

***Prosorhynchus maternus* sp. n. (Digenea: Bucephalidae) from the Malabar grouper *Epinephelus malabaricus* (Perciformes: Serranidae) off New Caledonia**

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Abstract. A new species, *Prosorhynchus maternus* sp. n., is described from the serranid fish *Epinephelus malabaricus* (Bloch et Schneider) in the waters off New Caledonia. It belongs to a group of *Prosorhynchus* species from serranids in which the uterus is restricted to the postovarian region. Its distinguishing features include the vitellarium relatively distant from the rhynchus, the cirrus-sac relatively distant from the posterior testis, the distinctly pre-equatorial mouth and several other somatic ratios. New records of *Prosorhynchus longisaccatus* Durio et Manter, 1968 from *Epinephelus cyanopodus* (Richardson) and *Prosorhynchoides lamprelli* Bott et Cribb, 2005 from *Caranx papuensis* Alleyne et Macleay off New Caledonia are also included.

There are over 70 named species of *Prosorhynchus* Odhner, 1905, about 60 of which are marine and about 10 are from freshwaters of China (e.g. Pan 1988), south-eastern Asia (Moravec and Sey 1989) and south America (e.g. Thatcher 1999). As pointed out by Cribb et al. (2002), 13 of the marine species are found in members of the fish family Serranidae, particularly in the subfamily Epinephelinae. Some hosts were not fully identified and Cribb et al. (2002) did not consider the parasites from these. We have detected some 16 species reported in what are definitively or probably epinephelines. These are *P. atlanticus* Manter, 1940, *P. bulbosus* Kohn, 1961, *P. caudovatus* Manter, 1940, *P. chorinemi* Yamaguti, 1952, *P. epinepheli* Yamaguti, 1939, *P. freitasi* Nagaty, 1937, *P. gonoderus* Manter, 1940, *P. jupe* (Kohn, 1967), *P. longisaccatus* Durio et Manter, 1968, *P. mcintoshii* (Velasquez, 1959), *P. ozakii* Manter, 1934, *P. pacificus* Manter, 1940, *P. platycephali* (Yamaguti, 1934), *P. promicropsi* Manter, 1940, *P. serrani* Durio et Manter, 1968, and *P. thapari* Manter, 1953 (Manter 1934, 1940a, b, 1953, Yamaguti 1934, 1939, 1952, Nagaty 1937, Velasquez 1959, Kohn 1961, 1967, Durio and Manter 1968). Most of these species have been reported from individual host species or a few closely related hosts. Some, such as *P. chorinemi* and *P. platycephali*, were originally reported from other host groups. In this study we describe a new species from an epinepheline in the waters of the Coral Sea off New Caledonia. It is clearly related to a group of species from related hosts, but has a suite of distinctive features.

Seven species of bucephalids are known from the waters around New Caledonia. Durio and Manter (1968) reported *Myorhynchus pritchardae* Durio et Manter,

1968 from an unknown serranid, *Neidhartia coronata* Durio et Manter, 1968 from *Epinephelus* sp., *Prosorhynchus freitasi* from *Epinephelus* sp., *P. longisaccatus* from an unknown serranid and *Prosorhynchus serrani* from the yellow-edged lyretail *Variola louti* (Forsskål). We (new record) have found *Prosorhynchoides lamprelli* Bott et Cribb, 2005 (see below). The seventh species is that described below.

MATERIALS AND METHODS

A large wounded *E. malabaricus* (local name “mère loche”) was noticed by divers off Nouméa, New Caledonia. The wound affected all the upper jaw and prevented the fish from eating; it was decided to kill the animal and use it for parasitological research. The fish was spear fished and immediately brought back to the laboratory, photographed and measured (fork length 1,280 mm, weight 45 kg). As predicted from the wound, the digestive tract was empty of food. Digenans were collected alive, immediately fixed in hot seawater then transferred to ethanol.

Whole-mounts were stained with Mayer’s paracarmine, cleared in beechwood creosote and mounted in Canada balsam. Measurements were made through a drawing tube on an Olympus BH-2 microscope, using a Digicad Plus digitising tablet and Carl Zeiss KS100 software adapted by Imaging Associates, and are quoted in micrometres, with the range and the mean in parentheses (Table 1). The following abbreviations are used: BMNH, the British Museum (Natural History) Collection at the Natural History Museum, London, UK; IPASCR, Institute of Parasitology, Academy of Sciences of the Czech Republic, České Budějovice; MNHN, Muséum National d’Histoire Naturelle, Paris; USNPC, United States National Parasite Collection, Beltsville.

For purposes of comparison, various measurements and ratios were extracted from the literature. Where measurements were available, the range of ratios were estimated by dividing the shortest measurement of the organ in question by the shortest body length and the similarly for the longest measurements of organ and body length. Some measurements were estimated from those illustrations with scale bars and ratios estimated from these or directly from the illustrations.

RESULTS

Family *Bucephalidae* Poche

Subfamily *Prosorhynchinae* Nicoll

Genus *Prosorhynchus* Odhner

Prosorhynchus maternus sp. n. Figs. 1–4

Description (based on 8 whole-mount preparations). Measurements and ratios in Table 1. Body elongate, widest at level of anterior part of vitellarium, distinctly narrowing immediately posterior to widest part of rhynchus (Figs. 1, 2). Tegument spinous; spines squamous, tiny, reach to posterior extremity. Rhynchus elongate, with about 5–6 muscular lobes around anterior rim, narrows posteriorly, strongly muscular, with patches of embedded gland-cells (Fig. 3). Mouth at level of ovary and/or anterior testis, well inside anterior half of body. Pharynx globular. Caecum oval, reaching anteriorly to level of anterior part of vitellarium.

Testes 2, oval, in posterior part of anterior half of body, slightly separated, contiguous or slightly overlapping. Cirrus-sac elongate, parallel sided, never reaching posterior testis. Seminal vesicle large, elongate-oval, in proximal cirrus-sac. Pars prostatica long, in 2 distinct parts; proximal part (seminal duct) coiled at level of seminal vesicle, with few gland-cells; distal part, wider, straight, surrounded by dense layer of gland-cells, lining of 2 types, proximal region lined with anuclear cell-like bodies, distal region lined with filaments in chevron arrangement pointing distally (Fig. 4). Ejaculatory duct narrow, short, opening on knobby genital lobe, inside genital atrium. Genital atrium large. Genital pore distinctly separated from posterior extremity; in one case spermatophore seen extruded through pore (Fig. 1).

Ovary oval, mainly antero-lateral to anterior testis (6 specimens), may be lateral (1) or postero-lateral (1) to anterior testis. Uterine seminal vesicle just posterior to ovary. Laurer's canal not seen. Uterus fills most of post-ovarian region, does not reach anteriorly beyond ovary. Eggs numerous, tanned, operculate. Metraterm not detected, obscured by eggs. Vitellarium consists of 2 lateral fields of follicles, usually symmetrical (Fig. 2), or with one field offset (Fig. 1), anterior extremity distinctly posterior to rhynchus, but always anterior to caecum, gonads and uterus; posterior extremity at about level of posterior testis.

Excretory pore terminal; anterior extent of vesicle obscured by eggs.

Type host: *Epinephelus malabaricus* (Bloch et Schneider), Serranidae, Malabar grouper.

Site: Intestine.

Type locality: Nouméa, off Ouen Toro, New Caledonia (22°19'S, 166°27'E, 18.v.2005).

Prevalence: 1/1.

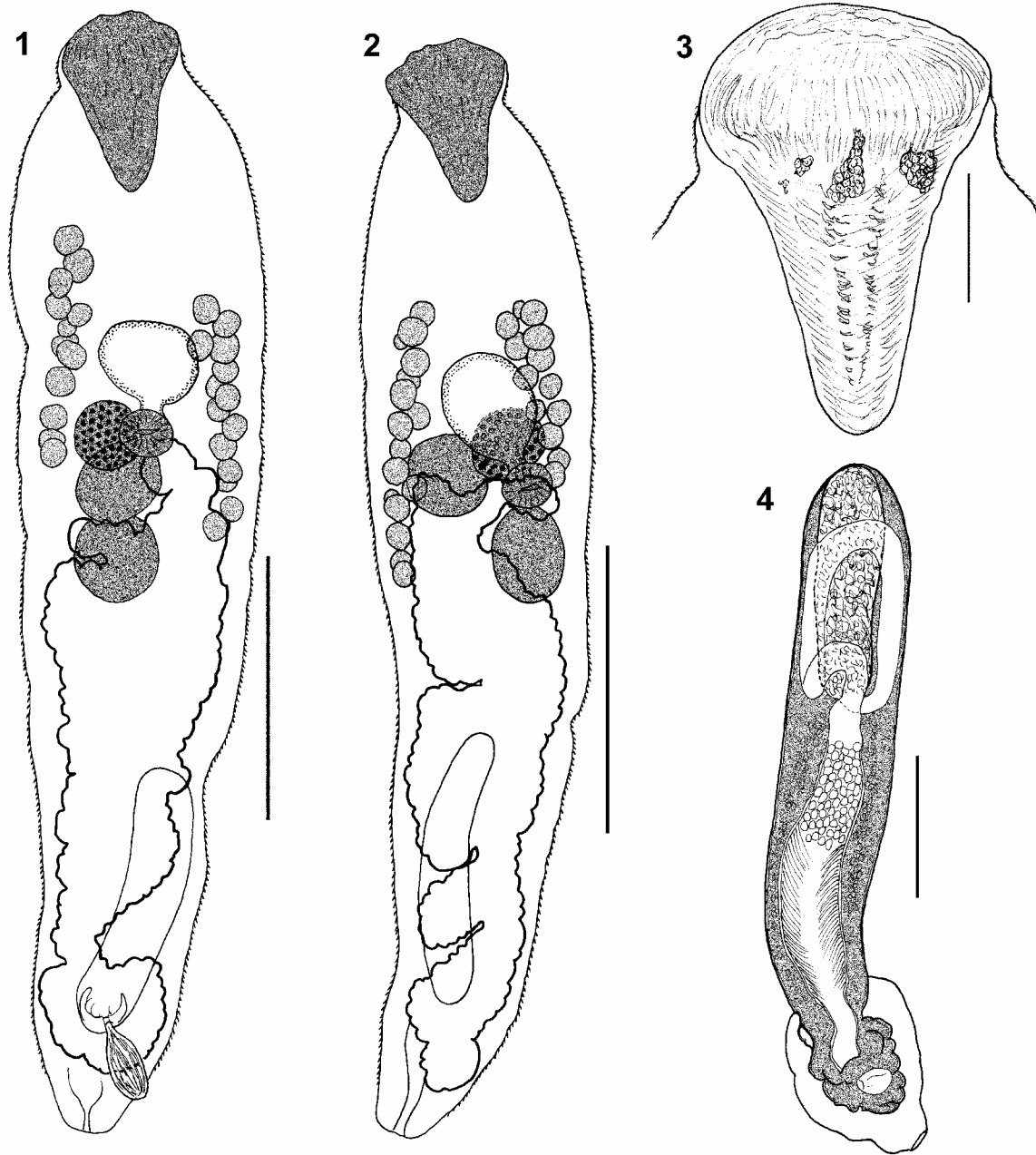
Intensity: 8.

Deposition of specimens: holotype MNHN JNC1536D 01, paratypes, MNHN1536D 02–04, BMNH 2006.4.27.14–16. IPASCR D-596.

Etymology: This refers to the local name of the host, “mère loche” or mother grouper, probably referring to the fact that it is large enough to be the mother of all groupers.

Remarks. Cribb et al. (2002) reckoned that there were 13 species of *Prosorhynchus* reported from epinepheline serranids and this figure now stands at 16 (see above). *Prosorhynchus maternus* belongs to a group of species which share the character of the uterus being restricted to the post-ovarian region, a relatively unusual feature in this genus. Other members of this group are *P. atlanticus* Manter, 1940, *P. bulbosus* Kohn, 1961, *P. gonoderus* Manter, 1940, *P. longicollis* Yamaguti, 1953, *P. mcintoshi* (Velasquez, 1959), *P. pacificus* Manter, 1940 and *P. promicropsi* Manter, 1940. Of parasites of non-epinephelines only *P. mizellei* Kruse, 1977 from the smooth lump sucker, the cyclopterid *Aptocyclus ventricosus* (Pallas), in the Bering Sea and *P. kahala* Yamaguti, 1970 from the great amberjack, the carangid *Seriola dumerili* (Risso) have this character (Yamaguti 1970, Kruse 1977).

The only species so far reported from *Epinephelus malabaricus* is *P. pacificus* (or its putative synonym *P. atlanticus*). These records are by Hafeezullah and Siddiqi (1970) from Karwar, India and Leong and Wong (1988, 1990) from juvenile *E. malabaricus* imported from the Philippines for culture in Malaysia. The present form is close to *P. pacificus*, which was originally described by Manter (1940a) from the epinephelines, the sailfin grouper *Mycteroperca olfax* Jenyns and the broomtail grouper *M. xenarcha* Jordan, along with unidentified groupers, off various Galapagos Islands. Having examined USNPC slide No. 9326 labelled ‘type’, which bears three specimens, two of which are measurable (see Table 1), we consider that *P. maternus* differs from *P. pacificus* in the following features (see Table 1). The mouth is relatively further anterior, the vitellarium and caecum are also relatively closer to the anterior extremity and the testes are relatively further from the posterior extremity. The rhynchus is relatively smaller. The cirrus-sac is relatively smaller and never reaches even close to the posterior testis, whereas in *P. pacificus* the cirrus-sac overlaps the posterior testis in 68% of the specimens (Manter 1940a) and in two of the three specimens on the ‘type’ slide. In the one specimen where the cirrus-sac does not reach the posterior testis, it is very close (Table 1). Hafeezullah and Siddiqi (1970) gave an illustration of the worm they found in



Figs. 1–4. *Prosorhynchus maternus* sp. n. **Fig. 1.** Holotype, ventral view, uterus in bold outline and treated as transparent, cirrus-sac in outline, note spermatophore. **Fig. 2.** Paratype, ventral view, uterus in bold outline and treated as transparent, cirrus-sac in outline. **Fig. 3.** Rhynchus, showing embedded gland-cells. **Fig. 4.** Cirrus-sac and genital atrium, with egg in atrium. Scale bars: Figs. 1, 2 = 500 μ m; Figs. 3, 4 = 100 μ m.

E. malabaricus and called *P. atlanticus*, and some data can be gleaned from it (Table 1). It appears more similar to our specimens than does the original description of the species. Winter (1960) described *P. pacificus* from the spotted grouper *Epinephelus analogus* Gill from the Pacific Ocean off Sinaloa, Mexico. The illustration is in the form of a microphotograph which gives no useful

information, but the description is quite detailed and suggests that this form differs from *P. maternus* in its more posterior mouth, larger cirrus-sac and larger eggs (Table 1). All the above descriptions give a greater relative width than in *P. maternus*, but this may be due in most cases to flattening.

Table 1. Measurements of various *Prosorhynchus* species. Major ratios and some measurements differentiating worms from *P. maternus* sp. n. are emboldened. Measurements and ratios estimated from published dimensions or illustrations are in brackets.

Species Source	<i>P. maternus</i> sp. n. Present study	<i>P. pacificus</i> USNPC 9326, types	<i>P. atlanticus</i> Hafeezullah and Siddiqi (1970)	<i>P. pacificus</i> Winter (1960)
Host(s)	<i>Epinephelus malabaricus</i>	<i>Mycteroperca olfax</i>	<i>Epinephelus malabaricus</i>	<i>Epinephelus analogus</i>
Locality	New Caledonia	Albemarle Is., Galapagos	off Karwar, India	off Pacific coast, Mexico
n	8	2	[1]	5
Length	2,052–2,227 (2,142)	1,232–1,359	[1,359]	1,554–1,887
Width	392–476 (438)	350–367	[335]	459–592
Pre–vitelline distance	409–477 (441)	313–414	[388]	281–444
Pre-caecal distance	497–604 (552)	366–450	[441]	
Pre-uterine distance	739–922 (818)	509–631	[741]	
Pre-mouth distance	788–870 (833)	590–624	[653]	757–808
Pre-testicular distance	665–816 (745)	427–623	[565]	
Pre-ovarian distance	633–762 (712)	421–562	[441]	
Rhynchus	280–360 × 189– 243 (317 × 219)	239–242 × 211–211	[208 × 157]	[259–278 × 210–292]
Rhynchus to vitellarium	77–186 (125)	98–180	[173]	
Rhynchus to uterus	386–641 (510)	277–396	[547]	
Rhynchus to caecum	142–330 (243)	126–212	[238]	
Long vitelline field	475–606 (545)	252–342	[327]	407–422
Number of follicles in above	14–17 (15.5)	13–14		
Short vitelline field	360–512 (445)	233–245	[300]	296–392
Number of follicles in above	12–15 (13.1)	13–15		
Caecum	202–231 × 134– 178 (214 × 152)	99–125 × 142–199	[194 × 106]	252–296 × 206–275
Pharynx	58–101 × 69– 100 (80 × 87)	56–69 × 61–62	[62 × 62]	69–103 diam.
Ovary	127–153 × 98– 131 (140 × 118)	96–98 × 119–129	[86 × 86]	112–138 × 105–120
Ovary to anterior testis	0–12 (2)	0	[0]	
Anterior testis	152–188 × 124– 160 (172 × 147)	104–107 × 141–151	[132 × 106]	177–188 × 138
Distance between testes	0–114 (49)	0–30	[39]	
Posterior testis	152–191 × 117– 148 (166 × 131)	83–100 × 149–159	[122 × 106]	189 × 138
Posterior testis to cirrus-sac	230–363 (281)	0–37	[124]	
Cirrus-sac	468–541 × 91– 116 (499 × 102)	428–464 × 114–118	[309 × 53]	482–671 × 102–129
Seminal vesicle	198–275 × 61– 88 (233 × 72)	150–212 × 30–41	[106 × ?]	
Pars prostatica	181–291 × 49– 90 (222 × 65)	244–245 × 63–64	[168 × 53]	
Post-testicular region	982–1,143 (1,045)	512–605	[530]	
Post-vitelline region	1,022–1,203 (1,110)	606–671	[627]	
Anterior extremity of cirrus-sac to posterior extremity (AECSPE)	695–837 (775)	591–595	[420]	929–1,075
Post-ovarian region	1,190–1,374 (1,267)	693–721	[759]	
Genital pore to posterior extremity	198–288 (230)	96–178	[122]	234–279
Post-uterine region	105–161 (128)	66–98		
Eggs	27–28 × 14– 22 (28 × 19)	28–31 × 15–16		29–33 × 19–20
Width%*	17.7–22.2 (20.4)	25.8–29.8	[24.7]	[29.5–31.4]
Pre-vitelline distance%*	18.8–23.2 (20.6)	25.8–30.5	[28.6]	[18.1–23.5]
Pre-caecal distance%*	23.1–28.0 (25.8)	29.7–33.1	[32.5]	
Pre-uterine distance%*	34.4–41.4 (38.2)	41.3–46.4	[54.5]	

Table 1. Continued.

Pre-mouth distance%*	37.7–39.6 (38.6)	45.9–47.9	[48.1]	[48.7–42.8]
Pre-testicular distance%*	30.6–38.0 (34.8)	34.7–45.8	[41.6]	
Pre-ovarian distance%*	29.4–35.1 (33.3)	34.2–41.3	[32.5]	
Rhynchus length%*	12.6–16.7 (14.8)	17.8–19.4	[15.3]	[16.6–14.7]
Rhynchus width as % rhynchus length	65.2–85.7 (69.5)	87.0–88.3	[75.5]	[75.5–105]
Long vitelline field%*	22.0–28.2 (25.5)	18.5–27.7	[24.1]	[26.2–22.4]
Caecal length%*	9.32–10.5 (10.0)	7.31–10.2	[14.3]	[16.2–15.7]
Ovary length%*	5.83–7.27 (6.54)	7.08–7.93	[6.33]	[7.21–7.31]
Anterior testis length%*	7.29–8.68 (8.02)	7.65–8.65	[9.71]	[11.4–9.96]
Distance between testes%*	0–5.24 (2.30)	0–2.23	[2.87]	
Posterior testis length%*	7.07–9.19 (7.75)	6.72–7.37	[8.98]	
Posterior testis to cirrus-sac%*	10.3–16.9 (13.1)	0–3.01	[9.12]	
Cirrus-sac length%*	21.6–24.5 (23.3)	31.5–37.7	[22.7]	[31.0–35.6]
Seminal vesicle length as % of cirrus-sac length	37.7–58.8 (46.9)	35.0–45.8	[34.3]	
Post-testicular region%*	45.2–53.1 (48.8)	37.6–49.1	[39.0]	
Post-vitelline region%*	48.8–55.4 (51.8)	49.2–49.4	[46.1]	
AECSPE%*	32.4–39.0 (36.2)	43.8–48.0	[30.9]	[59.8–57.0]
Post-ovarian region%*	56.9–63.9 (59.2)	51.0–58.5	[55.8]	
Genital pore to posterior extremity%*	9.17–13.8 (10.8)	7.80–13.1	[8.98]	[15.1–18.0]
Post-uterine region%*	4.75–7.49 (5.97)	4.84–7.98		

* as % of body-length

Table 1. Continued.

Species	<i>P. atlanticus</i>	<i>P. pacificus</i>	<i>P. pacificus</i>
Source	USNPC 36711, types	BMNH 1981.6.1.25	BMNH 1981.6.1.25
Host(s)	<i>Mycteroperca bonaci</i>	<i>Epinephelus tauvina</i>	<i>Epinephelus tauvina</i>
Locality	Dry Tortugas, Florida	Waltair Coast, Bay of Bengal	Waltair Coast, Bay of Bengal
n	3	3	2
Length	996–1,047 (1,027)	1,772–1,836 (1,808)	1,239–1,664
Width	282–325 (301)	359–452 (394)	322–488
Pre-vitelline distance	234–265 (254)	401–500 (457)	219–379
Pre-caecal distance	302–355 (329)	496–519 (511)	378–548
Pre-uterine distance	362–500 (410)	548–741 (659)	372–625
Pre-mouth distance	467–503 (485)	632–679 (656)	752–752
Pre-testicular distance	399–471 (430)	617–767 (674)	536–819
Pre-ovarian distance	383–421 (397)	543–617 (580)	484–729
Rhynchus	241–265 × 175–233 (253 × 201)	266–319 × 231–263 (292 × 244)	242–389 × 229–270
Rhynchus to vitellarium	0–8 (3)	103–210 (163)	0
Rhynchus to uterus	112–253 (169)	217–500 (375)	120–242
Rhynchus to caecum	69–115 (169)	176–246 (218)	133–156
Long vitelline field	222–272 (242)	353–449 (401)	305–428
Number of follicles in above	10–14 (12.3)	14–15 (14.7)	14–16
Short vitelline field	165–230 (199)	241–403 (305)	262–389
Number of follicles in above	11–13 (12)	11–14 (12.3)	11–13
Caecum	84–112 × 86–142 (98 × 114)	117–178 × 123–170 (143 × 139)	126–156 × 107–153
Pharynx	53 × 54	84–91 × 86–106 (88 × 96)	76–76 × 90–90

(continued)

Table 1. Continued.

Species	<i>P. atlanticus</i>	<i>P. pacificus</i>	<i>P. pacificus</i>
Source	USNPC 36711, types	BMNH 1981.6.1.25	BMNH 1981.6.1.25
Host(s)	<i>Mycteroperca bonaci</i>	<i>Epinephelus tauvina</i>	<i>Epinephelus tauvina</i>
Locality	Dry Tortugas, Florida	Waltair Coast, Bay of Bengal	Waltair Coast, Bay of Bengal
n	3	3	2
Ovary	80–90 × 71–115 (84 × 88)	104 × 89–91 (104 × 90)	79–98 × 68–97
Ovary to anterior testis	0	8–9 (8)	0
Anterior testis	92–121 × 79–132 (105 × 101)	112–143 × 97–131 (126 × 115)	111–137 × 94–130
Distance between testes	0–40 (13)	8–72 (47)	7–26
Posterior testis	79 × 88	108–122 × 78–119 (115 × 98)	87–123 × 82–117
Posterior testis to cirrus-sac	0–10 (3)	167–324 (242)	0–25
Cirrus-sac	288–314 × 86–92 (298 × 89)	416–480 × 96–120 (446 × 107)	424–481 × 84–136
Seminal vesicle	107–155 × 19–25 (133 × 23)	192–271 × 46–59 (230 × 53)	187–201 × 41–82
Pars prostatica	185–216 × 49–56 (201 × 52)	165–215 × 40–58 (198 × 52)	179–222 × 45–86
Post-testicular region	398–458 (428)	826–976 (898)	484–710
Post-vitelline region	442–551 (504)	884–968 (932)	739–813
Anterior extremity of cirrus-sac to posterior extremity (AECSPE)	377–434 (408)	642–721 (674)	546–687
Post-ovarian region	549–566 (556)	1,063–1,176 (1,120)	676–916
Genital pore to posterior extremity	83–172 (127)	228–271 (255)	137–181
Post-uterine region	15–28 (22)	112–155 (127)	114–115
Eggs	31–36 × 18–20 (34 × 19)	31–33 × 18–20 (32 × 19)	34–38 × 21–24
Width%*	26.9–32.7 (29.3)	19.7–24.6 (21.8)	26.0–29.3
Pre-vitelline distance%*	23.4–25.4 (24.8)	22.6–27.2 (25.2)	17.7–22.8
Pre-caecal distance%*	30.3–33.9 (32.0)	27.0–29.3 (28.3)	30.5–32.9
Pre-uterine distance%*	35.6–47.8 (39.9)	29.8–40.8 (36.5)	30.0–37.5
Pre-mouth distance%*	44.6–48.5 (46.6)	35.7–37.4 (36.5)	45.2–45.2
Pre-testicular distance%*	40.1–44.9 (41.8)	33.6–42.2 (37.3)	43.3–49.2
Pre-ovarian distance%*	37.0–40.2 (38.7)	29.6–34.8 (32.2)	39.0–43.8
Rhynchus length%*	24.1–25.6 (24.6)	14.6–17.4 (16.1)	19.5–23.4
Rhynchus width as % rhynchus length	69.2–92.8 (79.9)	74.4–99.1 (84.4)	69.7–94.6
Long vitelline field%*	21.2–27.3 (23.6)	19.9–24.5 (22.1)	24.6–25.7
Caecal length%*	8.04–11.3 (9.66)	6.59–9.71 (7.91)	9.37–10.2
Ovary length%*	7.61–8.65 (8.22)	5.67–5.85 (5.78)	5.88–6.40
Anterior testis length%*	8.75–12.2 (10.3)	6.16–7.81 (6.95)	8.21–8.94
Distance between testes%*	0–3.86 (1.29)	0.42–4.09 (2.62)	0.41–2.12
Posterior testis length%*	7.53	5.94–6.63 (6.38)	7.05–7.38
Posterior testis to cirrus-sac%*	0–0.92 (0.31)	9.42–17.7 (13.3)	0–1.50
Cirrus-sac length%*	27.5–30.3 (29.0)	22.9–27.1 (24.7)	28.9–34.2
Seminal vesicle length as % of cirrus-sac length	36.7–49.3 (44.5)	46.1–61.2 (51.5)	41.9–44.2
Post-testicular region%*	38.0–44.2 (41.1)	45.5–53.2 (49.7)	39.1–42.7
Post-vitelline region%*	42.2–53.2 (49.1)	48.2–54.6 (51.6)	48.9–59.7
AECSPE%*	36.0–41.9 (39.8)	35.3–40.7 (37.3)	41.3–44.1
Post-ovarian region%*	52.4–55.4 (54.2)	60.0–64.1 (62.0)	54.6–55.1
Genital pore to posterior extremity%*	8.32–16.6 (12.3)	12.4–15.1 (14.1)	19.9–11.1
Post-uterine region%*	1.46–2.71 (2.19)	6.10–8.52 (6.99)	6.85–9.29

* as % of body-length

Madhavi (1974) reported, but did not describe, *P. pacificus* from the greasy grouper *Epinephelus tauvina* (Forsskål) in the Bay of Bengal. She gave egg-measurements ($27\text{--}33 \times 16\text{--}20 \mu\text{m}$), but no other data. We have examined five of her specimens (BMNH 1981.6.1.25) and two distinct species appear to be present. Three specimens are similar to our form and may well be conspecific, whereas two differ in the vitellarium reaching the rhynchus, the cirrus-sac reaching to or almost to the posterior testis and in several other ratios (Table 1).

Prosorhynchus pacificus has also been reported in the lutjanid John's snapper *Lutjanus johni* Bloch, off Malaysia (Leong and Wong 1989). There are several reports of *P. pacificus* in the Atlantic Ocean resulting, no doubt, from the synonymy discussed below. These records need confirmation.

Hanson (1950) considered *P. atlanticus* a synonym of *P. pacificus*, and Winter (1960), Overstreet (1969) and Madhavi (1974) agreed, whereas Nahhas and Cable (1964) did not. We have examined the USNPC slide No. 36711 of *P. atlanticus* labelled 'type' and have measured the three specimens (Table 1). This species differs from *P. maternus* in that the vitellarium reaches to or almost to the rhynchus, the cirrus-sac reaches to or almost to the posterior testis, the mouth is more posterior, the rhynchus relatively longer, the cirrus-sac is relatively larger and several other ratios do not overlap (Table 1). The synonymy of *P. atlanticus* and *P. pacificus* is not supported by our measurements in that in the former the vitellarium reaches to or close to the rhynchus, the rhynchus is relatively longer, the cirrus-sac is relatively shorter and the eggs are larger (Table 1).

Madhavi (1974) also considered *P. luzonicus* Velasquez, 1959, from the barramundi *Lates calcarifer* (Bloch) (Latidae) from off of the Philippines, a synonym of *P. pacificus*. *Prosorhynchus luzonicus* differs from *P. maternus* in that the vitellarium reaches almost to the rhynchus and the cirrus-sac reaches almost to the posterior testis.

Prosorhynchus gonoderus differs from *P. maternus* in the much more anterior position of the mouth, vitellarium and gonads (Manter 1940a).

Prosorhynchus longicollis differs from *P. maternus* in many features. It is much narrower, has a tiny button-like rhynchus, the mouth is well into the posterior third of the body, the testes are relatively close to the posterior extremity and the cirrus-sac overlaps the gonads as far as the ovary (Yamaguti 1953).

Other species differ from *P. maternus* in the following characters: In *P. mcintoshii* the cirrus-sac overlaps the posterior testis and the mouth is equatorial (Velasquez 1959). *P. bulbosus*, an Atlantic species, differs in being narrower, with a more posterior vitellarium, an equatorial mouth and testes in the posterior

half of the body (Kohn 1961, Kohn 1967). *P. promicropsi*, an Atlantic species, differs in the much more posteriorly situated vitellarium, with the caecum reaching distinctly anterior to it, and the more posteriorly situated mouth and gonads (Manter 1940b). *P. mizellei*, from a cyclopterid, is a squat worm, with the relatively very large cirrus-sac reaching to the ovary, a small rhynchus and eggs $32\text{--}40 \mu\text{m}$ long (Kruse 1977). *P. kahala*, from a carangid, is an elongate worm, with all the gonads in the posterior half of the body, the mouth in the posterior quarter of the body and the cirrus-sac overlapping the anterior testis (Yamaguti 1970).

Prosorhynchus maternus can be readily distinguished from the other *Prosorhynchus* species reported from New Caledonia by its post-ovarian uterus and several other features. In *P. freitasi* the vitellarium reaches only to the equatorial level and most of the organs are crowded into the posterior half of the body, the rhynchus is relatively tiny and the cirrus-sac reaches to the posterior testis (Nagaty 1937). *P. longisaccatus* is a relatively squat worm, with a relatively large rhynchus, the vitellarium overlaps the rhynchus and the long cirrus-sac reaches almost to the equatorial level, overlapping the gonads. In *P. serrani* the uterus reaches into the previtelline region and the cirrus-sac overlaps the posterior testis (Durio and Manter 1968).

Further records of bucephalids from New Caledonia. We have found two further bucephalid species from epinepheline serranids from off New Caledonia. *Prosorhynchus longisaccatus* Durio et Manter, 1968, originally reported from the 'leche' has been found by us in the speckled blue grouper *Epinephelus cyanopodus* (Richardson) (MNHN JNC1659, BMNH 2006.4.27.1–10). In New Caledonia *E. cyanopodus* is known as the 'loche bleue', being blue, and is readily identifiable. Durio and Manter (1968) used the name 'loche bleue' without the scientific binomial in several other descriptions, prompting us to think that the original report of this worm is from a different species of grouper. We have also found *Prosorhynchoides lamprelli* Bott et Cribb, 2005 from the brassy trevally *Caranx papuensis* Alleyne et Macleay, off Nouméa (MNHN JNC1189C, BMNH 2006.4.27.11–13) (see Bott and Cribb 2005).

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