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Review of the genus *Cociella* Whitley (Teleostei: Platycephalidae) with the description of three new species

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Abstract.—The genus *Cociella* Whitley is diagnosed as having vomerine teeth in two discrete patches, teeth in jaws not depressible, diagonal scale rows slanting downward above lateral line more numerous than lateral-line scales, lateral-line scale pores with a single canal opening to the exterior, iris lappet a simple lobe, side of head bicarinate, suborbital ridge bearing one spine under middle eye and one spine under rear margin of eye (additional spines may or may not be present posterior to eye), and upper preopercular spine distinctly longer than lower spines, bearing a small accessory spine on base. *Cociella punctata* (Cuvier) is removed from the synonymy *C. crocodilus* (Tilesius) and the occurence of possible intergrades between *C. punctata* and *C. crocodilus* is discussed. Young *C. punctata* appear to utilize the mangroves as nursury grounds. Three new species tentatively assigned to *Cociella* are described, *C. heemstrai* from off the west coast of southern Africa, *C. somaliensis* from off Oman and Somalia and *C. hutchinsi* from the Arafura Sea. A key to the species of *Cociella* is provided that primarily uses differences in arrangement of spines on the suborbital ridge, fin ray counts, number of gill rakers, and scale counts to separate the species.

The status of many nominal genera of the Platycephalidae remains unclear. Relatively little has been published in this regard since extensive revision of Japanese flatheads by Matsubara & Ochiai (1955). Matsubara & Ochai (1955) synonymized *Platycephalus punctatus* (Cuvier *in* Cuvier & Valenciennes, 1829) under *Platycephalus crocodilus* (Tilesius, 1812), restricting the genus *Cociella* to *C. crocodilus*. The genus *Cociella* is here regarded as containing *C. crocodilus, C. punctata,* and three new species described below. This paper attempts to clarify the limits *Cociella* and compares features between *Cociella* and *Ratabulus*.

The taxonomic significance of the pore morphology of the lateral-line scales in the Platycephalidae is well documented. Matsubara and Ochiai (1955) found that differences in pore structure of the scales were useful as generic characters in *Cociella, Onigocia, Platycephalus* and *Rogadius*. This was further corroborated by Hughes (1981, 1985) who, in addition to pore structure, also included other features of lateral-line scale morphology in a comprehensive study of the flatheads that utilized scanning electron microscopy. The configuration of lateral-line scale pores is also considered important here. For example, the scale pores of *Thysanophrys* have two canals to the exterior and are Y-shaped; those of *Onigocia* also have two canals to the exterior and resemble short, stubby Ts. Other flathead nominal genera with two canals include *Inegocia, Papillolabium, Rogadius, Sorsogona* and *Suggrundus*. On the basis of having two pore canals, and with the diagonal scale rows above the lateral line being equal or nearly so to the number of lateral-line scales, these genera are removed from consideration here.

A second group of genera has lateral line scale pores with one canal to the exterior: *Cociella; Elates; Grammoplites; Kumococius; Leviprora; Platycephalus;* and *Ratabulus.* To separate these from *Cociella,* it is necessary to use additional characters. The condition found in *Cociella* is given in parentheses. Vomerine teeth in a single patch is diagnostic for *Platycephalus* (two patches). A single elongate preopercular spine and six dorsal spines is unique to *Elates* (2–3 preopercular spines, 9 dorsal spines). Scale rows slanting downward above the lateral line closely approximate the number of lateral line scales in *Kumococius* and *Grammoplites* (scale rows are more numerous than lateral line scales). In *Leviprora,* the type of iris lappet (or umbraculum) on the upper surface of the eye is finger-like or cirrose (Matsubara & Ochiai 1955:5, Fig. 2F) and the two upper preopercular spines are subequal (iris lappet a simple lobe, upper propercular spine distinctly longest). *Ratabulus* shares many of the diagnostic features given here for *Cociella* but differs in having depressible teeth in the jaws, a greater number of spines on the suborbital ridge beneath the eye, more elongate lateral-line scales (Fig. 1A) and a smaller and more pointed iris lappet. Although there is some justification for placing *Cociella* in the synonymy of *Ratabulus,* such action would require additional evidence that is not available here.

Drawings of lateral line scales from the species of *Cociella, Ratabulus megacephalus* and *Kumococius rodericiensis* appear in Fig. 1A–G. These ctenoid scales are small, rather uniformly rectangular, have well-developed radii, and pores that open to the exterior through a single slender canal. The canal of *C. heemstrai* is somewhat shorter than the canals in other species of *Cociella.* In Fig. 1A, *Ratabulus megacephalus,* the pore and canal is quite similar to those of the other species shown but the scale is more slender and elongate. The scale from *Kumococius rodericiensis* (Fig. 1G) appears quite similar to those found in *Cociella* but the spine at the anterior margin of the pore is much more robust.

Methods.–Counts follow procedures described by Hubbs & Lagler (1958:19–24) with the following exceptions: number of diagonal scale rows slanting downward (and backward) starting with the row nearest the anteriormost lateral line scale and ending with row nearest the posterior lateral line scale; number of interpelvic scales are counted in a straight line between the pelvic bases. Measurements (in mm) were taken as follows: interorbital width is the least bony width between the eyes; orbit diameter is taken from the lower rear margin of the orbit to the base of the preocular spine; snout length is the distance from the tip of snout to rear base of the preocular spine; head length is taken from the tip of the snout to the rear margin of the head; and standard length is the stright line distance from the tip of snout to the rear margin of the hypural plate. Counts and measurements were routinely taken from the left side (unless damaged) while gill rakers were counted on the right side. The material examined was from the following institutions (abbreviations in parentheses): Academy of Natural Sciences of Philadelphia (ANSP); American Museum of Natural History, New York (AMNH); Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM); California Academy of Sciences, San Francisco (CAS, SU); Commonwealth Science and Industrial Research Organization, Hobart (CSIRO); Field Museum of Natural History, Chicago (FMNH); Hebrew University, Jerusalem (HUJ); Hokkaido University, Hakodate (HUMZ); J. L. B. Smith Institute of Ichthyology, Grahamstown (RUSI); Kanudi Fisheries Research Station, Konedobu, Papua New Guinea (KFRS); Museum of Comparative Zoology, Harvard University (MCZ); Muséum National d'Histoire Naturelle, Paris (MNHN); Museum für Naturkunde der Universitat-Humboldt, Berlin (ZMB); Museum of Zoology, University of Michigan, Ann Arbor (UMMZ); National Museum of

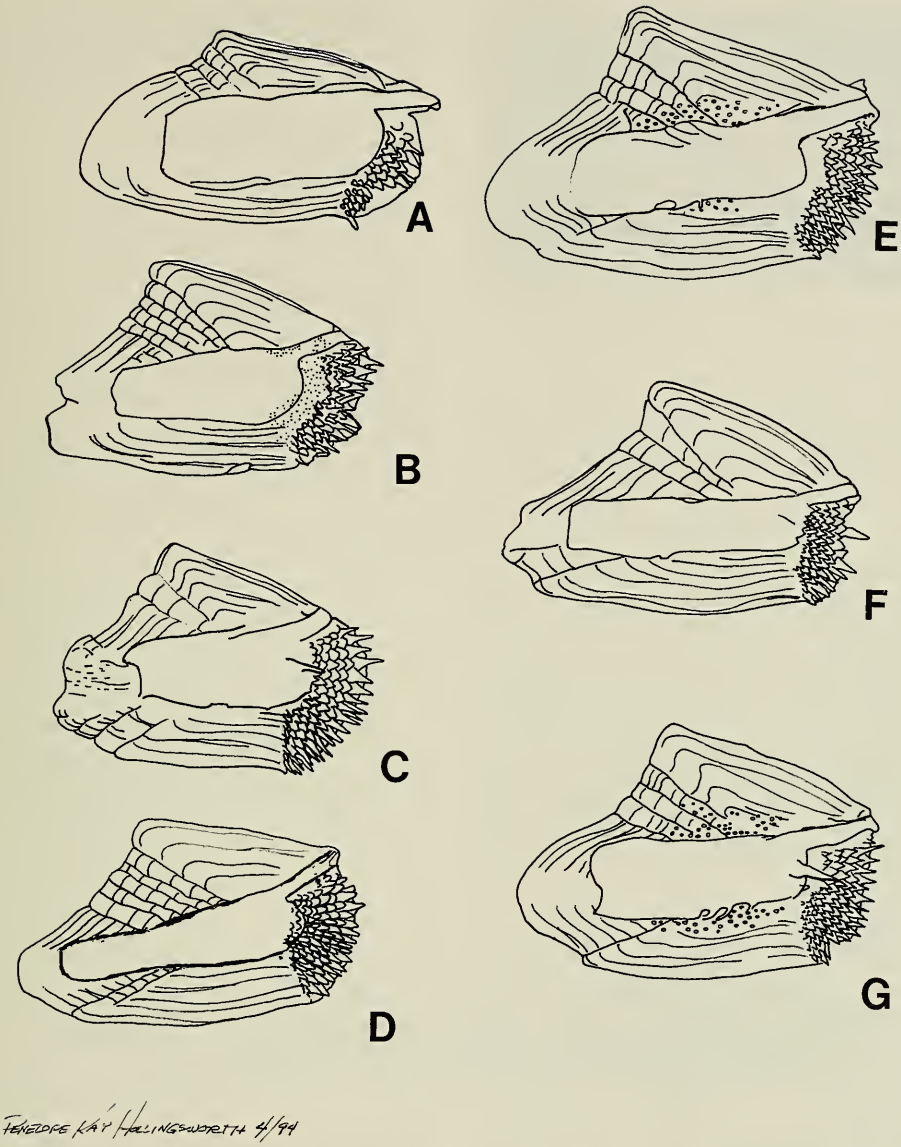

Fig. 1. Drawings of pored lateral line scales taken from right side (12th scale from front, scale length in parentheses) of species of *Cociellà* and related flatheads: A, *Ratabulus megacephalus,* USNM 329510, 236 mm SL, (3 mm); B, *Cociella somaliensis,* USNM 326300, 216 mm SL, (3 mm); C, *Cociella heemstrai,* USNM 326629, 178 mm SL, (2.9 mm); D, *Cociella crocodilus,* USNM 329509, 261 mm SL, (3.6 mm); E, *Cociella hutchinsi,* USNM 327279, 240 mm SL, (4.3 mm); F, *Cociella punctata,* USNM 327189, 216 mm SL, (4.0 mm); G, *Kumococius rodericiensis,* WAM P26206, 180 mm SL, (4.0 mm).

Natural History, Washington D.C. (USNM); National Natuurhistorische Museum, Leiden (RMNH); Natural History Museum, London (BMNH); Natural History Museum, Los Angeles County (LACM); Naturhistorisches Museum, Vienna (NMW); Northern Territory Museum of Arts & Sciences, Darwin (NTM); Royal Ontario Museum, Toronto (ROM); South African Museum, Cape Town (SAM); Western Australian Museum, Perth (WAM); Zoölogische Museum, Universtiteit van Amsterdam

Fig. 2. Interopercular flap (IOP), right side of *Cociella punctata,* USNM 329292, 111 mm SL.

(ZMA); and Zoologisk Museum, Kobenhavns Universitet, Copenhagen (ZMUC).

Cociella Whitley, 1940

Cocius Jordan & Hubbs, 1925:286 (type species *Platycephalus crocodilus* Tilesius, 1812, by original designation).

Cociella Whitley, 1940:243 (substitute for *Cocius* Jordan & Hubbs, preoccupied).

Diagnosis.—A genus of platycephalid fishes characterized by the following: ocular papillae absent; iris lappet a simple lobe (Figs. 3, 7) or slightly bilobed (latter may be an artifact of preservation); anterior nostril with an elongate dermal flap posteriorly; interopercular flap present or absent; pelvic-fin rays I, 4+1; anteriormost 1 to 19 lateral-line scales bearing small spines; scale rows slanting downward above lateral line more numerous than lateral-line scales; lateral-line scale pores with a single opening to the exterior; suborbital ridge bearing one spine under middle of eye and one spine under rear margin of eye, additional spines may or may not be present posterior to the eye; a single preocular spine; preopercular spines 2 or 3, uppermost bearing a small accessory spine on base; side of head bicarinate; teeth villiform, caniniform or granular, in broad bands on tooth-bearing bones; and vomerine teeth in 2 discrete patches.

Key to the species of *Cociella*

1A. Dorsal-fin rays and anal-fin rays usually 11; total number of gill rakers on first arch 5–8 2

1B. Dorsal-fin rays and anal-fin rays usually 12; total number of gill rakers on first arch 9–18 4

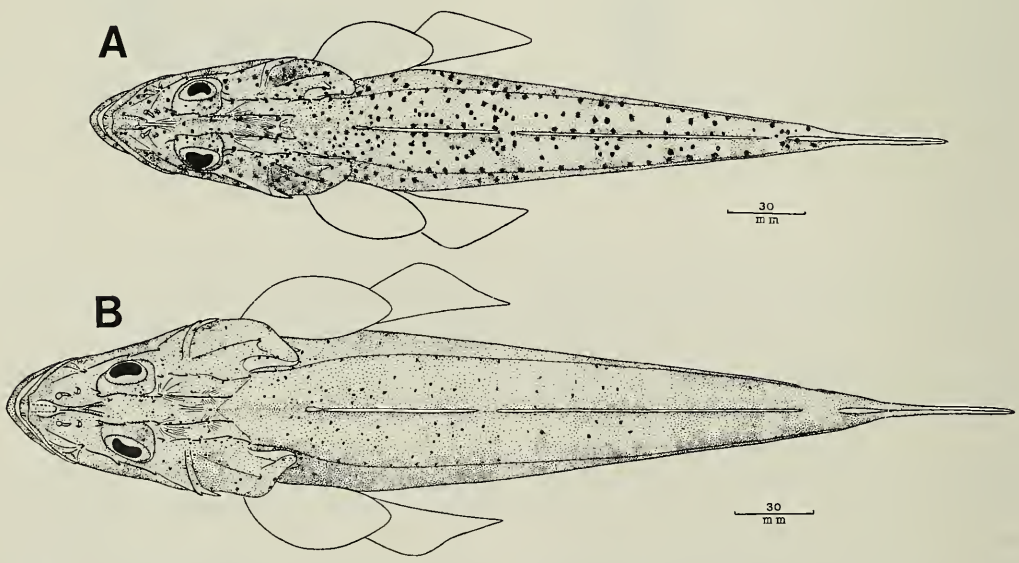

Fig. 3. Color pattern variation in *Cociella crocodilus* (After Matsubara & Ochiai, 1955): A, Pattern typical of *C. crocodilus.* Specimen from Kanaiwa, Japan, 285 mm SL; B, Pattern usually found in *C. punctata.* Specimen from the East China Sea, 340 mm SL.

2A. Suborbital ridge with 2 spines below eye, several spines behind eye; upper preopercular spine long, nearly reaching to opercular margin; preorbital spine slight or lacking .... *C. hutchinsi,* new species

2B. Suborbital ridge with 2 spines below eye, no spines behind eye; upper preopercular spine shorter, reaching about half-way to opercular margin; preorbital spine usually well developed ... 3

3A. Diagonal scale rows slanting downward above lateral line 74–91 ($\bar{X}$ = 80.6); total gill rakers usually 7 (6–8); interopercular flap absent .. *C. crocodilus.*

3B. Diagonal scale rows slanting downward above lateral line 60–76 ($\bar{X}$ = 67.1); total gill rakers 5–6, usually 6; interopercular flap present ... *C. punctata*

4A. Total gill rakers 9–11 ($\bar{X}$ = 10.0); interpelvic scale count 16–24 ($\bar{X}$ = 20.6); caudal fin dusky, with small dark spots on upper half .. *C. heemstrai,* new species

4B. Total gill rakers 12–18 ($\bar{X}$ = 15.1); interpelvic scale count 25–35 ($\bar{X}$ = 29.9); caudal fin light, with large dark spots and horizontal streaks throughout .. .. *C. somaliensis,* new species

Cociella crocodilus (Tilesius, 1812) Fig. 3A

Platycephalus crocodilus Tilesius, 1812, pl. 59, fig. 2 (original description, type locality, Nagasaki).—Cuvier *in* Cuv. & Val., 1829:256 (description taken from Tilesius).—Beaufort & Briggs, 1962: 159–161.—Burgess & Axelrod, 1971: 541, fig. 510.—Burgess & Axelrod, 1974:1006, fig. 302.

Platycephalus punctatus.—Günther, 1880: 66.

Platycephalus inermis (not *Silurus inermis* Houttuyn, 1878) Jordan & Evermann, 1903:361.

Thysanophrys crocodilus.—Jordan & Richardson, 1908:638–640, fig. 4.—Jordan & Metz, 1913:54, fig. 49.—Jordan et al., 1913:286, fig. 235.

Inegocia crocodilus.—Jordan & Thompson, 1914:279.

Cocius crocodilus.—Jordan & Hubbs, 1925:287.

Cociella crocodila.—Matsubara & Ochiai, 1955:87–89, figs. 32, 33 (in part).—Anonymous, 1975:214, pl. 208.—Masuda et al., 1975:342, pl. 146, figs. F, G.—Kyushin et al. (eds.), 1982:276, fig. 255.—Masuda et al. (eds.), 1984:322, pl. 289, figs. C, D.

Inegocia crocodila.—Tomiyama & Abe, 1963:69, fig. 201.

Material examined (63 specimens).—Japan: UMMZ 183219 (5, 140–174) Niigita. UMMZ 183220 (1, 181) Niigita. SU 23650 (1, 285) Naoetsu. UMMZ 183218 (2, 240–256) Namerikawa. UMMZ 183222 (1, 250) Namerikawa. FMNH 104717 (3, 142–204) Tokyo. FMNH 71864 (1, 193) Yokohama. MCZ 48821 (1, 140) Yenosima. MCZ 31160 (1, 126) Yenosima. UMMZ 198916 (1, 178) Toba. FMNH 58790 (1, 142) Toba. FMNH 57413 (5, 230–293) Osaka. USNM 151815 (1, 239) Kobe. NMW 11179 (2, 332–403) Kobe. ZMB 18778 (2, 251–258) Kobe. USNM 10734 (4, 192–216) Wakanoura. USNM 62317–18 (2, 112–175) Hiroshima & Onomichi. UMMZ 183215 (1, 218) northern Kyushu. CAS 120708 (2, 241) Nagasaki. SU 13362 (1, 350) Nagasaki. ZMUC P80233 (1, 146) Nagasaki. Korea, Pusan: UMMZ 183216 (5, 133–206). UMMZ 198900 (2, 159–172). USNM 143416 (2, 126–174). FMNH 55763 (1, 251). China: SU 31261 (1, 242). ZMA 112.715 (1, 339) near Chin-huang-tao. MCZ 13789 (1, 253) Shanghai. SU 32766 (1, 218) Ting-hai. USNM 130414 (1, 227) Ningpo. USNM 327194 (1, 245) northern East China Sea. HUMZ 108647 (1, 308) East China Sea. USNM 329509 (1, 261) Dongxiang. UMMZ 198909 (1, 88) Fukien. Taiwan: CAS 30012 (1, 231) Formosa Strait. CAS 15234 (1, 218) Formosa Strait. CAS 107973 (1, 171) Chilung. Hong Kong: ZMUC P80193-194 (2, 80–85).

Possible intergrades, C. crocodilus × *C. punctata* (5 specimens).—MNHN 05–222 (1, 170) Bay d'Along, Gulf of Tonkin. SU

Table 1.—Number of diagonal scale rows slanting downward above lateral line in the species of *Cociella.*

	53–55	56–58	59–61	62–64	65–67	68–70	71–73	74–76	77–79	80–82	83–85	86–88	89–91	*n*	$\bar{X}$
C. crocodilus								7	18	17	9	5	5	61	81.0
C. heemstrai	1	16	24	14	6	1								62	60.7
C. hutchinsi			6	14	5	1								26	62.9
C. punctata		2	1	16	29	34	23	6						111	67.9
C. somaliensis	2	12	11	7	2									34	59.9

14151 (1, 337) S.W. Kwangtung. HUMZ 109566 (1, 269) South China Sea, off Sarawak, Borneo. USNM 32924 (1, 394), Penghu Is., Taiwan. FMNH 47490 (1, 54) Singapore.

Description.—(Mean values appear in parentheses). Dorsal-fin rays I, VIII, 10–11 (10.9), usually 11; anal-fin rays 10–12 (11.0), usually 11; pectoral-fin rays 19–22 (20.3); pored lateral line scales 51–60 (54.3), the anteriormost 1–19 (8.2) scales bearing weak spines; number of diagonal scale rows above lateral line slanting downward 74–91 (81.0); diagonal scale count 14–20 (16.7); interpelvic scales 28–46 (34.4); total gill rakers on first arch 6–8 (7.1) and branched caudal rays 10–12 (11.3). Least interorbital width going into greatest diameter of orbit 2.3–4.3 (2.9). Nape, opercle and cheek behind eye covered with ctenoid scales; top of head and cheek below eye mostly naked, with a few embedded scales. Preorbital spine present; a pair of small nasal spines. Preopercular spines often two, sometimes three; uppermost longest, reaching about half-way to opercular margin. Infraorbital ridge usually smooth over anterior ¼ of eye, bearing 5–8 small spines posteriorly; suborbital ridge with one spine below middle of eye, a second spine below rear margin of eye, no spines behind eye. Lateral-line scale shown in Fig. 1D. Interopercular flap absent.

Color in alcohol.—Five or six dark bands usually crossing back. Dark spots on dorsum numerous anteriorly (on head, including upper surface of eye and on anterior trunk reaching below lateral line), more scattered and primarily above lateral line on posterior body. Spinous dorsal fin with broad dusky margin, clear area at base; second dorsal fin with dark spots on rays; anal-fin membranes dusky, rays pale; pectoral fin dusky below, with vertical rows of dark spots on upper half; pelvic fin dusky; caudal fin dusky, with a series of dark blotches or streaks that usually form a broad marginal band.

Remarks.—No type specimens are known for *Cociella crocodilus.* The species is based on an inconotype (Tilesius 1812: pl. 59, fig. 2) and a secondary description based on Tilesius given by Cuvier (*in* Cuvier & Valenciennes, 1829:256). A more complete description appears in Matsubara & Ochiai (1955:87–89). Several characters effectively separating *Cociella crocodilus* and *C. punctata* include differences in the number of diagonal scale rows slanting downward above the lateral line (Table 1), total numbers of gill rakers (Table 2) and presence or absence of a preopercular flap (Fig. 2). Most *C. crocodilus* have from 77 to 91 scale rows ($\bar{X}$ = 81) while most *C. punctata* have 56 to 73 scale rows ($\bar{X}$ = 67.9). Nearly all of *C. crocodilus* have 7 or 8 gill rakers ($\bar{X}$ = 7.1) while most *C. punctata* have 6 gill rakers or less ($\bar{X}$ = 6.0). The flap is absent in *C. crocodilus* but is usually well-developed in *C. punctata* (Fig. 2). This flap may be partially developed in young specimens and may be difficult to see in larger specimens that were poorly fixed or that have been preserved for many years.

Matsubara & Ochiai (1955) illustrated variation in color pattern between a specimen taken from off Kanaiwa, Ishikawa Prefecture, Japan (Fig. 3A) and one from the East China Sea (Fig. 3B). In general, large dark spots on the dorsum are typical for *C.*

Table 2.—Total number of gill rakers on the first arch in the species of *Cociella.*

	5	6	7	8	9	10	11	12	13	14	15	16	17	18	*n*	$\bar{X}$
C. crocodilus		1	45	6											52	7.1
C. heemstrai					14	36	13								63	10.0
C. hutchinsi		15	3												18	6.2
C. punctata	1	84	5												90	6.0
C. somaliensis								1	5	5	13	11	2	2	39	15.1

crocodilus (Fig. 3A), while *C. punctata* is characterized by having smaller and less prominent dark spots (Fig. 3B).

Intergrades.—Possible intergrades between *C. crocodilus* and *C. punctata* (Table 3) include three specimens from the northern South China Sea, one from off Sarawak, Borneo and one from Singapore (Fig. 4). Interopercular flaps present in some specimens from this area appear to be less strongly developed than is typical for *C. punctata.* A zone of intergradation may extend into the East China Sea and other areas surrounding the South China Sea and it is possible that a few specimens identified by me as *C. crocodilus* or *C. punctata* are actually intergrades. This could account for some of the overlap in characters for the two species as shown in Tables 1 and 2. Additional specimens from the South China Sea are needed to clarify relationships between the two species. If integration is occurring between *C. crocodilus* and *C. punctata,* it must be very limited as both species appear to be maintaining separate character states.

Distribution.—This species is found along the coast of China, Taiwan, Korea and southern Japan (Fig. 4). Limited data indicate that it is taken by trawling at depths from 50 to 90 m and attains a maximum size of about 400 mm SL.

Cociella punctata
(Cuvier *in* Cuvier & Valenciennes, 1829)
Figs. 2, 3B

Platycephalus punctatus Cuvier *in* Cuvier & Valenciennes, 1829: 243 (original description, type locality, Ceylon, Vanikoro Is.).—Günther, 1860:180.—Sauvage, 1875:307, pl. 36, figs. 5, 5a.—Day, 1876: 277, pl. LX, fig. 3.

Platycephalus malabaricus Cuvier *in* Cuvier & Valenciennes, 1829:245 (original description, type locality, Mahé).—Günther, 1860 (in part): 181.

Platycephalus quoyi Bleeker, 1856–1857: 206 (original description, type locality, Ternate and Amboina).

Platycephalus fasciatus Günther, 1872:397 (original description, type locality, Manila Bay).

Thysanophrys quoyi.—Fowler, 1927:289.—Herre, 1953:582.

Platycephalus crocodilus.—Barnard, 1927: 933 (in part).—Smith, 1950:178 (in part).—Beaufort & Briggs, 1962:161–162 (in part).—Fourmanoir, 1957:277 (in part)—Jones & Kumaran, 1980:644, fig. 550.

Suggrundus hunti Fowler, 1937:244, figs. 249, 250 (original description, type locality, Rayong, Siam).

Grammoplites jacksoni Fowler, 1944:175, figs. 25, 26 (original description, type locality, New Hebrides).

Cocius crocodilus.—Herre, 1953:578.

Thysanophrys punctatus.—Munro, 1955: 253, fig. 736 (fig. is *C. crocodilus,* after Jordan et al., 1913).

Cociella quoyi.—Munro, 1967:528–529, fig. 993.

Cociella crocodila.—Matsubara & Ochiai, 1955:87–89, figs. 32, 33 (in part).—Gloerfelt-Tarp & Kailola, 1984:121, figs. A, B.—Dor, 1984:89–90.—Knapp, 1984: no pagination (fig. is *C. crocodilus,* after Jordan et al., 1913).—Bianchi, 1985a:30 (fig. is *C. crocodilus,* after Jordan et al.,

Table 3.—Possible intergrades between *Cociella crocodilus* and *C. punctata.*

Character	Northern South China Sea			Borneo	Singapore
	MNHN 05-222	SU 14515	USNM 329294	HUMZ 109566	FMNH 47490
Number of scale rows above lateral line	74	76	71	73	71
Total gill rakers on first arch	7	6	6	6	7 (left), 6 (right)
Development of interopercular flap	Present, both sides	Present, both sides	Absent on left, trace on right	Absent on left, trace on right	Absent
Color pattern	?	?	Like Fig. 3A	Like Fig. 3B	?

1913).—Bianchi, 1985b:28 (fig. is *C. crocodilus,* after Jordan et al., 1913).—Knapp, 1986:483, fig. 155.1.—Baranes & Golani, 1993:305, pl. 7, fig. 23.

Material examined (123 specimens).—Syntypes: MNHN 6836 (1, 187) Voyage of Perón; MNHN 6851 (1, 209) Trincomalee, Ceylon; MNHN 5852 (1, 193) Vanikoro I. Taiwan: RUSI 38443 (1, 223) Tachi. Okinawa: USNM 75448 (1, 127) Naha. Philippines: BMNH 1872.10.18.117 (1, 190) Manila. SU 39846 (1, 55) Manila. SU 9598 (1, 107) Cavite. SU 39021 (1, 122) Nasugbu. USNM 99762 (1, 210) Leyte I. SU39020 (1, 203) Iloilo. SU 27219 (1, 170) Culion. SU 27218 (1, 190) Dumaguete. SU 29758 (1, 103) Dumaguete. CAS 81318 (6, 37–124) Dumaguete. USNM 329287 (1, 45) Dumaguete. USNM 329511 (1, 42) near Dumaguete. USNM 329512 (1, 79) near Dumaguete. SU 29756 (1, 141) Jolo I. Palau Islands: CAS 81319 (1, 97) Koror I. CAS 83122 (1, 130) Koror I. CAS 83121 (1, 182) Nardueis I. USNM 329288 (1, 243) Nardueis I. CAS 81320 (1, 208) Babelthuap I. USNM 329292 (2, 102–111) Babelthuap I. South Pacific: AMS I.17482-006 (1, 78) Guadacanal I. (1, 26) New Hebrides Is. Papua New Guinea: KFRS F.5629.01 (2, 190–210) Port Moresby. CSIRO 1517 (2, 156–161) Port Moresby. Indonesia: SU 13756 (1, 330) Manokwari. USNM 327189 (3, 62–216) Semei I. USNM 327289 ((4, 70–146) Misoöl I. USNM 325917 (5, 45–99) Kepuluan Aru, Borear I. WAM 27697.001 (1, 145) Tanimbar I. BPBM 19433 (1, 100) Ambon I. RMNH 5915 (3, 128–182) Ambon & Ternate Is. ZMA 112.697 (2, 135–136) Obi Is. USNM 264806 (1, 72) Bali. USNM 264805 (1, 100) Bali. USNM 264794 (1, 194) Bali. BMNH 1984.1.1.65 (1, 270) Bali. NTM S.11127–042 (1, 116) Bali. NTM S.10733.014 (1, 195) Bali. Gulf of Thailand: CAS 81316 (1, 73) Ko Chang I. CAS 81317 (1, 227) Bangkok fish market. USNM 32928 (1, 157) Prachuap Kiri Khan. ANSP 62861 (1, 150) Siracha. ANSP 68247 (1, 75) Rayong. Singapore:

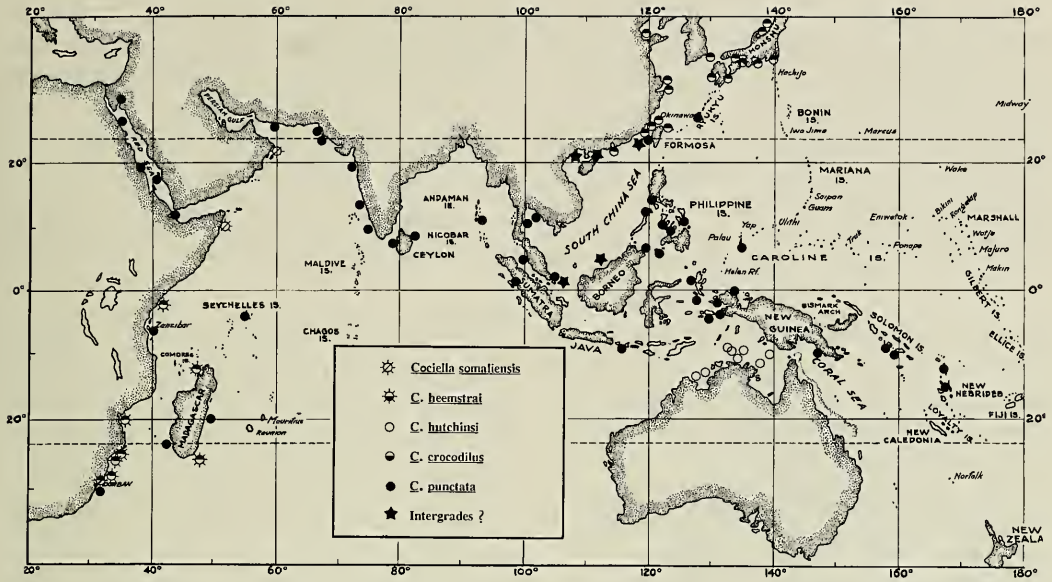

Fig. 4. Distribution of *Cociella crocodilus, C. heemstrai, C. hutchinsi, C. punctata,* and *C. somaliensis.*

SU 30809 (2, 61–76). NMW 11171 (2, 146). Malaysia: SU 27794 (1, 174) Sandakan. ZMUC P80196 (1, 210) Malacca. ZMUC P80195 (1, 109) Penang. ZMUC P80191 (2, 104–153) Penang. AMS B.5024 (1, 167) Penang. Ceylon: ROM 1878 (1, 130). USNM 327285 (1, 355) Colombo. India: SU 37202 (1, ?) Andaman Is., Port Blair. USNM 327288 (1, 227) Cochin. USNM 329285 (1, 209) Cochin. SU 41735 (2, 136–142) Calicut. AMS B.8128 (1, 205) Malabar. MCZ 4287 (1, 151) Carnara. NMW 11720 (2, 155–232) Bombay. ANSP 101419 (1, 180) Bombay. USNM 327284 (1, 288) near Bombay. Pakistan: LACM 38126 (1, 222) Karachi. USNM 327286 (1, 267) near Karachi. AMS B.8130 (1, 241) Sind. Iran: USNM 327283 (1, 358) Gulf of Oman. Western Indian Ocean: USNM 326291 (1, 200) Zanzibar. MNHN 6848 (1, 220) Mahé. AMNH 88086 (1, 170) Madagascar. USNM 327287 (1, 346) Madagascar. MNHN 1994.505 (1, 275) Madagascar. SU 31387 (3, 118–175) Durban. ANSP 55103 (2, 87–160) Durban. BMNH 1921.3.1.51 (1, 151) Durban. Gulf of Aden: Uncataloged, J. M. Rose 296-004 (1, 180) Djibouti. Red Sea: NMW 11718 (1, 170) Ghalefca. RMNH 15955 (2, 197–219) Kamaran. NMW 11719 (1, 162) Kamaran. BPBM 20382 (1, 195) Suakin. NMW 11167 (1, 164) Quseir. USNM 326280 (8, 129–185) Hurghada. HUJ 14019 (2, 303–320) Gulf of Aqaba.

Description. (Mean values appear in parentheses).—Dorsal-fin rays IX or I, VIII, 10–12 (11.0); anal-fin rays 11–12 (11.0); pectoral-fin rays 19–22 (20.6), usually 20 or 21; pored lateral line scales 50–56 (53.7) usually 53 or 54, anteriormost 1–16 (5.5) bearing small spines; number of diagonal scale rows above the lateral line slanting downward 56–76 (67.9); diagonal scale count 10–17 (13.7); interpelvic scales 21–41 (29.1); total gill rakers on first arch 5–7 (6.0); branched caudal rays 10–26 (11.3). Least interorbital width going into greatest diameter of orbit 1.8–6.0 (3.5). Nape covered with ctenoid scales; top of head, opercle and cheek bear embedded scales. Preorbital spine present; a pair of small nasal spines. Preopercular spines usually three, sometimes two; uppermost longest, reaching about half-way to opercular margin. Infraorbital ridge usually smooth over anterior ½ of eye, bearing 5–8 (small spines

Table 4.—Young stages of *Cociella punctata* associated with mangrove habitat.

Locality	SL (mm)	Depth of capture (m)	Bottom type
Thailand, CAS 81316	73	0–0.9	rocky, sand, mud
Philippines, USNM 329511	42	0–1.0	sand
Philippines, USNM 329512	79	0–0.5	sand, silt
Guadalcanal, AMS I.17482-006	78	?	?
Palau, USNM 329292	102–111	0–0.9	mud, sand, gravel, cobbles
Indonesia, USNM 329517	45–98	0–1.0	?

posteriorly); suborbital ridge with one spine below middle of eye, a second spine below rear margin of eye, no spines behind eye. Lateral-line scale shown in Fig. 1F. Interopercular flap present.

Color in alcohol.—Five or six dark bands usually crossing back. Numerous small dark spots on dorsum reaching below lateral line, more widely scattered posteriorly. Spinous dorsal fin with broad marginal dark band, clear area at base; second dorsal fin with dark spots on rays; anal fin interradial membranes dusky, rays pale; pectoral fin dusky on lower half, spotted above (fin entirely spotted in some specimens from western Indian Ocean); pelvic fin dusky; caudal fin variable (entirely dusky in a few), usually with a broad dark marginal band or series of dark spots and horizontal streaks, basal area more or less pale.

Remarks.—Young specimens of *Cociella punctata* appear to be closely associated with mangrove habitat (Table 4). The smallest typically have a broad dark saddle across the back in the area of the spinous dorsal-fin and a narrow saddle near the rear of the soft dorsal-fin (Fig. 5). In juvenile to adult *C. punctata,* five or six dark bands may cross the back (Fig. 3B) or in some, the bands may become obscure. A similar pattern is also found in juvenile to adult *C. crocodilus.*

One specimen of *C. punctata* (USNM 326291) from Zanzibar was found by East African Marine Fisheries Organization biologists in the stomach contents of a Chwaka sole (species unknown, recorded as 370 mm in total length).

Distribution.—This species is known from the Red Sea to South Africa, to Taiwan, Indonesia and to the New Hebrides (Fig. 4). As it is common off Port Moresby, Papua New Guinea, I would expect *C. punctata* to be found in northern Australian waters but, to my knowledge, none have been taken to date. Perhaps competition from some of Australia's endemic platycephalids has prevented *C. punctata* from becoming established. It is frequently taken at shallow depths by seines or with ichthyocide and it has been taken by trawl at depths from 23–250 m. Two large specimens (303,

Fig. 5. Young *Cociella punctata* from mangroves, USNM 329511, 42 mm SL; Negros, Philippines.

320 mm SL) were taken in a trap at 300 m in the Gulf of Aqaba (Baranes & Golani 1993:305).

Cociella heemstrai, new species
Figs. 6, 7

Platycephalus malabaricus (non Cuvier).—Gilchrist & Thompson, 1909:253.—Fowler, 1925:255.
Platycephalus tentaculatus (non Ruppell).—Fowler, 1925:255.
Platycephalus crocodilus (non Tilesius).—Barnard, 1927:933 (in part).—Fowler, 1934:488 (part).—Smith, 1950:378 (in part).—Fourmanoir, 1957:274 (in part).
Cociella sp.—Knapp, 1986:483.

Material examined.—Holotype, USNM 326281 (formerly RUSI 13761) (172 mm SL) Kenya, 02°38′S, 40°28′E, R/V *Fridtjof Nansen,* otter trawl, 280 m, 17 Dec 1980, Phillip C. Heemstra.

Paratypes (68): Natal: SAM 10514 (2, 232–245) Durban Bay. SAM 11877 (1, 203) Durban Bay. RUSI 1510 (2, 118–157) Durban. BMNH 1919.4.1.33 (1, 109) Durban. ANSP 54935 (2, 63–136) Durban; 1931. SU 69736 (1, 118) Durban. SAM 10035 (1, 216) Natal. RUSI 16492 (2, 135–138) Natal; 1914–20. ANSP 77600 (1, 235) Tugela R. N of Durban. SAM 11876 (3, 167–231) South Head, Tugela R., N of Durban; 21 Jan 1901. RUSI 36880 (3, 86–198) Tugela Bank, N of Durban. RUSI 1510 (2, 118–157) Durban. Mozambique: RUSI 10516 (1, 122) Inhaca Island near Lourenço Marques; Aug 1948. USNM 326296 (1, 178) Polana near Lourenço Marques; Feb 1969. RMNH 25144 (1, 172) Lourenço Marques; 5 Jul 1965. SAM 10822 (1, 215) Lourenço Marques; Jun 1920. SAM 26023 (1, 200) Lourenço Marques; Jun 1920. ANSP 77598 (1, 183) Delagoa Bay. USNM 326297 (1, 175) Delagoa Bay; 6 Feb 1969. USNM 326295 (2, 192–210) Delagoa Bay; 10 Feb 1969. SAM 16725 (1, 202) Delagoa Bay. BMNH 1922.2.9.29 (1, 175) Delagoa Bay. RUSI 39859 (5, 152–206) Maputo Bay (Delagoa Bay); 28 May 1992. USNM

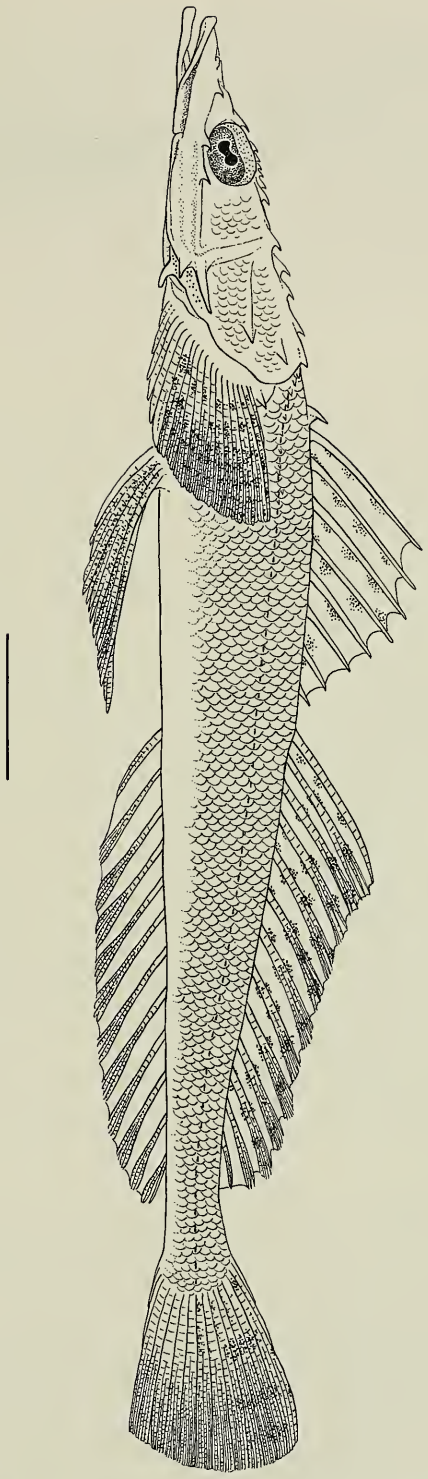

Fig. 6. Holotype of *Cociella heemstrai,* USNM 326281, 172 mm SL; Kenya.

Fig. 7. Paratype of *Cociella heemstrai,* USNM 303749, 180 mm SL; Mozambique Channel.

326294 (11, 83–144) Delagoa Bay, west side; 14 Feb 1969. USNM 326293 (8, 111–177) near Beira; 9 Oct 1964. Madagascar: MNHN B.2887 (4, 100–140) Nosy Be. USNM 326292 (3, 79–166) Northwest coast, Baie D'Amboro; 12 Feb 1964. USNM 303749 (4, 140–180) 12°42′12″S, 48°43′06″E; 11 Nov 1988. MNHN 1994.504 (1, 227) 25°03′S, 47°07′E; 12 Mar 1969.

Diagnosis.—This species is distinguished from others in the genus *Cociella* in having 9–11 gill rakers on the first arch (Table 2) and interpelvic scale count of 16–24 ($\bar{X}$ = 20.6). It is further distinguished by the following combination of characters: second dorsal fin and anal fin with 12 rays; ratio of snout length divided by interorbital width ranging from 2.5–4.4 ($\bar{X}$ = 3.4); only two spines on suborbital ridge below and behind eye; and interopercular flap present.

Description.—(Values for holotype given in parentheses). Dorsal-fin rays I, VIII or IX (I, VIII), 11–12 (12), usually 12; anal-fin rays 11–13 (12), usually 12; pectoral-fin rays 19–22 (20), usually 20 or 21; pored lateral line scales 52–55 (53), the anterior 3–19 (10) scales bearing weak spines; scale rows above lateral line slanting downward and backward 55–69 (64); diagonal scales 9–15 (12); interpelvic scales 16–24 (20); total gill rakers on first arch 9–11 (9), branched caudal rays 11–14 (11), usually 11 or 12. Measurements for the holotype and paratypes appear in Table 5. Least interorbital width going into greatest diameter of orbit 1.8–3.4 times (2.2), usually less than 2 times in specimens over 215 mm SL. Nape, opercle and cheek behind eye covered with ctenoid scales; top of head and cheek below eye mostly naked, with a few embedded scales. Preorbital spine single; a pair of small, reclining nasal spines usually present; infraorbital ridge smooth anteriorly, bearing 5–7 spines over posterior half of eye; suborbital ridge with one spine below middle of eye and a second spine near rear margin of eye; upper preopercular spine reaching nearly to opercular margin. Lateral-line scale shown in Fig. 1C. A narrow, elongate interopercular flap present.

Table 5.—Proportional measurements of *Cociella heemstrai* expressed in thousandths of standard length. Number of specimens given in parentheses after range.

Character	Holotype	Paratypes	
		Range	$\bar{X}$
Standard length (mm)	172.0	63.0–245.0 (62)	149.1
Head length	319.8	301.5–355.0 (62)	333.1
Snout length	95.9	79.8–111.8 (62)	98.6
Orbit diameter (greatest)	66.9	60.2–82.9 (62)	73.4
Interorbital width (least)	30.8	24.0–35.9 (62)	29.6
First dorsal spine length	22.1	15.0–36.7 (45)	24.5
Second dorsal spine length	130.2	94.7–166.5 (42)	124.3

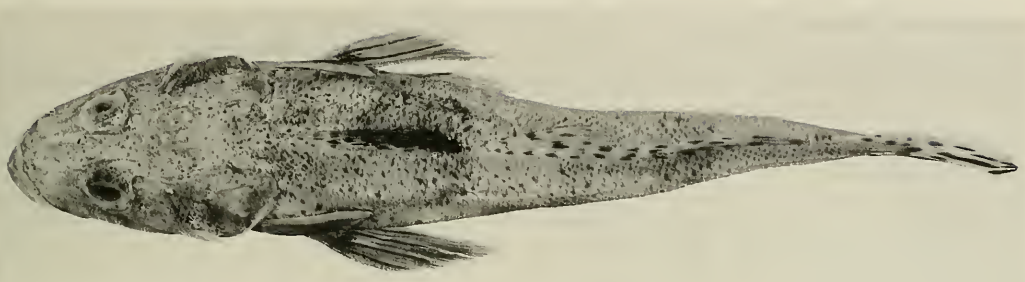

Fig. 8. Holotype of *Cociella somaliensis,* USNM 326300, 216 mm SL; Somalia.

Color in alcohol.—Dorsum grayish or brownish, sometimes with a few small dark spots. Spinous dorsal-fin dusky, with a few large dark spots. Soft dorsal-fin bearing numerous large dark spots. Pelvic fin dusky. Pectoral and caudal fins dusky below, with small dark spots near upper margin.

Color in life.—Specimens taken from Richards Bay and the Tugela Shelf off Natal were observed to have a bright yellow horizontal bar in the middle of the caudal fin. Live specimens seen at the Durban Aquarium had dark bands over the back and 4 or 5 pairs of white spots along the dorsum. The coloration pattern was somewhat similar to that exhibited by live specimens of *Platycephalus indicus* of similar size.

Distribution.—Cociella heemstrai is known from Durban, South Africa to Mombasa, Kenya and Madagascar (Fig. 4). Common in trawl catches at depths to 280 m., it is also taken by seining in shallow estuaries such as Durban Bay.

Etymology.—Named in honor of Phillip C. Heemstra, J. L. B. Smith Institute of Ichthyology, who, over the years, has contributed many specimens of flatheads to my studies.

Cociella somaliensis, new species
Fig. 8

Material examined.—Holotype, USNM 326300 (216 mm SL) Western Indian Ocean, Somalia, S of Ras Hafun, M/V *Beinta* Cruise 19, Sta. 13A, 10°13′N, 51°00′18″E, trawl, 30 m, 8 Feb 1987, Greg Small.

Paratypes (38): Somalia: USNM 326299 (8, 199–280) same data as holotype. USNM 302847 (3, 228–290) 10°20′54″N, 51°15′06″E; 8 Feb 1987. USNM 302846 (1, 271 same data as USNM 302847. USNM 326298 (20, 198–272) 10°07′24″N, 51°31′12″E; 6 Feb 1987. BMNH 1993.11.5.1–3 (3, 252–236) same data as USNM 326298. MNHN 1993-0265 (1, 213) same data as USNM 326298. MNHN 1993-0266 (1, 236) same data as USNM 326298. Oman: USNM 326301 (1, 273) 21°28′N, 59°28′E; 4 Dec 1963.

Diagnosis.—A species tentatively assigned to *Cociella* Whitley, it is distinguished from other members of the genus in having 12–18 gill rakers on the first arch (Table 2) and the ratio of snout length divided by interorbital width ranging from 2.0–2.5 ($\bar{X}$ = 2.2). It is further distinguished by the following combination of characters: an interpelvic scale count of 25–35 ($\bar{X}$ = 29.9); second dorsal fin and anal fin each with 12 rays; only two spines on suborbital ridge below and behind eye; and interopercular flap present.

Description. (Values for holotype given in parentheses).—Dorsal-fin rays I, VIII, 12; anal-fin rays 11–13 (12), usually 12; pectoral-fin rays 19–22 (20), usually 20 or 21; pored lateral line scales 52–55 (53), anterior 6–15 (9) scales bearing weak spines; diagonal scale rows above lateral line slanting downward 54–66 (54); diagonal scale count 10–14 (13); interpelvic scales 25–35

Table 6.—Proportional measurements of *Cociella somaliensis* expressed in thousandths of standard length. Number of specimens given in parentheses after range.

Character	Holotype	Paratypes	
		Range	$\bar{X}$
Standard length (mm)	216.0	199.0–290.0 (38)	241.4
Head length	318.1	296.9–328.0 (38)	310.6
Snout length	85.6	84.4–93.8 (38)	88.2
Orbit diameter (greatest)	65.7	55.4–67.4 (38)	62.5
Interorbital width (least)	38.0	36.4–44.7 (38)	39.6
First dorsal spine length	24.1	13.7–28.3 (31)	20.6
Second dorsal spine length	145.8	119.6–162.0 (33)	146.5

(30); total gill rakers on first arch 12–18 (17); branched caudal-fin rays 11–12 (11), usually 11. Measurements for holotype and paratypes appear in Table 6. Least interorbital width going into greatest diameter of orbit 1.3–1.8 (1.7) times. Nape, opercle and cheek behind eye covered with ctenoid scales; top of head and cheek below eye mostly naked, with a few embedded scales. Single preocular and preorbital spine; nasal spines usually absent; infraorbital ridge smooth anteriorly, bearing 5–7 small spines over rear half of eye; suborbital ridge with one spine below middle of eye and a second spine near rear margin of eye; upper preopercular spine curved slightly upward, reaching nearly to or slightly beyond opercular margin. Lateral-line scale shown in Fig. 1B. A narrow, elongate interopercular flap present.

Color in alcohol.—Dorsum light tan, usually with small scattered dark spots. Spinous dorsal-fin dusky, with large dark spots. Soft dorsal-fin pale, with large dark spots. Pectoral and pelvic fins dusky. Anal fin with pale rays, interradial membrane slightly dusky. Caudal fin pale, with bold dark spots and elongate bars throughout.

Distribution.—This species is found off Somalia and Oman (Fig. 4). It has been taken in the trawl catch at depths from 30–49 m.

Etymology.—Named for the country of Somalia, off whose shores all but one of the known specimens were captured.

Cociella hutchinsi, new species
Fig. 9

?*Platycephalus malabaricus* (non Cuvier).—Günther; 1880:41.

Suggrundus sp. 1.—Gloerfelt-Tarp & Kailola; 1984:123, color fig.—Sainsbury, Kailola & Leyland; 1985:120, color fig.

Material examined.—Holotype, CSIRO 1865 (206 mm SL) Australia, Arafura Sea, 09°16′S, 135°00′E; FRV *Soela,* trawl, 113 m, 27 Jun 1981. Paratypes (26): Arafura

Fig. 9. Holotype of *Cociella hutchinsi,* CSIRO 1865, 206 mm SL; Arafura Sea (after Sainsbury et al. 1984).

Table 7.—Proportional measurements of *Cociella hutchinsi* expressed in thousandths of standard length. Number of specimens given in parentheses after range.

Character	Holotype	Paratypes	
		Range	$\bar{X}$
Standard length (mm)	206.0	142.0–261.0 (23)	203.4
Head length	363.1	351.4–393.8 (23)	373.5
Snout length	109.7	107.1–126.3 (23)	114.1
Orbit diameter (greatest)	77.7	76.2–90.3 (23)	82.4
Interorbital width (least)	20.4	17.6–25.1 (23)	20.8
First dorsal spine length	14.6	10.6–20.4 (21)	15.4
Second dorsal spine length	112.6*	110.0–142.9 (22)	128.7

* Indicates broken.

Sea: BMNH 1879.5.14.222 (1, 192) 9°59′S, 139°42′E; 10 Sep 1874. AMS I.27847-020 (4, 148–259) 10°02′S, 133°58′E; 17 Nov 1980. AMS I.21846-002 (2, 254–261) 09°38′S, 134°02′E; 17 Nov 1980. NTM S.11898-008 (1, 235) 10°18′S, 136°30′E; 24 Apr 1986. NTM S.12266-010 (1, 226) 10°20′S, 134°23′E; 13 Jun 1987. NTM S.11957-005 (2, 175–230) 10°18′S, 134°08′E; 16 Oct 1986. NTM S.11613-017 (2, 173–218) 10°15′S, 136°20′E; 10 Mar 1985. USNM 327179 (formerly NTM S.11621-002) (1, 240) 10°08′S, 136°48′E; 17 Mar 1985. Timor Sea: CSIRO 2739 (1, 177) 13°46–48′S, 128°13–14′E; 28 Jun 1980. CSIRO 2740 (1, 175) same data as CSIRO 2739. CSIRO 2741 (1, 165) same data as CSIRO 2739. USNM 327190 (3, 159–165) same data as CSIRO 2739. WAM P30716-001 (4, 142–184) 13°43.5′S, 128°38.6′E; 26 Dec 1969. USNM 326279 (2, 198–216) 12°04′S, 127°14–16′E; 29 Jun 1979.

Diagnosis.—This species is distinguished from other members of the genus *Cociella* in having 3–4 spines on the suborbital ridge under eye. It is further distinguished by the following combination of characters: second dorsal fin and anal fin with 11 rays; 6–7 gill rakers on the first arch (Table 2); interpelvic scales 23–34 ($\bar{X}$ = 28.1); interopercular flap absent; and ratio of snout length divided by interorbital width ranging from 4.6 to 6.7 ($\bar{X}$ = 5.6).

Description.—(Values for holotype given in parentheses). Dorsal-fin rays I, VII, I-I, VIII (I, VIII), 11; anal-fin rays 11; pectoral-fin rays 20–23 (22), usually 21 or 22; pored lateral line scales 51–55 (54), the anteriormost 2–8 (6) scales bearing weak spines; diagonal scale rows above lateral line slanting downward 59–68 (63); diagonal scale count 11–14 (12); interpelvic scales 23–34 (24); total gill rakers on first arch 6–7 (6); branched caudal-fin rays 11–12 (12). Measurements for the holotype and paratypes appear in Table 7. Least interorbital width going into greatest diameter of orbit 3.2–5.0 (3.8). Nape, opercle and cheek behind eye covered with ctenoid scales, top of head and cheek below eye mostly naked, with few embedded scales. Preorbital spine slight or lacking, a pair of small nasal spines present. Infraorbital ridge usually smooth over anterior ¼ of eye, bearing 7–10 small spines posteriorly; suborbital ridge with one spine below middle of eye, a second spine below rear margin of eye and 3–4 spines behind eye; upper preopercular spine reaching nearly to opercular margin. Lateral-line scale shown in Fig. 1E). Interopercular flap absent.

Color in alcohol.—Dorsum brownish; venter white with brownish stippling, sparse on breast, more evident posteriorly. Spinous dorsal fin dusky, with a broad submarginal black band. Soft dorsal fin pale, with small brownish spots on rays. Anal fin pale, rays white. Pectoral fin dusky brown, with traces of vertical dark bands, lower margin white. Pelvic fin with whitish base,

stippled with brown, with well-developed submarginal dark band. Caudal fin dusky, sometimes with a series of streaks forming submarginal dark band.

Distribution.—This is species is known from the Timor and Arafura Seas of Australia. It has been taken by trawling at depths from 39–108 m.

Etymology.—Named in honor of J. Barry Hutchins, Western Australian Museum, who has provided substantial assistance to the author's studies of Australian flatheads.

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