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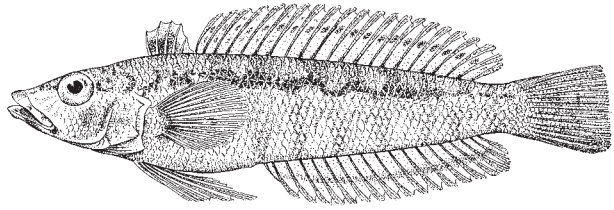
REVIEW OF THE SANDPERCHES OF THE *PARAPERCIS CYLINDRICA* COMPLEX (PERCIFORMES: PINGUIPEDIDAE), WITH DESCRIPTION OF TWO NEW SPECIES FROM THE WESTERN PACIFIC

JOHN E. RANDALL



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1525 Bernice Street
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Review of the Sandperches of the *Parapercis cylindrica* Complex (Perciformes: Pinguipedidae), with Description of Two New Species from the Western Pacific

JOHN E. RANDALL (Senior Ichthyologist Emeritus, Bishop Museum, 1525 Bernice St., Honolulu, Hawai'i 96817-2704, USA; email: jackr@hi.net)

ABSTRACT. The following five species of the Indo-Pacific pinguipedid genus *Parapercis* constitute the *cylindrica* complex: *P. cylindrica* (Bloch), *P. australis*, n. sp., *P. haackei* (Steindachner), *P. lineopunctata*, n. sp., and *P. snyderi* Jordan and Starcks. *Parapercis australis* consists of two populations, one from the Great Barrier Reef to Lord Howe Island with 48–55 lateral-line scales, and the other from New Caledonia, Fiji, and Tonga with 52–59 scales (by contrast the very similar *P. cylindrica* has 44-50 scales). *Parapercis australis* differs further from *cylindrica* in less body depth, 20.5–22.6% SL compared to 23.0–25.0% for *cylindrica*, longer caudal fin, 22.9–24.0% SL compared to 20.3-22.8% for *cylindrica. Parapercis lineopunctata* from the Philippines to the Great Barrier Reef and Coral Sea is closest to the western Pacific *snyderi* (both differ from the other three species by having 8 instead of 10 canine teeth at the front of the lower jaw); *P. lineopunctata* has 45–51 lateral-line scales (*snyderi* with 38–43), usually 15 pectoral rays (*snyderi* with 14), and a common color pattern of longitudinal lines of dark dots (*snyderi* typically has five U-shaped dark marks on the back). *Parapercis haackei* from South and Western Australia is unique in having scales in the interorbital space. Illustrations are provided for all species.

INTRODUCTION

The family Pinguipedidae (also known in the older literature as Parapercidae and Mugiloididae) consists of four genera, only one of which, *Parapercis* Bleeker, contains marine fishes in the Indo-Pacific region. These species are generally found on sedimentary or rubble substrata, often near coral reefs. They are usually seen at rest on the bottom, propped on their pelvic fins, but they often move short distances as they forage for food—chiefly small benthic crustaceans. Several authors have noted the sexual dichromatism of species of the genus, and protogynous hermaphroditism has been demonstrated for some (Randall, 1984; Nakazono *et al*., 1985; Clark *et al*., 1991; Donaldson, MS); it may be expected for all species.

Cantwell (1964) revised *Parapercis*, recognizing 27 species. Randall (1984) briefly reviewed the genus and described two new species, bringing the total to 40. Randall & Francis (1993) described *P. colemani* from Norfolk Island, thus raising the species count to 43.

Within the genus *Parapercis* there is a complex of five species that have a prominent pointed spine at the upper edge of the subopercle, 8 or 10 teeth in the outer row at the front of the lower jaw, palatine teeth, ctenoid scales on the cheek, and 4–6 predorsal scales. This group is here designated the *cylindrica* complex for the first named and best known species, *P. cylindrica* (Bloch). The others are *P. haackei* (Steindachner), *P. snyderi* Jordan & Starks, and two new species long in need of scientific names; these are described below and differentiated from the others of the complex.

MATERIALS AND METHODS

Specimens of *Parapercis* were examined from the following institutions: Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM); and California Academy of Sciences, San Francisco (CAS, SU). Type specimens were deposited in these museums, as well as the Museum National d'Histoire Naturelle, Paris (MNHN); National Science Museum, Tokyo (NSMT), and the U.S. National Museum of Natural History, Washington, D.C. (USNM).

Lengths of specimens are given as standard length (SL), the distance from the front of the upper lip to the base of the caudal fin (posterior end of the hypural plate). Body depth is measured vertically from the origin of the anal fin. Head length is measured from the front of the upper lip to the posterior end of the opercular membrane, and snout length from the same anterior point to the fleshy edge of the orbit. Orbit diameter is the greatest fleshy diameter, and interorbital width the least fleshy width. Upper-jaw length is taken from the front of the upper lip to the fleshy end of the maxilla. Dorsal and anal spines and soft rays are measured from the point they depart from the contour of the body (not to their extreme bases for which X-rays or dissection would be needed).

Counts of lateral-line scales are made to the base of the caudal fin, hence do not include two or three pored scales on the anterior edge of the fin.

In the description of the new species, data in parentheses apply to paratypes. In reference to dark color markings, bars imply vertical bands, and stripes horizontal ones. Proportional measurements in the text are rounded to the neared 0.05.

***Parapercis cylindrica* (Bloch)** Fig. 1, Table 1

Sciaena cylindrica Bloch, 1792: 42, pl. 299, fig. 1 (no locality).
Chilias synaphodesmus Fowler, 1946: 211, 213, fig. 170 (type locality, Ryukyu Islands).
Parapercis sp. 2 Kuiter, 1992: 208, fig. B (Flores).

Diagnosis: Dorsal rays V,21; anal rays I,17; pectoral rays 14–16 (rarely 14 or 16); lateral-line scales 44–50; gill rakers 2–3 + 6–8; predorsal scales 5–6; scales on cheek ctenoid, in 7–8 horizontal rows;10 canine teeth at front of lower jaw, the most posterior large and recurved; teeth on vomer in a semicircular patch; palatine teeth present; a prominent sharp spine at upper edge of subopercle; posterior edge of preopercle often irregular to finely serrate; edge of subopercle and upper edge of interopercle sometimes finely serrate, especially in large adults; body depth 4.0–4.35 in SL (23.0–25.0% SL); middle dorsal spine longest, 8.7–10.2% SL; membrane from last dorsal spine joined near base of first soft ray; caudal fin slightly rounded, 20.3–22.8% SL; whitish with a series of ten quadrangular dark brown blotches along back, progressively shorter posteriorly, each with a darker brown spot at upper corners that merge with small black spots at base of dorsal rays; first five blotches joined basally by a wavy dark brown stripe, its upper parts touching lateral line; ten dark brown bars on lower part of body, broadest in the middle, linked in the broad upper part by two horizontal series of dark brown blotches; narrow upper end of each dark bar joining corresponding lower part of above-mentioned wavy stripe, thus isolating a series of ten large roundish pale spots which may contain dark brown blotches or small dark spots; a narrow dark brown bar below middle of eye, and sometimes a second less distinct one below front of eye; a dark line from upper lip to eye; a median brown band on upper lip, edged in dark brown; a large black spot basally on dorsal fin between spines

Table l. Lateral-line Scales of Species of *Parapercis*

	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
australis																						
-Grt Barr. Reef											2	3	7	9	11	10	3	2				
-New Caled.															1	1	3	2	2			
-Fiji – Tonga															1	1	4	3	2	2	1	2
cylindrica							4	9	13	15	8	3	3									
lineopunctata								1	3	2	4	8	6	1								
snyderi	2	2	6	7	6	1																

II and V; caudal fin usually yellow or yellowish with numerous very small black spots, a narrow white posterior margin and black submarginal line. Males often with a dark spot of side of upper lip (spot found in one female). Largest specimen examined, 99 mm SL.

Remarks: Cantwell (1964: 262) placed *Bodianus sebae* Bloch and Schneider, 1801 in the synonymy of *Parapercis cylindrica*. Bloch and Schneider based their name *sebae* on Seba's illustration (Seba, 1759: pl. 27, fig. 16) of *Perca oblonga*; however, this figure is not *cylindrica* but *Parapercis tetracanthus* (Lacepède, 1800).

As noted by Paepke (1999: 102), the holotype *Sciaena cylindrica* Bloch, ZMB 514, 66 mm SL, is in the Museum für Naturkunde der Humboldt-Universität in Berlin. He gave the type locality as Indian Ocean, but Bloch wrote that the locality of his specimen of *cylindrica* was not known. Furthermore, I am not aware of any valid Indian Ocean records. Burgess and Axelrod (1973: figs. 277, 278) reported *P. cylindrica* from the Maldive Islands, but their illustrations are *P. hexophtalma* (Cuvier). Eichler and Myers (1997) and Myers (1999) included the Maldives in the distribution of *P. cylindrica*, but these records are in error (R.F. Myers, pers. comm.). *Parapercis cylindrica* ranges from Ryukyu Islands to Indonesia, east to Palau and Yap. It is usually seen around shallow silty reefs or in sparse seagrass.

Schultz *in* Schultz and collaborators (1960: 272) recorded one specimen of *Parapercis cylindrica* from Rongelap Atoll and one from Bikini Atoll in the Marshall Islands for which he gave the counts of 54 or 55 lateral-line scales to the base of the caudal fin. These counts are higher than the present range for the species. More specimens are needed from this archipelago, as well as knowledge of the life color, before they can be conclusively identified as *P. cylindrica*.

Examination of the gonads of Bishop Museum specimens of *Parapercis cylindrica* revealed no small males and no large females, indicating the probability of protogynous hermaphroditism.

Material Examined: RYUKYU ISLANDS: Okinawa, BPBM 19074, 83 mm. Ishigaki, BPBM 7396, 2: 82–85 mm. PHILIPPINES: Cebu, CAS 45952, 7: 88–99 mm; Mactan Island, BPBM 22119, 7: 48–93 mm. Iloilo, SU 27132, 71 mm. Negros, SU 26499, 8: 45–93 mm. Mindanao, CAS 30519, 68 mm. Sulu Province, Sitkankai Island, SU 26498, 4: 86–97 mm. MALAYSIA(Borneo): Sabah, Darvel Bay, CAS 35193, 3: 46–53 mm. INDONESIA: Irian Jaya, Biak, BPBM 34238, 54 mm. Waigiu, SU 28072, 39 mm. Sulawesi, BPBM 26778, 3: 67–95 mm. Bali, BPBM 20929, 4: 47.5–91 mm; BPBM 32264, 3: 63–85 mm. Lombok, BPBM 29802, 94 mm. Komodo, BPBM 31544, 71 mm; BPBM 32395, 55 mm. Flores, BPBM 32090, 80 mm. PALAU: Koror, CAS 214513, 67.5 mm. Urukthapel, CAS 214512, 80 mm. Ngarvangl Atoll, BPBM 7228, 87 mm. CAROLINE ISLANDS: Yap, CAS 214511, 8: 57–82 mm; CAS 214514, 3: 44.5–55 mm.

***Parapercis australis*, new species** Figs. 2–5, Tables 1, 2

Parapercis cylindrica (non Bloch) Kuiter, 1992: 207, fig. (Moreton Bay, Queensland); Kuiter, 1993: 315, middle fig. (New South Wales).

Holotype: BPBM 14484, female, 84.8 mm, AUSTRALIA, Queensland, Great Barrier Reef, Capricorn Group, One Tree Island, rubble and sand bottom next to lagoon patch reef, 3 m, spear, J.E. Randall, 14 January 1973.

Paratypes: MNHN 2002-001, 2: 52.5–53.0 mm, AUSTRALIA, Queensland, Great Barrier Reef, Capricorn Group, Heron Island, northwest side, foreslope of reef crest, R.H. Snider, 7 October 1964 (formerly BPBM 10820); NSMT-P 63010, 2: 39.4–41.3 mm, Great Barrier Reef, Capricorn Group, Heron Island, shallow lagoon, rotenone, R.H. Snider, 7 October 1964; USNM 367373, 4: 24.2–51.1 mm, same locality, rotenone, R.H. Snider, 9 October 1964; CAS 13725, 13: 36–92 mm, Great Barrier Reef, Capricorn Group, One Tree Island, lagoon patch reef to 6 m, rotenone, F.H. Talbot, B.B. Collette, and W.N. Eschmeyer, 20 November 1969; CAS 13851, 4: 30–73 mm, One Tree Island, C transect outside lagoon, 6 m, rotenone, B.B. Collette, F.H. Talbot, and W.N. Eschmeyer, 26 November 1969; BPBM 38942, 5: 34.6–83.7 mm, same locality as holotype, spear and rotenone, J. E. Randall, 14 January 1973; BPBM 14910, 2: 72.0–73.4 mm, Lord Howe Island, lagoon off Dawson's Point, spear, J.E. Randall, 23 February 1973; AMS I.21343–040, 22: 21.5–77.0 mm, Queensland, Great Barrier Reef, Lizard Island, east edge of Palfrey Island (14°42'S, 145°27'E), 1–2 m, D.F. Hoese and party, 25 January 1975; AMS I.18755–074, 4: 29.5–78.5 mm, Lizard Island, south of Palfrey Island (14°41'S, 145°27'E), 4–8 m, rotenone, Australian Museum party, 2 November 1975; AMS I.18740-010, 67.5 mm, Queensland, Great Barrier Reef, Yonge Reef (14°36'S, 145°36'E), lagoon side, 9–12 m, rotenone, D.F. Hoese *et al*., 8 November 1975; AMS I.19461-026, 65.3 mm, Decapolis Reef (14°51'S, 145°17'E), 2–4 m, no collector listed, 14 November 1975; AMS I.20780-035, 9: 33.0–73.2 mm, Nymph Island (14°39'S, 145°15'E), 0–1 m, rotenone, D.F. Hoese and H.K. Larson, 7 December 1978.

Nontype Material: SU 24852, 2: 48–65 mm, FIJI, Ovalau, no further data; BPBM 28663, 5: 34–80 mm, NEW CALEDONIA, Ile aux Canards, coral and sand, 3–5 m, rotenone, R. Lubbock and P. Fourmanoir, 18 March 1975; BPBM 11382, 88.7 mm, FIJI, Viti Levu, Rat-tail Pass (first pass west of entrance to Suva Harbor), 2–6 m, rotenone, J.E. Randall, R.D. Randall, M. Gawel, O. McCausland, D. Owens, and L. Craighead, 7 August 1971; BPBM 37915, 7: 43–99 mm, TONGA, Tongatapu, Nuku'alofa, reef flat to base of reef front, 1–13 m, spear, J.E. Randall, 19–24 February 1983; BPBM 38212, 66 mm, Vava'u, causeway between Vava'u Island and Kolua Island, east side, embayment isolated at low tide, silty sand and rubble, with some rock and algae, 0–0.5 m, rotenone, J.E. Randall, K. Okamoto, and N. Manu, 17 March 1983; BPBM 33768, 90 mm, CORAL SEA, Chesterfield Bank, south end of lagoon, patch reef and sand, 2–4 m, rotenone, M.L. Kulbicki, J.E. Randall, P.J. Doherty *et al*., 29 August 1988.

Diagnosis: Dorsal rays V,20–21 (rarely 20); anal rays I,17; pectoral rays 14–16 (rarely 14 or 16); lateral-line scales 48–59; gill rakers 3–4 + 6–8; predorsal scales 5–6; scales on cheek ctenoid; 10 canine teeth at front of lower jaw; vomerine teeth in a broad chevron pattern; palatine teeth present; a prominent sharp spine at upper edge of subopercle; posterior edge of preopercle sometimes slightly irregular or partially finally serrate; body depth 4.35–4.9 in SL (20.5–23.0% SL); middle dorsal spine longest, 9.5–10.6% SL; membrane from last dorsal spine joined to base of first soft ray; caudal fin slightly rounded, 22.9–24.0% SL; color pattern essentially like *Parapercis cylindrica* except caudal fin not yellow. Largest specimen examined, 92 mm SL.

Description: Dorsal rays VI,21 (20–21, rarely 20); anal rays I,17; all dorsal and anal rays branched, the last to base; pectoral rays 15 (two of 33 paratypes with 16, and one with 14), the upper two rays unbranched; pelvic rays I,5; principal caudal rays 15, the median 13 branched; upper procurrent cau-

Table 2. Proportional Measurements of Type Specimens of *Parapercis australis* Expressed as Percentages of the Standard Length

	Holotype	Paratypes						
	BPBM 14484	BPBM 38942	BPBM 38942	BPBM 38942	BPBM 38942	BPBM 14910	BPBM 14910	BPBM 38942
Sex	female	?	female	intersex	male	female	female	male
Standard length (mm)	84.8	34.6	55.2	65.9	69.8	72.0	73.4	83.7
Body depth	22.3	21.7	21.7	21.4	22.9	22.8	23.0	22.6
Body width	15.4	15.9	15.5	15.9	15.8	15.2	16.0	15.4
Head length	29.5	30.2	29.4	30.4	28.7	28.8	28.6	28.5
Snout length	10.5	10.1	10.7	10.7	10.5	10.1	10.8	10.2
Orbit diameter	7.8	8.9	8.7	7.8	7.9	7.0	7.4	7.3
Interorbital width	3.5	3.9	3.7	3.2	3.8	3.7	3.6	3.5
Upper-jaw length	11.8	11.5	11.0	10.7	11.5	11.1	10.6	11.8
Caudal-peduncle depth	9.8	11.0	10.7	10.5	9.8	10.4	10.8	9.7
Caudal-peduncle length	8.4	8.5	8.6	8.1	8.6	8.3	8.2	8.2
Predorsal length	29.2	29.4	28.2	28.9	28.0	28.3	28.5	27.4
Preanal length	48.3	49.0	49.3	49.1	48.5	48.8	48.2	47.4
Prepelvic length	28.4	29.6	29.8	28.7	30.1	28.0	27.7	27.5
Dorsal-fin base	65.1	62.5	62.6	64.5	64.0	64.7	65.2	65.7
First dorsal spine	7.1	7.2	7.2	7.3	7.2	7.0	6.6	6.8
Longest dorsal spine	10.0	9.5	10.4	10.6	10.3	broken	9.5	10.2
Fifth dorsal spine	6.0	5.5	5.1	6.0	5.1	5.1	5.3	5.9
Longest dorsal ray	17.1	15.0	15.7	15.5	15.8	15.0	15.8	16.0
Anal-fin base	43.8	43.7	44.3	44.2	43.0	45.0	44.6	44.4
Anal-fin spine	6.8	5.9	5.8	7.0	6.8	6.9	5.7	6.8
Longest anal ray	16.5	13.0	14.0	15.2	15.8	13.9	14.2	16.5
Caudal-fin length	23.8	23.4	23.8	24.0	23.3	23.6	22.9	22.7
Pectoral-fin length	21.6	20.8	21.7	22.1	22.8	22.0	21.9	22.5
Pelvic-spine length	10.3	11.1	11.0	11.3	10.7	10.3	10.5	9.9
Pelvic-fin length	30.9	31.7	32.2	31.9	30.1	29.3	30.8	31.1

dal rays 8, the most posterior segmented; lower procurrent caudal rays 7, the most posterior segmented; lateral-line scales 52 (plus 3 on caudal-fin base) (48–59); scales above lateral line to origin of dorsal fin 5, to base of anterior soft rays of dorsal fin 3.5; scales below lateral line in a vertical row to origin of anal fin 15; circumpeduncular scales 25; predorsal scales 5; horizontal rows of scales on cheek 7; gill rakers 3 + 8 (3–4 + 6–8); branchiostegal rays 6; pseudobranchial filaments of holotype 11; vertebrae 9 + 21.

Body depth 4.5 (4.35–4.7) in SL; body little compressed, the greatest width 1.45 (1.35–1.5) in body depth; head length 3.4 (3.3–3.5) in SL; snout pointed, its length 2.8 (2.65–3.0) in head length; orbit diameter 3.8 (3.4–4.1) in head; eyes oriented as much dorsally as laterally, the interorbital space narrow, 7.15 (7.05–7.95) in head; caudal-peduncle depth 3.2 (2.75–3.05) in head; caudal-peduncle length 3.55 (3.35–3.75) in head.

Mouth slightly oblique and terminal or with the lower jaw slightly projecting; upper jaw extending to or slightly posterior to a vertical at front edge of orbit, the upper-jaw length 2.5 (2.4–2.85) in head; front of upper jaw with 8 incurved canine teeth, followed by a distinct gap and a large recurved canine; a broad band of villiform teeth immediately behind anterior canines, narrowing to a single row of slender conical teeth along posterior half of jaw; front of lower jaw with 10 canine teeth, the fifth on each side a large recurved canine; a second recurved canine about half as large about half way back in jaw; a very broad band of villiform teeth immediately behind anterior

Fig. 1. *Parapercis cylindrica*, BPBM 22119, 67 mm, Mactan Island, Cebu, Philippines.

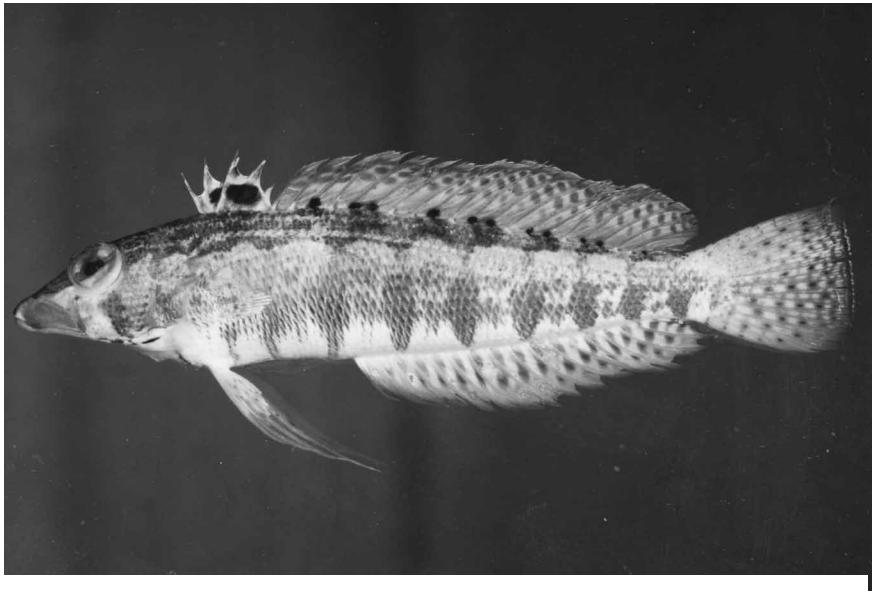

Fig. 2. Holotype of *Parapercis australis*, BPBM 14484, 84.8 mm, One Tree Island, Capricorn Group, Great Barrier Reef.

Fig. 3. Underwater photograph of *Parapercis australis*, Brookfield Reef, Capricorn Group, Great Barrier Reef.

Fig. 4. Underwater photograph of *Parapercis australis*, New Caledonia.

canines, narrowing to a single row of slender conical teeth along posterior half of jaw; small conical teeth in two irregular rows on vomer in a broad chevron-shaped patch; a few small teeth anteriorly on palatines. Inner surface of lips with ridges of fleshy papillae. Tongue narrowly triangular with a rounded tip.

Gill membranes united, not attached to isthmus, with a broad free fold across. Gill rakers short, less than one-third length of longest gill filaments on first gill arch. Anterior nostril a small membranous tube with a posterior flap in front of center of eye about half way to base of upper lip; posterior nostril a simple aperture dorsoposterior to anterior nostril, the internarial distance about half pupil diameter.

Opercle with a strong spine, angling slightly upward, on line between lower edge of eye and upper edge of pectoral-fin base; upper edge of subopercle with a strong spine, also angling slightly upward, at level of lower edge of pectoral-fin base, continuing as a ridge across upper edge; preopercle broadly rounded, its posterior margin finely serrate (smooth to irregular or finely serrate in paratypes); opercular membrane broadest ventrally where it joins branchiostegal membrane.

Lateral line continuous, approximately following contour of back; lateralis system of head well developed; scales ctenoid, those on side of body with about 35–40 cteni; scales on opercle and preopercle ctenoid, those on cheek extending to below anterior edge of orbit; no scales on dorsal, anal, or pelvic fins; small scales on about basal fourth of pectoral fins; very small scales extending about four-fifths length of caudal fin.

Origin of dorsal fin above posterior end of opercular flap, the predorsal length 3.4 (3.4–3.65) in SL; first dorsal spine 4.15 (4.0–4.35) in head; third dorsal spine longest (but fourth nearly as long), 2.95 (2.8–3.2) in head; fifth dorsal spine 4.9 (4.85–5.65) in head; membrane from fifth dorsal spine attached nearly to base of first soft dorsal ray; longest dorsal soft ray 1.75 (1.8–2.0) in head; origin of anal fin below base of fifth dorsal soft ray, the preanal length 2.05 (2.05–2.1) in SL; anal-fin spine very slender and closely applied to first soft ray, 4.35 (4.2–5.2) in head; longest anal soft ray 1.8 (1.75–2.3) in head; caudal fin truncate to slightly rounded, the upper corner angular, the lower broadly rounded, its length 4.2 (4.15–4.4) in SL; pectoral fins rounded, the middle rays longest, 4.65 (4.45–4.8) in standard length; origin of pelvic fins below upper base of pectoral fins, the prepelvic length 3.5 (3.3–3.65) in SL; pelvic spine very slender and closely applied to first soft ray, its length 2.85 (2.65–2.9) in head; fourth pelvic soft ray longest, reaching well beyond origin of anal fin, 3.25 (3.1–3.4) in SL.

Color in alcohol of holotype: ten quadrangular dark brown blotches along back, progressively shorter posteriorly, the upper corners of each in contact with a small black spot at base of a dorsal soft ray (except three blotches with only a single black spot above); first five blotches joined basally by a wavy dark brown stripe along anterior part of lateral line; ten spindle-shaped dark brown bars on lower part of body, with an irregular brown blotch joining each pair of bars at widest place; a series of large roundish pale brown spots, one between upper narrow part of each pair of dark bars; ventral part of body whitish, crossed by narrowing lower part of each dark bar, reaching or nearly reaching midventral line; head brown with a triangular whitish bar on cheek, its apical end below anterior edge of pupil, followed by a dark brown bar; a dark-edged narrow pale band from eye, enclosing anterior nostril and continuing less pale across upper lip; side of upper lip brown except anteriorly at edge of band across lip; front and side of upper lip with an elongate brown spot; interopercle with a dark brown dot anteriorly, followed by a broad dark brown mark, two dots (one above the other) and a long dash (these markings black in life); a large elliptical black spot near base of dorsal fin between spines II and V; outer half of soft portion of dorsal fin with rows of dark brown spots, those in outer row of anterior half of fin joined to form a stripe; anterior half of anal fin with two rows of vertically elongate dark brown spots on membranes, each spot in second row on an adjacent membrane, and tending to join spot of basal row to form a short bar; posterior half of fin with an outer third row of dark spots; caudal fin pale with numerous dark brown dots and a black submarginal line; paired fins pale.

Color when fresh (Fig. 3) nearly the same as in preservative; the only difference of significance was the darker markings when fresh. Because the species is not colorful, only a black and white photograph is shown.

Etymology: This species is named *australis* from the Latin for southern, in reference to its localities, all south of 14° south latitude.

Remarks: *Parapercis australis* has been identified in museum collections as *P. cylindrica*. The only obvious difference in color is the yellow to yellowish caudal fin of the latter in life. The markings are usually darker on Indonesian and Philippine specimens, but it was assumed that these were from the generally darker substratum of the large East Indian islands compared to the coral reefs of the southern localities. The taking of meristic data of species of *Parapercis* for a book on South Pacific fishes led to the discovery of a significant difference in the number of lateral-line scales (Table 1), the lowest counts being those of East Indian specimens. Attempts to correlate this difference with color characters in preserved specimens were not successful. When a difference was found, it could not be maintained with the examination of additional specimens. Two measurement characters, however, provide complete, though close, separation. The body depth of 14 adult specimens of *australis* measures 20.5–22.6% SL ($\bar{x}$ = 21.8%), compared to 23.0–25.0 % SL ($\bar{x}$ = 23.8%) for *cylindrica*. The caudal fin is longer in the specimens of *australis*, 22.9–24.0% SL, compared to 20.3–22.8% for *cylindrica*. Also, the longest dorsal spine is generally longer in *australis*, 9.5–10.6% SL, compared to 8.65–10.2% for *cylindrica*, and the patch of vomerine teeth are in a broad chevron shape instead of broadly semicircular as in *cylindrica*.

As noted in Table 1, the specimens of *Parapercis australis* from New Caledonia, Fiji, and Tonga have notably higher, though overlapping, lateral-line scale counts than the Great Barrier Reef (and Lord Howe Island) specimens. More material should be obtained before concluding whether these specimens to the east represent a different species. They are here identified as *P. australis*, but not designated as paratypes. The counts of New Caledonia specimens suggest a possible cline across the southwestern Pacific. Only one specimen from the Chesterfield Bank in the middle of the Coral Sea (BPBM 33768, 90 mm SL) is available. It has 53 lateral-line scales (not included in Table 1). If this proved to be a modal count, the concept of a cline would be strengthened.

The gonad of one of the paratypes, BPBM 38942, 65.9 mm, consisted of both testicular and regressing ovarian tissue, thus indicating protogynous hermaphroditism for this species, along with the consistent larger size of males.

Parapercis haackei (**Steindachner**) Fig. 6

Percis haackei Steindachner, 1884: 1070 (type locality, St. Vincent's Gulf, South Australia).

Diagnosis: Dorsal rays V,21–22 (rarely 21); anal rays I,17–18 (rarely 17); pectoral rays 13–15; lateral-line scales 47–53; gill rakers about 3 + 8; 3–4 predorsal scales, ending in a median naked area on nape; rest of nape scaled, the scales extending into posterior interorbital space and continuing in a single row to front of interorbital; scales on nape and cheek ctenoid;10 canine teeth at front of lower jaw; palatine teeth present; a prominent sharp spine at upper edge of subopercle; vertical edge of preopercle serrate to irregular; body depth 4.45–5.35 in SL (18.7–22.6% SL); middle dorsal spine longest, 7.05–8.9% SL; caudal fin truncate to slightly rounded, 19.2–21.3% SL; membrane from last dorsal spine joined to base of first soft ray; whitish with a straight to wavy black stripe from behind eye to upper base of caudal fin (stripe may be broken into blotches, especially on head); a series of ten dark bars on ventral half of body; a broad median brown band on upper lip

Fig. 5. *Parapercis australis*, BPBM 11382, 88.7 mm, Viti Levu, Fiji.

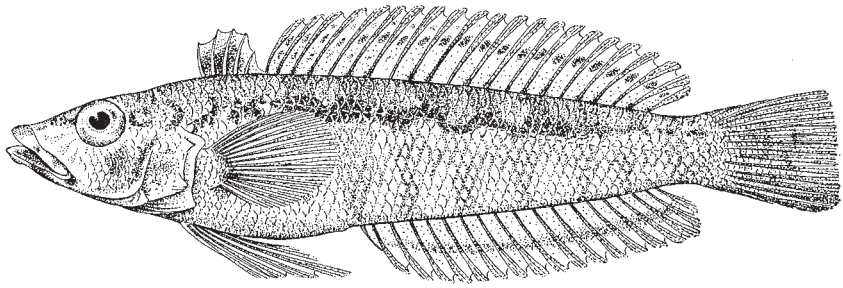

Fig. 6. *Parapercis haackei*, Investigator Strait, South Australia (after McCulloch, 1914).

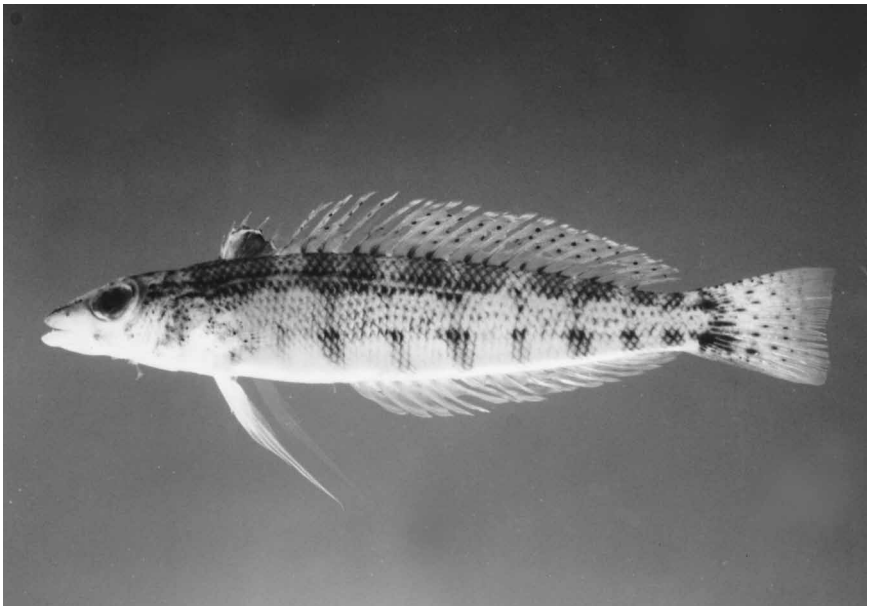

Fig. 7. Holotype of *Parapercis lineopunctata*, BPBM 36841, 57.8 mm, Bolinao, Luzon, Philippines.

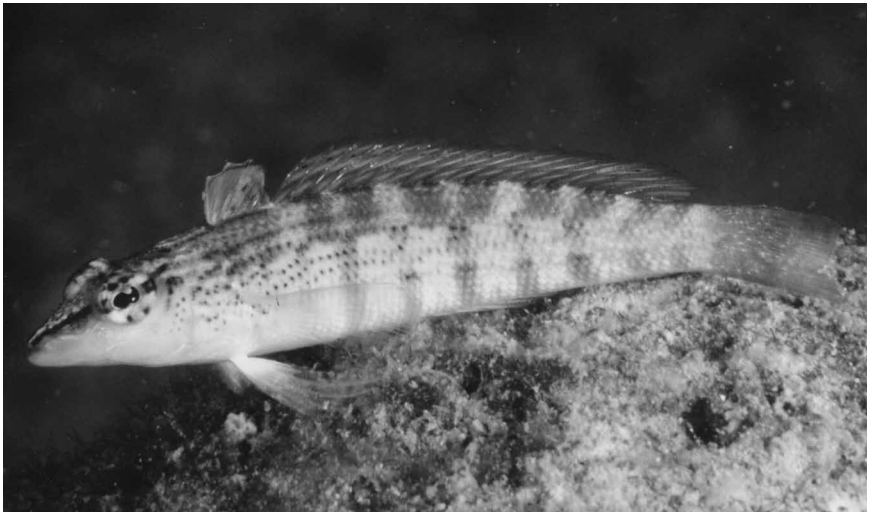

Fig. 8. Underwater photograph of *Parapercis lineopunctata*, Lion Island, Papua New Guinea.

and two spots on side of lip; a long dark brown streak on side of lower lip; a large black spot basally in dorsal fin between spines II and V; soft portion of dorsal fin pale a small blackish spot at base of most rays and one or two outer rows of small black spots on membranes; anal fin pale with a row of faint blackish spots at base of most rays and a middle row of small dark spots; caudal fin pale with a dusky lower margin Reported to 10 cm.

Remarks: As noted by Cantwell (1964: 262), this is the only species of the genus with a scaled interorbital. Gomon *et al*. (1994: 713) gave the distribution as St. Vincent Gulf, South Australia to Shark Bay, Western Australia. They added that it is a small territorial fish found in protected sandy and muddy areas near reefs and rocky outcrops from the shallows to depths of just over 35 m.

Material Examined: WESTERN AUSTRALIA: Dirk Hartog Island (26° 8'S, 113° 10'E), WAM P.26650-001, 72 mm. Mouth of Murchison River (27° 30'S, 114° 25'E), WAM P.27960-020, 6: 16–63 mm. Port Gregory (28° 12'S, 114° 15'E), WAM P.28427-006, 4: 27–65 mm; WAM P.28428-020, 4: 52–76 mm. Abrolhos Islands, Long Island (28° 29'S, 113° 46'E), WAM P.27589-007, 11: 37–60 mm. Dongarra (29° 15'S, 114° 56'E), WAM P.2507-001, 47 mm. Port Denison (29° 16'S, 114° 55'E), WAM P.27955-020, 4: 40–65 mm. Jurien Bay, Osprey Islet (30°18'S, 115°E), WAM P.2795-021, 5: 22–53 mm. Perth, Point Peron (32° 16'S, 115°40'E), AMS I.20227-005, 82 mm. Rottnest Island (32° 1'S, 115° 27'E), AMS I.20239-022, 62 mm; WAM P.25725-010, 4: 58–83.5 mm. Bunelton (33° 39'S, 115° 21'E), WAM P.28521-010, 10: 22–79 mm. Albany (35° S, 117° 52'E), WAM P.1224-001, 79 mm. Récherchés Archipelago (34° 29'S, 122° 27'E), WAM P.2602-001, 46 mm.

***Parapercis lineopunctata*, new species** Figs. 7–8; Tables 1, 3

Parapercis sp. 1 Kuiter, 1992: 208, fig. A (Lizard Island, Great Barrier Reef).

Holotype: BPBM 36841, female, 57.8 mm SL, PHILIPPINES, Luzon, Bolinao, small corals on silty sand, 5–7 m, rotenone, P.C. Heemstra, D.A. Hensley, and J.K. Dooley, 9 October 1995.

Paratypes: SU 27131, 60.5 mm, PHILIPPINES, Cebu, no additional collecting data; USNM 367374, 63.2 mm, AUSTRALIA, Queensland, Great Barrier Reef, Capricorn Group, one Tree Island, sand and rubble next to lagoon patch reef, 3 m, rotenone, J.E. Randall, 14 January 1973; AMS I.19450-025, 20: 9.5–57.0 mm, Great Barrier Reef, Lizard Island (14°40'S, 145°27'E), Watson's Bay, 15 m, Lizard Island team, 10 November 1975; AMS I.34953-001, 3: 39.0–59.0 mm, Great Barrier Reef, Lizard Island, Watson's Bay, off Chinaman's Ridge, 7–13 m, baited trap, J.K. Lowry and R.T. Springthorpe, 15 February 1987; BPBM 32331, 59.9 mm, INDONESIA, Molucca Islands, Ambon, Ambon Bay, southeast side off Batuanyut Point, reef and sand, 20 m, spear, J.E. Randall, 4 October 1987: MNHN 2002-002, 76.0 mm and NSMT-P 63011, 72.5 mm, same data as preceding; BPBM 32435, 3: 47.6–74.1 mm, Papua New Guinea, reef south of Loloata Island, 13 m, spear, J.E. Randall, 27 October 1987; BPBM 33591, 75.9 mm, CORAL SEA, Chesterfield Bank, southeast corner, lagoon, small patch reef and sand (19°53.5'S, 158°28.1'E), 14–15 m, rotenone, J.E. Randall, M.L. Kulbicki, P.J. Doherty, *et al*., 21 August 1988; BPBM 33694, 72.0 mm, CORAL SEA, Chesterfield Bank, southeast end of lagoon, small coral heads and sand patches, 27–28 m, spear, J.-L Menou and J.E. Randall, 27 August 1988; AMS I.29654-001, 2: 32.0–37.5 mm, Great Barrier Reef, Lizard Island, Watson's Bay, off Chinaman's Ridge, 14.5 m, baited traps, S. Keable and J.K. Lowry, 18 January 1989; BPBM 36239, 33.5 mm, PAPUA NEW GUINEA, D'Entrecasteaux Islands, Normanby Island, Gippiwalla Point, isolated rock and sand (9°42'12"S, 150°45'12"E), 6 m, hand net, J.L. Earle, 12 December 1993; BPBM 37635, 2: 63.3–71.5 mm, INDONESIA, Sumatra, off Padang, Pulau Ular (1°7.2'S, 100°21.35'E), rubble bottom, 13 m, spear, J.E. Randall, 18 February 1997.

Diagnosis: Dorsal rays V,21; anal rays I,17; pectoral rays 14–16 (rarely 14 or 16); lateral-line scales 45–51; 4 predorsal scales; scales on cheek ctenoid, in 5 or 6 horizontal rows; gill rakers 3–4 + 8–10; 8 canine teeth at front of lower jaw; palatine teeth present; a promi-

Table 3. Proportional Measurements of Type Specimens of *Parapercis lineopunctata* Expressed as Percentages of the Standard Length

	Holotype	Paratypes						
	BPBM 36841	BPBM 36239	BPBM 32435	BPBM 32331	BPBM 37635	BPBM 32435	BPBM 33604	BPBM 33591
Sex	female	female	female	female	female	male	male	female
Standard length (mm)	57.8	33.5	47.6	59.9	63.3	72.0	74.1	75.9
Body depth	19.4	19.7	20.9	20.6	20.2	19.5	21.2	21.4
Body width	15.4	16.3	16.5	15.9	15.2	15.5	15.9	15.5
Head length	27.8	27.6	29.2	28.1	29.5	28.2	28.4	28.3
Snout length	9.1	9.0	9.3	9.4	10.5	10.7	10.7	10.0
Orbit diameter	8.4	8.5	8.4	8.0	8.1	7.6	7.5	6.9
Interorbital width	3.9	3.6	4.1	3.8	3.7	3.8	4.0	3.9
Upper-jaw length	10.7	10.8	10.9	10.5	11.1	11.3	11.4	10.9
Caudal-peduncle depth	9.0	8.9	10.4	10.0	9.6	9.7	10.2	9.9
Caudal-peduncle length	8.2	8.1	8.4	8.5	8.0	8.7	8.1	8.8
Predorsal length	27.7	27.9	29.4	28.4	29.3	27.9	28.1	27.8
Preanal length	46.7	44.6	48.3	44.8	49.7	47.0	45.3	48.5
Prepelvic length	27.8	24.8	28.4	25.0	26.8	28.5	28.8	26.0
Dorsal fin base	62.7	61.5	64.5	64.3	62.3	62.8	64.2	64.4
First dorsal spine	4.7	5.5	6.3	5.8	6.1	5.9	6.8	6.6
Longest dorsal spine	8.7	9.0	10.4	8.4	8.2	9.4	10.5	9.2
Fifth dorsal spine	3.8	4.1	4.3	4.6	4.7	4.4	4.4	4.2
Longest dorsal ray	14.3	14.2	15.2	15.0	15.0	15.9	15.8	15.4
Anal-fin base	43.3	42.6	43.0	45.2	42.8	45.8	44.6	45.9
Anal-fin spine	5.8	5.9	6.2	5.5	5.8	5.4	4.8	5.2
Longest anal ray	11.9	11.5	12.8	12.9	12.6	12.5	12.4	12.5
Caudal-fin length	24.2	23.7	25.2	23.9	23.8	22.4	24.1	24.1
Pectoral-fin length	21.1	20.8	23.1	22.2	22.1	20.9	22.8	22.7
Pelvic-spine length	8.7	8.0	8.2	8.0	7.9	8.3	8.3	8.7
Pelvic-fin length	30.3	29.7	33.2	30.2	30.1	29.6	29.9	28.8

nent sharp spine at upper edge of subopercle; middle dorsal spine longest; membrane from last dorsal spine joined to base of first soft ray; pale greenish to pale yellow dorsally, white below, with a series of five broad double dark bars on back, smaller posteriorly; a series of 9 bars on lower part of body, the top of each with a short blackish dash; a black line from front of upper lip to eye, sometimes with one to three iridescent pale blue lines on snout and cheek below eye; two rows of black dots from behind eye along back to about middle of body, one row just above and the other just below lateral line; black dots on rear of cheek and lower opercle, often continuing in irregular rows anteriorly on body; first dorsal fin with a large dusky to dark brown spot at base, and usually a submarginal dark brown or red line (or combined dark brown and red).

Description: Dorsal rays V,21 (holotype aberrant in having a small slender additional spine at the front); anal rays I,17; pectoral rays 15 (three of 21 paratypes with 16, and one with 14) the upper two rays unbranched; pelvic rays I,5; principal caudal rays 15, the median 13 branched; upper procurrent caudal rays 8, the most posterior segmented; lower procurrent caudal rays 7, the most posterior segmented; lateral-line scales 50 (plus 3 on caudal-fin base) (45–51); scales above lateral line to origin

Fig. 9. *Parapercis snyder*i, BPBM 18986, 77 mm, Miyake Jima, Izu Islands, Japan.

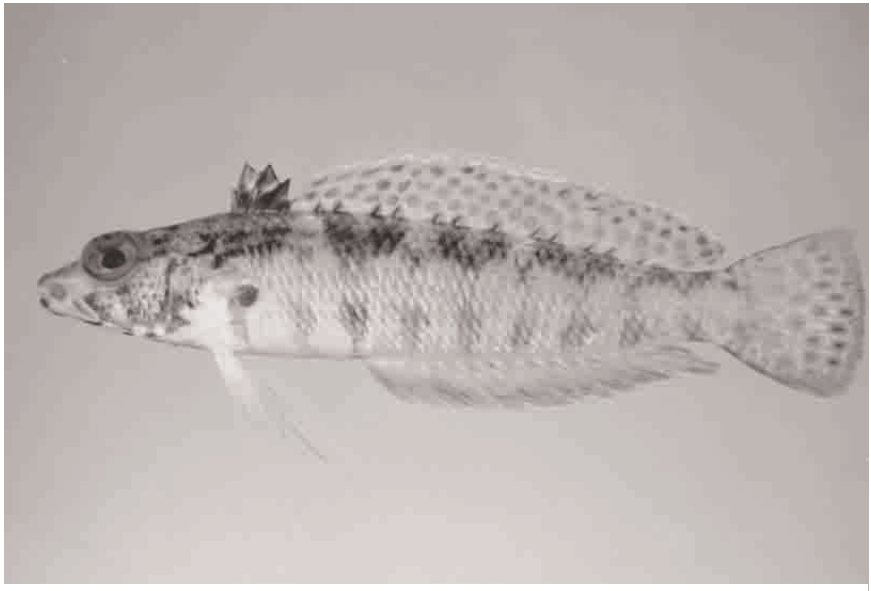

Fig. 10. *Parapercis snyderi*, BPBM 21959, 56 mm, Pulau Tioman, Malaysia.

of dorsal fin 5, to base of anterior soft rays of dorsal fin 3.5; scales below lateral line in a vertical row to origin of anal fin 13 (13–14); circumpeduncular scales 24; predorsal scales 4; horizontal rows of scales on cheek 5 (5–6); gill rakers 3 + 8 (3 –4 + 8–10); branchiostegal rays 6; pseudobranchial filaments of holotype 9; vertebrae 9 + 21.

Body depth 5.15 (4.8–5.15) in SL; body little compressed, the greatest width 1.45 (1.3–1.5) in body depth; head length 3.6 (3.4–3.6) in SL; snout pointed, its length 3.05 (2.65–3.15) in head length; orbit diameter 3.3 (3.25–4.1) in head; eyes oriented as much dorsally as laterally, the interorbital space narrow, 8.45 (7.15–9.2) in head; caudal–peduncle depth 3.0 (2.8–3.1) in head; caudal-peduncle length 3.4 (3.2–3.7) in head.

Mouth very slightly oblique and terminal or with the lower jaw slightly projecting; upper jaw extending to or slightly posterior to a vertical at front edge of orbit, the upper-jaw length 2.6 (2.6–2.8) in head; front of upper jaw with 8 incurved canine teeth with a broad inner band of villiform teeth that narrows to a single row of slender conical teeth along side of jaw; anterior canines followed by a distinct gap (though outer teeth of villiform band in gap nearly as large as front canines) and a large recurved canine; front of lower jaw with 8 canine teeth, the fourth on each side a large recurved canine; a second recurved canine about half as large about half way back in jaw; a broad band of villiform teeth immediately behind anterior canines, narrowing to a single row of slender conical teeth along posterior half of jaw; small conical teeth in two irregular rows on vomer in a broad chevron-shaped patch; a narrow band of small conical teeth on palatines. Inner surface of lips with small fleshy ridges. Tongue narrowly triangular with a rounded tip.

Gill membranes united, not attached to isthmus, with a broad free fold across. Gill rakers short, the longest about one-fourth length of longest gill filaments on first gill arch. Anterior nostril small, with a membranous posterior flap, in front of center of eye about half way to base of upper lip; posterior nostril a simple aperture with a slight rim, dorsoposterior to anterior nostril, the internarial distance about half pupil diameter.

Opercle with a strong spine, its tip slightly dorsal to upper edge of pectoral-fin base; upper edge of subopercle with a strong spine, angling slightly upward, its tip a little dorsal to lower edge of pectoral-fin base, margin of preopercle broadly rounded, its posterior margin slightly irregular; opercular membrane broadest ventrally where it joins branchiostegal membrane.

Lateral line continuous, approximately following contour of back; lateralis system of head well developed; scales ctenoid, those on side of body with about 30 cteni; scales on opercle and preopercle ctenoid, those on cheek extending to posterior end of maxilla; no scales on dorsal, anal, or pelvic fins; small scales on about basal fourth of pectoral fins; very small scales extending about three-fourths length of caudal fin.

Origin of dorsal fin above tip of opercular flap, the predorsal length 3.6 (3.4–3.6) in SL; first dorsal spine 4.65 (4.2–5.0) in head (holotype aberrant in having six dorsal spines, the first slender and short, so second spine treated here as the first); third dorsal spine longest, 3.2 (2.6–3.6) in head; fifth dorsal spine 4.8 (6.1–6.8) in head (fifth spine of holotype abnormally small); membrane from fifth dorsal spine attached nearly to base of first soft dorsal ray; longest dorsal soft ray 1.95 (1.75–1.95) in head; origin of anal fin below base of fifth dorsal soft ray, the preanal length 2.1 (2.0–2.25) in SL; anal-fin spine very slender and closely applied to first soft ray, 4.8 (4.7–5.9) in head; longest anal soft ray 2.35 (2.2–2.4) in head; caudal fin truncate, its length 4.15 (4.0–4.45) in SL; pectoral fins rounded, the middle rays longest, 4.75 (4.35–4.8) in standard length; origin of pelvic fins slightly anterior to upper base of pectoral fins, the prepelvic length 3.6 (3.5–4.0) in SL; pelvic spine very slender and closely applied to first soft ray, its length 2.85 (2.7–2.8) in head; fourth pelvic soft ray longest, reaching well beyond origin of anal fin, 3.3 (3.0–3.5) in SL.

Color of female holotype in alcohol: pale yellowish with a line of dark brown dots, one per scale, just above lateral line and another just below, continuing to middle of body; two rows of dark brown dashes and dots continuing forward from two rows of dots to eye; a series of five double brown bars along back, progressively shorter posteriorly, the first three extending to lateral line; a series of nine narrow dusky bars on lower side of body (due to dark edges of scales), the top of each with a short blackish dash; a dark brown blotch on cheek between end of maxilla and eye; scales of

opercle and preopercle to below posterior edge of pupil with dark brown centers; upper lip dusky with two parallel dark brown lines medially that continue irregularly on snout to nostrils; three median dark brown dots in interorbital, diverging to three pairs on occiput and on scaled part of nape as two dotted lines that continue, one on each side, along base of dorsal fin; spinous portion of dorsal fin mainly dark brown; soft portion of fin transparent with scattered blackish dots, some on rays, some on membranes; base of most rays blackish; anal and pelvic fins pale; caudal fin mottled blackish at base with two black spots, one above the other, the rest of fin pale with scattered dark brown dots.

Color of holotype when fresh: pale yellow, shading to white ventrally, with dark markings as above but more strongly pigmented; the dark edges of many scales no longer apparent on alcoholic specimen; spinous portion of dorsal fin brown with a brownish red margin and white submarginal line; remaining fins translucent whitish except for dark spots mentioned above, the soft portion of the dorsal fin with a white margin; anal fin with a small yellow spot at the base of each membrane; lower margin of caudal fin light red.

Thirteen underwater photos taken of different individuals of this species by the author reveal considerable color variation. Some fish have lost the double row of dark dots along the lateral line but still have irregular rows of dots anteriorly on the side of the body; the dark bars on the lower side of the body of some individuals continue upward to the lateral line; the double dark bars on the back may be heavily pigmented, the first two or three joining ventrally to form U-shaped markings as one usually sees in *Parapercis snyderi*; one to three iridescent pale blue oblique lines may be present on the snout and cheek below eye; the spinous dorsal fin often has only a large dusky spot at the base, the outer part of fin pale yellowish with a submarginal dark brown or red line or a double line of both colors.

Etymology: This species is named *Parapercis lineopunctata* from the Latin *linea* for line and *punctum* for dot, in reference to the prevalence of dotted lines on the body.

Remarks: Specimens of *Parapercis lineopunctata* have been collected or photographed by the author from the Great Barrier Reef, Lord Howe Island, Chesterfield Bank, Papua New Guinea, including the D'Entrecasteaux Islands, and Sumatra, Sulawesi, and Ambon in Indonesia. Also a specimen has been examined from Cebu, Philippines. Mary Jane Adams provided a underwater photograph of one from Florida Island in the Solomon Islands. The species is generally found in calm environments on sand or rubble near reefs; the deepest collection was from 27–28 m.

Parapercis snyderi appears to be the closest relative. That species also exhibits considerable variation in color pattern, with some phases resembling *P. lineopunctata*. The two species can most easily be separated by lateral-line scale counts, 38–43 for *snyderi* and 45–51 for *lineopunctata* (Table 1) and pectoral-ray counts (*lineopunctata* usually with 15 and *snyderi* with 14). *Parapercis snyderi* usually has a small black spot on the penultimate membrane of the anal fin about one-third distance to margin that is lacking in *lineopunctata*.

The sex of specimens of Table 3 shows the typical picture of small females and large males as expected for a protogynous hermaphrodite, except the largest specimen is a female. This fish, however, was from a collection of a single specimen. It is possible to have females of larger size than males of the same species of *Parapercis* in collections from different localities (T.J. Donaldson, pers. comm.).

***Parapercis snyderi* Jordan and Starks** Figs. 9–10; Table 1

Parapercis snyderi Jordan and Starks, 1905: 210, fig. 10 (type locality, Korea).

Diagnosis: Dorsal rays V,20–21(usually 21); anal rays I,16–18; pectoral rays 13–15 (rarely 13, usually 14); lateral-line scales 38–43; gill rakers about 2–4 + 7–10; about 4 pre-

dorsal scales; scales on cheek ctenoid, in 4 horizontal rows; 8 canine teeth at front of lower jaw; vomerine teeth in a broad chevron-shaped patch; palatine teeth present; a prominent sharp spine at upper edge of subopercle; no serrae on opercular bones; body depth 4.15–4.75 in SL (21.2–24.1% SL); middle dorsal spine longest; membrane from last dorsal spine joined near base of first soft ray; gray to reddish dorsally, white below with the edges of scales gray; a series of five broadly U-shaped dark brown bars on back, smaller posteriorly, or with a series of five double dark brown to black dashes, the anterior two with one above and one below lateral line; a series of nine spots or short bars on lower side of body that may be blackish, reddish, or dusky yellow; small dark reddish spots, one per scale, often present scattered along side of body and on cheek; an iridescent pale blue line may be present on side of snout, and one beneath eye; large dark blotches on lips; a midventral blackish spot often present on isthmus, usually with a smaller black spot to each side anteriorly; edge of chin below lower lip dusky to blackish; spinous portion of dorsal fin may be entirely black, but usually blackish with large pale yellowish blotches in outer part; soft dorsal fin with rows of black to black-edged orange spots, the base of most rays black or with black upper ends of U-shaped marks extending into base of fin; anal fin with a row of red spots at base, a red submarginal line, and a small black spot on penultimate membrane about one-third distance to margin; caudal fin with small blackish, dusky orange, or red spots, often with smaller white spots as well. Largest specimen examined, 79.5 mm SL.

Remarks: *Parapercis snyderi* is known in the western Pacific over a broad range from Korea, Japan, and Taiwan south to New Caledonia. Bishop Museum specimens have been collected from tidepools in less than 1 m to 22 m, generally on sand bottom near coral reefs or rocky outcrops. One specimen from the Timor Sea in the collection of the California Academy of Sciences was taken by a dredge in 31 m.

This species is surprising for one with so much color variation in not having any junior synonyms. The most diverse form is from the Gulf of Thailand which has the double black dashes starting on the lateral line, joined with black lines, then continuing on posterior half of body above lateral line as a series of black blotches and spots of progressively smaller size; the series of dusky yellow spots is present on the lower side of the body, each enlarged into a bar with a dusky zone below; the characteristic small black spot on the penultimate anal fin membrane is lacking in both specimens collected by the author.

Nakazono *et al*. (1985) determined the spawning season at Kyushu as May to October. Males maintain a harem of 1–4 females in their territories of about 20 square meters; pair spawning was observed at dusk. Sex change from female to male was demonstrated histologically.

Material Examined: JAPAN: Shikoku, BPBM 23041, 3: 46–79.5 mm. Izu Islands, Miyake Jima, BPBM 18986, 2: 66–77 mm. TAIWAN: BPBM 23070, 2: 53–73 mm. CHINA: Hong Kong, BPBM 18635, 3: 65–69 mm. GULF OF THAILAND: BPBM 36209, 2: 43–46 mm. MALAYSIA: Pulau Tioman, BPBM 21959, 56 mm. INDONESIA: Sulawesi, BPBM 26710, 4: 34–48 mm; BPBM 26797, 53 mm. Sumatra, BPBM 37634, 2: 41–52 mm; BPBM 37638, 2: 40–55 mm. TIMOR SEA (12°15'S, 129°13.5'E), CAS 29130, 48 mm. Ashmore Reef, CAS 56646, 50 mm. PAPUA NEW GUINEA: Madang, CAS 63658, 41 mm. NEW CALEDONIA: BPBM 27091, 2: 37–45 mm.

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