

PSEUDOCEROS (PLATYHELMINTHES: POLYCLADIDA) FROM THE INDO-PACIFIC WITH TWELVE NEW SPECIES FROM AUSTRALIA AND PAPUA NEW GUINEA

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ABSTRACT. - New records of previously described species of *Pseudoceros* from eastern and western Australia, Indonesia, Philippines, Micronesia and Kenya are presented. In addition, twelve new species of *Pseudoceros* are described from subtropical and tropical waters of Australia and eastern Papua New Guinea. Species are diagnosed on the basis of their dorsal colour pattern, though details of the reproductive anatomy are also given.

KEYWORDS. - *Pseudoceros*, Platyhelminthes, Polycladida, Taxonomy.

INTRODUCTION

Although Marcus (1950), Hyman (1959), Faubel (1984) and Prudhoe (1985; 1989) listed over 150 species of *Pseudoceros* worldwide, Newman & Cannon (1994a) considered that only 26 were reliable. Many species have been described from immature animals, with little or no colour documentation and rarely have the reproductive organs been studied or type material deposited. Presently we recognise over 47 species of *Pseudoceros* world-wide (Newman & Cannon, 1994a; Newman, Cannon & Brunckhorst, 1994; Newman & Anderson, 1997), but numbers are probably much higher (Newman & Cannon, 1994a, b).

Within the Pseudocerotidae, genera can be separated by their distinct colour patterns since no recognisable differences occur in the reproductive anatomy (Newman & Cannon, 1994a; 1995a; 1996a, b). Further, observations (Michiels & Newman, unpublished) on copulatory behaviour suggest that morphological isolating mechanisms do not operate in these animals. Presumably they use chemical cues for intra and inter-species recognition.

Twelve new species of *Pseudoceros* are described here from Madang, Papua New Guinea and eastern and western Australia. In addition, twelve new records from Australia, Indonesia, Philippines, Micronesia and Kenya are given for the following species described or redescribed by Newman & Cannon (1994a): *P. bifurcus* Prudhoe, 1989; *P. bimarginatus* Meixner, 1907; *P. bolool* Newman & Cannon, 1994; *P. ferrugineus* Hyman, 1959; *P. goslineri* Newman & Cannon, 1994; *P. imitatus* Newman, Cannon & Brunckhorst, 1994; *P. jebborum* Newman & Cannon, 1994; *P. laticlavus* Newman & Cannon, 1994; *P. lindae* Newman & Cannon, 1994; *P. paralaticlavus* Newman & Cannon, 1994; *P. prudhoei* Newman & Cannon, 1994; and *P. sapphirinus* Newman & Cannon, 1994.

MATERIAL AND METHODS

Polyclads were collected from Heron Island (23° 27' S, 151° 55' E) and One Tree Island (23° 30' S, 152° 05' E), southern Great Barrier Reef (GBR); Myora, North Stradbroke Island (27° 29' S, 153° 25' E) and Point Halloren, Redland Bay (27° 34' S, 153° 18' E), Moreton Bay, southeast Queensland (SE Qld.); Lizard Island (14° 40' S, 145° 28' E), northern GBR; Coral Bay, (23° 9' S, 113° 46' E), Western Australia (WA); Madang (5° 14' S, 145° 45' E) and Laing Island (4° 16' S, 144° 56' E), Papua New Guinea (PNG). Additional records were supplied from the central GBR, southeast Queensland, northern New South Wales, Australia; Indonesia; Singapore; Micronesia; and Kenya.

Animals were hand collected from under coral rubble or boulders on the reef crest or near the low water mark inshore: others were collected by scuba from under ledges or rubble on the reef slope. Specimens were kept in separate containers, brought back to the laboratory live, and then retained in non-aerated 2 litre containers. Photographs were taken either in situ or in the laboratory. Unless otherwise stated all animals were collected and photographed by L.J.N. and A.E. Flowers.

Polyclads were fixed on frozen polyclad fixative (Newman & Cannon, 1995b). After fixation for at least 48 hours specimens were preserved in 70% ethanol. Whole mounts were prepared by first staining with Mayer's haemalum, then dehydrating in graded alcohols and mounting in Canada balsam. Longitudinal serial sections of the reproductive region were prepared by embedding excised tissue in Paraplast (56 ° C), sectioning at 5 - 7 µm and staining with haematoxylin and eosin Y. When possible, only mature animals were prepared for serial sections and wholemounts.

Drawings (following the convention top = anterior, for whole mounts; right = anterior, for sections) and measurements were made with the aid of a camera lucida by L.J.N. and K.A. Jennings. Measurements are from type specimens and due to the plasticity of these animals are to be used as a guide only. Body measurements are expressed in mm (length x width) and were taken from live animals in a quiescent state. As an indication of abundance the number of animals collected is given as rare (1 - 5), common (6 - 20) or abundant (> 21 animals). Presentation of the reproductive anatomy derived from sections of a paratype is given with minimal interpretation.

Descriptions of colour patterns are based on living animals. Colour Groups based on the dorsal colour pattern are modified from Newman & Cannon (1994a) (Table 1). Colours (colour number in parenthesis) refer to Pantone Colors by Letraset 1989 Series U. All material is lodged at the Queensland Museum (QM): wet specimens in 70% ethanol are designated

Table 1. Heuristic arrangement of colour pattern groups of *Pseudoceros* (modified from Newman & Cannon, 1994a)

| # | Background Colour Pattern | Recognised Species | New Species |
|---|------------------------------------|---|---|
| 1 | Plain without pattern | <i>P. bolool</i> - black <i>P. perviolaceus</i> - purple | |
| 2 | Plain with distinct marginal bands | <i>P. bimarginatus</i> - white: orange, black & yellow margin <i>P. confusus</i> - white: black, orange, black & yellow margin <i>P. contrarius</i> - white: yellow, black, orange margin <i>P. gamblei</i> - white: blue margin <i>P. intermittus</i> - white: orange, black, yellow interrupted margin <i>P. litoralis</i> - brown: orange & black margin <i>P. depiliktabub</i> - black: green & cream & yellow margin <i>P. jebborum</i> - orange: black & orange margin <i>P. periaurantius</i> - black: orange margin <i>P. peripurpureus</i> - black: violet & purple margin <i>P. prudhoei</i> - brown: blue & yellow margin <i>P. sapphirinus</i> - black: blue lateral band <i>P. verecundus</i> - cream: orange & black interrupted margin | <i>P. lactolimbus</i> - black, white margin <i>Pseudoceros</i> sp. 1 - black, white & orange margin |
| 3 | Plain with longitudinal stripes | <i>P. bifasciatus</i> - purple: 2 black stripes, orange & white margin <i>P. bifurcus</i> - blue: 1 median stripe, orange & white <i>P. dimidiatus</i> - black: 2 yellow stripes, orange margin <i>P. gravieri</i> - blue: many yellow stripes <i>P. kelaartii</i> - purple mottled: 3 white stripes <i>P. laticlavus</i> - black: median white stripe, white margin <i>P. monostichos</i> - cream: median black line, blue, purple, green margin <i>P. paralaticlavus</i> - black: median white stripe, white & yellow margin <i>P. susanae</i> - blue: orange and white stripe, red margin <i>P. tristriatus</i> - blue, 3 orange stripes <i>P. violaceus</i> - purple: 1 yellow median stripe, yellow margin | <i>P. imperatus</i> - brown: yellow branching stripe, orange margin |
| 4 | With spots & dots | <i>P. atropurpeus</i> - purple: white dots <i>P. concinnus</i> - cream: blue spots <i>P. ferrugineus</i> - red: white regular dots, orange margin | <i>P. cruentus</i> - red: cream dots & blotches <i>P. josei</i> - black: white & yellow dots <i>P. laingensis</i> - cream: purple spots |

Table 1. Continued

| # | Background Colour Pattern | Recognised Species | New Species |
|---|------------------------------------|--|---|
| | | <i>P. goslineri</i> - cream & brown: pink, purple spots and dots | <i>P. rubronanus</i> - red: white irregular dots |
| | | <i>P. heronensis</i> - cream: brown & white dots, yellow margin | <i>Pseudoceros</i> sp. 2 - yellow: purple spots |
| | | <i>P. leptostictus</i> - cream: orange & black spots, interrupted margin | |
| | | <i>P. memoralis</i> - white: brown dots & interrupted margin | |
| | | <i>P. mosambicus</i> - black: greenish spots | |
| | | <i>P. ouini</i> - cream: pink spots at margin | |
| | | <i>P. pardalis</i> - brown: yellow spots | |
| | | <i>P. pius</i> - yellow: red & black spots | |
| | | <i>P. vinosus</i> - red: yellow & white speckles | |
| 5 | Background mottled | | <i>P. kylie</i> - black & cream: orange & brown interrupted margin <i>P. simpsoni</i> - brown & cream: orange & black interrupted margin |
| 6 | Background with maculae or patches | <i>P. glaucus</i> - grey: black maculae <i>P. imitatus</i> - black: green or pink patches in raised pustules <i>P. lindae</i> - burgundy: yellow & blue maculae <i>P. scintillatus</i> - black: yellow maculae, orange margin | <i>P. scriptus</i> - white: black patches, orange margin |
| 7 | Transverse streaks & stripes | <i>P. zebra</i> - yellow: black streaks, orange margin <i>P. felis</i> - grey mottled: black bifurcating stripes & spots | |
| 8 | Reticulate Colour indeterminate* | <i>P. fuscogriseus</i> , <i>P. langemaakensis</i> & <i>P. tomiokaensis</i> | <i>P. irretitus</i> - red: white line |

* colour pattern not given in original description, but sufficient details provided from preserved specimens for generic determination.

(S), wholemounts (WM) and serial sections (LS). Colour transparencies (CT) are held by L.J.N.

TAXONOMY

FAMILY PSEUDOCEROTIDAE LANG, 1884

Pseudoceros Lang, 1884

(Figs. 1A-D, 2)

Proceros velutinus Blanchard, 1847; deposition of type unknown, painting only?

Pseudoceros velutinus (Blanchard, 1847); Lang, 1884: 49, 538; Plehn, 1896: 4, 9; Palombi, 1928: 605; Prudhoe, 1985: 131, Faubel, 1984: 208, Newman & Cannon, 1994a: 214 - 216. Gender: masculine.

Diagnosis. - Emended from Newman & Cannon, 1994a. Body soft, oval, flat medially, few marginal ruffles, blunt or tapering slightly posteriorly (Figs. 1A, B). Pseudotentacles simple

folds or broad flaps formed from the anterior margin (Figs. 1C, D). Cerebral eyespot horseshoe shaped with 20 to 60 eyes in semicircular rows, usually in an inverted heart shaped or clear oval area. Dorsal pseudotentacular eyes in two to three scattered lines along the anterior margin; ventral pseudotentacular eyes more numerous, extending medially to the pseudotentacular tips in two loose clusters. Pharynx anterior with about seven (one anterior, four lateral and two posterior) highly ruffled, deep, complex pharyngeal folds (Fig. 1B). Intestine narrow, extends towards and ends prior to the posterior margin, numerous lateral branches. One male pore situated posterior to the pharynx, usually between posterior pair of pharyngeal lobes. Female pore well separated from male pore, equidistant from it and sucker. Sucker distinct, mid-body. Male copulatory apparatus single with seminal vesicle and armed penis papilla, prostate orientated antero-dorsally (Fig. 2). Vas deferens branched or unbranched.

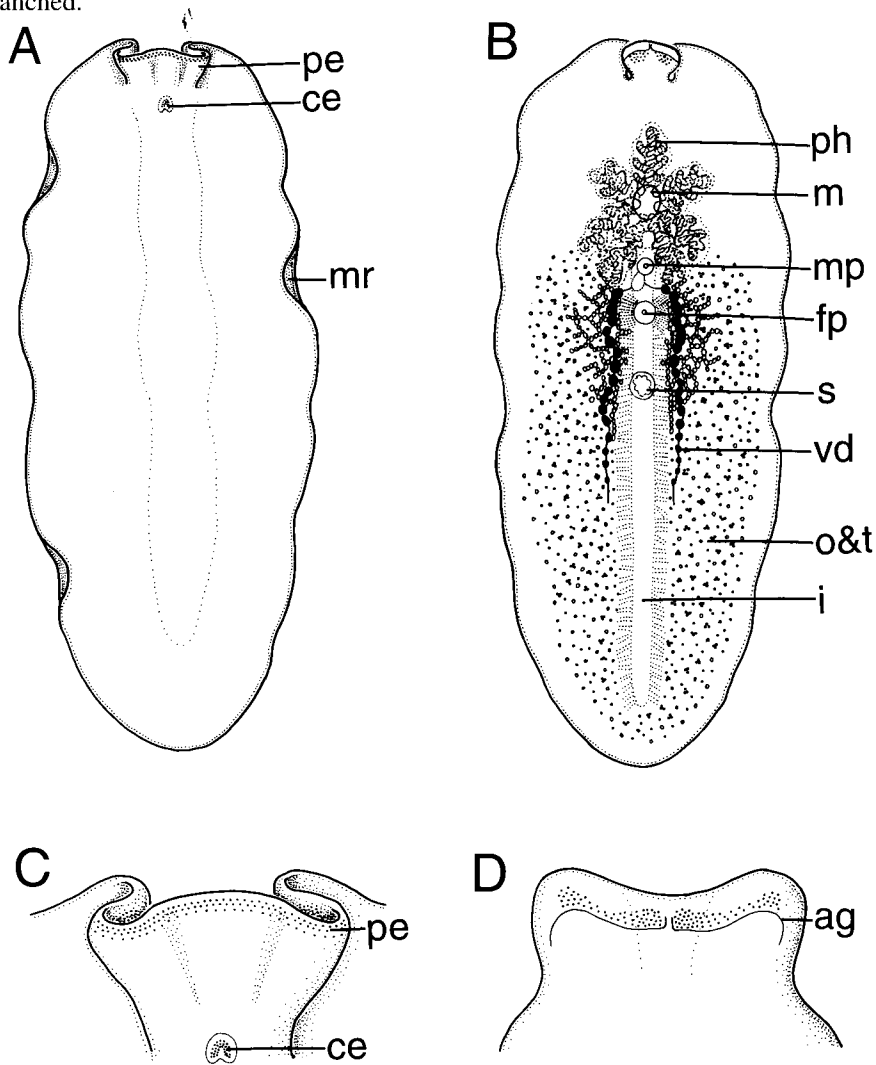


Fig. 1. Diagrams of *Pseudoceros*, A) morphology of the dorsal surface, B) morphology of the ventral surface and internal anatomy; morphology of the pseudotentacles and eyes, C) dorsally, D) ventrally (after Newman & Cannon, 1994a) (Legends for all figures: ag - auricular groove, ce - cerebral eyes, cg - cement glands, fp - female pore, i - intestine, m - mouth, mp - male pore, mr - margin ruffles, o - ovaries, ov - oviducts, p - prostate, pe - pseudotentacular eyes, ph - pharynx, s - sucker, st - stylet, sv - seminal vesicle, t - testes, v - vagina, vd - vas deferens).

The following 47 species may be reliably placed in *Pseudoceros* sensu stricto based on the morphology of the pharynx, eyes, pseudotentacles or reproductive anatomy: *P. atropurpeus* Kato, 1938; *P. bifasciatus* Prudhoe, 1989; *P. bifurcus* Prudhoe, 1989; *P. bimarginatus* Meixner, 1907; *P. bolool* Newman & Cannon, 1994; *P. concinnus* (Collingwood, 1876); *P. confusus* Newman & Cannon, 1995; *P. contrarius* Newman & Cannon, 1995; *P. depiliktatub* Newman & Cannon, 1994; *P. dimidiatus* von Graff, 1893; *P. felis* Newman & Cannon, 1994; *P. ferrugineus* Hyman, 1959; *P. fuscogriseus* Hyman, 1959; *P. gamblei* Laidlaw, 1902; *P. glaucus* Prudhoe, 1989; *P. goslineri* Newman & Cannon, 1994; *P. gravieri* Meixner, 1907; *P. heronensis* Newman & Cannon, 1994; *P. imitatus* Newman, Cannon & Brunckhorst, 1994; *P. intermittus* Newman & Cannon, 1995; *P. jebborum* Newman & Cannon, 1994; *P. kelaartii* (Collingwood, 1876); *P. langemaakensis* Faubel, 1984; *P. laticlavus* Newman & Cannon, 1994; *P. leptostictus* Bock, 1913; *P. lindae* Newman & Cannon, 1994; *P. litoralis* Bock, 1913; *P. memorialis* Kato, 1938; *P. monostichos* Newman & Cannon, 1994; *P. mossambicus* Prudhoe, 1989; *P. ouini* Newman & Cannon, 1994; *P. paralaticlavus* Newman & Cannon, 1994; *P. pardalis* Verrill, 1900; *P. periaurantius* Newman & Cannon, 1994; *P. peripurpureus* Newman & Cannon, 1994; *P. perviolaceus* (Schmarda, 1859); *P. pius* Kato, 1944; *P. prudhoei* Newman & Cannon, 1994; *P. sapphirinus* Newman & Cannon, 1994; *P. scintillatus* Newman

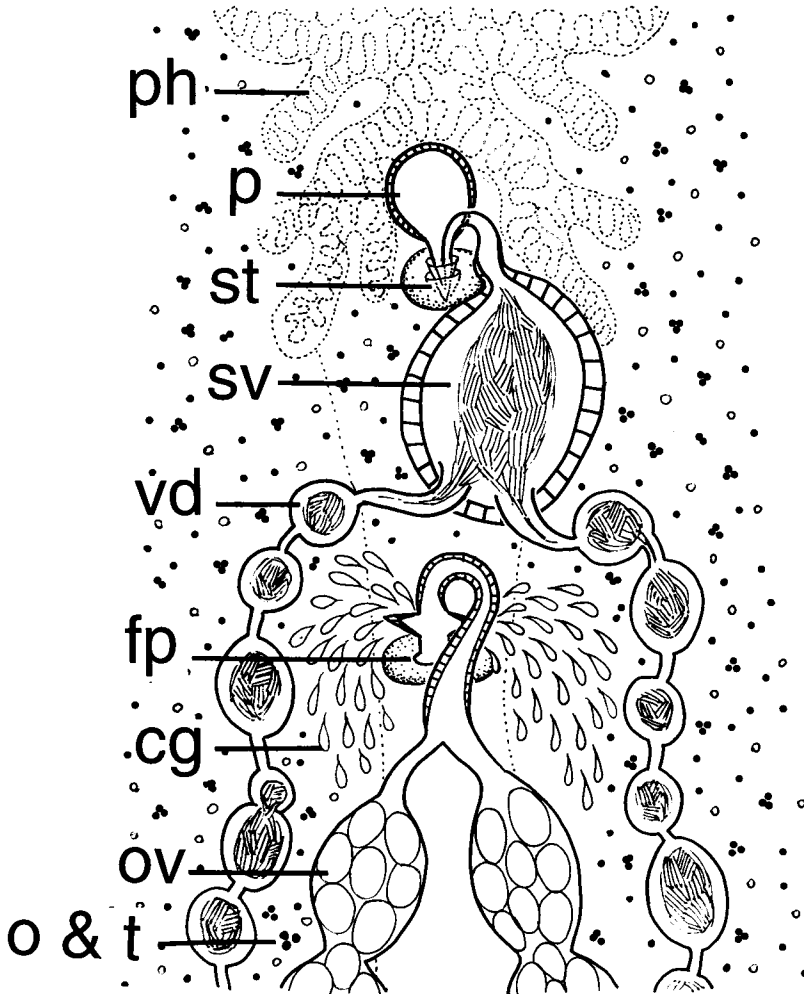


Fig. 2. Diagrammatic representation of the reproductive anatomy of *Pseudoceros* from dorsal surface.

& Cannon, 1994; *P. susanae* Newman & Anderson, 1997; *P. tomiokaensis* Kato, 1938; *P. tristriatus* Hyman, 1959; *P. verecundus* Newman & Cannon, 1994; *P. vinosus* Meixner, 1907; *P. violaceus* (Kelaart, 1858); *P. zebra* (Leuckart, 1828).

Pseudoceros bifurcus Prudhoe, 1989

Pseudoceros dimidiatus - von Graff, 1893; George & George, 1979: 43, pl. 49 fig. 7 [not *Pseudoceros dimidiatus* von Graff, 1893].

Pseudoceros unidentified species; Stummer-Traunfels, 1933: pl. 1, fig. 17.

Pseudoceros liparus - Marcus, 1950; Coleman, 1990: 30 [not *Pseudoceros liparus* Marcus, 1950].

Pseudoceros bifurcus Prudhoe, 1989: 78, fig. 20; Newman & Cannon, 1994a: 216-218, figs. 9a-c, 46a; Gosliner, Behrens & Williams, 1996: 104, fig. 346.

Material examined. - CT, 3 to 20 m, outer barrier, off Lizard Is., N GBR, 8 Apr. 1995; CT, 3 to 15m, outer barrier, off Lizard Is., 8 Apr. 1995 ; CT, #IN95-332 D, 10 m, Manado, Sulawesi, Indonesia, S. Weinberg, no date.

Habitat & distribution. - Found under ledges (usually on ascidian prey) on reef slope. Abundant from S GBR; rare from the central GBR, Madagascar (Newman & Cannon, 1994a) and the Philippines (Gosliner et al., 1996). New records: Rare from Lizard Is., N GBR and Manado, Sulawesi, Indonesia.

Pseudoceros bimarginatus Meixner, 1907

Pseudoceros bimarginatum Meixner, 1907: 465 - 468, pl. XXV figs. 5, 6, pl. XXVI, figs. 17, 18; Marcus, 1950: 84.

Pseudoceros - undescribed species Stummer-Traunfels, 1933: pl. 7.

Pseudoceros corallophilus Hyman, 1954: 223, fig. 2; Faubel, 1984: 207; Coleman 1990: 31; Cannon & Newman, 1993: 83, pl. 4.

Pseudoceros bimarginatus Prudhoe, 1985: 194; Prudhoe, 1989: 78 - 79; Newman & Cannon, 1994a: 217- 218, figs. 10a-c, 46b; Gosliner et al., 1996: 104, fig. 347.

Material examined. - CT, Kwajalein, Marshall Islands, S. Johnson, no date.

Habitat & distribution. - Found moving across boulders or sand during the day on the reef crest. Common from S GBR; rare from the central GBR, Somalia, Philippines (Newman & Cannon, 1994a) and Djibouti (Gosliner et al., 1996). New records: Kwajalein, Marshall Islands.

Pseudoceros bolool Newman & Cannon, 1994a

Newman & Cannon, 1994a: 218-219, figs. 11a-c, 46c.

Material examined. - CT, 3 m, under rubble, Lizard Is. Lagoon, N GBR, 2 Mar. 1995; CT, 3 m, under rubble, inside ascidian, 10 Mar.1995; S (QM G210997), under rubble, reef crest, Heron Is., S GBR, 9 Mar.1997.

Habitat & distribution. - Usually found on colourless, transparent, encrusting colonial ascidians under boulders at the reef crest or from under rubble on the reef slope. Common from Heron Is. and rare from One Tree Is., S GBR and Madang, PNG (Newman & Cannon, 1994a). New record: Lizard Island, N GBR.

Pseudoceros cruentus, new species

(Figs. 3A-C, 15A)

Material examined. - Holotype - WM (QM G210847), under rubble, reef crest, One Tree Is., S GBR, 14 Sep.1992.

Paratypes - WM (QM G210842), Heron, Is., S GBR, 16 Feb. 1992; LS (QM G210938), 19 Feb.1992; LS (QM G210936), under rubble, reef crest, One Tree Is., S GBR, 15 Jun.1992; WM (QM G210841); LS (QM G210935), Heron Is., 7 Aug.1992 ; WM (QM G210843); WM (QM G210844), 9 Jun.1992.

Other material - WM (G210937), under rubble, reef crest, Heron Is., 13 Jun.1991; S (QM G210972), 2 spec., 4 Feb.1992; S (QM G210973), 22 Feb. 1992; LS (QM G210939), One Tree Is., 13 Jun.1992; WM (QM G210845); WM (QM G210846), 14 Sep.1992; S (QM G210974), 14 Jun.1992; S (QM

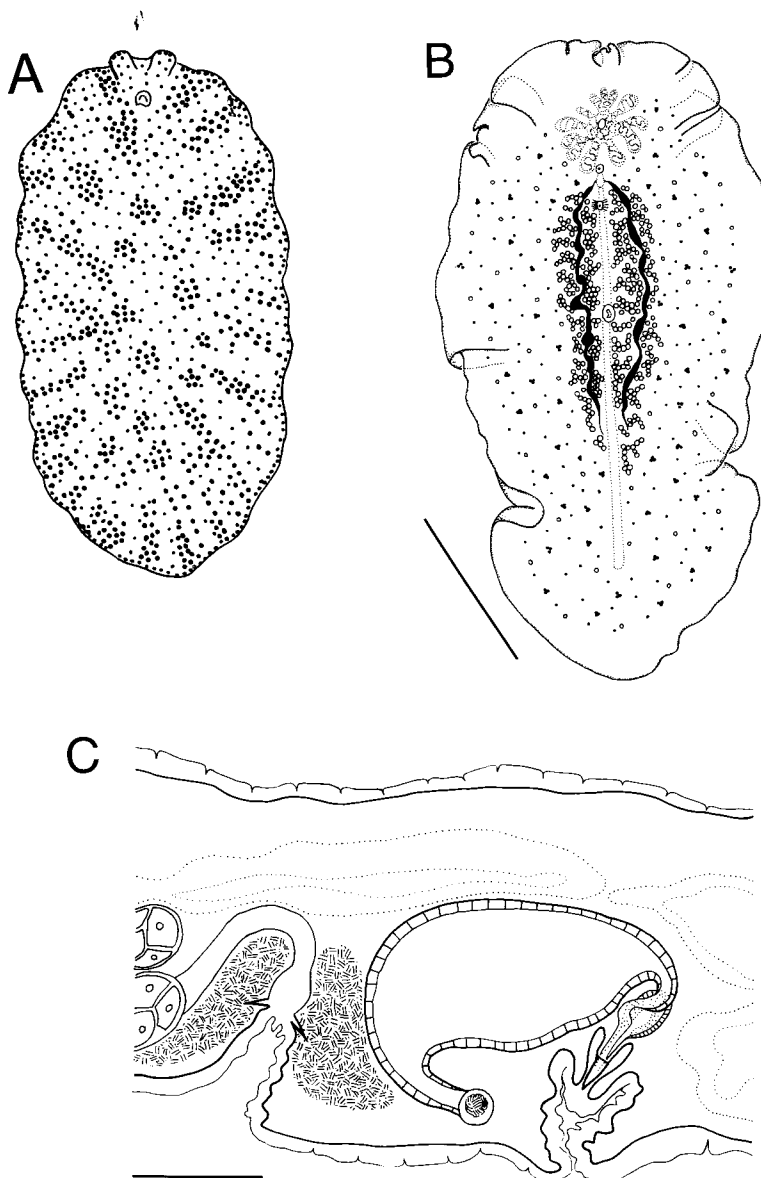


Fig. 3. *Pseudoceros cruentus*, new species., A) diagram of the dorsal surface, B) wholemount from the ventral side, C) reconstruction of the male structures. Scales: B= 5 mm, C= 250 μ m.

G210970), 2 spec., under rubble on ascidians, reef crest, Heron Is., 3 Feb.1993; S (QM G210971), 2 spec., 8 Feb.1993; S (QM G210967), 14 Jun.1995; S (QM G210969), 2 spec., 15 Jun.1995; S (QM G210968), 10 Mar.1997. Record: CT, Chuuk, Micronesia, P. Schupp, no date.

Description. - Colour and pattern variable. Background mottled deep red (Rubine or 199U), pigment granular; raised cream microdots, scattered in irregular flecks and blotches over the dorsal surface, especially on the margin (Figs. 3A, 15A). Ventrally light red. Body extremely fragile and soft, rounded oval, margin not ruffled but indented. Pseudotentacles extremely small and close together. Cerebral eyespot small with about 20 eyes. Dorsal pseudotentacular eyes few and appear embedded in the epidermis, ventral eyes few. Size range: 4 x 2.5 mm (immature) to 35 x 18 mm (mature).

Vas deferens unbranched (Fig. 3B). Seminal vesicle relatively large, oblong (1 mm long); prostate oval (120 µm long); stylet 75 µm long x 25 µm wide, length: width ratio = 1: 0.3; male antrum deep (Fig. 3C).

Diagnosis. - Red with irregular dots and blotches of cream.

Etymology. - Named from the Latin (masculine), *cruentus* = blood red, for its colour.

Remarks. - This species belongs in Group 4 (Table 1). Two other species are also red, *P. ferrugineus* and *P. vinosus*. However, *P. ferrugineus* has evenly spaced white dots (vs. irregular cream) and a distinct orange margin (vs. no marginal band) and *P. vinosus* has evenly spaced yellow and white speckles (vs. irregular cream dots and blotches).

Often several were found together embedded in the cloacal chamber of a brown colonial ascidian. Bright red egg masses, one layer thick, were found on the outside of the ascidian's test. These flatworms were also found to extrude red mucus when disturbed.

Habitat & distribution. - Found associated with colonial ascidians under rubble at the reef crest. Abundant from Heron Is. and One Tree Is., S GBR; rare from Madang, PNG and Chuuk, Micronesia.

Pseudoceros ferrugineus Hyman, 1959

Pseudoceros ferrugineus Hyman, 1959: 571, fig. 9 b,c; Prudhoe, 1977: 586; Cannon & Newman, 1993: 83, pl. 4; Newman & Cannon, 1994a: 222-223, figs. 15a-c, 47a; Erhardt & Moosleitner, 1995: 512; Gosliner et al., 1996: 106, fig. 352.

Pseudobiceros ferrugineus Faubel, 1984: 216.

Pseudoceros kentii von Graff, 1893: 362, pl. XIII, fig. 1; Poulter, 1987: 48, pl. 2.I.3. a.

Material examined. - CT, Flores, Indonesia. C. Anderson, Oct. 1989; S (QM G210956), under rubble, reef crest, Heron Is., S GBR, 11 Jun.1995; S (QM G213880), 15 Jun.1995; S (QM G210957), 14 Jun.1995; S (QM G210802), 5 to 10 m, Exmouth, WA, 24 Apr.1996; S (WAM 184-96), 6 m, N Coral Bay, WA, 2 May.1996;

Habitat & distribution. - Found on colonial ascidians under boulders on the reef crest or reef slope. Common from Heron Is., S GBR; rare from the central GBR, Micronesia, Philippines (Newman & Cannon, 1994a), Sri Lanka (Erhardt & Moosleitner, 1995), Palau and Hawaii (Gosliner et al., 1996). New records: Exmouth and Coral Bay, WA and Flores, Indonesia.

***Pseudoceros goslineri* Newman & Cannon, 1994**

Pseudoceros goslineri Newman & Cannon, 1994a: figs. 16a-c, 47b; Gosliner et al., 1996: 106, fig. 353; Newman & Anderson, 1997: 249, fig. 1.

Material examined. - CT, Flores, Indonesia, C. Anderson, Oct.1989; S (QM G210977), 4 m, reef crest, Lizard Is. Lagoon, N GBR, H. & C. Peterken, 7 Apr.1994; S (QM G210976), 6 m, outer barrier, off Lizard Is., 8 Apr.1995.

Habitat & distribution. - Found under boulders at the reef crest. Rare from Heron and One Tree Is., S GBR; Madang, PNG (Newman & Cannon, 1994a); Tanzania, Maldives (Gosliner et al., 1996) and Chagos (Newman & Anderson, 1997). New records: Lizard Island, N GBR and Flores, Indonesia.

***Pseudoceros imitatus* Newman, Cannon & Brunckhorst, 1994**

Pseudoceros imitatus Newman, Cannon & Brunckhorst, 1994a: 19-25, figs. 1a-c, 2 a,b; Gosliner et al., 1996: 106, fig. 354.

Material examined. - S (QM G210712), 10 m, reef slope, Heron Is., S GBR, 22 Mar.1995, A. Flowers; S (QM G210713), 6 m, reef slope, MacGuillvray's Reef, off Lizard Is., N GBR, 6 Apr.1995; S (QM G210714), 4 m, under rubble, Lizard Is. Lagoon, 7 Apr.1995.

Habitat & distribution. - Found out on the reef slope. Rare from PNG and the central GBR (Newman et al., 1994). New records: Lizard Is., N GBR and Heron Is., S GBR.

***Pseudoceros imperatus*, new species**

(Figs. 4A-C, 15B)

Pseudoceros sp. Fossa & Nilsen, 1996: 71.

Material examined. - Holotype - WM (QM G210947), 3 m, under rubble, reef crest, N Madang, PNG, 1 Apr.1994.

Paratypes - LS (QM G210924) same data as holotype; WM (QM G210948), 12 May.1994.

Description. - Background dark brown (484U), darker towards the margin, with a prominent central stripe which has branches in yellow-green (393U) and white around the borders, margin orange (150U), extending across the pseudotentacles (Figs. 4A, 16A). Ventrally pink-cream medially, slightly brown laterally with faint orange margin, ovaries purple-red. Pseudotentacles small and close together (Fig. 4B). Cerebral eyespot with about 30 eyes. Relatively small species, size range: 10 x 4 mm to 12 x 8 mm (mature).

Vas deferens unbranched. Seminal vesicle rounded oblong (700 µm long); prostate round (340 µm wide), prostatic duct short; stylet long and narrow (330 µm long x 80 µm wide), stylet length: width ratio = 1: 0.2 (Fig. 4C). Male antrum moderately wide.

Diagnosis. - Brown with median branching stripe in yellow-green, margin orange.

Etymology. - Named after the Latin (masculine), *imperatus*= imperial, for its commanding and bold pattern.

Remarks. - This species belongs to Group 3 (Table 1) and is the only species with a branching median stripe.

Habitat & distribution. - Found on encrusting colonial ascidians under coral rubble at reef crest. Rare from Madang, PNG.

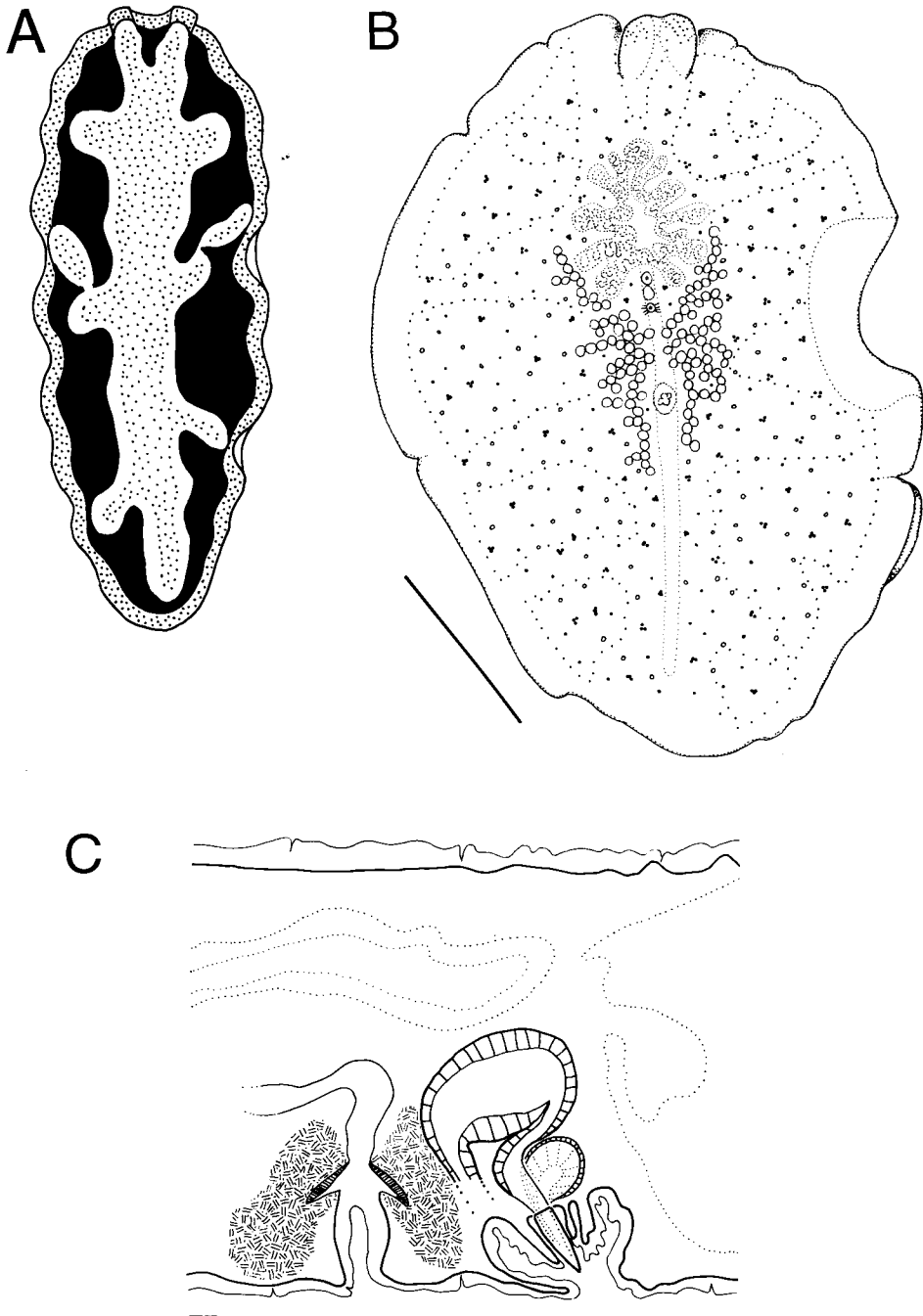


Fig. 4. *Pseudoceros imperatus*, new species, A) diagram of the dorsal surface, B) wholemount from the ventral side, C) reconstruction of the male structures. Scales: B= 2 mm, C= 500 μ m.

Pseudoceros irretitus, new species

(Figs. 5A-C, 15C)

Material examined. - Holotype - WM (G210849), under rubble, reef crest, One Tree Is., 14 Jun. 1992.

Paratypes - WM (QM G210848), under rubble, reef crest, Heron Is., 14 Aug. 1992; LS (QM G210929), One Tree Is., 11 Jun. 1992; WM (QM G211085), 14 June 1992; LS (G210928), Heron Is., 8 Feb. 1993.

Other material - S (QM G210993), reef crest, Heron Is., S GBR, 12 Aug. 1992; S (QM G210991), 17 Aug. 1993; S (QM G210990), 7 spec., under rubble on ascidians, reef crest, One Tree Is., S GBR, 11 Sep. 1992; WM (QM G210850), 13 Aug. 1993; WM (QM G210851); S (QM G210992), 14 Aug. 1993; LS (QM G210927), 19 Aug. 1993; S (QM G210906), 9 Sep. 1996; WM (QM G211086) 9 Sep. 1996.

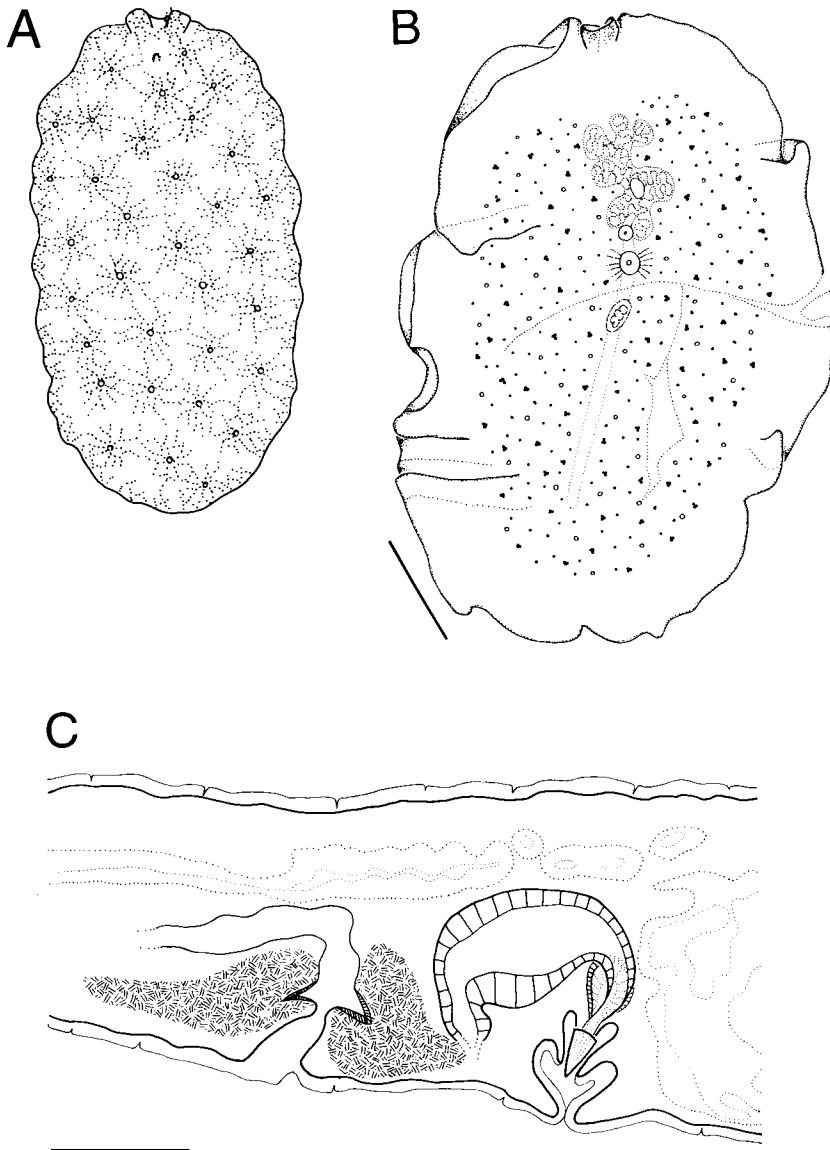


Fig. 5. *Pseudoceros irretitus*, new species. A) diagram of the dorsal surface, B) wholemount from the ventral side, C) reconstruction of the male structures. Scales: B= 2 mm, C= 250 μ m.

Description. - Background colour variable; bright red (185U) in juveniles to pale red (191U) in larger animals with a fine, white reticulate pattern of irregular squares and evenly dispersed, scattered, large raised white dots (Figs. 5A, 15C). Ventrally lighter red. Body rounded oval with few if any shallow marginal ruffles. Pseudotentacles small, close together (Fig. 5B). Cerebral eyespot in a clear oval area with about 20 eyes. Dorsal pseudotentacular eyes few (appearing embedded in the epidermis), about 20 eyes ventrally. Small species, size range: 6 x 3 mm (immature) to 28 x 8 mm (mature).

Seminal vesicle rounded oblong (378 μ m long); prostate oval (107 μ m long); stylet 88 μ m long x 44 μ m wide, length: width ratio = 1: 0.5; male antrum narrow (Fig. 5C).

Diagnosis. - Red with a fine reticulate pattern of white lines and evenly dispersed white, raised dots.

Etymology. - Named from the Latin (masculine), *irretitus* = net-like, for its dorsal colour pattern.

Remarks. - This species is the only species belonging to Group 8 (Table 1). It appears to be cryptically coloured when found on coralline algae or burgundy colonial ascidians.

Habitat & distribution. - Found on coralline algae or burgundy colonial ascidians under rubble at the reef crest. Common from Heron and One Tree Is., S GBR.

***Pseudoceros jebborum* Newman & Cannon, 1994**

Pseudoceros jebborum Newman & Cannon, 1994a: 226-227, figs. 19a-c, 47f; Gosliner et al., 1996: 106, fig. 355.

Material examined. - S (QM G210829), under rubble, reef crest, Heron Is., S GBR, 20 Mar.1996; S (QM G210806) 10 m, under rubble, reef slope, 31 Mar.1996; S (QM G210807), 6 m, under rubble, S Coral Bay, WA, 30 Apr.1996.

Habitat & distribution. - Found under rubble on the reef crest or slope. Rare from Heron Is., S GBR, Madang, PNG (Newman & Cannon, 1994a) and Hawaii (Gosliner et al. 1996). New records: Coral Bay, WA.

***Pseudoceros josei*, new species (Figs. 5A-B, 15C)**

Material examined. - Holotype - WM (QM G210954), 4 m, under rubble, reef crest, N Madang, PNG, 25 Jun.1992.

Paratype - LS (QM G210926), same data as holotype, 24 Mar.1995.

Description. - Background transparent black; covered with numerous small, densely packed, and evenly spaced regular yellow spots; spots becoming smaller and tending to white marginally; margin with concentrated small white spots (Figs. 5A, 15D). Ventrally black-grey without spots. Cerebral eyespot in grey area with about 50 eyes, pseudotentacular eyes not visible due to dark pigment. Size range: 8 x 10 mm to 20 x 10 mm (all mature).

Vas deferens branched (Fig. 6B). Seminal vesicle rounded oblong (935 μm long); prostate oval (485 μm wide); stylet wide (250 μm long & 155 μm wide), length: width ratio = 1: 0.6; male antrum deep (Fig. 6C).

Diagnosis. - Transparent black with densely packed, regular yellow and white spots.

Etymology. - Named in honour of Mr Jose L. Newman.

Remarks. - This species belongs to Group 4 (Table 1). Only one other species, *P. mossambicus* Prudhoe, 1989, is black with spots, however the spots are green and appear as irregular maculae (vs. yellow and white regular spots).

Habitat & distribution. - Found under rubble from the reef crest. Rare from Madang, PNG.

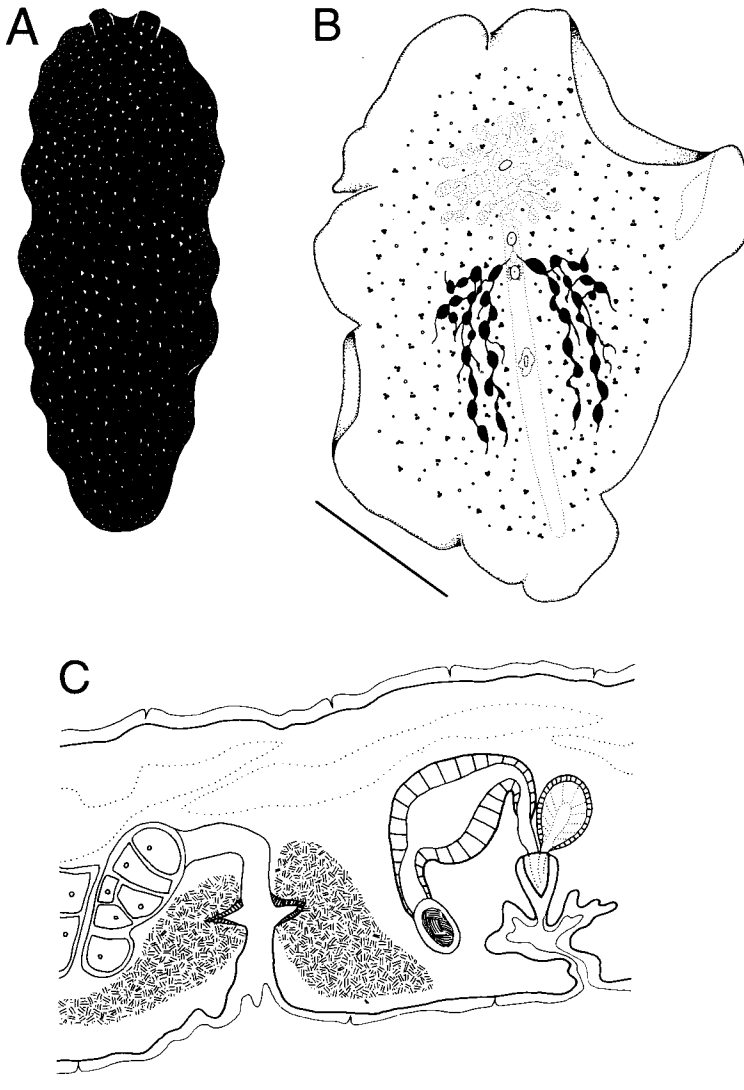


Fig. 6. *Pseudoceros josei*, new species, A) diagram of the dorsal surface, B) wholemount from the ventral side, C) reconstruction of the male structures. Scales: B= 5 mm, C= 500 μm .

Pseudoceros kylie, new species

(Figs. 7A-C, 15E)

Material examined. - WM (QM G213881), under rocks, mud flat, Point Halloren, Redland Bay, SE Qld, 8 Dec.1990; WM (QM G210955), under rubble, oyster lease, Myora, N. Stradbroke Is., SE Qld., K. Jennings, 19 Jan.1996; LS (QM G210940); S (QM G210995), K. Jennings; S (QM G210965), K. Jennings, 25 Jan.1996; S (QM G210966), 3 spec., K. Jennings, 13 May.1996; LS (QM G211056).

Description. - Background dark brown, mottled with irregular cream dots and spots; margin with a thin bright orange band, not at the rim, rim brown and interrupted with white angular markings (Figs. 7A, 15E). Ventrally light grey. Cerebral eyespot with about 30 eyes. Size range: 1.0 x 0.4 mm (immature) to 60 x 35 mm (mature).

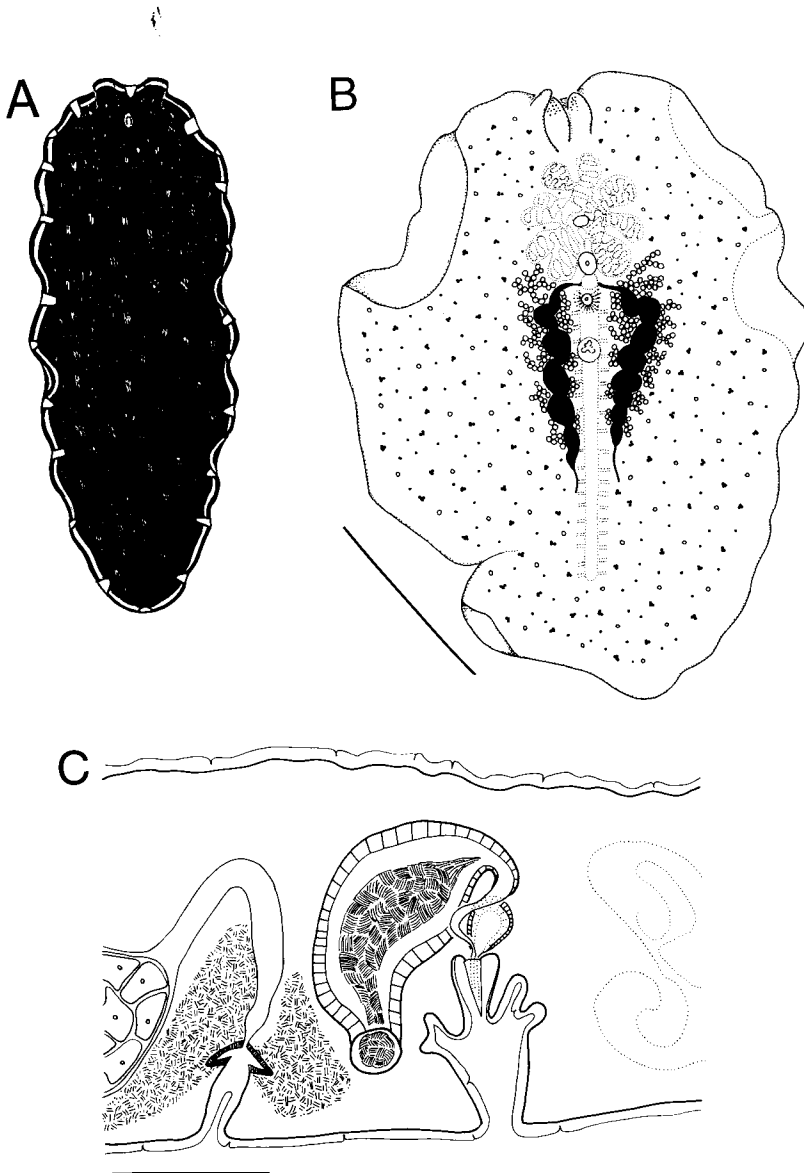


Fig. 7. *Pseudoceros kylie*, new species, A) diagram of the dorsal surface, B) wholemount from the ventral side, C) reconstruction of the male structures. Scales: B= 5 mm, C= 500 μ m.

Vas deferens unbranched (Fig. 7B). Seminal vesicle rounded oblong (720 μm long); prostate vesicle round (175 μm wide); stylet short and narrow (175 μm long x 53 μm wide), length: ratio = 1: 0.3; male antrum deep (Fig. 7C).

Diagnosis. - Mottled brown and cream, margin orange then brown and interrupted with white irregular spots.

Etymology. - Named in honour of Ms Kylie A. Jennings. Used as a noun in apposition.

Remarks. - This species belongs to Group 5 (Table 1) and appears to be cryptic with the periostracum of hairy mussels.

Habitat & distribution. - Found under clumps of mussels or oysters, inshore at low tide. Rare from Moreton Bay, SE Qld.

Pseudoceros lactolimbus, new species

(Figs. 8A-C, 15E)

Material examined. - Holotype - WM (QM G210951), under rubble, reef crest, Heron Is., S GBR, 18 Jan.1992.

Paratypes - LS (QM G210941), 12 m, reef slope, night, Heron Is., 29 Aug 1989; WM (QM G210950) reef crest, 17 Oct.1989; WM (QM G210949), 29 Jul.1992; WM (QM G210910), 7 Feb.1993; LS (QM G210942), 16 Mar.1996; S (QM G210958), 9 Mar.1997; S (QM G210996), 10 Mar.1997.

Description. - Background velvety black, margin narrow white fading to grey laterally (Figs. 8A, 15F). Ventrally dark grey. Cerebral eyespot in oblong light grey area, pointed anteriorly with about 40 eyes. Size range: 15 x 9 mm (immature) to 48 x 25 mm (mature).

Vas deferens branched (Fig. 8B). Seminal vesicle extremely large, oblong (3.8 mm long), ejaculatory duct straight; prostate large, oval (920 μm long), prostatic duct short; stylet short and wide (220 μm long x 110 μm wide), length: width ratio = 1: 0.5; male antrum shallow (Fig. 8C).

Diagnosis. - Black fading into a narrow white margin.

Etymology. - Named from the Latin (masculine), *lacto* = white and *limbus* = border, for its white marginal band.

Remarks. - This species belongs to Group 2 (Table 1) where the majority of species are black with a brightly coloured marginal band. This is the only species with a white margin. The seminal vesicle and prostate are extremely large in this species.

Habitat & distribution. - Found out on the reef slope (especially at night) and under rubble on the reef crest. Common from Heron Is., S GBR.

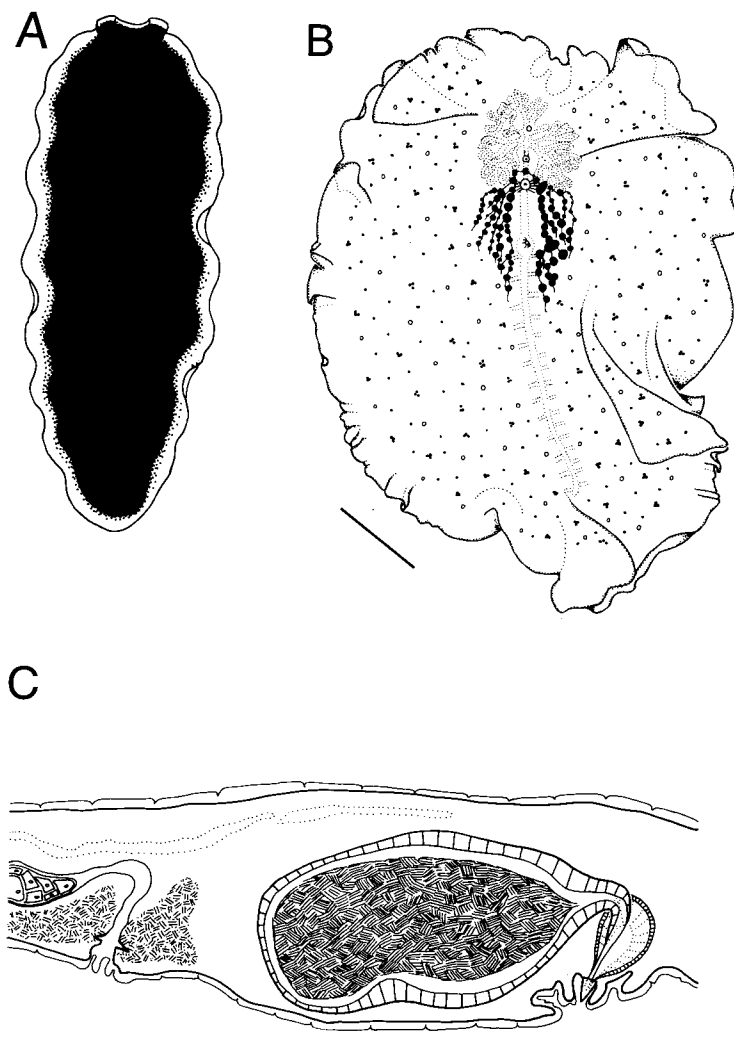


Fig. 8. *Pseudoceros lactolimbus*, new species, A) diagram of the dorsal surface, B) wholemount from the ventral side, C) reconstruction of the male structures. Scales: B= 5 mm, C= 500 μ m.

Pseudoceros laingensis, new species
(Figs. 9A-C, 16A)

Material examined. - Holotype - WM (QM G210952), Laing Is., Hansa Bay, PNG, J-M. Ouin, 15 Aug. 1992.

Paratype - LS (QM G210925), same data as holotype.

Description. - Background cream with widely spaced scattered purple spots, each spot is denser in the middle with fine dots outwards (Figs. 9A, 15F). Ventrally cream. Cerebral eyespot with about 100 eyes. Size range: 50 x 29 mm to 64 x 35 mm (both mature).

Vas deferens branched (Fig. 9B). Seminal vesicle rounded oblong (530 μ m long); ejaculatory duct long and coiled; two prostates, one prostate large and oval with two chambers (215 μ m

long), the other prostate smaller and rounded (130 μm wide); both prostatic ducts join together at the proximal end of the stylet; stylet extremely long and narrow, 100 μm long x 13 μm wide, length: width ratio = 0: 0.1 (Fig. 9C). Male antrum deep and voluminous.

Diagnosis. - Cream with scattered purple spots.

Etymology. - Named after its type location, Laing Island, PNG.

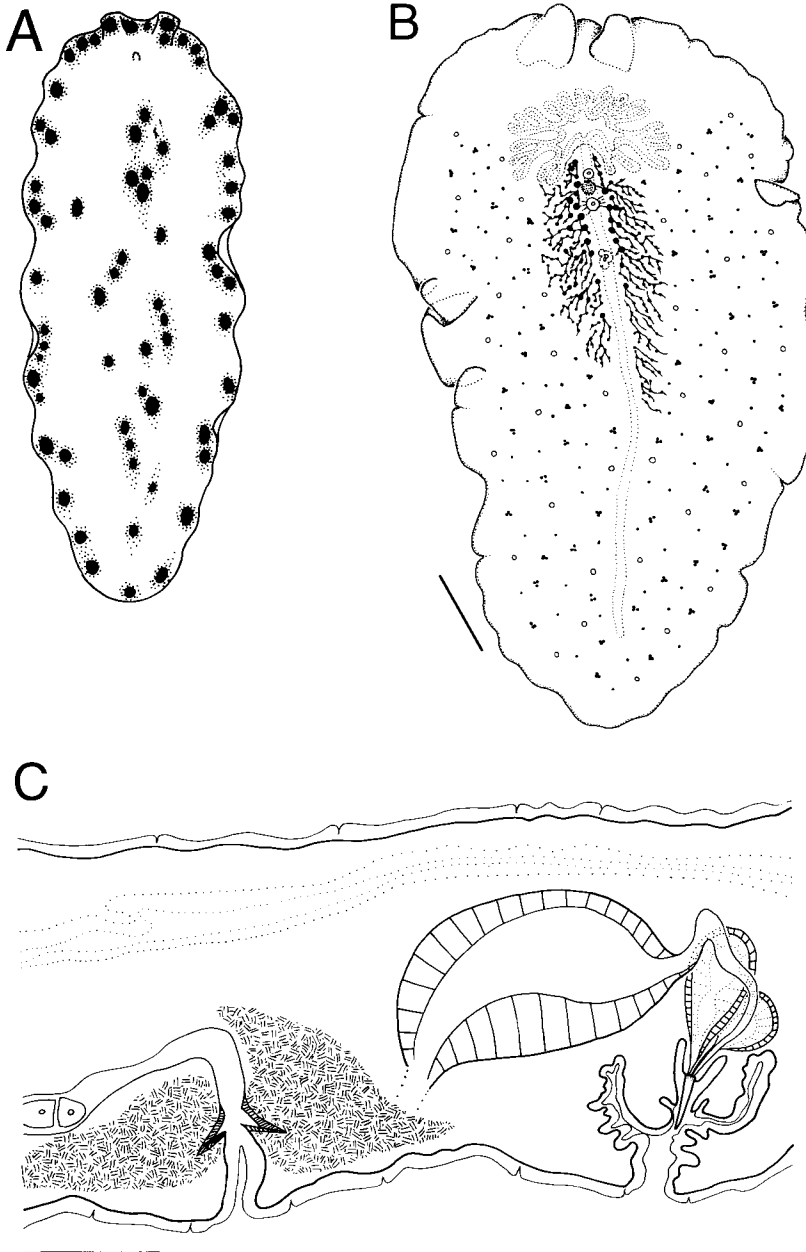


Fig. 9. *Pseudoceros laingensis*, new species, A) diagram of the dorsal surface, B) wholemount from the ventral side, C) reconstruction of the male structures. Scales: B= 5 mm, C= 250 μm . (Photo by J-M. Ouin).

Remarks. - This species belongs to Group 4 (Table 1). Only one other species, *P. concinnus*, is cream with spots, however, the spots are blue and restricted to the margin (not purple and scattered over the entire dorsal surface).

This species is rather unusual as it possesses two prostates. Until further animals are collected, it is not possible to determine if this is a teratology, a variable or a fixed character and hence its significance. In other respects, this worm appears typical of the genus.

Habitat & distribution. - Found crawling over sand in shallow lagoonal waters. Rare from Laing Is., Hansa Bay, PNG.

Pseudoceros laticlavus Newman & Cannon, 1994

Pseudoceros laticlavus Newman & Cannon, 1994a: 227-228, figs. 20a-c, 48a.

Material examined. - S (QM G210804), 2 spec., 3 m, under rubble, N Coral Bay, WA, 29 Apr.1996; S (WAM 186-96), 5 m, under rubble, S Coral Bay, 8 May.1996.

Habitat & distribution. - Found on colonial ascidians and under coral rubble from the reef crest or slope to 10 m. Common from Heron Is. and rare from One Tree Is., S GBR and Madang, PNG (Newman & Cannon, 1994a). New record: Coral Bay, WA.

Pseudoceros lindae Newman & Cannon, 1994

Pseudoceros lindae Newman & Cannon, 1994a: 229 - 230, figs. 22a-c, 48c; Gosliner et al., 1996: 107.

Material examined. - S (QM G210711), 10 m, out on ledge, front slope, outer barrier, off Lizard Is., N GBR, 8 Apr.1995; CT, several, 3 to 15 m; CT, Manado, Sulawesi, Indonesia, C. Anderson, June 1994; CT, Broadhorst Reef, central GBR, I. Loch, no date; CT (SUL94-776 & IND95-3350), 10 m, Manado, Sulawesi, Indonesia, S. Weinberg, no date; CT, 10 m, near Shimoni, S Kenya, 3 Apr.1997, K. Fiedler.

Habitat & distribution. - Found under ledges on the reef slope to 10 m. Common from Heron Is., S GBR (Newman & Cannon, 1994a) and rare from South Africa (Gosliner et al. 1996). New records: Rare from Lizard Is., N GBR; Manado, Sulawesi, Indonesia and S Kenya.

Pseudoceros paralaticlavus Newman & Cannon, 1994

Pseudoceros paralaticlavus Newman & Cannon, 1994a: 232-233, figs. 25a-c, 48f; Gosliner et al., 1996: 107.

Material examined. - S (QM G210962), 3 spec., 3 m, under rubble, reef crest, N Madang, PNG, 25 Apr.1994; CT, 2 m, under rubble, Lizard Is. Lagoon, N GBR, 7 Apr.1995; S (QM G210961), 20 Feb.1996. 10 m, under boulders, Flatrock, N Stradbroke Is., Moreton Bay, SE Qld.

Habitat & distribution. - Found on yellow colonial ascidians under boulders at the reef crest. Common from Heron Is., southern GBR, rare from Madang, PNG (Newman & Cannon, 1994a). New record: rare from Lizard Island, N GBR and Moreton Bay, SE Qld.

***Pseudoceros prudhoei* Newman & Cannon, 1994**

Pseudoceros prudhoei Newman & Cannon, 1994a: 235-236, figs. 28a-c, 49c; Gosliner et al, 1996: 107.

Material examined. - CT, 3 m, under rubble, Lizard Is. Lagoon, N GBR, 5 Apr.1995; S (QM G210964), 2 spec., 3 m, under rubble, reef crest, N Madang, PNG, 11 Apr.1994; S (QM G210959), under rubble, reef crest, 14 Jun.1995; CT, 10 m, near Shimoni, S Kenya, 3 Apr.1997, K. Fielder.

Habitat & distribution. - Found under ledges on the reef slope. Rare from Heron Is. S GBR (Newman & Cannon, 1994a) and New Guinea (Gosliner et al, 1996). New record: Rare from Lizard Is., N GBR and S Kenya.

***Pseudoceros rubronanus*, new species**

(Figs. 10A-C, 16B)

Material examined. - Holotype - WM (QM G210836), under rubble, reef crest, Heron Is., S GBR, 14 Aug.1992.

Paratypes - WM (QM G210835), same data as holotype, 29 Aug.1989; WM (QM G210837), 26 Aug.1992; WM (QM G210838), reef crest, Heron, 28 Aug.1992; WM (QM G210839), 7 Jul.1992; WM (QM G210840), 8 Sep.1992; LS (QM G210945), 16 Aug.1993.

Other material - S (QM G210983), under rubble, reef crest, Heron Is., S GBR, 6 Nov.1990; S (QM G210981), 26 Aug.1992; S (QM G210982), under rubble, reef crest, One Tree Is., 14 Sep.1992; WM (QM G213883), One Tree Is., 19 Aug.1993, S (QM G210984), 3 m, under rubble, reef crest, N Madang, PNG, 10 Apr.1994; LS (QM G210946), Heron Is., 13 Jun.1995; S (QM G210870), 16 Mar.1996; LS (QM G213882), 19 Mar.1996.

Description. - Background colour variable, velvety bright red-orange (Warm Red U or Rubine Red U, 172 or 173U, 192U), fuchsia-pink (226U) at margin with irregular white dots over the entire surface, more concentrated in a line along the margin and sometimes in irregular clusters longitudinally and medially (Figs. 10A, 16B). Ventral surface light red (219U). Body oval with few marginal ruffles. Pseudotentacles small bumps. Auricular groove short and only found in centre of the pseudotentacles. Cerebral eyespot in round clear area with about 6-30 eyes in one row in round clear area. Dorsal pseudotentacular eyes few or lacking. Small species, size range: 8 x 3 mm (immature) to 20 x 8 mm (mature).

Vas deferens unbranched (Fig. 10B). Seminal vesicle relatively large, rounded oblong (1 mm long); prostate round (312 µm wide), prostatic duct extremely short; stylet long and wide (312 µm long x 156 µm wide), stylet length: width ratio = 1: 0.5 (Fig. 10C).

Diagnosis. - Red with irregular white dots.

Etymology. - Named from the Latin (masculine), *rubo* = red and *nanus* = dwarf, for its small size and colour.

Remarks. - This species belongs to Group 4 (Table 1). There are several red species but only *P. vinosus* is similar with a red background and yellow and white speckles (vs. white irregular dots).

Habitat & distribution. - Found feeding on colonial ascidians. Common from reef crest at Heron Is, and rare from One Tree Is., S GBR.

***Pseudoceros sapphirinus* Newman & Cannon, 1994**

Pseudoceros sapphirinus Newman & Cannon, 1994a: 236-237, figs. 30a-c, 49e; Gosliner et al., 1996: 108, fig. 361.

Material examined. - CT, 12 m, out on wall, outer barrier, off Lizard Is., N GBR, 8 Apr.1995; S (QM G210963), under rubble, reef crest, Heron Is., S GBR, 6 Jun.1995; CT, 5 to 10 m, Beluu Lukes Reef, off Ulebechel Is., Palau, Micronesia, G. Paulay, 24 May.1996.

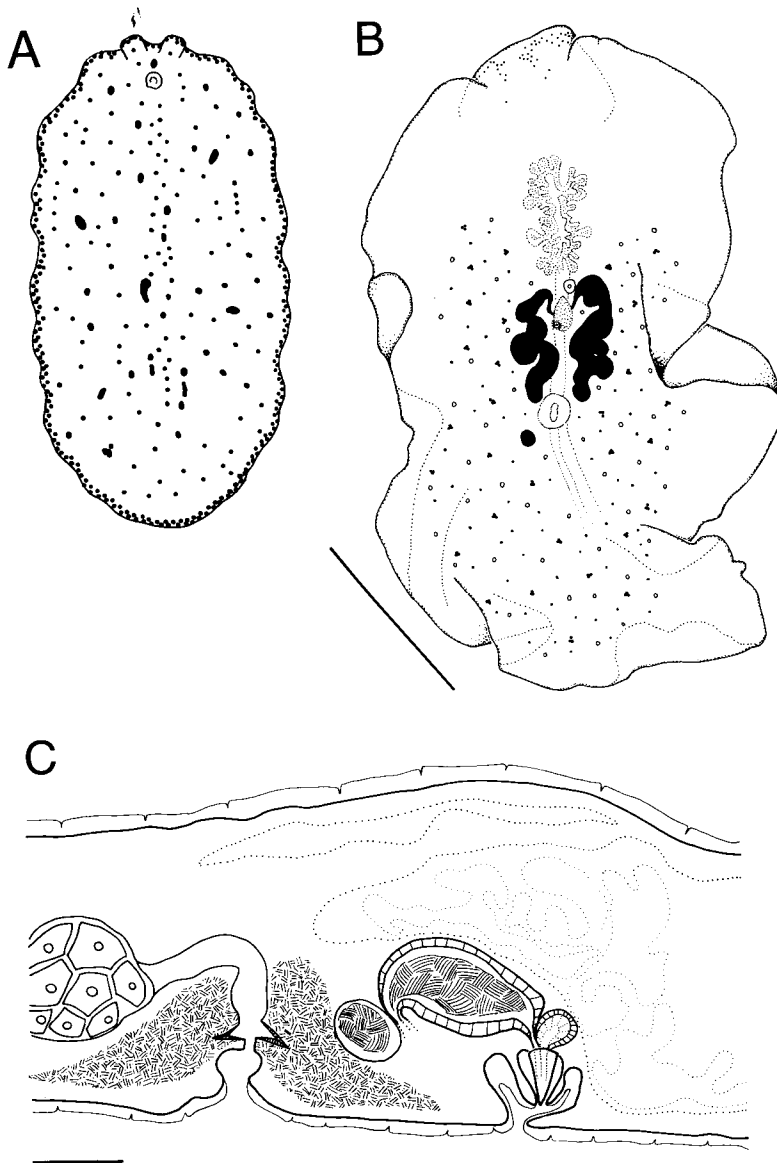


Fig. 10. *Pseudoceros rubronanus*, new species, A) diagram of the dorsal surface, B) wholemout from the ventral side, C) reconstruction of the male structures. Scales: B= 2 mm, C= 500 μ m.

Habitat & distribution. - Found under ledges on the reef slope, especially at night. Common from Heron Is., S GBR and rare from the Philippines (Newman & Cannon, 1994a) and Marshal Islands (Gosliner et al., 1996). New records: rare from Lizard Is., N GBR and Palau, Micronesia.

***Pseudoceros scriptus*, new species**

(Figs. 11A-C, 16C)

Pseudoceros sp. 6 Gosliner et al., 1996: 110, fig. 370.

Pseudoceros sp. Fossa & Nilsen, 1996: 82.

Material examined. - Holotype - LS (QM G210931), 3 m, on rubble, reef crest, N Madang, PNG, 17 May. 1994.

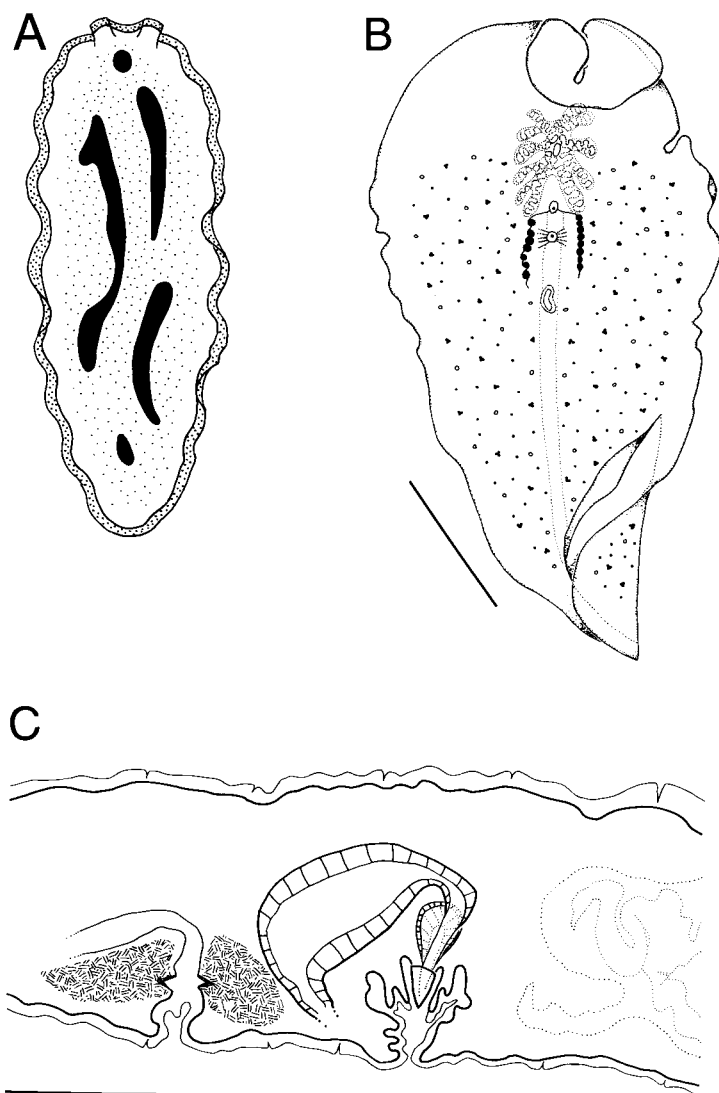


Fig. 11. *Pseudoceros scriptus*, new species, A) diagram of the dorsal surface, B) wholemount from the ventral side, C) reconstruction of the male structures. Scales: B= 5 mm, C= 250 μ m.

Description. - Background cream-yellow, white near margin with black, irregular maculae or large patches on either side of median line; margin narrow orange (116U) (Figs. 11A, 16C). Ventrally cream and darker marginally (162U), margin wide orange (Fig. 11B). Cerebral eyespot with about 40 eyes.

Vas deferens unbranched (Fig. 11B). Seminal vesicle oblong (300 μm long); prostate oval (95 μm long); stylet 60 μm long x 25 μm wide, length: width ratio = 1: 0.4 (Fig. 11C).

Diagnosis. - Cream with irregular black patches and orange margin.

Etymology. - Named from the Latin (masculine), *scriptus* = writing, for its distinct pattern resembling hand written script.

Remarks. - This species belongs in Group 6 (Table 1) and is the only species which is white.

Habitat & distribution. - Found on the reef slope, N Madang. Record: Philippines (Gosliner et al., 1996).

***Pseudoceros stimpsoni*, new species**
(Figs. 12A-C, 16D)

Pseudoceros interruptus (Stimpson, 1855) Prudhoe, 1989: 84, fig. 31.

Material examined. - Holotype - WM (QM G210944), under rocks, inshore, Nagada Harbour, N Madang, PNG, 1 May.1994.

Paratypes - LS (QM G210943), same data as holotype, 29 Apr.1994; S (QM G210994), 30 Apr.1994; LS (QM G210945), 1 May.1994; LS (QM G210953).

Description. - Background cream (5803U) mottled with brown-grey, darker medially; margin interrupted with a narrow orange (137U) band, not at margin, bordered on both sides by black (Figs. 12A, 16D). Ventrally cream or white. Pseudotentacles small. Cerebral eyespot with about 30 eyes, not in a clear area. Small species, size range: 10 x 4 mm (immature) to 16 x 6 mm (mature).

Vas deferens unbranched (Fig. 12B). Seminal vesicle oblong (350 μm long), prostate oval (110 μm long); stylet 75 μm long x 30 μm wide, length: width ratio = 1: 0.4 (Fig. 12C). Male antrum deep.

Diagnosis. - Mottled cream and brown; margin interrupted black and orange.

Etymology. - Named in honour of Dr Wm. Stimpson.

Remarks. - This species belongs in Group 5 (Table 1) and is the only species with a black and orange interrupted marginal band.

Prudhoe (1989) described a similar worm from Mozambique with sufficient details to clearly place it in *Pseudoceros*. He referred it to Stimpson's 1855 species, *Eurylepta interrupta*, from Japan on the basis of a similar colour pattern. Stimpson, however, gave no details of the shape of the pseudotentacles or pharynx and number of male pores. Without these data,

it is not clear which genus Stimpson's species belongs to and we agree with Faubel (1984) that it is incertae sedis. Consequently, we believe that Prudhoe's specimen is probably referable to our new species, *P. stimpsoni*.

Habitat & distribution. - Found inshore, under rocks on beige-brown colonial ascidians. Rare from Nagada Harbour, N Madang, PNG.

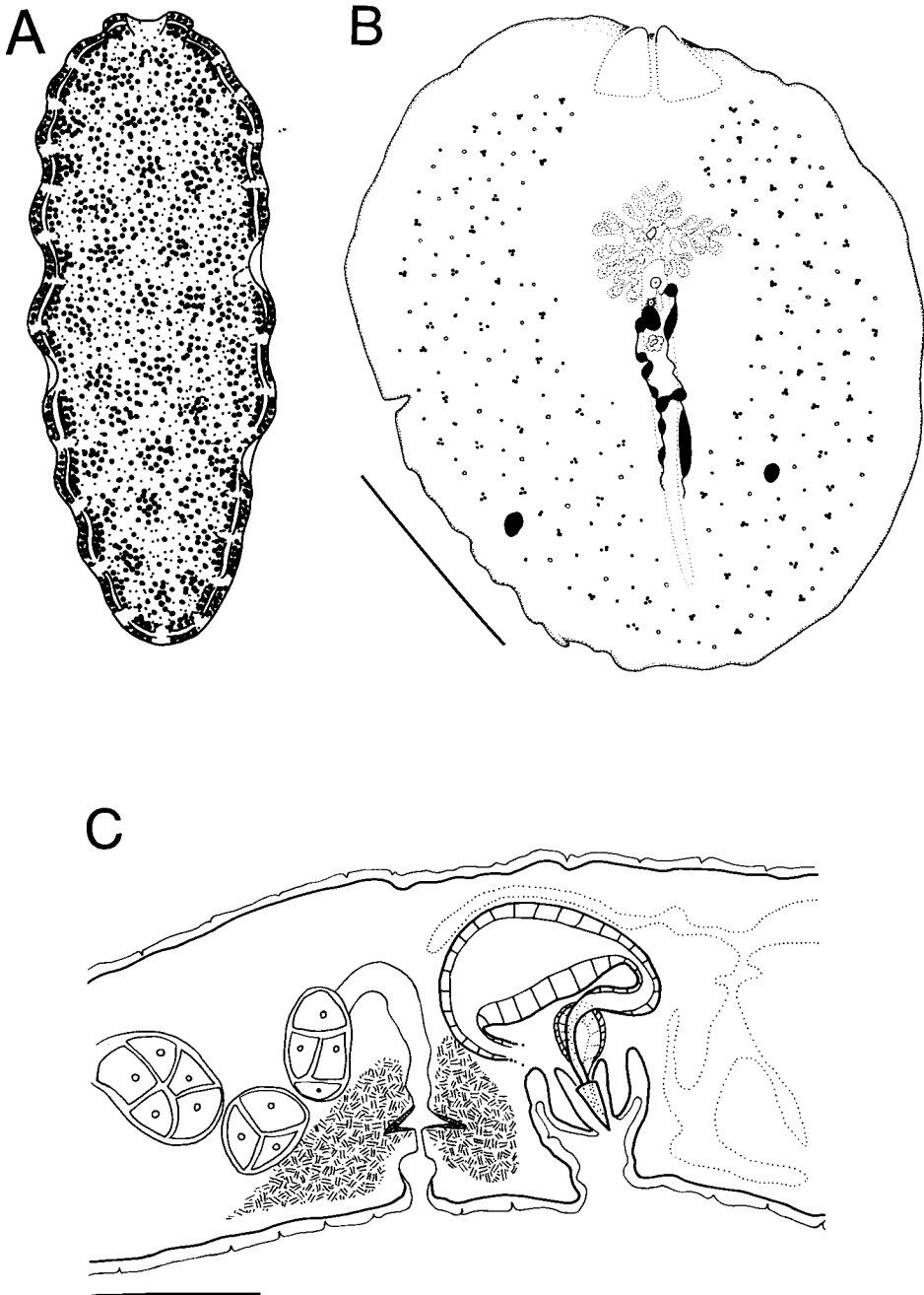


Fig. 12. *Pseudoceros stimpsoni*, new species, A) diagram of the dorsal surface, B) wholemount from the ventral side, C) reconstruction of the male structures. Scales: B= 2 mm, C= 250 μ m.

Pseudoceros sp. 1

(Figs. 13A-B, 16E)

Material examined. - WM (QM G210852), 3m, reef slope, Heron Is., S GBR, 14 Jun.1991; S (QM G210975), 12 m, on ledge, outer reef slope, One Tree Is., 7 Sep.1996.

Description. - Background velvety black (Figs. 13A, 16E); margin with two distinct bands of equal width, inner band white and outer band bright orange, marginal bands continue over the pseudotentacles. Ventrally grey-black with the same marginal bands. Size range: 18 x 10 mm (immature) to 26 x 12 mm (mature). Vas deferens unbranched (Fig. 13B).

Diagnosis. - Black, margin white then orange at rim.

Remarks. - This species belongs to Group 2 (Table 1). Other similar species are *P. periaurantius* which is black with an orange margin (no white marginal band) and *P. lactolimbus* which is also black with a narrow white margin (no orange marginal band). The colour pattern of *Pseudoceros* sp. 1 is specifically similar to *Pseudobiceros hancockanus*, however, in this species the white and orange bands are reversed. This species is probably aposematic: it was observed moving across the hard coral, *Acropora*, during the day.

Habitat & distribution. - Found under rubble of the reef crest or on the reef slope. Rare from Heron Is., S GBR.

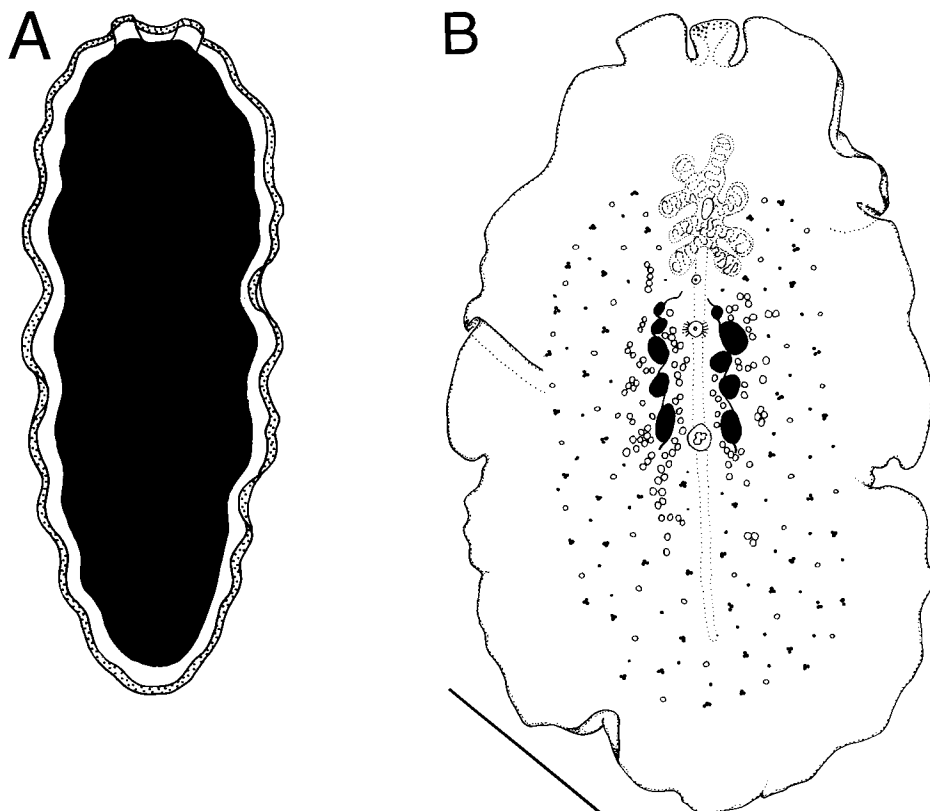


Fig. 13. *Pseudoceros* species 1, A) diagram of the dorsal surface, B) wholemount from the ventral side, scale= 5 mm.

Pseudoceros sp. 2
(Figs. 14A-B, 16F)

Pseudoceros sp. Allen & Steene, 1994: 128; Fossa & Nilsen, 1996: 82.

Material examined. - CT, 20 m, on reef slope, Bathurst Reef, central GBR, I. Loch, no date; CT, 10 m, Lizard Is. Lagoon, N GBR, I. Loch, no date; CT, Solitary Is., Coffs Harbour, N NSW, B. Rudman, Nov.1990; WM (QM G210853), 20 m, reef slope, Wistari Reef, S GBR, 5 Jun.1992; S (G210815), 13 m, reef slope, Heron Is., H. Jussiet, 2 Sep.1996.

Description. - Background mottled mustard yellow and white with small purple (252U) spots over the entire dorsal surface; margin with larger well spaced purple spots (Figs. 14A, 16F). Pseudotentacles bright orange (021U), white triangle between pseudotentacles outlined in darker purple. Ventrally cream, margin with purple spots. Small horseshoe shaped cerebral eyespot with about 30 eyes. Size: 40 x 18 mm.

Diagnosis. - Mottled yellow and white with small purple spots pseudotentacles bright orange with a white triangle in between.

Remarks. - This species belongs to Group 4. The number of observations indicates that this species must be common. Regrettably we have not found a mature specimen and hence are reluctant to formally describe this magnificent species.

Habitat & distribution. - Found on the reef slope. Rare from Heron Is., S GBR. Records: Rare from Bathurst Reef, central GBR; Lizard Is., N GBR and Solitary Is., Coffs Harbour, N NSW.

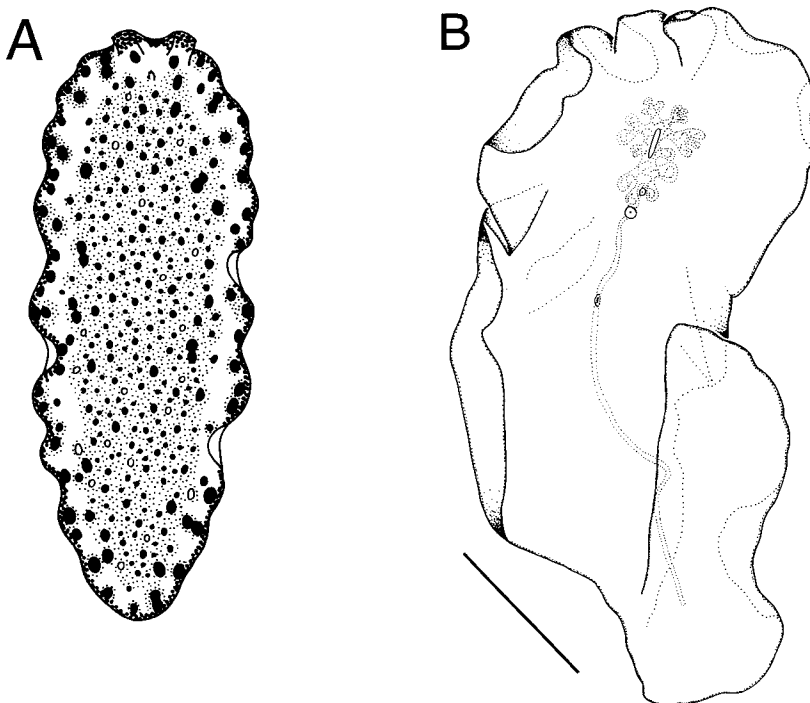


Fig. 14. *Pseudoceros* species 2, A) diagram of the dorsal surface, B) wholemount from the ventral side, scale= 5 mm.

DISCUSSION

The formerly large genus *Pseudoceros*, sensu lato is now known to be comprised of several genera (Faubel, 1984; Newman & Cannon, 1994a, 1996a, b) and details of the pseudotentacles, pharynx and arrangement of the reproductive structures, best seen in live animals, are needed for these generic determinations. Within genera, species may be reliably recognised by their distinct colour patterns (Newman & Cannon, 1994a, 1995a, 1996a, b): however, we are reluctant still to erect species without examining sections of mature worms. Our caution

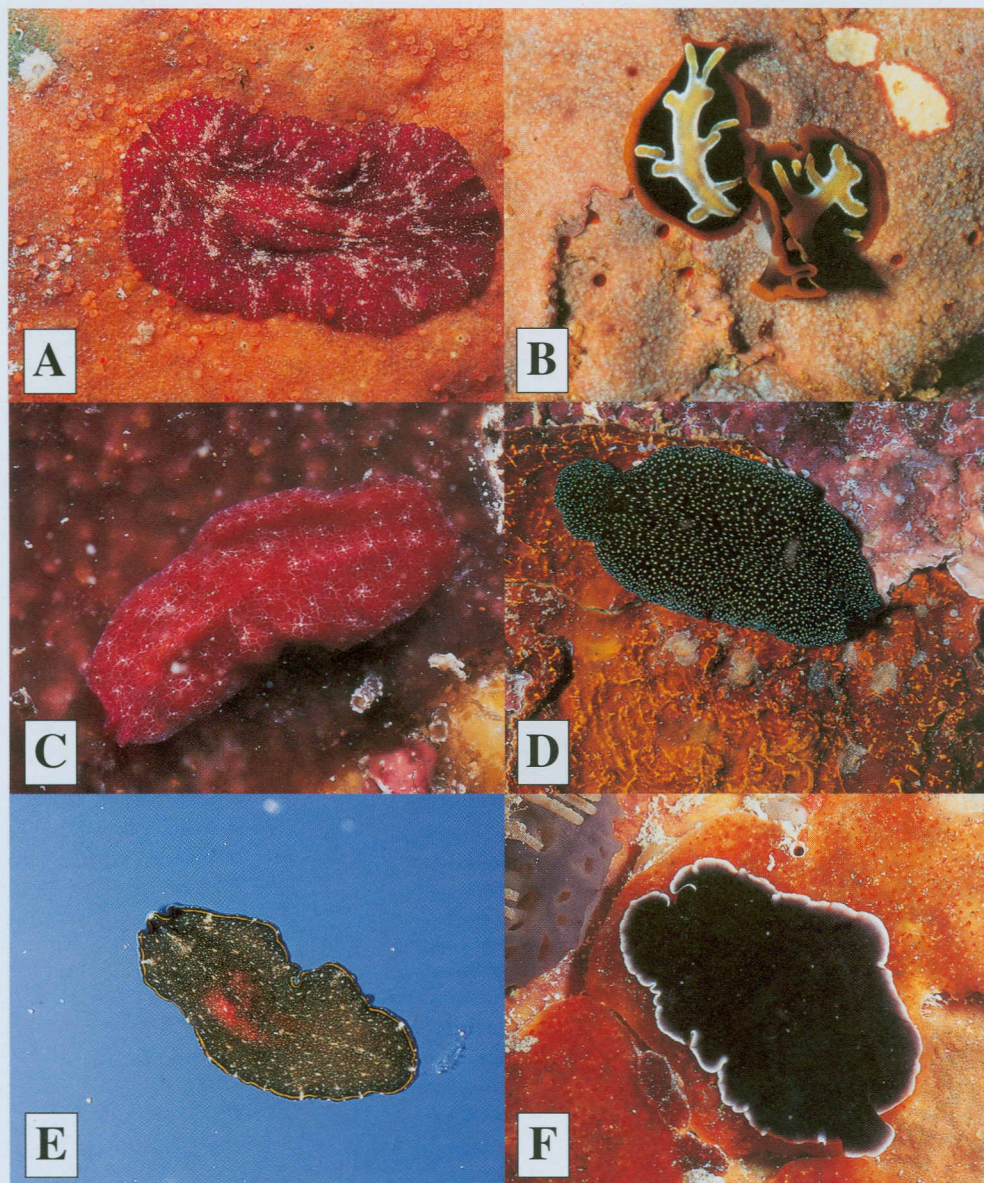


Fig. 15. A) *Pseudoceros cruentus*, new species, Heron Is., S GBR, B) *P. imperatus*, new species, Madang, PNG C) *P. irretitus*, new species, One Tree Is., S GBR, D) *P. josei*, new species, Madang, PNG, E) *P. kylie*, new species, N Stradbroke Is., SE Queensland, F) *P. lactolimbus*, new species, Heron Is.

appears justified by reference to the unusual anatomy of two species presented here; *P. lactolimbus* and *P. laingensis*.

Our records show that many species of *Pseudoceros* sensu stricto are widespread throughout the tropical Indo-Pacific and though some variations in colours can be seen, patterns are quite consistent. We are confident that provided genera are appropriately recognised (by examination of live animals and colour photography), colour pattern can be used to identify species. We are supported in this view by the molecular studies of Goggin & Newman (1996) and behavioural observations on copulation by Newman & Cannon (1994a) and Michiels &

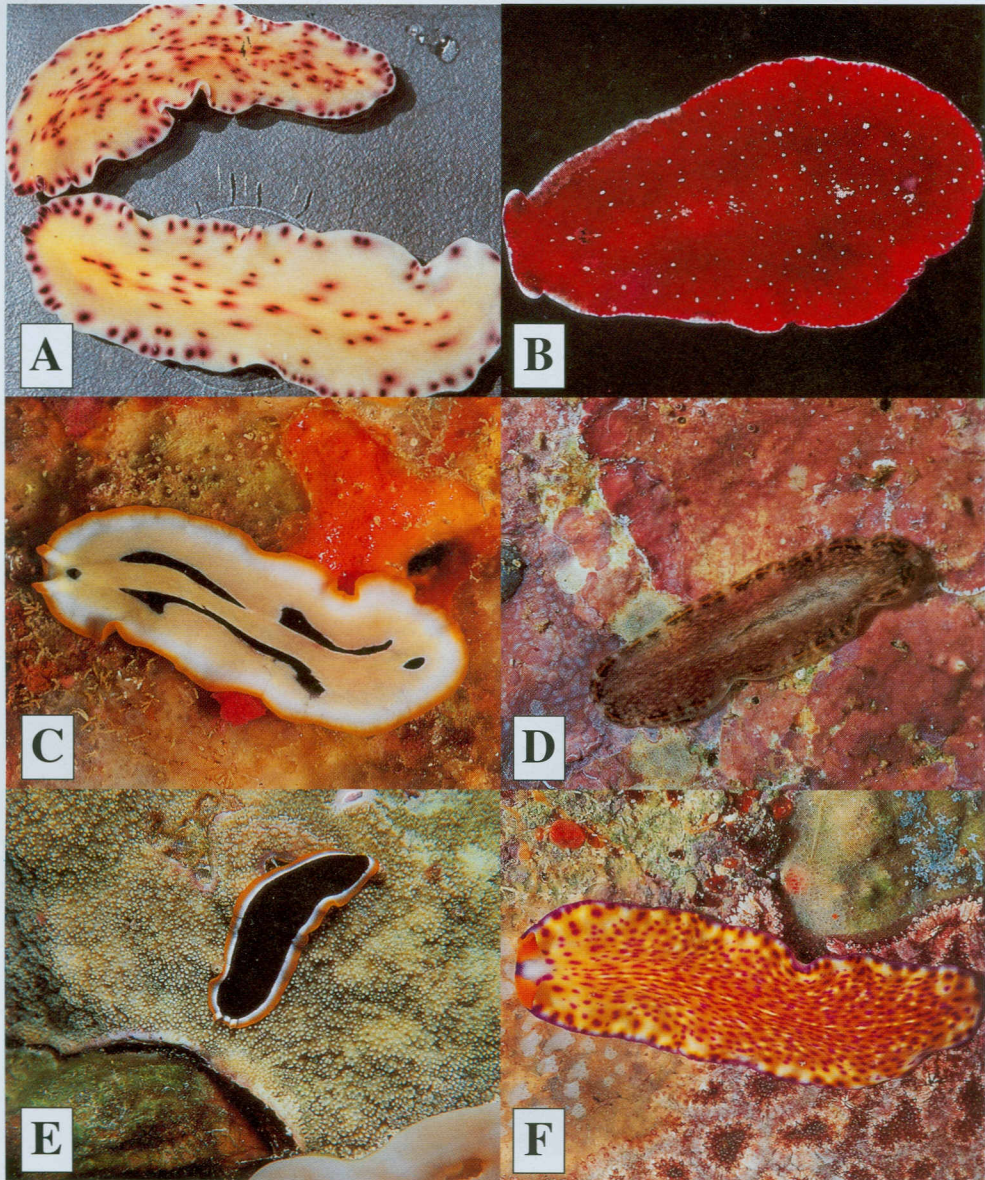


Fig. 16. A) *Pseudoceros laingensis*, new species, Laing Is., PNG, B) *P. rubronanus*, new species, Heron Is., S GBR, C) *P. scriptus*, new species, Madang, PNG, D) *P. stimpsoni*, new species, Madang, PNG, E) *Pseudoceros* sp. 1, Heron Is., F) *Pseudoceros* sp. 2, Heron Is.

Newman (unpublished). For successful copulation, presumably chemical rather than morphological species recognition occurs, nevertheless, colour pattern does appear to be fixed.

Two selection forces seem to be at work to offset predation pressure viz. crypsis, where animals are camouflaged in their natural environment and aposematism in which the prevalence of bold colour patterns i.e. black, orange and white, in many species coupled with diurnal activity suggests they are either toxic or are mimicking toxic organisms. Certainly some species do contain toxins and anecdotal evidence suggests others are distasteful to fish (Newman & Cannon, 1995a; Newman & Ang, 1996). Mimicry or convergence is seen on an inter-generic basis. Examples which bear a striking resemblance to each other are *Pseudoceros* sp. 1 and *Pseudobiceros hancockanus* and *Pseudoceros periaurantius* and *Pseudobiceros periculosus* (see Newman & Cannon, 1995a).

Among the new species discussed here, three (*P. cruentus*, *P. irretitus* and *P. rubronanus*) share common characters not found in other members of the genus, viz. small pseudotentacles with few if any dorsal pseudotentacular eyes and a short auricular groove. At this stage, we would like to consider this species group at a higher rank but we believe that further collecting is needed before any elevation is considered. Furthermore, serial sections of two other species show unique reproductive characters; *P. lactolimbus* has a huge seminal vesicle and prostate and *P. laingensis* has two prostates. The significance of these unusual characters remains uncertain until more animals are studied.

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