

Journal of the Ocean Science Foundation

2013, Volume 7



Seven new species of labrid fishes (*Coris*, *Iniistius*, *Macropharyngodon*, *Novaculops*, and *Pteragogus*) from the Western Indian Ocean

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Abstract

The following labrid fishes are described as new species from the Western Indian Ocean: *Coris latifasciata* from the Chagos Archipelago and Maldive Islands, most recently identified as *C. batuensis* Bleeker, is distinguished from this species by much smaller maximum size, fewer lateral-line scales, more gill rakers, and in color; *Iniistius brevipinnis* from Eastern Cape, South Africa, unusually colorful for a razorfish, is distinguished mainly by color from *I. griffithsi* Randall (type locality Mauritius); *Novaculops alvheimi* from St. Brandon's Shoals, very similar in color to *N. pastellus* Randall & Earle from Lord Howe Island, differs in having a more slender body, lower dorsal fin, and one fewer pectoral rays; the Red Sea subspecies *Macropharyngodon bipartitus marisrubri* Randall is elevated to an endemic Red Sea species, distinct from *M. bipartitus* of the Indian Ocean in having a deeper body, progressively longer dorsal spines, and in color of the male. *Pteragogus clarkae* and *P. trispilus* from the Red Sea, and *P. variabilis* from Mauritius, St. Brandon's Shoals, and Aldabra, all three previously identified as *P. pelycus* Randall, are distinguished by smaller size, straight instead of concave dorsal profile of the head, nearly flat interorbital, and color. A key is provided for the seven Western Indian Ocean species of *Pteragogus*. Underwater photographs are included that appear to represent five undescribed species from the region for which specimens are not available, two in the genus *Iniistius* and three in the genus *Pteragogus*.

Key words: Western Indian Ocean, Red Sea, Labridae, new species, wrasses, coral reef fishes.

Introduction

Seven new species of labrid fishes, popularly known as wrasses, have been discovered during the study of fishes of the family Labridae for the multiple-author, multi-volume publication of the South African Institute for Aquatic Biodiversity on all the coastal fishes of the Western Indian Ocean (west of the longitude of the southern tip of India, including the Red Sea and Persian Gulf). Descriptions of these species are provided in the present paper. The forthcoming review of the family for the western Indian Ocean region includes a key to the 42 genera and a key to the species of each genus. The total number of labrid species for the region, including those described herein, is 145, second only to the Gobiidae.

Materials and Methods

Specimens have been examined from the following institutions: Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM); California Academy of Sciences, San Francisco (CAS); Hebrew University of Jerusalem (HUJ); Royal Ontario Museum, Toronto (ROM); South African Institute for Aquatic Biodiversity, Grahamstown (SAIAB); Senckenberg Museum, Frankfurt (SMF); and the United States National Museum of

Natural History, Washington, D.C. (USNM). A photograph of a type specimen of *Novaculops pastellus* from the Australian Museum is illustrated for comparison with a species described herein. Five underwater photographs are included of fishes from the Western Indian Ocean that appear to represent undescribed species for which specimens are not available, two in the genus *Iniistius* and three in the genus *Pteragogus*.

The length of specimens is given as standard length (SL), measured from the median anterior end of the upper lip to the base of the caudal fin (posterior end of the hypural plate); body depth is the greatest depth from the base of the dorsal spines to the ventral edge of the abdomen (correcting for any malformation of preservation); body width is measured just posterior to the gill opening; head length from the front of the upper lip or anterior upper teeth (whichever is most anterior) to the posterior end of the opercular flap; orbit diameter is the greatest fleshy diameter, and interorbital width the least bony width; suborbital depth is taken from the fleshy edge of the orbit to the nearest edge of the snout above the upper lip; snout length is measured from the median anterior point of the upper lip to the nearest fleshy edge of the orbit; upper-jaw length from the same anterior point to the posterior end of the maxilla; 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 spines and rays are measured to their extreme bases; caudal-fin and pectoral-fin lengths are the length of the longest ray; pelvic-fin length is measured from the base of the pelvic spine to the tip of the longest soft ray. Morphometric data are presented for the new species in Tables 1, 4, and 6–9 as percentages of the standard length. Proportional measurements in the text are rounded to the nearest 0.05. Lateral-line scale counts include the last pored scale that overlaps the end of the hypural plate; scales above and below the lateral line are counted in oblique rows to the origin of the dorsal and anal fins, respectively, not including very small scales that may be present at base of fins; the count of gill rakers is made on the first gill arch and includes rudiments. Counts and measurements for paratypes are shown in parentheses following data for the holotype.

***Coris latifasciata*, n. sp.**

Figures 1–3; Tables 1–3.

Coris variegata [non Rüppell] Winterbottom *et al.* 1989: 53, fig. 313 (Chagos Archipelago).

Coris batuensis [non Bleeker] Allen & Steene 1987: 87, pl. 87, fig. 7 (Maldive Islands); Randall 1992: 120, 2 figs. (Maldive Islands); Randall & Anderson 1993: 33 (Maldive Islands); Randall 1999: 16 (Maldive Islands).



Figure 1. *Coris latifasciata*, ROM 37498, holotype, 67.5 mm SL, Chagos Archipelago (R. Winterbottom).

Holotype. ROM 37498, 67.5 mm, Chagos Archipelago, Peros Banhos Atoll, Isle Poule/Isle Montparte, 5°24'25"S, 70°45'58"E, patch reef and sand, S face of reef, 20 m, rotenone, R. Winterbottom, Feb. 7, 1979.

Paratypes. SAIAB 187773, 75 mm SL, Maldivé Islands, North Malé Atoll, Baros Island, lagoon, base of coral reef, 28 m, spear, J.E. Randall, March 20, 1975 (formerly BPBM 18897); ROM 93828, 47 mm, same data as holotype; ROM 37496, 38.5 mm, Chagos Archipelago, Peros Banhos Atoll, lagoon, 5°25'34"S, 71°45'58"E, patch reef and sand on slope, 21 m, rotenone, R. Winterbottom, Feb. 12, 1979; ROM 37499, 2: 86.5–93.5 mm, Chagos Archipelago, Peros Banhos Atoll, lagoon, 5°25'20"S, 71°46'12"E, varied coral on slope, 10–20 m, rotenone, R. Winterbottom, March 10, 1979; BPBM 32907, 56 mm, Maldivé Islands, North Malé Atoll, Villingili Island, lagoon, off boatyard, patch reef, 10 m, spear, J.E. Randall, March 16, 1988; BPBM 33063, 68 mm, Maldivé Islands, North Malé Atoll, Huraa Island, W side, base of fringing reef, 20–22 m, rotenone, J.E. Randall, R.C. Anderson, M.S. Adam, and H. Shareef, March 24, 1988.

Diagnosis. Dorsal rays IX,11; anal rays III,11; pectoral rays 14 (rarely 15); lateral-line scales 50–52 (+1); no scales on head; gill rakers 19–22; a single pair of large, strongly projecting, and slightly recurved canine teeth anteriorly in each jaw, the upper pair slightly out-flaring, the lowers fitting between uppers when mouth closed; body depth 3.25–3.55 in SL; caudal fin truncate to slightly rounded; pelvic fins short, 1.4–1.6 in head length; body of adults pale blue to blue-green, the scale centers whitish, especially on abdomen, with six dusky orange bars dorsally on body, much broader than whitish interspaces, and two small bars on nape; broadest bar below fourth to eighth dorsal spines, curving posteriorly in its lower part; head pale green with oblique pink bands; an ocellated black spot between first and second soft rays of dorsal fin; a black spot at upper base of pectoral fin, continuing as a narrowing line across base; juveniles light blue-green with scattered small red spots, larger and more numerous on postorbital head and anterior body; a second smaller ocellus posteriorly in dorsal fin; a blackish stripe on side of snout. Largest specimen, 93.5 mm SL.

Description. Dorsal rays IX,11; anal rays III,11; all soft dorsal and anal rays branched, the last to base; pectoral rays 14 (one of eight with 15), the first rudimentary, the second unbranched; pelvic rays I,5; principal caudal rays 14, the upper and lower unbranched; upper and lower procurent caudal rays 6 or 7 (usually 6); lateral-line scales 51 (50–52) (+1 on caudal-fin base); scales above lateral line to origin of dorsal fin 6; scales below lateral line to origin of anal fin 18 or 19; circumpeduncular scales 33; gill rakers 19–22; branchiostegal rays 6; vertebrae 9 + 16.

Body depth 3.55 (3.25–3.5) in SL; body width 2.5 (2.45–2.7) in body depth; head length 3.05 (3.0–3.05) in SL; dorsal profile of head nearly straight on snout, forming angle of about 45° to horizontal axis of body, and slightly convex on nape; snout pointed, its length 2.9 (2.7–3.05) in head length; orbit diameter 4.4 (3.8–5.1) in head length; interorbital space convex, the least width 4.8 (4.7–5.1) in head length; caudal-peduncle depth 2.05 (1.95–2.05) in head length; caudal-peduncle length 2.75 (2.85–3.0) in head length.

Mouth terminal, slightly oblique, the maxilla reaching a vertical through posterior nostril; a pair of large, strongly projecting, and slightly recurved canine teeth anteriorly in each jaw, the upper pair slightly out-flaring, the lowers fitting between uppers when mouth closed; a small nodular tooth behind each canine; side of upper jaw with a row of 8–10 stout, close-set, progressively smaller, conical teeth, the first nearly half length of anterior canines, the first few with slightly recurved tips; lower jaw with 10–12 similar teeth, but slightly smaller and without recurved tips; a large pointed canine tooth posteriorly in upper jaw, angling forward and slightly laterally; upper pharyngeal plate diamond-shaped, the long axis lateral, with five bluntly conical teeth anteriorly on each side, four well-developed molars in middle with four or five lesser molariform to bluntly conical extending laterally from each molar, and a row of much smaller bluntly conical teeth along posterior margin; lower pharyngeal plate with a slender anterior ramus bearing a stout conical tooth at the front, followed by approximate pairs of progressively blunter teeth to an irregular row of four small near-molars at the front of the broad laterally expanded posterior triangular part of the plate, with three progressively broader lateral rows of molars, the third row dominated by a very large central molar, flanked by progressively smaller and less molariform teeth. Tongue small, bluntly triangular, set far back in buccal cavity. Gill rakers short, the longest at angle about one-third length of longest gill filaments.

Ventral edge of preopercle free to a vertical slightly anterior to front of orbit; vertical free margin of preopercle ending a half pupil diameter below ventral edge of orbit. Anterior nostril a slender pointed tubule in line with up-

TABLE 1

Proportional measurements of type specimens of *Coris latifasciata* as percentages of the standard length

	ROM 37498	BPBM 32907	BPBM 33063	BPBM 18897	ROM 37499	ROM 37499
Standard length (mm)	67.5	56	68	75	86.5	93.5
Body depth	28.2	28.8	29.0	29.5	30.9	28.6
Body width	11.9	11.0	11.5	11.4	12.3	10.7
Head length	32.7	33.2	33.4	32.6	32.4	32.5
Snout length	11.2	10.9	11.0	11.3	11.5	12.0
Orbit diameter	7.4	8.8	7.2	6.9	6.7	6.4
Interorbital width	6.8	6.5	6.6	6.8	6.9	6.9
Caudal-peduncle depth	15.8	16.2	15.7	16.7	15.7	15.7
Caudal-peduncle length	11.9	11.7	11.5	10.8	10.8	10.7
Predorsal length	32.8	32.6	32.0	32.4	32.1	32.4
Preanal length	55.8	56.0	56.7	55.1	55.4	55.2
Prepelvic length	31.7	33.1	32.8	32.0	32.6	32.5
Base of dorsal fin	59.0	58.4	58.8	58.7	59.8	59.7
First dorsal spine	8.4	9.1	8.8	8.7	8.3	8.5
Ninth dorsal spine	aberrant	14.3	13.4	14.2	14.3	14.5
Longest dorsal ray	16.0	15.7	15.9	16.6	15.5	16.0
Base of anal fin	35.8	33.5	33.6	33.4	34.5	35.0
First anal spine	7.1	6.0	aberrant	6.9	5.9	5.5
Second anal spine	7.8	9.5	aberrant	9.1	8.2	7.9
Third anal spine	broken	14.4	aberrant	13.0	11.2	11.1
Longest anal ray	16.5	19.6	18.4	18.2	15.8	15.4
Caudal-fin length	25.3	25.5	25.6	25.1	24.3	24.4
Pectoral-fin length	23.2	broken	22.4	19.2	23.0	21.8
Pelvic-spine length	16.3	14.5	16.2	14.7	14.0	13.9
Pelvic-fin length	23.2	21.2	22.9	22.3	20.9	20.2

per margin of orbit, a pupil diameter anterior to front of orbit; posterior nostril a small aperture nearly a half pupil diameter directly posterior to anterior nostril, covered by a membranous flap except for a transverse slit.

Orbital pores from above orbit around posterior margin to below anterior margin 22 (counting paired ventral pores as one); 11 pores along margin of preopercle, leading to 3 on mandible.

Scales thin and cycloid; largest scales on chest less than half size of smallest scales on body; no scales on head; small scales dorsally on nape extending forward to a vertical at upper end of free margin of preopercle; no scales on base of dorsal and anal fins; small scales basally on caudal fin extending one-third distance to posterior margin of fin. Lateral line approximately paralleling dorsal contour of body to below base of ninth dorsal soft ray, then angling downward to midlateral peduncular portion. Most scales on about anterior half of lateral line with two pores, one at end of tubule across middle of scale, and one at the end of a branch that angles dorsally; remain-

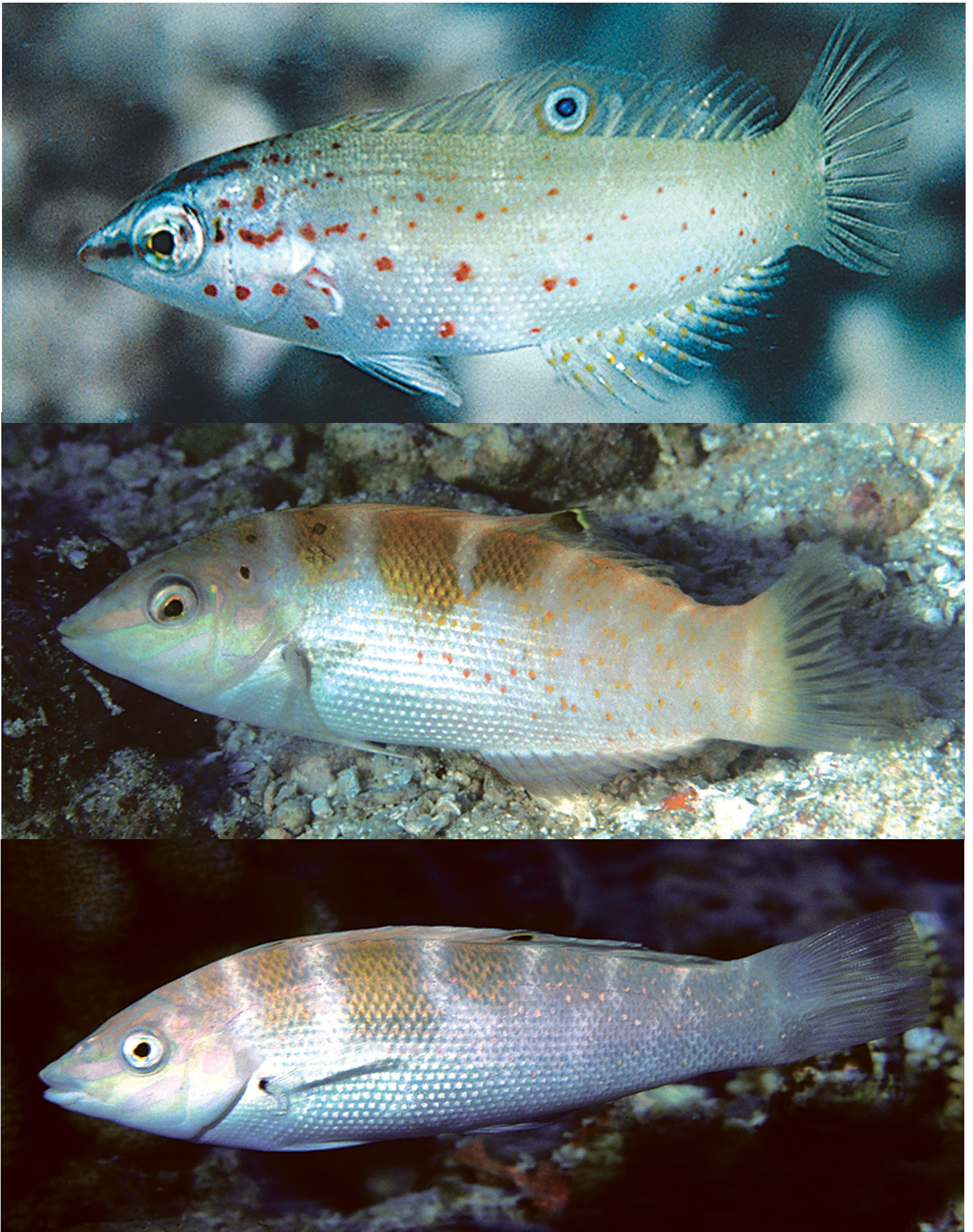


Figure 2. *Coris latifasciata*, Maldives Islands (J.E. Randall), top: juvenile; middle: female; bottom: male.



Figure 3. *Coris latifasciata*, ROM 37496, paratype, 38.5 mm SL, Chagos Archipelago (R. Winterbottom)

ing scales with one pore, most from the end of a slightly upturned tubule; pore of scales on caudal peduncle at end of straight midlateral tubule.

Origin of dorsal fin in line with base of pectoral fin, the predorsal length 3.05 (3.0–3.1) in SL; a filament extending from behind tip of each dorsal spine its length about equal to distance between base of spines; dorsal spines progressively longer, the first 3.9 (3.65–3.8) in head length; ninth dorsal spine aberrant in holotype (2.25–2.5) in head length; dorsal soft rays nearly equal in length, 2.05 (1.95–2.1) in head length; origin of anal fin below base of first dorsal soft ray, the preanal length 1.8 (1.75–1.8) in SL; first anal spine slender and flexible, 4.6 (4.75–7.9) in head length; second anal spine 4.2 (3.5–4.1) in head length; third anal spine (2.3–2.9) in head length; first six anal soft rays subequal 2.0 (1.7–2.1) in head length; caudal fin slightly rounded to truncate, 1.3 (1.3–1.5) in head length; first pectoral ray rudimentary, second and third rays longest, 1.4 (1.5–1.7) in head length; pelvic-spine length 2.0 (2.05–2.3) in head length; pelvic fins of adults nearly or just reaching anus, 1.4 (1.45–1.55) in head length.

Color of holotype in alcohol pale beige, grading to pale lavender-gray on abdomen, with five faint brown bars dorsally on body below dorsal fin the second and third largest and darkest, extending below lateral line and curving posteriorly; a narrow vertical brown bar of about pupil height behind upper half of eye; fins with pale yellow rays and translucent membranes, the dorsal fin with a black spot of about pupil size on first membrane of soft portion; a triangular dark brown spot dorsally on base of pectoral fin, continuing as a faint dark line across base of fin.

Figure 1 provides the fresh color of the holotype (a probable young female). Figure 2 shows underwater photographs from the Maldives of a juvenile and an adult female and male. Color in life of a juvenile when fresh is in Figure 3.

Etymology. This species is named *Coris latifasciata* from the Latin, in reference to the broad dark bars dorsally on the body.

Comparisons. *Coris latifasciata* is one of a complex of three species of the genus that have IX,11 dorsal-fin rays and III,11 anal-fin rays. The other 21 species of the genus have IX,12 dorsal and III,12 anal-fin rays. The first record of the species was published by Allen and Steene (1987) as *Coris variegata* (Rüppell), type locality Red Sea, from an underwater photograph taken in the Maldivian Islands. They were followed by Richard Winterbottom (1989) who collected eight specimens in the Chagos Archipelago, also identified as *C. variegata*. Randall (1992) and Randall and Anderson (1993) identified their specimens from the Maldives as *Coris batuensis* (Bleeker), type locality Batu Island, off the southwest coast of Sumatra.

Randall (1999) continued to identify the Chagos and Maldivian specimens as *C. batuensis* in his revision of the genus *Coris*, and showed this species as wide-ranging in the Pacific from the Ryukyu Islands south to the Great Barrier Reef and New Caledonia, east to the Marshall Islands, Fiji, and Tonga. Allen and Erdmann (2012)

reported it as occurring throughout the East Indian region and illustrated a juvenile from the Andaman Islands and a female from the Philippines with narrow dark bars dorsally on the body.

While examining specimens of *Coris batuensis* for a review of Western Indian Ocean Labridae, the author became aware of the larger size of this species in the Pacific compared to the Chagos and Maldives specimens. BPBM 37932 from Tonga is a male that measures 134 mm SL; BPBM 38000, also from Tonga, includes a male 142 mm SL; and BPBM 19083 from Okinawa contains a male of 145 mm SL. The largest known specimen of *C. latifasciata* measures 93.5 mm SL. The small size at maturity of *C. latifasciata* is another indication of the difference in length from *C. batuensis*. The paratype of BPBM 33063 is a mature female at only 68 mm SL.

Knowing that Richard Winterbottom and colleagues had collected *Coris batuensis* in the Andaman Sea at Phuket, Thailand, a request was made for a loan of their specimens from the Royal Ontario Museum, and two were sent. They are correctly identified as *C. batuensis*. One of ROM 70038 measures 116 mm SL, hence larger than any known specimen of *C. latifasciata*. There is also a difference in the size of the eye of *C. batuensis* and *C. latifasciata*. Seven specimens of *Coris batuensis* from Pacific localities, 66.5–86 mm SL, have an eye diameter 5.75–6.75% SL. The four type specimens of *C. latifasciata* of 67.5–86.5 mm SL have an eye diameter 6.7–7.35% SL. The eye of the 116-mm specimen of *C. batuensis* from Phuket is also small for that length, 5.1% SL. Two meristic characters were found that slightly separate the two species, the lateral-line scales and gill rakers. These are shown in Tables 2 and 3, respectively. Specimens of *Coris variegata* have 52–54 lateral-line scales and 19–23 gill-rakers like *C. batuensis*, hence essentially the same as *C. latifasciata*.

Color differences of this complex of three species of *Coris* are best demonstrated by viewing color photographs. Compare Figs. 1–3 of *C. latifasciata* with Fig. 4 of *C. batuensis* and Fig. 5 of *C. variegata*.

Material of *Coris batuensis* examined. Tonga, Tongatapu, BPBM 37932, 134 mm; BPBM 38000, 2: 89–142 mm. Marshall Islands, Enewetak Atoll, BPBM 6267, 77 mm ; BPBM 6278, 85 mm; BPBM 7326, 78 mm; BPBM 29003, 2: 31–47 mm. Palau, BPBM 9907, 3: 50–59 mm. Philippines, Cebu, BPBM 18452, 113 mm. Japan, Okinawa, BPBM 19083, 2: 114–145 mm.

Material of *Coris variegata* examined. Red Sea, Gulf of Aqaba, BPBM 13859, 123 mm; BPBM 18183, 125 mm. Yemen, Parkin Rock, BPBM 35719, 4: 71.5–88 mm.

TABLE 2

Lateral-line scale counts for specimens of *Coris*

	50	51	52	53	54	55
<i>C. batuensis</i>			8	10	7	1
<i>C. latifasciata</i>	1	5	2			
<i>C. variegata</i>			2	2	2	

TABLE 3

Gill-raker counts for specimens of *Coris*

	17	18	19	20	21	22	23
<i>C. batuensis</i>	2	8	12	4			
<i>C. latifasciata</i>			1	1	3	3	
<i>C. variegata</i>			1	1	2	1	1

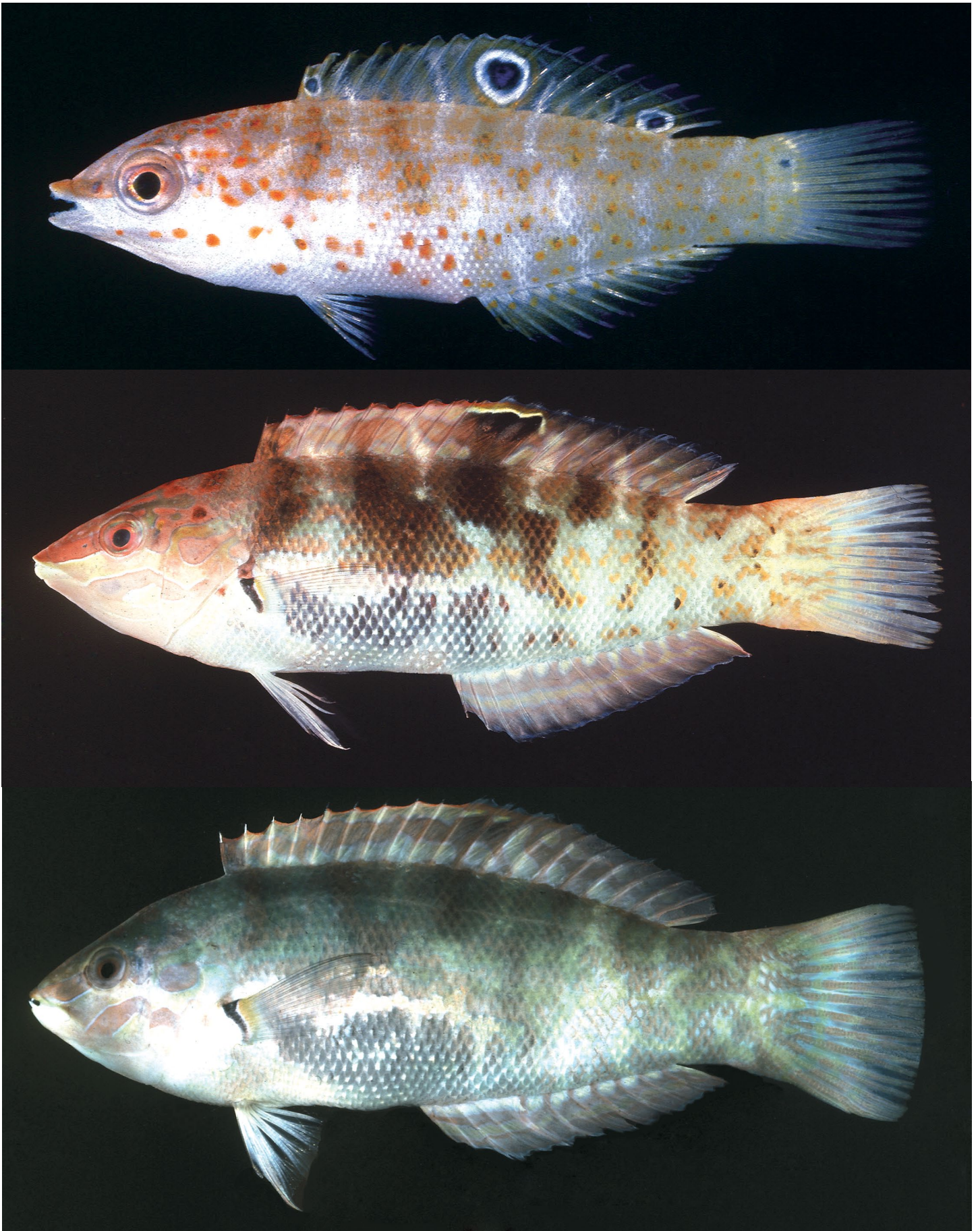


Figure 4. *Coris batuensis* top: BPBM 29003, juvenile, 31 mm SL, Marshall Islands; middle: BPBM 6268, female, 87 mm SL, Marshall Islands; bottom: BPBM 18452, male, 113 mm SL, Cebu, Philippines (all J.E. Randall).



Figure 5. *Coris variegata*, Red Sea (J.E. Randall), top: juvenile; middle: female; bottom: male.

Iniiustus brevipinnis, n. sp.

Figure 6; Table 4.

Holotype. SAIAB 87705, 142.5 mm SL, South Africa, Eastern Cape, off Port Edward 31°06.463'S, 30°14.657'E, 46 m, hook and line, Dirk Liebenberg, Nov. 17, 2009.

Diagnosis. Dorsal rays IX,12; anal rays III,12; pectoral rays 12; lateral line interrupted, the pored scales 21 + 5; cheek naked except for 3 rows of small scales below eye, the first row of 7 scales that curves to behind lower fourth of eye, the second row straight with 6 scales, and a third row of 3 embedded scales; 2 small scales dorso-anteriorly on opercle, one embedded; no scales basally on dorsal and anal fins; gill rakers 17; body depth 3.3 in SL; body compressed, the width 2.6 in body depth; dentition generic; origin of dorsal fin above posterior edge of orbit; first 2 dorsal spines slender and flexible, the first slightly longer, 3.0 in head length; third dorsal spine 4.8 in head length; space between first two dorsal spines 2.3 in space between second and third dorsal spines; membrane deeply notched between second and third spines; caudal fin slightly rounded and very short, 1.8 in head length; pelvic fins short, not approaching anus, 1.7 in head length; color when fresh greenish gray, the scales below lateral line with a vertically elliptical violet spot, except for a broad bright red area above anal fin and ventral half of caudal peduncle; scales above lateral line with green edges and a faint red spot; anterior edge of head and nape blue; two vertical parallel violet lines from chin across lips and fading half distance to eye; median fins blue with yellow markings; pectoral fins translucent, except for black edges on upper three rays, the base violet, with two broad lavender-pink arcs around base; pelvic fins blue; iris yellow with a broad lavender-pink ring.

Description. Dorsal rays IX,12, all soft rays branched, the last to base; anal rays III,12, all branched, the last to base; pectoral rays 12, the dorsalmost very short and spine-like, the second unbranched; pelvic rays I,5, all soft rays branched; principal caudal rays 12, the dorsalmost unbranched; upper procurrent caudal rays 6; lower procurrent caudal rays 5; lateral-line scales 21 + 5, the last on base of caudal fin; scales above lateral line to origin of dorsal fin 5 (uppermost small); scales above lateral line to middle of spinous portion of dorsal fin 2 (uppermost small); scales below lateral line to origin of anal fin 9 (lower two scales small); circumpeduncular scales 15; median prepelvic scales 5, progressively smaller anteriorly; gill rakers 17; branchiostegal rays 5; vertebrae 25.

Body moderately deep, the depth 3.3 in SL, and very compressed, the width 2.6 in body depth; head length 2.9 in SL; snout length (measured from lower edge of orbit to front of upper lip) 1.8 in head length; dorsal profile of snout forming an angle of about 80° to horizontal axis of body to level of lower edge of eye, then convex to origin of dorsal fin; front of snout narrowing to firm ridge that extends to above eye; front of chin also a ridge, though



Figure 6. *Iniiustus brevipinnis*, SAIAB 87705, holotype, 142.5 mm SL, Eastern Cape, South Africa (Jade Maggs).

TABLE 4

Proportional measurements of holotype of *Iniistius brevipinnis* as percentages of the standard length

SAIAB 87705			
Standard length (mm)	142.5	First dorsal spine	11.3
Body depth	33.0	Second dorsal spine	10.5
Body width	12.6	Third dorsal spine	7.1
Head length	34.1	Ninth dorsal spine	7.5
Snout length	19.0	Longest dorsal ray	11.3
Suborbital depth	14.0	Base of anal fin	38.7
Orbit diameter	6.2	First anal spine	3.5
Interorbital width	5.8	Second anal spine	4.0
Upper-jaw length	9.9	Third anal spine	6.5
Caudal-peduncle depth	13.8	Longest anal ray	11.6
Caudal-peduncle length	9.1	Caudal-fin length	18.2
Predorsal length	10.0	Pectoral-fin length	23.5
Preanal length	53.5	Pelvic-spine length	7.9
Prepelvic length	29.8	Pelvic-fin length	20.1
Base of dorsal fin	70.4		

not as sharp as that of snout; eye set high on head, the suborbital depth 2.45 in head length; orbit diameter 5.5 in head length; interorbital width 5.85 in head length; caudal-peduncle depth 2.45 in head length; caudal-peduncle length 3.75 in head length.

Mouth not large, the maxilla extending to a vertical at anterior nostril, the upper-jaw length 3.45 in head length; mouth very slightly oblique, forming an angle of only about 5° to horizontal axis of body; a pair of large, recurved, outflaring canine teeth at front of jaws that overlap lips when mouth closed, the lower pair medial and fitting between upper canines when mouth closed; upper pair of teeth longer, about one-third eye diameter in length; side of jaws with a close-set series of strong conical teeth, 13 on upper jaw and 12 in lower jaw; a row of very small nodular teeth medial to outer row of teeth in jaws. Tongue rounded, set far back in mouth. Lips thin, the lower with a well-developed flap along side of mandible. Gill rakers short, the longest at angle on first arch about one-third length of longest gill filaments. Free posterior margin of preopercle broadly rounded, the straight distance between ends one-half head length; a narrow fleshy flap covering dorsoposterior half of orbit and a comparable one ventrally. Nostrils very small, close together a half orbit diameter before lower fourth of eye. Cephalic sensory pores tiny and difficult to detect.

Scales cycloid and very thin; lateral-line scales with a single horizontal tubule, ending posteriorly in a pore; scales on chest about half height of largest scales on side of body; head naked except for one or two small scales dorsally on opercle and a curved series of six scales, progressively smaller ventrally from behind lower part of eye to below posterior edge of pupil; no scales on dorsal and anal fins; three vertical rows of scales basally on caudal fin progressively smaller posteriorly; no pelvic axillary scale; a single scale extending posteriorly from between base of pelvic fins, equal in size to first prepelvic scale.

Origin of dorsal fin above posterior edge of orbit, the predorsal length 3.4 in SL; first two dorsal spines slender and flexible, the remaining spines sharp-pointed and stiff; space between second and third dorsal spines exactly twice space between first two spines; membrane deeply notched between second and third spines; first dorsal spine longest, slightly longer than second, 3.0 in head length; third dorsal spine 4.8 in head length; remaining dorsal spines progressively slightly longer, the ninth 4.55 in head length; penultimate dorsal ray longest, 1.7 in head length (last ray nearly as long); preanal length 1.85 in SL; third anal spine longest, 5.25 in head length; penultimate anal soft ray longest, 2.9 in head length; caudal fin very slightly rounded when rays spread, 5.5 in SL;

second and third pectoral rays longest, reaching to above origin of anal fin, 4.25 in SL; pelvic fins nearly or just reaching anus, the filamentous first soft ray longest, 5.0 in SL; pelvic spine 2.25 in head length.

Color in alcohol beige, the fins pale yellowish, except second to fourth rays of pectoral fins with black edges (first ray very short and spinous). Color when freshly caught described above in Diagnosis and shown in Fig. 6.

Etymology. This species is named *Iniistius brevipinnis* in reference to its fins being shorter, in general, than those of congeners.

Comparisons. *Iniistius griffithsi* Randall, type locality Mauritius, is the species of razorfish that appears most closely related to *I. brevipinnis*, despite being very different in color. Both species are deep-bodied, with the origin of the dorsal fin over the posterior edge of the orbit, similar pattern of small scales on the cheek, and short fins. *Iniistius griffithsi* differs in having a more evenly convex dorsal profile of the head, a shorter suborbital, larger mouth, and its fifth and sixth dorsal and anal rays longest, 2.5–2.6 in head length, compared to *I. brevipinnis* with penultimate rays longest, 3.0 in head length.

Unidentified Species of *Iniistius*

Figure 7 (upper) was taken by Dr. R. Charles Anderson in the Chagos Archipelago.

Figure 7 (lower) was taken by Jean Louis Rose at Naama Bay, Sharm el Sheikh, Egypt.

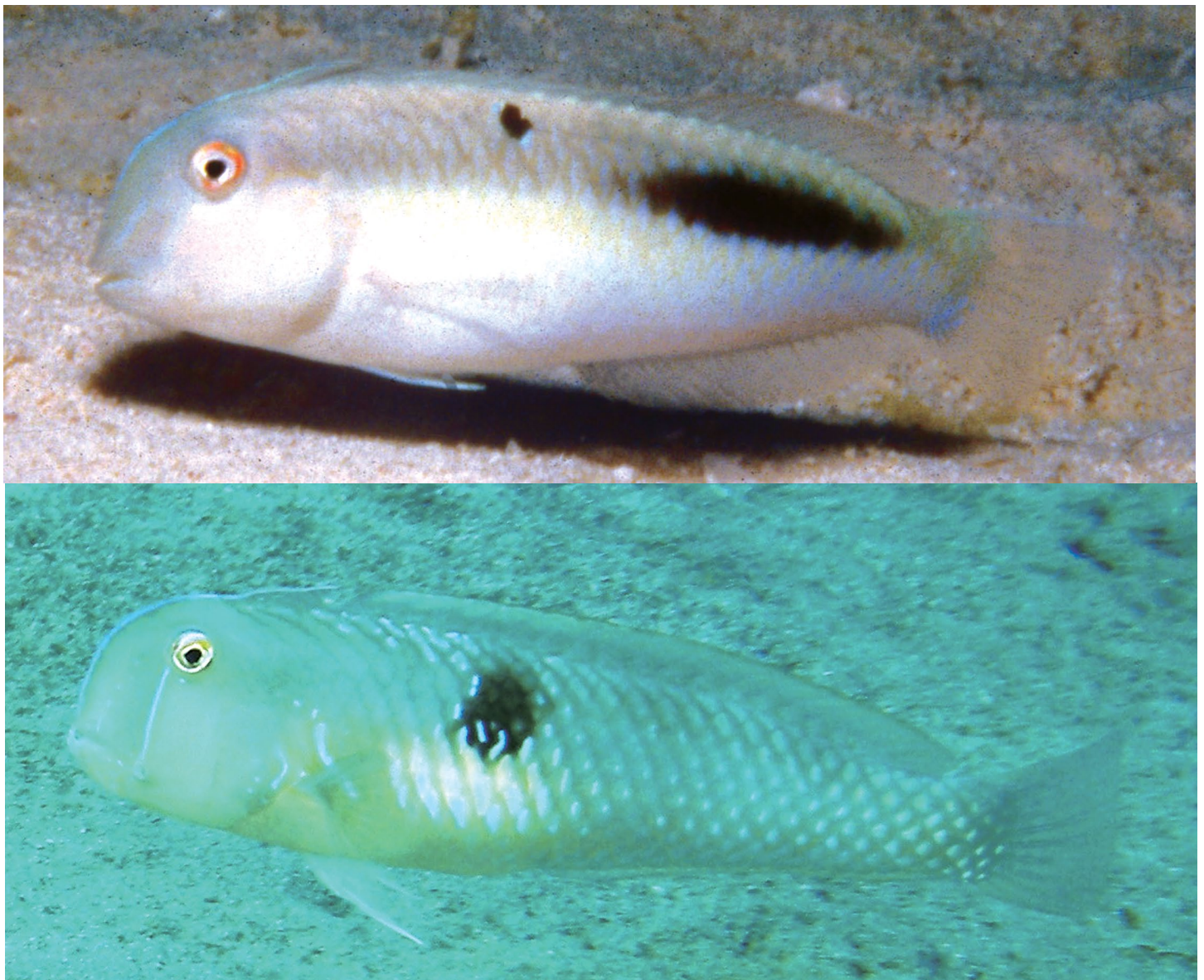


Figure 7. *Iniistius* sp. (above), Chagos Archipelago (R.C. Anderson); *Iniistius* sp. (below), northern Red Sea (J.L. Rose).

Macropharyngodon marisrubri Randall 1978

Figures 8, 10–12 (lower), 14; Table 5.

Macropharyngodon bipartitus Dor 1970: 21 (Eilat).

Macropharyngodon bipartitus marisrubri Randall 1978: 759, fig. 5 A,B (Taba, Gulf of Aqaba); Dor 1984: 205 (Red Sea); Gomon in Fischer & Bianchi 1984: 10; Goren & Dor 1994: 54 (Red Sea); Field & Field 1998: 150, middle figs. (Red Sea); Lieske & Myers 2004: 162, lower figs. (Red Sea).

Holotype. BPBM 13404, 81.3 mm, male, Red Sea, Gulf of Aqaba, Egypt, Taba, reef in 12 m, dipnet, D. Fridman, June 14, 1972.

Paratypes. 8 lots at BPBM, CAS, HUIJ, and USNM, as listed by Randall (1978).

Diagnosis. Dorsal rays IX,11; anal rays III,11; pectoral rays 12 (including upper rudimentary ray) lateral line complete, angling downward below last three or four dorsal rays to straight peduncular portion, the pored scales 27 (plus one on base of caudal fin); anterior lateral-line scales with 2 or 3 (rarely 4) pores; gill rakers 14–17; body depth 2.6–2.9 in SL; head length 2.95–3.05 in SL; snout short, 3.3–3.7 in head length; upper jaw with two pairs of canine teeth, the first pair straight and strongly projecting anteriorly, the second pair about two-thirds as long, the tips recurved and outflaring; lower jaw with a medial pair of long, straight, forward-jutting, canine teeth, each with an adjacent more slender canine about two-thirds as long, with recurved tip; side of jaws with a single row of close-set conical teeth, progressively shorter posteriorly; a very large, slender, forward-projecting, canine tooth posteriorly on upper jaw; lower pharyngeal plate with an enormous central molariform tooth, flanked on each side anteriorly with a row of small conical teeth, continuing as a single row on the long anterior process; each of the pair of upper pharyngeal plates with two large, nearly square molars, preceded by a patch of small stout conical teeth; orbit diameter 4.25–4.95 in head length; origin of dorsal fin slightly anterior to a vertical at upper end of gill opening; first dorsal spine 4.25–5.25 in head length; remaining spines progressively longer, the ninth 3.1–3.25 in head length; fifth or sixth dorsal soft ray longest, 1.9–2.2 in head length; third anal spine longest, 2.45–3.55 in head length; fifth or sixth anal soft ray longest, 1.95–2.2 in head length; caudal fin slightly rounded, 1.2–1.3 in head length; pectoral fins 1.4–1.5 in head length; pelvic fins 1.35–1.8 in head length, usually reaching

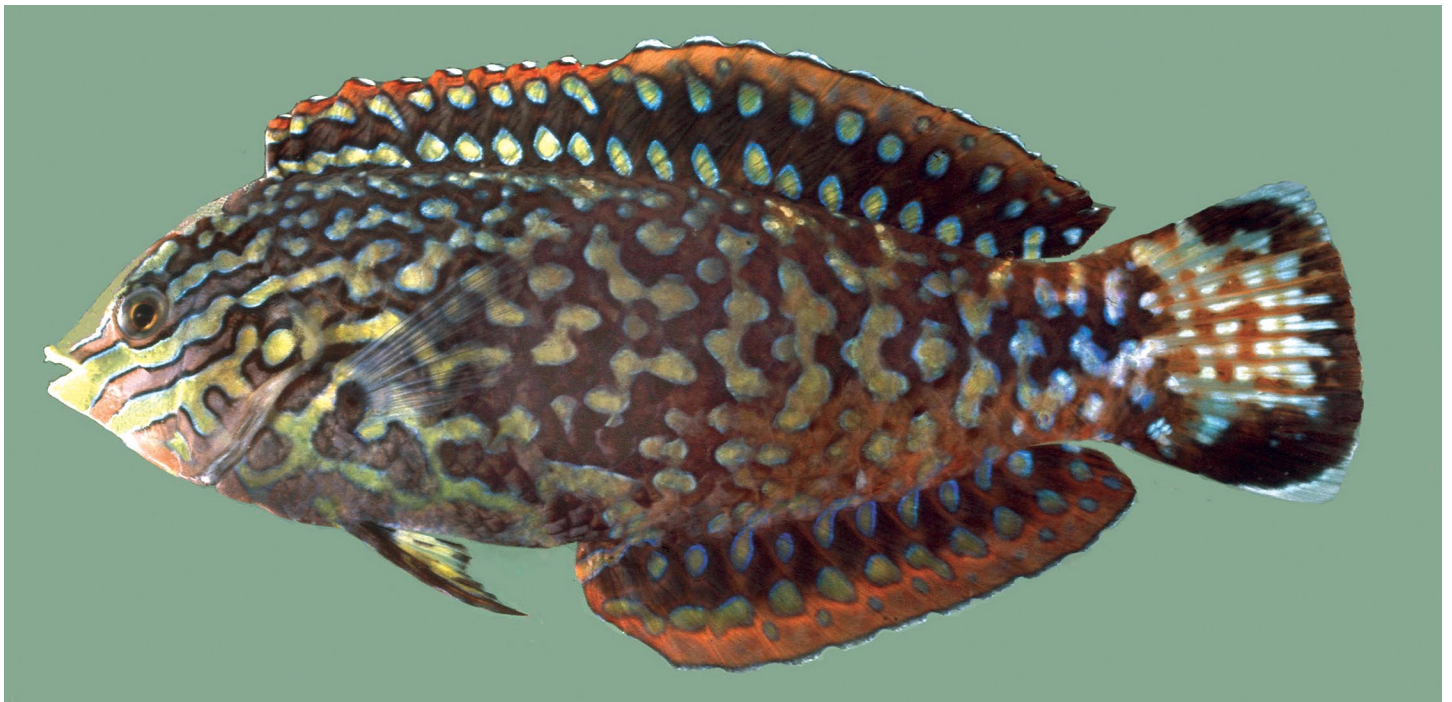


Figure 8. *Macropharyngodon marisrubri*, BPBM 13404, holotype, male, 81 mm, Gulf of Aqaba (J.E. Randall).

TABLE 5

Gill-raker counts for specimens of *Macropharyngodon*

	14	15	16	17	18	19
<i>M. bipartitus</i>		1	6	7	5	2
<i>M. marisrubri</i>	2	5	4	1		

to or slightly posterior to origin of anal fin in mature males, usually not reaching anus in females. Color pattern complex, as illustrated.

Description. As given for the Red Sea subspecies by Randall (1978), here elevated to a species.

Remarks. Smith (1957: 104–105, figs. 2, 3) described two new species of labrid fishes of the genus *Macropharyngodon* from Pinda, Mozambique: *M. bipartitus* and *M. variialvus*. In a revision of the genus, Randall (1978) determined that *M. variialvus* and *M. bipartitus* are female and male, respectively, of the same species and selected the former as the senior name. He described the population of *M. bipartitus* in the Red Sea as a subspecies, *M. b. marisrubri*, based on the more spotted color pattern on the body of the male (Fig. 8), compared to the color form in the western Indian Ocean (Fig. 9 from Mauritius). His selection of the specimen of Fig. 8 as the holotype of *M. b. marisrubri* was unfortunate. Although clearly a male from examination of the gonad, it has not attained the definitive male coloration. Too much orange coloration of the female remains, and the pattern is primarily dark-spotted instead of linear. However, it was his only male Red Sea specimen, and he was unaware of the typical more linear pattern of the fully mature male. He reported a range in gill-raker counts of 14–17 for the Red Sea population and 15–19 for the Indian Ocean subspecies (reproduced here as Table 5, with additional counts from specimens from Oman, Seychelles, Mauritius, and Réunion).

Macropharyngodon marisrubri has a deeper body on average than *M. bipartitus*, the depth 2.6–3.0 in SL, compared to 2.9–3.2 for *M. bipartitus*. Another difference is the relative length of the dorsal spines. The spines of *M. marisrubri* are progressively longer, whereas in *M. bipartitus*, the third to sixth spines are almost equal in length, and the seventh only a little longer. This can be seen by comparing spine lengths of Figs. 9, 11 (upper), and 12 (upper) of *M. bipartitus* with Figs. 8, 11 (lower), and 12 (lower) of *M. marisrubri*.

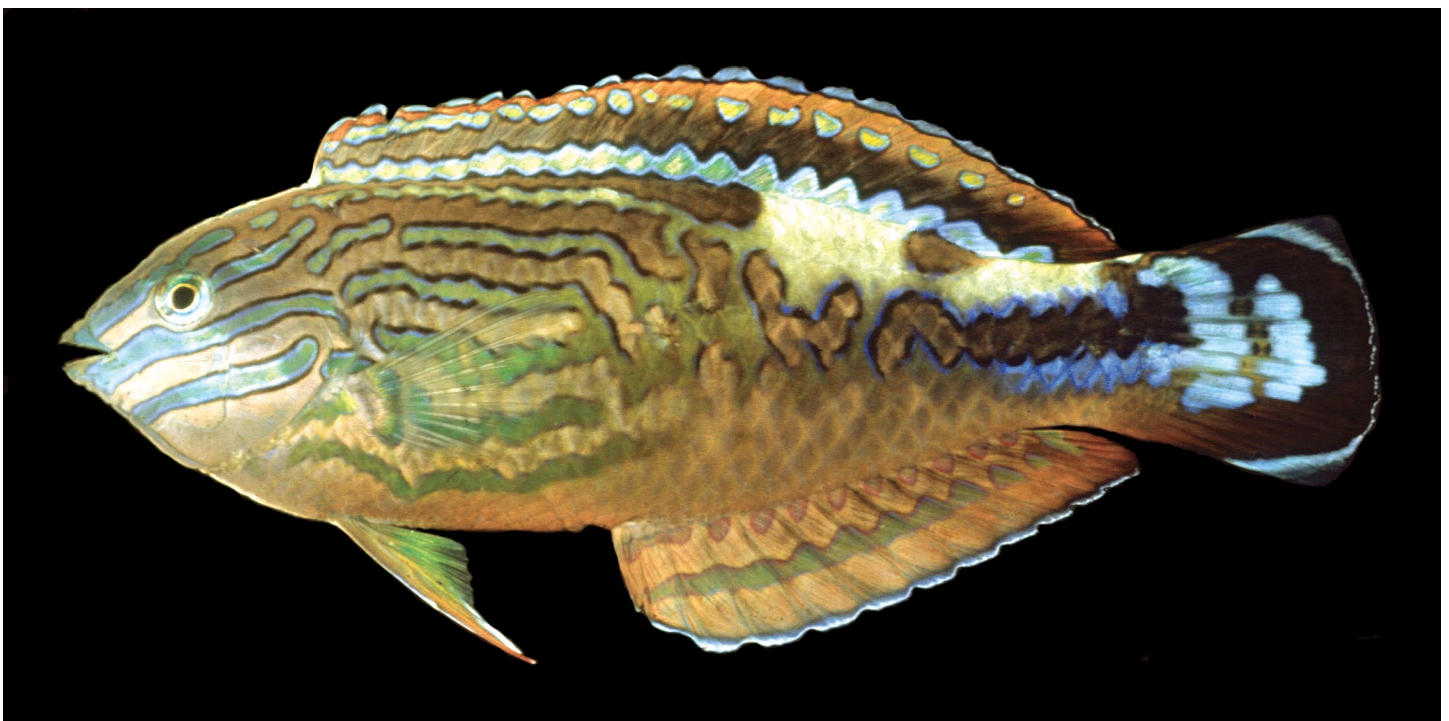


Figure 9. *Macropharyngodon bipartitus*, male, Mauritius (J.E. Randall).

The juveniles and females of the two species are essentially the same in color. Compare the juvenile *M. bipartitus* (Fig. 10 upper) from the Maldives with *M. marisrubri* (Fig. 10 lower) from the Red Sea (from eye size, one can see that the latter fish is larger, and the abdominal coloration of the female form is developing). Comparison of the females is provided in Figs. 11 and 12. The most obvious difference in color of the males of the two species is the presence in *M. bipartitus* of two large pale areas dorsally on the posterior half of the body, the first and largest below the soft portion of the dorsal fin, and the second dorsally on the caudal peduncle (Fig. 13). These pale areas are either absent or much smaller on males of *M. marisrubri* (Fig. 14).

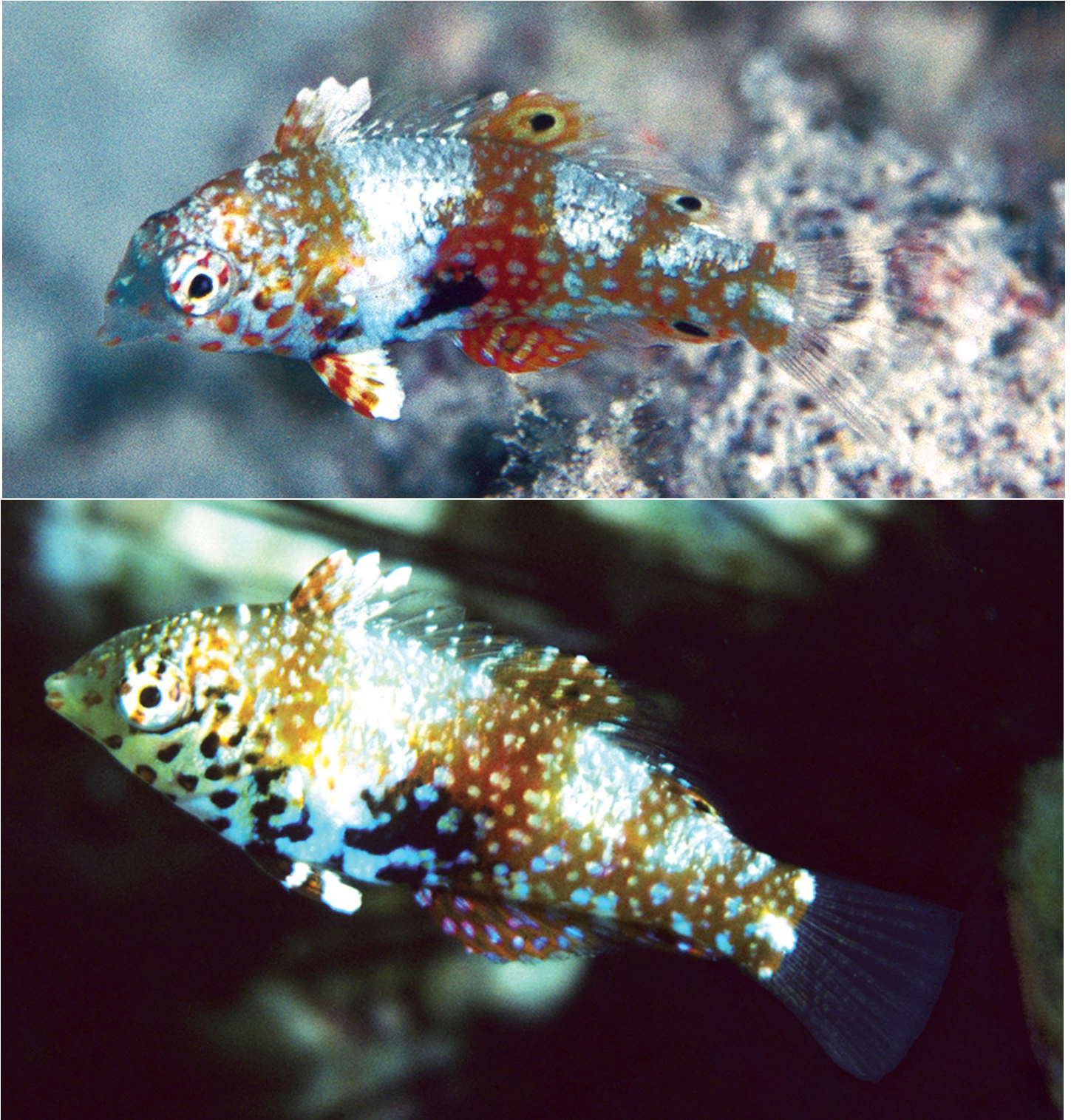


Figure 10. *Macropharyngodon bipartitus* (above), juvenile, Maldives (J.E. Randall); *M. marisrubri* (below), juvenile, Gulf of Aqaba (J.E. Randall).

Distribution. *Macropharyngodon bipartitus* is a western Indian Ocean species known from Zanzibar to Mozambique and Aldabra (Smith 1957); Seychelles (Smith & Smith 1963); Réunion (Harmelin-Vivien 1976, as *Macropharyngodon* sp.); Mauritius and Maldives (Randall 1978); Kwa-Zulu-Natal (Randall in Smith & Heemstra 1986); Chagos Archipelago (Winterbottom *et al.* 1989), southern Oman (Randall 1995), and Rodrigues (Heemstra *et al.* 2004).

Macropharyngodon bipartitus was listed by Zajonz *et al.* (2000) from the Socotra Archipelago, and Kemp (2000) reported it as common in the Gulf of Aden off the Hadramaut and Shabwa provinces of Yemen. Neither Uwe Zajonz nor Jeremy Kemp were able to provide a specimen or photograph to determine if their material was *M. bipartitus* or *M. marisrubri*. However, Zajonz asked Moteah Sheikh Aideed, a student at the Hadhramaut University of Science and Technology at Mukallah studying reef fish populations of Socotra, to try to collect an adult



Figure 11. *Macropharyngodon bipartitus* (above), female, Mauritius (J.E. Randall); *M. marisrubri* (below), BPBM 13387, female, 62 mm, Red Sea (J.E. Randall).

male of *Macropharyngodon* and provide a color photograph. Aideed collected the specimen of Fig. 13 (bottom), clearly a male of *M. bipartitus*, now SMF 34894, 78 mm SL, at Burum, SW of Mukallah, Yemen.

Macropharyngodon marisrubri is presently known only from the Red Sea, with most records from the Gulf of Aqaba (Dor 1984). Richard Field and Luiz A. Rocha (pers. comm.) reported it as common in the vicinity of Jeddah, Saudi Arabia, and Field observed it south to the Farasan Islands.

Five ichthyologists spent 8 days of diving throughout the Gulf of Tadjoura from a vessel out of Djibouti in 2012. They were asked by the author to photograph and collect specimens of *Macropharyngodon*. None was seen (Joseph D. DiBattista, pers. comm.).



Figure 12. *Macropharyngodon bipartitus* (above), BPBM 18885, female, 58 mm, Maldives (J.E. Randall); *M. marisrubri* (below), female, Gulf of Aqaba (J.E. Randall).

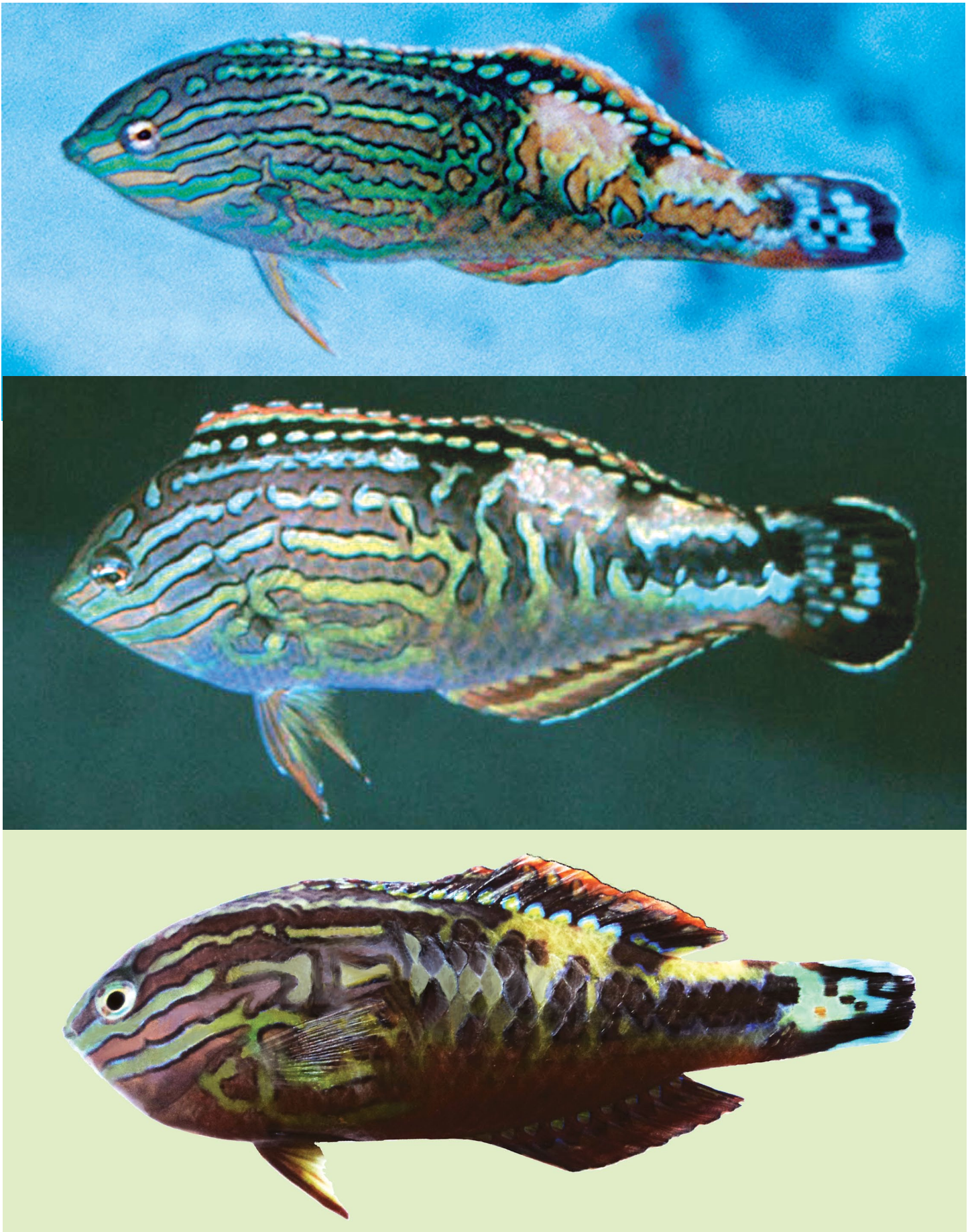


Figure 13. *Macropharyngodon bipartitus* top: male, Maldives (R. Field); middle: male, Mozambique (D. Polack); bottom: SMF 34894, male, 78 mm, Gulf of Aden, SW of Mukallah (M. Sheikh Aideed).

Material of *Macropharyngodon bipartitus* examined. Mauritius, BPBM 16324, 2: 62–69 mm; BPBM 20219, 5: 45–94 mm. Réunion, BPBM 20042, 83 mm. Seychelles, Cocos Island, BPBM 21628, 57 mm. Maldive Islands, North Malé Atoll, BPBM 18885, 2: 58–78 mm; South Malé Atoll, BPBM 32936, 44 mm. Oman, south coast, Sawda Island, BPBM 36037, 70 mm.



Figure 14. *Macropharyngodon marisrubri* (above), male, Gulf of Aqaba (S.V. Bogorodsky); (below), male, Red Sea (J.L. Rose).

Novaculops alvheimi, n. sp.

Figure 15; Table 6.

Holotype. SAIAB 83942, 96 mm, male, southeast of St. Brandon's Shoals (Cargados Carajos), Station Mascarene-4, 17°16'30.6"S, 58°40'28.2"E, 58–59 m, trawl, R/V *Dr. Fridtjof Nansen*, O. Alvheim and D. Tweddle, Oct. 13, 2008.

Paratype. SAIAB 83953, 83 mm, female, southeast of St. Brandon's Shoals (Cargados Carajos), Station Mascarene-3, 17°10'50.4"S, 58°42'13.8"E, 60 m, trawl, R/V *Dr. Fridtjof Nansen*, O. Alvheim and D. Tweddle, Oct. 13, 2008.

Diagnosis. Dorsal rays IX,12, the first spine flexible, remaining spines firm and sharp-tipped; space between first two dorsal spines half space between second and third spines; anal rays III,12; pectoral rays 12; lateral-line scales 20 + 5; no scales on head; no median predorsal scales; scales on side of nape extending to above free dorsal end of preopercular margin; gill rakers 18–21; body depth 3.2 in SL; dorsal profile of snout evenly convex; suborbital depth short, less than eye diameter, 5.3–5.45 in head length; caudal fin slightly rounded and short, 1.35–1.4 in head length; pelvic fins nearly or just reaching anus, 1.4 in head length; color of body in alcohol light yellowish brown; fins pale yellowish; a large black spot in axil of pectoral fins; a blackish spot on each membrane of spinous portion of dorsal fin, darker in male; color of body of male when fresh with a series of indistinct longitudinal bands: orangish brown below base of dorsal fin, blue in a zone along lateral line, the lateral-line pores white (progressively fainter posteriorly), light blue suffused with yellow in a broad zone along midside, and blue and white ventrally; snout and nape orangish gray with an oblique deep orange band behind eye; rest of head yellowish white; iris bright red; spinous dorsal fin blue with a deep blue spot ventrally on each membrane; remaining median and pelvic fins light orange; pectoral fins pale yellow with a bluish black spot in axil. Color of body of female purplish pink with two broad white longitudinal bands on lower side, narrowing posteriorly, and ending before caudal peduncle; ten close-set, oblique, white lines crossing abdomen from pectoral region of lower white band; a broad, oblique, dark purplish red zone from nape to upper operculum; a large black spot in axil of pectoral fins; fins pale yellowish to orangish.

Description. Dorsal rays IX,12; anal rays III,12; all soft dorsal and anal rays branched, the last to base; pectoral rays 12, the first ray rudimentary and spinous, second ray unbranched; remaining rays branched; pelvic rays I,5, all soft rays branched; principal caudal rays 12, all branched; upper and lower procurrent caudal rays 5, the most posterior segmented; lateral line interrupted, pored scales 20 + 5; scales above lateral line to origin of dorsal fin 3; scales below lateral line to origin of anal fin 8; circumpeduncular scales 16; no scales on head; no median predorsal scales; scales on side of nape extending to above dorsal end of free preopercular margin; median pre-pelvic scales 5 (first scale embedded); one median scale between bases of pelvic fins; gill rakers 6 + 12 (7 + 14); branchiostegal rays 5; vertebrae 24.

Body slender for the genus, depth 3.2 in SL, and moderately compressed, width 3.0 (3.25) in body depth; head length 3.1 (3.05) in SL; snout length 2.85 (3.1) in head length; suborbital depth 5.3 (5.45) in head length; dorsal snout profile evenly convex, of male about 55° to horizontal axis of body, of female about 35°; orbit diameter 6.2 (4.55) in head length; interorbital width 6.25 (6.1) in head length; caudal-peduncle depth 2.55 (2.5) in head length.

Mouth not large, the maxilla extending to a vertical at anterior nostril, the upper-jaw length 3.45 in head length; mouth very slightly oblique, forming an angle of only about 5° to horizontal axis of body; a pair of large, recurved outflaring canine teeth anteriorly in upper jaw, nearly half orbit diameter in length; a comparable pair of canines in lower jaw medial to upper pair and less outflaring; side of upper jaw with a close-set series of teeth, the first a small canine, followed in holotype by 12 progressively smaller conical teeth; a staggered row of 18 smaller teeth in a medial row, the anterior teeth conical, soon becoming low and nodular; teeth in lower jaw comparable to those of upper jaw, but slightly smaller, the medial row of nodular teeth ending about half way back in jaw. Tongue broadly rounded, set far back in mouth. Lips thin, the lower with a well-developed flap along side of mandible. Gill rakers near angle moderately long, the longest on first arch about one-half length of longest gill filaments. Free posterior margin of preopercle broadly rounded, extending from level of lower third or orbit to below middle of orbit. Nostrils small, in oblique alignment, separated by diameter of posterior nostril, a pupil diameter

before anterior edge of orbit. Cephalic sensory pores small and difficult to detect, even with staining: seven in suborbital series with three branches radiating to pores on side of snout; six pores along free edge of preopercle leading to three on mandible.

Scales cycloid and very thin; lateral-line scales with a single horizontal tubule, ending posteriorly in a pore; scales on chest about half height of largest scales on body; scales anteriorly on side of nape with only a narrow free posterior edge; no scales on base of dorsal and anal fins; four vertical rows of progressively smaller scales on basal third of caudal fin.

Origin of dorsal fin slightly anterior to a vertical at free upper end of gill opening, the predorsal length 3.85 (3.9) in SL; first dorsal spine slender and flexible, 3.5 in head length; remaining spines stiff and sharp-pointed; space between first two dorsal spines about 3/4 width of space between next pair of spines (and remaining pairs of spines); second dorsal spine 3.7 (3.75) in head length; ninth dorsal spine 3.9 in head length; penultimate dorsal ray slightly the longest, 2.6 (2.65) in head length; origin of anal fin below base of first dorsal soft ray, preanal distance 1.9 (1.85) in SL; third anal spine longest, 3.5 in head length; tenth anal soft ray slightly longest, 2.05 (2.1) in head length; caudal fin slightly rounded, 4.15 (4.25) in SL; third pectoral ray (first branched ray) slightly longest, 4.7 (4.65) in SL; pelvic spine 3.95 (3.8) in head length; filamentous first pelvic soft ray nearly or just reaching anus, 4.3 (4.35) in SL.

Color of holotype in alcohol pale yellowish on head and body, the fins with pale yellow rays and translucent membranes, except the spinous portion of the dorsal fin, of which the first membrane is entirely blackish; second to eighth membranes dusky with a darker brown area ventroposteriorly in each membrane, progressively smaller to last spinous membrane (none on soft portion); a large dark brown spot in axil of pectoral fins. Color of fresh male holotype and female paratype in Fig. 15.



Figure 15. *Novaculops alvheimi* (above) SAIAB 83942, holotype, male, 96 mm, St. Brandon's Shoals (O. Alvheim); (below) SAIAB 83953, paratype, female, 83 mm, St. Brandon's Shoals (O. Alvheim).

Etymology. I am pleased to name this species in honor of Oddgeir B. Alvheim of the Institute of Marine Research in Norway, who recognized the two type specimens from the trawl hauls of the R/V *Dr. Fridtjof Nansen* as a probable new species and took a color photograph of each.

Comparisons. When shown the color photographs of the two specimens of this species (Fig. 15), I first identified them as *Novaculops pastellus*, type locality Lord Howe Island (Fig. 16). However, when the specimens of *N. alvheimi* were examined, it was clear they are more slender (depth 31.3–31.5%, compared to 35.5–38.5% for *N. pastellus*), with a comparable difference in the depth of the caudal peduncle. In addition, the dorsal fin is lower in *N. alvheimi*, the longest dorsal spine 8.3–8.4% SL, compared to 10.4–11.2% for *N. pastellus*. There is also a difference in the number of pectoral rays, 12 for *N. alvheimi* vs. 13 for *N. pastellus*.

Generic Discussion. Jenkins (1901:52–53) described the first two nominal species of the genus *Novaculops* as *Novaculichthys woodi* and *N. entargyreus*, both with the type locality of Honolulu. Jordan and Evermann (1905: 324) correctly placed *N. entargyreus* in the synonymy of *N. woodi*. The third species was described as *Xyrichtys sciistius* Jordan & Thompson (1914), type locality Sagami Bay, Japan; the fourth, *Xyrichtys halsteadii* Randall & Lobel (2003) from Papua New Guinea to Tahiti; the fifth, *X. koteamea* Randall & Allen (2004) from Easter Island (native name Rapanui), and the sixth, *X. pastellus* Randall, Earle & Rocha (2008) from Lord Howe Island.

Schultz in Schultz and collaborators (1960: 143) distinguished four genera in a “Key to the Genera Related to *Xyrichtys*”, the other three being *Hemipteronotus* Lacepède, *Iniistius* Gill, and *Novaculops*, new genus. Randall and Bauchot (1993) recommended that the generic name *Hemipteronotus* Lacepède be suppressed to preserve the names *Naucrates* Rafinesque 1810 and *Xyrichtys* Cuvier 1814 (note that the original spelling of the latter name did not have a second h). This was accepted by Opinion 1799 of the International Commission on Zoological Nomenclature.

Schultz distinguished his new genus *Novaculops* by the following characters: first dorsal spine flexible, spines II to IX sharp-tipped; vertical line through front of eye behind rear corner of mouth, least preorbital distance 2–2.5 in postorbital length of head. Randall *et al.* (2008) did not accept Schultz’s *Novaculops*, treating it as a synonym of *Xyrichtys*. However, *Novaculops* should be regarded as a valid genus. While the species of this genus live over open stretches of sand and dive into the sand with the approach of a predator, they lack the higher level of specialization of the genera *Iniistius* and *Xyrichtys* for this habitat: a steep forehead with a firm knife-like anterior edge, and a highly compressed body. The razorfishes of these two genera can dive more quickly into the sand and are able to move more readily within the sand by undulating movement of the body. This ability is soon frustratingly apparent if one tries to dig a razorfish from the sand.



Figure 16. *Novaculops pastellus*, AMS I.4385-001, holotype, male, 106 mm, Lord Howe Island (G. Kelly).

A comment is appropriate here regarding common names for fishes that shelter by diving into sand. The species of the labrid fish genus *Cymolutes* are called knifefishes; *Gonorynchus greyi* is the Sandfish; the trichonotid fishes are known as sanddivers; the ammodytids are sandlances; the creediid fishes are sandburrowers; the microdesmid fishes of the subfamily Ptereleotrinae are dartfishes; and the monotypic *Ammolabrus dicrus* is the Sand Wrasse. I propose the common name Sandy for the species of the genus *Novaculops*. We would therefore have the Hawaiian Sandy (*N. woodi*), Oriental Sandy (*N. sciistius*), Halstead's Sandy (*N. halsteadi*), Rapanui Sandy (for the Easter Island *N. koteamea*), Lord Howe Sandy (*N. pastellus*), and St. Brandon's Sandy (*N. alvheimi*).

Material of *Novaculops pastellus* examined. Lord Howe Island, AMS I.43850-001, 106 mm (holotype); BPBM 14758, 66.2 mm (paratype); BPBM 35027, 117 mm (paratype).

TABLE 6

Proportional measurements of type specimens of *Novaculops alvheimi* as percentages of the standard length

	SAIAB 83942 holotype	SAIAB 83953 paratype
Standard length (mm)	96	83
Body depth	31.3	31.5
Body width	10.4	9.7
Head length	32.4	32.8
Snout length	11.3	10.6
Suborbital depth	6.1	6.0
Orbit diameter	6.8	7.2
Interorbital width	5.2	5.4
Upper-jaw length	9.9	9.5
Caudal-peduncle depth	12.7	13.0
Caudal-peduncle length	10.4	9.1
Predorsal length	26.0	25.6
Preanal length	53.3	54.8
Prepelvic length	29.8	29.5
Base of dorsal fin	68.5	67.8
First dorsal spine	9.2	9.3
Second dorsal spine	8.7	8.7
Ninth dorsal spine	8.3	8.4
Longest dorsal ray	12.5	12.4
Base of anal fin	38.7	38.3
First anal spine	4.2	4.0
Second anal spine	7.1	7.2
Third anal spine	9.5	9.6
Longest anal ray	15.7	15.7
Caudal-fin length	24.0	23.5
Pectoral-fin length	21.2	21.6
Pelvic-spine length	8.2	8.6
Pelvic-fin length	23.4	23.0

***Pteragogus clarkae*, n. sp.**

Figure 17; Table 7.

Duymaeria opercularis [non Peters] Klunzinger 1871: 551 (Quseir, Egypt, Red Sea).

Pteragogus opercularis [non Peters] Al-Hussaini 1947: 17 (Hurghada, Egypt, Red Sea); Klauswitz 1964: 132 (Hurghada).

Pteragogus pelycus [in part] Dor 1984: 207 (checklist, Red Sea); Goren & Dor 1994: 55 (checklist, Red Sea); Golani & Bogorodsky 2010: 41 (checklist, Red Sea).

Holotype. USNM 167021, female, 56.5 mm, Red Sea, Egypt, Al Ghardaqa (Hurghada), 27°15'N, 33°49'E, E. Clark, 1951.

Paratypes. SMF 1597, 2: 68–81 mm, Red Sea, Egypt, O-Kosseir (=Al-Qusayr = Quseir), 26°6'N, 34°17'N, C.B. Klunzinger, 1872; USNM 410093, 13: 34.5–64.5 mm, and BPBM 41145, 2: 47–51.5 mm, same data as holotype; SMF 6442, 62 mm, Red Sea, Egypt, Al Ghardaqa, 27°14'N, 33°50'E, sea-grass meadow, 2 m, D. Magnus, Oct. 1962.

Diagnosis. Dorsal rays XI,9; anal rays III,9; pectoral rays 13 or 14 (usually 13); lateral line complete, angling sharply downward below soft portion of anal fin to straight peduncular part; the pored scales 24 (plus 2 on base of caudal fin, the last greatly enlarged); body moderately deep, depth 2.95–3.15 in SL; head length 2.6 in SL; dorsal profile of head straight; straight part of posterior margin of preopercle serrate, serrae varying from 14 on 34.5-mm paratype to 21 on the 64.5-mm paratype; dorsal spines progressively longer, the last 1.95–2.2 in head length; caudal fin rounded and moderately long 3.0–3.25 in SL; first soft ray of pelvic fins not very long, 3.5–3.8 in SL. Color in alcohol yellowish brown with dark brown blotches on lower side of body; small dark brown spots along anterior part of lateral line; scattered small dark brown spots on nape; a dark brown dash or pair of small dark spots on side of snout before eye; only traces remain of opercular ocellus; posterior margin of preopercle and an adjacent band of opercle pale yellowish; dorsal fin pale yellowish with a dark brown spot on each of first two spinous membranes, the second spot usually smaller; an irregular black spot at rear base of dorsal fin. Largest specimen, 64.5 mm SL, 81 mm TL.

Description. Dorsal rays XI,9; anal rays III, 9; last dorsal and anal rays branched to base; pectoral rays 13 or 14 (usually 13), the first ray rudimentary, the second and last unbranched; pelvic rays I,5; principal caudal rays 12



Figure 17. *Pteragogus clarkae*, USNM 167021, holotype, female, 56.5 mm, Hurghada, Egypt (S. O'Hara).

(median 10 branched); upper and lower procurrent caudal rays 6; branchiostegal rays 6; vertebrae 25; lateral line complete, the pored scales 24 (plus 2 on base of caudal fin, the last scale greatly enlarged); scales above lateral line to origin of dorsal fin 2; scales below lateral line to origin of anal fin 5; circumpeduncular scales 15; median predorsal scales 4; median prepelvic scales 6; preopercular serrae progressively longer ventrally, except last few, varying from 13 on the 34-mm paratype to 21 on the 56.5-mm holotype and the 64.5-mm paratype; corner of preopercle rounded, thin, and membranous; gill rakers 14 (13–16); branchiostegal rays 5; vertebrae 24.

Body moderately deep in adults, depth 2.95 (3.0–3.15) in SL; body compressed, width 2.6 (2.4–2.65) in body depth; head length 2.6 (2.55–2.6) in SL; dorsal profile of head straight to above eye, then slightly convex; snout length 3.2 (3.1–3.35) in head length; orbit diameter 4.35 (3.15–5.35) in head length; scleral cornea of eye modified to form a double pupil; interorbital strongly convex, the least width 5.6 (4.2–5.45) in head length; caudal-peduncle deeper than long, the least depth 2.7 (2.7–3.4) in head length.

Mouth terminal, slightly oblique, the maxilla extending posteriorly to a vertical at posterior edge of pupil; two pairs of large recurved canine teeth anteriorly in jaws, the pair at front of lower jaw fitting in space between larger upper pair when mouth closed; second pair of canine teeth twice as large as anterior pair, very strongly recurved and outflaring; a double row of small stout conical teeth medial to canines of upper jaw, followed along side of jaw by a single row of 21 close-set, conical teeth of progressively smaller size; lower jaw with a single row of small conical teeth medial to anterior canines, followed by a row of 8 large conical teeth that are slightly retrorse and incurved, then a series of about 11 progressively smaller conical teeth, the first half length of previous tooth. Each lateral half of upper pharyngeal plate with 12 teeth, those in anterior row as large very stout conical teeth, the rest molariform, those in posterior row small; anterior limb of T-shaped lower pharyngeal plate with a cluster of eight short snout conical teeth, the transverse posterior limb with two rows of teeth, the first of nine stout conical teeth and the posterior row of eight submolariform teeth (the crowns slightly pointed), the largest teeth medial. Tongue triangular with rounded tip.

Straight part of posterior margin of preopercle with close-set, spinous serrae that angle slightly dorsally, progressively longer ventrally, except last few a little shorter; number of serrae increasing with growth, from 14 on 34.5-mm paratype to 18 on 64.5-mm paratype.

Nostrils in alignment from dorsal edge of eye to front of snout, the anterior nostril tubular, its length about one-third internarial space (which equals length of largest lower canine tooth); posterior nostril elliptical with a slight rim; a sensory pore in mid-internasal space.

Scales relatively large and cycloid, those on chest varying from nearly as large as largest of rest of body to about half that size; opercle and subopercle nearly covered by large scales; preopercle with a series of 6 large thin scales from behind to below eye; base of dorsal and anal fins with large oblique scales progressively larger on spinous portion to about half distance to margin near middle of fin, then progressively shorter posteriorly; caudal fin with two rows of scales of about body size on base followed by three enormous scales, the pointed middle scale (the last of lateral line, with tubule to end of scale) reaching more than half distance to posterior margin of fin.

Sensory tubule of each lateral-line scale crossing scale, angling slightly upward, and ending in a pore; in addition, anterior lateral-line scales have a short dorsal branch near middle of each scale, ending in a pore. This species, like others of the genus, is remarkable for the maze of sensory tubules bearing numerous pores that radiate in all directions from the orbit, meeting tubules of other side middorsally on nape, and extending to upper lip and lowermost corner of preopercle.

Gill membranes free from isthmus, with a free fold across; larger gill rakers expanded distally and bearing short cirri.

Origin of dorsal fin above upper end of gill opening, the predorsal length 2.9 (2.85–3.0) in SL; first dorsal spine 3.2 (3.05–3.4) in head length; eleventh dorsal spine longest, 2.1 (2.0–2.05) in head length; sixth dorsal ray slightly the longest, 1.7 (1.7–1.8) in head length; origin of anal fin below base of first dorsal soft ray, preanal distance 1.7 (1.65–1.7) in SL; third anal spine longest, 2.1 (2.05–2.1) in head length; sixth anal soft ray slightly longest, 1.7 (1.7–1.75) in head length; caudal fin slightly rounded, 3.1 (3.0–3.3) in SL; third pectoral ray (first branched ray) slightly longest, 1.8 (1.85–1.9) in head length; pelvic spine 2.2 (2.1–2.2) in head length; filamentous first pelvic soft ray reaching origin of anal fin, 3.65 (3.5–3.85) in SL.

TABLE 7

Proportional measurements of type specimens of *Pteragogus clarkae* as percentages of the standard length

	holotype	paratypes				
	USNM 167021	USNM 410093	USNM 410093	USNM 410093	BPBM 41145	USNM 410093
Standard length (mm)	56.5	38.0	42.0	48.0	51.5	64.5
Body depth	33.8	31.7	33.1	33.4	33.4	32.7
Body width	12.8	13.2	13.7	12.5	12.6	12.7
Head length	38.7	38.8	38.6	38.2	38.7	38.9
Snout length	11.8	11.6	11.9	11.7	11.8	12.4
Orbit diameter	8.9	10.7	9.8	9.1	8.9	8.5
Interorbital width	6.9	7.4	7.5	7.0	7.1	7.3
Caudal-peduncle depth	14.2	13.0	14.4	13.6	13.8	13.4
Caudal-peduncle length	11.0	12.1	11.8	12.8	11.7	12.0
Predorsal length	34.3	33.6	35.2	34.4	33.4	34.2
Preanal length	59.4	60.6	59.5	60.5	58.8	59.0
Prepelvic length	39.3	38.1	40.1	39.7	37.0	37.1
Base of dorsal fin	57.8	57.2	57.5	58.5	58.3	57.0
First dorsal spine	12.3	11.8	12.4	12.5	11.5	11.4
Eleventh dorsal spine	18.6	18.4	19.1	18.6	18.8	19.0
Longest dorsal ray	22.5	21.2	22.3	22.4	22.3	21.8
Base of anal fin	29.3	28.7	29.8	29.2	28.8	29.0
First anal spine	12.4	12.1	12.2	12.6	12.6	12.4
Second anal spine	16.8	16.5	17.2	17.6	16.8	17.8
Third anal spine	18.6	18.3	18.7	18.4	18.8	18.7
Longest anal ray	22.9	23.0	22.6	22.2	22.7	23.2
Caudal-fin length	32.1	31.9	32.9	33.0	broken	30.5
Pectoral-fin length	21.5	20.8	20.5	20.8	broken	broken
Pelvic-spine length	17.6	17.6	17.8	18.0	17.4	17.5
Pelvic-fin length	27.5	26.1	28.6	26.9	28.7	27.7

Color in alcohol yellowish brown with dark brown blotches on lower side of body, eight in most ventral row from chest to base of caudal fin, the middle ones larger than eye; small dark brown spots along anterior part of lateral line; scattered small dark brown spots on nape, most just dorsoposterior to eye; an irregular short dark brown dash or pair of small dark spots on side of snout before eye; only traces remain of the opercular ocellus; posterior margin of preopercle and adjacent band of opercle pale yellowish; outer part of dorsal fin pale yellow with a dark brown spot on each of first two spinous membranes, three large irregular brown blotches well-spaced in middle of fin, and an irregular pupil-size very dark brown spot at rear base of fin; caudal fin light orange-yellow with a broad blackish bar at base, most of outer half of fin dark brown; paired fins pale yellowish.

Etymology. This species is named *Pteragogus clarkae* for Dr. Eugenie Clark, not only for her collection of most of the type specimens, but also in recognition of her major contribution to the classification and biology of fishes. Her research continues at the present age of 90.

Remarks. The first specimens of *Pteragogus clarkae*, SMF 1597, 2: 67–81 mm SL, were recorded by Klunzinger (1871) from Kosseir, Egypt (=Al Qusayr = Quseir) as *Duymaeria opercularis* Peters (1847), type locality Mozambique. Randall (1981: 82) noted that this name is preoccupied by *Duymaeria opercularis* Guichenot [= *Bodianus opercularis* (Guichenot)] and provided the substitute name *Pteragogus pelycus*, in reference to the long pelvic fins. Peters' holotype is present in the Zoologisches Museum of Humboldt-Universität in Berlin as ZMB 2474, 107 mm SL. This species is large for the genus *Pteragogus*, attaining a standard length of 150 mm. Figures 18 and 19 are photographs of specimens from the Seychelles and Comoro Islands. The species remains unknown from the Red Sea.

Klunzinger's specimens of *Pteragogus clarkae* and SMF 6442, a specimen 55 mm SL from Hurghada reported as *Pteragogus opercularis* by Klausewitz (1964: 132) were sent on loan by Tilman P. Alpermann; they are included as paratypes of *P. clarkae*. Al-Hussaini (1947: 17) reported on the food habits of four specimens identified as *Pteragogus opercularis* from Hurghada, Egypt collected at a depth of 10–15 m. He found the intestine full of the shells of foraminiferans, the larger fish also contained gastropods of small size. His specimens were probably *P. clarkae*.



Figure 18. *Pteragogus pelycus*, BPBM 35527, juvenile, 35 mm, Mahé, Seychelles (J.E. Randall).



Figure 19. *Pteragogus pelycus* (above) BPBM 35631, intersex, 74 mm, Platte Island, Amirantes, Seychelles (J.E. Randall); (below) SAIAB 90191, probable male, 87 mm, Comoro Islands (R. Winterbottom).

***Pteragogus trispilus*, n. sp.**

Figures 20–22; Table 8.

Pteragogus pelycus [in part] Randall 1981: 82 (Gulf of Aqaba); Dor 1984: 207 (checklist, Red Sea); Goren & Dor 1994: 55 (checklist, Red Sea); Khalaf & Disi 1997: 162 (Aqaba); Kuitert 2002: 54, figs. B, C (Egypt, Red Sea); Golani & Bogorodsky 2010: 41 (checklist, Red Sea).

Holotype. BPBM 13399, male, 73 mm SL, Red Sea, Gulf of Aqaba, west coast, Taba, 3 km S of Interuniversity Institute of Marine Sciences, 29°30'N, 34°53'E, *Halophila* bottom, 12–18 m, spear, J.E. Randall, June 12, 1972.

Paratypes. HUJ 4218, 2: 52–65.5 mm, Gulf of Suez, SW Sinai Peninsula, A-Tur, Hebrew University fish collecting staff, Sept. 21, 1967; USNM 223878, 65.5 mm, Red Sea, Gulf of Aqaba, Sinai Peninsula, east coast, El Hamira, depth to 16 m, rotenone, V.G. Springer *et al.*, July 19, 1969; USNM 361254, 5: 24–46 mm, Gulf of Aqaba, east coast, Ras Burqa, Gulf of Aqaba, Sinai Peninsula, east coast, 9–15 m, rotenone, V.G. Springer, G. Raz, A. Amir, H. Harpaz, and J. Oselka, July 21, 1969; HUJ 5998, 45 mm, same data as preceding; HUJ 15204, 3: 44–63 mm, Gulf of Suez, Ras Sudar, Hebrew University fish collecting staff, Sept. 23, 1970; BPBM 13377, 73.5 mm, Gulf of Aqaba, east coast, Marsa el Mukabeila (24 km south of Eilat), sand bottom with detached brown algae, 10.5 m, spear, J.E. Randall, June 5, 1972; BPBM 41116, 54.5 mm, same data as holotype; SMF 15717, 68 mm, same data as holotype; SAIAB 187742, 23 mm, Gulf of Aqaba, Eilat, off desalination plant, 15 m, sand, sea grass, and small coral patches, rotenone, J.E. Randall and H. Gordin, Sept. 28, 1974; BPBM 19816, 44 mm, Gulf of Aqaba, east coast, beach N of El Muzeini, Nuweiba, sea grass, 3 m, rotenone, A. Ben-Tuvia, A. Baranes, O. Gon, and J. Wendling, Oct. 29, 1975; SAIAB 187999, 52.5 mm, same locality as preceding, sand and small rocks, 0–0.5 m, rotenone, J.E. Randall and J. Wendling, Oct. 31, 1975; BPBM 19890, 27 mm, Eilat, off desalination



Figure 20. *Pteragogus trispilus*, BPBM 13399, holotype, male, 73 mm, Red Sea, Gulf of Aqaba, Egypt, Taba (J.E. Randall).

plant, sea grass and small coral heads, 15 m, rotenone, J.E. Randall, A. Baranes, and A. Diamant, Nov. 3, 1975; SMF 15830, 13: 16.5–43.5 mm, Jordan, Aqaba, Big Bay, sea-grass bed, 10–15 m, explosives, M. Harmelin, Feb. 13, 1979; HUI 10793, 61 mm, Gulf of Aqaba, Nuweiba, A. Ben-Tuvia, Dec. 6, 1981; HUI 19018, 79.0 mm, Gulf of Aqaba, Eilat, D. Golani, June 17, 1990; HUI 15840, Mediterranean Sea, Israel, Haifa Bay, O. Sonin, Nov. 1, 1991; SAIAB 42629, 5: 54–63 mm, Red Sea, Gulf of Aqaba, off Eilat, P.H. Heemstra *et al.*, Jan. 19, 1993; SAIAB 42686, 65 mm, Gulf of Aqaba, Israel, Eilat, seine, D. Golani, P.H. Heemstra, and M.J. Smale, Jan. 20, 1993.

Diagnosis. Dorsal rays XI,9; anal rays III,9; pectoral rays 13 (rarely 12); lateral line complete, angling sharply downward below soft portion of anal fin to straight peduncular part; the pored scales 24 (plus 2 on base of caudal fin, the last greatly enlarged); body moderately deep, depth 2.75–2.95 in SL; head length 2.7 in SL; dorsal profile of head of adult female straight, of adult male with a very slight concavity above eye; interorbital convex; orbit diameter 4.15–5.4 in head length; straight part of posterior margin of preopercle serrate, the serrae varying from 14 on 27-mm paratype to 23 on 73-mm holotype; no long filaments extending from tips of dorsal spines; caudal fin rounded and moderately long 2.7–3.1 in SL; first soft ray of pelvic fins very long, 2.0–3.3 in SL. Color in alcohol yellowish brown with faint dark spots and dashes along anterior part of lateral line; fins translucent yellowish with a black spot on each of first three spinous membranes of dorsal fin of males (half size on third membrane) and two spots on adult females (sometimes as faint small spot on third membrane). Color when fresh olivaceous, the scale edges dotted with white; an oblique elliptical black spot on opercle, broadly rimmed in yellow; a vertical white streak to each side of posterior edge of preopercle; scattered small black spots behind eye and on nape; pupil rimmed with orange, the rest of iris with seven spoke-like dark lines; lateral line with black dots and dashes and white dots; median fins olivaceous with white dots on rays, oblique white lines on spinous portion ventral part of head and posterior opercle of male suffused with orange; females may have a whitish stripe from front of snout, broadening to pupil depth as it passes posteriorly on body below lateral line to upper base of caudal fin; longitudinal rows of white spots may be present on body ventral to pectoral-fin base, as well as faint orange spots. Largest specimen, 79 mm SL, 103 mm TL.

Description. Dorsal rays XI,9; anal rays III, 9; last dorsal and anal rays branched to base; pectoral rays 13, the first ray rudimentary, the second unbranched; pelvic rays I,5; principal caudal rays 12 (median 10 branched); upper and lower procurrent caudal rays 6; branchiostegal rays 6; vertebrae 25; lateral line complete, the pored scales 24 (plus 2 on base of caudal fin, the last scale greatly enlarged); scales above lateral line to origin of dorsal fin 2; scales below lateral line to origin of anal fin 5; circumpeduncular scales 16; median predorsal scales 4; median prepelvic scales 6; preopercular serrae progressively longer ventrally, except last few, varying from 12 on 23-mm paratype to 26 on 73-mm holotype; corner of preopercle rounded, thin, and membranous; gill rakers 15 (13–15); branchiostegal rays 5; vertebrae 24.

Body moderately deep in adults, depth 2.9 (2.75–2.95) in SL, less so in young (3.2 in SL of a 27-mm sub-adult); body compressed, width 2.35 (2.3–2.5) in body depth; head length 2.7 (2.7) in SL; dorsal profile of head of adult male a slight sinuous curve the concave part above eye, of nape slightly convex; dorsal profile of adult female straight; snout length 2.8 (2.8–3.0) in head length; orbit diameter 5.4 (4.15–5.35) in head length; scleral cornea of eye modified to form a double pupil; interorbital strongly convex, the least width 5.55 (5.35–5.5) in head length; caudal-peduncle deeper than long, the least depth 2.3 (2.35–2.5) in head length.

Mouth terminal, slightly oblique, the maxilla extending posteriorly to a vertical at posterior edge of pupil; two pairs of large recurved canine teeth anteriorly in jaws, the pair at front of lower jaw fitting in space between larger upper pair when mouth closed; second pair of canine teeth twice as large as anterior pair, very strongly recurved and outflaring; front of jaws with a double row of small stout conical teeth posterior to canines; side of upper jaw behind large curved canine with a row of 10 close-spaced conical teeth, followed by four progressively larger, broadly spaced, conical teeth. Each lateral half of triangular upper pharyngeal plate with about 15 teeth (some missing from dissection of 63-mm paratype of HUI 15204), those in medial row as very stout conical teeth, the largest most anterior, the remaining teeth molariform; median anterior limb of T-shaped lower pharyngeal plate with 13 teeth, the most anterior a large stout conical tooth, followed by four transverse rows of three small stout conical teeth; each side of transverse limb of pharyngeal plate with a double row of four teeth, the anterior row more conical than molariform, the posterior row as molars; largest tooth a median posterior molar (a few very small anterior conical teeth not counted).



Figure 21. *Pteragogus trispilus*, BPBM 19816, subadult, 44 mm, Red Sea, Gulf of Aqaba, Israel, Eilat (J.E. Randall).

Straight part of posterior margin of preopercle with close-set, spinous serrae that angle slightly dorsally, progressively longer ventrally, except last few a little shorter; number of serrae increasing with growth, from 14 on 27-mm paratype to 23 on 73-mm holotype.

Nostrils in alignment with dorsal edge of eye and front of snout, the posterior nostril an aperture with a slight fleshy rim dorsal to bony anterior edge of orbit; anterior nostril a small short tapering tube with a tiny aperture within a circular depression one-half orbit diameter anterior to middle of orbit; posterior nostril ovate with el-



Figure 22. *Pteragogus trispilus*, Red Sea, Gulf of Aqaba, Egypt, Dahab, 28 m (S.V. Bogorodsky).

evated rim, obliquely dorsoposterior to anterior nostril, the internarial distance one-half pupil diameter.

Scales relatively large and cycloid, those on chest varying from nearly as large as largest of rest of body to about half that size; opercle and subopercle nearly covered by large scales; preopercle with a series of 6 large thin scales from behind to below eye; base of dorsal and anal fins with large oblique scales progressively larger on spinous portion to about half distance to margin near middle of fin, then progressively shorter posteriorly; caudal fin with two rows of scales of about body size on base followed by three enormous scales, the pointed middle scale (the last of lateral line, with tubule to end of scale) reaching more than half distance to posterior margin of fin.

Sensory tubule of each lateral-line scale crossing scale, angling slightly upward, and ending in a pore; in addition, anterior lateral-line scales have a short dorsal branch near middle of each scale, ending in a pore. This species, like others of the genus, is remarkable for the maze of sensory tubules bearing numerous pores that radiate in all directions from the orbit, meeting tubules of other side middorsally on nape, and extending to upper lip and lowermost corner of preopercle.

Gill membranes free from isthmus, with a free fold across; gill rakers short, all but smallest with short branches, the longest at angle about one-half length of longest gill filament.

Origin of dorsal fin above upper end of gill opening, the predorsal length 2.95 (2.85–3.0) in SL; first dorsal spine 3.45 (3.3–3.75) in head length; eleventh dorsal spine longest, 2.15 (1.95–2.2) in head length; membranes of spinous portion of dorsal fin very narrowly incised posteriorly (about one-third spine length anteriorly and progressively less posteriorly); sixth dorsal ray slightly the longest, 1.45 (1.55–1.85) in head length; origin of anal fin below base of first dorsal soft ray, preanal distance 1.75 (1.7–1.75) in SL; third anal spine longest, 2.7 (2.1–2.8) in head length; sixth anal soft ray slightly longest, 1.6 (1.55–2.05) in head length; caudal fin slightly rounded, 2.85 (2.7–3.1) in SL; third pectoral ray (first branched ray) slightly longest, 1.95 (1.8–2.0) in head length; pelvic spine 2.55 (2.3–2.55) in head length; filamentous first pelvic soft ray reaching well beyond origin of anal fin, 2.35 (2.0–3.3) in SL.

Color in alcohol yellowish brown with faint dark spots and dashes along anterior part of lateral line; fins translucent yellowish, with a dark brown spot on each of first three spinous membranes of dorsal fin in males, the third spot half size of first two; spots present on first two membranes of mature females, sometimes a faint small spot on third membrane; color of subadult when fresh as in Fig. 21 and of mature male in Fig. 20. Fig. 22 is an underwater photograph of the species taken in a sea-grass bed in 28 m.

Etymology. Named *trispilus* from the Latin for the three black spots anteriorly on the dorsal fin, one on each of the first three membranes.

Remarks. As noted above, Randall (1981) provided a new name *Pteragogus pelycus* for Peters' preoccupied name *Cossyphus opercularis*, type locality Mozambique, the name in reference to the long pelvic fins. He had no hesitation identifying specimens of *Pteragogus* he collected from the Gulf of Aqaba beginning in 1972 as *P. pelycus*, noting the long filamentous pelvic fins, the opercular ocellus, and a black spot on each of the first three membranes of the dorsal fin. However, later comparison with specimens from Mozambique (BPBM 26394, 4: 49–106 mm SL) provide obvious differences from Red Sea material. First, the larger size; the largest of 24 specimens of *P. trispilus* from 12 collections in the Red Sea measures 73.5 mm SL and 97 mm TL. The total length of *P. pelycus* from the lot from Mozambique is 140 mm, and Randall in Smith and Heemstra (1986: 702) gave the maximum length as 150 mm. Other obvious differences from *P. pelycus* are the straight dorsal profile of the head, compared to the very strong concavity in the dorsal profile of the head of adult *P. pelycus*; nearly flat interorbital, compared to the convex interorbital of *P. trispilus*; seven spoke-like short lines instead of small dark spots in iris of eye, and the smaller and different shape of the ocellus on the opercle (compare Fig. 19 of adults of *P. pelycus* with Figs. 20 and 22 of *P. trispilus*).

Pteragogus trispilus and *P. pelycus* have the lowest counts of preopercular serrae of the four species compared by Randall (1981: fig. 1), 12 at a standard length of 22–24 mm, and 25 at a standard length of about 73 mm for *P. trispilus*. *Pteragogus flagellifer* has the highest counts, from 18 in a 28 mm specimen to 46 in a 92 mm specimen.

Pteragogus trispilus is presently known only from the Gulf of Aqaba, the Gulf of Suez, and as a Lessepsian migrant to the eastern Mediterranean Sea, first reported from Haifa Bay, Israel by Golani and Sonin (1992), and now known east to Rhodes Island in the Aegean Sea (Golani *et al.* 2006), where it reaches a usual size of 3–6 cm and a maximum of 10 cm. Specimens have been collected from the depth range of 0.5–18.5 m in sheltered waters,

typically on a bottom of sea grass or low-profile dead reef, often with heavy algal growth. It is very cryptic, hence difficult to photograph underwater. A small sample of stomach contents from the holotype contained foraminifera, consistent with the food-habit study of Al-Hussaini (1947) of what is now believed to be *P. clarkae*. The stomach contents of the 73.5-mm paratype consisted mainly of crushed remains of small gastropods, some foraminifera, and unidentified crustacean fragments, including a small crab chela. Noting the very large stomach of the 44-mm paratype, it was opened and found to contain the remains of a moderately large shrimp, so this fish does not feed exclusively on tiny prey.

TABLE 8

Proportional measurements of type specimens of *Pteragogus trispilus* as percentages of the standard length

	holotype		paratypes				
	BPBM 13399	HUJ 15840	SAIAB 188061	BPBM 41116	HUJ 10793	BPBM 13377	HUJ 19018
Standard length (mm)	73.0	48.0	52.5	54.5	62.0	73.5	79.0
Body depth	34.7	34.7	36.2	35.0	34.3	34.6	36.5
Body width	14.8	14.9	14.3	14.5	14.2	14.9	15.1
Head length	37.1	37.2	37.5	37.6	37.6	37.4	37.5
Snout length	13.2	12.7	12.8	12.9	12.6	13.3	12.5
Orbit diameter	6.9	8.7	8.4	8.3	8.0	7.0	7.4
Interorbital width	6.7	7.0	7.0	6.9	7.0	6.8	6.9
Caudal-peduncle depth	16.3	15.0	15.7	15.2	15.3	15.6	15.0
Caudal-peduncle length	12.3	12.4	11.5	11.9	13.1	12.2	11.4
Predorsal length	33.8	34.4	33.5	34.7	33.0	33.5	34.2
Preanal length	57.5	57.3	59.0	59.1	57.4	57.8	58.0
Prepelvic length	37.1	36.8	37.8	37.0	37.1	37.6	36.7
Base of dorsal fin	61.2	59.5	59.1	60.5	61.4	60.0	61.1
First dorsal spine	10.7	11.3	10.5	10.1	11.3	10.4	10.2
Eleventh dorsal spine	17.2	19.0	17.1	18.1	18.5	17.7	17.7
Longest dorsal ray	24.0	23.9	21.3	20.4	21.4	24.2	22.7
Base of anal fin	31.8	31.2	29.0	29.1	31.2	31.4	32.1
First anal spine	9.5	10.0	10.4	11.0	11.2	9.5	9.4
Second anal spine	12.4	14.6	14.2	14.3	14.5	12.3	13.9
Third anal spine	13.6	17.8	15.8	16.8	17.2	13.4	15.7
Longest anal ray	23.2	22.5	19.4	18.2	22.6	24.0	22.8
Caudal-fin length	35.2	36.8	32.2	broken	34.5	36.0	35.4
Pectoral-fin length	18.9	20.6	19.3	19.2	19.3	19.5	20.1
Pelvic-spine length	14.6	16.3	15.4	15.2	16.1	15.3	15.2
Pelvic-fin length	42.7	50.0	30.5	broken	33.5	34.8	49.8

***Pteragogus variabilis*, n. sp.**

Figures 23–27; Table 9.

Pteragogus pelycus [non Randall] Kuitert 2002: 54, Mauritius (Fig. A).

Holotype. BPBM 22926, male, 46.5 mm, Mauritius, reef about 1.5 miles N of Flic en Flac, 15 m, quinaldine, J.E. Randall, March 27, 1980.

Paratypes. USNM 361253, female, 43 mm, Aldabra Atoll, 9°21'42"S, 46°26'42"E, E side of La Passe Houareau (East Channel) adjacent to NW point of South Island, 9–3 m, rotenone, H.A. Fehlmann, Sept. 8, 1967; BPBM 16331, female, 48.5 mm, Mauritius, same locality as holotype, 28 m, quinaldine, J.E. Randall, Nov. 17, 1973; USNM 361251, 5: 10.5–47 mm, St. Brandon's Shoals, 16°45'S, 59°34'E, low dead coral rocks and sand, 15.2 m, rotenone, V.G. Springer *et al.*, April 11, 1976; USNM 307218, 3: 22–58 mm, St. Brandon's Shoals (Cargados Carajos), just NE of Siren Island, 16.5–71 m, rotenone, V.G. Springer *et al.*, Apr. 12, 1976; USNM 361252, 2: 27–47.5 mm, St. Brandon's Shoals, about 0.5 miles S of Ile Raphael, 16°27'S, 59°36'E, 0–9 m, rock cliff with incuts, rotenone, V. G. Springer *et al.*, Apr. 12, 1976; SAIAB 55132, 44.5 mm, St. Brandon's Shoals, 16°38'S, 59°38"E, reef, 10 m, D. Pelicier, May 19, 1997.

Diagnosis. Dorsal rays XI,9; anal rays III,9; pectoral rays 13 or 14 (usually 13), the rays flattened at tips but not branched; lateral line complete, angling sharply downward below soft portion of anal fin to straight peduncular part; the pored scales 24 (plus 2 on base of caudal fin, the last greatly enlarged); body moderately deep, depth 2.7–3.05 in SL; head length 2.55–2.6 in SL; dorsal profile of head straight; straight part of posterior margin of preopercle serrate, the serrae varying from 13 on 34-mm paratype to 25 on 58-mm paratype; no long filaments extending from tips of dorsal spines; caudal fin rounded and moderately long 3.1–3.15 in SL; first soft ray of pelvic fins moderately long, reaching between origin of anal fin and origin of soft portion of anal fin, 3.2–4.1 in SL. Color in alcohol pale brownish yellow; an oblique elliptical ocellus about twice pupil diameter in length on opercle (often damaged, sometimes effaced); a short dark brown dash on side of snout before middle of eye; dark dots sometimes faintly visible on nape; fins translucent pale yellowish, the dorsal with a blackish spot on



Figure 23. *Pteragogus variabilis*, BPBM 22926, holotype, male, 46.5 mm, Mauritius (J.E. Randall).



Figure 24. *Pteragogus variabilis*, BPBM 16331, paratype, female, 49 mm, Mauritius (J.E. Randall).

first membrane, and usually a second smaller spot on second membrane; a small dark brown spot at rear base of dorsal fin. Some specimens, including holotype, may be entirely pale yellowish with no dark markings. Color in life very variable, the ground color may be brown, sometimes suffused with orange, red, or yellow; or greenish gray, orange-yellow, or red; all sharing the following features: opercle of darker color, often more red, orange, or yellow than rest of head, and containing an oblique elliptical ocellus; four white spots along anterior lateral line, the fourth anteriorly on caudal peduncle, with irregular white spots and flecks extending dorsally from first three spots into dorsal fin, and ventrally from all four spots; a broad white posterior border on preopercle, with an adjacent white triangular band on opercle; white dots extending ventrally and posteroventrally from orbit; median and pelvic fins colored much like adjacent body, but with more small white blotches and dots; dorsal fin with a

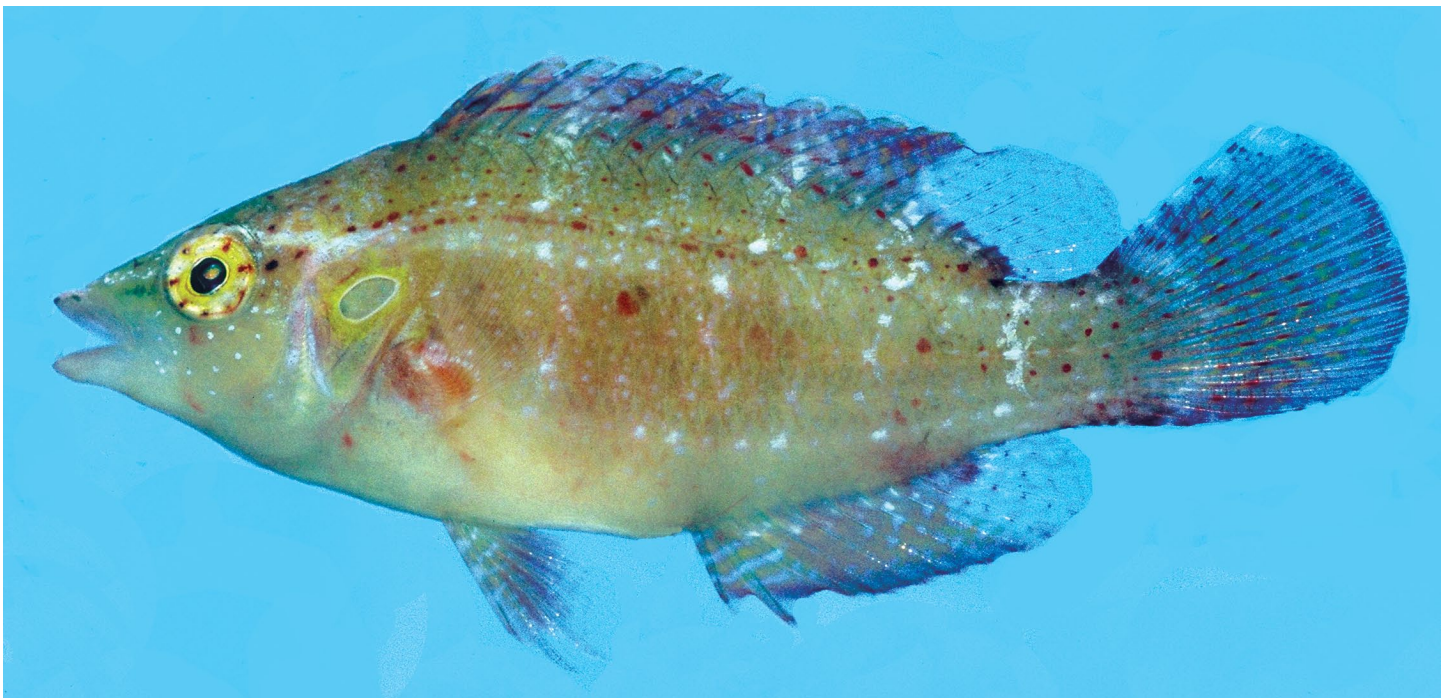


Figure 25. *Pteragogus variabilis*, SAIAB 55132, 45 mm, St. Brandon's Shoals (P.C. Heemstra).

blackish spot on first membrane and usually a smaller spot on second membrane; about posterior three-fourths of soft portion of fin transparent, except basally (the transparent zone may be crossed by brown lines); caudal fin with a series of white or transparent spots along dorsal margin and smaller spots along ventral margin.

Description. Dorsal rays XI,9; anal rays III,9; last dorsal and anal rays branched to base; pectoral rays 13 (13 or 14, usually 13), the first ray rudimentary, the remaining rays flattened distally but not branched (or with only a very slight bifurcation at tips); pelvic rays I,5, all soft rays branched; principal caudal rays 12 (median 10 branched); upper and lower procurrent caudal rays 6; branchiostegal rays 6; vertebrae 25; lateral line complete, the pored scales 24 (plus 2 on base of caudal fin, the last scale greatly enlarged); scales above lateral line to origin of dorsal fin 2; a series of single large scales above lateral line to base of remaining spinous portion of dorsal fin; scales below lateral line to origin of anal fin 5; circumpeduncular scales 16; median predorsal scales 4; median prepelvic scales 6; preopercular serrae 18 (13–25), progressively longer ventrally, except last few, varying from 13 on 34-mm paratype to 18 on 46.5-mm holotype and 25 on 58-mm paratype; corner of preopercle rounded, thin, and membranous; gill rakers 12 (13–15); branchiostegal rays 5; vertebrae 24.

TABLE 9

Proportional measurements of type specimens of *Pteragogus variabilis* as percentages of the standard length

	holotype		paratypes				
	BPBM 22926	USNM 361251	SAIAB 55132	USNM 361251	BPBM 16331	USNM 361252	USNM 307218
Standard length (mm)	46.5	34.5	44.5	47.0	48.5	49.0	58.0
Body depth	35.7	34.7	33.0	35.1	37.2	36.4	37.1
Body width	14.4	14.3	14.2	14.2	15.7	14.7	14.6
Head length	39.0	39.5	39.5	38.4	38.2	38.8	38.9
Snout length	11.8	12.6	11.7	11.9	12.2	12.3	12.1
Orbit diameter	9.7	11.2	10.2	9.3	9.4	9.2	8.9
Interorbital width	7.5	6.5	6.7	7.4	6.9	6.8	7.1
Caudal-peduncle depth	15.2	14.3	14.7	14.7	14.6	14.5	14.0
Caudal-peduncle length	12.9	12.7	13.3	12.8	12.4	12.3	12.0
Predorsal length	34.4	36.0	35.0	34.3	34.8	36.1	36.1
Preanal length	60.2	60.5	58.8	58.4	60.0	59.3	59.0
Prepelvic length	38.0	38.2	39.6	39.3	39.2	37.2	37.1
Base of dorsal fin	59.9	58.4	58.3	59.5	59.5	58.8	60.3
First dorsal spine	11.2	13.1	13.0	13.0	12.6	12.5	12.1
Eleventh dorsal spine	18.0	17.9	18.9	18.8	19.1	18.7	19.2
Longest dorsal ray	21.3	20.6	21.9	22.2	broken	21.4	22.3
Base of anal fin	28.1	29.0	30.1	29.8	28.3	29.0	29.3
First anal spine	11.5	11.8	10.5	10.7	10.3	11.2	11.4
Second anal spine	17.2	17.3	16.9	16.8	16.7	17.3	17.3
Third anal spine	17.8	17.9	19.4	17.0	18.1	18.8	18.6
Longest anal ray	19.8	20.0	21.1	20.2	broken	19.7	20.1
Caudal-fin length	32.4	32.5	31.7	32.3	broken	32.3	31.9
Pectoral-fin length	19.8	22.3	22.4	21.5	20.8	20.6	22.4
Pelvic-spine length	17.2	17.4	17.7	18.7	16.7	18.1	17.3
Pelvic-fin length	29.3	24.6	24.8	28.6	26.0	26.4	31.4

Body moderately deep in adults, depth 2.8 (2.75–3.0) in SL, less so in young (3.2 in SL of a 27-mm subadult); body compressed, width 2.5 (2.35–2.55) in body depth; head length 2.55 (2.55–2.6) in SL; dorsal profile of head straight; snout length 3.3 (3.15–3.35) in head length; orbit diameter 4.0 (3.5–4.35) in head length; scleral cornea of eye modified to form a double pupil; interorbital flat to slightly convex, the least width 5.2 (5.2–6.1) in head length; caudal-peduncle deeper than long, the least depth 2.55 (2.6–2.75) in head length.

Mouth terminal, slightly oblique, the maxilla extending to or slightly posterior to a vertical at anterior edge of orbit; two pairs of large recurved canine teeth anteriorly in jaws, the pair at front of lower jaw fitting in space between larger upper pair when mouth closed; second pair of canine teeth twice as large as anterior pair, very strongly recurved and outflaring; front of jaws with a double row of small stout conical teeth posterior to canines; side of upper jaw behind large curved canine with a row of 22 close-spaced conical teeth in holotype, the penultimate tooth nearly twice length of smallest tooth; side of lower jaw with a row of 22 teeth posterior to canines, eight in midside largest. Pharyngeal dentition essentially as described for *P. trispilus*, each pair of upper plates with anterior and lateral stout conical teeth and molariform medial and posterior teeth; lower plate with a very large, somewhat pointed, central molariform tooth, flanked by lesser molars. Tongue triangular with rounded tip.

Straight part of posterior margin of preopercle with close-set, spinous serrae that angle slightly dorsally and are progressively longer ventrally, except last few a little shorter; number of serrae increasing with growth, from 13 on 34-mm paratype to 25 on 58-mm paratype.

Anterior nostril like a miniature volcano in line with upper edge of orbit a distance before anterior edge of orbit equal to diameter of one of the two double pupils of eye; posterior nostril also volcanic, broader but half as high as anterior nostril, in alignment with anterior edge of orbit.

Scales relatively large and cycloid, those on chest varying from nearly as large as largest of rest of body to about half that size; opercle and subopercle nearly covered by large scales; preopercle with a series of six large thin scales from behind to below eye between the broad suborbital sensory zone and the broad margin; base of dorsal and anal fins with large oblique scales progressively larger on spinous portion to about half distance to margin near middle of fin, then progressively shorter posteriorly; base of caudal fin with two rows of scales of about size of those on body, followed by three enormous scales, the pointed middle scale (the last of lateral line, with tubule to end of scale) reaching more than half distance to posterior margin of fin.

Sensory tubule of each lateral-line scale crossing scale, angling slightly upward, and ending in a pore; in addition, anterior lateral-line scales have a short dorsal branch near middle of each scale, ending in a pore. This species, like others of the genus, is remarkable for the maze of sensory tubules bearing numerous pores that radiate in all directions from the orbit, meeting tubules of other side middorsally on nape, and extending to upper lip and lowermost corner of preopercle.



Figure 26. *Pteragogus variabilis*, Mauritius (R.C. Steene).

Gill membranes free from isthmus, with a free fold across; gill rakers short, all but smallest with short branches, the longest at angle about one-half length of longest gill filament.

Origin of dorsal fin above upper end of gill opening, the predorsal length 2.9 (2.75–2.9) in SL; first dorsal spine 3.5 (2.95–3.2) in head length; eleventh dorsal spine longest, 2.15 (2.0–2.2) in head length; membranes of fins incised adjacent to posterior spine about one-fourth spine length anteriorly, progressively less posteriorly; fourth or fifth dorsal ray slightly the longest, 1.85 (1.75–1.9) in head length; origin of anal fin below base of first dorsal soft ray, preanal distance 1.65 (1.65–1.7) in SL; third anal spine longest, 2.2 (2.0–2.3) in head length; sixth anal soft ray slightly longest, 1.95 (1.85–2.25) in head length; caudal fin slightly rounded, 3.1 (3.1–3.15) in SL; third pectoral ray (first branched ray) slightly longest, 1.95 (1.75–1.9) in head length; pelvic spine 2.25 (2.05–2.3) in head length; filamentous first pelvic soft ray reaching well beyond origin of anal fin, 3.4 (3.2–4.05) in SL.

Color of holotype in alcohol uniformly pale yellowish brown with no dark markings; fins translucent pale yellowish. Color of holotype when fresh shown in Fig. 23. Color variation in Figs. 24–27.

Etymology. This species is aptly named *Pteragogus variabilis* for the great variation in color, not only as shown in color photographs of different fish, but in the same individual. Fig. 27 upper and lower are the same fish photographed in an aquarium in Mauritius.

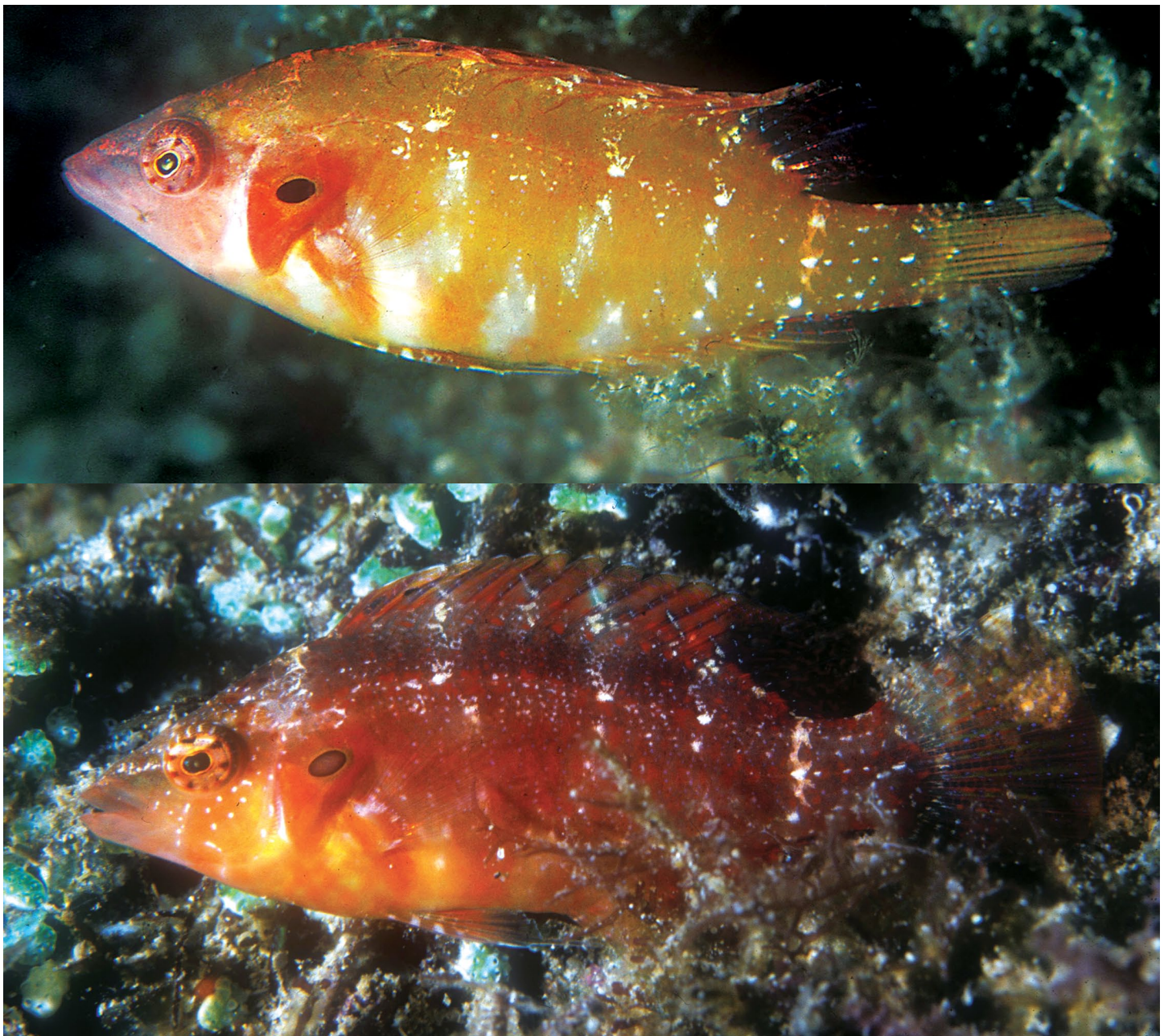


Figure 27. *Pteragogus variabilis*, above and below same fish, est. 5.5 cm TL, aquarium photos, Mauritius (J.E. Randall).

Material of *Pteragogus pelycus* examined. Tanzania, Dar-es-Salaam, SAIAB 12395, 73 mm. Mozambique, Maputo Bay, BPBM 26394, 4: 49–106 mm; SAIAB 12401, 2: 79–103 mm. Seychelles, Mahé, BPBM 35527, 35 mm; SAIAB 12397, 63 mm; Amirantes, Platte Island, BPBM 35621, 75 mm; Aldabra, SAIAB 12398, 61 mm.

Comparisons. Seven species of *Pteragogus* are known for the Western Indian Ocean. They may be distinguished by the following key.

Key to Species of *Pteragogus* in the Western Indian Ocean

- 1a. Dorsal rays IX,11; long filaments and adjacent membrane extending from tip of anterior four dorsal spine membranes in males (short and only from first two membranes in females); an oblique white band usually present from near eye to chest below pectoral-fin base; no ocellated black spot on opercle (Red Sea and western Indian Ocean to western Pacific).....*P. flagellifer*
- 1b. Dorsal spines X or XI, 9 or 10; long filaments from tip of anterior dorsal spine membranes present or absent; no white band from below eye to chest; an ocellated black spot present or absent on opercle.....2
- 2a. Dorsal spines X; black spot present or absent anteriorly on dorsal fin (if present, spot only on first membrane).....3
- 2b. Dorsal spines XI; black spot present on first two or three membranes of dorsal fin.....4
- 3a. Males with filaments extending from membranes of first four membranes of dorsal fin; pelvic fins not reaching posterior to origin of anal fin; a dark ocellus on opercle; no prominent dark bar extending ventrally from eye; no dark bars dorsally on body; no black spot at rear base of dorsal fin; maximum total length 11 cm (Red Sea).....*P. cryptus*
- 3b. Males without filaments from membranes of first four membranes of dorsal fin; pelvic fins of males long, the first soft ray reaching posterior to spinous portion of anal fin; no dark ocellus on opercle; a prominent, usually pale-edged, dark bar extending ventrally from eye; irregular dark bars on body dorsal to lateral line; a pupil-size black spot at rear base of dorsal fin; maximum total length 15 cm (Zanzibar to KwaZulu-Natal, Madagascar, and Comoro Islands).....*P. taeniops*
- 4a. Dorsal profile of head of adults concave; body depth of adults 2.35–2.5 in SL; maximum total length 150 mm (Tanzania to Durban, Seychelles, and Comoro Islands).....*P. pelycus*
- 4b. Dorsal profile of head of adults straight; body depth of adults 2.7–2.9 in SL; maximum total length less than 110 mm.....5
- 5a. Interorbital convex; pelvic fins very long, reaching well posterior to origin of anal fin in adults, 2.0–3.3 in SL; eye small, 4.3–5.35 in head length; caudal fin long, 2.7–3.1 in SL; a black spot on each of first three membranes of dorsal fin (may be faint or absent on third membrane of small females) (Gulf of Aqaba).....*P. trispilus*

- 5b. Interorbital flat; pelvic fins not very long, 3.3–4.1 in SL; eye not small, 3.5–4.5 in head length; caudal fin not long, 3.0–3.3 in SL; black spot present on first one or two membranes of dorsal fin.....6
- 6a. Longest anal soft ray 1.7–1.75 in head length; body depth 2.95–3.15 in SL; dark brown spots present along lateral line; posterior soft portion of dorsal fin probably not transparent in life (Egypt: Hurghada to Quseir).....*P. clarkae*
- 6b. Longest anal soft ray 1.85–2.25 in head length; body depth 2.7–3.0 in SL; no dark brown spots along lateral line; posterior three-fourths of soft portion of dorsal fin transparent in life, except basally (Mauritius, St. Brandon’s Shoals, and Aldabra)*P. variabilis*

Unidentified Species of *Pteragogus*

Figure 28 was taken by Sergey V. Bogorodsky in Naama Bay, Sharm el Sheikh, Egypt.

Figure 29 (upper) was taken by the author at Eilat in the Gulf of Aqaba.

Figure 29 (lower) was taken by Dr. Gerald R. Allen at Ambodi-Vahibe Bay, NE coast of Madagascar.



Figure 28. *Pteragogus* sp., Naama Bay, Egypt, Red Sea (S.V. Bogorodsky).



Figure 29. *Pteragogus* sp. (above), Eilat, Gulf of Aqaba (J.E. Randall); *Pteragogus* sp. (below), Ambodi-Vahibe Bay, NE coast of Madagascar (G.R. Allen).

Acknowledgments

I thank Dr. Tilman P. Alpermann for providing information on and the loan of specimens of *Pteragogus* in the Senckenberg Museum, Frankfurt; Uwe Zajonz for arranging for the collection of *Macropharyngodon bipartitus* by Moteah Sheikh Aideed in the Gulf of Aden; Roger Bills and Elaine Heemstra of the South African Institute for Aquatic Biodiversity for the loan of specimens and photographs; Daniel Golani of the Hebrew University for loan of specimens of *Pteragogus trispilus* from the Red Sea and Mediterranean Sea; Mary BurrIDGE, Hernan Lopez-Fernandez, and Don Stacey of the Royal Ontario Museum for photographs, field data, and specimens of *Coris batuensis* and *C. latifasciata*; and Loreen R. O'Hara and Arnold Y. Suzumoto of the Bishop Museum for curatorial assistance and x-rays. I am grateful also to Moteah Sheikh Aideed, Dr. Gerald R. Allen, Oddgeir B. Alvheim, Dr. R. Charles Anderson, Sergey V. Bogorodsky, Richard Field, Dr. Phillip C. Heemstra, Geoff Kelly, Jade Maggs, Sean O'Hara, Dennis Polack, Jean Louis Rose, Roger C. Steene, and Dr. Richard Winterbottom for the use of their photographs. The specimens of *Novaculops alvheimi* were collected through the Agulhas and Somali Current Large Marine Ecosystems Project and the EAF-Nansen Project of the FAO, funded by the Global Environment Facility through the United Nations Development Programme and by the Norwegian Agency for International Development (NORAD) through FAO. Sergey V. Bogorodsky, William N. Eschmeyer, Wouter Holleman, and Helen A. Randall reviewed the manuscript.

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