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A Review of the Fishes of the Subgenus *Goniistius*, Genus *Cheilodactylus*, with Description of a New Species from Easter Island and Rapa

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THE FISH FAMILY Cheilodactylidae, popularly known as morwongs, is primarily a Southern Hemisphere group. Australia has the largest number of species, 11. Allen and Heemstra (1976) included 9; however, they omitted *Cheilodactylus ephippium* McCulloch and Waite and the eastern Australian *C. vestitus* (Castelnau), here regarded as distinct from the western Australian *C. gibbosus* Richardson. New Zealand has 6 species (Doak 1972), but all are shared with Australia. South Africa has 5 species (Smith 1980). Three species are found on the coasts of Chile and Peru (Günther 1860, Nielsen 1963) and one off Argentina (Stehmann 1979). Only *Goniistius* Gill, regarded by most authors as a genus, has species in the Northern Hemisphere. There are 3 in Japan and China (Lindberg & Krasyukova 1969), one in Hawai'i, 4 in the South Pacific, and one off Western Australia. This group is clearly antitropical in its distribution, as pointed out by Randall (1981).

The species of *Goniistius* are distinctive in having dark brown to black bars or diagonal bands, a highly arched nape, and a very long fourth dorsal spine (nearly twice or more as long as the third). Allen and Heemstra (1976) placed the genus *Goniistius* in the synonymy of *Cheilodactylus*. Their decision is followed; *Goniistius* is here regarded as a subgenus. Were it not for *Cheilodactylus ephippium* and to a lesser extent *C. fuscus* Castelnau, which link the species of *Goniistius* to more typical cheilodactylids, *Goniistius* would clearly rate generic rank.

The author became interested in *Cheilodactylus* when he collected specimens representing a new species of the subgenus *Goniistius* at Easter Island in 1969, and at Rapa and Îlots de Bass in 1971. The primary purpose of the present paper is to describe this species.

Type-specimens of the new *Cheilodactylus* are deposited in the Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM), British Museum (Natural History), London [BM(NH)]; California Academy of Sciences, San Francisco (CAS); Museum National d'Histoire Naturelle, Paris (MNHN), Natural History Museum of Los Angeles County (LACM), U.S. National Museum of Natural History, Washington, D.C. (USNM) and University of British

Columbia, Vancouver (BC). The author examined specimens of *Goniistius* at all of these institutions except the last-mentioned, from which a loan was made. Loans of cheilodactylids were also provided by the Academy of Natural Sciences of Philadelphia (ANSP), the National Museum of New Zealand (NMNZ), and the Western Australian Museum (WAM).

In the description of the new species, data in parentheses refer to paratypes. More measurements of type specimens are presented in Table 5 than are summarized in the text. Proportional measurements in the text are rounded to the nearest .05. Measurements recorded for species other than the new one are based only on adult specimens. All meristic and measurement data were taken by the author.

Standard length (SL) is measured from the most anterior end of the upper lip in the median line to the base of the caudal fin (posterior end of hypural plate). Head length is taken from the same anterior point to the posterior end of the opercular flap. Snout length is measured from the fleshy edge of the orbit to the front of the upper lip. Body depth is the greatest depth from the base of the dorsal spines (hence below the basal scaly sheath) vertically to the most ventral part of the thorax or abdomen (excluding the pelvic fins). Width of body is measured just posterior to the gill opening. Orbit diameter is the greatest fleshy diameter; interorbital width is the least bony width. The length of the upper jaw is measured from the posterior end of the maxilla to the bony front of the snout in the median line (not to upper lip or either rostral projection of the maxilla). The depth of the caudal peduncle is the least depth. The length of the caudal peduncle is the horizontal distance between verticals at the rear base of the anal fin and the base of the caudal fin. The lengths of the fin spines and rays are measured from their distal tips to the extreme bases (best determined from radiographs). The length of the caudal fin is the horizontal length of the longest lobe (with the fin in natural position) from the base of the fin (posterior end of hypural plate); caudal concavity is the horizontal distance between verticals at the distal tips of the longest and shortest caudal rays. Length of the paired fins is the length of the longest ray of the longest fin of either side. The last 2 dorsal or anal rays are counted separately as long as some distance separates their bases. Lateral-line scales are counted to the base of the caudal fin. Gill-raker counts include all rudiments; the raker at the angle is contained in the lower-limb count.

GENUS *Cheilodactylus* Lacepède
Subgenus *Goniistius* Gill

Goniistius Gill, 1862, Proc. Acad. Nat. Sci. Phila., vol. 14, pp. 114, 120 (type-species, *Cheilodactylus zonatus* Cuvier, by original designation).

Zeodrius Castelnau, 1879, Proc. Linn. Soc. N.S.W., vol. 3, p. 377 (type-species, *Zeodrius vestitus* Castelnau, by subsequent designation, McCulloch, 1929).

Gregoryina Fowler and Ball, 1924 Proc. Acad. Nat. Sci. Phila., vol. 76, p. 269 (type-species, *Gregoryina gygis* Fowler and Ball, by original designation and monotypy, = *Cheilodactylus vittatus* Garrett).

DIAGNOSIS: Dorsal rays XVI-XIX,25-37; anal rays III,8-10; pectoral rays 14, the lower 6 simple, thickened, the upper 2 or 3 of these notably longer than the branched rays; lateral-line scales 54-71; branchiostegal rays 6; gill rakers relatively short, 5-10 + 13-17; body relatively deep, the depth 2.35-3.05 in SL, and compressed, the width 2.5-3.2 in depth; caudal peduncle narrow, its least depth about one-third its length; head small, its length 3.0-3.75 in SL; dorsal profile of nape strongly elevated (at least on adults); a single flat spine posteriorly on opercle; margin of preopercle smooth; adults (except *C. zonatus*) with a knob-like projection on prefrontal bone anterior to each orbit and another (usually smaller) on each maxilla anteriorly on snout; mouth small, the lips fleshy; jaws with several rows of small teeth embedded in dermal tissue; no teeth on vomer or palatines; scales cycloid; head with small scales except anteriorly on snout and

TABLE 1.
DORSAL FIN RAY COUNTS OF SPECIES OF THE SUBGENUS *GONIISTIUS*

	DORSAL SPINES				DORSAL SOFT RAYS												
	XVI	XVII	XVIII	XIX	25	26	27	28	29	30	31	32	33	34	35	36	37
nigripes			11	1	1	2	6	3									
plessisi	2	30									1	16	17	7	1		
quadricornis		5	1			1	3	2									
zonatus	3	24	1							5	12	7	4	1			
zebra	2	4										2	1	3			
vittatus	3	13							2	5	6	2	1				
gibbosus	6	3												2	4	2	1
vestitus	3	14										3	7	4	3		

ventrally; dorsal and anal fins with a scaly basal sheath; fourth dorsal spine longest, nearly twice or more length of third dorsal spine; spinous portion of dorsal fin about equal in length to soft portion; caudal fin forked; origin of pelvic fins distinctly posterior to base of pectoral fins; head and body with dark brown to black bars or diagonal bands.

REMARKS: The late postlarval stage of species of the subgenus *Goniistius* (and of at least some other *Cheilodactylus*) attains relatively large size, about 50 to 60 mm in total length. It is semitransparent and silvery, and very compressed, the body deepest beneath pectoral fin base, the ventral edge of the thorax and abdomen a sharp-edged keel. In Australia this form is often referred to as the "paper fish" stage. After leaving the pelagic realm, it takes refuge in rocky bottom where it soon begins to take on some of the banded color pattern of adults; the silvery coloration may persist for a few weeks. As it attains more color, it ventures more into the open (Kuiter, 1979). It was this late postlarval stage of *C. vittatus* that was described by Fowler and Ball (1924) as *Gregoryina gygis* for which the family Gregoryinidae was erected (see Remarks for *C. vittatus*).

Within the subgenus *Goniistius*, *Cheilodactylus nigripes* is the most divergent species and seems to be an early offshoot from the basal stock of the group. It is also the one living in the highest latitude (known to about 43° S in Tasmania). The remaining species form an assemblage within which the most

TABLE 2.
ANAL SOFT RAY COUNTS OF SPECIES OF THE SUBGENUS *GONIISTIUS*

	8	9	10
nigripes		4	8
plessisi	1	31	
quadricornis	5	1	
zonatus	25	3	
zebra	5	1	
vittatus	14	2	
gibbosus	1	8	
vestitus	14	3	

TABLE 3.
LATERAL-LINE SCALE COUNTS OF SPECIES OF THE SUBGENUS *GONIISTIUS*

	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
nigripes										1	2	1	2	3	2	1		
plessisi												1	3	8	8	8	3	1
quadricornis	2			1	2	1												
zonatus		1	2	3	6	7	6	2	1									
zebra										3		2	1					
vittatus						1	3	3	2	4	2	1						
gibbosus								1	2	3	2	1						
vestitus					1	3	2	5	2	3		1						

TABLE 4.
GILL RAKER COUNTS ON FIRST ARCH OF SPECIES OF THE SUBGENUS *GONIISTIUS*

	Upper Limb						Lower Limb					
	5	6	7	8	9	10	13	14	15	16	17	18
nigripes	1	10	1					3	9			
plessisi			23	3					2	10	19	1
quadricornis		2	3					2	3			
zonatus			2	16	7	1		3	16	7		
zebra	1	5						2	3	1		
vittatus		1	14	1			1		9	5	1	
gibbosus			6	3				1	6	2		
vestitus			8	9				1	13	3		

primitive seems to be *C. zonatus* which has no bony protuberances anteriorly on the head, a relatively short fourth dorsal spine, and narrow diagonal dark bands which reach the ventral part of the body. *C. quadricornis* appears to be more highly evolved, having broader diagonal dark bands which do not pass as far ventrally on the body, but retaining a short fourth dorsal spine. *C. zebra* is still more specialized, with a longer fourth dorsal spine and a coalescing of the posterior dark bands. Most advanced are the three species *gibbosus, vestitus,* and *vittatus,* which have long fourth dorsal spines and a complete fusion of the posterior dark bands on the body of adults to form one continuous band from the middle of the spinous portion of the dorsal fin into the lower caudal lobe. Smaller individuals of these species show the separate bars fusing to form this band. There is a striking parallelism in color pattern of these 3 *Goniistius* and the sciaenid fish *Equetus lanceolatus* (Linnaeus) of the western Atlantic. *C. plessisi* may have arisen from stock similar to *vittatus* or *zebra.*

The species of subgenus *Goniistius* are relatively inactive by day, often seen at rest on the bottom propped by their thickened lower pectoral rays. They appear to be primarily night feeders. To examine stomach content material, specimens should be taken at night or early morning hours. Limited data indicate that by late afternoon alimentary tracts are completely empty. Feeding takes place by contact of the substratum with the fleshy lips followed by strong suction; possibly the teeth are brought into play to assist in detaching the food organisms. Sand may be expelled from the gill openings after feeding. As indicated by notes on the food habits of some of the species discussed in subsequent pages, a variety of very small marine animals are ingested, particularly crustaceans, worms, and mollusks.

KEY TO THE SPECIES OF *CHEILODACTYLUS* OF THE SUBGENUS *GONIISTIUS*

1a. Dorsal spines XVIII or XIX; anal soft rays 9 or 10 (usually 10); dorsal profile of snout forming an angle less than 45° to the horizontal; body with 2 broad near-vertical black bars (southern Australia and New Zealand) ..... ***nigripes***

1b. Dorsal spines XVI or XVII (rarely XVIII); anal soft rays 8 or 9; dorsal profile of snout forming an angle greater than 45° to the horizontal; body with diagonal dark bands (except a vertical one posteriorly on body of *plessisi*) ... **2**

2a. Lateral-line scales 65-71; anal soft rays usually 9; lower-limb gill rakers usually 16 or 17; a broad diagonal dark brown band anterodorsally on body commencing on first 3 dorsal spines, and a vertical bar (sometimes irregular) anteriorly on caudal peduncle, continuing onto posterior part of anal fin (Easter Island, Rapa, and Îlots de Bass) ..... ***plessisi, n. sp.***

2b. Lateral-line scales 54-66; anal soft rays usually 8 (except *gibbosus*); lower-limb gill rakers usually 15; color of body not as in 2a **3**

3a. Dorsal soft rays 26-28; body with 5 well-separated diagonal black bands (discounting one from nape to pectoral base and one on caudal base), the last 4 broader than pale interspaces (Japan and China) ***quadricornis***

3b. Dorsal soft rays 29-37; body not colored as in 2a (*zonatus* has 6 diagonal brown bands narrower than interspaces; *zebra* has 6, the last 3 largely fused) **4**

4a. No knob-like bony protuberances on prefrontal and maxilla; fourth dorsal spine 1.5-2.0 in head; lateral-line scales 55-62; caudal fin with white spots; 6 diagonal brown bands on body narrower than interspaces (except posteriorly) (Japan, Taiwan, and China) ..... ***zonatus***

4b. Adults with knob-like bony protuberances on each prefrontal bone (anterior to orbit) and anteriorly on each maxilla at front of snout (poorly developed on *zebra*); fourth dorsal spine 1.0-1.5 in head; lateral-line scales 58-66; caudal fin without white spots; body without 6 brown bands narrower than interspaces 5

5a. Body with 6 broad diagonal black bands, the posterior three nearly fused, upper-limb gill rakers usually 6 (Japan and China) ..... ***zebra***

5b. Body with 2 broad diagonal black bands; upper-limb gill rakers usually 7 or 8 6

6a. A diagonal black band on cheek from below eye to isthmus; dorsal soft rays 29-33 (Hawaiian Islands, possibly New Caledonia, and Lord Howe Island) ..... ***vittatus***

6b. No diagonal black band on lower cheek and isthmus; dorsal soft rays 32-37 7

7a. Posterior diagonal black band on body of adults ending anterodorsally on caudal peduncle; dorsal soft rays 34-37; anal soft rays usually 9; depth of body 2.75-3.05 in SL (Western Australia) ..... ***gibbosus***

7b. Posterior diagonal black band on body of adults crossing caudal peduncle and continuing broadly into lower lobe of caudal fin; dorsal soft rays 32-35; anal soft rays usually 8; depth of body 2.6-2.85 in SL (eastern Australia, New Caledonia, Lord Howe Island) ..... ***vestitus***

Cheilodactylus (Goniistius) nigripes Richardson

Figs. 1, 2

Cheilodactylus nigripes Richardson, 1850, Proc. Zool. Soc. London, part 18, p. 66. (type-locality, King George's Sound, Australia).

Chilodactylus vizonarius Kent, 1888, Proc. Roy. Soc. Tasm., p. 48 (type-locality, Tasmania).

Chilodactylus bizonarius Kent, 1897, Naturalist in Australia, pp. 165, 166, pl. 28, fig. 3 (correction of *vizonarius*, a misprint).

DIAGNOSIS: Dorsal rays XVIII or XIX (usually XVIII), 25-28; anal rays III, 9 or 10 (usually 10); lower 5 or 6 pectoral rays simple (lower 6 on other species of the subgenus); lateral-line scales 63-69; gill rakers 5-7 + 14-15; depth of body 2.5-2.8 in SL; head length 3.3-3.75 in SL; dorsal profile of snout forming an angle of about 30-40° to the horizontal (more than 45° for other species); base of front of upper lip at about same level as lower edge of orbit (mouth more ventral on other species); fourth dorsal spine not very long, 1.75-2.45 in head; third dorsal spine contained 1.75-2.1 times in fourth dorsal spine; pectoral fins 2.55-2.9 in head; pelvic fins not reaching or just reaching anus, 1.25-1.5 in head; a prominent knob-like bony projection on each maxillary and prefrontal bone.

Color in preservative: Body pale with 2 broad black bars, the first passing from base of dorsal fin between the fourth and fourteenth spines to beneath pectoral fin, then narrowing as it passes diagonally posterior to region of basal two-thirds of pelvic fins, the second from base of soft portion of dorsal fin between second and nineteenth rays to base of anal fin; a blackish bar from nape through eye to ventral margin of preopercle, then curving posteriorly onto anterior thorax; caudal peduncle and base of caudal fin dusky; upper lip and snout blackish except for a triangular zone of whitish anterior to orbit containing nostrils; dorsal fin dusky except for continuations of black body bars broadly into fin; anal and caudal fins blackish; pectoral rays blackish, the membranes pale; pelvic fins black. Juveniles (Fig. 2) have only the tips of the caudal lobes broadly blackish.

REMARKS: Richardson based his description of *C. nigripes* on a 13-inch dried specimen speared by an aborigine at King George's Sound in southwestern Australia. He noted that the pelvic fins were black, the other fins nearly as dark, and the body also dark. Evidently the

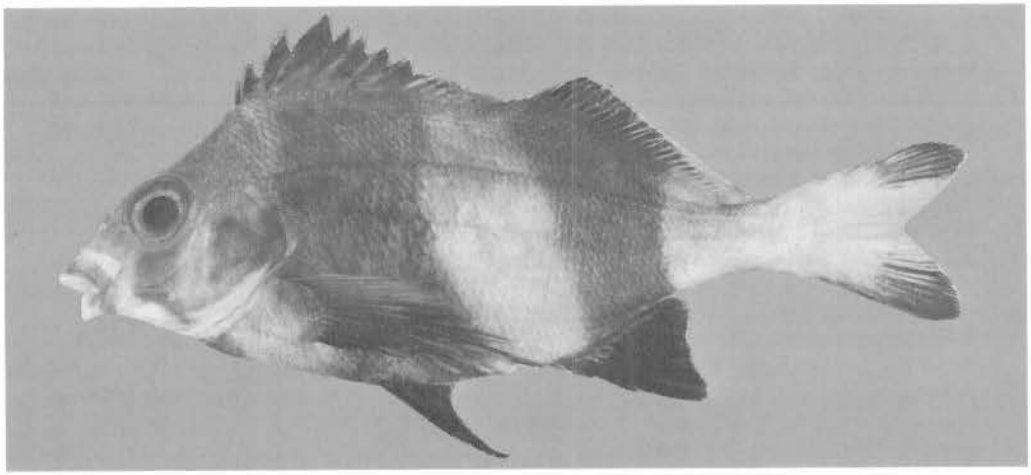

Figure 1. *Cheilodactylus nigripes,* juvenile, 79 mm SL, AMS I.17608-001, Moana, South Australia.

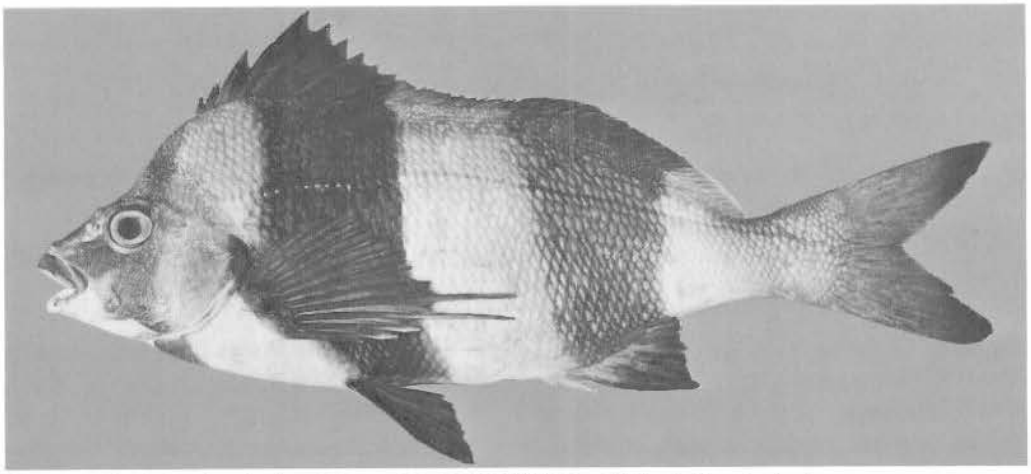

Figure 2. *Cheilodactylus nigripes,* 249 mm SL, NMNZ 4776, Kapiti Island, New Zealand.

characteristic black bars were not noticed on the dried fish. Other data on the specimen, in particular the fin-ray and scale counts, leave no doubt, however, of the identity as the species here diagnosed.

C. nigripes, known by the common name Magpie Perch, occurs along the southern shore of Australia, Tasmania, and New Zealand. McCulloch (1911:64-65, pl. 11) reported on specimens (as *Goniistius vizonarius*) taken by the *Endeavour* in 14 fathoms at Anderson Bay, Tasmania, and off Flinder's Island. Thomson (1918:6, fig. 2) recorded the first specimen from New Zealand; it was taken at Kapiti Island (near Wellington). The species, however, is rare in New Zealand (John Moreland & J.A.F. Garrick, pers. comm.). The specimen shown in Fig. 2 was speared in 1968 at Kapiti Island in 8 m. Kuiter (1979:36, figs. 5, 5A) reported this species as probably the most common morwong in Victoria. He wrote that juveniles are often found under jetties; one small specimen collected off Kiama, N.S.W., represents the most northern record. His Fig. 5A of a juvenile (and a color photo of another juvenile from Moana, South Australia, sent by Douglass F. Hoese) indicates that the caudal fin and to a lesser extent the caudal peduncle is yellow in life at this stage. Kuiter's Fig. 5 shows 2 adult males underwater in which the second black bar is barely visible; this he wrote, can be "switched off" by the fish.

Scott et al. (1974) stated that this species does not take a hook, adding that its diet includes mollusks, polychaete worms, and algae.

As indicated in the Remarks for *Goniistius* herein, *C. nigripes* is the most divergent species of the subgenus. It is readily separated from the other species by its high dorsal spine count, modal count of 10 anal rays, more anterior position of the mouth and its distinctive color pattern of 2 broad black bars on the body.

The largest specimen examined by the author, 346 mm SL, from Tasmania, is in the British Museum (Natural History).

According to A.C. Wheeler (pers. comm.) the holotype of *C. nigripes* never came to the British Museum (Natural History). He wrote "you can safely assume that it is lost."

Cheilodactylus (Goniistius) plessisi, new species

Figs. 3-5; Table 5

Cheilodactylus vittatus Adam (not Garrett), 1945, Bull. Mus. Hist. Nat. (Paris), vol. 17, no. 5, p. 388 (l'Ile de Paques).
Goniistius sp. Randall, 1970, Oceans, vol. 3, no. 3, p. 50, fig. on p. 53 (Easter Island).

HOLOTYPE: BPBM 6670, 203.5 mm SL, male, Easter Island, Mataveri O Tai, north side of bay, 6 m, larger boulders with a heavy cover of *Sargassum* and other brown algae and small sand areas, spear, J.E. Randall, 2 February 1969.

PARATYPES: MNHN 42-70, 268.0 mm SL, Easter Island, Mission Franco-Belge, 1934; LACM 6560-25, 6: 75-232 mm SL, Easter Island, Anakena Cove, 100 yards northeast of beach, rotenone, R. Parks and crew of *Chiriqui*, 4 October 1958; BC 65-430, 4: 126.4-273 mm SL, Easter Island, Rano Raraku area (27° 08′ 37″ S, 109° 26′ 10″ W), 3-10 m, spear and rotenone, I.E. Efford and J.A. Mathias, 8 January 1965; BC 65-434, 123.2 mm SL, Easter Island, 200 m north of Hanga Roa, 8 m, spear, I.E. Efford and J.A. Mathias, 13 January 1965; BC 65-446, 2: 124.8-272 mm SL, Easter Island, Anakena Cove, 7-8 m, rotenone, I.E. Efford and J.A. Mathias, 16 January 1965; BC 65-457, 4: 108.8-157.9 mm SL, Easter Island, Hanga Roa, subtidal zone, rotenone, I.E. Efford and J.A. Mathias, January-February, 1965; BC 65-458, 5: 105-145 mm SL, Easter Island, Hanga Roa, rocky shore, rotenone, I.E. Efford and J.A. Mathias, 6 February 1965; MNHN 1971-37, 280 mm, Rapa, Y. Plessis, 1 May 1968; BPBM 6668, 2: 89.9-97.8 mm SL, Easter Island, west coast between Hanga Roa and Hanga Piko, large tidepool at low tide, 0-0.5 m, rotenone, J.E. Randall and G.R. Allen, 26 January 1969; AMS I.22178-001, 101.7 mm SL and BM(NH) 1981.3.18.4, 120.0 mm SL, same data as preceding; BPBM 6669, 260.2 mm SL, Easter Island, wreck about 20 m offshore between Hanga Roa and Hanga Piko, 6 m, spear, J.E. Randall, 27 January 1969; USNM 226553, 112.0 mm SL, same data as preceding; BPBM 12834, 2: 170.0-225.2 mm SL, Rapa, off Haurei Bay north of Rapa Iti, 21.5 m, spear, J.E. Randall and D.B. Cannoy, 27 January 1971; BPBM 12842, 220.3 mm SL, same locality as preceding, 9 m, spear, D.B. Cannoy, 28 January 1971; CAS 47908, 221.8 mm SL, Rapa, south side of Ruea Point, 14 m, spear, A. Sinoto, 9 February 1971; BPBM 13050, 243.0 mm SL, Îlots de Bass (Marotiri), southeast islet, reef, 12.5 m, spear, J.E. Randall, 20 February 1971.

DIAGNOSIS: A species of the subgenus *Goniistius* with dorsal rays XVI or XVII,31-35; anal rays III,8 or 9 (usually 9); lateral-line scales 65-71; gill rakers 7-8 + 15-18; fourth dorsal spine 1.05-1.45 in head length; third dorsal spine 2.4-3.7 in fourth dorsal spine; pectoral fins 2.9-3.45 in head; pelvic fins relatively long, reaching origin of anal fin, 1.35-1.55 in head; body with 2

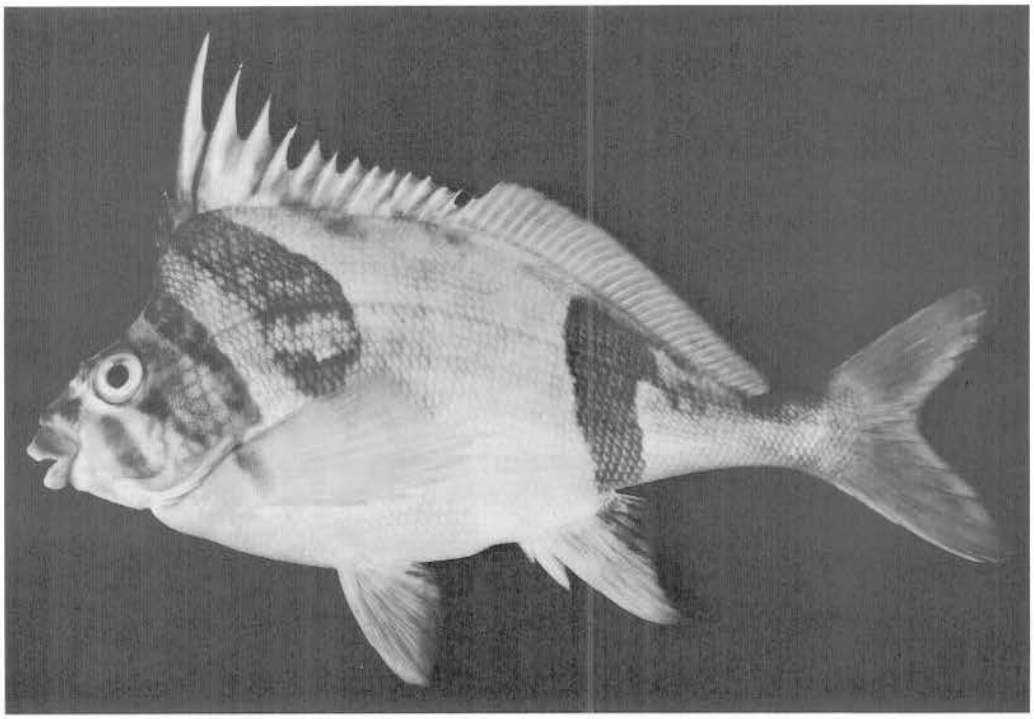

Figure 3. Holotype of *Cheilodactylus plessisi,* 203.5 mm SL, BPBM 6670, Easter Island.

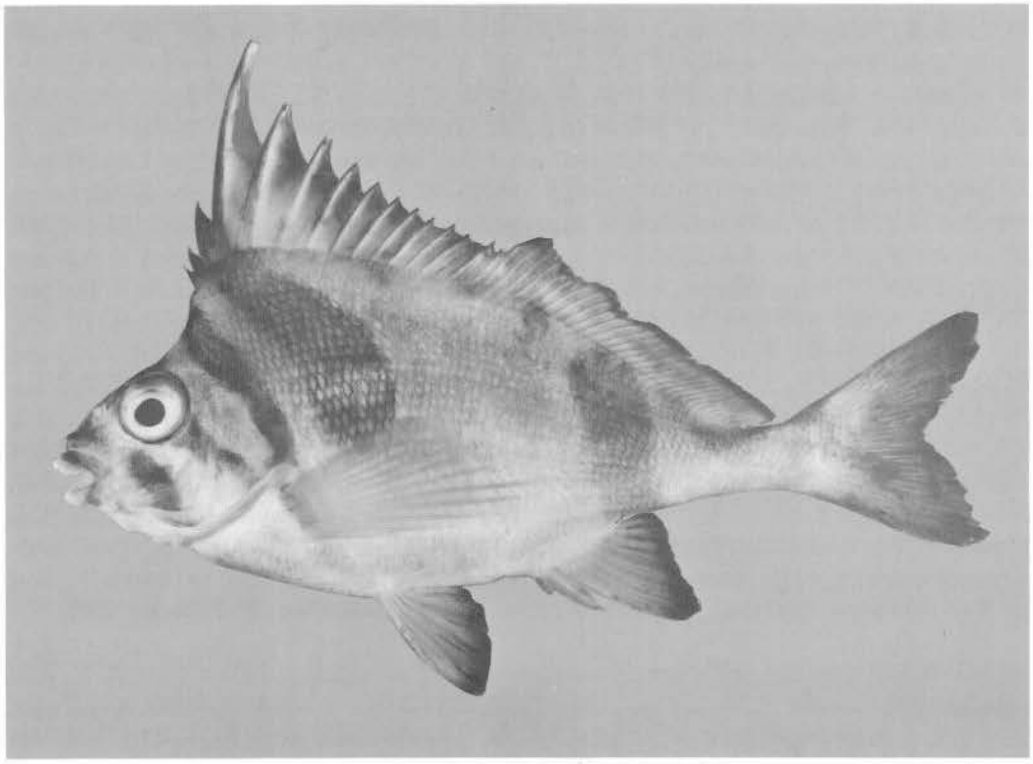

Figure 4. Paratype of *Cheilodactylus plessisi,* 97.8 mm SL, BPBM 6668, Easter Island.

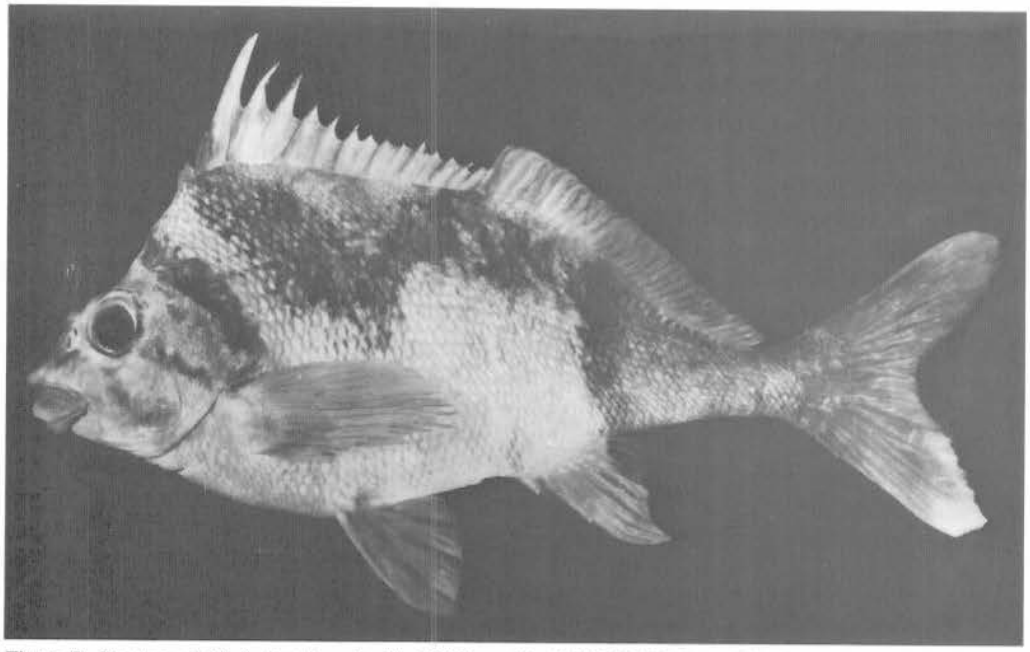

Figure 5. Paratype of *Cheilodactylus plessisi*, 260.2 mm SL, BPBM 6669, Easter Island.

principal dark markings, a broad diagonal band anterodorsally and a bar anteriorly on caudal peduncle; head with 3 diagonal dark bands.

DESCRIPTION: Dorsal rays XVII,32 (XVI or XVII, usually XVII, 31-35); anal rays III,9 (III,8 or 9, rarely 8); pectoral rays 14, the upper 2 unbranched and the lower 6 unbranched, thickened, with distal ends free from membranes; pelvic rays I,5; principal caudal rays 15, the uppermost and lowermost unbranched; upper and lower procurrent (unsegmented) caudal rays 8; lateral-line scales 69 (65-71), plus 6 or 7 posterior to end of hypural; scales above lateral line to middle of spinous portion of dorsal fin 11 (11-12); scales below lateral line to origin of anal fin 20 (20-22); circumpeduncular scales 30 (30-33); branchiostegal rays 6; gill rakers 7 + 16 (7 or 8, usually 7, + 15-18); vertebrae 14 + 21.

Body deep, the greatest depth 2.45 (2.35-2.75) in SL, and compressed, the width 3.15 (2.75-4.0) in depth; head length 3.25 (3.1-3.35) in SL; nape strongly elevated; dorsal profile of snout forming angle slightly greater than 45° to the horizontal, the snout length (to front of upper lip) 2.45 (2.45-3.2) in head; orbit diameter 4.45 (3.55-4.45) in head; interorbital space broadly flat medially, the edges convex, the least width 4.65 (3.95-4.60) in head; caudal peduncle slender, the least depth 3.55 (3.55-4.0) in head, and long, the peduncle length 1.2 (1.1-1.2) in head.

Mouth small, somewhat ventral on head, the upper lip projecting, the maxilla reaching a vertical through posterior nostril; lips thick, fleshy, and smooth; small slender teeth in villiform bands in jaws (teeth of outer row of holotype 1.5 mm long), about 9 irregular rows anteriorly in upper jaw and about 6 in lower, narrowing to a single row posteriorly in jaws; teeth encased in dermal tissue, only the pointed tips protruding; no teeth on vomer or palatines; villiform teeth in numerous rows on pharyngeal bones; adults with a pair of bony knobs anterior to orbit, one above each posterior nostril, and a second, usually shorter pair, anteriorly on snout just above upper lip (these projections about 1 mm long on holotype, but the prefrontal knobs on 243-mm paratype measure 6.5 mm, and the maxillary knobs 3.1 mm); opercle with a single flat feeble spine

posteriorly; preopercular margin entire; nostrils large, in front of center of orbit, the anterior elliptical, the upper part covered by a flap from posterior margin and the lower part covered by a flap from the anterior margin, the distal ends of both flaps fringed (12 cirri on upper flap and 4 on lower of holotype); posterior nostril round, diagonally above and behind anterior nostril; pores of lateralis system of head very small and inconspicuous; gill rakers short, the longest about half length of longest gill filament on first arch; tongue short, smooth, and broadly rounded; gill membranes free from isthmus.

Scales cycloid; scales on head very small, the height of the exposed part about one-sixth height of largest scales on side of body; scales dorsally on head extending forward to above anterior nostrils; scales on cheeks extending anteriorly nearly to corner of mouth; snout, lips, and ventral part of head naked; lateral line slightly arched above pectoral fin, coming progressively closer to dorsal contour of body until, at rear base of dorsal fin, it is separated from fin by only 3 scale rows; lateral-line scales small, the exposed part about one-third height of adjacent scales; scaly sheath at base of dorsal fin two-fifths length of last dorsal spine, the distal scales about one-third to one-half as high as largest body scales; scaly sheath at base of anal fin not as deep, consisting of only 2 rows of scales; progressively small scales extending onto caudal fin nearly to posterior margin (the last 3-6 mm of caudal rays of holotype naked); small scales basally on

TABLE 5.
PROPORTIONAL MEASUREMENTS OF TYPE SPECIMENS OF *CHEILODACTYLUS PLESSISI* EXPRESSED AS A PERCENTAGE OF THE STANDARD LENGTH

	HOLOTYPE	PARATYPES						
	BPBM 6670	BPBM 6668	BPBM 6668	BM(NH) 1981.3.18.4	BPBM 12834	BPBM 12842	BPBM 12834	BPBM 13050	BPBM 6669
Standard length (mm)	203.5	89.9	97.8	120.0	170.0	220.3	225.2	243.0	260.2
Depth of body	40.7	38.8	40.9	42.5	37.0	36.5	38.2	38.1	40.6
Width of body	12.9	10.8	10.2	11.6	11.6	11.8	13.1	13.8	13.8
Head Length	30.8	32.2	31.7	30.0	30.1	31.3	31.3	30.0	31.5
Snout Length	12.5	10.0	11.1	10.8	11.5	12.3	12.2	11.9	12.9
Orbit diameter	6.9	9.0	8.9	8.1	7.8	7.0	7.3	7.7	7.4
Interorbital width	6.6	7.3	6.9	6.5	7.1	7.4	7.5	7.6	7.8
Length of upper jaw	8.4	8.7	8.2	8.5	8.3	8.7	8.7	8.6	9.4
Depth of caudal peduncle	8.7	8.1	8.6	8.4	8.4	7.8	8.5	8.3	8.5
Length of caudal peduncle	26.2	27.0	26.5	26.9	27.4	26.7	25.9	27.8	26.1
Predorsal length	30.4	30.0	28.9	29.2	29.9	31.8	31.5	32.0	33.5
Preanal length	62.7	63.9	64.2	61.0	62.4	63.8	62.7	63.5	62.8
Prepelvic length	42.0	44.6	44.8	40.3	39.3	41.5	41.6	38.7	42.3
Length of dorsal fin base	75.2	73.5	75.0	76.1	76.6	72.1	73.0	74.7	74.4
Length of first dorsal spine	3.5	3.6	3.7	3.1	3.5	2.6	3.0	2.7	3.6
Length of second dorsal spine	4.7	6.2	6.2	5.6	5.2	4.1	4.7	4.2	4.7
Length of third dorsal spine	7.6	9.3	11.2	10.0	7.8	6.6	7.9	7.5	8.1
Length of fourth dorsal spine	26.4	25.9	29.8	23.9	29.0	22.7	24.0	22.4	21.8
Length of last dorsal spine	9.2	10.1	8.8	9.2	9.5	7.8	8.9	8.4	7.0
Length of longest dorsal ray	10.8	13.2	12.8	13.0	12.9	11.0	10.9	11.1	10.5
Length of anal fin base	13.2	13.2	12.9	13.2	12.5	11.5	12.2	12.3	12.0
Length of first anal spine	4.8	5.6	5.1	4.8	4.4	3.5	4.7	4.5	4.9
Length of second anal spine	10.2	11.7	11.9	10.7	10.6	7.7	8.7	9.5	10.6
Length of third anal spine	12.3	13.3	13.2	11.3	12.8	9.5	10.8	10.6	11.5
Length of longest anal ray	22.0	22.6	20.6	22.6	21.6	18.4	19.7	20.5	21.2
Length of caudal fin	25.2	broken	24.4	broken	27.3	22.2	26.0	23.8	23.9
Caudal concavity	12.4	—	9.1	—	14.8	10.2	13.5	12.2	12.5
Length of longest pectoral ray	30.7	31.6	32.1	29.6	34.3	29.7	28.9	29.5	30.1
Length of pelvic spine	12.5	13.4	13.6	12.5	13.6	13.3	13.1	12.4	13.5
Length of pelvic fin	21.6	22.2	21.5	20.6	21.4	20.5	20.9	21.9	21.7

pectoral fins (scaled part 8.5 mm at widest place on holotype); no scales in axil of pectoral fins; a few rows of small scales basally on pelvic fins.

Origin of dorsal fin on a vertical between upper end of preopercular margin and posterior edge of orbit; anterior 3 dorsal spines short, the first 8.8 (8.55-12.05), the second 6.55 (5.1-7.65), and the third 4.05 (2.85-4.75) in head; fourth dorsal spine longest, about 3 times longer than third spine, its length 1.15 (1.05-1.45) in head; remaining dorsal spines progressively shorter, the last 3.35 (3.15-4.5) in head; second to ninth dorsal rays subequal, the longest 2.85 (2.3-3.0) in head; origin of anal fin below base of ninth dorsal soft ray; first anal spine 6.4 (5.75-8.95), second anal spine 3.0 (2.65-4.05), and third anal spine 2.5 (2.35-3.3) in head; anterior part of soft portion of anal fin about 3 times longer than posterior, the second ray longest, 1.4 (1.35-1.7) in head; caudal fin 1.2 (1.1-1.4) in head; strongly forked, the caudal concavity 2.5 (2.3-3.5) in head; second of the lower 6 simple pectoral rays longest, about equal to head length, 3.25 (2.9-3.45) in SL; pelvic spine 2.45 (2.2-2.4) in head; origin of pelvic fins below base of eleventh to twelfth dorsal spines; pelvic fins relatively long, reaching origin of anal fin, 1.45 (1.35-1.55) in head.

Color of holotype in alcohol: Light brown with a dark brown band passing from base of first 5 dorsal spines diagonally downward across sixth to sixteenth lateral-line scales to just above tip of first pectoral ray (band contains a pale area just below lateral line); a dark brown bar from base of 13th to 21st dorsal soft rays across 39th to 46th lateral-line scales, and narrowing as it passes to rear base of anal fin and anterior caudal peduncle; 3 diffuse dark brown blotches dorsally on body posterior to dark bar, the last at upper base of caudal fin; a diagonal dark brown band from nape across upper end of gill opening (including all of upper opercular membrane) to axil of pectoral fin; 2 dark brown bands across interorbital space; a diagonal dark brown band from orbit across opercle to level of dorsal end of pectoral base; a diagonal dark brown band on cheek from below orbit to ventral margin of preopercle almost to corner; snout dark brown except region of nostrils which is pale; upper lip blackish except edge, which is pale; ventral part of head pale; unscaled part of dorsal fin light yellowish brown except first 3 spines, associated membranes and base of fourth dorsal spine which are dark brown; anal fin pale anteriorly, except distally where darker, the fin dark brown posterior to fifth ray; pectoral fins pale, a little dusky at base; pelvic fins brown, the rays darker than membranes.

Color of holotype when fresh: Light greenish yellow, the edges of the scales narrowly brownish; a near-vertical dark brown bar from beneath middle of soft portion of dorsal fin to rear base of anal fin; a diagonal dark reddish brown bar from first 5 dorsal spines to beneath upper outer part of pectoral fin, this bar containing areas of pale ground color; 3 small dark reddish orange blotches on back between the 2 dark bands; 2 larger dark brown blotches dorsally on caudal peduncle; a diagonal dark brown bar from nape to end of opercle; 2 dark brown bands across interorbital, the edges of these bands orangish; prefrontal bony knobs orangish; a narrowing dark brown band from orbit across operculum toward upper edge of pectoral base; a diagonal dark brown bar on snout, nearly continuous with one from beneath orbit to lower margin of preopercle; edge of upper lip and most of lower lip (especially anteriorly) whitish; rest of lower lip orange-red, of upper lip brown and orange-red; gill membranes orange-red; edge of preopercle with some orange-red; a reticulum of dark dotted lines on opercle; median and pelvic fins dusky greenish yellow, the caudal darkest except for blackish areas anteriorly on dorsal fin and posteriorly on anal fin; an orangish streak on the 3 largest interspinous membranes of dorsal fin; a narrow orangish streak on each pelvic membrane; posterior margin of caudal fin and distal margin of soft portion of dorsal fin narrowly dusky orange; pectoral fins clear with yellow rays except outer third of lower simple rays which are salmon-pink; nostrils orange; iris mainly light yellow.

Color of 97.8-mm paratype (Fig. 4) when fresh: Light olivaceous with blackish bars; posterior edge of opercular membrane light orangish; lips pale, faintly orangish at edges and corner of mouth; dorsal fin light olive with blackish areas, including margin of soft portion of fin;

distal portion of membrane posterior to fourth dorsal spine light yellow; anal and pelvic fins light olive with a broad blackish margin; caudal fin blackish olive; pectoral fins clear with bright yellow rays, the outer part of the long lower simple rays light orange; iris light olive with an outer rim of yellow; upper edge of eye blackish.

Underwater photographs taken by the author of 2 different adult fish of this species at Easter Island, one of which was published in color in *National Geographic* (Anonymous, 1970: nominations page, lower fig.) revealed the caudal peduncle and fin to be entirely blackish posterior to the black bar at the rear base of the anal fin.

REMARKS: This species is named *Cheilodactylus plessisi* in honor of the French naturalist Yves Plessis who collected a specimen in Rapa, realized it was undescribed, but deferred further research upon hearing of the author's study of this and related species.

C. plessisi was collected at Easter Island, Rapa, and Îlots de Bass. It was expected at the intermediate locality of islands of the Pitcairn Group, but a month of intensive diving and fish collecting there in 1970-71 failed to reveal its presence.

Specimens of this species were taken in the depth range of 0.5 to 21.5 m. It was usually found over rocky bottoms or sand near such substrata.

The largest specimen examined, 330 mm SL, was part of a fisherman's catch at Easter Island; it was not purchased, but a sample of the gut was obtained. The gut contents of this fish and 3 others of 207-280 mm SL were examined. The gut material by percent of volume consisted of shrimps (39%, mainly alpheids, the largest, taken from the largest fish, measured 17 mm in length), crabs (38%, the largest 8.5 mm in greatest width of carapace), small gastropods (5.5%), unidentified small crustaceans (5%), algae and sand (4.5%), unidentified animal material (4%), bryozoans (2%), ophiuroids (1.5%), and foraminifera (1.5%). The alimentary tract of a fifth specimen of 240 mm SL taken at 4 p.m. was completely empty.

C. plessisi is readily distinguished from all other members of the subgenus *Goniistius* by having the highest average number of lateral-line scales and lower-limb gill rakers and by its distinctive color pattern. Of the known species, it seems closest to those of the complex which includes *gibbosus*, *vestitus*, and *vittatus*. It shares with these species the same body form, the very elevated fourth dorsal spine, and the relatively short third dorsal spine. At first glance the color pattern of *plessisi* seems very different from that of these 3 species, having only one anterior diagonal dark band on the body and one posterior dark bar; however, vestiges of other bands between these 2 markings and dorsally on the caudal peduncle suggest that the pattern of *plessisi* may have been secondarily derived from a form similar to these 3 fishes. In head coloration *plessisi* is closest to *vittatus*.

Cheilodactylus (Goniistius) quadricornis Günther

Fig. 6

Chilodactylus quadricornis Günther, 1860, Cat. Fishes Brit. Mus., vol. 2, p. 83 (type-locality, Sea of Japan).
Goniistius zebroides Tanaka, 1915, Figs. Descr. Fishes Japan, vols. 19-21, p. 347, pl. 93 (type-locality, Wakayama, Prov. Kii, Japan).

DIAGNOSIS: Dorsal rays XVII or XVIII,26-28; anal rays III,8, rarely 9; lateral-line scales 54-59; gill rakers 6-7 – 15-16; depth of body 2.45-2.8 in SL; head length 3.0-3.2 in SL; fourth dorsal spine 1.7-2.15 in head; third dorsal spine 2.1-3.2 in fourth dorsal spine; pectoral fins long, the second lower unbranched ray longest, generally reaching to or posterior to origin of anal fin, 2.6-3.0 in SL; pelvic fins nearly or just reaching anus, 1.55-1.7 in head; prefrontal and maxillary bony knobs prominent.

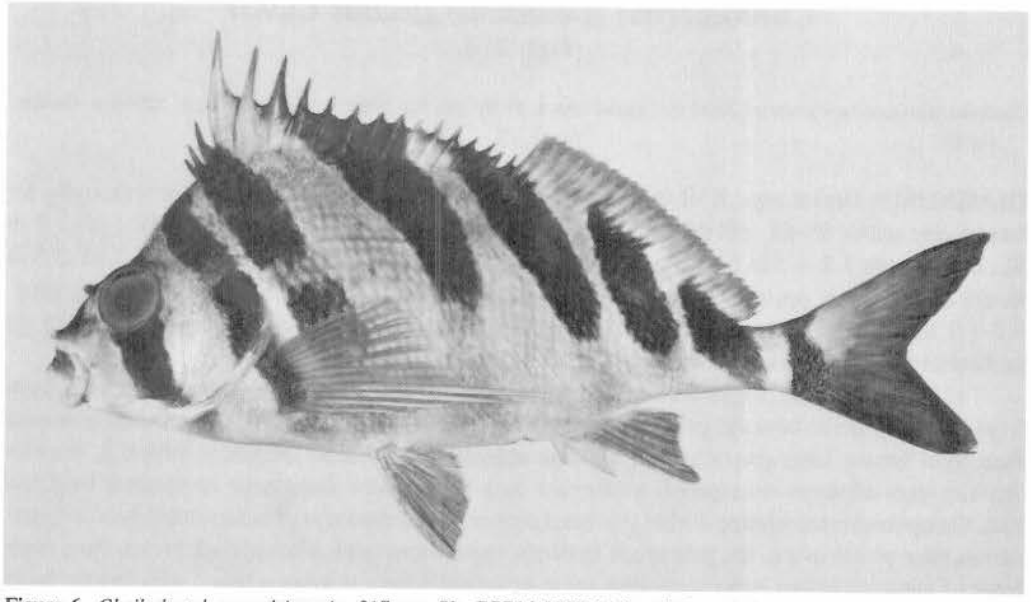

Figure 6. *Cheilodactylus quadricornis,* 217 mm SL, BPBM 8537, Tokyo fish market.

Color in alcohol: Pale with a diagonal dark brown band from nape to pectoral fin axil and base, 5 diagonal bands on body, the first from base of first 5 dorsal spines to beneath pectoral fin (nearly interrupted just below lateral line), and last on caudal fin base; brown bands on body all well separated, the broadest space between first 2 bands about as wide as bands; remaining pale interspaces notably narrower than bands; a broad dark brown band across interorbital faintly divided by a narrow pale band; a broad, slightly diagonal dark brown band from below orbit to anterior thorax; snout dusky, except a triangular whitish area in front of orbit containing nostrils; a quadrangular dark brown patch nearly covering front of upper lip; spinous portion of dorsal fin pale, the first 3 dark brown bands of body extending broadly into fin to distal margin; soft portion of dorsal fin pale, becoming dusky distally, with extensions of last 2 body bands into basal part of fin; soft portion of anal fin dark brown; caudal fin brown with a diagonal dark brown band across base and continuing onto most of lower lobe; pectoral fin membranes pale, the rays dusky, except distal ends of elongate simple rays, which are pale; pelvic fins medium to dark brown.

Color when fresh: Dull silvery with diagonal dark brown bars; tips of first 3 simple pectoral rays orange; opercular membrane faintly orangish.

REMARKS: In their review of the cirrhitoid fishes of Japan, Jordan and Herre (1907) mistakenly reported *C. quadricornis* as an Australian species. It occurs in Japan from Tokyo (the specimen illustrated in Fig. 6 is from Tokyo Bay) southward, in Korea (Mori 1952) and the South China Sea (Chu et al. 1963).

Only 6 specimens of this species were found in the museums visited by the author. Masuda et al. (1975) stated that it is "fairly rare" in southern Japan and occurs in deeper water than the other 2 Japanese species, *C. zonatus* and *C. zebra*. It is easily distinguished from other Northern Hemisphere *Cheilodactylus* by the low count of the dorsal soft rays, 26-28, as well as its distinctive color pattern.

The holotype of *C. quadricornis,* BM(NH) 1844.2.21.12, a stuffed specimen 236 mm SL, is in the British Museum (Natural History).

Cheilodactylus (Goniistius) zonatus Cuvier

Figs. 7, 8

Cheilodactylus zonatus Cuvier in Cuvier and Valenciennes, 1830, Hist. Nat. Poiss., vol. 5, p. 365, pl. 129 (type-locality, Japan).

DIAGNOSIS: Dorsal rays XVI-XVIII (usually XVII),30-34; anal rays III,8 or 9 (usually 8); lateral-line scales 55-62; gill rakers 7-10 + 14-16 (modally 8 + 15); depth of body 2.65-2.9 in SL; head length 3.2-3.5 in SL; fourth dorsal spine 1.5-2.0 in head; third dorsal spine 2.05-2.5 in fourth dorsal spine; pectoral fins 3.2-3.7 in SL; pelvic fins not reaching or just reaching anus, 1.5-1.7 in head; no bony protuberances on prefrontal or maxilla (though a slight convexity on prefrontal above posterior nostril).

Color in alcohol: Light brown with 6 diagonal dark brown bands on body, the first from front of dorsal fin to beneath pectoral fin, and the last on caudal fin base, these bands narrower than light brown interspaces except the one anteriorly on caudal peduncle which is broader dorsally than adjacent interspaces; a diagonal dark brown band from nape to pectoral base and axil, the opercular membrane within this band darker brown than rest of band; 2 dark brown bands across interorbital space, the pale space between narrow and faint; a broad dark brown band from front of snout to below orbit (covering most of snout) where it joins a broad dark brown band passing ventrally and slightly posteriorly from orbit; upper lip dark brown (except edge which is pale) and a short brown band extending posteriorly from corner of mouth; dorsal fin light brown, the soft portion with a faint median longitudinal pale band; anal fin dark brown; caudal fin dark brown with white spots about size of pupil; pectoral fins with pale membranes and dusky rays except distal ends of lower simple rays which are pale; pelvic fins dark brown.

Small specimens (less than about 80 mm SL) have a large blackish area on the last 3 or 4 interspinous membranes of the dorsal fin, and the dark bands on the body extend farther ventrally (Fig. 7).

Color when fresh: The illustrated adult specimen (Fig. 8) was pale greenish, the diagonal bars orangish brown; a yellow-orange blotch posteriorly on opercle and a diffuse one behind orbit; opercular membrane black; unscaled part of dorsal fin brownish orange, the spinous portion with 2 extensions of pale greenish ground color into it from body, and the soft portion with a pale greenish longitudinal band; anal and pelvic fins dark brown, a little orangish basally; caudal fin dark brown with greenish white spots; tips of pectoral rays light orange. Two other specimens (BPBM 5818, 201-212 mm SL) from the Tokyo fish market were bluish gray with yellowish brown diagonal bars; fins yellowish orange, the caudal darkest and white-spotted, the soft portion of the dorsal fin with a median longitudinal blue band.

REMARKS: Judging from illustrations of this species in color (Temminck & Schlegel 1842, Tomiyama et al. 1958, Abe 1963, Kamohara 1967, Hiyama & Yasuda 1971, Masuda 1972, Burgess & Axelrod 1974, and Masuda et al. 1975), there is a variation in the life color; some individuals exhibit far more orange coloration than others.

C. zonatus occurs throughout southern Japan from Tokyo southward. It is among the most common fishes in southern Honshu (Masuda et al. 1975). Richardson (1846) recorded it from China; Jordan and Metz (1913) from Pusan, Korea; Fowler (1930) from Hong Kong; Schmidt (1930a) from Okinawa; Liang (1948a) from the Pescadores; and Liang (1948b) from northern Taiwan (as *Goniisticus zonatus*).

Lindberg and Krasyukova (1969) gave the depth range for this species as 20-30 m; however, the illustrated adult specimen was collected by the author in Japan in only 4.5 m, and another from northern Taiwan in 15 m. The young may be found in even shallower water.

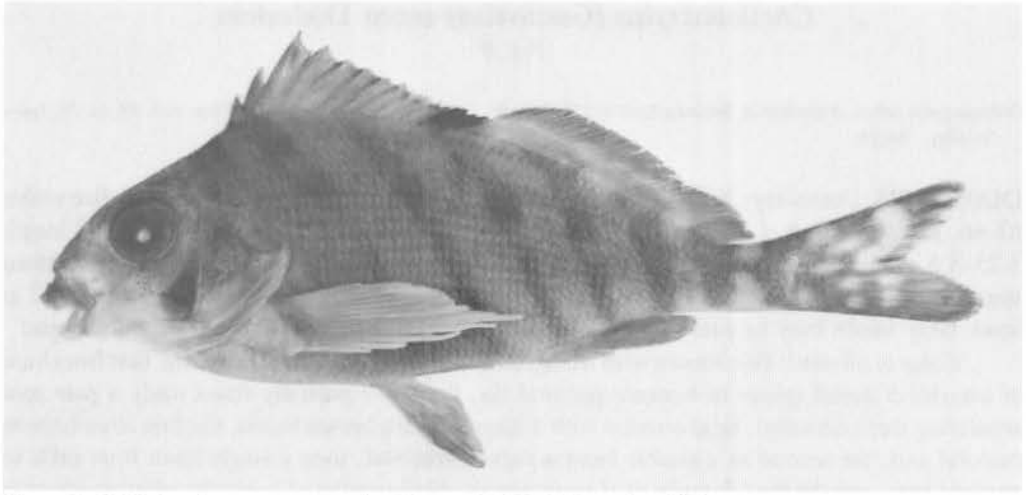

Figure 7. *Cheilodactylus zonatus,* juvenile, 67 mm, BPBM 9347, northern Taiwan.

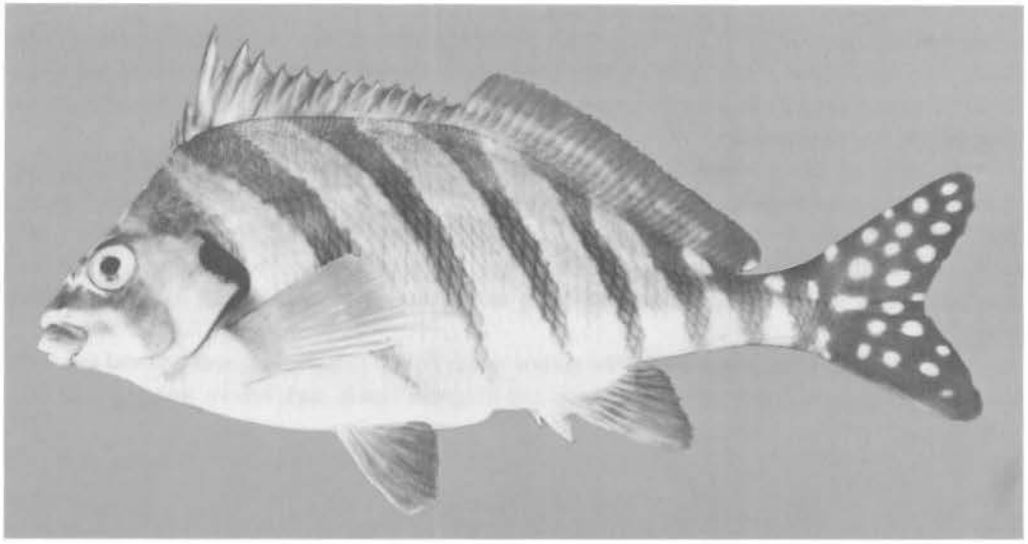

Figure 8. *Cheilodactylus zonatus,* 228 mm SL, BPBM 6500, Shirahama, Honshu, Japan.

Nakamura (1936) presented a drawing of a 21.5-mm specimen of this species collected in open water from the region of Kominato, Japan, and Hiyama and Yasuda (1971: fig. 446) portrayed a juvenile in color.

Suyehiro (1936: figs. 5,6) described the digestive system of *C. zonatus* and examined the contents of the digestive tracts of 42 specimens from Japan. He found that it feeds principally on small animals that live on sandy bottoms, especially crustaceans (*Crago* sp., *Ebalia,* sp. and several amphipods), polychaetes (*Nereis* sp., *Glycera* sp.), lamellibranchs (Ostreacea), ophiuroids, and nudibranchs.

Masuda et al. (1975) recorded the species to attain a total length of 450 mm.

The holotype (MNHN A.5140, a dried specimen, 284 mm SL, 343 mm TL) is in the Muséum National d'Historie Naturelle in Paris.

Cheilodactylus (Goniistius) zebra Döderlein

Fig. 9

Chilodactylus zebra Döderlein in Steindachner and Döderlein, 1884, Denks. Akad. Wiss. Wien, vol. 48, p. 29 (type-locality, Tokyo).

DIAGNOSIS: Dorsal rays XVI or XVII,32-34; anal rays III,8 or 9 (usually 8); lateral-line scales 63-66; gill rakers 5-6 + 14-16 (modally 6 + 15) depth of body 2.7-2.95 in SL; head length 3.25-3.6 in SL; fourth dorsal spine 1.2-1.5 in head; third dorsal spine 3.0-3.8 in fourth dorsal spine; pectoral fins 3.0-3.5 in SL; pelvic fins at most reaching slightly beyond anus, 1.45-1.7 in head; bony knobs may be present on prefrontal and maxilla of adults, but poorly developed.

Color in alcohol: Pale brown with 6 diagonal dark brown bands on body, the first from base of anterior 5 dorsal spines to beneath pectoral fin, the last 3 partially fused (only a pale spot separating them dorsally); head crossed with 3 diagonal dark brown bands, the first from nape to pectoral axil, the second as a double band across interorbital, then a single band from orbit to pectoral base, and the third from front of snout across cheek to edge of operculum just posterior to corner of preopercle; dorsal fin pale except for extensions of diagonal dark bands of body into spinous portion and some dark pigment on last few soft rays; anal fin dusky; caudal fin with a dark brown bar on base (which is confluent with last diagonal dark band on caudal peduncle), this continuing into entire lower lobe of fin; upper lobe slightly dusky; pectoral fins with pale membranes and slightly dusky rays except distal ends (longest on lower simple rays) which are pale; pelvic fins dark brown.

Color when fresh: When first caught, the illustrated specimen was light greenish yellow, shading to whitish ventrally, with diagonal black bars; fins dull greenish yellow except base and lower lobe of caudal fin and pelvic fins which were black; pelvic, anal, and fourth dorsal spines partly whitish; distal tips of lower pectoral rays light orange; lips red-orange except anteriorly and at edges where whitish; edge of gill opening and posterior branchiostegal membranes deep orange.

Another specimen, obtained by the author in the Tokyo fish market, was colored much the same but the ground color was dull silvery and diagonal bands dark brown instead of black.

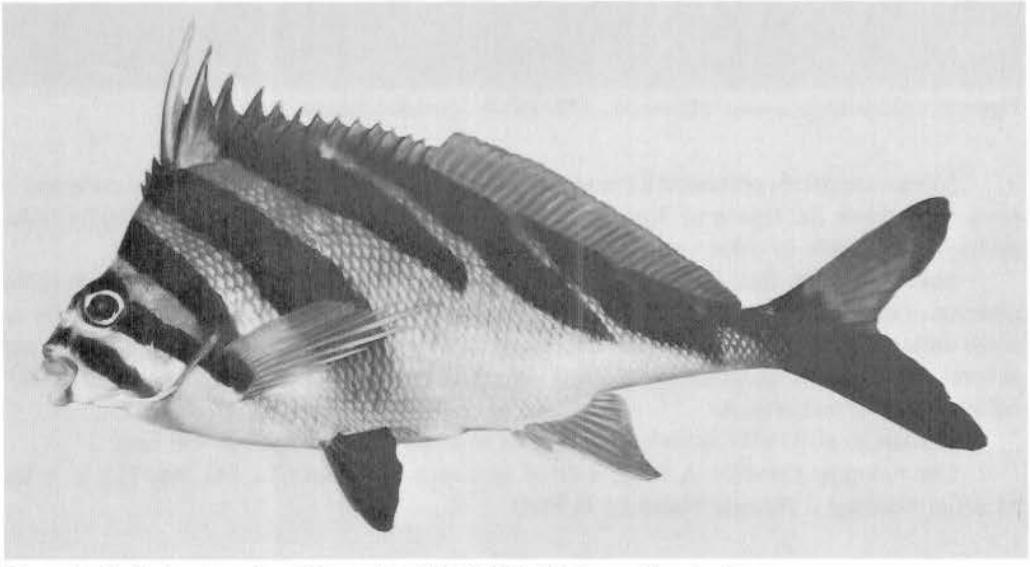

Figure 9. *Cheilodactylus zebra*, 221 mm SL, BPBM 6523, Shirahama, Honshu, Japan.

REMARKS: *C. zebra* appears to be endemic to Japan. It ranges southward from Sagami Bay on the Pacific coast of Honshu and Sado Island in the Sea of Japan to Okinawa (Schmidt 1930b, Matsubara 1955). Masuda et al. (1975) gave the maximum length of this species as 350 mm. They stated that it is found at somewhat greater depths than *C. zonatus;* however, they gave no depth figures for either species. The specimen illustrated in Fig. 9 was collected by the author in 10.5 m.

As pointed out by Jordan and Herre (1907) and Fowler (1956), *zebra* was a provisional name proposed by Döderlein in the text under the heading of *gibbosus*.

A syntype of *C. zebra* (NMW-72193, 255 mm SL) has been found at the Naturhistorisches Museum in Vienna. The locality on the catalog card is "Tokio."

Cheilodactylus (Goniistius) vittatus Garrett

Figs. 10-12

Cheilodactylus vittatus Garrett, 1864, Proc. Calif. Acad. Sci., vol. 3, p. 103 (type-locality, Hawaiian Islands).
Gregoryina gygis Fowler and Ball, 1924, Bull. B. P. Bishop Mus. 26, p. 270 (type-locality, Laysan Island, Hawaiian Islands); Fowler, 1928, Mem. B. P. Bishop Mus., vol. 10, p. 223, fig. 46.

DIAGNOSIS: Dorsal rays XVI or XVII (usually XVII),29-33; anal rays III,8 or 9 (usually 8); lateral-line scales 59-65; gill rakers 6-8 + 13-17 (modally 7 + 15); depth of body 2.5-2.6 in SL; head length 3.2-3.4 in SL; fourth dorsal spine 1.05-1.3 in head; third dorsal spine 3.5-4.0 in fourth dorsal spine; pectoral fins 3.5-4.3 in SL; pelvic fins nearly or just reaching or extending well beyond anus, their length 1.35-1.7 in head; prominent bony knobs present anteriorly on maxilla and prefrontal (7 mm long on prefrontal of one 230-mm specimen).

Color in alcohol: Pale to light brown with a diagonal dark brown band from nape to axil of pectoral fin, one from front of dorsal fin to beneath distal part of pectoral fin, and one from margin of dorsal fin between fifth and eighth dorsal spines to lower lobe of caudal fin; last-mentioned band often with a break beneath posterior part of dorsal fin and another on caudal peduncle in front of base of caudal fin; 2 dark bands across interorbital and 2 on cheek (one from orbit to pectoral base and one from below eye to ventroanterior part of thorax; a faint dark band sometimes present on snout; 2 posterior bands of head and dorsal part of anterior band of body often with a dark brown spot on scales; dorsal fin pale except for 2 dark bands extending into spinous portion; anal fin and pectoral fins pale; upper lobe of caudal fin pale, often broadly tipped with blackish; lower lobe of fin entirely blackish; pelvic fins dark brown except spine, which is pale.

Color of a 233-mm specimen when fresh: Light olivaceous, shading ventrally to whitish, with diagonal dark brown bands on head and body; dorsal part of dark band on snout orange-red, the second and third bands of head and dorsal part of first on body containing black spots (not evident on individuals with very dark bands); upper lip orange-red to brownish red, becoming whitish at edge; gill membranes, groove at base of lower lip, corner of mouth, opercular membrane, prefrontal knobs, narrow lower edge of orbit, and upper edge of eye orange-red; median fins olivaceous except for dusky lower lobe of caudal fin and portions of spinous dorsal receiving extensions of dark diagonal bands of body which vary from dusky orange-red on some individuals to nearly black on others; tip of upper lobe of caudal fin may be dusky; a very narrow orange margin sometimes visible on soft portion of dorsal fin and posterior edge of caudal fin; pectoral fins with translucent membranes and orange-yellow rays, the distal ends of the lower simple rays broadly salmon-pink; pelvic fins dark brown, sometimes with longitudinal streaks of orange on membranes.

REMARKS: *C. vittatus* was formerly believed to be endemic to the Hawaiian Islands. However, photographs were sent to the author of 2 live individuals of this species in the Nouméa Aquarium, one taken by René Catala, the former director, and the other by Yves Magnier, the present director. These fish had been collected in New Caledonia. Recently underwater photographs of 2 *vittatus* from Lord Howe Island were sent to the author by Rudie H. Kuiter. One photograph was taken by Adrian Newman and the other by Neville Coleman. The color and general morphology of the fish in the photographs are the same as that for the Hawaiian *vittatus*. Unfortunately, no New Caledonia or Lord Howe specimens of *vittatus* have yet been deposited in museums. Positive identification of these photographs as *vittatus* should await a direct comparison of southern specimens with Hawaiian material.

C. vittatus is a rare species in Hawai'i as noted by Jordan and Evermann (1905) who were fully aware of only 5 specimens in the world at that time; one of these, the 7-inch holotype, was reported by them as probably not in existence. A search was made recently for the type at the California Academy of Science by Pearl M. Sonoda, but it was not found. Günther (1874: pl. 51, fig. B) illustrated the type in color.

Although the author has seen subadults in as little as 2 m, this species is generally found in more than 30 m. The largest specimens reported (Jordan & Dickerson 1908) measured 400 mm total length.

A 280-mm specimen speared by the author in 30.5 m at 10 a.m. had food material only posteriorly in the gut. This consisted of crabs (38%), polychaetes (18%), gastropods (12%, including *Gibbala marmorea, Granula sandwicensis, Zebina tridentata,* a juvenile *Cypraea caputserpentis* and *Thalotia ocellata,* all intact), shrimps (8%, mainly alpheids), spatangoid echinoids (4%), foraminifera (3%), pelecypods (3%, including *Ervilia sandwichensis* and *Chlamys* sp., both epifaunitic) and amphipods (2%). The rest of the gut material was unidentified detritus. The gut contents of 3 specimens, 166-190 mm SL, from among the preserved fish were examined. Because the food material was coalesced in the gut, it was difficult to quantify. It was mainly crustacean, including crabs, shrimps, amphipods and a few isopods. There was also a

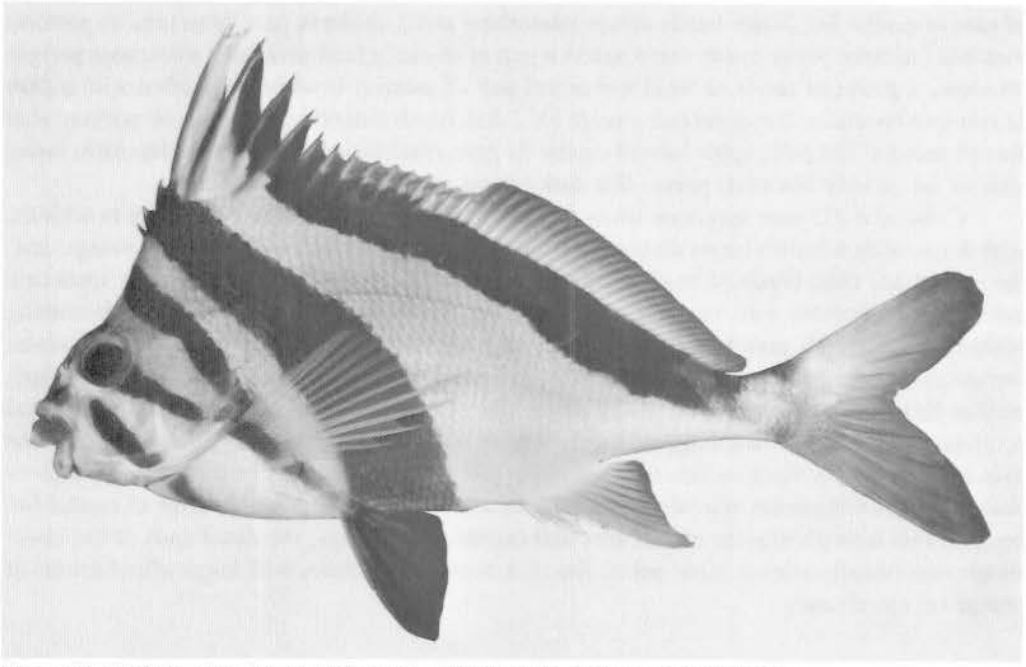

Figure 10. *Cheilodactylus vittatus,* 172 mm SL, BPBM 11983, O'ahu, Hawaiian Islands.

significant number of polychaete and sipunculid worms. None of the food organisms was more than a few mm in greatest dimension.

Gregoryina gygis was described by Fowler and Ball (1924) from a single specimen approximately 56 mm in total length that was taken from the nest of a white tern on the island of Laysan in the Leeward Hawaiian Islands. These authors erected a new family for this one fish, Gregoryinidae. Except for the number of pectoral rays, the meristic data given for this specimen (D XV,24; A III,7; P 14; scales about 48 ? in lateral line) do not match the corresponding counts of *C. vittatus*. Unfortunately, the type specimen, which was once housed by the Bishop Museum, has been lost. It was not present when the author reorganized the fish collection beginning in 1965.

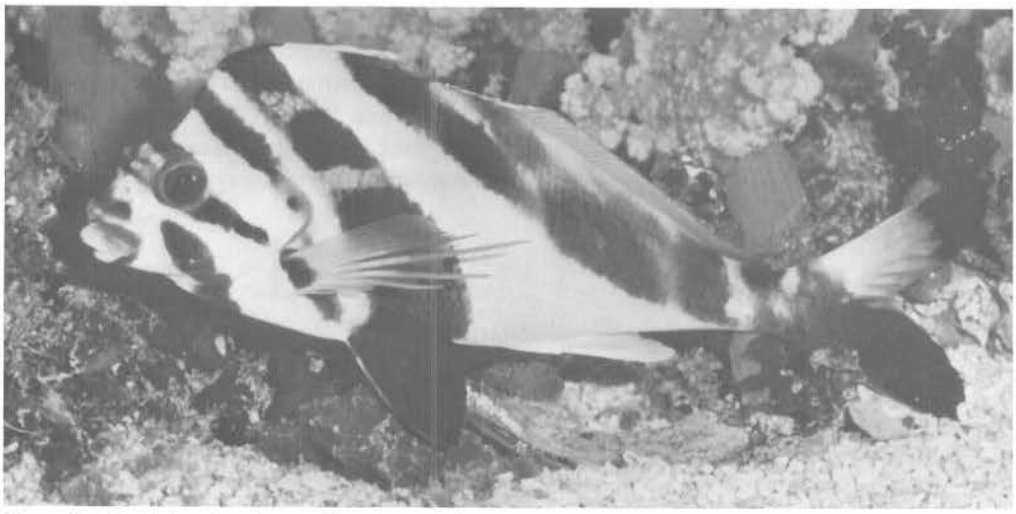

Figure 11. *Cheilodactylus vittatus*, Nouméa Aquarium, New Caledonia (photograph by Yves Magnier).

Figure 12. *Cheilodactylus vittatus*, about 150 mm SL, Lord Howe Island (underwater photograph by Neville Coleman).

Gosline and Brock (1960) provisionally recognized the family Gregoryinidae. They provided additional information from examination of the holotype that supports consideration of this fish as a cheilodactylid. Gosline (pers. comm.) pointed out that the type specimen had been sun dried before it was preserved and the fins could not be raised; thus it was impossible to make accurate counts of fin rays visually from the specimen. Other authors have also recognized the family, though some obviously with uncertainty. Greenwood et al. (1966), for example, listed the family, but they added the remark "(?based on young of cheilodactylid)." Only Norman (1957) correctly allocated *Gregoryina* to the synonymy of *Goniistius*, though he did not examine the holotype.

Bishop Museum has a late postlarval specimen of *C. vittatus* (BPBM 22950, 41 mm SL) that was dropped by a white tern at Midway Island on 15 March 1979; it was presented to the museum by Thomas Hida of the Honolulu Laboratory of the National Marine Fisheries Service. This specimen has the same meristic data as *C. vittatus*. In other respects it is compatible with the data presented by Fowler and Ball (1924) for *G. gygis*, the illustration of the holotype of *gygis* by Fowler (1928: Fig. 46) and the additional data of Gosline and Brock (1960). It has the same 2 black areas in the spinous portion of the dorsal fin and the bilobed black area at the base of the caudal fin as figured by Fowler. *G. gygis* may now be regarded as a junior synonym of *C. vittatus* with more certainty.

Cheilodactylus (Goniistius) gibbosus Richardson

Figs. 13, 14

Cheilodactylus gibbosus Richardson, 1842, Ann. Mag. Nat. Hist., vol. 8, p. 464 (type-locality, Western Australia); Richardson, 1849, Trans. Zool. Soc. London, vol. 3, p. 102.

DIAGNOSIS: Dorsal rays XVI or XVII,34-37; anal rays III,8 or 9; lateral-line scales 61-65; gill rakers 7-8 + 14-16; depth of body 2.75-3.25 in SL; head length 3.35-3.95 in SL; fourth dorsal spine as long as head or slightly longer (except largest specimen where shorter); third dorsal spine 3.3-4.4 in fourth dorsal spine; pectoral fins 2.7-3.6 in SL; pelvic fins reaching to or beyond anus (except largest specimen) 1.25-1.5 in head; bony knobs present on prefrontal and maxilla.

Color in alcohol: Pale with a diagonal dark brown band from first 3 dorsal spines and base of fourth spine to beneath pectoral fin and a second band originating on fifth dorsal spine, curving through middle of spinous portion of dorsal fin, and continuing along back parallel to dorsal contour of body to beneath rear base of dorsal fin; head with a dark brown band from nape to axil of pectoral fin; 2 dark brown bands across interorbital space, continuing as a single band across operculum to base of pectoral fin; a short transverse dark brown band on snout linking lower edge of anterior nostril on each side; caudal and pelvic fins dusky; remaining fins pale.

A 105-mm specimen (WAM P 25999-001) differs in having a series of 6 subquadrate dark brown blotches instead of the second dark stripe on the body, and the lower lobe of the caudal fin is a little darker than the upper. A 58-mm juvenile is shown in Fig. 13.

An underwater photograph in color of an individual in Kuiter (1979: fig. 6) and another in Hutchins (1979: pl. 51) portray whitish fish with dark brown bands as described above; some red is apparent in the groove at the base of the lips and a pale blue stripe in the soft portion of the dorsal fin in Kuiter's photograph.

REMARKS: Richardson named *C. gibbosus* from 2 specimens collected by Gould in Western Australia, one of which was deposited in the British Museum (Natural History) and the other in the Museum of Haslar Hospital. Both are now in the British Museum. The larger of these, BM(NH) 1840.12.9.57, 273 mm SL, is a stuffed specimen from which Richardson took his measurements.

This specimen is here designated the lectotype. The other specimen, BM(NH) 1855.9.19.310, which is preserved in alcohol, measures 100 mm SL. A drawing of a *Cheilodactylus* from the Endeavour River on the east coast of Australia that Richardson attributed to Parkinson [actually, the drawing was by Sporing (A.C. Wheeler, pers. comm.)] was labeled *Chaetodon gibbosus*. Because Richardson believed this figure to be a "correct representation" of the West Australian specimens, he chose the name *gibbosus* for the species. This name was used for a *Cheilodactylus* on both west and east coasts of Australia until Kuiter (1979) chose to resurrect *C. vestitus* (Castelnau) from synonymy and apply it to the eastern Australian species; he stated that *C. gibbosus* "is strictly a W.A. species." Kuiter did not document the differences of these two species—only suggested a comparison of his photographs. Tables 1-3 clearly show differences in the counts of the dorsal spines and rays, anal rays, and gill rakers between these two species. There are slight differences in color patterns. Also *gibbosus* has a more elongate body on the average

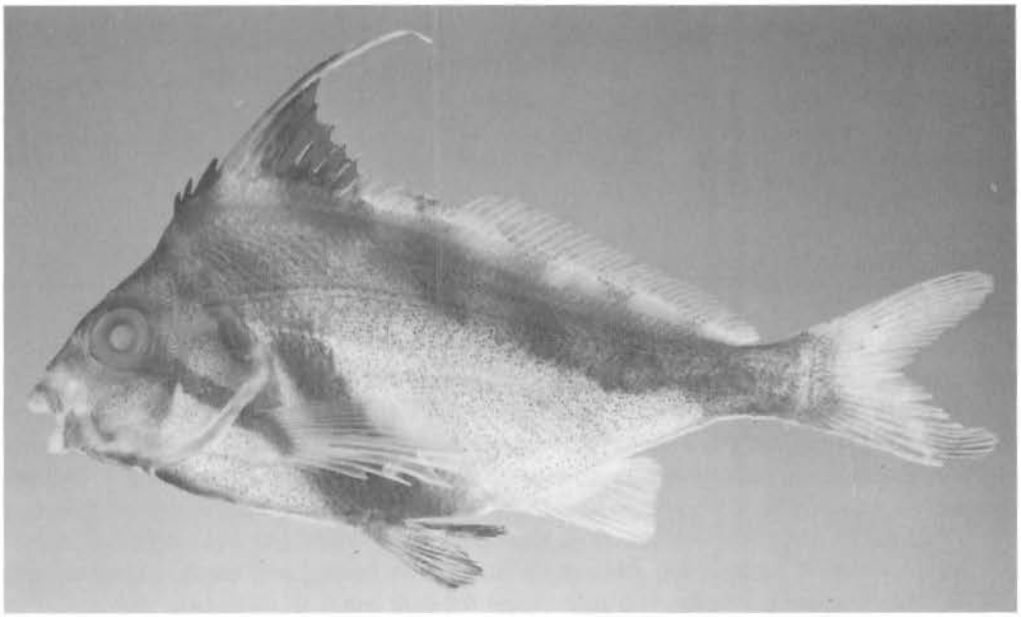

Figure 13. *Cheilodactylus gibbosus*, 129 mm SL, WAM P.27052-001, Garden Island, Western Australia.

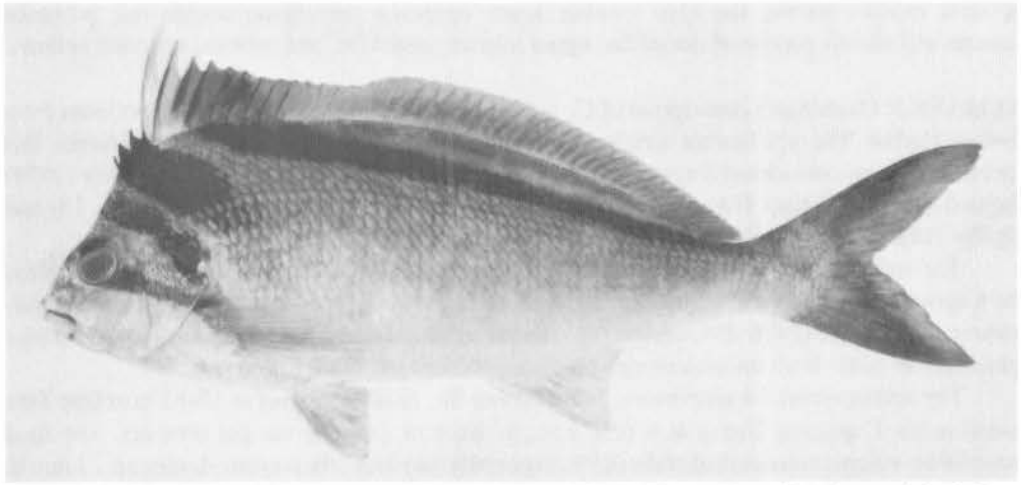

Figure 14. *Cheilodactylus gibbosus*, 292 mm SL, BPBM 26844, Perth, Western Australia (photograph by J. Barry Hutchins).

than *vestitus*. Kuiter's decision to regard *vestitus* as valid is therefore followed in the present paper.

Nine specimens, 58-292 mm SL, have been available for the present study, all sent by the Western Australian Museum (the largest, Fig. 14, as a gift to the Bishop Museum). These were collected at the following Western Australian localities: Shark Bay, Lancelin Island, Garden Island, Hardy Inlet, Irwin Inlet, Wilson Inlet, Point Peron, Perth, and off Fremantle. Hutchins (1979) stated that this species is common around Rottnest Island (35° S., 115° 30′ E) in sheltered shallow-water areas. He gave the maximum length as 30 cm.

Kuiter (1979) used the common name Magpie Morwong for *C. gibbosus*. His photograph was taken at Busselton jetty where the fish was noted to be common. In reference to size he wrote, "It grows to about 35 cm."

Cheilodactylus (Goniistius) vestitus (Castelnau)

Fig. 15

Zeodrius vestitus Castelnau, 1878, Proc. Linn. Soc. New South Wales, vol. 3, p. 377 (type-locality, Port Jackson = Sydney Harbor, Australia).

DIAGNOSIS: Dorsal rays XVI or XVII,32-35; anal rays III,8 or 9 (usually 8); lateral-line scales 58-65; gill rakers 7-8 + 14-16; depth of body 2.6-2.85 in SL; head length 3.3-3.7 in SL; fourth dorsal spine 1.0-1.1 in head; third dorsal spine 3.75-5.0 in fourth dorsal spine; pectoral fins 2.8-3.3 in SL; pelvic fins reaching or extending well beyond anus, their length 1.25-1.6 in head; bony knobs anteriorly on maxilla and prefrontal well developed.

Color in alcohol: Pale with a dark brown band from first 3 dorsal spines and base of fourth to beneath middle of pectoral fin; a second dark brown band from distal part of dorsal fin beginning with fifth dorsal spine, curving downward through base of dorsal fin and continuing along back diagonally across caudal peduncle onto lower lobe of caudal fin; a dark brown band from nape to axil of pectoral fin and a double band across interorbital space continuing as a single band across operculum to base of pectoral fin; a transverse dark brown band across snout, ending beneath nostrils; base of upper lip dusky; fins pale except for dark bands as mentioned above.

Color when fresh: Whitish with dark brown (almost black) bands as described above; upper lip dark reddish brown, the edge whitish; lower opercular membrane orange-red; posterior spinous and all soft portion of dorsal fin, upper lobe of caudal fin, and pectoral rays dull yellow.

REMARKS: Castelnau's description of *C. vestitus* was based on a single 8-inch specimen from Sydney Harbor. The type has not been located. As mentioned in the Remarks for *C. gibbosus*, this species has been considered a synonym of the western Australian *gibbosus* until Kuiter (1979) showed that it is distinct from *gibbosus*. Exceptions are Tenison-Woods (1882:47, pl. 13) and Ogilby (1889:59), who misidentified it as *C. vittatus*.

The author has examined specimens from Moreton Bay (Southern Queensland), Sydney, the Capricorn Group of the Great Barrier Reef, Lord Howe Island, and New Caledonia. Fourmanoir and Laboute (1976:284, middle fig.) illustrated an individual of this species (as *Goniistius gibbosus*) in color from an underwater photograph taken off New Caledonia.

The author speared 4 specimens, 246-268 mm SL, outside the reef in 10-12 m at One Tree Island in the Capricorn Group at 6-6:30 a.m. in order to examine the gut contents. The food material by volume consisted of crabs (25%, especially xanthids, the largest, *Actaea* sp., 7 mm in carapace width), gastropods (13%, including *Stomatella* sp., *Pseudostomatella* sp., and *Gibbula* sp., the largest 7.5 mm in length), shrimps (12%, especially alpheids), foraminifera (7%),

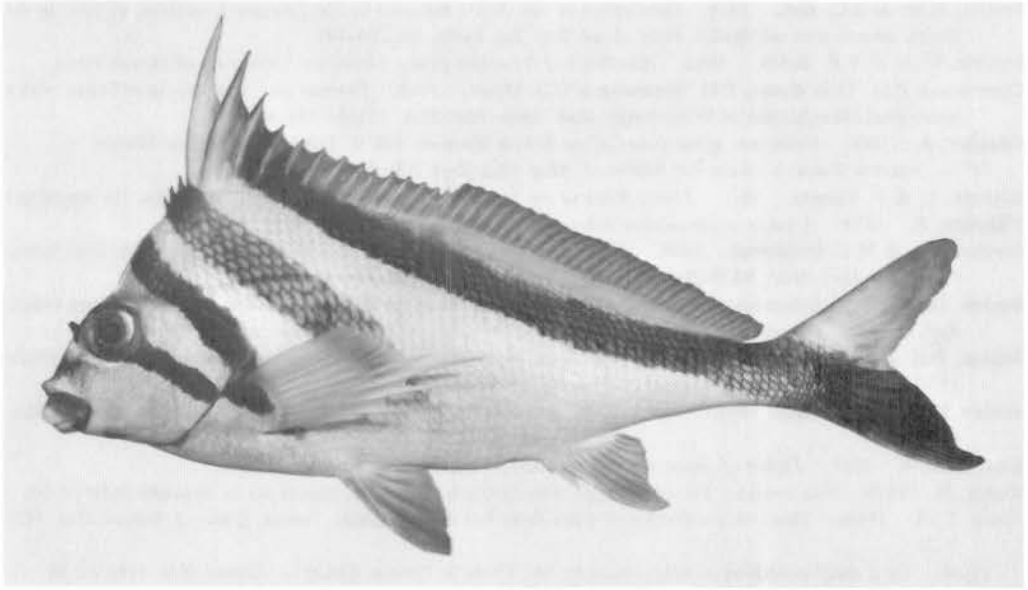

Figure 15. *Cheilodactylus vestitus,* 274 mm SL, BPBM 14371, One Tree Island, Capricorn Group, Great Barrier Reef.

gammarid amphipods (6.5%), polychaetes (5%), chitons (3%), pelecypods (2%), algae (1.5%), ophiuroids (0.8%), unidentified eggs (0.6%), isopods (0.5%), and echinoids (0.4%). The remaining 27.2% of the gut-content volume was sand and detritus.

Kuiter (1979) employs the common name Crested Morwong for this species.

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LITERATURE CITED

Abe, T. 1963. *Keys to the Japanese fishes fully illustrated in colors.* 2nd ed. Tokyo: Hokuryukan. (In Japanese.)

Allen, G.R. & P.C. Heemstra. 1976. *Cheilodactylus rubrolabiatus,* a new species of morwong (Pisces: Cheilodactylidae) from Western Australia, with a key to the cheilodactylid fishes of Australia. *Rec. West. Austral. Mus.* 4(4): 311-25.

Anonymous. 1970. Fish men land a bonanza for science. *Natl. Geogr.* 137(5): nominations page.

Burgess, W. & H.R. Axelrod. 1974. *Pacific marine fishes. Book 4.* Neptune City: T.F.H. Publications, Inc.

Chu, et al. 1963. *Fishes of the South China Sea.* [In Chinese; reference from Lindberg and Krasyukova, (1969).]

Doak, W. 1972. New fishes. *Dive* 12(1): 18-19.

Fourmanoir, P. & P. Laboute. 1976. *Poissons de Nouvelle Calédonie et des Nouvelles Hébrides.* Papeete: Les Éditions du Pacifique.

Fowler, H.W. 1928. The fishes of Oceania. *Mem. Bernice P. Bishop Mus.* 10.

1930. Notes on Japanese and Chinese fishes. *Proc. Acad. Nat. Sci. Phila.* 8: 589-616.

1956. A synopsis of the fishes of China. Part VII. The perch like fishes (completed). *Quart. J. Taiwan Mus.* 9 (3 & 4): 161-354.

Fowler, H.W. & S.C. Ball. 1924. Description of new fishes obtained by the *Tanager* Expedition of 1923 in the Pacific islands west of Hawaii. *Proc. Acad. Nat. Sci. Phila.* 76: 269-74.

Gosline, W.A. & V.E. Brock. 1960. *Handbook of Hawaiian fishes.* Honolulu: University of Hawaii Press.

Greenwood, P.H., D.E. Rosen, S.H. Weitzman & G.S. Myers. 1966. Phyletic studies of teleostean fishes, with a provisional classification of living forms. *Bull. Amer. Nat. Hist.* 131(4): 341-456.

Günther, A. 1860. *Catalogue of the fishes of the British Museum,* vol. 2. London: Taylor and Francis.

1874. Andrew Garrett's Fische der Südsee. *J. Mus. Godeffroy* 7(3): 57-96, pls. 21-60.

Hiyama, Y. & F. Yasuda. 1971. *Living fishes of the Japanese coastal waters.* Tokyo: Kodansha. (In Japanese.)

Hutchins, B. 1979. *A guide to the marine fishes of Rottnest Island.* Perth: Creative Research.

Jordan, D.S. & M.C. Dickerson. 1908. On a collection of fishes from Fiji, with notes on certain Hawaiian fishes. *Proc. U.S. Natl. Mus.* 34(1625): 603-17.

Jordan, D.S. & B.W. Evermann. 1905. The aquatic resources of the Hawaiian Islands. Part I. The shore fishes. *Bull. U.S. Fish Commission* 23 (1903).

Jordan, D.S. & A.C. Herre. 1907. A review of the cirrhitoid fishes of Japan. *Proc. U.S. Natl. Mus.* 33(1562): 157-67.

Jordan, D.S. & C.M. Metz. 1913. A catalog of the fishes known from the waters of Korea. *Mem. Carnegie Mus.* 6(1): 1-65.

Kamohara, T. 1967. *Fishes of Japan in color.* Osaka: Hoikusha Publishing Co., Ltd.

Kuiter, R. 1979. Fish cousins. The morwongs—Family Cheilodactylidae. *Skindiving in Australia* 9(3): 35-38.

Liang, Y.-S. 1948a. Notes on a collection of fishes from Pescadores Islands, Taiwan. *Quart. J. Taiwan Mus.* 1(2): 1-20.

1948b. On a small collection of fishes made by Mr. Chow at Taiwan. *Quart. J. Taiwan Mus.* 1(4): 51-59.

Lindberg, G.U. & Z.V. Krasyukova. 1969. *Fishes of the Sea of Japan and the adjacent areas of the Sea of Okhotsk and the Yellow Sea. Part 3. Teleostomi XXIX. Perciformes.* Leningrad: Izdatel'stvo "Nauka" Leningradskoi Otdelenie. (In Russian; English trans., 1971.)

Masuda, H. 1972. *Sea fantasy wonders of fish life in Japan's coastal waters.* Tokyo: Mainichi Newspaper.

Masuda, H., C. Araga & T. Yoshino. 1975. *Coastal fishes of southern Japan.* Tokyo: Tokai University Press.

Matsubara, K. 1955. *Fish morphology and hierarchy. Part I.* Tokyo: Ishizaki-shoten. (In Japanese.)

McCulloch, A.R. 1911. *Zoological results of the fishing experiments carried out by the F.I.S.* Endeavour *1909-1910. Vol 1. Report on the fishes. Part I.* Sydney: Department of Trade and Customs, Commonwealth of Australia.

Mori, T. 1952. *Check list of the fishes of Korea.* Sasayama (Japan): Zoological Department, Hyogo University of Agriculture.

Nakamura, S. 1936. Young stages of the shore fishes appearing near Kominato. *Yōshokukaishi* 6(7/8): 133-39. (In Japanese.)

Nielsen, J.G. 1963. On the development of *Cheilodactylus variegatus* Valenciennes 1833 (Cheilodactylidae). *Copeia* (3): 528-33.

Norman, J.R. 1957. *A draft synopsis of the orders, families and genera of recent fishes and fish-like vertebrates . . .* London: British Museum (Natural History) private printing.

Ogilby, J.D. 1889. The reptiles and fishes of Lord Howe Island. *Mem. Australian Mus., Sydney* (2): 51-74.

Randall, J.E. 1981. Examples of antitropical and antiequatorial distribution of Indo-West-Pacific fishes. *Pac. Sci.* 35(3): 197-209.

Richardson, J. 1846. *Report on the ichthyology of the seas of China and Japan.* London: Richard and John E. Taylor. (Reprinted 1972).

Schmidt, P. 1930a. A list of fishes of the Riu-Kiu Islands, collected by K. Awaya in 1929. *Bull. Acad. Leningrad* (1930): 541-58.

1930b. Fishes of the Riu-Kiu Islands. *Trans. Pac. Committee Acad. Sci. USSR* 1: 19-156.

Scott, T.D., C.J.M. Glover & R.V. Southcott. 1974. *The marine and freshwater fishes of South Australia.* South Australia: D.J. Woolman, Govt. Printer.

Smith, M.M. 1980. A review of the South African cheilodactylid fishes *(Pisces: Perciformes),* with descriptions of two new species. *Ichthy. Bull. J.L.B. Smith Inst. Ichthy., Rhodes Univ., Grahamstown* (42): 1-14.

Stehmann, M. 1979. *Illustrated field guide to abundant marine fish species in Argentine waters.* Hamburg: Institut für Seefischerei.

Suyehiro, Y. 1936. On the digestive system and the feeding habits of *Goniistius zonatus* (Cuvier & Valenciennes). *Acta Zooecologica Tokyo* 1(1): 17-20. (Japanese with English summary.)

Temminck, C.J. & H. Schlegel. 1842. *Fauna Japonica, sive descriptio animalium . . . Pisces.* Kobe: J.L. Thompson & Co., Ltd.

Tenison-Woods, J.E. 1882. *Fish and fisheries of New South Wales.* Sydney: Thomas Richards, Govt. Printer.

Thomson, J.A. 1918. Records of new or rare fish from New Zealand waters. *New Zeal. Sci.* 1: 4-7.

Tomiyama, I., T. Abe & T. Tokioka. 1958. *Encyclopaedia zoologica illustrated in colours. II.* Tokyo: Hokuryukan Co. (In Japanese.)