

**CHAETODONTOPLUS POLIOURUS, A NEW ANGELFISH  
(PERCIFORMES: POMACANTHIDAE)  
FROM THE TROPICAL WESTERN PACIFIC**

**John E. Randall**

Bishop Museum, 1525 Bernice St., Honolulu, HI 96817-2704, USA  
Email: jackr@hawaii.rr.com

**Luiz A. Rocha**

University of Texas at Austin, Marine Science Institute, 750 Channel View Dr., Port Aransas, TX 78373, USA  
Email: rocha@mail.utexas.edu

**ABSTRACT.** – *Chaetodontoplus poliourus* is described as a new species of pomacanthid fish from 30 specimens collected in New Britain (type locality), other localities in Papua New Guinea, Solomon Islands, Palau, and islands of Indonesia. It was previously regarded as a colour variant of *C. mesoleucus* (Bloch) by having a grey caudal fin with a narrow yellow margin instead of a yellow fin, yellow instead of white pelvic fins, and more pale yellow anteriorly on the dorsal fin. The two species coexist at several islands of Indonesia, but only *C. mesoleucus* ranges northwest to the coast of southeast Asia, the Philippines and the Ryukyu Islands, and only *C. poliourus* is found east of the Indonesian province of West Papua. No external morphometric differences could be detected between the two species, but *C. poliourus* was found to have two supraneural bones, compared to one for *C. mesoleucus*, modally one fewer pectoral-fin rays, and a higher average number of anal-fin rays. Mitochondrial and nuclear DNA analyses revealed significant differences between the species (6.07% sequence divergence on mtDNA and a 25 base pair indel on nDNA), reinforcing their distinct taxonomic status.

**KEY WORDS.** – Taxonomy, angelfishes, *Chaetodontoplus*, new species, western Pacific.

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## INTRODUCTION

Bloch (1787: 117, pl. 216, fig. 2) described the first species of *Chaetodontoplus* as *Chaetodon mesoleucus* (not to be confused with *Chaetodon mesoleucos* Forsskål, an endemic Red Sea butterflyfish). Of all the angelfishes, *Chaetodontoplus mesoleucus* most resembles a species of *Chaetodon* in body shape and in having a broad black bar through the eye. Bloch gave the type locality as Japan, but this is questionable because the species is not known from the main islands of Japan.

Lacepède (1802: 528, 537), Cuvier in Cuvier & Valenciennes (1831: 170), and Günther (1860: 54) classified Bloch's species in the genus *Holacanthus*. Günther included *Chaetodon atratus* Gronow in Gray (1854) in his synonymy. He gave the locality for *H. mesoleucus* as the East Indian Archipelago, listing specimens from Macassar and the Molucca Islands.

Bleeker (1876: 307) described the new angelfish genus *Chaetodontoplus*, designating *Holacanthus septentrionalis* as the type species. In volume 9 of his *Atlas Ichthyologique*,

Bleeker (1877: 56, pl. 379, fig. 5) provided a detailed species account of *Chaetodontoplus mesoleucus* and illustrated it in colour. His localities included Singapore, and the Indonesian localities Batu, Java, Sulawesi, Ceram, Halmahera, and Batjan.

In a review of Philippine butterflyfishes and their allies, Herre & Montalban (1927: 101, pl. 7, fig. 1) reported 12 specimens as *Holacanthus mesoleucus*, ranging from 81 to 125 mm in length, from Mindoro, Panay, Masbate, Mindanao, Leyte, Tawitawi, and Jolo. Their detailed colour description mentioned the paired and caudal fins as clear lemon yellow and the first one or two dorsal spines as yellow. Their smallest specimen was a female ready to spawn.

Fowler & Bean (1929: 191) listed numerous specimens of *Holacanthus mesoleucus* ranging in length from 34–150 mm from 50 collections made by the steamer *Albatross* throughout the Philippines from the Sulu Archipelago to Luzon. No life colour notes were given. However, the first author found an unpublished colour painting of a specimen (linen tag no. 492) in the National Museum of Natural

History that was collected during the *Albatross* cruise at Romblon Island, Sibuyan Sea, central Philippines on 26 Mar. 1908. It is reproduced here as Fig. 1. The probable artist was Kumataro Ito (Lisa Palmer, pers. comm.). In addition, Jeffrey T. Williams provided his colour photograph of a specimen of the yellow-tailed *C. mesoleucus* from Busuanga (between Mindoro and Palawan) that was collected for the Field Museum of Natural History, Chicago.

Borodin (1930: 56) described *Holacanthus bicolor* var. *oahuensis* as a new colour variety, supposedly collected at Oahu, Hawaiian Islands. Fraser-Brunner (1933: 550) reviewed the pomacanthid fishes, then still regarded as a subfamily of the Chaetodontidae. He treated Borodin's variety as a synonym of *Chaetodontoplus mesoleucus* and gave the distribution as East Indies, listing specimens from Singapore, Macassar, Manado, Jolo, and New Britain.

Munro (1967: 373, pl. 51, fig. 702) included *Chaetodontoplus mesoleucus* in his book, *The Fishes of New Guinea*. However, he listed no specimens or localities within New Guinea and used Herre & Montalban's illustration for his figure of the species.

In 1968 the first author collected three specimens of an angelfish from Palau (Fig. 2), which he provisionally identified as *Chaetodontoplus mesoleucus*, because the caudal fin was grey with only a narrow yellow posterior border, instead of yellow with a narrow transparent posterior margin, and the pelvic fins were yellow instead of white. In 1987, while diving with Rudie H. Kuiter at the southern Indonesian island of Flores, both the yellow-tailed and grey-tailed forms of *C. mesoleucus* were common on the coral reefs. The grey-tailed fish were generally seen in lesser depths, and when the fish were seen in pairs, they were the same colour. They concluded that the two colour forms were most likely different species. Specimens of both were collected (Fig. 3 is the yellow-tailed *C. mesoleucus*), and tissue samples were taken for electrophoresis. The tissue samples were sent to a colleague, but she failed to complete the electrophoretic study.

Although the difference in the colour of the caudal and pelvic fins is lost in preserved specimens of the two presumed species, one useful life colour difference persists in alcohol. The first one or two dorsal spines and membranes of *C. mesoleucus* are yellow in life, compared to the first three or four of the grey-tailed form.

An early effort was made to find some morphological or meristic difference to separate the two presumed species, but none was detected. Nevertheless, Randall (1998: 233) treated the two as one of 61 Indo-Pacific geminate species of fishes, with an underwater photograph of *Chaetodontoplus mesoleucus* from Sulawesi as Fig. 41, and *Chaetodontoplus* sp. from Halmahera as Fig. 42.

In July of 2002, the first author and John L. Earle carried out field research on reef fishes at Kimbe Bay at the north shore of New Britain, followed by a dive cruise to Rabaul

at the northeast end. *Chaetodontoplus mesoleucus* was not seen, but the grey-tailed species was common (Figs. 4 and 5). Specimens were collected and photographed (Fig. 6), and tissue samples were taken.

In 2006, the second author, Brian W. Bowen, and Matthew T. Craig determined that only the grey-tailed species of *Chaetodontoplus* is found in Palau; six specimens were collected, tissue was removed, and underwater photos taken (Fig. 7). Seven Philippine specimens of the yellow-tailed *C. mesoleucus* were obtained from the aquarium trade. An analysis of the DNA of the two angelfishes has confirmed species-level separation.

Some problems still remain in the classification of *Chaetodontoplus*. Fraser-Brunner (1933) recognized seven species in the genus. He regarded *C. dimidiatus* (Bleeker) as a synonym of *C. melanosoma* Bleeker, and he included *C. chrysocephalus* Bleeker, but considered it "very probably" a variety of *C. septentrionalis* (Temminck & Schlegel). Whitley (1959) described *C. ballinae* from Ball's Pyramid, Lord Howe Island, since reported from New South Wales. Chan (1969) described *C. niger* from a juvenile from the South China Sea, now known to range to southern Japan. Shen & Lim (1975) named *C. cephalareticulatus* from northeast coast of Taiwan, and Yasuda & Tominaga (1976) added *C. caeruleopunctatus* from the Philippines. Kuiter (1990) described *C. meredithi* from the eastern coast of Australia. Pyle & Randall (1994) suggested that *C. chrysocephalus* is the hybrid, *C. melanosoma* x *C. septentrionalis*. Allen et al. (1998) recognized 11 species of *Chaetodontoplus*, including *C. chrysocephalus*, but not *C. cephalareticulatus*. Gerald R. Allen (pers. comm.) now concedes that *C. chrysocephalus* might be a hybrid. Debelius et al. (2003) accepted *C. cephalareticulatus* and *C. chrysocephalus* as valid species, but considered *C. caeruleopunctatus* a synonym of the latter. However, the second author of the book, Hiroyuki Tanaka (pers. comm.), did not agree. Allen & Steene (2004) described *C. vanderloosi* as a new species from Papua New Guinea and

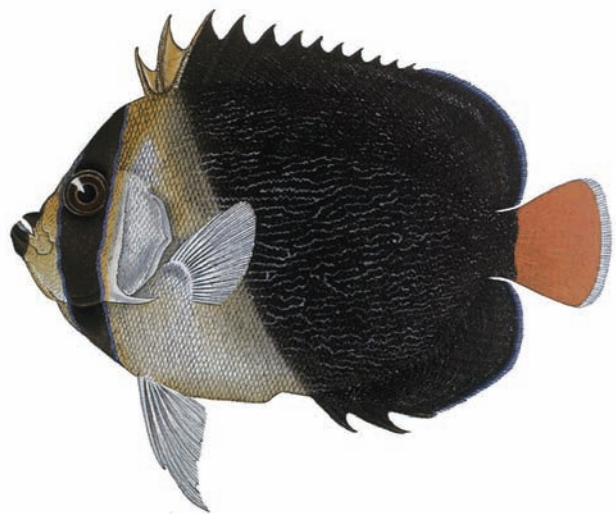


Fig. 1. Painting of *Chaetodontoplus mesoleucus*, USNM 182470, Romblon Island, Philippines, *Albatross* Expedition, 1908 (probable artist, Kumataro Ito).

resurrected *C. dimidiatus* Bleeker from synonymy, noting its distribution as the Molucca Islands and the western end of New Guinea.

Tominaga & Yasuda (1975: 82) presented a paper at the Thirteenth Pacific Science Congress at the University of British Columbia in Vancouver, "Revision of the genus *Chaetodontoplus* (Pomacanthidae) of the world." They wrote in their abstract, "*C. mesoleucus* and *C. niger* are different in important characteristics from the remaining members of *Chaetodontoplus* and should be excluded from the genus." Their revision was never published. In correspondence in 1987 with the first author after the death of Fujio Yasuda, Yoshiaki Tominaga wrote, "Both *mesoleucus* and *niger* have only one predorsal bone, but I believe these two species are not particularly related." Pyle (2003: 154, Fig. 2.2) showed that *C. mesoleucus* may have either one or two predorsal bones (now termed supraneural bones). His radiographs were of specimens of both the yellow and grey-tailed forms. On checking the x-rays, we find that the grey-tailed specimens have one supraneural bone, and the yellow-tailed ones have two. The specimens of *C. mesoleucus* for the study of Tominaga & Yasuda were from Japan where only the yellow-tailed form is found. Nevertheless, *C. mesoleucus* and its grey-tailed sister species warrant consideration as a genus, as does *C. niger*. A combined morphological and genetic study of the classification of the Pomacanthidae is planned.

## MATERIALS AND METHODS

Specimens of the new species of *Chaetodontoplus* are present in the collections of the Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM); California Academy of Sciences, San Francisco (CAS; SU); Field Museum of Natural History, Chicago (FMNH); Muséum National d'Histoire Naturelle, Paris (MNHN); Museum Zoologicum Bogoriense, Cibinong, Indonesia (MZB); National Museum of Nature and Science, Tokyo (NSMT); Royal Ontario Museum, Toronto (ROM); National Museum of Natural History, Washington, D.C. (USNM); and the Western Australian Museum, Perth (WAM).

Lengths of specimens are given as standard length (SL), measured from the front of the lower jaw to the base of the caudal fin (posterior end of the hypural plate); head length (HL) is measured from the same anterior point to the posterior end of the opercular flap; body depth is the greatest depth taken vertically from the internal base of the spinous portion of the dorsal fin to the ventral edge of the abdomen; body width is the maximum width just posterior to the gill opening; snout length is taken from the front of the upper lip to the bony edge of the orbit; orbit diameter is the greatest bony diameter, and interorbital width the least bony width; cheek depth is measured from the ventral bony edge of the orbit vertically to the ventral margin of the interopercle; upper-jaw length from the front of the upper lip to the posterior end of the maxilla; preopercular spine length is the distance from the dorsobasal point of insertion

to the distal tip; caudal-peduncle depth is the least depth, and caudal-peduncle length 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 from their extreme base. The scales on the body are small and not in regular rows, so accurate counts cannot be taken. The pored lateral-line scales are in two series, the first from the gill opening to below the posterior base of the dorsal fin, and the second mid-laterally on the caudal peduncle. The last dorsal and anal rays are fully branched to base, but counted as one ray. The rays of the pectoral fins were counted on both sides. Gill-raker counts were made on the first gill arch and include rudiments. The raker at the angle is contained in the lower-limb count.

In the description of the new species, data in parentheses refer to paratypes. The data in the table of measurements of the new species are given as percentages of the standard length. Proportional measurements in the text of the diagnosis and description are rounded to the nearest .05.

## Genetic Analysis

Total genomic DNA was extracted from tissue samples using the Qiagen DNeasy tissue kit following the manufacturer's protocol. Segments from the mitochondrial DNA cytochrome b gene (CytB), and the nuclear encoded S7 intron were amplified for samples from Palau, Papua New Guinea, Philippines and Indonesia. Primers used for amplification and sequencing were 5' GTG ACT TGA AAA ACC ACC GTT G, 5' AAT AGG AAG TAT CAT TCG GGT TTG ATG (CytB) and 5' AAT GGC GAA CCA GAC and 5' TCA TAT TTC TGT TTA CAT CCA ACA A (S7). Polymerase chain reaction (PCR) and sequencing methods are described in detail by Rocha et al. (2008).

## TAXONOMY

### *Chaetodontoplus poliourus*, new species

(Figs. 2, 4–7; Tables 1, 2)

*Chaetodontoplus* sp. 1 Kuitert, 1992: 109, Fig. D (Flores).

*Chaetodontoplus* sp. Randall, 1998: 246, Fig. 42 (Halmahera).

*Chaetodontoplus mesoleucus* (non Bloch) Halstead, 2000: 135, upper Fig. (Papua New Guinea and Solomon Islands).

*Chaetodontoplus* cf. *mesoleucus* Debelius et al., 2003: 132, Figs. A–E (Bali to Flores, Papua New Guinea, Solomon Islands, Palau).

**Material examined.** – Holotype: BPBM 39031, male, 81.5 mm SL, Papua New Guinea, New Britain, Kimbe Bay, first reef off Walindi Plantation, 6–10 m, spear, J. L. Earle, 19 Jul.2002.

Paratypes: USNM 150535, 54.5 mm SL, Solomon Islands, Florida Islands, W. M. Chapman & H. Cheyne, dynamite, 4 May 1944; USNM 169824, 76.0 mm SL, same data as preceding; USNM 169785, 2 ex., 64.0–77.0 mm SL, Solomon Islands, New Georgia, outer reef of Wana-Wana Island and Blacketts Strait, dynamite, W. M. Chapman & H. Cheyne, 25 Jun.1944; BPBM 6833, 85.0 mm SL, Palau, limestone islet east of Koror, coral reef, 6 m, spear, J. E. Randall, 1 Jun.1968; BPBM 6834, 2 ex., 81.5–92.0 mm SL,

Palau, Ngargol Island, west end, coral bottom, 6–12 m, spear, J. E. Randall, 8 Jun.1968; USNM 209956, 81.0 mm SL, Indonesia, Molucca Islands, Saparua, off Kampungmahu, isolated coral patch in 4 m, surrounded by calcareous matrix in 10 m, rotenone, V. G. Springer & M. F. Gomon, 18 Jan.1973; AMS I.19881-001, 90 mm SL, Solomon Islands, Sandfly Passage, Biki Island, coral reef, 20 m, spear, B. Goldman, 24 Jul.1973; USNM 245400, 88.0 mm SL, Indonesia, New Guinea, Papua, Batanta Island, Marchesa Bay, Hawaii Islet, 0°49.8'S 130°56.8"E, 0–6 m, rotenone, RV Alpha Helix, B. B. Collette, 2 Jul.1979; BPBM 32217, 4 ex., 56.0–80.5 mm SL, Indonesia, Flores, off Pertamina oil storage site, Waipare Reef, 8°37'46"S 122°16'35"E, 21 m, rotenone and spear, J. E. Randall, R. H. Kuitert, & L. C. Reynolds, 19 Sep.1987; WAM P.33068-001, 72.0 mm SL, same data as preceding; BPBM 32239, 2 ex., 60.0–76.0 mm SL, Flores, Wodong Reef, 8°36'10"S 122°25'30"E, 20 m, quinaldine and spear, J. E. Randall, 20 Sep.1987; MZB 17171, 79.5 mm SL, same data as preceding; BPBM 32580, 3 ex.: 76.0–88.0 mm SL, Papua New Guinea, Madang Province, Kranket Island, inner lagoon, live coral bottom, 3–4 m, spear, J. E. Randall, 12 Nov.1987; BPBM 32427, 2 ex., 42.0–71.0 mm SL, Madang, off Christiansen Research Institute, spear, P. L. Colin, late 1987; ROM 77374, 75.0 mm SL, Palau, Koror, SSE of Tlutkaraguis Island, off W coast of Ngerubktabel Island, reef between small and



Fig. 4. Underwater photo of *Chaetodontoplus poliourus*, Kimbe Bay, New Britain (J. E. Randall).



Fig. 2. *Chaetodontoplus poliourus*, paratype, BPBM 32239, 76.0 mm SL, Palau (J. E. Randall).



Fig. 5. Head-on underwater photo of *Chaetodontoplus poliourus*, Kimbe Bay, New Britain (J. E. Randall).



Fig. 3. *Chaetodontoplus mesoleucus*, BPBM 32218, 94.0 mm SL, Flores, Indonesia (J. E. Randall).



Fig. 6. Holotype of *Chaetodontoplus poliourus*, BPBM 39031, 81.5 mm SL, Kimbe Bay, New Britain (J. E. Randall).

larger island, 7°17'11.7"N 134°25'34.3"E, 6.1–14.3 m, rotenone, R. Winterbottom, W. Holleman, B. Hubley, D. Winterbottom & A. Bauman, 26 May 2004; ROM 84401, 77.5 mm SL, same data as holotype; BPBM 40963, 2 ex., 57.0–107.0 mm SL, Palau, Koror, inland channel, 8 m, spear, L. A. Rocha, B. W. Bowen, & M. T. Craig, 23 Oct.2006; CAS 227415, 109 mm, MNHN 2009-002, 97.5 mm, NSMT-P 92943, 96.0 mm SL, same data as BPBM 40963; USNM 394206, 89.5 mm SL, Southwest Islands of Palau, Helen Reef, east side of lagoon opposite entry channel, just inside of wreck on reef top, 02°51'48"N 131°48'06"E, hard corals, lettuce corals, algae on rubble, and sand, 7–23 m, spear, M. W. Westneat & J. T. Williams, 16 Sep.2008; FMNH 118117, 89.4 mm SL, same data as preceding.

**Diagnosis.** – Dorsal rays XII,17 (rarely 16 or 18); anal rays III,16 or 17; pectoral rays 15–17 (usually 16); scales small, about 80 in longitudinal series; dorsal series of pored lateral-line scales 29–35; gill rakers 4 + 12; supraneural bones 2; body depth 1.70–1.85 in SL; head length 3.15–3.3 in SL; fourth to sixth dorsal spines longest, 1.1–1.3 in HL; colour in alcohol: head and anterior body pale yellowish grey to an approximate oblique demarcation connecting base of second to third dorsal spine to anus, gradually changing posteriorly in an intermediate zone containing pectoral fin to one of irregular longitudinal lines on dark brown; a dark brown bar from nape, broadening as it passes through eye, then curving and narrowing as it ends shortly before origin of pelvic fins; front of lips brown; dorsal and anal fins coloured as adjacent body; caudal fin abruptly pale grey; paired fins pale yellowish; colour in life: dark brown posteriorly with white dots, which merge anteriorly to form narrow irregular white lines; dark brown of body progressively lighter anteriorly, becoming pale grey at demarcation, then gradually changing to pale yellow on head; ocular bar black, narrowly edged in bluish white; snout and chest yellow, the front of lips blue, this colour sometimes continuing as a narrow triangle medially on front of snout; first three to four dorsal spines and membranes yellow, the rest of fin dark brown with rows of white dots paralleling rays on about basal three-fourths of fin; a narrow white or blue margin on soft portion of fin; anal fin similar, but not yellow anteriorly; caudal fin grey with a narrow yellow posterior border; pectoral fins pale grey; pelvic fins bright yellow.

**Description.** – Dorsal rays XII,17 (one of 23 paratypes with 16, and one with 18); anal rays III,17 (16 or 17); all dorsal and anal rays branched, the last to base; pectoral rays 16 (15–17, usually 16), the upper two and lowermost unbranched; pelvic rays I,5; principal caudal rays 17, the upper and lower unbranched; upper procurrent caudal rays 4, the most posterior segmented; lower procurrent caudal rays 3, the most posterior segmented; longitudinal scale series about 80; pored lateral-line scales 32 + 7 (29–35 + 7–9); gill rakers 4 + 12; pseudobranchial filaments 21 (14–23); branchiostegal rays 6; vertebrae 10 + 14; supraneural bones 2.

Body deep, the depth 1.7 (1.7–1.85) in SL, and compressed, the width 3.4 (3.05–3.4) in depth; head length 3.25 (3.15–3.3) in SL; dorsal profile of head forming an angle of about 60°, with a slight concavity above eye and a slight convexity before dorsal fin; snout short, the length 3.0 (2.75–3.1) in HL; orbit diameter 3.55 (3.1–3.95) in HL; interorbital width 3.6 (3.35–4.0) in HL; caudal-peduncle depth 2.55 (2.5–2.95) in HL; caudal-peduncle length 6.05 (4.7–6.1) in HL.

Mouth small, the maxilla reaching to below anterior nostril, and strongly oblique when fully closed, forming an angle



Fig. 8. Underwater photo of *Chaetodontoplus mesoleucus*, northern Sulawesi (J. E. Randall).



Fig. 7. Underwater photo of *Chaetodontoplus poliourus*, Palau (L. A. Rocha).

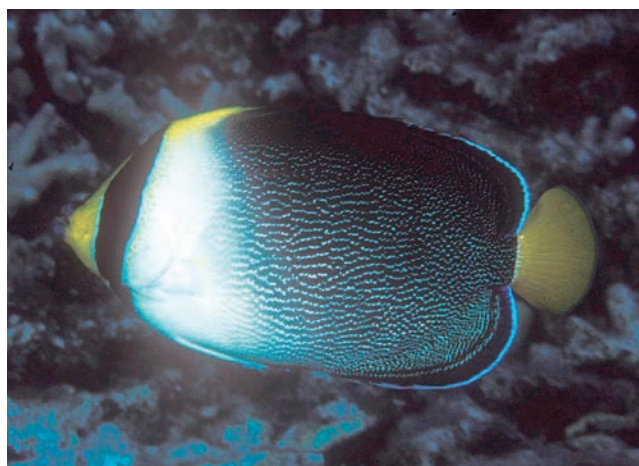


Fig. 9. Underwater photograph of *Chaetodontoplus mesoleucus*, Kerama Islands, Okinawa (J. E. Randall).

of about 60° to horizontal axis of head and body; lower jaw strongly projecting; jaws very protrusible, the angle of mouth reduced to about 20° when jaws fully extended; lips broad, the median depth of upper lip about one-half orbit diameter; teeth in jaws in four rows, the inner rows progressively shorter; teeth close-set, long and slender, about twice as wide as thick, the tips slightly incurved, expanded and tricuspid; central cusp of teeth much the largest and strongly pointed; upper jaw of holotype with 38 teeth in outer row, and lower jaw with 40 (largest paratype with 34 upper teeth and 40 lower teeth); no teeth on palate; tongue short and rounded, set far back in mouth; gill membranes narrowly attached to isthmus; gill rakers short, about one-sixth length of gill filaments.

Anterior nostril a short fleshy tubule with small opening a pupil diameter before centre of eye; posterior nostril a narrow elliptical aperture directly dorsoposterior to anterior nostril; no fleshy papillae midventrally on head.

A strong spine at corner of preopercle, its length 3.0 (2.6–5.05) in HL; posterior margin of preopercle with 22 (20–38), small, unevenly spaced serrae, some as tiny nodules; lower margin of preopercle with 10 small serrae on one side of holotype and 14 on other (3–15 in paratypes); margin of subopercle with 1 (0–12) small serrae; preorbital with 1 (0–5) small serrae.

Dorsal part of lateral line strongly arched to middle of body, then curving downward to end near rear base of dorsal fin; separate midlateral part of lateral line on caudal peduncle, extending about a peduncle length anteriorly; scales on body not in regular rows, coarsely ctenoid, with up to 23 cteni, continuing as ridges across exposed part of scales; many scales on body with auxiliary scales (also ctenoid); scales smaller on head, progressively smaller anteriorly; scales extending out on dorsal and anal fins as rows of narrow oblique ridges, the scales progressively smaller distally; no scales on first two dorsal spines and membranes and about outer half of next two spines and membranes (naked part of fin not pigmented, in contrast to very dark remaining part

of fin); caudal fin densely covered with very small scales; rays of pectoral fins with a row of close-set, quadrangular scales, only those basally on rays with a few cteni; pelvic fins with small ctenoid scales on rays.

Origin of dorsal fin above first lateral-line scale, the predorsal length 2.8 (2.7–2.9) in SL; first dorsal spine 2.5 (2.35–3.0) in HL; fourth to sixth dorsal spine longest, 1.2 (1.15–1.3) in HL; first dorsal soft ray longest, 1.35 (1.2–1.45) in HL; origin of anal fin below base of eleventh dorsal spine, the preanal length 1.55 in SL; first anal spine 2.0 (1.85–2.4) in HL; third anal spine longest, 1.35 (1.2–1.45) in HL; first anal soft ray longest, 1.3 (1.2–1.45) in HL; third to fifth pectoral rays longest, 1.4 (1.3–1.55) in HL; origin of pelvic fins below midbase of pectoral fins, the prepelvic length 2.75 (2.65–2.75); pelvic spine 1.35 (1.3–1.5) in HL; first pelvic soft ray longest, reaching posterior to anus, 1.2 (1.05–1.25) in HL.

Colour of holotype in alcohol: head and anterior body pale yellowish grey to an approximate oblique demarcation connecting base of second to third dorsal spines to anus, then gradually changing posteriorly in an intermediate zone containing pectoral fin to a pattern of irregular longitudinal pale lines on dark brown; a dark brown bar from nape, broadening as it passes through eye, then curving and narrowing as it ends shortly before origin of pelvic fins; front of lips dark brown, the dark pigment continuing medially on front of snout, forming a narrow triangle when viewed from the front, the apex above nostrils; dorsal and anal fins dark brown as adjacent body except pale yellowish anterior part of dorsal fin before an oblique demarcation from base of third dorsal spine to tip of fifth dorsal spine; caudal fin abruptly pale yellowish grey; paired fins pale yellowish, the membranes translucent.

Colour of holotype when fresh as in Figure 6. Figures 4 and 5 are underwater photographs of other individuals from the type locality of Kimbe Bay, New Britain. Figure 5 shows the blue pattern of the lips and snout, as well as the variant with a bright blue margin on the soft portion of the dorsal and anal fins (bluish white on holotype).

**Etymology.** – We have selected the species name *poliourus* from the Greek meaning grey tail for its most distinguishing colour feature, the predominantly grey caudal fin.

**Genetics.** – As mentioned, our earlier efforts to distinguish this species morphologically from the yellow-tailed *Chaetodontoplus mesoleucus* were not successful, so we decided to check if a molecular difference could be determined. Tissue samples of the new species were obtained from type specimens from New Britain, Indonesia (Raja Ampat) and Palau, and from *C. mesoleucus* also from Indonesia (collected at the same date and locality as *C. poliourus*) and from the Philippines (imported for the aquarium fish trade).

The genetic analysis revealed a very large difference between the species in both mitochondrial (mt) and nuclear DNA

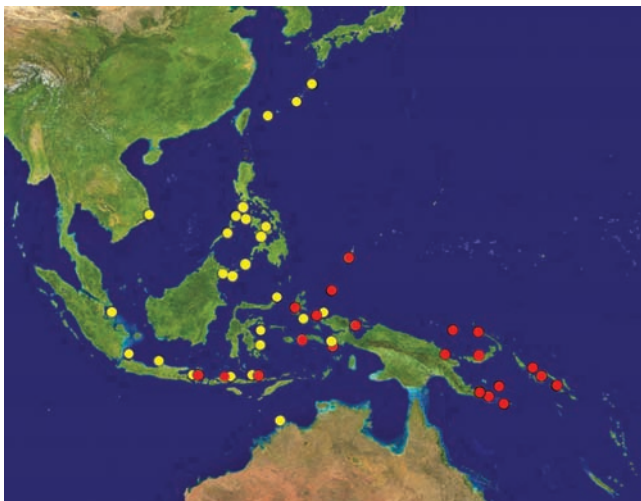


Fig. 10. Distribution map of *Chaetodontoplus mesoleucus* (yellow spots) and *C. poliourus* (red spots).

Table 1. Proportional measurements of type specimens of *Chaetodontoplus politourus* as percentages of the standard length.

	Holotype					Paratypes					
	BPBM	BPBM	BPBM	BPBM	BPBM	ROM	BPBM	BPBM	BPBM	BPBM	
Standard length (mm)	39031	32217	40963	32239	32427	84401	32217	6834	32580	6834	40963
Body depth	81.5	56	57	60	71	77.5	80.5	81.5	88	92	107
Body width	58.2	53.5	56.4	56.6	57.9	57.7	56.0	58.2	59.0	57.9	58.0
Head length	17.2	17.2	18.5	17.3	16.9	16.8	18.3	18.7	19.0	18.7	18.3
Snout length	30.7	31.2	31.6	30.8	31.7	30.8	31.6	31.6	30.4	30.8	30.4
Orbit diameter	10.4	10.6	10.7	10.0	10.8	11.3	11.3	10.4	10.4	10.8	11.0
Interorbital width	8.6	10.0	9.7	9.9	9.7	9.1	8.9	8.8	8.7	7.8	7.9
Preopercular spine	8.6	9.0	8.8	8.5	9.2	8.0	7.9	8.9	8.7	8.2	9.1
Caudal-peduncle depth	10.2	6.2	10.2	7.5	12.1	10.4	7.5	10.5	11.6	8.7	11.4
Caudal-peduncle length	12.1	12.6	10.8	11.2	13.0	12.2	11.2	12.5	12.7	11.6	12.4
Predorsal length	5.1	6.5	5.5	6.6	5.4	6.1	5.2	5.5	5.6	5.1	5.7
Prenal length	35.5	37.3	36.6	36.3	35.6	37.3	37.0	37.2	36.4	34.4	34.5
Prepelvic length	64.1	64.2	64.8	63.7	65.5	63.9	64.1	64.2	65.5	64.6	65.0
First dorsal spine	36.3	36.7	37.8	36.7	36.9	37.7	36.4	36.9	36.7	36.7	36.8
Second dorsal spine	12.3	12.9	13.5	11.7	12.9	12.7	11.5	12.9	12.7	10.3	10.8
Longest dorsal spine	18.9	19.7	20.8	19.5	18.6	18.8	18.1	18.4	19.1	17.5	16.4
Longest dorsal ray	25.4	27.5	27.8	27.5	26.7	26.0	24.8	24.5	25.4	24.8	23.5
First anal spine	22.7	23.7	26.1	24.8	24.2	23.5	21.8	21.9	22.7	22.1	20.8
Second anal spine	15.4	15.6	17.0	15.2	14.1	13.2	13.7	15.6	14.7	14.3	12.8
Third anal spine	19.5	22.6	24.7	20.9	21.3	20.7	18.7	21.3	19.0	19.9	18.0
Longest anal ray	23.0	25.8	25.9	22.9	24.1	24.2	23.4	23.8	20.8	22.5	22.4
Caudal-fin length	23.4	26.0	26.8	22.8	24.0	24.4	23.3	24.0	21.5	23.2	22.8
Pectoral-fin length	19.7	20.9	21.1	22.4	21.4	damaged	20.6	20.1	19.7	19.5	19.7
Pelvic-spine length	21.8	22.4	22.9	22.2	24.6	22.8	20.5	21.5	21.2	20.6	20.2
Pelvic fin length	22.9	22.8	23.6	23.3	24.2	22.2	22.2	21.0	22.6	21.1	20.7
	25.7	28.8	29.7	27.3	28.3	28.0	25.7	27.2	26.7	26.0	25.1

Table 2. Counts of soft rays of fins of two species of *Chaetodontoplus* from the Bishop Museum fish collection

	Dorsal rays			Anal rays			Pectoral rays		
	16	17	18	16	17	18	15	16	17
<i>C. mesoleucus</i>	3	9	1	11	1	1	4	22	
<i>C. poliourus</i>	1	22	1	12	12		4	39	5

(nDNA). For the mtDNA, a 757 base pair fragment of the cytochrome *b* gene was obtained. There were 46 diagnostic mutations, corresponding to a 6.07% uncorrected sequence divergence between species. This divergence is equal to or greater than that observed between pairs of closely related sister species of angelfishes (Bellwood et al., 2004), wrasses (Rocha, 2004), butterflyfishes (Fessler & Westneat, 2007), and grunts (Rocha et al., 2008). The nDNA analysis resulted in a 532 base pair segment of the S7 intron in *C. mesoleucus* and a 507 base pair segment of the same region in *C. poliourus*. The 25 base pair gap corresponds to an insertion or deletion (indel) between positions 220 and 245. This consistent difference in nDNA indicates that there is no ongoing hybridization between the two species.

**Remarks.** – While taking meristic data on additional specimens of the two species of *Chaetodontoplus*, we found that *C. poliourus* has modally 16 pectoral-fin rays, compared to 17 for *C. mesoleucus*, and a lower average number of anal-fin rays (Table 2).

The distribution of the two species of *Chaetodontoplus* (Fig. 10) was determined mainly from specimens examined by the authors, specimens in the California Academy of Sciences examined for the authors by David Catania and Richard L. Pyle, underwater photographs taken by the first author (Figs. 8, 9), and the following localities for *C. poliourus* provided by Gerald R. Allen from his field work in Indonesia and Papua New Guinea: Cenderwasih Bay, Milne Bay, D'Entrecasteaux Islands, Woodlark Island, Louisiade Archipelago, Manus Island, and the northern tip of New Ireland. He added the following localities for the Solomon Islands: Choiseul, Shortland Islands, Russell Islands, and Guadalcanal. He found both species at the islands of Misool and Kofiau off the western end of New Guinea where *C. mesoleucus* was by far the most common. Conversely, *C. poliourus* was relatively common along the west side of Halmahera, but only one individual of *C. mesoleucus* was observed (at Widi Islands, 0°33.4'S, 128°20.6'E). Other Allen records for *C. mesoleucus* include Banggai Island off eastern Sulawesi and the Kimberly coast of Western Australia at Cape Bougainville. John L. Earle (pers. comm.) observed both species at Raja Ampat and at Komodo. He wrote, "They are often observed on the same dive, however not in the same micro-habitat, and never as mixed species pairs".

Masuda & Kobayashi (1994: 206, Fig. 4) illustrated a juvenile of *C. mesoleucus*, 25 mm total length, from a photo taken at the Yaeyama Islands, Japan. The northernmost record for *C. mesoleucus* is that of Masuda et al. (1975: 314, pl. 12a) from the Amami-Ō-Shima Islands. Another example of live

colouration in Japan may be seen in Okamura & Amaoka (1997: 404, middle right fig.).

Allen et al. (1998: 67) reported that *Chaetodontoplus mesoleucus* (they illustrated both *mesoleucus* and *poliourus* as yellow-tailed and grey-tailed forms, respectively) feeds on sponges, tunicates, and algae.

**Taxonomic notes.** – We were concerned that *Chaetodon atratus* Gronow in Gray (1854), with a locality of India, might be an earlier name for *Chaetodontoplus poliourus*. Fraser-Brunner (1933: 550) corrected the locality to Singapore, but without explanation. We obtained a photograph of the dried skin of the holotype from James MacLaine of the Natural History Museum in London. Only the first dorsal spine and part of the second is pale, so we confidently identify this taxon as *C. mesoleucus*.

There was also a possibility that *Holacanthus bicolor* var. *oahuensis* Borodin, 1930, placed in the synonymy of *C. mesoleucus* by Fraser-Brunner, might predate *C. poliourus*. Borodin's record of this species from Oah'u is obviously a locality error, as are three other of his records of fishes for the Hawaiian Islands (Mundy, 2005: 406). His holotype, formerly in the Vanderbilt Marine Museum and now in the American Museum of Natural History, was examined by Richard L. Pyle (pers. comm.), who identified it as *C. mesoleucus*.

**Material of *Chaetodontoplus mesoleucus* examined.**

– INDONESIA: New Guinea, Papua Barat Province, Waigeo, SU 26739, 81.0 mm SL; Sulawesi, off Kendari, BPBM 26755, 94.0 mm SL; Flores, Maumere Bay, BPBM 32218, 94.0 mm SL, BPBM 32240, 2 ex., 107.0–123.0 mm SL; Komodo, BPBM 32371, 2 ex., 85.0–97.0 mm SL; Java, Karimunjawa Islands, USNM 280046, 5 ex., 35.0–94.0 mm SL, USNM 280048, 6 ex., 32.0–95.0 mm SL; Seribu Islands, USNM 280045, 3 ex., 68.0–92.0 mm SL, USNM 280047, 2 ex., 74.0–76.0 mm SL. SINGAPORE, CAS 88113, 2 ex., 65.0–94.0 mm SL. VIETNAM, Nha Trang Bay, CAS 88117, 59.0 mm SL. MALAYSIA, Sabah, Darvel Bay, USNM 345093, 3 ex., 87.0–92.0 mm SL. PHILIPPINES (from the aquarium fish trade), BPBM 10571, 94.0 mm SL; BPBM 10922, 4 ex., 42.0–85.0 mm SL; BPBM 40968, 2 ex., 68.0–84.0 mm SL; Sulu Archipelago, Tawi-Tawi, SU 25833, 140.0 mm SL; Siluag, CAS 49541, 107.0 mm SL; Jolo, SU 25832, 2 ex., 110.0–120.0 mm SL; Palawan, Puerto Princessa Bay, USNM 260909, 74.0 mm SL; Cebu, SU 28531, 125.0 mm SL; Negros, CAS 52746, 107.0 mm SL; East of Bais, USNM 280050, 104.0 mm SL; Busuanga, FMNH uncat., 90.0 mm SL; Mindoro, SU 29627, 2 ex., 107.0 mm SL.



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## LITERATURE CITED

- Allen, G. R., R. Steene & M. Allen, 1998. *A Guide to Angelfishes & Butterflyfishes*. Odyssey Publishing, Australia. 250 pp.
- Allen, G. R. & R. Steene, 2004. *Chaetodontoplus vanderloosi*, a new species of angelfish (Pomacanthidae) from Papua New Guinea. *aqua, Journal of Ichthyology and Aquatic Biology*, **8** (1): 23–30.
- Bellwood, D. R., L. van Herwerden, & N. Konow, 2004. Evolution and biogeography of marine angelfishes (Pisces: Pomacanthidae). *Molecular Phylogenetics and Evolution*, **33**: 140–155.
- Bleeker, P., 1876. *Systema Percarum revisum*. Pars II. *Archives Néerlandais de Sciences Naturelles*, Haarlem, **11**: 289–340.
- Bleeker, P., 1877–1878. *Atlas Ichthyologique des Indes Orientales Néerlandaises*. Vol. 9. Frédéric Muller et C°, Amsterdam. 80 pp., pls. 355–420.
- Bloch, M. E., 1787. *Naturgeschichte der ausländischen Fische*, vol. 3. J. Morino & Comp., Berlin. x + 146 pp., 15 pls.
- Borodin, N. A., 1930. Scientific results of the yacht "Ara" Expedition during the years 1926 to 1930, while in command of William K. Vanderbilt. *Bulletin of the Vanderbilt Marine Museum*, **1** (2): 39–64.
- Chan, W. L., 1969. Two new pomacanthid angelfishes from the Macclesfield Bank, South China Sea. *Annals and Magazine of Natural History*, ser. 13, **8**: 325–334.
- Cuvier, G. & Valenciennes, A., 1831. *Histoire Naturelle des Poissons*, vol. 7. F. G. Levrault, Strasbourg. xxix + 531 pp., 38 pls.
- Debelius, H., H. Tanaka & R. H. Kuiter, 2003. *Angelfishes. A Comprehensive Guide to Pomacanthidae*. TMC Publishing, Chorleywood, UK. 208 pp.
- Fessler, J. L., & M. W. Westneat, 2007. Molecular phylogenetics of the butterflyfishes (Chaetodontidae): Taxonomy and biogeography of a global coral reef fish family. *Molecular Phylogenetics and Evolution*, **45**: 50–68.
- Fowler, H. W. & B. A., Bean, 1929. The fishes of the series Capriformes, Ehippiformes, and Squamipennes, collected by the United States Bureau of Fisheries Steamer "Albatross," chiefly in Philippine seas and adjacent waters. *Bulletin of the United States National Museum*, 100, vol. 8: xi + 352 pp.
- Fraser-Brunner, A., 1933. A revision of the chaetodont fishes of the subfamily Pomacanthinae. *Proceedings of the Zoological Society of London*, **103** (3): 36–599.
- Gray, J. E., 1854. *Catalogue of fish collected and described by Laurence Theodore Gronow, now in the British Museum*. British Museum, London. vii + 196 pp.
- Günther, A., 1860. *Catalogue of the Acanthopterygian Fishes in the Collection of the British Museum*. British Museum, London. xxi + 548 pp.
- Halstead, B., 2000. *Coral Sea Reef Guide*. Sea Challengers, Danville, California. 321 pp.
- Herre, A. W. & H. R. Montalban, 1927. The Philippine butterflyfishes and their allies. *The Philippine Journal of Science*, **34** (1): 1–113, pls. 1–24.
- Kuiter, R. H., 1990. A new species of angelfish (Pomacanthidae), *Chaetodontoplus meredithi* from eastern Australia. *Revue française d'Aquariologie Herpetologie*, **16**(4)[1989]: 113–116.
- Kuiter, R. H., 1992. *Tropical Reef-Fishes of the Western Pacific Indonesia and Adjacent Waters*. Penerbit Pt Gramedia Pustaka Utama, Jakarta. xiii + 314 pp.
- Lacepède, B. G. E., 1802. *Histoire Naturelle des Poissons*, vol. 4: xlv + 728 pp, Chez Plassan, Paris.
- Masuda, H., Araga, C. & Yoshino, T., 1975. *Coastal Fishes of Japan*. Tokai University Press, Tokyo. 381 pp. + 142 pls.
- Masuda, H. & Kobayashi, Y., 1994. *Grand Atlas of Life Fish Modes*. Tokai University Press, Tokyo. 465 pp. In Japanese.
- Mundy, B. C., 2005. Checklist of the fishes of the Hawaiian Archipelago. *Bishop Museum Bulletin in Zoology*, **6**: 704 pp.
- Munro, I. S. R., 1967. *The Fishes of New Guinea*. Department of Agriculture, Stock and Fisheries, Port Moresby. xxxvii + 651 pp., 78 pls.
- Okamura, O. & K. Amaoka, 1997. *Fishes of Japan*. Yama-Kei Publishers, Co., Tokyo. 783 pp. In Japanese.
- Pyle, R. L., 2003. *A Systematic Treatment of the Reef-Fish Family Pomacanthidae (Pisces: Perciformes)*. PhD thesis, University of Hawaii, Honolulu. xvi + 419 pp.
- Pyle, R. L. & Randall, J. E., 1994. A review of hybridization in marine angelfishes (Perciformes: Pomacanthidae). *Environmental Biology of Fishes*, **41**: 127–145.
- Randall, J. E., 1998. Zoogeography of shore fishes of the Indo-Pacific region. *Zoological Studies*, **37** (4): 227–269, 21 pls.
- Rocha, L. A., 2004. Mitochondrial DNA and color pattern variation in three western Atlantic *Halichoeres* (Labridae), with the revalidation of two species. *Copeia*, **2004** (4s): 770–782.
- Rocha, L. A., K. C. Lindeman, C. R. Rocha & H. A. Lessios, 2008. Historical biogeography and speciation in the reef fish genus *Haemulon* (Teleostei: Haemulidae). *Molecular Phylogenetics and Evolution*, **48**: 918–928.
- Shen, S.-C. & P.-C. Lim, 1975. An additional study on chaetodont fishes (Chaetodontidae) with description of two new species.

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- Bulletin of the Institute of Zoology Academia Sinica* (Taipei), **14** (2): 79–105.
- Tominaga, Y. & F. Yasuda, 1975. Revision of the genus *Chaetodontoplus* (Pomacanthidae) of the world. *Records of the Proceedings of the Thirteenth Pacific Science Congress*, Vancouver, vol. 1: 82–83 (abstract).
- Whitley, G. P., 1959. More ichthyological snippets. *Proceedings of the Royal Zoological Society of New South Wales*, **1957-58**: 11–26.
- Yasuda, F. & Y. Tominaga, 1976. A new pomacanthid fish, *Chaetodontoplus caeruleopunctatus*, from the Philippines. *Japanese Journal of Ichthyology* **23** (3): 130–132.