



## Descriptions of four new species of damselfishes (Pomacentridae) in the *Pomacentrus philippinus* complex from the tropical western Pacific Ocean

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### Abstract

Four new species of *Pomacentrus*, allied to *P. philippinus*, are described from the western Pacific Ocean. *Pomacentrus albiaxillaris*, n. sp. is described on the basis of 81 specimens, 14.5–70.0 mm SL, from the Palau Archipelago in Micronesia. It was formerly considered to be a Palauan population of *P. emarginatus* Cuvier, a species of uncertain status from Waigeo in West Papua. However, the two species differ in appearance and morphology and the new species from Palau has never been observed at Waigeo and surrounding areas despite extensive surveys by the authors. *Pomacentrus albiaxillaris* differs from other members of the *philippinus* complex in possessing a white pectoral-fin axil; a small dark spot that is restricted to the uppermost portion of the pectoral-fin base (instead of a large black marking that covers the entire fin base); a whitish caudal fin; and a bright blue dorsal scleral surface of the eye. *Pomacentrus flavoaxillaris*, n. sp. is described on the basis of 28 specimens, 49.5–72.9 mm SL, from Micronesian locations east of Palau, including Ulithi Atoll, Chuuk, Pohnpei, and Kosrae. Additional photographic and literature records include Ngulu Atoll, Yap, and the Mortlock Islands. It is similar to *P. albiaxillaris* n. sp. in having a white caudal fin and blue dorsal scleral surface of the eye, but differs in having a yellow inner pectoral-fin axil, a large black spot covering the entire pectoral-fin base, white zones at the bases

of the posteriormost dorsal- and anal-fin rays, and a whitish caudal peduncle. *Pomacentrus magniseptus*, n. sp. is described from 24 specimens, 34.6–75.6 mm SL, collected at the Great Barrier Reef of Australia. It differs from other members of the *philippinus* complex by its unique color pattern, consisting of horizontal rows of pale spots on the side of the body and entirely blackish median fins. It also differs from most relatives in always lacking scales on the preorbital and most of the suborbital. *Pomacentrus nigriradiatus*, n. sp. is described on the basis of 48 specimens, 28.8–86.9 mm SL, from Samoa, Rotuma, Wallis Island, Loyalty Islands, New Caledonia, and Vanuatu. Diagnostic features include highly contrasting dark fin rays on the posterior portions of the dorsal, anal, and caudal fins, as well as the lack of a contrasting marking on the inner pectoral-fin axil. It also differs from *P. albiaxillaris* and *P. flavoaxillaris* in usually having at least a few scales on the preorbital. Genetic evidence is also provided to resolve relationships among the four new species and *P. philippinus*. The divergence in the mtDNA sequence of three concatenated markers between these species ranges from 5.1–7.4% (in average pairwise distances), with the closest relationship between *P. flavoaxillaris* and *P. magniseptus*. The four new species differ by an average of 12.9% in mtDNA sequence from the type population of *P. philippinus* in the Philippines.

**Key words:** ichthyology, taxonomy, systematics, phylogenetics, coral-reef fishes, Indo-Pacific Ocean, cryptic species, mtDNA.

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## Introduction

Damselfishes of the genus *Pomacentrus* Lacepède, 1802 are common inhabitants of coral reefs throughout the Indo-West and central Pacific Ocean. Allen (1991) recognized 54 species, but since then an additional 19 species have been described (Allen 1992, 1993, 1995, 1999, 2002, 2004, Randall 2002, Allen & Wright 2003, Allen & Randall 2004, 2005, Allen & Erdmann 2009, Allen *et al.* 2011, Allen & Drew 2012, Liu *et al.* 2014), for a total of 73 species (not counting the 4 new species described here). *Pomacentrus* is the second largest genus in this major reef-fish family that contains approximately 395 species, surpassed only by the circumglobal genus *Chromis*, with 98 species. The majority (about 72%) of *Pomacentrus* species are primarily distributed in the western and central Pacific region, with lesser representation in the Indian Ocean. The genus is especially well represented in the diverse Indo-Australian Archipelago, where 45 species were reported by Allen & Erdmann (2012).

Some widespread nominal pomacentrid species tend to develop complexes of cryptic species that are only minimally different in appearance, but show significant divergence in mtDNA sequence from related species (Allen, Erdmann & Cahyani 2015, Victor 2015). The development of cryptic speciation, especially geographic complexes of parapatric lineages, appears to be correlated with reduced dispersal, either by benthic eggs in conjunction with a short larval stage or extreme distances between populations (Victor 2015). Damselfishes are one of the few reef fish families that brood benthic eggs and they also tend to have relatively short pelagic larval durations: for example, one of the new species described here, *Pomacentrus albiaxillaris* from Palau, has a particularly short larval duration of 17–20 days (Wellington & Victor 1989; as *P. emarginatus*).

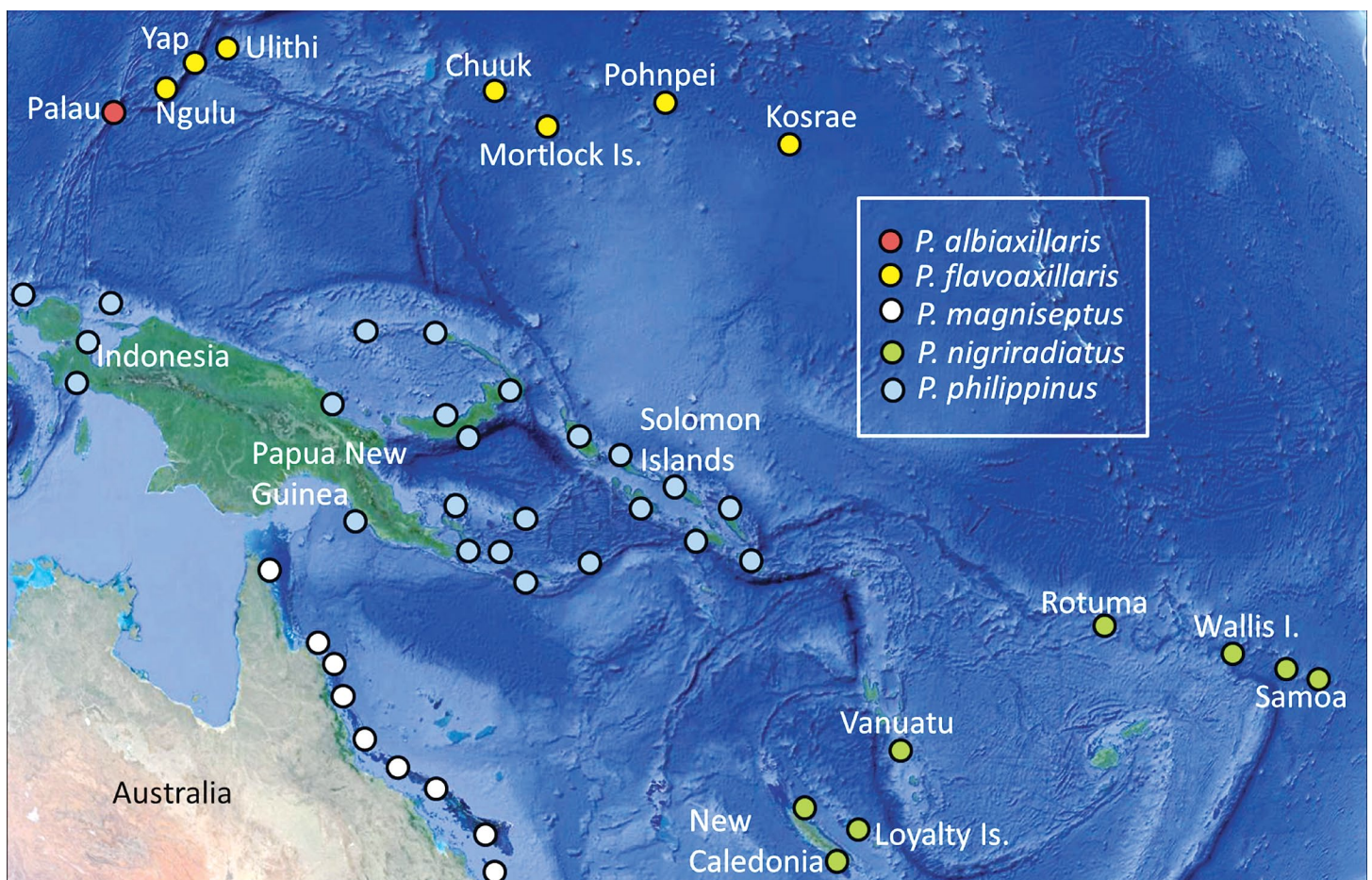
The nominal species, *Pomacentrus philippinus* Evermann & Seale, 1907, was described from southeastern Luzon, Philippines, but the species was subsequently reported from numerous widespread locations in the East Indies and adjacent regions, from the Great Barrier Reef north to the Ryukyu Islands of Japan, and the Maldives east to Micronesia and Samoa (Allen 1975, 1991, Myers 1989, 1999, Randall *et al.* 1990, Allen & Erdmann 2012). We have surveyed some of these populations and found that four populations show color-pattern differences from the type population, as well as diverging substantially in mtDNA sequences.

The present paper describes these populations as four new species of the *P. philippinus* species complex: two from Micronesia and one each from the Great Barrier Reef and insular South Pacific locations (Fig. 1). One of the Micronesian species is apparently restricted to the Palau Archipelago and was previously misidentified as *Pomacentrus emarginatus* Cuvier, 1829 (Allen 1975, 1991, Myers 1989, 1999). However, our extensive fish surveys around the island of Waigeo (the type locality of *P. emarginatus*) and the surrounding Raja Ampat Islands of West Papua, Indonesia, revealed that the Palau form does not occur there, and the name is likely a synonym of another species of *Pomacentrus*. The three other new species described here were previously confused with and typically misidentified as *P. philippinus* (Allen 1975, 1991, Myers 1989, 1999).

The members of this species complex share morphological and meristic features, as well as a basic color pattern of a dark network pattern on the sides of the body imparted by the thick dark scale margins. Most species also possess abruptly pale posterior dorsal- and anal-fin rays, which, depending on the species, are clear, whitish, orange, or yellow, with a matching caudal-fin coloration. Unlike many other members of the genus, juveniles lack the characteristic ocellus on the dorsal fin, and are generally bluish or bluish gray. The species complex is also characterized by several short filaments on the posterior edge of the caudal fin, often concentrated at the apex of the upper and lower lobes. In addition, the presence of preorbital-suborbital scalation is particularly diagnostic for the *philippinus* complex, with only the unrelated *P. lepidogenys* Fowler & Bean, 1928, sharing this feature.

## Materials and Methods

Lengths of specimens are given as standard length (SL) measured from the anterior end of the upper lip to the base of the caudal fin (posterior edge of the hypural plate); head length (HL) is measured from the same anterior point to the posterior edge of the opercle flap; body depth is the maximum depth taken vertically between the belly and base of the dorsal-fin spines; body width is the maximum width just posterior to the gill opening; snout length



**Figure 1.** Map of a portion of the western Pacific Ocean with approximate distributions of the *P. philippinus* species complex.

is measured from the anterior end of the upper lip to the anterior edge of the eye; orbit diameter is the horizontal fleshy diameter, and interorbital width the least fleshy width; upper-jaw length is taken from the front of the upper lip to the posterior end of the maxilla; caudal-peduncle depth is the least depth, and caudal-peduncle length is the horizontal distance between verticals at the rear base of the anal fin and the caudal-fin base; lengths of fin spines and rays are measured to their extreme bases (i.e. not from the point where the ray or spine emerges from the basal scaly sheath); caudal-fin length is the horizontal length from the posterior edge of the hypural plate to a vertical at the tip of the longest ray; caudal concavity is the horizontal distance between verticals at the tips of the shortest and longest rays; pectoral-fin length is the length of the longest ray; pelvic-fin length is measured from the base of the pelvic-fin spine to the filamentous tip of the longest soft ray; pectoral-fin ray counts include the small splint-like uppermost rudimentary ray; only the tube-bearing anterior lateral-line scales are counted; a separate count is given for the deeply pitted scales occurring in a continuous series midlaterally on the caudal peduncle; the decimal figure “.5” appearing in the scale-row count above and below the lateral line refers to a small truncated scale at the bases of the dorsal and anal fins; gill-raker counts include all rudiments and are presented as separate counts for the upper and lower (includes raker at angle) limbs, as well as a combined count; the last fin-ray element of the dorsal and anal fins is usually branched near the base and is counted as a single ray. The terms inner and outer pectoral-fin axil refers to the respective body and fin sides of the axil.

Counts and proportions in parentheses refer to the range of data for the paratypes, if different from the holotype. Proportional measurements (expressed as percentage of the standard length) for each of the new species are presented in Tables 1 & 4–6, and counts for soft dorsal-fin rays, soft anal-fin rays, pectoral-fin rays, total gill rakers on the first arch, and tubed lateral-line scales are presented in Table 3. Type specimens are deposited at the Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu, Hawaii (BPBM); Royal Ontario Museum, Toronto, Canada (ROM), National Museum of Natural History, Washington, D.C. (USNM), and the Western Australian Museum, Perth (WAM). The holotype of *P. emarginatus* was examined at Muséum national d’Histoire naturelle, Paris, France (MNHN).

DNA sequences were obtained from 22 individuals of the *philippinus* species complex from the following geographic regions: Palawan (Philippines), Palau, Lotutuga (Samoa), New Caledonia, Chuuk, and the Great Barrier Reef (Australia). Eight outgroup sequences were obtained from *P. lepidogenys*, *P. brachialis*, and *P. melanochir*. The specimens were fixed in 95% EtOH and stored at room temperature until tissues were processed for DNA extraction. Mitochondrial DNA was extracted using a 10% Chelex solution (Walsh *et al.* 1991). A portion of the 16S, cytochrome c oxidase subunit I (COI), and control-region markers was amplified via PCR using the primers 16Sar/16Sbr (Westneat & Alfaro 2005), jgHCO/jgLCO (Geller *et al.* 2013) and CRK/CRE (Lee *et al.* 1995), respectively. The PCR reaction was carried out in 25  $\mu$ L volumes, using 1  $\mu$ L of template. Each reaction included 2.5  $\mu$ L 10x PCR buffer (Applied Biosystems), 2.5  $\mu$ L 10 mM dNTPs, 1.25  $\mu$ L of each primer at 10 mM, 2  $\mu$ L 25 mM MgCl<sub>2</sub> solution, 0.125  $\mu$ L AmplyTaq Red™ (Applied Biosystems), 1  $\mu$ L 1x BSA and 13.5  $\mu$ L ddH<sub>2</sub>O. The thermocycling profile included an initial denaturation of 94°C for 15 s, 38 cycles of 94 °C for 30 s, 50°C for 30 s, and 72°C for 45 s, with a final extension of 72 °C for 5 min. PCR reactions were checked on 1% agarose gels stained with ethidium bromide. The PCR product was sequenced at the University of California Berkeley sequencing facility. Forward and reverse sequences were proofread using MEGA5 (Tamura *et al.* 2011) and then aligned using CLUSTALW, with subsequent alignment by eye. Phylogenetic analyses were performed using Bayesian reconstruction methods in BEAST v1.7 (Drummond & Rambaut 2007) with the concatenated alignment of the three loci. Model that best fit data for each locus were chose using jModeltest 0.1.1 (Guindon & Gascuel 2003, Posada 2008), while all other priors were left as the default values in BEAUTi (Drummond & Rambaut 2007). All BEAST analyses were run for a total of 360 million generations and sampled every 1000 generations. Convergence and the consequent proportion of burn-in were assessed using Tracer v.1.5 (available from <http://beast.bio.ed.ac.uk/>). Genetic distances from concatenated data from the three mtDNA markers sequenced in this study were generated using the PATRISTIC program (Fourment & Gibbs 2006). Analyses of polymorphic sites were conducted by DNAsp (Librado & Rozas 2009).



*Pomacentrus albiaxillaris*, n. sp.

White-axil Damsel fish

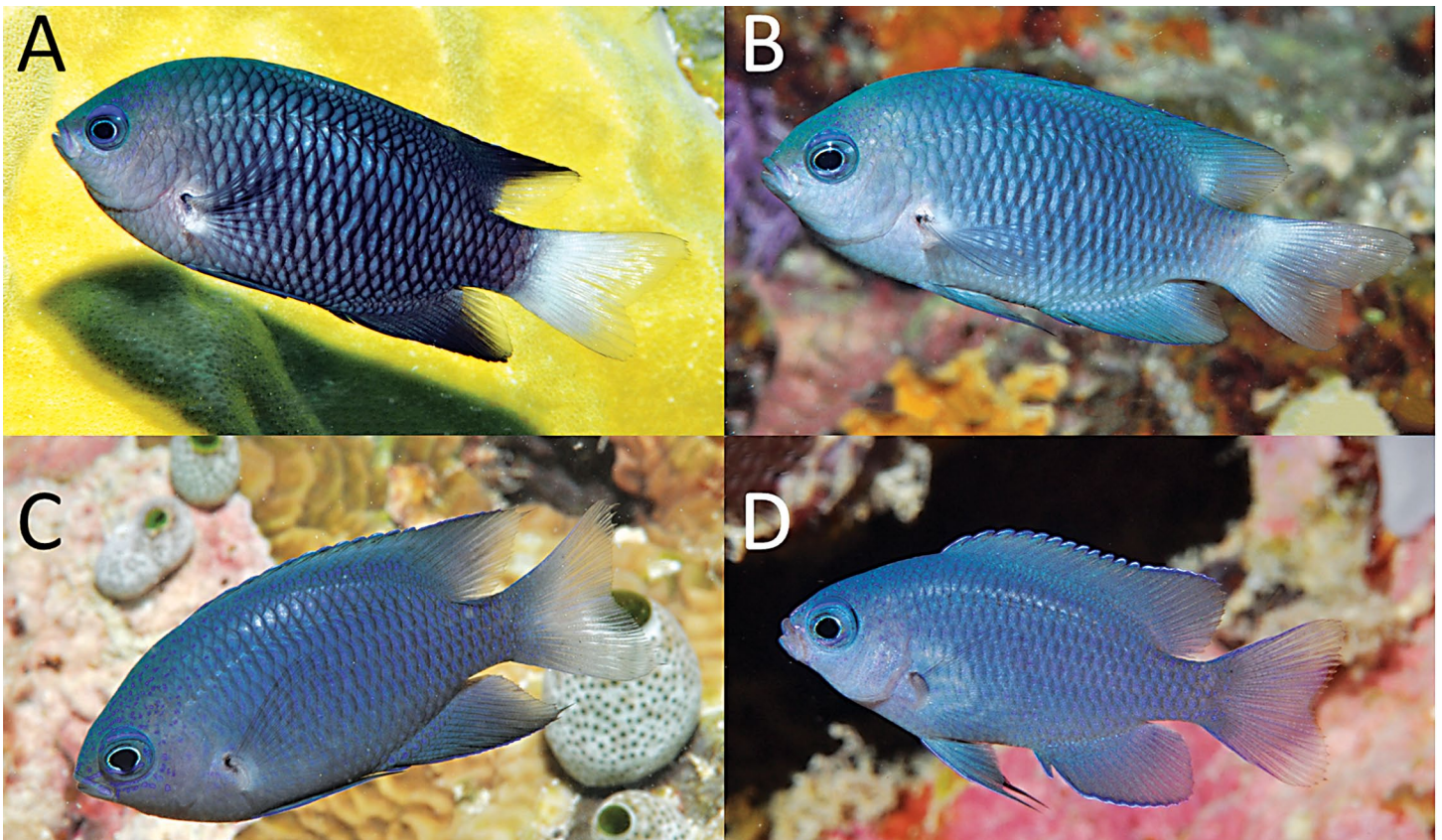
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Figures 2, 3, 4B, 5, 6A & 7B; Table 1.

*Pomacentrus emarginatus* [non Cuvier] Allen 1975: 211 (Palau); Myers 1989: 173 (Palau); Allen 1991:146 (Palau); Myers 1999: 185 (Palau).

**Holotype.** ROM 78468, 66.7 mm SL, Republic of Palau, SE of Koror, Uchelbeluu Reef, 7°16.680' N, 134°33.272' E, rotenone, R.W. Winterbottom *et al.*, 22 May 2004.

**Paratypes.** (all Palau Islands, rotenone) ROM 101282, 3 specimens, 67.6–70.0 mm SL, collected with holotype; ROM 78481, 51.2 mm SL, Lighthouse Reef off Ngeruktabel (Urukthapel) Island, 7°16.628' N, 134°27.645' E, R.W. Winterbottom *et al.*, 22 May 2004; ROM 78483, 17 specimens, 37.1–69.2 mm SL, Ngeruktabel, Urukthapel Island, 7°16.417' N, 134°29.483' E, R.W. Winterbottom *et al.*, 21 May 2004; ROM 78501, 2 specimens, 61.8–69.2 mm SL, due W of Koror where lagoon rises to outer barrier, 7°20.738' N, 134°16.787' E, R.W. Winterbottom *et al.*, 24 May 2004; ROM 78520, 65.7 mm SL, outer reef off Ulong Pass, 7°18.187' N, 134°14.103' E, R.W. Winterbottom *et al.*, 26 May 2004; ROM 78594, 10 specimens, 21.6–69.2 mm SL, outer reef off W Babeldaob Island, 7°37.397' N, 134°30.920' E, R.W. Winterbottom *et al.*, 31 May 2004; ROM 78656, 4 specimens, 15.8–65.9 mm SL, outer reef off E coast of Babeldaob Island, 7°27.395' N, 134°39.525' E, R.W. Winterbottom *et al.*, 6 June 2004; ROM 78667, 64.3 mm SL, outer reef off Ulong Island, 7°17.737' N, 134°14.315' E, R.W. Winterbottom *et al.*, 7 June 2004; ROM 78680, 4 specimens, 63.3–65.3 mm SL, Cormoran Reef off N tip of Babeldaob Island, 7°48.073' N, 134°32.665' E, R.W. Winterbottom *et al.*, 11 June 2004; ROM 78689, 25 specimens, 14.5–66.8



**Figure 2.** *Pomacentrus albiaxillaris*, underwater photographs, Palau: A) approx. 70 mm SL; B) approx. 55 mm SL; C) approx. 40 mm SL; and D) approx. 30 mm SL (G.R. Allen).



mm SL, Uchelbeluu Reef, off E side of Koror, 7°15.570' N, 134°31.600' E, R.W. Winterbottom *et al.*, 8 June 2004; ROM 78700; 4 specimens: 21.9–67.1 mm SL, Cormoran Reef off N tip of Babeldaob Island, 7°48.105' N, 134°32.422' E, R.W. Winterbottom *et al.*, 10 June 2004; USNM 432515, 6 specimens, 55.2–67.0 mm SL, collected with ROM 78483; WAM P.34548-001, 62.6–66.9 mm SL, collected with ROM 78594; WAM P.34549-001, 3 specimens, 61.3–63.3 mm SL, collected with ROM 78689.

**Non-type specimens.** (all Palau Islands, rotenone) ROM 78482, 10 specimens, 12.5–28.8 mm SL; Ngeruktabel, Urukthapel Island, S of easternmost point, 7°16.417' N, 134°29.483' E; ROM 78496, 3 specimens 12.3–33.0 mm SL, off Babeldaob Island, 7°26.572' N, 134°21.242' E.

**Diagnosis.** Dorsal-fin rays XIII,12–15 (usually 14); anal-fin rays II,13–15 (usually 14); pectoral-fin rays usually 16–18 (usually 18); tubed lateral-line scales 15–18 (rarely 15–16); total gill rakers on first arch 22–25 (usually 23–24); body depth 2.0–2.2 in SL; scales absent on preorbital, single row of scales on suborbital, often restricted to posterior part, continuing around posterior margin of eye; color in life generally gray to bluish gray with thick black or dark-brown scale margins producing a network pattern; a small black spot restricted to uppermost portion of pectoral-fin base; both sides of pectoral-fin axil white; dorsal and anal fins dark gray or blackish with translucent portion posteriorly; caudal fin whitish; dorsal scleral surface of eye bright blue.

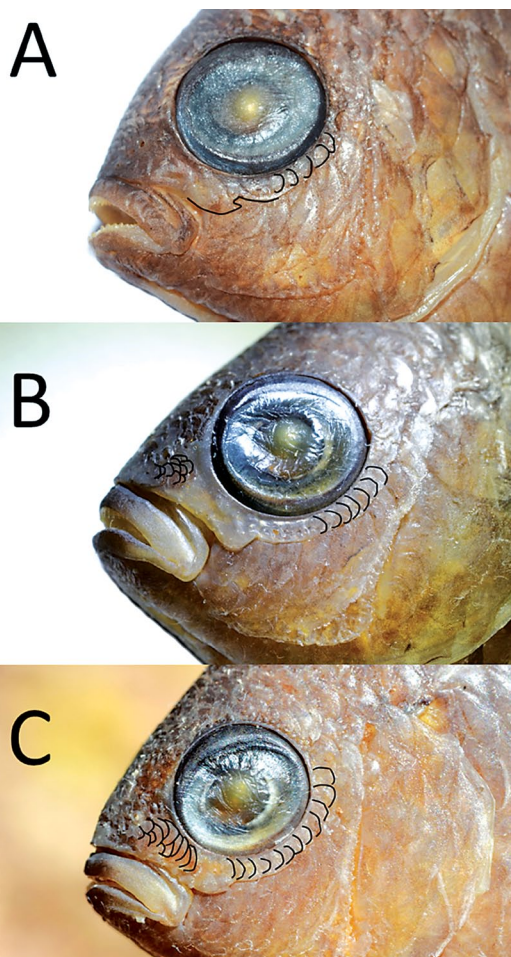
**Description.** Dorsal-fin rays XIII,14 (XIII,12–15); anal-fin rays II,14 (II,13–15); all dorsal- and anal-fin soft rays branched, last to base; pectoral-fin rays 18 (16–18), lowermost 1–2 rays and uppermost 2 unbranched; pelvic-fin rays I,5; principal caudal-fin rays 15, median 13 branched; upper procurrent caudal-fin rays 6 (5–6) and lower rays 6 (5–6), posterior pair segmented; scales in longitudinal series 27; tubed lateral-line scales 18 (15–19); posterior midlateral scales with a pore or deep pit (in continuous series) 8 (5–8); scales above lateral line to dorsal-fin origin 3; scales above lateral line to base of middle dorsal-fin spine 1.5; scales below lateral line to origin of anal fin 9; gill rakers 7 + 16 (6–9 + 15–17), total rakers 23 (22–24); pseudobranch filaments 13 (12–14); total vertebrae 26 (10 specimens).

Body ovate, depth 2.0 (2.0–2.2) in SL, and compressed, width 2.4 (2.2–2.8) in body depth; head length 3.3 (3.2–3.5) in SL; dorsal profile of head evenly rounded from dorsal-fin origin to snout; snout shorter than orbit, its length 3.7 (3.3–4.1) in HL; orbit diameter 2.9 (2.7–3.1) in HL; interorbital space convex, its width 2.8 (2.6–3.2) in HL; caudal-peduncle depth 1.9 (1.8–2.0) in HL; caudal-peduncle length 2.4 (2.2–2.9) in HL.

Mouth terminal, small, and oblique, forming an angle of about 35–40° to horizontal axis of head and body; maxilla reaching a vertical about even with anterior edge of pupil, upper-jaw length 3.3 (3.0–3.5) in HL; teeth of jaws uniserial posteriorly, becoming biserial at front of jaws with additional slender buttress teeth in spaces between main row of larger teeth; teeth incisiform to conical, about 36–42 in main row of each jaw of holotype (excluding buttress teeth). Tongue triangular with rounded tip, set far back in mouth. Gill rakers long and slender, longest on lower limb near angle, about two-thirds length of longest gill filaments. Nostril round with slightly raised rim, level with lower edge of pupil and about midway between anterior edge of eye and upper lip.

Opercle ending posteriorly in a flat spine, tip obtuse, barely projecting from beneath a large scale; rear margin of preopercle with 16 tiny serrae on left side of holotype (14–22); preorbital with a single serra separated by a rounded notch from suborbital series; lower edge of suborbital smooth.

Scales finely ctenoid; head scaled except lips and tip of snout, and preorbital (lacrimal), which is usually naked (Fig. 3A), but two paratypes (Fig. 3B & C) have a patch of scales on anterior half of preorbital, posterior half naked; suborbital with a single row of scales,



**Figure 3.** *Pomacentrus albiaxillaris*, ROM 78689, paratypes: A) partially scaled suborbital; B) plus preorbital patch; C) large preorbital patch and fully scaled suborbital (G.R. Allen).

TABLE 1

Proportional measurements of selected type specimens of *Pomacentrus albiaxillaris*, n. sp.  
as percentages of the standard length

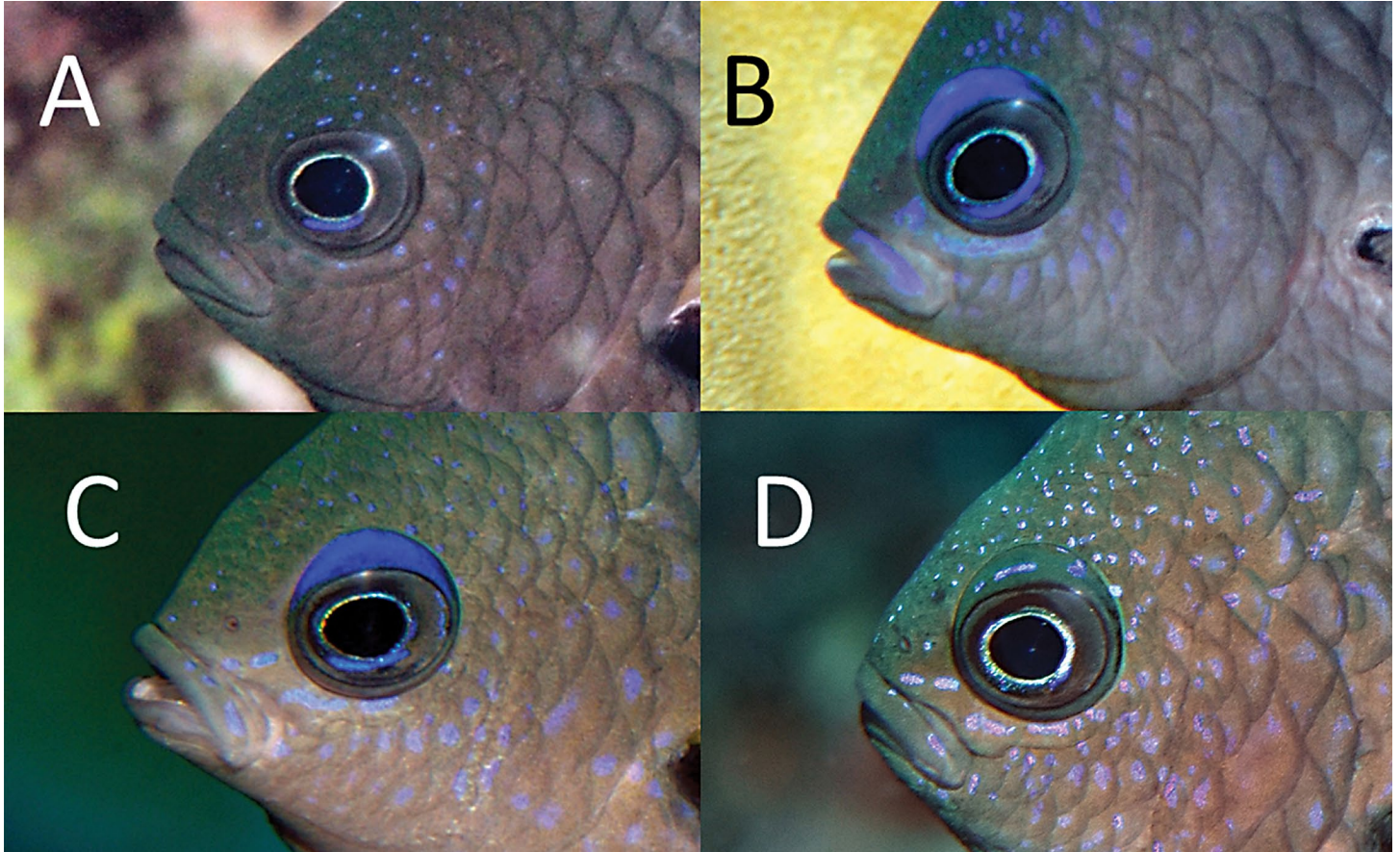
	holotype				paratypes					
	ROM 78468	ROM 101282	ROM 78594	ROM 101282	ROM 78483	ROM 78483	ROM 78594	ROM 78656	ROM 78689	ROM 78481
Standard length (mm)	65.7	70.0	69.2	67.9	66.2	64.6	62.0	58.4	54.1	51.8
Body depth	49.1	45.9	47.5	47.7	49.4	48.5	48.9	49.8	48.9	48.6
Body width	20.5	18.2	20.2	19.6	18.5	18.1	19.9	19.8	18.2	17.2
Head length	30.0	31.6	28.2	30.3	29.9	28.6	29.6	29.8	29.7	30.0
Snout length	8.1	8.8	7.7	9.0	7.6	7.4	8.6	7.6	8.3	8.0
Orbit diameter	10.4	10.3	9.6	10.5	11.0	9.6	10.8	10.5	10.1	10.9
Interorbital width	10.8	9.9	9.6	10.2	9.9	10.8	10.8	10.1	10.0	9.8
Caudal-peduncle depth	15.9	15.4	15.7	16.0	15.8	15.9	16.6	16.4	16.2	16.7
Caudal-peduncle length	12.6	13.2	11.5	11.7	12.1	11.9	12.6	11.0	13.5	13.2
Upper jaw length	9.1	9.8	9.1	9.7	9.1	8.7	9.2	9.1	9.7	8.6
Predorsal length	37.4	38.1	37.7	39.7	40.2	38.2	38.7	38.1	38.8	37.4
Preanal length	68.9	65.9	62.2	66.1	65.7	63.1	66.0	64.3	63.0	65.7
Prepelvic length	43.7	41.0	38.9	39.6	38.5	38.1	40.0	42.1	38.8	38.8
Length dorsal-fin base	58.9	59.4	59.0	59.8	59.5	63.0	60.0	62.0	61.7	59.3
Length anal-fin base	27.7	27.2	28.6	29.1	26.2	29.2	28.5	30.1	28.8	29.1
Length pectoral fin	31.0	29.1	29.4	32.4	30.5	30.5	33.3	32.1	33.4	31.2
Length pelvic fin	33.9	33.8	31.7	36.9	33.1	33.0	36.0	36.2	33.7	33.6
Length pelvic-fin spine	16.1	16.5	15.1	16.6	15.9	15.7	16.2	16.1	16.8	16.7
Length first dorsal spine	8.0	7.1	6.7	7.9	6.9	7.0	7.2	7.4	8.2	6.0
Length second dorsal spine	13.7	14.2	12.5	13.5	13.4	14.9	13.7	13.6	14.2	14.2
Length seventh dorsal spine	16.5	16.9	14.4	16.8	17.2	18.1	15.4	16.4	15.5	17.5
Length longest dorsal ray	24.7	22.8	22.9	23.9	22.7	22.0	23.2	25.5	27.8	23.5
Length first anal spine	8.2	7.8	7.1	8.0	6.9	6.7	7.8	7.9	8.2	6.3
Length second anal spine	16.8	16.9	15.7	18.1	16.6	15.5	18.2	16.5	16.8	16.2
Length longest anal ray	21.1	22.8	20.9	23.2	22.0	24.4	22.9	23.0	23.8	27.5
Length caudal fin	31.6	30.6	30.5	32.2	30.5	32.5	35.2	32.8	34.7	33.0
Caudal concavity	6.6	8.2	5.8	7.7	7.2	7.4	9.3	8.4	9.9	5.4



continuing around posterior margin of eye; scaly sheath at base of dorsal and anal fins, averaging about two-thirds pupil-width at base of dorsal fin and about same width at base of anterior part of anal fin, tapering in width on anteriormost and posteriormost sections; column of scales on each membrane of dorsal and anal fins narrowing distally, progressively longer on spinous portion of dorsal fin, reaching at least two-thirds distance to spine tips on posterior membranes and covering as much as half of soft portion of dorsal and anal fins; small scales on caudal fin extending about two-thirds distance to posterior margin; small scales on basal quarter of pectoral fins; a cluster of several scales forming median process, extending posteriorly from between base of pelvic fins, its length slightly greater than half that of pelvic-fin spine; axillary scale above base of pelvic-fin spine, its length 60–83% of pelvic-fin spine.

Origin of dorsal fin over third or fourth tubed lateral-line scale, predorsal distance 2.7 (2.5–2.7) in SL; base of soft portion of dorsal fin contained about 1.8 times in base of spinous portion; dorsal-fin spines gradually increasing in length up to last spine; first dorsal-fin spine 3.7 (3.4–5.0) in HL; seventh dorsal-fin spine 2.2 (1.9–2.8) in HL; last dorsal-fin spine 1.8 (1.6–2.2) in HL; membranes of spinous portion of dorsal fin moderately incised between spine tips; seventh dorsal-fin soft ray longest, 1.2 (1.1–1.4) in HL; first anal-fin spine 3.5 (3.5–4.8) in HL; second anal-fin spine 1.8 (1.6–2.2) in HL; longest (ninth) anal-fin soft ray 1.4 (1.1–1.4) in HL; caudal fin moderately forked with rounded to moderately angular lobes, its length 3.2 (2.8–3.4) in SL; posterior margin of caudal fin frequently with short filamentous extensions (usually abraded or absent in preserved specimens); fourth pectoral-fin ray longest, 3.2 (3.0–3.4) in HL; pelvic-fin spine 1.9 (1.7–1.9) in HL; first soft ray of pelvic fin forming filamentous tip, 3.0 (2.8–3.1) in SL.

**Color in life.** (Figs. 2, 4B, ) Body of adult overall gray to bluish gray with thick black or dark-brown scale margins producing a network pattern; head dark gray to gray brownish, usually with scattered blue markings, including small spots on nape and forehead, streaks below eye and on upper lip, and faint spots on cheek and opercle; eye with narrow white ring around pupil except lower edge with bright blue streak and dorsal scleral surface bright blue (Fig. 4B); dorsal and anal fins mainly dark gray to blackish with thin blue margin, except posterior edge of fin translucent; caudal fin whitish on basal one-half to two-thirds, translucent on rest; pelvic



**Figure 4.** *Pomacentrus philippinus* complex, blue head markings, underwater photographs, A) *P. philippinus*, Sulawesi, Indonesia; B) *P. albiaxillaris*, Palau; C) *P. flavoaxillaris*, Chuuk; and D) *P. nigriradiatus*, Loyalty Islands (G.R. Allen).





**Figure 5.** *Pomacentrus albiaxillaris*, preserved holotype, ROM 78468, 66.7 mm SL, Palau (G.R. Allen).

fins dark gray to blackish; pectoral fins translucent with dusky gray rays; small black spot on uppermost portion of pectoral-fin base, slightly invading axil, rest of base pale gray to whitish; both sides of pectoral-fin axil white (Fig. 6). Juveniles with a blue spot or streak on each scale, resulting in an overall blue-gray appearance (Fig. 2D); median fins blueish grey with a blue margin on dorsal and anal fins; pelvic fins dusky gray with a blue anterior margin; eye markings similar to adult; dark spot on uppermost pectoral-fin base with narrow ventral extension on upper third of base.

**Color in alcohol.** (Fig. 5) Generally brown with darker brown scale margins, lighter brown on lower head and thorax; dorsal, anal, and pelvic fins mainly brown; caudal fin pale tan; pectoral fins semitranslucent with whitish base and axil, and a small black spot at base of uppermost ray.

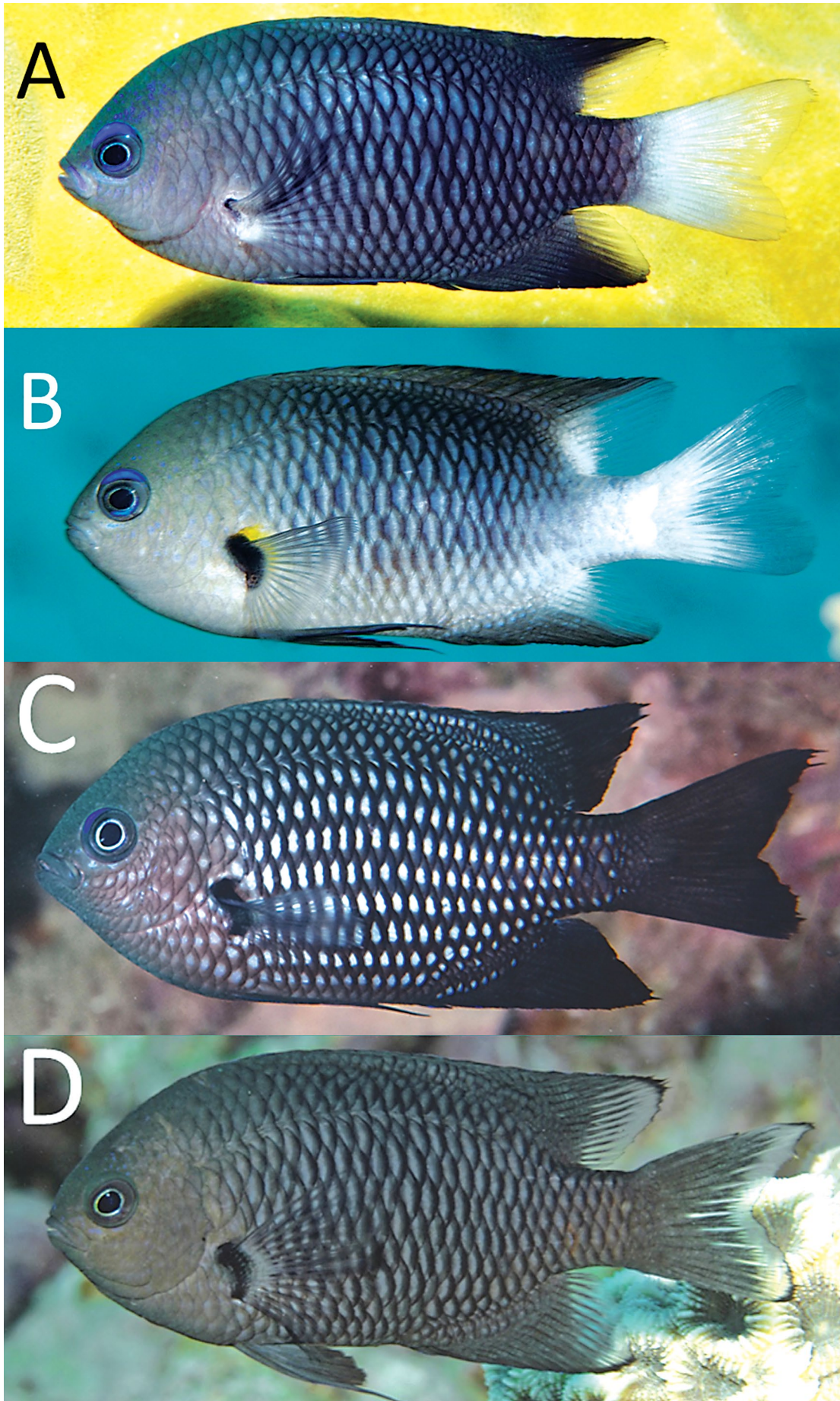
**Etymology.** The new species is named *albiaxillaris* (Latin: white armpit or axil), with reference to the diagnostic color of the pectoral-fin axil. The specific epithet is a compound adjective.

**Distribution.** The new species is known only from the islands of the Palau Archipelago, where it is commonly encountered in depths of about 4–15 m.

**Nomenclatural history.** This species in Palau was formerly identified by Allen (1975, 1991) and Myers (1989, 1999) as *Pomacentrus emarginatus* Cuvier, 1829. While the original description did not include a type locality, Cuvier (in Cuvier & Valenciennes [1830]) published a redescription with the type locality of Waigeo (now part of Raja Ampat Islands of West Papua Province, Indonesia). We have examined the holotype (MNHN 9656) and, although the precise identification remains doubtful, we conclude it is most likely *P. littoralis* Cuvier in Cuvier & Valenciennes, 1830; *P. taeniometopon* Bleeker, 1852; or *P. tripunctatus* Cuvier, 1830 in Cuvier & Valenciennes, 1830 (based on the preserved color pattern and counts of fin rays, lateral-line scales, and gill rakers, and general proportions). All three of these species are common shallow-water inhabitants at Waigeo, where the present authors have extensively surveyed reef fishes. These three species and the holotype of *P. emarginatus* lack scales on the preorbital-suborbital series, in contrast to the scaled condition of *P. albiaxillaris*. The holotype of *P. emarginatus* also possesses 20 total gill rakers on the first branchial arch in contrast to the 22–25 (usually 23–24) count for *P. albiaxillaris*. Finally, we have never seen the Palau form in our extensive surveys at Waigeo and the surrounding Raja Ampat Islands, or anywhere else in the region.

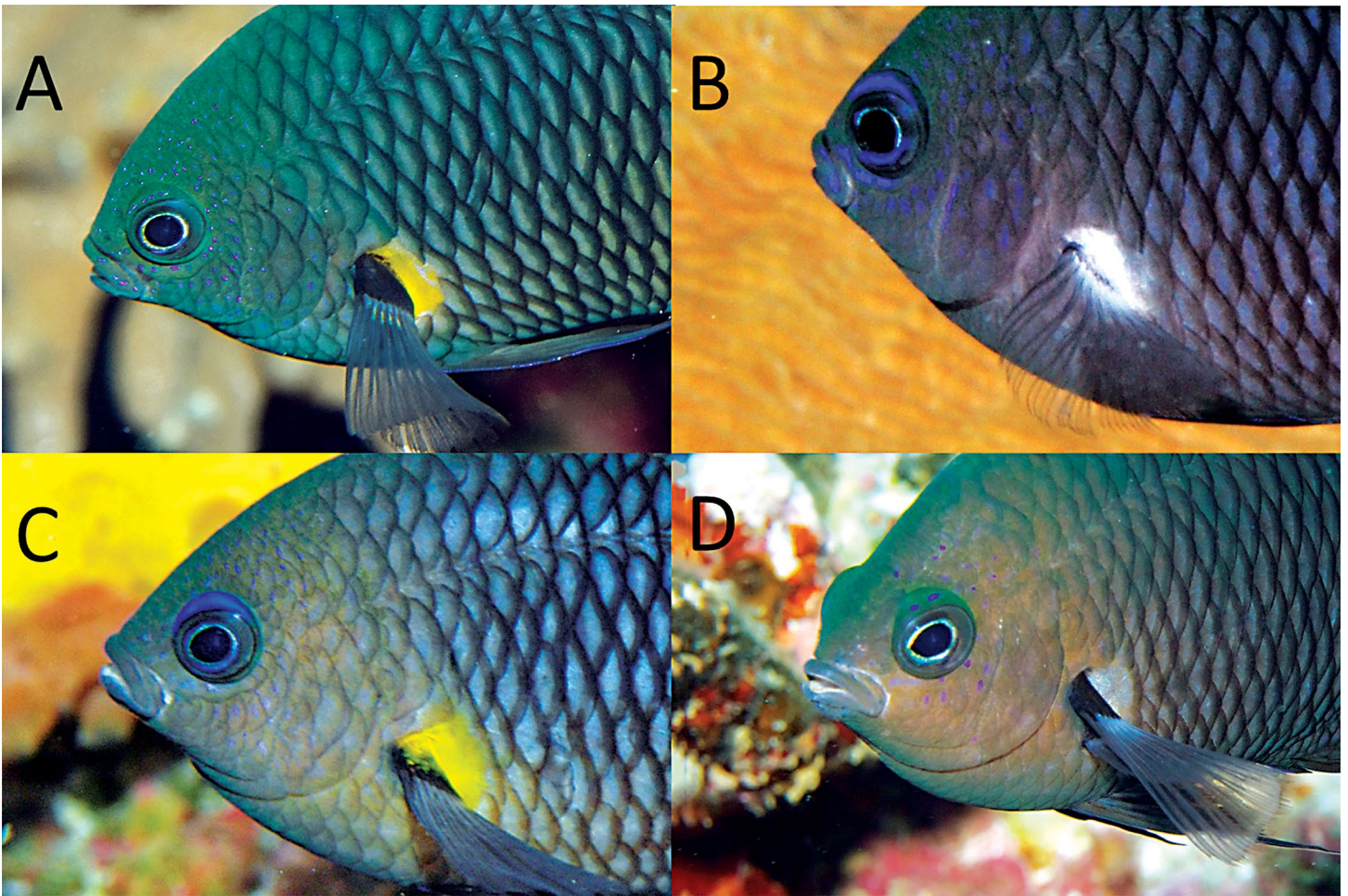
**Comparisons.** *Pomacentrus albiaxillaris* mainly differs from other members of the *philippinus* complex by having a small black spot restricted to the uppermost portion of the pectoral-fin base vs. a large black spot that completely covers the base, and a white pectoral-fin axil vs. other colors or not especially colored (Figs. 6 & 7). It shares a whitish caudal fin and similar blue eye markings with *P. flavoaxillaris*, but the latter can be distinguished by a pale caudal peduncle, white areas at the base of the posterior dorsal- and anal-fin rays, and yellow on the inner side of the pectoral-fin axil (Figs. 4, 6–7 & Table 2).



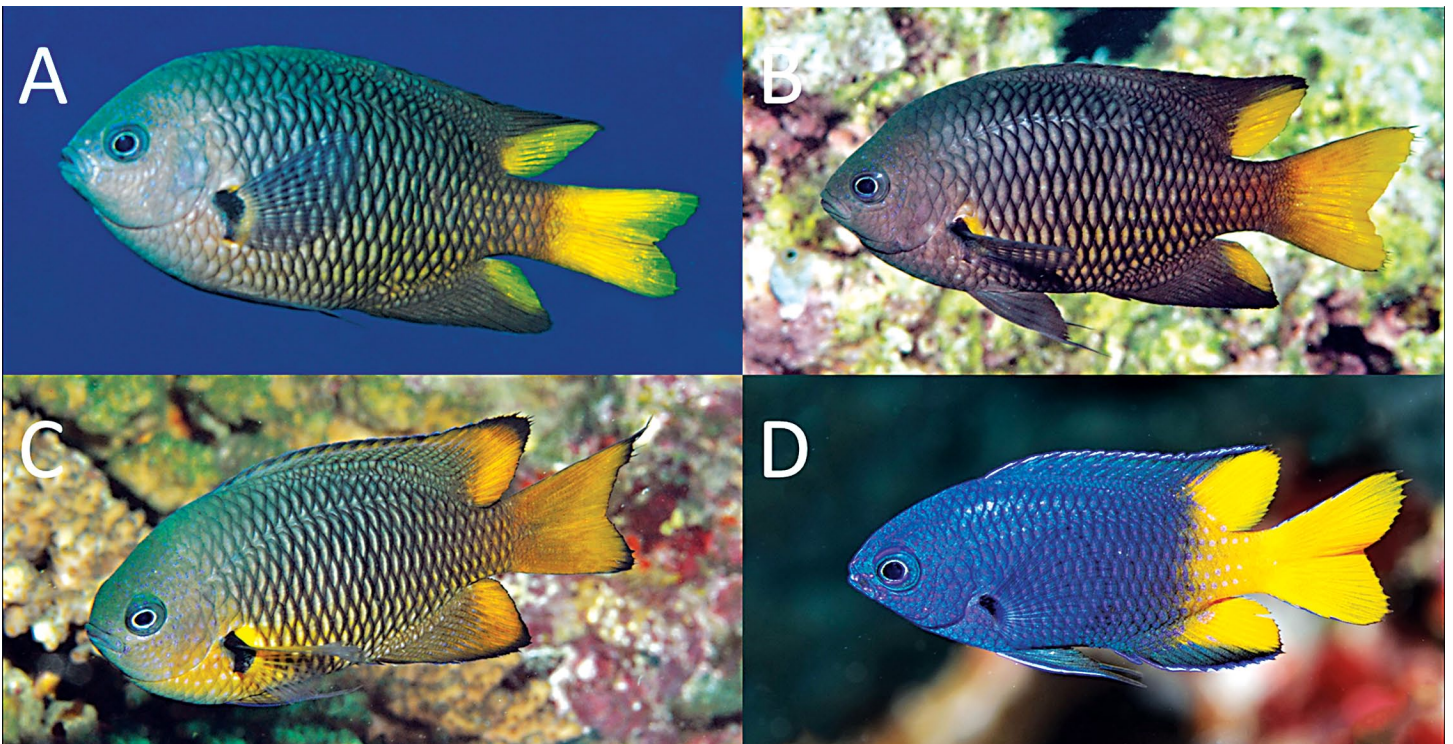


**Figure 6.** Adult *Pomacentrus philippinus* complex color patterns (approx. 65–75 mm SL), underwater photographs: A) *P. albiaxillaris*, Palau; B) *P. flavoaxillaris*, Chuuk; C) *P. magniseptus*, GBR; D) *P. nigriradiatus* New Caledonia (G.R. Allen).





**Figure 7.** *Pomacentrus philippinus* complex, pectoral-axil markings, underwater photographs: A) *P. philippinus*, Sulawesi, Indonesia; B) *P. albiaxillaris*, Palau; C) *P. flavoaxillaris*, Chuuk; and D) *P. nigriradiatus*, Loyalty Islands (G.R. Allen).



**Figure 8.** *Pomacentrus philippinus*, underwater photos: A) approx. 75 mm SL, Palawan, Philippines; B) approx. 70 mm SL, Manado, Sulawesi, Indonesia; C) approx. 65 mm SL, Port Moresby, Papua New Guinea; and D) approx. 30 mm SL, Raja Ampat Islands, West Papua, Indonesia (G.R. Allen).



TABLE 2

Color features of adults of the *Pomacentrus philippinus* species complex  
(Post. D & A= color of posterior dorsal- and anal-fin rays)

Species	Pectoral-fin base	Inner pectoral axil	Caudal fin	Post. D & A	Dorsal scleral eye
<i>P. philippinus</i>	solid black	yellow-orange	orange	yellow	mainly gray
<i>P. albiaxillaris</i>	small spot	white	white	clear/whitish	solid blue
<i>P. flavoaxillaris</i>	solid black	yellow	white	whitish	solid blue
<i>P. grandiseptus</i>	solid black	grayish	black	black	solid blue
<i>P. nigriradiatus</i>	solid black	grayish	blackish rays	blackish rays	mainly color

**Comparisons to *P. philippinus*.** (Figs. 4 & 7–8, Tables 2 & 3) All four new species described in this paper are part of the *philippinus* species complex, which is characterized by a network pattern on the body formed by the thick dark scale margins, prominent black spots on the pectoral-fin base, and contrasting colors in the pectoral-fin axil. Meristic counts vary little among the species (Table 3). True *P. philippinus* differs from all of the new species in having abruptly orange posterior dorsal and anal fins, an orange caudal fin, and the inner surface of the pectoral-fin axil tends to be more orange (Fig. 8). Various populations of true *P. philippinus* are additionally distinguished by an orange hue on the thorax and ventralmost part of the sides and juveniles have an expanded yellow-to-orange zone posteriorly on the body, encompassing the soft dorsal and anal fins, caudal fin, and adjacent caudal peduncle (Fig. 8D).

TABLE 3

Frequency distribution of soft dorsal-fin, anal-fin, pectoral-fin and total gill-raker and lateral-line scale counts for members of the *Pomacentrus philippinus* species complex

Species	Soft dorsal-fin rays				Soft anal-fin rays			Total gill-rakers				
	12	13	14	15	13	14	15	21	22	23	24	25
<i>P. albiaxillaris</i>	1	11	42	2	4	48	4		7	25	22	22
<i>P. flavoaxillaris</i>		2	23	1	1	24	1			6	8	2
<i>P. magniseptus</i>		1	18	4	1	15	4	1	4	13	5	
<i>P. nigriradiatus</i>		1	24	17		16	26		7	20	14	
<i>P. philippinus</i>		2	5	1		5	3		1	6	1	

Species	Pectoral-fin rays				Lateral-line scales				
	16	17	18	19	15	16	17	18	19
<i>P. albiaxillaris</i>	1	25	85		1	2	32	71	4
<i>P. flavoaxillaris</i>	2	5	43	2			16	9	
<i>P. magniseptus</i>		1	44	1		1	8	31	4
<i>P. nigriradiatus</i>		6	70	10			19	53	3
<i>P. philippinus</i>		1	11			1	6	8	

*Pomacentrus flavoaxillaris*, n. sp.

Yellow-axil Damsel

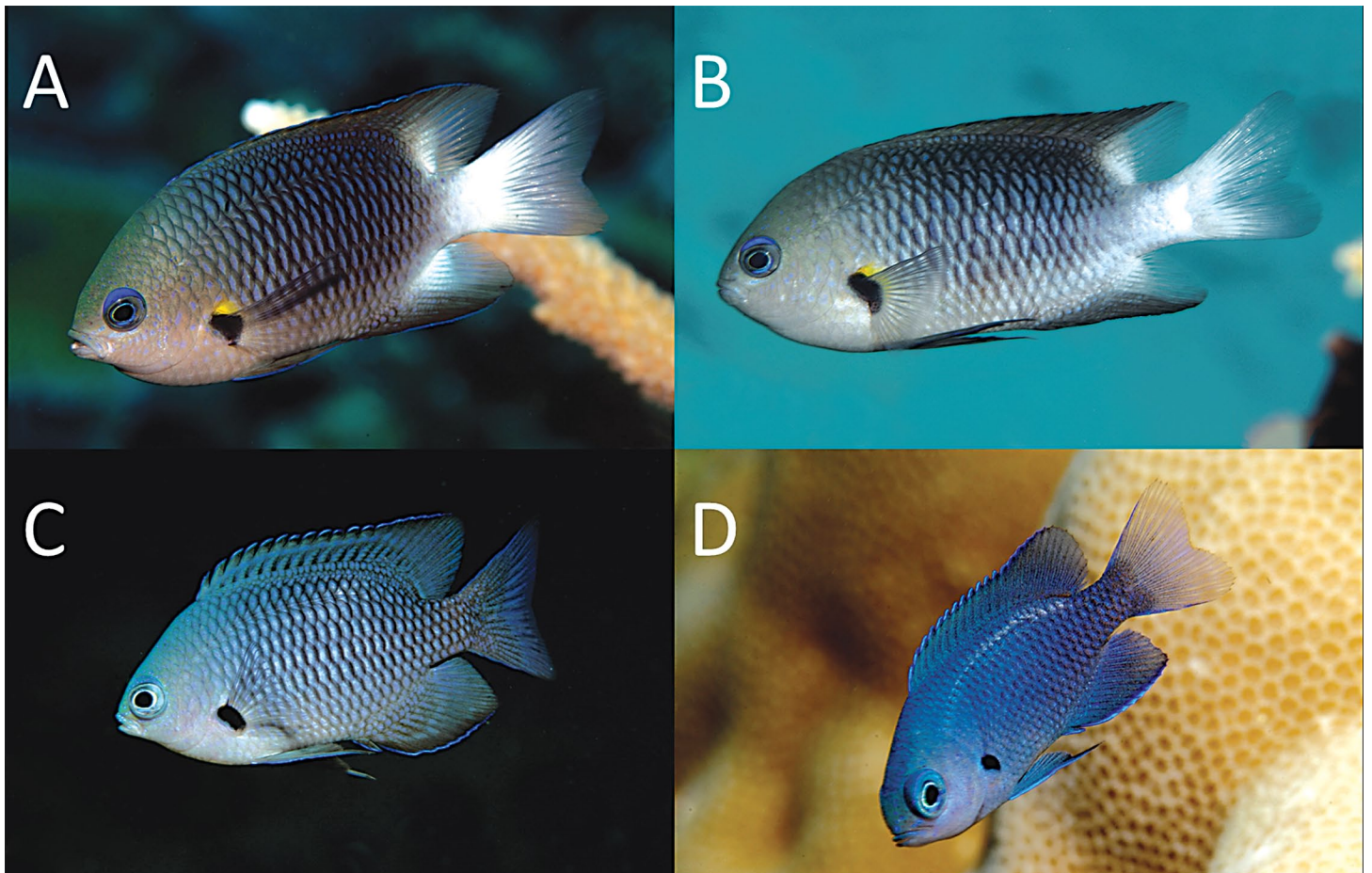
urn:lsid:zoobank.org:act:B37F6FDA-C939-4BFC-9B80-E612633617CE

Figures 4C, 6B, 7C, 9–11; Table 4.

*Pomacentrus philippinus* [non Evermann & Seale] Myers 1989: 174 (Kosrae & Pohnpei); Myers 1999: 186 (Kosrae & Pohnpei).

**Holotype.** WAM P.33149-001, 69.5 mm SL, Federated States of Micronesia, Pohnpei, Ant Atoll, pinnacle reef in SE part of lagoon, 6°46.104' N, 157°59.767' E, 8–10 m, spear, G.R. Allen, 31 August 2005.

**Paratypes.** (all Federated States of Micronesia) BPBM 28291, 64.6 mm SL, Kosrae, off Okat Village, 5°21.810' N, 162°58.042' E, 6–9 m, spear, M. Gawel, 8 August 1981; BPBM 28309, 58.3 mm SL, Kosrae, Mwot Passage, 5°19.169' N, 162°55.437' E, 6–9 m, spear, M. Gawel, 9 August 1981; USNM 223947, 10 specimens, 20.0–66.6 mm SL, Pohnpei, E of Jokaj Passage, 7°00.258' N, 158°11.820' E, 0–15 m, rotenone, V.G. Springer et al., 8 September 1980; WAM P.33149-002, 7 specimens, 56.8–72.9 mm SL, collected with holotype; WAM P.34504-001, 4 specimens, 49.5–58.7 mm SL, Ulithi Atoll, outer reef off southern tip, 9°46.662' N, 139°39.778' E, 10–12 m, spear, G.R. Allen, 27 July 2007; WAM P.34505-001, 4 specimens, 62.2–68.8 mm SL, Chuuk, back reef on S side of lagoon, 7°13.779' N, 151°40.869' E, 8–12 m, spear, G.R. Allen, 10 August 2008.



**Figure 9.** *Pomacentrus flavoaxillaris*, underwater photographs: A) approx. 70 mm SL, Chuuk; B) approx. 60 mm SL, Chuuk; C) approx. 45 mm SL, Pohnpei; and D) approx. 30 mm SL, Ngulu Atoll (G.R. Allen).

**Diagnosis.** Dorsal-fin rays XIII,13–14; anal-fin rays II,13–15 (usually 14); pectoral-fin rays usually 16–18 (usually 18); tubed lateral-line scales 17–18; total gill rakers on first arch 23–25; body depth 1.9–2.1 in SL; scales absent on preorbital; a single row of scales on suborbital, often restricted to posterior part, continuing around posterior margin of eye; color in life generally gray to bluish gray with thick black or dark-brown scale margins producing a network pattern; a black spot covers entire pectoral-fin base; inner surface of pectoral-fin axil usually bright yellow (except pale gray at Ngulu Atoll); dorsal and anal fins dark gray or blackish with translucent portion posteriorly with white basal area; caudal fin and adjacent peduncle whitish; dorsal scleral surface of eye bright blue.

**Description.** Dorsal-fin rays XIII,14 (XIII,13–15); anal-fin rays II,14 (II,13–15); all dorsal- and anal-fin soft rays branched, last to base; pectoral-fin rays 18 (16–18), lowermost 1–2 rays and uppermost pair unbranched; pelvic-fin rays I,5; principal caudal-fin rays 15, median 13 branched; upper procurrent caudal-fin rays 6 (6–6) and lower procurrent 6 (5–6), posterior pair segmented; scales in longitudinal series 27; tubed lateral-line scales 17 (17–18); posterior midlateral scales with a pore or deep pit (in continuous series) 8 (6–9); scales above lateral line to origin of dorsal fin 3; scales above lateral line to base of middle dorsal-fin spine 1.5; scales below lateral line to origin of anal fin 9; gill rakers 7 + 16 (7–8 + 16–17), total rakers 23 (22–25); pseudobranch filaments 11 (12–14); total vertebrae 26 (16 specimens).

Body ovate, depth 2.0 (1.9–2.1) in SL, and compressed, width 2.5 (2.5–2.9) in body depth; HL 3.4 (3.3–3.6) in SL; dorsal profile of head evenly rounded from dorsal-fin origin to snout; snout shorter than orbit, its length 3.8 (3.3–3.8) in HL; orbit diameter 2.9 (2.5–3.2) in HL; interorbital space convex, its width 2.6 (2.6–3.1) in HL; caudal-peduncle depth 1.8 (1.7–1.9) in HL; caudal-peduncle length 2.3 (2.1–2.6) in HL.

Mouth terminal, small, and oblique, forming an angle of about 37–40° to horizontal axis of head and body; maxilla reaching a vertical about even with anterior edge of pupil, upper-jaw length 3.3 (2.8–3.6) in HL; teeth of jaws uniserial posteriorly, becoming biserial at front of jaws with addition of slender buttress teeth in spaces between main row of larger teeth; teeth incisiform to conical, about 40–46 in main row of each jaw of holotype (excluding buttress teeth). Tongue triangular with rounded tip, set far back in mouth. Gill rakers long and slender, longest on lower limb near angle, about two-thirds length of longest gill filaments. Nostril round with slightly raised rim, level with lower edge of pupil and about midway between anterior edge of eye and upper lip.

Opercle ending posteriorly in a flat spine, tip obtuse, barely projecting from beneath a large scale; rear margin of preopercle with 23 tiny serrae on left side of holotype (23–25); preorbital usually with a single serra separated by a rounded notch from suborbital series; lower edge of suborbital smooth.

Scales finely ctenoid; head scaled except lips and tip of snout, and preorbital (lacrimal); suborbital with single row of scales, continuing around posterior margin of eye (similar to Figure 3A); scaly sheath at base of dorsal and anal fins, averaging about two-thirds pupil width at base of dorsal fin and about same width at base of anterior part of anal fin, tapering in width on anteriormost and posteriormost sections; column of scales on each membrane of dorsal and anal fins, narrowing distally, progressively longer on spinous portion of dorsal fin, reaching at least two-thirds distance to spine tips on posterior membranes, and covering as much as half of soft portion of dorsal and anal fins; small scales on caudal fin extending about two-thirds distance to posterior margin; small scales on basal third of pectoral fins; a cluster of several scales forming median process, extending posteriorly from between base of pelvic fins, its length about 60–65% of pelvic-fin spine; axillary scale above base of pelvic-fin spine, its length 60–64% of pelvic-fin spine.

Origin of dorsal fin over third or fourth tubed lateral-line scale, predorsal distance 2.7 (2.4–2.8) in SL; base of soft portion of dorsal fin contained about 1.8 times in base of spinous portion; dorsal-fin spines gradually increasing in length to last spine; first dorsal-fin spine 4.7 (3.6–5.0) in HL; seventh dorsal-fin spine 2.2 (2.0–2.3) in HL; last dorsal-fin spine 1.7 (1.7–2.1) in HL; membranes of spinous portion of dorsal fin moderately incised between spine tips; seventh dorsal soft ray longest, 1.3 (1.0–1.4) in HL; first anal-fin spine 4.4 (3.4–4.3) in HL; second anal-fin spine 1.8 (1.6–2.2) in HL; longest (ninth) anal soft ray 1.4 (1.1–1.4) in HL; caudal fin moderately forked with rounded to moderately angular lobes, its length 3.5 (2.8–3.5) in SL; lobe tips and posterior margin of caudal fin frequently with short filamentous extensions (usually abraded or absent in preserved specimens); fourth pectoral-fin ray longest, 3.0 (2.9–3.3) in HL; pelvic-fin spine 1.8 (1.6–2.0) in HL; first soft ray of pelvic fin forming filamentous tip, 2.8 (2.7–3.2) in SL.



TABLE 4

Proportional measurements of selected type specimens of *Pomacentrus flavoaxillaris*, n. sp.  
as percentages of the standard length

	holotype		paratypes							
	WAM P. 33149	WAM P. 33149	WAM P. 34505	WAM P. 34505	WAM P. 34505	WAM P. 33149	WAM P. 33149	WAM P. 34504	WAM P. 34504	WAM P. 34504
Standard length (mm)	69.5	72.9	68.8	66.6	65.0	64.4	62.0	58.7	52.3	49.5
Body depth	49.7	47.1	48.9	51.5	51.2	49.1	50.2	51.1	48.8	47.2
Body width	19.9	17.6	18.5	18.8	19.0	18.0	18.1	18.1	17.9	16.6
Head length	29.2	28.8	29.1	28.9	28.9	29.6	28.7	29.0	30.4	29.3
Snout length	7.6	7.8	8.0	8.1	8.8	8.0	8.4	7.6	8.4	8.9
Orbit diameter	10.1	9.1	9.9	10.4	10.4	10.2	9.9	11.0	10.7	11.3
Interorbital width	11.1	9.9	10.0	10.2	10.3	10.6	10.6	10.1	10.2	9.8
Caudal-peduncle depth	16.4	15.7	16.2	15.7	16.5	15.8	15.5	17.0	16.8	15.5
Caudal-peduncle length	12.6	13.2	12.1	11.2	14.1	12.0	10.2	12.9	11.5	11.4
Upper jaw length	8.9	9.0	9.0	9.7	9.2	9.3	8.9	9.0	8.8	9.4
Predorsal length	36.4	36.8	39.6	40.2	40.9	39.6	35.8	38.6	39.8	37.5
Preanal length	64.4	63.0	60.7	62.4	66.9	65.4	68.4	63.7	64.5	62.9
Prepelvic length	37.3	36.9	36.9	37.2	37.0	40.8	46.7	38.4	39.7	41.3
Length dorsal-fin base	62.0	64.1	64.6	65.5	63.5	60.0	61.8	63.1	62.4	60.8
Length anal-fin base	29.3	31.4	29.7	28.8	27.0	29.2	30.0	28.8	28.1	28.6
Length pectoral fin	32.9	31.0	33.8	33.1	33.2	31.0	30.4	34.3	34.4	34.2
Length pelvic fin	36.0	33.3	34.4	37.0	33.8	31.5	33.1	35.5	34.0	37.0
Length pelvic-fin spine	16.6	14.8	16.5	16.6	17.8	16.5	16.4	17.0	16.9	16.0
Length first dorsal spine	6.2	7.9	7.1	5.8	7.2	7.0	7.6	8.0	7.2	7.8
Length second dorsal spine	13.2	13.8	14.4	13.4	13.8	13.0	13.8	12.8	14.5	13.3
Length seventh dorsal spine	16.8	16.9	16.0	14.6	16.6	16.3	15.2	15.7	16.0	15.5
Length longest dorsal ray	22.4	20.3	24.7	27.1	25.4	24.0	22.8	24.0	26.2	26.6
Length first anal spine	6.6	7.3	7.6	6.8	8.1	6.9	21.4	8.6	7.2	27.2
Length second anal spine	16.1	17.7	17.1	16.7	16.3	16.1	15.9	16.3	16.9	15.8
Length longest anal ray	20.5	20.4	24.6	23.0	21.6	23.6	21.4	24.2	28.7	27.2
Length caudal fin	29.0	28.4	34.2	34.7	34.2	35.6	32.4	30.2	33.6	31.7
Caudal concavity	6.5	5.5	8.9	7.5	6.5	8.3	7.3	5.2	8.8	7.9

**Color in life.** (Figs. 9 & 10) Body of adult overall gray to bluish gray with thick black or dark-brown scale margins producing a network pattern; head gray to brownish, usually with scattered blue markings, including small spots on nape and forehead, streaks below eye and on upper lip, and larger faint spots on cheek and opercle; eye with narrow white ring around pupil except lower edge with bright blue streak and dorsal scleral surface bright blue (Fig. 4C); dorsal and anal fins mainly dark gray to blackish with a thin blue outer margin, except posterior edge of fin abruptly translucent with pronounced white area basally; caudal fin and adjacent peduncle whitish, grading to translucent on posterior third of fin; pelvic fins dark brown with thin blue anterior margin; pectoral fins translucent with dusky gray rays; a black spot covering entire pectoral-fin base (including outer axil); inner side of pectoral-fin axil bright yellow (except pale gray at Ngulu Atoll; Fig. 10). Juvenile and subadult (Fig. 9 C & D) generally lighter blue gray, with similar blue markings on head and eye as described for adults, but with less-prominent dark scale margins and lacking key adult features, including white areas at base of posterior dorsal- and anal-fin rays, a white caudal fin and adjacent peduncle (both blue gray), and a yellow marking on inner pectoral-fin axil.

**Color in alcohol.** (Fig. 11) Generally brown with darker-brown scale margins, lighter brown on lower head, thorax, and ventral portion of side; dorsal, anal, and pelvic fins mainly brown, except tannish posteriorly on dorsal and anal fins, and tan submarginal stripe on spinous portion of dorsal fin; caudal fin pale tan to whitish; pectoral fins semitranslucent with dusky brown rays and a conspicuous black spot covering entire base and on inner side of axil. The two BPBM paratypes, collected in 1981 at Kosrae, are overall tannish brown without a trace of dark marking on the pectoral-fin base.



**Figure 10.** *Pomacentrus flavoxillaris*, underwater photograph, approx. 65 mm SL, Ngulu Atoll (G.R. Allen).





**Figure 11.** *Pomacentrus flavoaxillaris*, preserved holotype, WAM P.33149-001, 69.5 mm SL, Ant Atoll, Pohnpei (G.R. Allen).

**Etymology.** The new species is named *flavoaxillaris* (Latin: yellow armpit or axil), with reference to the diagnostic color on the inner pectoral-fin axil. The specific epithet is a compound adjective.

**Distribution.** The new species is widely distributed in the Federated States of Micronesia, i.e. the Caroline Islands east of Palau, ranging from Ngulu Atoll to Kosrae, with intermediate locations that include Yap, Ulithi Atoll, Chuuk, Mortlock Islands, and Pohnpei (Fig. 1). The known depth range is from about 8–20 m.

**Comparisons.** *Pomacentrus flavoaxillaris* differs from other members of the *philippinus* complex mainly by the yellow marking on the inner pectoral-fin axil, the pronounced white areas at the base of the posterior dorsal and anal fins, the whitish caudal peduncle, and an overall general paler coloration of the ventral body. The blue markings on the eye of the new species are very similar to those of *P. albiaxillaris* from Palau, but the latter differs in having only a small black spot on the upper pectoral-fin base, a white area on the inner pectoral-fin axil, and in lacking the white areas at the base of the posterior dorsal- and anal-fin rays as well as the whitish or light-gray caudal peduncle of *P. flavoaxillaris* (Table 2). Meristic counts of the new species overlap broadly with other members of the species complex, but the modal count of lateral-line scales is one fewer in *P. flavoaxillaris* vs. the other species.

Although specimens were not obtained at Ngulu Atoll, an underwater photograph from this location shows an individual that lacks the typical yellow marking on the pectoral-fin axil (Fig. 10). Nevertheless, the other markings on that individual, in particular the white coloration at the base of the posteriormost dorsal- and anal-fin rays, the light-gray caudal peduncle and whitish caudal fin, are fully consistent with those of *P. flavoaxillaris* from other locations.



*Pomacentrus magniseptus*, n. sp.

Blackfin Damsel

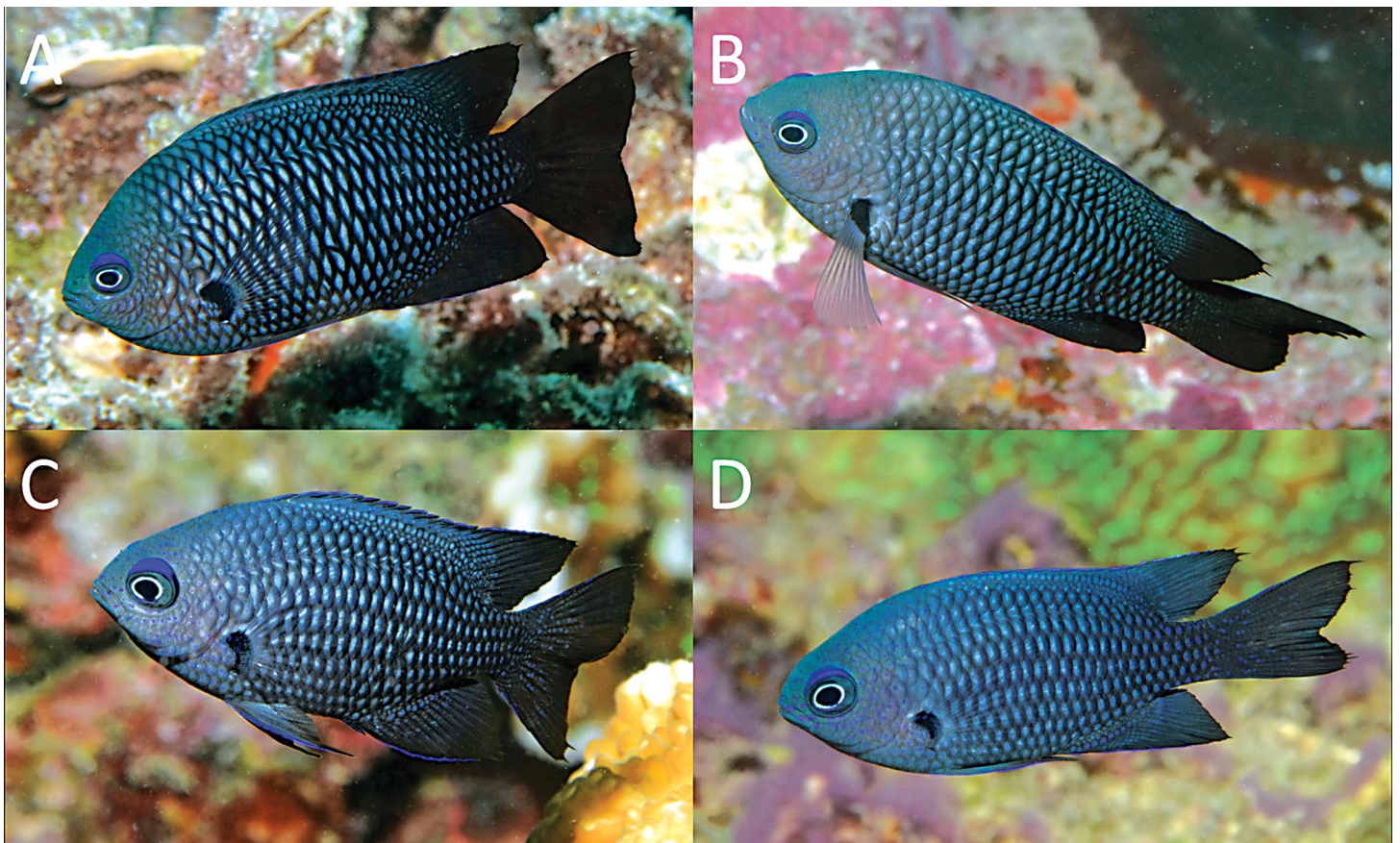
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Figures 6C, 12–13; Table 5.

*Pomacentrus philippinus* [non Evermann & Seale] Allen 1975 (in part): 218, photograph on 221 (Michaelmas Cay, Great Barrier Reef); Allen 1991:154, photograph lower right (Great Barrier Reef); Allen et al. 2006 (in part): 1467 (Great Barrier Reef).

**Holotype.** AMS I.22574-010, 63.8 mm SL, Australia, Queensland, Great Barrier Reef, northern corner of Escape Reef, approximately 15°50' S, 145°50' E, 3–6 m, rotenone, AMS party, 22 October 1981.

**Paratypes.** (all Great Barrier Reef, Queensland, Australia) AMS I.16680-007, 65.3 mm SL, Pixie Reef, approx. 16°40' S, 146°00' E, 10 m, spear, G.R. Allen, 1 July 1972; AMS I.17061-006, 2 specimens, 42.6–63.3 mm SL, One Tree Island, approx. 23°30' S, 152°05' E, 10 m, spear and quinaldine, 15 January 1973; AMS I.20757-045, 3 specimens, 34.6–62.5 mm SL, west end of Raine Island, approx. 11°36' S, 144°01' E, 2–20 m, rotenone, AMS-Australian Institute of Marine Science party, 13 February 1979; AMS I.22574-046, 6 specimens, 56.7–70.8 mm SL, collected with holotype; AMS I.22616-007, 10 specimens, 47.9–75.6 mm SL, outer reef on north side of Escape Reef, approx. 15°49' S, 145°50' E, 5–18 m, rotenone, AMS party, 2 November 1981; WAM P.28533-010, 57.7 mm SL, Number Nine Ribbon Reef, approx. 15°00' S, 145°42' E, 5–7 m, rotenone, G.R. Allen, 11 November 1985.



**Figure 12.** *Pomacentrus magniseptus*, underwater photographs, Pixie Reef, Great Barrier Reef, Queensland, Australia: A) approx. 70 mm SL; B) approx. 55 mm SL; C) approx. 45 mm SL; and D) approx. 35 mm SL (G.R. Allen).

**Diagnosis.** Dorsal-fin rays XIII,13–15 (usually 14); anal-fin rays II,13–15 (usually 14); pectoral-fin rays usually 17–19 (usually 18); tubed lateral-line scales 16–19 (usually 18); total gill rakers on first arch 21–24 (usually 23); body depth 1.9–2.1 in SL; scales usually absent on preorbital and suborbital, except occasional scales on posterior part of suborbital; color in life generally charcoal gray with thick blackish scale margins producing a network pattern and a vertically ovate whitish spot centered on each scale, forming rows that correspond with horizontal scale rows; a large black spot on pectoral-fin base, invading outer part of axil; inner surface of pectoral-fin axil grayish; median fins charcoal gray to blackish; dorsal scleral surface of eye bright blue.

**Description.** Dorsal-fin rays XIII,14 (XIII,13–15); anal-fin rays II,15 (II,13–15); all dorsal- and anal-fin soft rays branched, last to base; pectoral-fin rays 18/17 (17–19), lowermost 1–2 rays and uppermost pair unbranched; pelvic-fin rays I,5; principal caudal-fin rays 15, median 13 branched; upper procurrent caudal-fin rays 6 (5–6) and lower rays 7 (5–7), posterior pair segmented; scales in longitudinal series 27; tubed lateral-line scales 17/18 (16–19); posterior midlateral scales with a pore or deep pit (in continuous series) 10 (5–8); scales above lateral line to origin of dorsal fin 3; scales above lateral line to base of middle dorsal-fin spine 1.5; scales below lateral line to origin of anal fin 9; gill rakers 7 + 17 (5–8 + 15–17), total rakers 24 (21–24); pseudobranch filaments 13 (12–14); total vertebrae 26 (7 specimens).

Body ovate, depth 2.0 (1.9–2.1) in SL, and compressed, width 2.8 (2.4–2.9) in body depth; HL 3.4 (3.3–3.6) in SL; dorsal profile of head evenly rounded from dorsal-fin origin to snout; snout shorter than orbit, its length 3.7 (3.4–3.9) in HL; orbit diameter 3.0 (2.7–3.1) in HL; interorbital space convex, its width 2.6 (2.5–3.1) in HL; caudal-peduncle depth 1.7 (1.6–1.8) in HL; caudal-peduncle length 2.3 (1.9–2.6) in HL.

Mouth terminal, small, and oblique, forming an angle of about 35–40° to horizontal axis of head and body; maxilla reaching a vertical about even with anterior edge of pupil, upper-jaw length 3.4 (3.2–3.6) in HL; teeth of jaws uniserial posteriorly, becoming biserial at front of jaws with addition of slender buttress teeth in spaces between main row of larger teeth; teeth incisiform to conical, about 34–36 in main row of each jaw of holotype (excluding buttress teeth). Tongue triangular with rounded tip, set far back in mouth. Gill rakers long and slender, longest on lower limb near angle, about two-thirds length of longest gill filaments. Nostril round with slightly raised rim, level with lower edge of pupil and about midway between anterior edge of eye and upper lip.

Opercle ending posteriorly in a flat spine, tip obtuse, barely projecting from beneath a large scale; rear margin of preopercle with 22 tiny serrae on left side of holotype (12–22); preorbital with either a single serra separated by a rounded notch from suborbital series or frequently without serra and separated by shallow indentation; lower edge of suborbital smooth.

Scales finely ctenoid; head scaled except lips and tip of snout, preorbital, and suborbital, except occasional scales on posterior part of suborbital (similar to Fig. 3A); scaly sheath at base of dorsal and anal fins, averaging about two-thirds pupil width at base of dorsal fin and about the same width at base of anterior part of anal fin, tapering in width on anteriormost and posteriormost sections; column of scales on each membrane of dorsal and anal fins, narrowing distally, progressively longer on spinous portion of dorsal fin, reaching at least two-thirds distance to spine tips on posterior membranes, and covering as much as half of soft portion of dorsal and anal fins; small scales on caudal fin extending about two-thirds distance to posterior margin; small scales on basal quarter of pectoral fins; a cluster of several scales forming median process, extending posteriorly from between base of pelvic fins, its length 63–79% of pelvic-spine; axillary scale above base of pelvic-fin spine, its length 51–77% of pelvic-spine length.

Origin of dorsal fin over fourth tubed lateral-line scale, predorsal distance 2.6 (2.3–2.7) in SL; base of soft portion of dorsal fin contained about 2.6 (2.0–2.5) times in base of spinous portion; dorsal-fin spines gradually increasing in length to last spine; first dorsal-fin spine 4.0 (3.4–5.3) in HL; seventh dorsal-fin spine 2.2 (2.1–2.5) in HL; last dorsal-fin spine 1.9 (1.8–2.3) in HL; membranes of spinous portion of dorsal fin moderately incised between spine tips; seventh dorsal soft ray longest, 1.0 (0.8–1.3) in HL; first anal-fin spine 4.5 (4.0–6.1) in HL; second anal-fin spine 2.3 (2.0–2.6) in HL; longest (ninth) anal soft ray 1.1 (0.9–1.3) in HL; caudal fin moderately forked with angular lobes, its length 2.8 (2.4–3.4) in SL; fourth pectoral-fin ray longest, 2.9 (2.8–3.1) in HL; pelvic-fin spine 1.8 (1.7–2.1) in HL; first soft ray of pelvic fin forming filamentous tip, 2.7 (2.5–3.1) in SL.

**Color in life.** (Fig. 12) Body of adult generally charcoal gray with thick blackish scale margins producing a network pattern and vertically ovate pearl-white to pale-gray spot on each scale, forming rows that correspond

TABLE 5

Proportional measurements of selected type specimens of *Pomacentrus magniseptus*, n. sp.  
as percentages of the standard length

	holotype				paratypes					
	AMS I.22574	AMS I.22616	AMS I.22616	AMS I.22616	AMS I.17061	AMS I.22616	WAM P. 28533	AMS I.22574	AMS I.22616	AMS I.17061
Standard length (mm)	63.8	75.6	72.0	66.7	63.3	60.1	57.7	56.6	49.9	42.6
Body depth	51.1	47.6	48.2	48.2	50.3	52.3	52.2	51.8	48.5	50.6
Body width	18.0	20.1	19.0	18.3	18.8	19.6	19.0	18.8	17.1	18.3
Head length	29.3	29.5	28.0	29.2	28.4	28.4	29.1	29.6	29.4	30.0
Snout length	8.0	8.4	7.4	7.7	7.9	7.7	7.9	7.7	8.6	6.8
Orbit diameter	9.8	10.2	10.0	10.0	9.7	10.8	10.1	10.9	11.3	11.2
Interorbital width	11.1	10.4	11.2	9.5	10.8	11.0	10.9	11.1	10.7	10.4
Caudal-peduncle depth	16.9	16.3	16.3	16.7	15.4	15.6	17.7	16.5	16.3	16.5
Caudal-peduncle length	12.5	11.4	14.1	13.2	12.2	12.4	12.7	14.3	12.6	13.1
Upper jaw length	8.5	8.9	7.9	9.1	8.6	8.9	9.1	8.9	8.9	8.6
Predorsal length	39.1	38.8	38.9	38.6	38.9	39.4	41.6	38.2	43.4	43.7
Preanal length	65.0	65.8	61.6	64.8	66.1	65.6	61.9	64.5	64.6	66.5
Prepelvic length	38.4	38.9	36.6	38.2	37.5	39.4	38.8	38.4	37.0	38.6
Length dorsal-fin base	62.3	62.6	64.4	60.9	62.2	62.6	62.5	61.5	56.8	51.4
Length anal-fin base	27.4	27.1	28.9	27.9	29.2	28.5	28.9	27.5	28.4	26.7
Length pectoral fin	34.6	32.5	33.7	33.7	32.1	34.1	34.6	36.0	33.8	33.7
Length pelvic fin	36.5	34.1	35.2	37.1	35.2	36.3	37.7	37.0	39.2	40.3
Length pelvic-fin spine	16.0	15.1	15.1	15.9	13.4	16.1	15.6	16.9	15.3	15.4
Length first dorsal spine	7.3	6.8	6.0	6.8	5.8	8.4	6.7	6.9	6.9	5.6
Length second dorsal spine	13.3	12.1	12.6	12.7	11.7	13.5	12.3	12.5	14.1	12.6
Length seventh dorsal spine	15.2	13.6	14.2	14.0	12.7	14.7	14.0	14.5	16.0	14.8
Length longest dorsal ray	30.3	23.2	23.3	31.9	25.5	26.9	27.0	30.9	35.0	37.5
Length first anal spine	6.5	6.8	6.9	7.2	7.0	6.9	6.4	6.5	6.3	6.4
Length second anal spine	12.8	12.8	13.1	12.4	13.0	14.2	13.1	12.5	14.4	13.0
Length longest anal ray	26.5	22.1	24.9	25.7	24.7	27.8	24.9	25.5	30.5	31.9
Length caudal fin	35.4	32.2	38.5	37.4	29.2	37.8	38.0	37.2	35.4	41.8
Caudal concavity	8.6	6.8	6.9	9.9	3.9	8.8	10.0	8.9	8.0	13.9



with horizontal scale rows; eye with narrow white ring around pupil except lower edge with bright blue streak and dorsal scleral surface bright blue (similar to Fig. 4B & C); dorsal, anal, and caudal fins charcoal gray to blackish; pelvic fins dark gray to blackish; pectoral fins translucent with dark gray rays; large black spot covering pectoral-fin base, invading outer portion of axil; inner surface of pectoral-fin axil grayish (Fig. 12B).

**Color in alcohol.** (Fig. 13) Generally brown, often with darker-brown scale margins, and lighter brown on lower head and thorax; dorsal, anal, caudal, and pelvic fins dark brown to blackish; pectoral fins semitranslucent whitish with a large black spot covering base, invading outer portion of axil.

**Etymology.** The new species is named *magniseptus* (Latin: great-barrier), with reference to its Great Barrier Reef geographic distribution. The specific epithet is a noun in apposition.

**Distribution.** The new species is known from the Great Barrier Reef of Queensland, Australia, ranging southward to the Capricorn Goup (23°30' S) and north to at least Raine Island (11°36' S)(Fig. 1). The typical habitat consists of passages and outer reef slopes in about 1.5–12 m, usually adjacent to vertical walls or in the shadows of overhanging cliffs and ledges. It is a common species on coral reefs throughout the length of the Great Barrier Reef.

**Comparisons.** *Pomacentrus magniseptus* differs from other members of the *philippinus* species complex by its distinctive color pattern, consisting of horizontal rows of whitish spots on the side of the body made up of the pale centers of the distinctly outlined scales. It further differs in always lacking scales on the preorbital and most of the suborbital; occasional specimens, however, possess 1–3 scales on the posteriormost section of the suborbital. Meristic counts of the new species overlap broadly with other members of the species complex.

Preserved specimens are difficult to distinguish from *P. brachialis* Cuvier, 1830, a widely distributed species from the western Pacific Ocean that co-occurs with *P. magniseptus*. In life, *P. brachialis* does not show the prominent network pattern of outlined scales and is missing the characteristic blue markings. In preservative, both species are mainly dark brown with a large black spot covering the pectoral-fin base. However, specimens collected at Escape Reef on the northern Great Barrier Reef indicate that *P. brachialis* at that location usually has 16–17 lateral-line scales and 16–17 pectoral-fin rays compared with modal counts of 18 pectoral-fin rays (70% of specimens) and 18 pectoral-fin rays (100%) in *P. magniseptus*.



**Figure 13.** *Pomacentrus magniseptus*, preserved holotype, AMS I.22574-010, 63.8 mm SL, Escape Reef, Great Barrier Reef, Queensland, Australia (G.R. Allen).

*Pomacentrus nigriradiatus*, n. sp.

Blackray Damsel

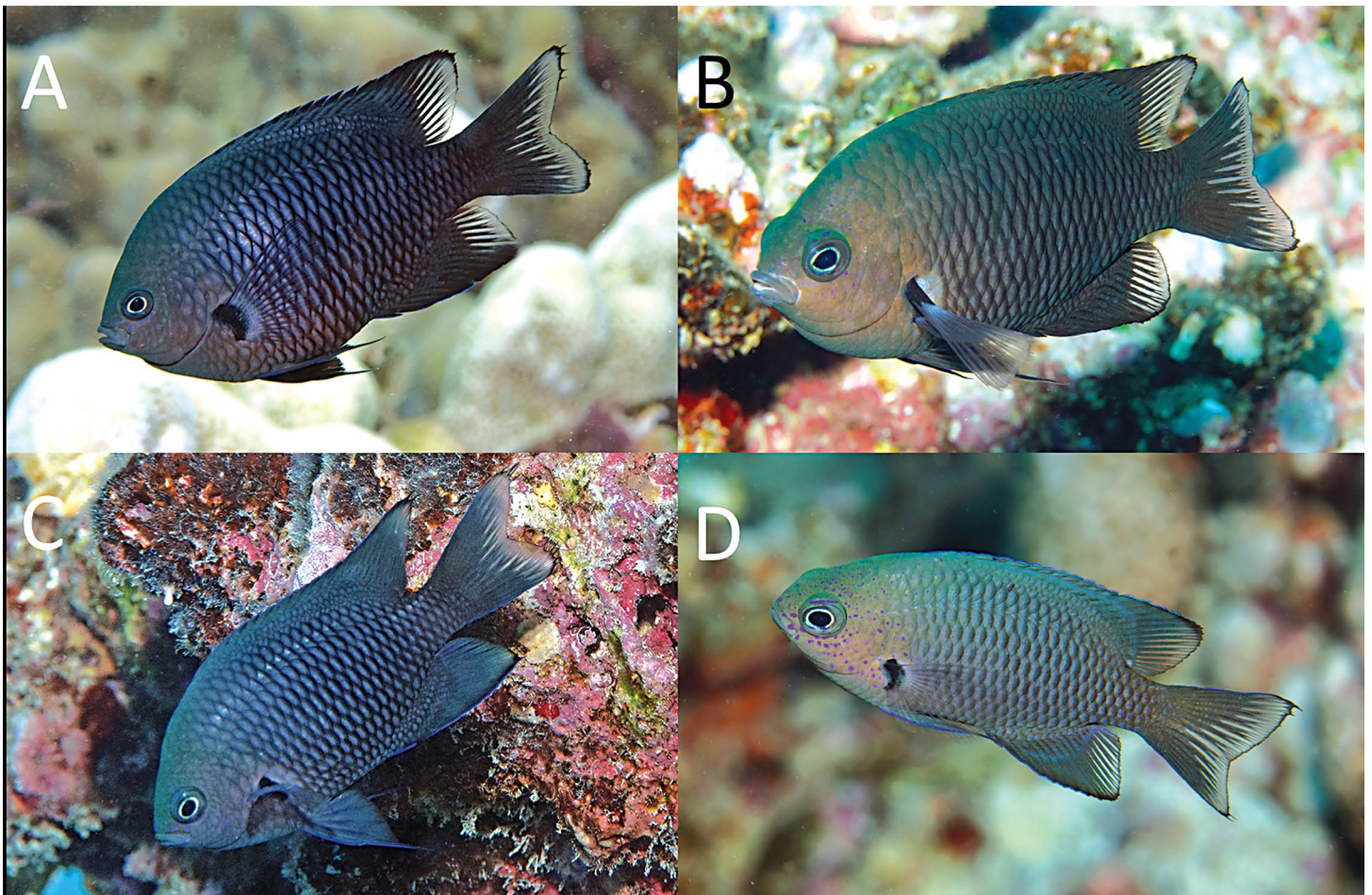
urn:lsid:zoobank.org:act:A4298DEF-D895-40F3-97B9-F8E5A61A1F66

Figures 4D, 6D, 14–15; Table 6.

*Pomacentrus philippinus* [non Evermann & Seale] Allen 1975 (in part): 218 (Vanuatu and New Caledonia).

**Holotype.** WAM P.34491-003, 70.4 mm SL, Samoa, Upolu Island, off Lotofaga, 14°01.034' S, 171°50.644' W, 12–15 m, spear, M.V. Erdmann, 16 August 2015.

**Paratypes.** AMS I.17468-001, 82.2 mm SL, Loyalty Islands, Ouvea Atoll, off west end of Muli Island, 20°43.198' S, 166°22.803' E, 10 m, spear, G.R. Allen, 16 June 1973; BPBM 8122, 2 specimens, 70.3–71.1 mm SL, American Samoa, Tutuila, off Fagaitua Village, 14°16.297' S, 170°36.682' W, 3 m, spear, J.E. Randall, 27 September 1967; BPBM 11308, 68.2 mm SL, American Samoa, Tutuila, Fagasa Bay, 14°61.957' S, 170°43.431' W, 4.5 m, spear, J.E. Randall, 5 September 1971; BPBM 11423, 86.9 mm SL, New Caledonia, off Noumea, Dumbea Pass, 22°20.861' S, 166°13.784' E, 15–18 m, rotenone, J.E. Randall & party, 14 August 1971; BPBM 16793, 48.2 mm SL, American Samoa, Tutuila, Pago Pago Harbor, off Aua Village, 14°16.312' S, 170°40.208' W, spear, 10 m, G.S. Losey, 31 March 1974; BPBM 17462, 2 specimens, 67.1–77.1 mm SL, American Samoa,



**Figure 14.** *Pomacentrus nigriradiatus*, underwater photographs: A) approx. 70 mm SL, Ouvea Atoll, Loyalty Islands; B) approx. 60 mm SL, Samoa; C) approx. 45 mm SL, Ouvea Atoll; and D) approx. 30 mm SL, Samoa (A & C, G.R. Allen; B & D, M.V. Erdmann).



Tutuila, Aunuu Island, 14°16.926' S, 170°33.665' W, rotenone, 12.5 m, J.E. Randall & R.C. & C.A. Wass, 4 May 1974; ROM 66095, 4 specimens, 47.7–60.7 mm SL, New Caledonia, off Noumea, northwest of Dumbea pass, 22°20.502' S, 166°14.748' E, 3–10 m, rotenone, R. Winterbottom *et al.*, 11 September 1991; USNM 324104, 2 specimens, 65.4–80.2 mm SL, Loyalty Islands, Ouvea Atoll, Ile Haute, 20°29'12" S, 166°19' 18" E, 3–10 m, rotenone, J.T. Williams *et al.*, 19 November 1991; USNM 347550, 6 specimens, 30.0–75.4 mm SL, Vanuatu, Epi Island, Ringdove Bay, 13°35'34" S, 168°02'25" E, J.T. Williams *et al.*, 15 June 1996; rotenone, 1–12 m, USNM 360955, 4 specimens, 32.8–62.1 mm SL, Vanuatu, Banks Islands, Rowa Island, approximately 13°38' S, 167°30' E, 1–6 m, rotenone, J.T. Williams & R.D. Mooi, 20 May 1997; USNM 362702, 4 specimens, 42.5–59.5 mm SL, Vanuatu, Santa Maria Island, Banks Islands, Lakona Bay, 14°22'20" S, 167°24'00" E, 2.5–4.5 m, rotenone, J.T. Williams *et al.*, 14 May 1997; USNM 373336, 7 specimens, 57.8–69.8 mm SL, Wallis Islands, Ile Uvea, outside SW end of barrier reef, SE of Nukuatea Islet, 13°23' 05" S, 176°14' 15" W, 2–3 m, rotenone, J.T. Williams *et al.*, 16 November 2000; WAM P.34491-001, 5 specimens, 68.3–73.8 mm SL, collected with holotype; WAM P.25129-002, 2 specimens, 69.3–73.1 mm SL, Vanuatu, Efate, off Erakor Island, 17°47.025' S, 168°18.562' E, 8–13 m, rotenone & spear, G.R. Allen, 23 June 1973; WAM P.29368-001, 5 specimens, 28.8–65.6 mm SL, Rotuma, off Ropuri Village, 12°30' S, 177°05' E, 17–18 m, rotenone, V.G. Springer *et al.*, 16 May 1986.

**Diagnosis.** Dorsal-fin rays XIII,14–15; anal-fin rays II,14–15; pectoral-fin rays usually 17–18 (rarely 17); tubed lateral-line scales 17–19 (rarely 19); total gill rakers on first arch 22–24 (rarely 22); body depth 2.0–2.2 in SL; a patch of scales usually present on preorbital and a single row of scales on suborbital, continuing around posterior margin of eye; color in life generally gray to gray brown with thick black or dark-brown scale margins producing a network pattern; a black spot covers entire pectoral-fin base; inner side of pectoral-fin axil tannish to pale gray; median fins dark gray with translucent portion posteriorly showing conspicuous contrasting blackish rays; dorsal scleral surface of eye either uniform grayish or with a few blue markings.

**Description.** Dorsal-fin rays XIII,15 (XIII,14–15); anal-fin rays II,14 (II,14 or 15); all dorsal- and anal-fin soft rays branched, last to base; pectoral-fin rays 18 (17–18), lowermost 1–2 rays and uppermost pair unbranched; pelvic-fin rays I,5; principal caudal-fin rays 15, median 13 branched; upper procurrent caudal-fin rays 6 (4–6) and lower procurrent rays 5 (5–7), posterior pair segmented; scales in longitudinal series 27 (27–28); tubed lateral-line scales 17/18 (17–19); posterior midlateral scales with a pore or deep pit (in continuous series) 7 (4–8); scales above lateral line to origin of dorsal fin 3; scales above lateral line to base of middle dorsal-fin spine 1.5; scales below lateral line to origin of anal fin 9; gill rakers 7 + 17 (6–8 + 16–17), total rakers 24 (22–24); pseudobranch filaments 12 (12–14); total vertebrae 26 (6 specimens).

Body ovate, depth 2.1 (1.9–2.2) in SL, and compressed, width 2.4 (2.4–2.8) in body depth; HL 3.6 (3.3–3.6) in SL; dorsal profile of head evenly rounded from dorsal-fin origin to snout; snout shorter than orbit, its length 3.5 (3.5–4.0) in HL; orbit diameter 2.7 (2.7–3.3) in HL; interorbital space convex, its width 2.6 (2.6–2.9) in HL; caudal-peduncle depth 1.7 (1.6–1.9) in HL; caudal-peduncle length 2.3 (2.2–2.7) in HL.

Mouth terminal, small, and oblique, forming an angle of about 37° to horizontal axis of head and body; maxilla reaching a vertical about even with anterior edge of pupil, upper-jaw length 3.3 (3.1–3.7) in HL; teeth of jaws uniserial posteriorly, becoming biserial at front of jaws with addition of slender buttress teeth in spaces between main row of larger teeth; teeth incisiform to conical, about 36–44 in main row of each jaw of holotype (excluding buttress teeth). Tongue triangular with rounded tip, set far back in mouth. Gill rakers long and slender, longest on lower limb near angle, about two-thirds length of longest gill filaments. Nostril round with slightly raised rim, level with lower edge of pupil and about midway between anterior edge of eye and upper lip.

Opercle ending posteriorly in a flat spine, tip obtuse, barely projecting from beneath a large scale; rear margin of preopercle with 13 tiny serrae on left side of holotype (5–29); preorbital with a single serra separated by rounded notch from suborbital series; lower edge of suborbital smooth.

Scales finely ctenoid; head scaled except lips and tip of snout; preorbital (lacrimal) with a patch of scales on anterior half and suborbital with a single row of scales, continuing around posterior margin of eye (Fig. 3B-C); scaly sheath at base of dorsal and anal fins, averaging about two-thirds pupil width at base of dorsal fin and about the same width at base of anterior part of anal fin, tapering in width on anteriormost and posteriormost sections; column of scales on each membrane of dorsal and anal fins, narrowing distally, progressively longer on spinous portion of dorsal fin, reaching at least two-thirds distance to spine tips on posterior membranes, and covering as



TABLE 6

Proportional measurements of selected type specimens of *Pomacentrus nigriradiatus*, n. sp.  
as percentages of the standard length

	holotype			paratypes						
	WAM P. 34491	WAM P. 34491	WAM P. 25129	WAM P. 34491	WAM P. 34491	WAM P. 34491	WAM P. 34491	WAM P. 29368	WAM P. 29368	WAM P. 29368
Standard length (mm)	70.4	73.8	73.1	70.8	70.1	69.2	68.3	65.6	64.9	54.2
Body depth	47.9	47.0	50.0	50.5	46.5	49.6	49.2	47.6	48.0	48.2
Body width	19.7	16.6	21.4	17.8	16.3	18.8	18.4	20.0	18.8	18.0
Head length	28.0	29.9	28.7	28.8	29.2	27.8	28.9	27.9	28.1	29.7
Snout length	8.0	8.2	7.5	7.3	8.0	8.0	7.6	7.5	7.6	8.3
Orbit diameter	10.5	9.5	9.7	9.9	10.0	9.2	10.4	9.8	9.6	11.0
Interorbital width	10.6	10.4	10.4	10.5	10.2	10.6	10.6	9.7	10.2	10.9
Caudal-peduncle depth	16.3	15.7	16.8	16.7	16.4	16.2	17.7	15.8	16.0	16.2
Caudal-peduncle length	11.9	13.5	12.4	11.1	12.5	10.4	12.9	13.4	13.2	14.2
Upper jaw length	8.5	8.5	8.7	7.8	8.4	9.1	9.0	8.7	8.6	8.4
Predorsal length	38.5	37.7	37.7	37.2	39.4	38.8	38.6	37.6	38.0	38.9
Preanal length	64.6	61.4	65.5	63.4	60.1	63.5	62.2	64.6	63.5	63.4
Prepelvic length	37.9	38.1	37.5	37.9	37.3	38.3	36.9	36.5	36.3	37.5
Length dorsal-fin base	62.6	64.5	61.2	62.3	63.4	64.6	63.3	61.0	61.7	61.4
Length anal-fin base	28.4	29.9	29.4	30.5	30.6	28.8	29.5	28.2	28.8	28.9
Length pectoral fin	33.6	33.2	31.8	32.3	35.3	33.8	32.0	31.8	33.1	31.7
Length pelvic fin	38.2	34.3	36.8	36.2	34.1	32.7	30.3	30.0	36.9	38.0
Length pelvic-fin spine	17.3	15.2	15.3	16.8	14.7	15.1	16.3	15.6	16.1	16.3
Length first dorsal spine	7.3	6.7	5.9	6.5	7.2	6.3	6.3	5.6	6.6	7.1
Length second dorsal spine	12.6	12.2	12.3	12.4	12.6	12.0	13.2	11.7	11.4	11.9
Length seventh dorsal spine	14.5	14.4	15.2	15.0	13.9	15.0	16.1	12.3	13.4	12.8
Length longest dorsal ray	24.4	24.7	22.6	24.7	25.3	24.2	26.1	24.8	25.2	28.8
Length first anal spine	6.2	7.0	21.2	7.1	6.7	6.9	6.4	23.3	6.4	24.8
Length second anal spine	15.4	15.1	12.8	15.1	14.5	13.2	16.1	12.6	12.0	12.9
Length longest anal ray	24.5	22.2	21.2	24.9	24.2	22.5	24.8	23.3	21.6	24.8
Length caudal fin	32.4	27.1	33.2	29.7	30.7	28.3	30.4	32.4	30.7	32.3
Caudal concavity	6.2	4.6	7.2	7.4	7.4	7.3	7.3	9.1	8.3	9.7

much as half of soft portion of dorsal and anal fins; small scales on caudal fin extending about two-thirds distance to posterior margin; small scales on basal third of pectoral fins; a cluster of several scales forming median process, extending posteriorly from between base of pelvic fins, its length slightly greater than half that of pelvic-fin spine; axillary scale above base of pelvic-fin spine, its length about one-half pelvic-fin spine.

Origin of dorsal fin over third tubed lateral-line scale, predorsal distance 2.6 (2.5–2.7) in SL; base of soft portion of dorsal fin contained about 1.8 times in base of spinous portion; dorsal-fin spines gradually increasing in length to last spine; first dorsal-fin spine 3.8 (4.1–5.1) in HL; seventh dorsal-fin spine 2.2 (1.9–2.5) in HL; last dorsal-fin spine 1.9 (1.7–2.3) in HL; membranes of spinous portion of dorsal fin moderately incised between spine tips; seventh dorsal soft ray longest, 1.1 (1.0–1.3) in HL; first anal-fin spine 4.5 (3.9–4.9) in HL; second anal-fin spine 1.8 (1.8–2.4) in HL; longest (ninth) anal soft ray 1.1 (1.2–1.4) in HL; caudal fin moderately forked with rounded lower lobe and more angular upper lobe, its length 3.1 (2.7–3.7) in SL; lobe tips and posterior margin of caudal fin frequently with short filamentous extensions (usually abraded or absent in preserved specimens); fourth pectoral-fin ray longest, 3.0 (2.8–3.2) in HL; pelvic-fin spine 1.6 (1.7–2.0) in HL; first soft ray of pelvic fin forming filamentous tip, 2.6 (2.6–3.3) in SL.

**Color in life.** (Fig. 14) Body of adult overall gray to gray brown with thick black or dark-brown scale margins producing a network pattern; head dark gray to brownish, sometimes with small, scattered blue spots; blue stripes sometimes on side of snout and immediately below lower margin of eye; eye with narrow white ring around pupil, dorsal scleral surface either uniform grayish or with a few blue markings; dorsal and anal fins mainly dark gray with black spine tips and a thin blue outer margin, except posterior edge of fin broadly translucent with conspicuous contrasting blackish fin rays; caudal fin mainly dark gray, except broadly translucent posteriorly with similarly conspicuous contrasting dark-gray to blackish fin rays, tip of lobes and posterior margin finely blackish; pelvic fins dark gray to blackish; pectoral fins translucent with dusky gray rays; a black spot covering entire pectoral-fin base (including axil side), bordered posteriorly with pale gray halo; inner side of pectoral-fin axil tannish to pale gray. Juvenile and subadult (Fig. 14C & D) similar, but dark scale margins and dark fin rays of median fins less prominent; also with bright blue outer margins on dorsal and anal fins, as well as on anterior edge of pelvic fins, and blue stripe on dorsal scleral surface of each eye.

**Color in alcohol.** (Fig. 15) Generally dark brown including median fins; relatively fresh specimens with darker-brown scale margins as described for live fish; median fins dark brown, except semitranslucent posteriorly, with conspicuous contrasting dusky brown fin rays; pelvic fins dark brown to blackish; pectoral fins semitranslucent with dusky brown rays and a prominent black spot covering base and inner side of axil.



**Figure 15.** *Pomacentrus nigriradiatus*, preserved holotype, WAM P.34491-003, 70.4 mm SL, Samoa (G.R. Allen).



**Etymology.** The new species is named *nigriradiatus* (Latin: black-rayed) with reference to the diagnostic dark rays on the posterior sections of the median fins. The specific epithet is a compound adjective.

**Distribution.** The new species is widely distributed in the South Pacific ranging from New Caledonia to American Samoa (Fig. 1). Intermediate locations include Loyalty Islands, Vanuatu, Rotuma, Wallis, and Samoa (formerly Western Samoa). The approximate depth range is 8–20 m. Judging from the distribution of other damselfishes from the South Pacific, it seems logical that this species would also occur at Fiji and Tonga, but no records or underwater photographs were discovered during the current study, despite relatively comprehensive collections from both areas. Specimens from these locations at ROM and USNM misidentified as *P. philippinus* invariably represented *Pomacentrus imitator* (Whitley, 1964).

**Comparisons.** *Pomacentrus nigriradiatus* differs from other members of the *philippinus* species complex by its distinctive color pattern features (Table 2), particularly the conspicuous contrasting dark fin rays on the posterior sections of the dorsal, anal, and caudal fins. It also differs from *P. albiaxillaris*, *P. flavoaxillaris*, and *P. magniseptus* in usually having at least a few scales on the preorbital (although this feature is lacking in three of the many type specimens). Meristic counts of the new species overlap broadly with other members of the species complex, but the modal count of anal-fin soft rays is one more in *P. nigriradiatus* vs. the other species.

*Pomacentrus imitator*, originally described from Lihou Reef in the Coral Sea of Australia, ranges eastward to Fiji and Tonga, and co-occurs with *P. nigriradiatus* at many intervening locations. While *P. imitator* also possesses a large black spot covering the pectoral-fin base and darker scale margins forming a network pattern on the sides of the body, the two species have distinctly different colors, with *P. imitator* having a bluish or violet head and body and a bright yellow tail, with a sharply contrasting yellow iris and a yellow patch on the pectoral-fin axil (compare Figs. 14 & 16). Randall (2005) mentioned that *P. imitator* has a patch of scales on the preorbital, but this feature was present on only one side of a single specimen out of 18 individuals we examined. Based on the mtDNA COI sequence in GenBank (JQ707157) for *P. imitator*, it also belongs in the *philippinus* species complex (about 8% divergent from *P. philippinus*). This relationship will be investigated further with relation to our continuing study of the East Indian members of this complex.



**Figure 16.** *Pomacentrus imitator*, underwater photo, approx. 65 mm SL, Fiji (G.R. Allen).



TABLE 7

Average interspecific pairwise genetic distance matrix for concatenated mitochondrial DNA sequences for the *Pomacentrus philippinus* species complex and some congeners

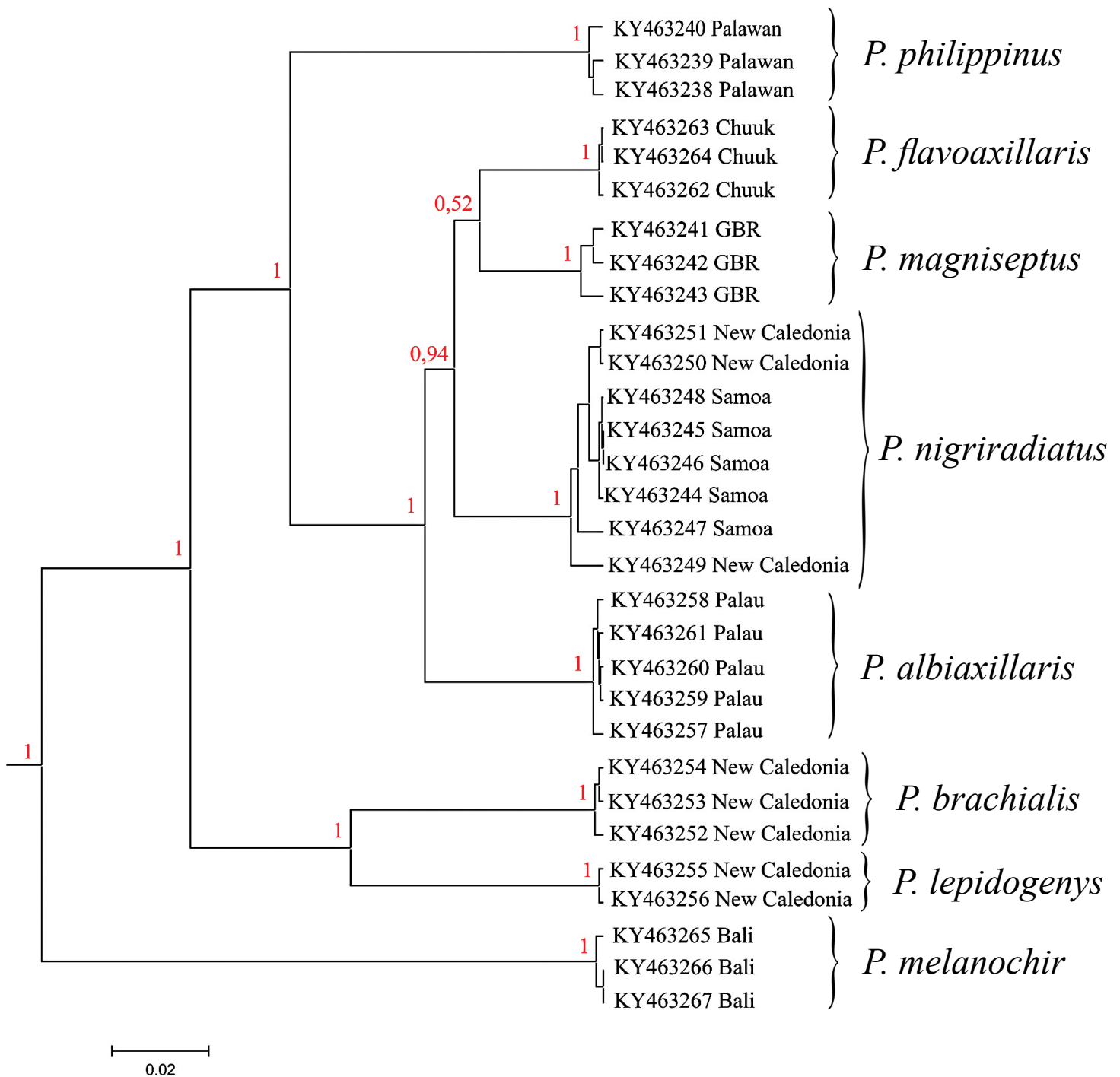
No.	Species	Location	1	2	3	4	5	6	7
1	<i>P. philippinus</i>	Palawan							
2	<i>P. flavoaxillaris</i>	Chuuk	0.129						
3	<i>P. magniseptus</i>	GBR	0.129	0.051					
4	<i>P. nigriradiatus</i>	Samoa & New Caledonia	0.129	0.061	0.061				
5	<i>P. albiaxillaris</i>	Palau	0.129	0.074	0.074	0.074			
6	<i>P. brachialis</i>	New Caledonia	0.171	0.171	0.171	0.171	0.171		
7	<i>P. lepidogenys</i>	New Caledonia	0.171	0.171	0.171	0.171	0.171	0.105	
8	<i>P. melanochir</i>	Bali	0.232	0.232	0.232	0.232	0.232	0.232	0.232

**Genetic Analysis.** We resolved relationships within the *P. philippinus* species complex using sequences derived from concatenated alignments of mtDNA segments, including 588 base-pairs of 16S, 657 base-pairs of COI, and 407 base-pairs of the control region. Within these regions, 45 sites were parsimony informative within 16S, 173 in COI, and 111 in the control region. The average pairwise genetic distance (Table 8) between the four new western Pacific species of the *P. philippinus* complex ranges from 5.1–7.4%, compared with 12.9% between the new species and the population of true *P. philippinus* from Palawan Island in the Philippines. The intraspecific pairwise genetic distance for each species ranges between 0–1.3%. The three outgroup species of *Pomacentrus* lie well outside the range for the *P. philippinus* complex, being separated from them by average pairwise genetic distances of 17.1–23.2%.

A phylogenetic tree obtained from BEAST (Fig. 17) shows a set of distinct monophyletic lineages representing five closely-related species in the *P. philippinus* species complex and three outgroup species (*P. brachialis*, *P. lepidogenys*, and *P. melanochir*). Although the posterior probability value between the branching of *P. flavoaxillaris* and *P. magniseptus* is relatively low (0.52), it is nevertheless a strong indication that these two clades represent distinct lineages, due to the solid branching pattern of the other clades (with a posterior probability value of 1).

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**Figure 17.** Maximum Credibility Tree generated from concatenated mitochondrial data set of 16S, COI, and control region loci from *Pomacentrus* species. Numbers on the nodes indicate posterior probability for Bayesian Inference methods. Genbank accession numbers and collection location are listed for each individual. Shaded area highlights the *P. philippinus* species complex. Great Barrier Reef is abbreviated as GBR. The scale bar refers to substitutions per site.



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