

**A new small ribbed miter from the Indo-Pacific
(Neogastropoda, Muricoidea, Costellariidae)**

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The description of *Vexillum (Pusia) kuiperi* spec. nov. is based on examination of more than 50 specimens from wide areas in the Indo-West-Pacific (East Africa to Western Samoa). This new species differs from the similar, little known *Vexillum (Pusia) purpuratum* with which it was frequently confused. It is also compared with the related *V. (P.) diutenerum*, *V. (P.) roseotinctum* and *V. (P.) suave*. A lectotype of *Mitra purpurata* Reeve, 1845 is designated.

Key words: Neogastropoda, Costellariidae, *Vexillum*, new species, Indo-West Pacific.

INTRODUCTION

At present there are 252 validly named living species of *Vexillum* (including the subgenera *Vexillum* Röding, 1798, *Costellaria* Swainson, 1840, *Nodicostellaria* Petuch, 1987, *Pusia* Swainson, 1840, *Pusiolina* Cossmann, 1921, and *Tosapusia* Azuma, 1965), and excluding other costellarid genera such as *Thala* H. & A. Adams, 1853, *Austromitra* Finlay, 1927 and *Zierliana* Gray, 1847 (Turner, 2001).

Besides I have knowledge of another 129 new (not yet described) recent species of *Vexillum*. So the total number of living *Vexillum* species known is 382. A cautious, nevertheless risky estimation of actually living species of *Vexillum* arrives at the number more than 500? "*Vexillum* may be on its way passing *Conus* as the most species-rich, 'hyperdiverse' genus" (Prof. A. Kohn, in litt. 15 July 2004). One particularly nice new species out of this 'hyperdiversity' is described here.

Acronyms: ANSP Academy of Natural Sciences, Philadelphia; BMNH, The Natural History Museum, London; HT, Collection Hans Turner, Rovio; MNHN, Muséum national d'Histoire naturelle (Malacologie), Paris; OPM, Okinawa Prefectural Museum, Naha City, Okinawa; ZMA, Zoölogisch Museum, Amsterdam.

SYSTEMATICS

Family Costellariidae

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. Indo-Pacific

Subgenus *Pusia* Swainson, 1840

Type species by monotypy: *Pusia microzonis* (sic) = *Mitra microzonias* Lamarck, 1811 = *Vexillum (Pusia) microzonias* (Lamarck, 1811). Recent. Indo-Pacific

Vexillum (Pusia) kuiperi spec. nov. (figs 1-3, 8)

Pusia diutenera; Kaicher, 1977: card 1459 (non Hervier, 1897)

Vexillum (Costellaria) purpuratum; Salisbury, 1985: 8-9, 2 col. figs (non Reeve, 1845)

Vexillum (Costellaria) purpuratum; Salisbury, 2000: 14, fig. 219 (non Reeve, 1845)

Type material.—Holotype (fig. 1): Shell length 10.3 mm, width 4.1 mm, aperture length 4.6 mm; Western Samoa: Savaii Island, Asau Bay, in shallow water, live collected deep in rubble, leg. H. Bayer, v.1995, deposited in ZMA Moll. 4.04.039 (ex coll. HT).

Paratypes: Western Samoa: Savaii Island, Vaisala, shallow water, leg. H. Bayer, xi. 1994, paratype 1 (9.0 × 3.4 mm, aperture 3.7 mm, immature, lip thin, bore hole in third and fourth teleoconch whorl) (coll. HT).

Fiji Islands: Viti Levu, Lami (near Suva), Mosquito Island, 3 m, in sand, leg. E. Gardner, ii.1980, paratype 41 (9.7 × 4.05 mm, aperture 4.1 mm; rare colour variant with light-brown basic shell colour; this specimen was figured by Salisbury (1985) as '*Costellaria purpuratum*' with erroneous size '8 mm'), ex A. Adams (coll. R. Salisbury).

Marshall Islands: Kwajalein Atoll, inside lagoon, at 15 m depth, in cave of coral pinnacle, leg. S. Jazwinski, 12.viii.1988, paratype 2 (7.4 × 3.0 mm, aperture 3.3 mm) (coll. HT); Lagoon pinnacle, at a depth of 15 m, leg. S. Johnson, x.1990, paratype 3 (7.1 × 3.0 mm, aperture 3.0 mm) (coll. HT); depth 4-5 m, 1971; paratypes 4-5 (10.6 × 4.3 mm, aperture 5.0 mm, fig. 2, figured also in Salisbury, 1985 as '*Costellaria purpuratum*' with size '9.5 mm'), 9.6 × 4.0 mm, aperture 4.8 mm, apex broken; both ex A. Adams (coll. R. Salisbury); Lagoon side, at 4-5 m depth, on coral pinnacle in ledge, night collected, ii 1994, paratype 6 (8.5 × 3.6 mm, aperture 3.8 mm) (coll. J. P. Lefort, 338); Lagoon side, at 15 m depth, in fine coral rubble, paratype 7 (9.0 × 3.5 mm, aperture 4.0 mm) (coll. J. P. Lefort, 789); Lagoon side, 15 m, night dived in cave of coral pinnacle, paratype 8 (7.8 × 3.1 mm, aperture 3.4 mm, protoconch damaged, only last 1 1/2 embryonic whorls preserved, colour bands pale pink) (coll. J.P. Lefort, 2543).

Vanuatu: Efate Island, Port Vila, dead in sand, depth 2-3 m, x.1978, paratype 43 (7.5 × 3.1 mm, aperture 3.2 mm, faded to pink, protoconch intact) (ex A. Adams, coll. R. Salisbury).

New Caledonia: sector of Touhu, Pointe Kombounou (20°46.6'S, 165°14.1'E), shallow water, 2-3 m depth, photophil algae [Expédition Montrouzier SEP93, Stn 1253], paratypes 31-34 (9.6 × 3.8 mm, aperture 4.6 mm, dead collected, protoconch intact; 9.7 × 4.2 mm, aperture 4.6 mm, dead collected, tip of protoconch broken; 8.9 × 3.8 mm, aperture 4.2 mm, dead collected, apex worn; 8.9 × 3.4 mm, aperture 4.0 mm, probably live collected, lip thin, protoconch intact) (coll. MNHN).

Solomon Islands: N'Gela (Florida) Island, in beach sand, leg. J. Stone, 1975, paratype 44 (8.2 × 3.4 mm, aperture 3.45 mm, faded and worn) (coll. R. Salisbury).

Papua New Guinea: New Britain, Rabaul, dived at 30 m depth, on dead coral near ship wreck, 1994, paratypes 29-30 (8.2 × 3.3 mm, aperture 3.6 mm; 7.4 × 3.0 mm, aperture 3.4 mm) (coll. HT).

Mariana Islands: Guam, Apra Harbor, Fuel piers, at 2 m depth, leg. J. Rodgers, × 1977, paratype 9 (7.0 × 2.8 mm, aperture 2.8 mm, immature, lip thin and slightly broken, protoconch intact) (coll. M. Marrow, 7891A); Crashboat Basin, at 2-5 m depth, i.1978, paratypes 10-12 (7.1 × 3.0 mm, aperture 3.2 mm, apex worn; 6.4 × 2.8 mm, aperture 3.2 mm, protoconch broken, 5.3 × 2.5 mm, aperture 2.5 mm, immature, protoconch intact) (coll. M. Marrow, 7891); Jade Shoals, paratype 13 (5.2 × 2.3 mm, aperture 2.35 mm, immature, lip thin, protoconch intact) (coll. M. Marrow, 7891B); Spanish Rocks, at 9 m depth, in coral rubble, iii.1989, paratypes 14-15 (7.9 × 3.2 mm, aperture 3.7 mm, apex broken; 7.1 × 2.9

mm, aperture 3.2 mm, immature, lip thin, protoconch intact) (ex R. Goldberg in coll. HT); Jade Shoals area, at 4-5 m depth, under coral heads, 1989; paratypes 16-17 (5.5 × 2.5 mm, aperture 2.7 mm, immature, lip thin, apex broken; 5.2 × 2.2 mm, aperture 2.4 mm, immature, lip thin, protoconch intact) (ex B. Christofel in coll. HT); Glass Breakwall, deep under rocks in rubble, not uncommon, live collected, leg. F. Schroeder, viii.1993; paratype 18 (6.1 × 2.7 mm, aperture 3.0 mm, immature, lip thin and broken, protoconch intact) (coll. HT); Glass Breakwall, at 7.5 m depth, under rubble, 1996, paratype 19 (fig. 3) (8.3 × 3.2 mm, aperture 4.0 mm, colour variant) (coll. HT); Tip of Glass Breakwall, at 3-10 m depth, in rubble, paratype 20 (8.1 × 3.1 mm, aperture 3.8 mm) (coll. E. F. Schroeder); Glass Breakwall, in 4.5 m depth, under coral in rubble, paratypes 21-22 (8.2 × 3.4 mm, aperture 4.0 mm; 7.0 × 3.1 mm, aperture 3.4 mm) (coll. J. P. Lefort, 347 & 2004); Jade Shoals, under coral rubble, 4-5 m, leg. R. Salisbury, ix.1978, paratype 45 (7.8 × 3.1 mm, aperture 3.55 mm)(ex R. Salisbury in BMNH), paratype 46 (7.3 × 3.0 mm, aperture 3.3 mm)(ex R. Salisbury in ANSP), paratypes 47-48 (7.6 × 3.1 mm, aperture 3.7 mm; 7.1 × 2.7 mm, aperture 3.45 mm)(ex R. Salisbury in coll. E. G. de Suduiraut), paratypes 49-54 (6.35 × 2.6 mm, aperture 2.95 mm; 5.7 × 2.6 mm, aperture 2.8 mm; 5.6 × 2.6 mm, aperture 2.7 mm, apex missing; 5.5 × 2.7 mm, aperture 2.6 mm; 5.3 × 2.5 mm, aperture 2.4 mm; 4.8 × 2.25 mm, aperture 2.3 mm) (coll. R. Salisbury); Gorco Fuel Piers, under rubble in silt, 4-5 m, scuba, leg. R. Salisbury, 10.xi.1978, paratypes 55-56 (6.54 × 2.75 mm, aperture 3.05 mm; 6.36 × 2.61 mm, aperture 2.98 mm)(coll. R. Salisbury).

Japan: southwest Okinawa Prefecture, dredged around Iriomote Island, at 20-30 m depth, 1990, paratypes 23-28 (6.4 × 2.9 mm, aperture 3.3 mm, apex broken; 6.4 × 2.6 mm, aperture 3.0 mm, anterior part of outer lip broken, protoconch intact; 6.4 × 2.5 mm, aperture 3.0 mm, tip of protoconch and lip broken, bore holes in penultimate and body whorls; 5.9 × 2.4 mm, aperture 2.8 mm, immature, protoconch intact; 5.8 × 2.7 mm, aperture 2.8 mm, immature, protoconch intact; 5.5 × 2.5 mm, aperture 2.5 mm, immature, protoconch intact) (all coll. HT); Sakishima-shoto, Ishigaki Island, Kabira reef pass [24°27'N, 124°09'E], depth 1 m, under dead coral, leg. Hirofumi Kubo, 3.i.2002, paratype 35 (fig. 8) (8.44 × 3.47 mm, aperture 4.01 mm, live collected) (coll. OPM).

Philippines: North Palawan, paratype 42 (7.4 × 3.1 mm, aperture 3.4 mm) (coll. S. Gori).

Indonesia: Flores, paratypes 37-39 (7.6 × 3.0 mm, aperture 3.3 mm, protoconch intact; 7.4 × 3.3 mm, aperture 3.6 mm, apex broken; 6.9 × 3.0 mm, aperture 3.0 mm, tip of protoconch broken) (ex Scrigni di Teti, coll. G. Pellifroni); paratype 40 (7.6 × 3.0 mm, aperture 3.3 mm, protoconch intact) (ex Scrigni di Teti, ex G. Pellifron, in coll. HT).

East Africa: N. Mozambique, Quissimajul Bay, diver, 1-2 m; paratype 36 (7.9 × 3.0 mm, aperture 3.6 mm) (coll. T. W. Baer).

Description.— Shell small for the subgenus, up to approximately 11 mm in length and 4.5 mm in width, acutely biconoidal to fusiform in shape. Protoconch hemi-ellipsoidal with 3 well rounded, smooth, glossy, brown embryonic whorls. Teleoconch with 7-8 sculptured whorls, first two whorls straight-sided, later whorls moderately convex and slightly shouldered below sutures. Penultimate whorl with 13-15 strong axial ribs, triangular in cross-section, interstices with 5 moderately deep spiral grooves. Ultimate whorl with 14-16 strong axial ribs and 14 spiral grooves bisecting the axial ribs particularly on the lower part, giving the shell base a strongly nodulous appearance; siphonal fasciole consisting of 6 narrow and close-set oblique cords. Aperture shorter than the spire: 45% (42-49%) of total shell length, moderately narrow, 6-8 weak spiral lirae within in some distance from the edge of the outer lip; outer lip simple, not thickened, slightly crenulate; parietal side of aperture moderately glazed, inner lip thin and weakly protruding, promi-





Fig. 8. *Vexillum (Pusia) kuiperi* spec. nov., paratype 35 (height 8.44 mm, with live animal), Japan, Sakishima-shoto, Ishigaki Island, Kabira reef pass [24°27'N, 124°09'E], depth 1 m, leg. & phot. Hirofumi Kubo, i.2002.

ment callus in the posterior aperture angle. Columella with four smooth and rounded oblique plaits, decreasing in size anteriorly. Siphonal canal rather short and wide, slightly recurved, siphonal notch indistinct. The colour pattern is very striking and peculiar, specifically distinct, and allows a reliable discrimination from similar species. The spire whorls show 2 blackish-brown spiral lines, the second line being close to the suture of the next whorl. The body whorl shows four black or chocolate brown spiral lines exactly coinciding with the second, sixth, ninth, and twelfth spiral grooves; in some specimens the third line (entering the posterior part of the aperture) is indistinct, sometimes the fourth (lowest) line is indistinct; colouration between the suture and these lines is alternate red or pink (rarely light-lavender) and basic shell colour; the basic shell colour varies individually, but is ivorywhite in most specimens, rarely yellow or light-orange or light-brown. The most frequent sequence of the colour bands in the type material is: pink - ivorywhite - pink - ivorywhite - pink. The fifth colour band (at the shell base) comprises also the columellar plaits and the siphon. All 5 colour bands are visible also within the aperture behind the outer lip. "Many of live collected Guam shells are light-lavender in color when first collected, fading quickly to red-pink or pink in color" (R. Salisbury, in litt., 27.viii.2004). A colour variant with light-lavender first, third and fifth band is shown in fig. 2 (paratype 4). Another rare colour variant with a completely dark reddishbrown third band is shown in fig. 3 (paratype 19). The body of the live animal is less striking in colour than the shell: globally ivory-white varied with dark brown (fig. 8). Whereas the sole of the foot is completely ivory-white, the right lateral side of the foot shows 3-4 broad transverse stripes of dark brown spotted with white, separated by narrow white zones. The eye-stalk is brown at the base and white at the upper part; the eye is surrounded by a light-brown belt; the terminal slender tentacle is overall white. The siphonal tube is dark

Figs 1-7. *Vexillum* spec. 1-3, *Vexillum (Pusia) kuiperi* spec. nov.; 1, Holotype (height 10.3 mm), Western Samoa, Savaii Island, Asau Bay, leg. H. Bayer, v.1995 (ex HT, deposited in ZMA Moll. 4.04.039); 2, Paratype 4 (height 10.6 mm, colour variant), Marshall Islands, Kwajalein Atoll, 4-5 m, 1971 (ex A. Adams, coll. R. Salisbury); 3, Paratype 19 (height 8.3 mm, colour variant), Guam, Apra Harbor, Glass Breakwall, 7.5 m, 1996 (coll. HT); 4, *Vexillum (Pusia) purpuratum* (Reeve, 1845), lectotype of *Mitra purpurata* Reeve, 1845 (BMNH 1967853/1, height 14.8 mm), Philippines, Island of Capul (leg. H. Cuming); 5, *Vexillum (Pusia) diutenerum* (Hervier, 1897), lectotype of *Mitra (Costellaria) diutenera* Hervier, 1897 (MNHN, height 6.7 mm), Loyalty Islands, Lifu (leg. Goubin); 6, *Vexillum (Pusia) roseotinctum* (Hervier, 1897), height 7.1 mm, Western Samoa, Savaii Island, Asau Bay, leg. H. Bayer, xi.1995 (coll. G. Trappe, 5312); 7, *Vexillum (Pusia) suave* (Souverbie, 1875), height 5.5 mm, American Samoa, Tutuila Island, Fagasa Bay, leg. S. Jazwinski, v.1987 (coll. HT).

brown and spotted with white.

Distribution and habitat.— Indo-West Pacific: Mozambique, Indonesia, Philippines, Japan, Marianas, Papua New Guinea, Solomons, Vanuatu, Marshall Islands, New Caledonia, Fiji, and Western Samoa. Shallow water from 1 to 30 m depth, in rubble under rocks and coral, also in ledges and caves of reef formations.

Etymology.— Named for Dr (h.c.) Johannes Gijsbertus Jacobus Kuiper (born 3.ix.1914), well known malacologist, whose great knowledge in small molluscs (in particular Sphaeriidae) is acknowledged all over the world. On occasion of his 90th birthday, and in appreciation of his great help in the preparation of the Swiss Mollusca Atlas (Turner et al., 1998).

Discussion.— The cited confusion of *Vexillum (Pusia) kuiperi* spec. nov. with *V. (P.) purpuratum* (Reeve, 1845) has been mentioned by many collectors and dealers. The true *V. (P.) purpuratum*, originally described as *Mitra purpurata* by Reeve (1845: pl. 33 fig. 275, Island of Capul, Philippines, found under stones at low water; leg. H. Cuming) has been illustrated by Sowerby (1874: pl. 23 fig. 507), Tryon (1882: 175, pl. 52 fig. 490 only), and Turner (1989: 60, pl. 8 fig. 13, two syntypes BMNH: 14.8 and 15.9 mm). Schepman 1911: 285, without illustration reported *Turricula (Costellaria) purpurata* (Reeve, 1845) from the E-coast of Rotti Island (22 m) and from the S-coast of Bawean Island (32 m). Cernohorsky (1970: 57) transferred the same taxon as a valid species to the still accepted genus-group *Vexillum (Pusia)*. *Vexillum (P.) purpuratum* (fig. 4) differs from *V. (P.) kuiperi* spec. nov. in having a larger shell, distinctly angulated whorls at the sutures, narrower and more numerous axial ribs, an aperture longer than the spire, the body whorl with up to 12 brownish-purple spiral lines on a whitish background, lacking the alternate broad pink (or red or light-lavender) and whitish (to light-brown) zones of about equal width which are typical for *V. (P.) kuiperi* spec. nov. *V. (P.) purpuratum* is more related to *V. (P.) oniscinum* (Lamarck, 1811), *V. (P.) glandiforme* (Reeve, 1845), and *V. (P.) daedalum* (Reeve, 1845) rather than to this new species. Syntype BMNH 19670853/1 (14.8 × 6.9 mm, aperture 7.5 mm) is the best of the three types of *Mitra purpurata* and corresponds closely to Reeve's original description and type figure. It is here designated as the lectotype (fig. 4). The remaining 2 paralectotypes BMNH 19670853/2-3 are conspecific and have the dimensions 15.9 × 6.7 mm (aperture height 7.2 mm) and 13.6 × 6.3 mm (aperture height 7.5 mm). *Vexillum (P.) kuiperi* spec. nov. has been confused by Kaicher (1977: card 1459) with *V. (P.) diutenerum* (Hervier, 1897). This species was little known until its types (lectotype see fig. 5) were examined and published by Cernohorsky (1982: 102, pl. 3 figs 22-23); it is obvious that *V. (P.) diutenerum* is hardly similar to the new species, in particular due to its lacking of the typical reddish bands bordered above and below by blackish spiral lines. *V. (P.) kuiperi* spec. nov. has also been confused with *V. (P.) roseotinctum* (Hervier, 1897) (fig. 6) although again in the latter the reddish bands bordered by black lines are missing.

V. (P.) kuiperi spec. nov. could also be confused with *V. (P.) suave* (Souverbie, 1875) (fig. 7). However, that species differs by its bright pink background and one broad peripheral whitish zone which is outlined by black spiral lines, the line on the upper side branches upward between the axial ribs.

Concerning the hitherto known distribution, it is striking that the new species apparently has not yet been collected in wide areas of the Indian Ocean. Up to now only one specimen (paratype 36) from the east coast of Africa (Mozambique) has been brought to my knowledge, a location quite far away from its known occurrences in Indonesia and the Philippines. The multispiral protoconch indicates, however, that the species has a relatively long embryonic stage and its veliger-larvae may be spread passively over huge distances by ocean currents. So it will to be only a matter of time and collecting activities that the new species will be recorded from Madagascar, the Mascarene and Maldive Islands.

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REFERENCES

- CERNOHORSKY, W. O., 1970. Systematics of the families Mitridae & Volutomitridae (Mollusca: Gastropoda). – Bulletin of the Auckland Institute and Museum 8: i-iv, 1-190.
- CERNOHORSKY, W. O., 1982. Revision of J. Hervier's type-specimens of Mitracea (Mollusca, Gastropoda) from the Loyalty Islands. – Bulletin Muséum national d'Histoire naturelle Paris (4) 3: 93-109.
- KAICHER, S. D., 1977. Mitridae part 4. – Card catalogue of world-wide shells, pack 15: cards 1435-1540.
- REEVE, L. A., 1844-1845. Monograph of the genus *Mitra*. London: Conchologia Iconica 2: pls 1-27 (1844), pls 28-39 (1845), temporary index 4 pp.
- SALISBURY, R., 1985. More about shell on the I.D. page. – Hawaiian Shell News 33 (7): 8-9.
- SALISBURY, R., 2000. Costellariidae of the World, Part 3. – Of Sea and Shore 23(1): 4-14.
- SCHEPMAN, M. M., 1911. The Prosobranchia of the Siboga-Expedition, Part 4, Rhachiglossa. In: Siboga-Expeditie 49d (pt. 4): 247-363. Leiden.
- SOWERBY, G. B. II & G. B. SOWERBY III. 1874. A monograph of the genus *Mitra*. Thesaurus Conchylorum, Monographs of genera of shells 4: 1-46.
- TRYON, G. W., 1882. Family Mitridae. In: Manual of Conchology, Structural and Systematic 4: 106-276.
- TURNER, H., 1989. Ungewöhnliche und neue Mitroidea aus dem Indopazifik, Teil 1. - Club Conchylia Informationen 21(5-6): 31-62.
- TURNER, H., 2001. Katalog der Familie Costellariidae Macdonald (Gastropoda: Prosobranchia: Muricoidea), Katalog supraspezifischer Taxa, Katalog infragenerischer Taxa, Bibliographie: 1-100. Hackenheim.
- TURNER, H., J.G.J. KUIPER, N. THEW, R. BERNASCONI, J. RÜETSCHI, M. WÜTHRICH & M. GOSTELI, 1998. Fauna helvetica 2: Atlas der Mollusken der Schweiz und Liechtensteins: 1-527. Neuchatel.