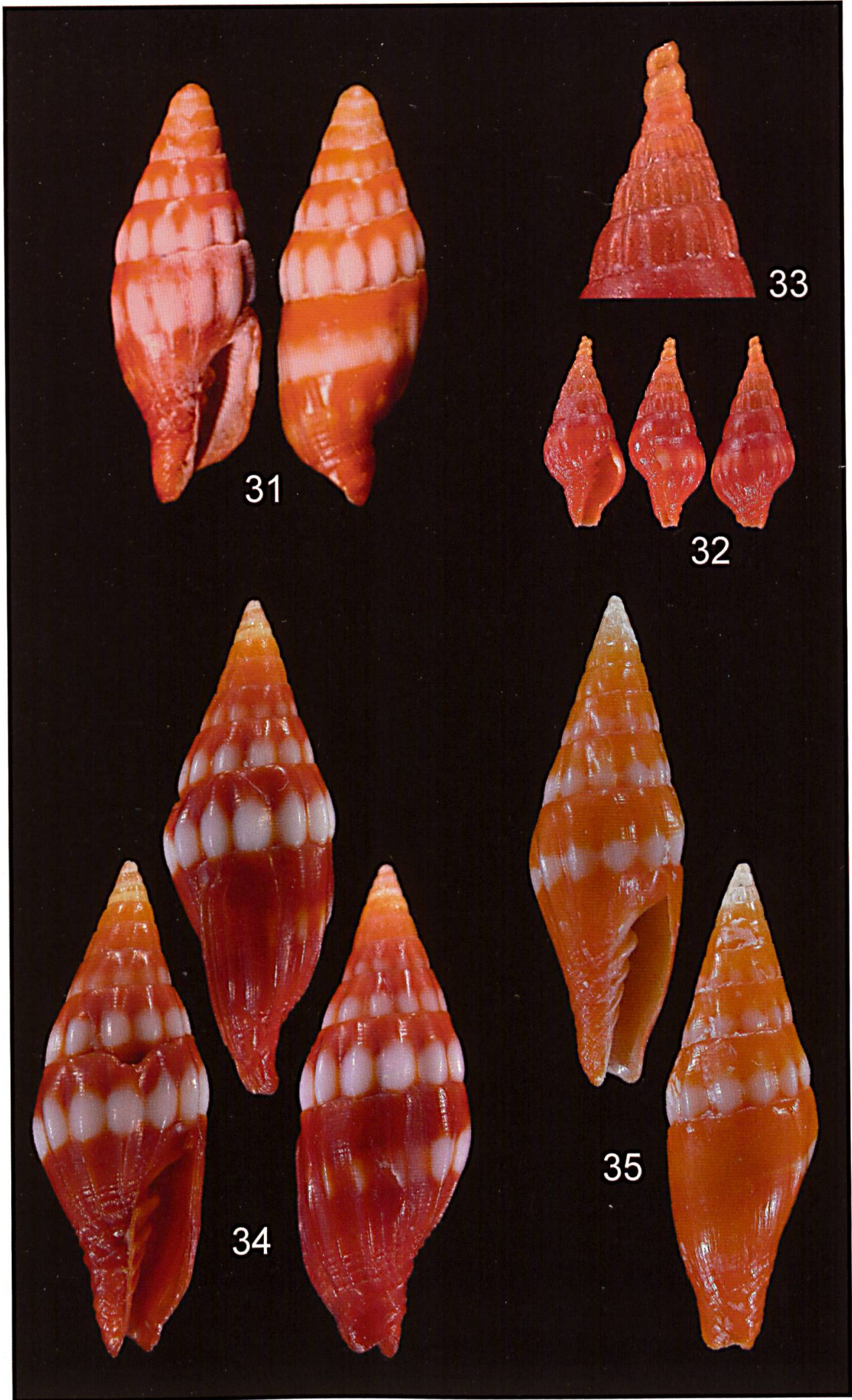


Plate 11: *Vexillum (Protoelongata) bilineatum* (REEVE, 1845) comb. nov., all figures 5 x

Fig. 36a–b: Syntype 1/3, unknown locality, 16.5 mm, NHMUK 1888.1.9.20.

Fig. 37: Juvenile Specimen, Guam, Orote Point , Orote Cliffs, scuba dived April 1979 under a huge pile of boulders at 17 m by Richard Salisbury, 9.0 mm, RAS.

Fig. 38: Type figure of *Mitra bilineata* REEVE, 1845.

Fig. 39: Specimen, Philippines, Cebu, dived 15–20 m, 20.6 mm, MH.

Photos: Fig. 36 John Wolff, Fig. 37 Richard Salisbury, Fig. 39 Manfred Herrmann.

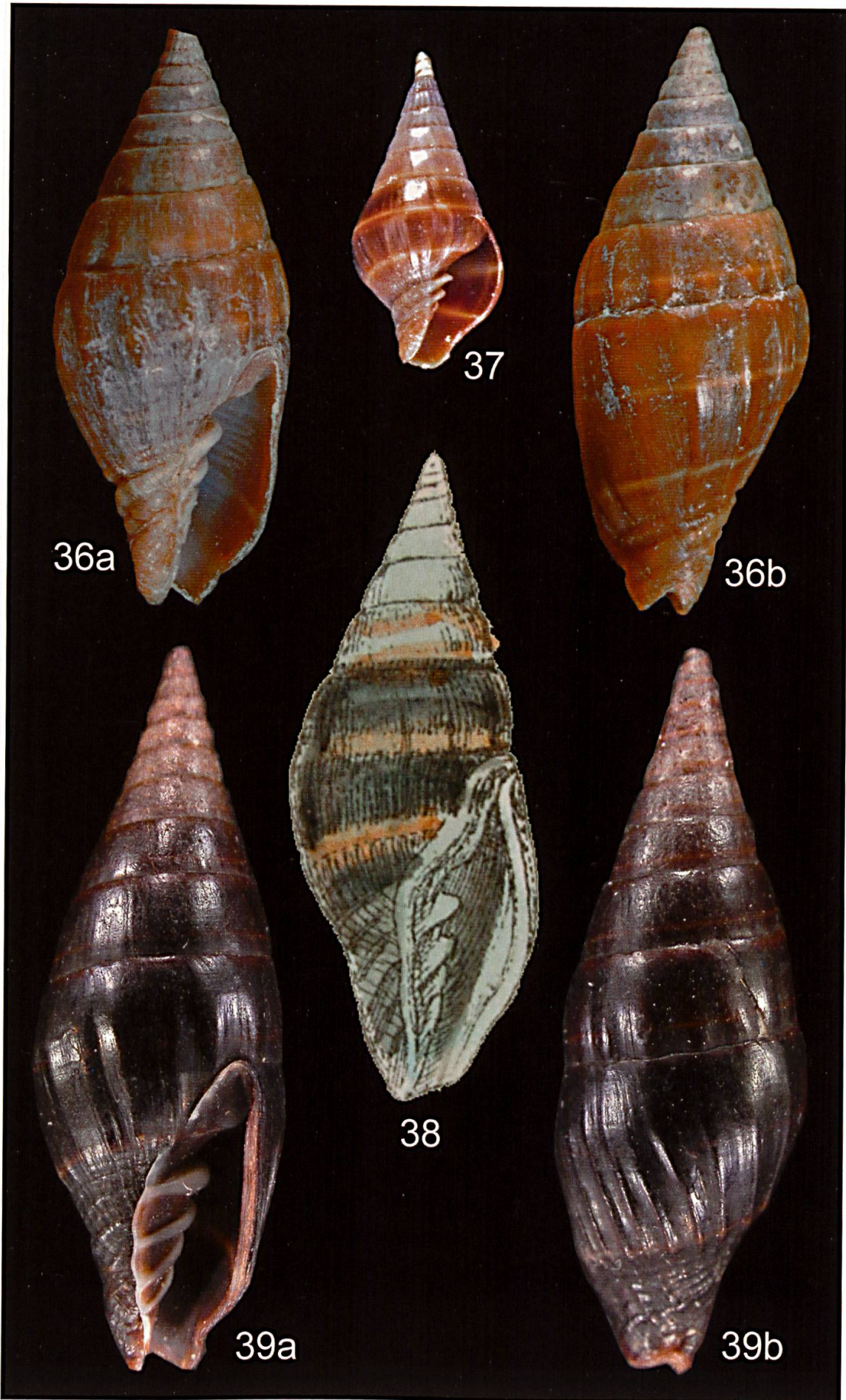


Plate 12: *Vexillum (Protoelongata) xerampelina* (MELVILL, 1895) comb. nov., all figures 3.5 x

Fig. 40: Holotype, Arabian Sea, Yemen, Aden, 18.8 mm, ex coll. E.R. Shopland; J.C. Melvill, NMW.1955.158.00429 (coll. Melvill-Tomlin).

Fig. 41: Specimen, Mozambique, Nacala Bay, taken Oct 2006 by snorkel in coral sand at 1–2 m, 17.5 mm, MH.

Fig. 42a–b: Specimen cf. *V. (Pr.) xerampelina* (MELVILL, 1895), Philippines, Cebu, Mactan Islands, collected May 1984 by shell nets, ex Ray Walker, 15.6 mm, NMBE 32379-2.

Fig. 43: Specimen cf. *V. (Pr.) xerampelina* (MELVILL, 1895), Philippines, Bohol Strait, collected Jul 1991 by shell nets, 15.7 mm, NMBE 32378-2.

Photos: Fig. 40 Harriet Wood (NMW), other photos Manfred Herrmann.

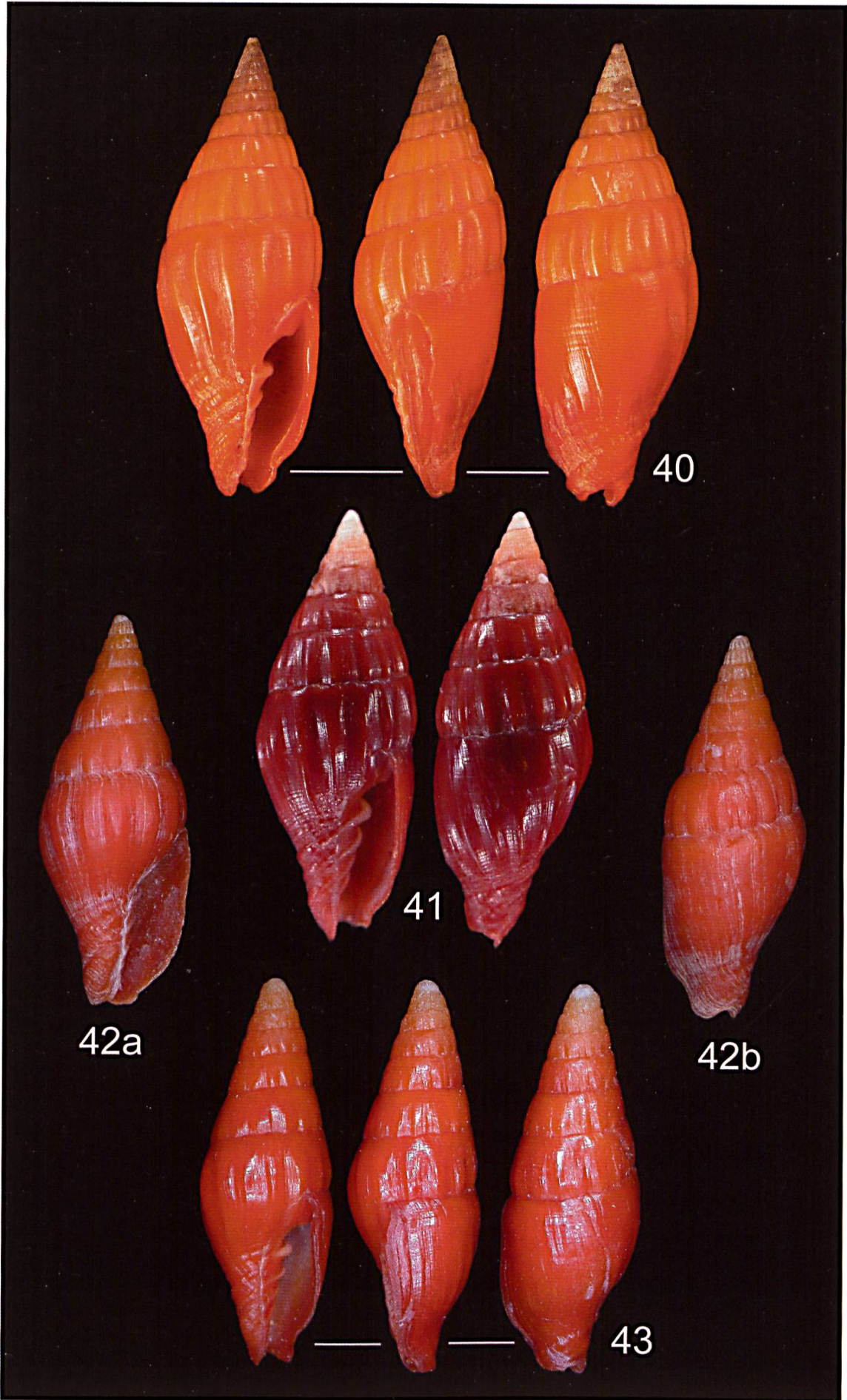


Plate 13: *Vexillum (Protoelongata) loyaltyense* (HERVIER, 1897) comb. nov., all figures 8 x

Fig. 44: Juvenile specimen, Philippines, Cebu, Mactan Island, Punta Engaño, 4.7 mm, GS.

Fig. 45a–b: Immature specimen, Philippines, Bohol, Balicasag Island, lumun lumun net 2006, 8.3 mm, MH.

Fig. 46: Lectotype, designated herein, type figure of *Mitra (Pusia) loyaltyensis* HERVIER, 1897, Loyalty Islands.

Fig. 47: Adult specimen, Philippines, Cebu, Mactan Island, Punta Engaño, lumun lumun net at 25–50 m, 10.3 mm, MH.

Photos: Manfred Herrmann.

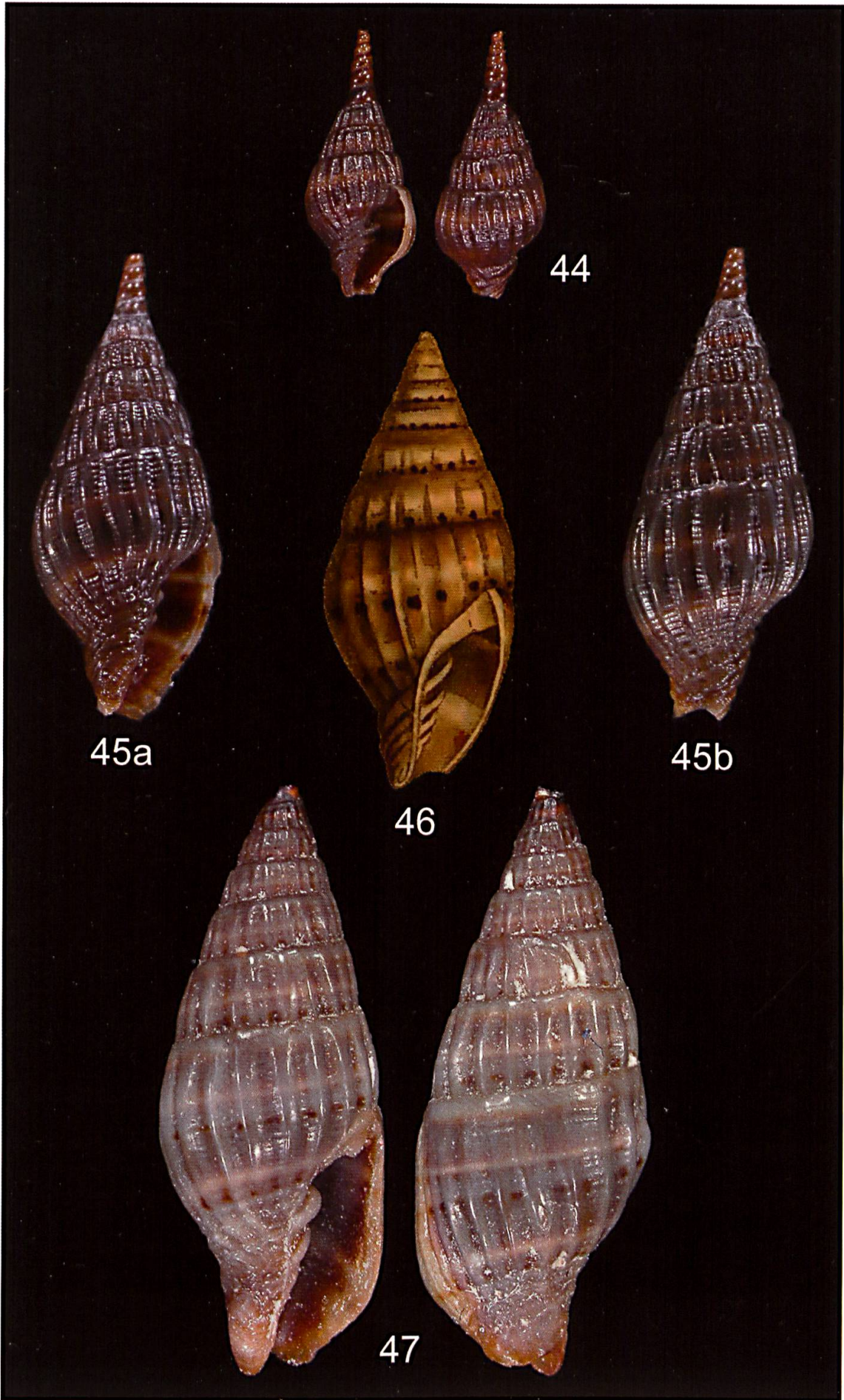


Plate 14: *Vexillum (Protoelongata) rubrotaeniatum* sp. nov., all figures 4 x

Fig. 48a–b: Paratype 9, Solomon Islands, Guadalcanal, Bonegi, collected Aug 1987 by F. Lorenz on rocks at night at 21 m, 13.8 mm, MH.

Fig. 49: Holotype, Papua New Guinea, New Ireland, Kavieng, Baudisson Bay, in rubble at 15–35 m, 15.0 mm, ex TB, NMBE 519550.

Fig. 50a–b: Paratype 18, Midway Island, Sand Island, dredged at 20–30 m Mar 1980 by P. Burgess, 16.0 mm, MH.

Fig. 51: Paratype 14, Marshall Islands, Kwajalein Atoll, Nell Island, on oceanside dropoff at 18 m, in dead coral rubble, 19.7 mm, SG.

Photos: Fig. 49 Ted Baer, other photos Manfred Herrmann.

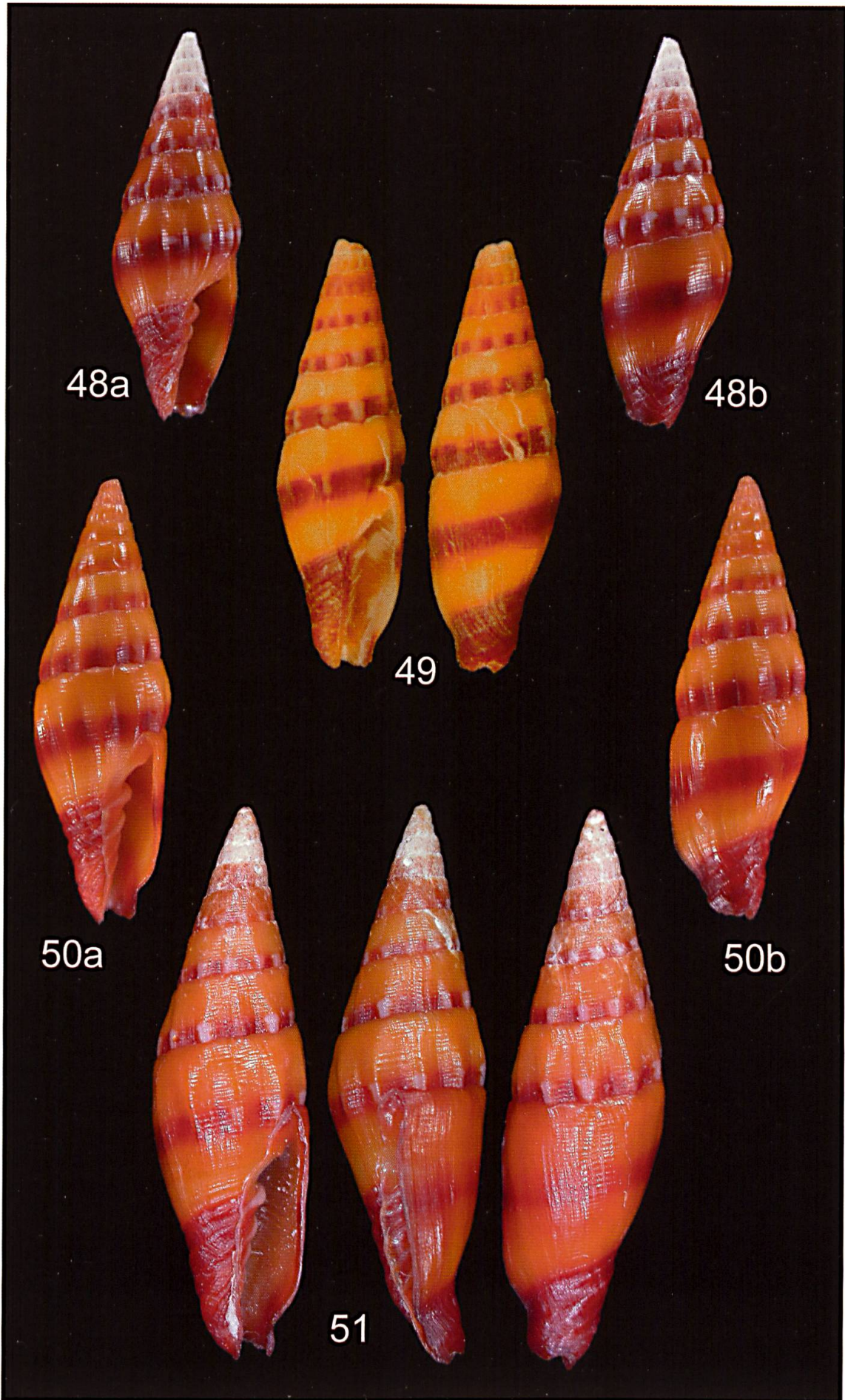


Plate 15: *Vexillum (Protoelongata) heleneae* sp. nov., all figures 4 x

Fig. 52a–b: Paratype 27, French Polynesia, Society Islands, Tahiti, Toahotu, 1–3 m under dead coral, small sponges and shells, collected Aug 2006 by Gilbert Busson; 17.2 mm, TB.

Fig. 53: Holotype, Guam, Orote Point, Orote Cliffs, collected 7 Jan 1978 by R. Salisbury under a pile of rocks at 18 m, 17.2 mm, MNHN 27071.

Fig. 54a–b: Paratype 17, Marshall Islands, Kwajalein, Carlson Island, collected 1990 by night scuba on oceanside dropoff at 15 m in dead coral, 16.9 mm, MH.

Fig. 55: comparison photo; left side: lectotype of *Mitra microzonias* LAMARCK, 1811, Indian Ocean (OD), 18.2 mm, MHNG 1108/12/1, right side: *V. (Pr.) heleneae* sp. nov., Marshall Islands, Kwajalein, collected 1968 in rubble at 6 m, 18.1 mm, RAS.

Photos: Fig. 53 Richard Salisbury, Fig. 55 Hans Turner, other photos Manfred Herrmann.

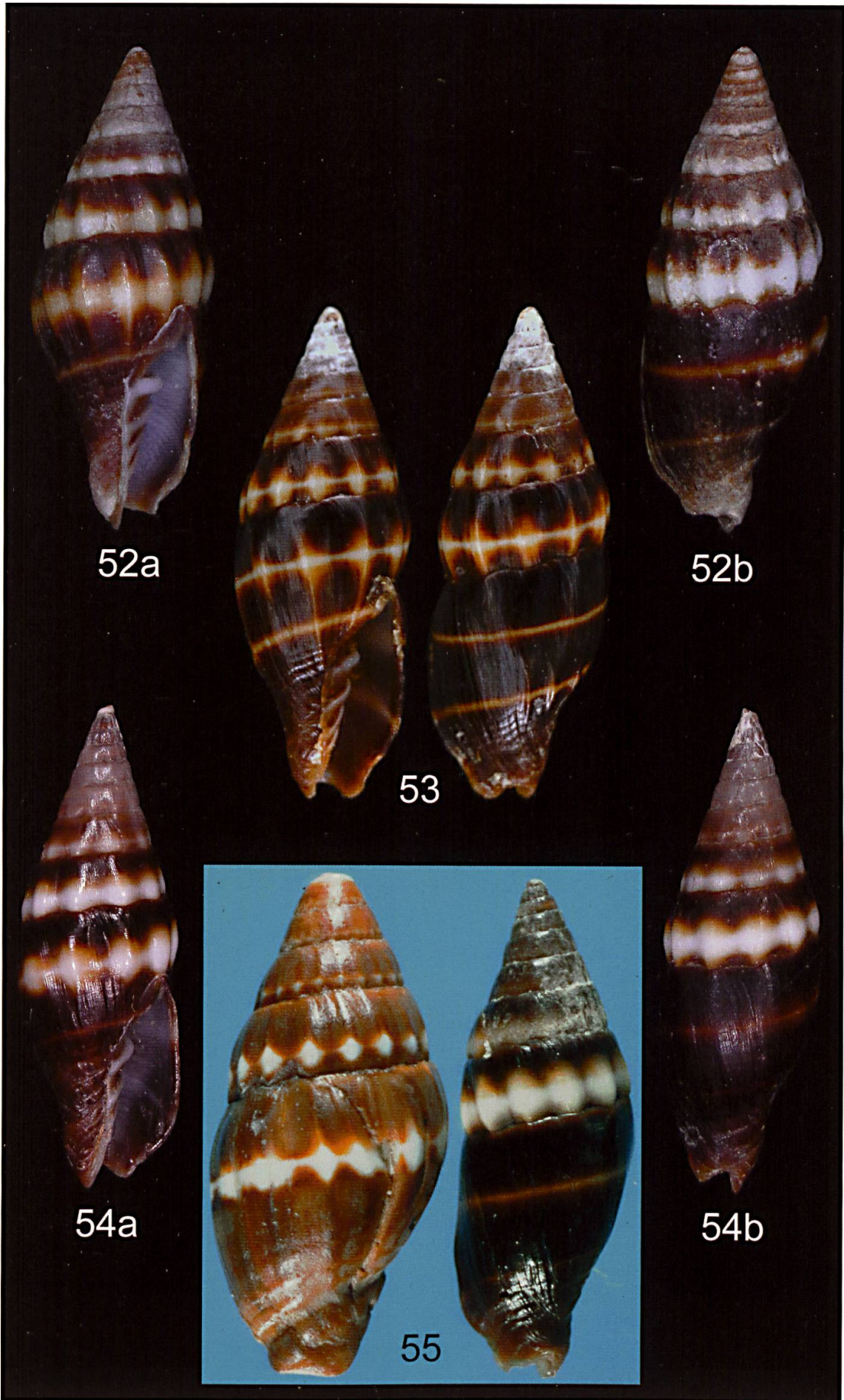


Plate 16: *Vexillum (Pusia)* species, all figures 7 x

Fig. 56: *Vexillum (Pusia) semicostatum* (ANTON, 1838), Lectotype (designated herein), 8.7 mm, MTD 3152.

Fig. 57: *Vexillum (Pusia) semicostatum* (ANTON, 1838), Indonesia, Sulawesi, Lembeh Island, collected 2005 by F. Lorenz, 7.0 mm, MH.

Fig. 58: Syntype 2/3 of *Vexillum (Pusia) semicostatum* (ANTON, 1838) = *Vexillum (Pusia) tusum* (REEVE, 1845), excluded from the type lot MTD 3152, 5.9 mm, MTD.

Fig. 59: Type figure of *Mitra tusa* REEVE, 1845, Philippines, Island of Mindoro, Puerto Galero.

Fig. 60: Syntype 3/3 of *Vexillum (Pusia) semicostatum* (ANTON, 1838) = *Vexillum (Pusia) tusum* (REEVE, 1845), excluded from the type lot MTD 3152, 7.4 mm, MTD.

Fig. 61: *Vexillum (Pusia) tusum* (REEVE, 1845), Philippines, Cebu, collected 2005, 8.1 mm, MH.

Photos: Figs 56, 58, 60 Katrin Schniebs (MTD), Figs 57a–b, 61 Manfred Herrmann.

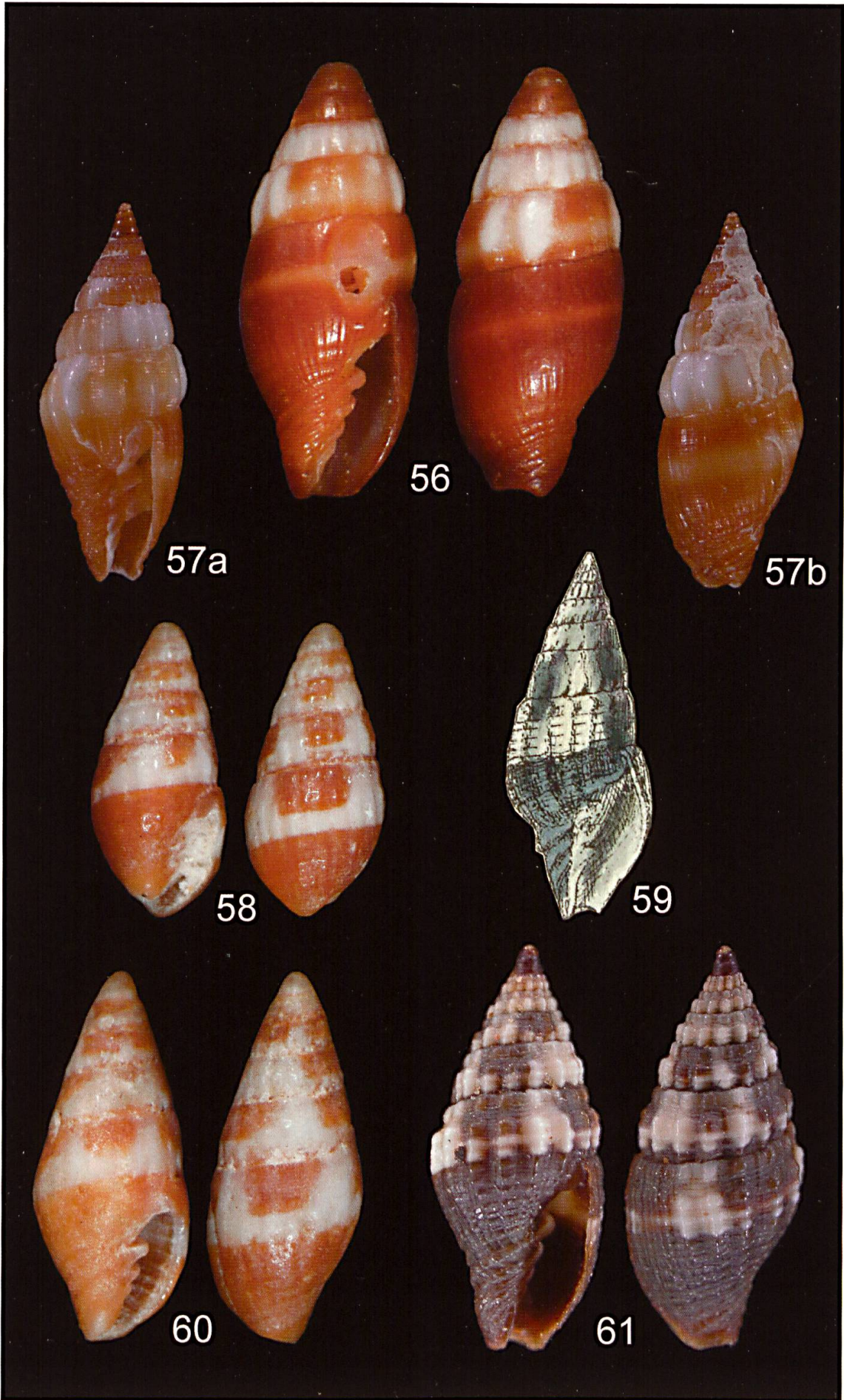


Plate 17: *Vexillum (Pusia) luigiraybaudii* POPPE, GUILLOT DE SUDUIRAUT & TAGARO, 2006, all figures 3.5 x

Fig. 62: Holotype, Philippines, Mactan Island, Punta Engaño, 60–150 m, 20.0 mm, NMP.

Fig. 63a–b: Specimen, Philippines, 20.6 mm, MH.

Fig. 64: Immature Specimen, Philippines, Bohol, Balicasag Island, lumun lumun net, 11.5 mm, MH.

Fig. 65a–b: Paratype 1, Philippines, Calituban Island, 23.4 mm, EGS.

Photos: Fig. 62 © Conchology, Inc., Fig. 65a–b E. Guillot de Suduiraut, other photos Manfred Herrmann.

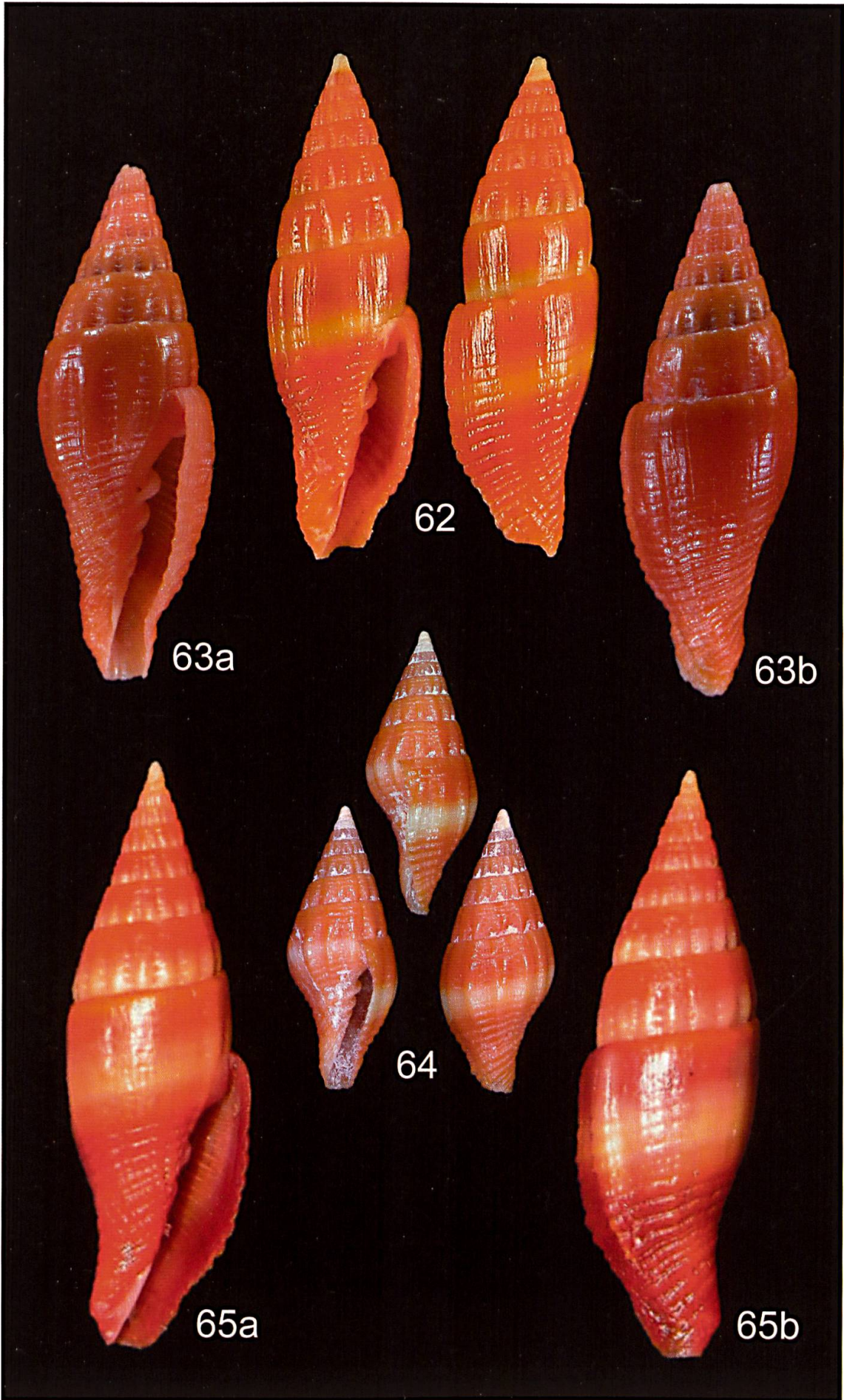


Plate 18: *Vexillum (Pusia) geronimae* POPPE, TAGARO & SALISBURY, 2009, all figures 5 x

Fig. 66: Holotype, Philippines, Palawan, Balabac Island, taken 2008 at 4 m by local fishermen, 17.4 mm, NMP.

Fig. 67a–b: Specimen, Philippines, Cebu, divers 15–20 m, 14.5 mm, MH.

Fig. 68: Specimen, Philippines, Cebu, Mactan Island, Punta Engaño, collected 2006 by tangle nets at 50–70 m on sandy coral rubble, 18.2 mm, MH.

Photos: Fig. 66 © Conchology, Inc., other photos Manfred Herrmann.

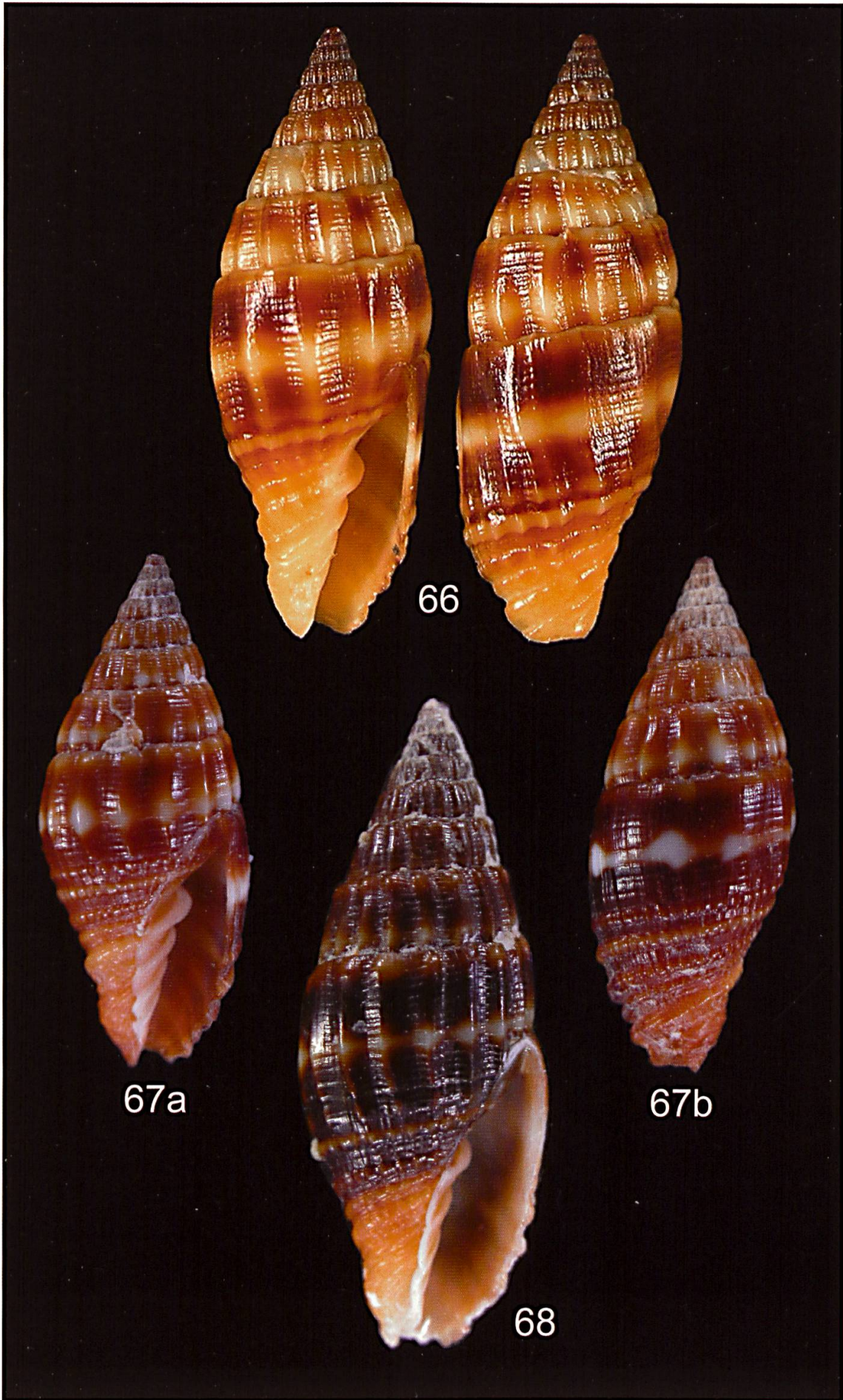


Plate 19: *Vexillum (Protoelongata)* species

Figs 69–71: species 1

Fig. 69: specimen, collected during the Atimo Vatae expedition (MNHN), south of Madagascar, 2010.

Figs 70–71: scaled 4 x; Specimens, Madagascar, Fort Dauphin, 11.5 mm x 4.9 mm and 11.3 mm x 4.9 mm, GS.

Figs 72–73: species 2, scaled 6 x;

Fig. 72: specimen, Papua New Guinea, West New Ireland, off Kavin Village, 32 m, in sand, collected 6 Nov 2002 by Sandro Gori, 10.4 mm x 4.3 mm, SG 30252.

Fig. 73: specimen, Indonesia, Sulawesi, Togian Islands, West Batudaka Island, 29–32 m, in grit from crevices along reef slope, collected by Peter Stahlschmidt Oct 2010, 8.4 mm x 3.6 mm, SMF.

Photos: Fig. 69 Bob Abela, Figs 70–71 Günter Stossier, Fig. 72 Sandro Gori, Fig. 73 Manfred Herrmann.

