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A Review of the Damselfish Genus *Chromis* from the Hawaiian Islands, with Descriptions of Three New Species[1]

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ABSTRACT: The pomacentrid genus *Chromis* is represented by eight species in the Hawaiian Islands: *vanderbilti*, *leucurus*, *agilis*, *ovalis*, *verater*, and the new species *acares*, *hanui*, and *struhsakeri*. *Agilis* and *hanui* were formerly confused as color phases of *leucurus*. *Ovalis*, *verater*, *hanui*, and *struhsakeri* are known only from the Hawaiian region, the latter from depths of 103 to 184 meters. The range of *vanderbilti* is extended to other central and western Pacific localities; *acares* is described from Johnston Island and other islands of Oceania; *leucurus* is recorded from the Marquesas Islands, and *verater* from Johnston Island.

The genera *Pycnochromis*, *Thrissochromis*, *Serrichromis*, *Lepicephalochromis*, and *Siphonochromis* described by Fowler (1941–1946) are referred to the synonymy of *Chromis*.

Dascyllus caudofasciatus Montalban is a junior synonym of *Chromis lepidolepis* Bleeker. *Siphonochromis lepidostethicus* Fowler and *Lepicephalochromis westalli* Whitley are junior synonyms of *Chromis isharae* (Schmidt).

THE POMACENTRID GENUS *Chromis* may be distinguished from other genera of demoiselles by the following characters *in toto*: soft portion of dorsal fin 1.7 to 3.9 in base of spinous portion; dorsal spines XIII to XV; lateral line ending beneath soft portion of dorsal fin; scales in longitudinal series on body 26 to 33; head fully scaled except for a narrow region at front of snout and side of snout around each nostril; margins of subopercle, preorbital, and suborbital (when free) smooth; preopercle usually smooth but may be crenulate or weakly serrate; teeth small, conical, the outer row at front of jaws enlarged; caudal fin forked, a few rays of the lobes often produced; nearly all species with two or three projecting spiniform procurrent caudal rays.

In contrast to the large genus *Abudefduf* which is obviously a polyphyletic assemblage as it is currently classified, *Chromis* seems to be a natural unit, though admittedly of rather broad limits. This is reflected in the relative stability of the genus in recent years.

One author who stands in opposition to the stability of *Chromis* is Fowler. In 1918 he described the subgenus *Hoplochromis* (type species, *Heliases caeruleus* Cuvier & Valenciennes). With Bean in 1928 he erected the subgenera *Lepidochromis* (type species, *Chromis lepidolepis* Bleeker) and *Dorychromis* (type species, *Heliases analis* Cuvier & Valenciennes). These taxa have not been recognized at the generic level by Norman (1957) and most other authors. In 1941 Fowler described the genera *Pycnochromis* (type species, *P. vanderbilti* Fowler) and *Thrissochromis* [type species, *Chromis velox* Jenkins = *C. ovalis* Steindachner). In 1943 he proposed *Serrichromis* (type species, *Dascyllus pomacentroides* Kendall & Goldsborough = *Chromis lepidolepis* Bleeker)[4] and *Lepicephalochromis* (type species, *Chromis cupreus* Fowler & Bean). In 1946 he described still another, *Siphonochromis* [type species, *S. lepidostethicus* Fowler = *Chromis isharae* (Schmidt)].[5] These five pomacentrid genera should also be regarded as synonyms of *Chromis*. It is possible that some of Fowler's names will be acceptable as subgenera.

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[4] *Dascyllus caudofasciatus* Montalban (1928) is also a junior synonym of *lepidolepis* Bleeker.

[5] *Lepicephalochromis westalli* Whitley (1964) is also a junior synonym of *isharae* Schmidt (1930).

The first *Chromis* described from the Hawaiian Islands was *C. ovalis* Steindachner (1900). This is the only valid species of the genus recognized by Jordan and Evermann (1905) in their large volume on Hawaiian fishes [one other, *Chromis elaphrus* Jenkins, is a junior synonym of *Plectroglyphidodon imparipennis* (Sauvage)]. In part II of the same work on the deeper dwelling fishes of Hawaii, Gilbert (1905) described *C. leucurus* from a specimen taken in 34 to 65 fathoms (his one paratype is a juvenile *C. verater*). Jordan and Metz (1912) added a third species, *verater*, from Hawaii, and Fowler (1941) a fourth, *vanderbilti*. These four species were included by Gosline and Brock (1960) in their *Handbook of Hawaiian Fishes*.

In the present paper it is shown that the two color phases of *Chromis leucurus* of Gosline and Brock are actually species, neither of which is *leucurus*. One is *Chromis agilis* Smith and the other is described herein. In addition, two other new species are named, one from deep water in the Hawaiian Islands, and one from Johnston Island and other islands of Oceania, thus bringing the total number of species of *Chromis* from the Hawaiian province to eight.

Counts and measurements are based on Hawaiian material except for *C. acares* which is described from specimens from Rarotonga, Guam, and Johnston Island (all counts of *acares* in Tables 1 and 2 from Johnston).

In the descriptions of new species, data in parentheses refer to paratypes (if different from the holotype).

Type specimens have been 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); Muséum National d'Histoire Naturelle, Paris (MNHN); J. L. B. Smith Institute of Ichthyology, Rhodes University, Grahamstown, South Africa (RUSI); and the United States National Museum, Washington, D.C. (USNM).

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KEY TO THE SPECIES OF *Chromis* FROM THE HAWAIIAN ISLANDS

1a. Dorsal spines XII (rarely XIII); pectoral rays 16 to 18 2
1b. Dorsal spines XIV (rarely XV); pectoral rays 19 to 22 6

2a. Dorsal soft rays 11; body elongate (for *Chromis*), the depth 2.3 to 2.65 in standard length; pectoral fins short, their length 3.6 to 4 in standard length; body not dark with caudal region abruptly pale; no black spot at pectoral base; anal fin with a large black area 3
2b. Dorsal soft rays 12 to 14; body not elongate, the depth 1.7 to 2.05 in standard length; pectoral fins not short, their length 3 to 3.4 in standard length; body brown with caudal region abruptly pale (demarcation less marked on *agilis* than other species); a large black spot at pectoral base; anal fin without a large black area (though fin brown except for posterior portion) 4

3a. Caudal fin with a broad black band on lower edge which narrows as it passes to tip of lower lobe; side of body alternately striped with yellow and blue in life; gill rakers 24 to 27; tubed lateral-line scales modally 17 ..... *vanderbilti*, p. 329
3b. Caudal fin entirely pale (upper and lower edges broadly edged with orange-yellow in life); body bluish in life without obvious stripes; gill rakers 21 to 25; tubed lateral-line scales modally 16 ..... *acares* n. sp., p. 331

4a. Tubed lateral-line scales 13 or 14; pectoral rays 16; dorsal soft rays 14; a bright yellow proximal zone on pectoral fin adjacent to black basal spot; pelvic fins mainly yellow in life ..... *leucurus*, p. 335

4b. Tubed lateral-line scales 15 to 18; pectoral rays 17 or 18; dorsal soft rays usually 13 (rarely 12 or 14); no yellow basal zone in pectoral fin; pelvic fins mainly brown in life 5

5a. Lower suborbital margin free to beneath center of eye (margin may be slightly covered by lower edges of suborbital scales); body brown, the thorax and lower part of head lavender to pinkish in life; demarcation of pale caudal region slightly anterior to caudal base (thus most of the caudal peduncle is brown) ..... *agilis*, p. 336

5b. Lower suborbital margin free slightly posterior to front edge of eye; body dark brown, the thorax and lower head not lavender or pink in life; demarcation of pale caudal region slightly posterior to rear base of dorsal fin (thus most of caudal peduncle is pale) .... *hanui* n. sp., p. 338

6a. Dorsal soft rays usually 12 (rarely 11 or 13); tubed lateral-line scales usually 20 (rarely 19 or 21); gill rakers 33 to 37; body moderately elongate, the depth 2 to 2.35 in standard length; caudal fin deeply forked, the caudal concavity 1.25 to 1.7 in head length ..... *ovalis*, p. 341

6b. Dorsal soft rays usually 13 or 14 (rarely 12); tubed lateral-line scales usually 17 or 18; gill rakers 28 to 34; body not elongate, the depth 1.8 to 2.05 in standard length; caudal fin not deeply forked, the caudal concavity of adults 1.8 to 2.6 in head length 7

7a. Three spiniform procurrent caudal rays; dorsal soft rays usually 13 (rarely 14); lower-limb gill rakers 19 to 23 (excluding raker at angle); paired fins relatively short, the pectorals 3.2 to 3.45 and the pelvics 2.6 to 3.6 in standard length; dark gray to dark brown with a large black spot at upper pectoral base and three prominent white spots posteriorly, one at rear base of dorsal fin, one at rear base of anal fin, and one at midbase of caudal fin (white spots usually disappear after death) ..... *verater*, p. 343

7b. Two spiniform procurrent caudal rays; dorsal soft rays 14; lower-limb gill rakers 22 to 25 (excluding raker at angle); paired fins relatively long, the pectorals 2.6 to 3 and the pelvics 2.3 to 2.5 in standard length; adults light brown in preservative, without a black spot at upper base of pectoral fins (however a large dark brown area present in axil)..... ..... *struhsakeri* n. sp., p. 344

Chromis vanderbilti

Fig. 1, Tables 1–2

Pycnochromis vanderbilti Fowler, 1941. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 93, p. 260, fig. 12 (type locality, Waianae, Oahu).

Diagnosis

Dorsal rays XII,11; anal rays II,11; pectoral rays 16 to 18 (modally 17); lateral-line scales with tubes 16 to 18; gill rakers 6 or 7+1+16 to 19; upper jaw with 40 to 50 teeth in outer row and lower jaw with 34 to 38; body elongate, the depth 2.3 to 2.65 in standard length; head length 3 to 3.4 in standard length; base of soft portion of dorsal fin (measured to base of last dorsal spine) 1.7 to 2 in base of spinous portion of fin; pectoral fins not reaching or just reaching a vertical at origin of anal fin, their length 3.6 to 4.0 in standard length (relatively longer in juveniles); caudal concavity (horizontal distance between longest and shortest caudal rays) 3.0 to 5.3 in standard length.

COLOR: The side of the body in the living animal is yellow with blue spots along scale rows, most cojoined to form stripes; region of opercle deeper yellow with about 10 blue spots; snout and dorsal part of head and body dusky; thorax and abdomen nearly white; caudal fin slightly dusky with a broad black band along lower margin which narrows as it extends posteriorly (includes all of attenuated portion of lower lobe); dorsal fin dusky bluish, the unscaled spinous portion orange-yellow, except epidermal tissue over distal part of spines which is blue (a little orange-yellow also in outer part of soft dorsal); a small orange-yellow spot at rear base of dorsal fin; anal fin blackish except zone of last three or four rays which is clear

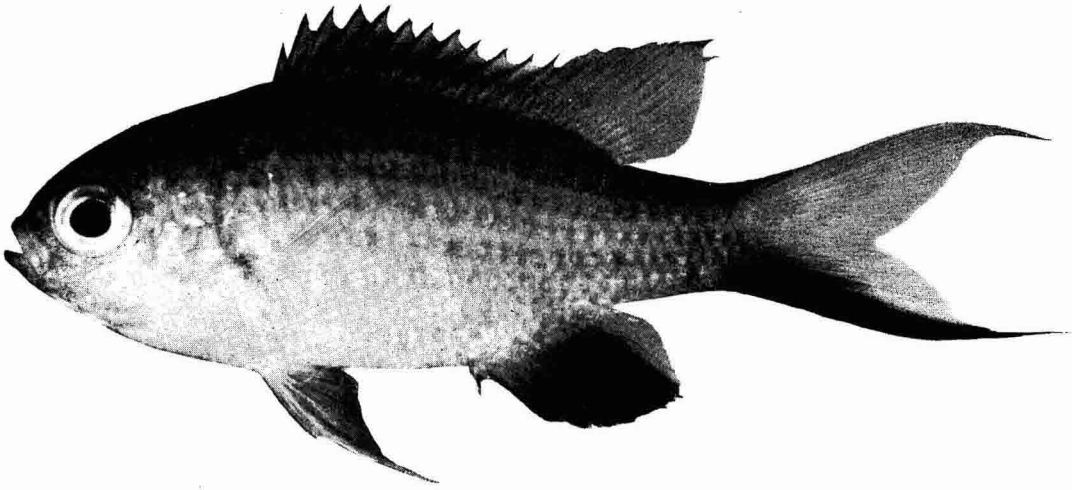

FIG. 1. *Chromis vanderbilti*, BPBM 6882, 35 mm SL, Tahiti, 18 m.

TABLE 1

FIN-RAY COUNTS OF HAWAIIAN SPECIES OF *Chromis*

	DORSAL SPINES				DORSAL SOFT RAYS				ANAL SOFT RAYS					PECTORAL RAYS						
SPECIES	XII	XIII	XIV	XV	11	12	13	14	10	11	12	13	14	16	17	18	19	20	21	22
vanderbilti	20	–	–	–	20	–	–	–	–	20	–	–	–	2	13	5	–	–	–	–
acares	17	2	–	–	19	–	–	–	3	15	–	–	–	2	16	1	–	–	–	–
leucurus	2	–	–	–	–	–	–	2	–	–	–	2	–	2	–	–	–	–	–	–
agilis	20	–	–	–	–	1	18	1	–	–	1	15	4	–	17	3	–	–	–	–
hanui	20	–	–	–	–	–	20	–	–	–	–	18	2	–	18	2	–	–	–	–
ovalis	–	–	19	–	3	15	1	–	–	–	6	13	–	–	–	–	–	3	14	2
verater	–	–	19	–	–	1	17	1	–	–	1	13	5	–	–	–	3	16	–	–
struhsakeri	–	–	7	1	–	–	1	7	–	–	–	7	1	–	–	–	3	5	–	–

with a little dusky pigment over rays, the anal spines which are largely blue, and a white margin anteriorly on soft portion of fin; paired fins pale, the pectorals yellow at base with a trace of dusky pigment.

Remarks

The holotype (ANSP 69749, 26.8 mm SL), was examined at the Academy of Natural Sciences of Philadelphia.

Although known in the literature only from the Hawaiian Islands, *C. vanderbilti* is a widespread species in the central and western Pacific. The senior author has collected it at Johnston Island, Wake, Marcus Island, Line Islands, Tahiti, Tuamotu Archipelago, Pitcairn Group, Rapa, New Caledonia, and Guam (the latter reported by Kami 1971). It was observed but not collected in the Austral Islands and Cook Islands. A. H. Banner and P. Helfrich took two small specimens in the Gilbert Islands (BPBM 10656). D. R. Robertson collected two at Kenn Reef, Coral Sea (BPBM 14647). Gerald R. Allen took two at Lord Howe Island in February 1973; these were the only individuals seen by him, the senior author, and others during an intensive month of collecting at the island. Allen also captured one prejuvenile (BPBM 9138, 22 mm SL) by nightlighting off the coast of Waianae, Oahu, from the *Townsend Cromwell* on 27 June 1967. This fish is entirely pale in pre-

TABLE 2

Lateral-Line Scale and Gill-Raker Counts of Hawaiian Species of *Chromis*

Species	Lateral-line scales*								Gill rakers																	
									Upper limb						Angle	Lower limb										
	13	14	15	16	17	18	19	20	21	5	6	7	8	9	10	11		15	16	17	18	19	20	21	22	23	24	25	26	27
vanderbilti	–	–	–	4	15	1	–	–	–	–	9	11	–	–	–	–	20	–	4	5	9	2	–	–	–	–	–	–	–	–
acares	–	–	3	12	4	–	–	–	–	12	7	–	–	–	–	–	19	2	8	6	3	–	–	–	–	–	–	–	–	–
leucurus	1	1	–	–	–	–	–	–	–	–	–	2	–	–	–	–	2	–	–	–	2	–	–	–	–	–	–	–	–	–
agilis	–	–	3	13	4	–	–	–	–	–	–	–	17	3	–	–	20	–	–	–	–	2	8	7	3	–	–	–	–	–
hanui	–	–	4	9	6	1	–	–	–	–	–	1	13	6	–	–	20	–	–	–	2	5	8	4	1	–	–	8	2	2
ovalis	–	–	–	–	–	–	2	16	1	–	–	–	–	11	7	1	19	–	–	–	–	–	–	–	–	1	6	–	–	–
verater	–	–	–	–	1	14	4	–	–	–	–	4	14	1	–	–	19	–	–	–	–	1	4	7	5	2	–	–	–	–
struhsakeri	–	–	–	1	6	1	–	–	–	–	–	3	5	–	–	–	8	–	–	–	–	–	–	1	1	3	2	1	–	–

* Scales with tubes; a few pored scales posterior to those with a tube not included in counts.

servative except for small melanophores over the dorsal surface of the brain. It has 10 serrae on the vertical margin of the preopercle beginning at the angle.

Smith (1960) described a very closely related form, *C. nigrurus*, from Mozambique. Smith and Smith (1963) recorded it from the Seychelles, and Smith (1962) from Durban, South Africa. It appears to differ from *vanderbilti* only in having a yellow caudal fin with both the upper and lower lobes edged in black and in having black on the soft portion of the dorsal fin as well as the anal fin. Analysis of future collections may reveal that this form is only subspecifically distinct.

C. vanderbilti is small; the largest we have measured is only 48 mm standard length. Our smallest juvenile is 20 mm. This species occurs in aggregations, often over live coral, where it feeds on zooplankton, especially copepods. It is generally found in the depth range of 5 to 20 meters but has been observed in 2 meters or less.

Chromis acares n. sp.

Figs. 2–3; Tables 1–3

Chromis vanderbilti Gosline, 1955 (non Fowler). Pacific Science, vol. 9, p. 453 (Johnston Island).

Chromis sp. Randall, in press, Occasional Papers of the Bernice P. Bishop Museum (Tahiti).

Holotype

BPBM 13823, 31.7 mm SL, Rarotonga, Cook Islands, off tanker buoys at harbor entrance, 20 m, numerous large coral heads, quinaldine, J. E. Randall and D. B. Cannoy, 7 March 1971.

Paratypes

BPBM 12296, 35.0 mm SL, Johnston Island, outer reef, W. A. Gosline, V. E. Brock, and Y. Yamaguchi, 24 February 1951; BPBM 8752, 3:23.9 to 33.9 mm SL, Guam, Mariana Islands, outside reef northwest of Cocos Island, 23 to 31 m, rotenone, J. E. Randall, R. S. Jones, H. T. Kami, A. J. Stark, and G. E. Fosse, 30 June 1968; CAS 15912, 28.8 mm SL, same data as preceding; MNHN 1972-96, 28.9 mm SL, same data as preceding; USNM 208430, 32.0 mm

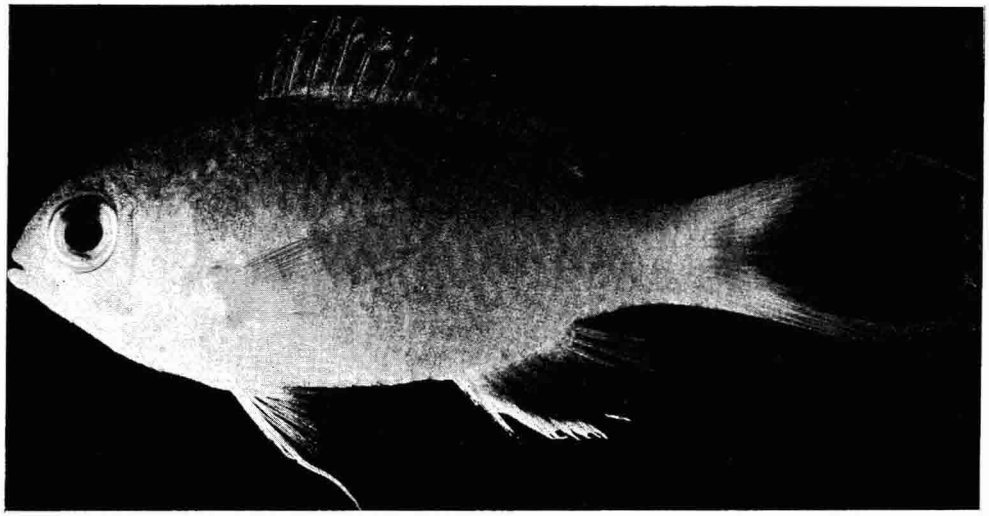

FIG. 2. Holotype of *Chromis acares*, BPBM 13823, 31.7 mm SL, Rarotonga, 20 m.

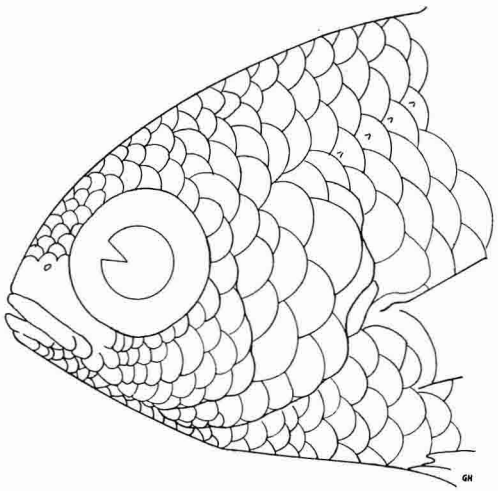

FIG. 3. Head of *Chromis acares*. Drawing by Glenn Higashi.

SL, same data as preceding; BPBM 11049, 14: 24.0 to 33.8 mm SL, Johnston Island, 200 m northeast of small boat channel, 6 to 9 m, rock and coral rubble bottom, rotenone, J. E. Randall, R. R. Bowers, and A. C. Banner, 26 July 1968; AMS I.16766-001, 29.3 mm SL, Eniwetok Atoll, Marshall Islands, pinnacle reef in lagoon off north end of Eniwetok Island, 9 to 12 m, G. R. Allen, 16 August 1968; BM(NH) 1972.12.5.4, 29.1 mm SL, same data as preceding; BPBM 13818, 3:30.5 to 36.5 mm SL, Tahiti, Society Islands, Papara, outside barrier reef 300 m east of Teavaraa Pass, 20 to 30 m, Chemfish and quinaldine, J. E. Randall, 1–9 March 1969; BPBM 13686, 28.0 mm SL, Tubuai, Austral Islands, outside barrier reef 1.5 km southwest of anchorage off pass, 15 m, D. B. Cannoy, 26 February 1971; BPBM 13820, 30.4 mm SL, Rarotonga, Cook Islands, 300 m east of Avaavaroa Pass, 20 m, quinaldine, J. E. Randall, 6 March 1971; BPBM 13970, 25.6 mm SL, Rarotonga, Cook Islands, off tanker buoy near harbor entrance, 24 to 31 m, rotenone, J. E. Randall and D. B. Cannoy, 11 March 1971; BPBM 11612, 2:27.2 and 31.8 mm SL, Huahine, Society Islands, off Teffaao Point, 31 m, quinaldine, J. E. Randall, 19 March 1971; BPBM 13817, 10:19.4 to 31.8 mm SL, same data as holotype; BPBM 11298, 33.0 mm SL, Tutuila, American Samoa, east side of Fagafue Bay, edge of coral reef in 12 m, quinaldine, J. E. Randall, 3 August 1971; BPBM 12172, 31.7 mm SL, Eniwetok Atoll, Marshall Islands, pinnacle reef in lagoon near deep channel, 6 m, quinaldine, J. E. Randall, 30 January 1972; AMS I.16772-001, 29.0 mm SL, Egum Atoll (9° 19′ S, 151° 55′ E), reef flat on NE side of Yanaba Island, 2 m, quinaldine, G. R. Allen, 10 June 1972; BPBM 14059, 2:32.2 and 34.4 mm SL, Fanning Island, Line Islands, seaward reef off English Harbor, about 15 m, quinaldine, E. Chave and D. Eckert, July 1972; BPBM 14659,

TABLE 3

Proportional Measurements of Type Specimens of *Chromis acares* (in Thousandths of the Standard Length)

	Holotype	Paratypes				
Item	BPBM 13823	BPBM 11049	BPBM 11049	BPBM 11049	BPBM 8752	BPBM 12296
Standard Length (mm)	31.7	24.0	28.7	32.2	33.9	35.0
Greatest Depth of Body	404	383	393	416	396	400
Greatest Width of Body	173	154	162	155	168	160
Head Length	305	337	313	311	314	314
Snout Length	82	87	74	81	84	83
Diameter of Orbit	113	123	108	110	115	114
Bony Interorbital Width	98	94	97	91	92	94
Length of Upper Jaw	101	96	108	99	103	108
Least Depth of Caudal Peduncle	156	154	146	155	150	148
Length of Caudal Peduncle*	189	173	181	186	185	191
Snout to Origin of Dorsal Fin	413	416	423	410	422	415
Snout to Origin of Anal Fin	675	670	663	675	670	669
Snout to Origin of Pelvic Fins	379	395	367	376	378	372
Length of First Dorsal Spine	74	79	68	74	67	66
Length of Second Dorsal Spine	123	125	120	124	112	111
Length of Longest Dorsal Spine	160	154	146	149	142	143
Length of Longest Dorsal Ray	205	200	212	208	198	200
Length of Base of Dorsal Fin	486	455	482	497	488	487
Length of First Anal Spine	63	62	63	62	56	56
Length of Second Anal Spine	151	141	146	152	139	148
Length of Longest Anal Ray	192	192	209	194	198	194
Length of Base of Anal Fin	200	194	192	203	189	200
Caudal Concavity†	261	271	279	260	275	276
Length of Pectoral Fin	277	279	270	275	280	265
Length of Pelvic Spine	154	150	157	152	147	154
Length of Pelvic Fin	300	302	314	297	313	309

* Measured horizontally between rear base of anal fin and base of caudal fin.
† Measured horizontally between longest and shortest caudal rays.

30.5 mm SL, Tetiaroa, Society Islands, outside reef off west side of Rimatuu Islet, 10 m, spear, J. E. Randall, 18 April 1973.

Description

Dorsal rays XII,11 (rarely XIII,11); anal rays II,11 (occasionally 10); pectoral rays 17 (16 to 18); branched caudal rays 13; lateral-line scales with tubes 16 (15 to 17); vertical scale rows from upper end of gill opening to caudal base 28 (27 to 29); scales above lateral line to origin of dorsal fin two; scales below lateral line to origin of anal fin eight (eight or nine); circumpeduncular scales 16; gill rakers 6+1+17 (5 or 6+1+15 to 18); branchiostegal rays five; vertebrae 26 (one specimen).

Body relatively elongate for the genus, the depth 2.45 (2.4 to 2.6) in standard length, and compressed, the width 2.35 (2.35 to 2.7) in depth; head length 3.3 (3.0 to 3.3) in standard length; snout 3.85 (3.85 to 4.3) in head; eye 2.65 (2.7 to 2.9) in head; interorbital space moderately convex, the bony width slightly less than eye diameter; least depth of caudal peduncle 2.2 (2.1 to 2.2) in head; longest (fifth) dorsal spine 2 (2.1 to 2.2) in head; first dorsal spine 1.65 (1.6 to 1.75) in second spine; second dorsal spine 1.3 (1.2 to 1.3) in longest dorsal spine; longest (fifth) dorsal soft ray 1.55 (1.45 to 1.7) in head; base of soft portion of dorsal fin 2 (1.7 to 2) in spinous portion of fin (the latter measured between bases of first and last spines); first anal spine shorter than first dorsal spine, its length 2.4 (2.3 to 2.65) in second spine; second anal spine 2.1 (2.05 to 2.4) in

head; longest (sixth) anal soft ray 1.65 (1.5 to 1.75) in head; base of anal fin 2.4 (2.35 to 2.6) in base of dorsal fin; caudal fin 2.2 (1.95 to 2.2) in standard length; caudal concavity 3.8 (3.6 to 3.8) in standard length; pectoral fins relatively short, not reaching a vertical at origin of anal fin of adults (just reaching anal fin on some juveniles), the longest pectoral ray 3.6 (3.45 to 3.75) in standard length; pelvic fins of adults not reaching origin of anal fin (reaching up to soft portion of fin on some juveniles), the longest pelvic ray 3.35 (3.2 to 3.3) in standard length.

Mouth terminal, oblique, small, the maxillary reaching to or slightly posterior to a vertical at anterior edge of eye; upper jaw with 38 (40 to 48) teeth in outer row, the largest less than twice diameter of nostril in length; those at front of jaw slightly incurved; lower jaw with 35 (34 to 40) teeth, the largest a little smaller than upper teeth and those at front of jaw also slightly incurved; two irregular rows of small teeth medial to outer row at front of upper jaw and one irregular row of small teeth medial to outer row at front of lower jaw; front of lips and unscaled portion of snout above upper lip with tiny papillae (not visible on all specimens, even with dissecting microscope); nostril with a low fleshy rim; five prominent pores in vicinity of nostril (one ventroposterior within about a nostril's diameter of nostril, the second directly anterior a distance equal to space between nostril and eye, the third above and slightly posterior, separated by nearly the same distance from nostril as nostril to anterior pore, the fourth directly below at edge of preorbital, and the fifth posterior to this, also on rim of preorbital); margin of preopercle slightly crenulate; suborbital narrow, the greatest depth about one-fifth eye diameter, the lower margin free only anteriorly; opercle with a single flattened obtuse spine only slightly projecting, this and associated opercular membranes almost completely covered by posterior opercular scales.

Scales entirely ctenoid; head fully scaled except narrow zone at front of snout and a small region in vicinity of nostril (Fig. 3); a diagonal row of seven scales across interorbital; suborbital with a single row of scales; four parallel rows of scales below this to lower margin of preopercle; dorsal and anal fins with a basal scaly sheath, mostly two scales in depth; caudal fin scaled nearly half distance to end of shortest medial rays (a little farther toward margin of lobes); paired fins scaled only basally; axillary scale of pelvic fins about half length of pelvic spine.

Tubed part of lateral line ending beneath anterior rays of soft portion of dorsal fin; four (three to four) pored scales posterior to tubed scales, the last usually in next scale row below; a series of 9 (9 to 11) pored scales mid-laterally on caudal peduncle to caudal base.

COLOR OF HOLOTYPE: Color in life blue, shading to bluish white on lower head, thorax, and abdomen, the scales on sides and back edged with yellowish brown, thus nearly masking blue color dorsally on head and body; postorbital part of head above level of pectoral base orange-yellow with large, light blue spots; some orange-yellow at extreme upper pectoral base and above; snout yellowish; a small but prominent orange-yellow spot at rear base of dorsal fin; caudal fin pale with broad orange-yellow bands in lobes except edges which are narrowly whitish and the filamentous tips which are blackish; upper orange-yellow caudal band extending a short distance anteriorly onto caudal peduncle; dorsal fin dusky with some yellow in outer part of interspinous membranes, the attenuated membraneous tips light blue; anal fin with a large black area over most of central and basal part, preceded by light blue on spinous portion and outer part of first four rays and associated membranes, the last five rays and membranes hyaline; paired fins pale.

In preservative this fish is light brown, whitish over lower head, thorax, abdomen, posteriorly on caudal peduncle, base of caudal fin, and base and axil of pectoral fins; a small whitish spot at rear base of dorsal fin; dorsal fin dusky, the spinous portion a little darker than soft; the large black area on the anal fin persists as the most conspicuous marking in alcohol as well as in life. Occasional specimens show a faint longitudinal banding on the body.

Remarks

This species has been collected in the Cook Islands, Austral Islands, Society Islands, Samoa Islands, Line Islands, Marshall Islands, Mariana Islands, Egum Atoll in the Solomon Sea, and Johnston Island in the depth range of 2 to 37 meters. Although not yet taken in the Hawaiian Islands, it has been observed in shallow water in Hilo Bay and off Kahe Point, Oahu, by James M. Peck, Jr. and John C. McCain, marine biologists of the Hawaiian Electric Company (identification obtained after consulting with the senior author and viewing his color slides of this species). Gerald R. Allen (personal communication) has observed *acares* at Osprey Reef off northern Queensland.

This species forms aggregations over coral reefs or rubble bottoms and may be observed feeding on zooplankton a few feet above the bottom. Although it may be seen feeding in the same area as *C. vanderbilti*, it seems to maintain itself in small groups within the mixed aggregations. At the atoll of Tetiaroa in the Society Islands, *acares* was much more common than *vanderbilti*. It was found from 3 to 37 meters; *vanderbilti* ranged into more surgy water of less than 2 meters depth.

C. acares is most closely related to *C. vanderbilti* and to *C. lineatus* Fowler & Bean. These three species are small fishes with similar meristic data, and all have a small orange-yellow spot at the rear base of the dorsal fin. *C. acares* shares with *vanderbilti* the large black area on the anal fin and the orange-yellow over the operculum containing light blue spots. It lacks the conspicuous stripes on the body and the black band of the lower caudal lobe. *C. lineatus* is striped; however, it does not have the black area on the anal fin (though Fowler and Bean described the anal fin as dark, an examination of the holotype, USNM 89953, 38 mm SL, by the senior author revealed no evidence of dark pigmentation; the dark edges of the bluish stripes on the body, however, are still very apparent). A specimen of *lineatus* collected in Palau by the senior author and G. S. Helfman (BPBM 8098, 36 mm SL) also has no dark area on the anal fin.

This fish has been named *acares* (ακαρής, small), in reference to its small size. The largest of our 48 specimens measures 36.5 mm in standard length.

Chromis leucurus

Fig. 4, Tables 1–2

Chromis leucurus Gilbert, 1905 (in part). Bulletin of the United States Fish Commission for 1903, vol. 23, pt. 2, p. 620, pl. 77, fig. 2 (type locality, Avau Channel between Maui and Lanai, Hawaiian Islands).

Diagnosis

Dorsal rays XII,14; anal rays II,13; pectoral rays 16; lateral-line scales with tubes 13 or 14; gill rakers 7+1+18; upper jaw with 47 to 54 teeth in outer row and lower jaw with 41 or 42; body moderately deep, the depth 1.9 to 2.15 in standard length; head length 3.0 to 3.35 in standard length; base of soft portion of dorsal fin 1.7 in base of spinous portion of fin; pectoral fins reaching beyond a vertical at front of soft portion of anal fin, their length 3.05 to 3.1 in standard length; second branched rays of upper and lower caudal lobes produced, the caudal concavity 2.7 in standard length (one specimen); suborbital margin free to beneath hind portion of eye.

COLOR: In life the specimen appearing in Fig. 4 was dark brown, abruptly whitish posterior to a vertical in middle of caudal peduncle, the upper and lower edges of whitish part pale bluish, this color extending onto upper and lower edges of base of caudal fin; head and thorax dark brown with purplish reflections; an irregular light blue line following lower rim of eye; two contiguous light blue spots behind center of eye; dorsal and anal fins brown, abruptly pale posteriorly in line with vertical demarcation in color on caudal peduncle, unscaled part of anterior interspinous membranes of dorsal fin broadly yellow distally, tipped with blue, the more posterior membranes brown, broadly edged with blue; spinous portion of anal fin similar but yellow less evident; pectoral fins pale with a large black spot at base (broader at upper base; and extending about three-fourths of the way down in axil of fins), followed by a zone of bright yellow as broad as

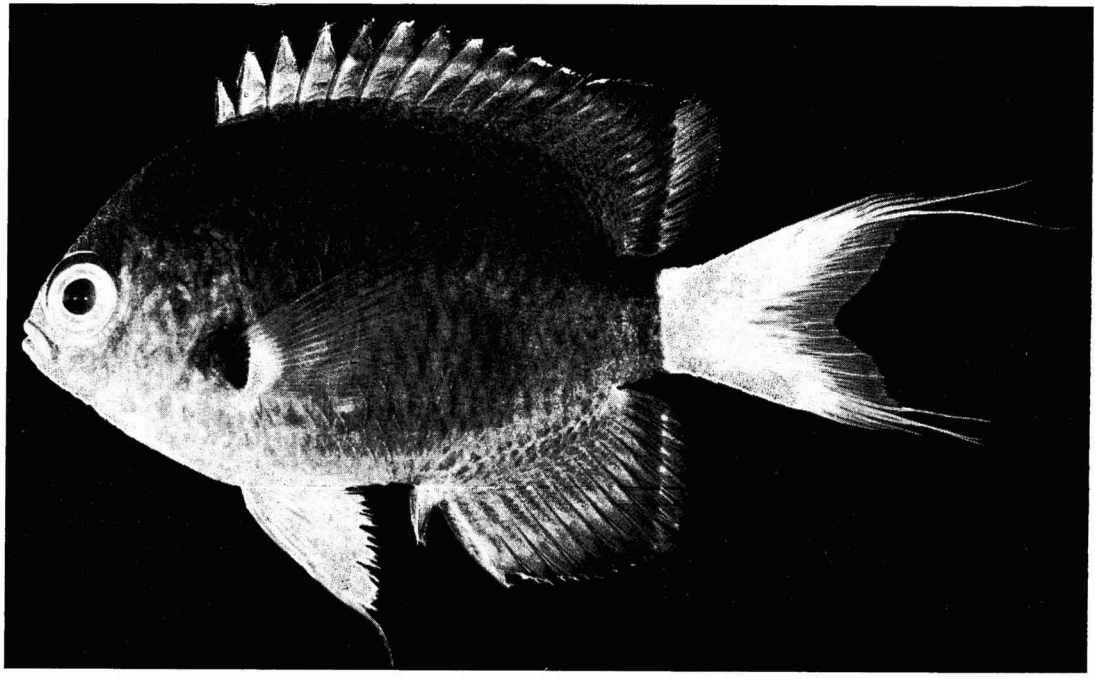

FIG. 4. *Chromis leucurus*, BPBM 7917, 46 mm SL, Oahu, 29 m.

the black spot; pelvic fins yellow with a brown lateral edge, the rays brownish basally; iris light blue with a median ring of dark blue.

Remarks

The holotype of *leucurus* (USNM 51587, 55 mm SL) was examined at the United States National Museum. It was collected in the depth range of 34 to 65 fathoms. Gilbert had one paratype taken in the vicinity of Kauai from 40 to 233 fathoms. This specimen (USNM 51660, 22 mm SL), however, is *Chromis verater*.

The senior author has collected only one specimen of *leucurus* in the Hawaiian Islands, the 46-mm one of Fig. 4. This was taken with rotenone in 29 meters at the base of a rocky ledge off Kaneohe Bay, Oahu. The specimen, 37 mm in total length reported by Madden (1973), which was collected when a sunken boat was raised from 68 meters near Manana Island, Oahu, has been lost.

A single specimen (BPBM 11883, 36 mm SL) was collected by the senior author in 50 meters off Fatu Hiva, Marquesas Islands. Its color is almost identical to that of the Hawaiian specimens.

To our knowledge there are only three existing specimens of *leucurus*. The other listings by this name are misidentifications. The two color phases of *leucurus* of Gosline and Brock (1960), for example, are *Chromis agilis* and *C. hanui*; and the *leucurus* of Woods and Schultz in Schultz et al. (1960) is *C. agilis*.

Chromis agilis

Fig. 5, Tables 1–2

Chromis agilis Smith, 1960. Ichthyological Bulletin, Rhodes University, Grahamstown, no. 19, pp. 322, 324, pls. 26 A, 32 J (type locality, Astove Island, western Indian Ocean).

Diagnosis

Dorsal rays XII,12 to 14 (usually 13); anal rays II,12 to 14 (usually 13); pectoral rays 17 or 18 (usually 17); lateral-line scales with tubes 15 to 17 (usually 16); gill rakers 8 or 9+1+19

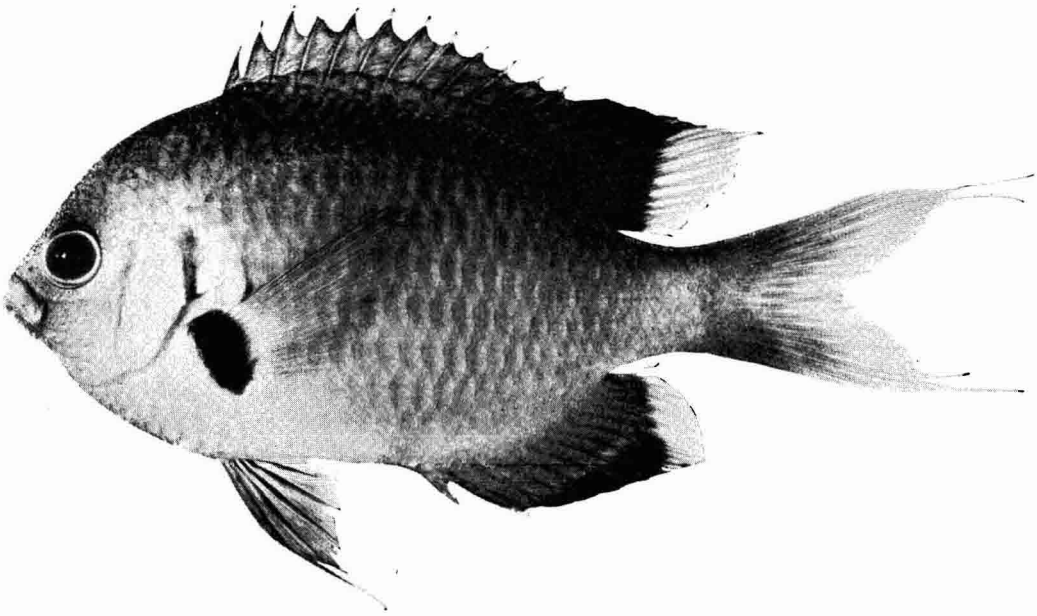

FIG. 5. *Chromis agilis*, BPBM 11292, 66 mm SL, Oahu, 27 m.

to 22; upper jaw with 41 to 52 teeth in outer row and lower jaw with 38 to 50; body moderately deep, the depth 1.7 to 2.0 in standard length; base of soft portion of dorsal fin 1.55 to 2 in base of spinous portion of fin; pectoral fins 2.9 to 3.3 in standard length; second branched rays of upper and lower caudal lobes produced, the caudal concavity 2.2 to 3.3 in standard length; suborbital margin free anterior to a vertical at front edge of pupil.

COLOR: The living fish is orange-brown with bluish iridescence on scales; lower half of head and thorax with a wash of lavender to pinkish; edge of gill opening above pectoral base dark brown; upper margin of preopercle slightly darker than rest of head; caudal fin and posterior caudal peduncle whitish, slightly suffused with brown; dorsal and anal fins colored much like body, becoming pale abruptly posterior to a vertical slightly behind axil of fins; a blackish spot at rear base of dorsal fin and a smaller one at rear base of anal fin; pectoral fins with a large black spot at base, followed by a whitish zone, the rest of fin pale with dusky rays; pelvic fins brown, the rays a little yellowish.

Remarks

Although this species is abundant and widespread in the Indo-Pacific region, it apparently was not named until Smith (1960) described it from specimens from the western Indian Ocean. Thomas H. Fraser of the J. L. B. Smith Institute of Ichthyology, Rhodes University, kindly sent two paratypes of *agilis* on loan (RUSI 2337, 44 mm SL and RUSI 2339, 49.5 mm SL). These two fish have 12 dorsal and anal soft rays, 16 pectoral rays, and 15 tubed lateral-line scales; hence, they differ slightly from specimens from the Pacific which have modally 13 dorsal and anal soft rays, 17 pectoral rays, and 16 tubed lateral-line scales. The color plate of *agilis* in Smith, however, leaves little doubt that the Pacific specimens are the same. It is not unusual to find slight differences between Pacific and Indian ocean populations of reef fishes.

In addition to having collected *agilis* in the Hawaiian Islands, the senior author has collected this species at Johnston Island, Tuamotu Archipelago, Society Islands, Pitcairn Group, Austral Islands, Cook Islands, Fiji Islands, Palau Islands, Mariana Islands, Marshall Is-

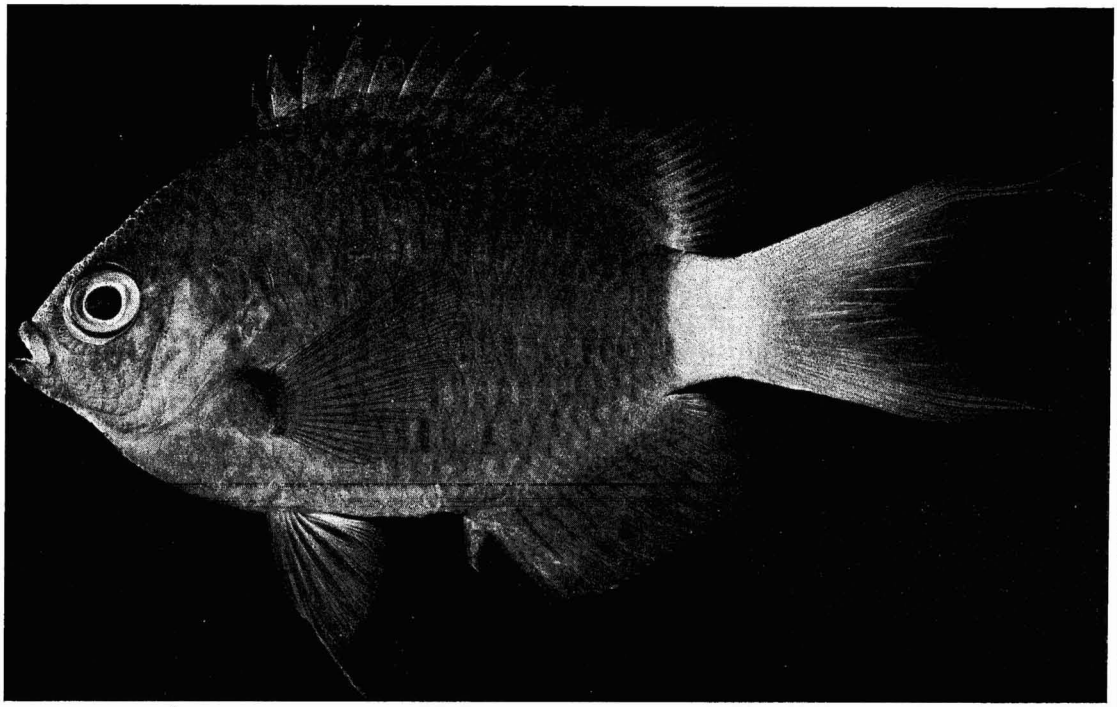

FIG. 6. Holotype of *Chromis hanui*, BPBM 7966, 63 mm SL, Moku Manu, Oahu, 50 m.

lands, Wake Island, and Marcus Island in the depth range of 5 to 56 m. It was observed but not collected at Rapa. Also we have examined specimens in museums from the New Hebrides (MNHN), Seychelles (Academy of Natural Sciences of Philadelphia), and Maldives (Field Museum of Natural History, Chicago).

In the Hawaiian Islands, *C. agilis* is seen in aggregations, often with *C. hanui*, over areas of dense coral or coral rubble. It appears to be more abundant on the lee sides of islands than in windward areas. It feeds on zooplankton such as crustacean larvae, fish eggs, and especially copepods.

Our largest specimen measures 78 mm SL.

Chromis hanui n. sp.

Figs. 6, 7; Tables 1, 2, and 4

Chromis dimidiatus Fowler & Ball, 1925 (non Klunzinger). Bernice P. Bishop Museum, Bulletin no. 25, p. 20 (French Frigate Shoals).

Chromis leucurus Gosline, 1955 (non Gilbert). Pacific Science, vol. 9, p. 452 (Hawaiian Islands).

Holotype

BPBM 7966, 60.3 mm SL, Moku Manu, Oahu, Hawaiian Islands, base of drop-off in 50 m, Chemfish, J. E. Randall, W. J. Baldwin, and A. J. Stark, 9 October 1968.

Paratypes

BPBM 4460, 55.6 mm SL, French Frigate Shoal, Hawaiian Islands, Tanager Expedition, July 1923; RUSI 2406, 3:55–56 mm SL, one-half mile off Waikiki, Oahu, Hawaiian Islands, E. Herald, R. Harry, V. Brock, and W. Gosline, 7 September 1951; USNM 208432, 5:53.0 to 59.6 mm SL, Kona coast of Hawaii, off Keahole Point, 6 to 12.5 m, R. Bolin et al., 15 August 1965; BPBM 6351, 2:54.3 and 54.8 mm SL, Kahe Point Beach Park, Oahu, Hawaiian Islands, reef in 11 m, rotenone, J. E. Randall and G. R. Allen, 30 March 1968; AMS I.16765-001, 2:57.8 and 61 mm SL, same data as preceding; BM(NH) 1972.12.5.1-2, 2:53.5 and 55.1 mm SL, same data as preceding; CAS 15913, 2:53.7 and 55.3 mm SL, same data as preceding; BPBM 13764, 57.2 mm SL, same data as holotype;

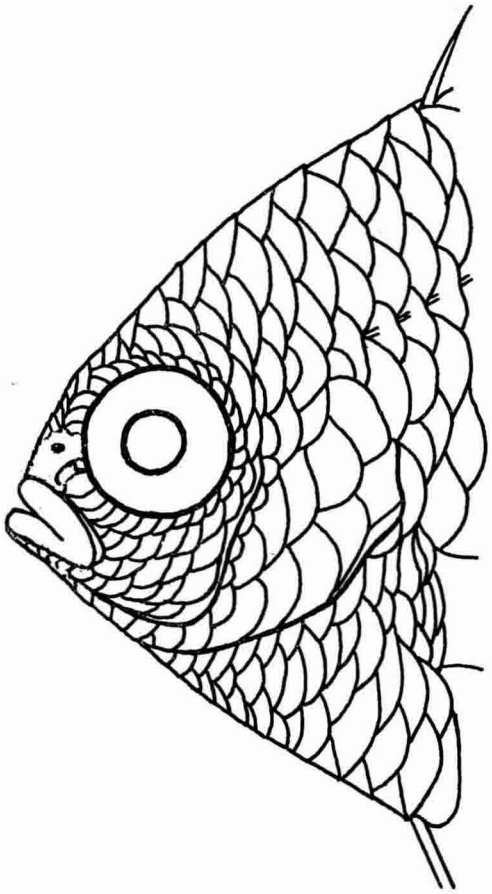

FIG. 7. Head of *Chromis hanui*. Drawing by Keiko Hiratsuka Moore.

MNHN 1972-95, 2:53.2 and 57.8 mm SL, same data as holotype; BPBM 7405, 40:26.9 to 58.7 mm SL, Oahu, Hawaiian Islands, off Pokai Bay, 21 to 28 m, Chemfish, J. E. Randall, S. N. Swerdloff, and E. Chave, 20 July 1969; USNM 208431, 4:52.0 to 55.8 mm SL, same data as preceding; BPBM 7931, 4:32.5 to 54.9 mm SL, Oahu, Hawaiian Islands; Waimea Bay, 6 to 9 m, Chemfish, J. E. Randall, S. N. Swerdloff, W. Smith-Vaniz, and G. R. Allen, 25 August 1969; BPBM 9774, 9:40.8 to 49.5 mm SL, Oahu, Hawaiian Islands, off Makaha Shores Apartment Hotel, 14 m, reef with small caves, Chemfish, J. E. Randall and A. R. Emery, 26 April 1970.

Description

Dorsal rays XII,13; anal rays II,13 (12 to 14); pectoral rays 17 (17 or 18); branched caudal rays 13; lateral-line scales with tubes 16 (15 to 18); vertical scale rows from upper end of gill opening to caudal base 28 (28 or 29); scales above lateral line to origin of dorsal fin 3; scales below lateral line to origin of anal fin 10 (9 or 10); circumpeduncular scales 16; gill rakers 8+1+21 (7 to 9+1+18 to 22); branchiostegal rays six; vertebrae 26 (one specimen).

Body moderately deep, the depth 1.85 (1.85 to 1.95) in standard length, and compressed, the width 2.7 (2.65 to 3) in depth; head length 3.05 (3 to 3.3) in standard length; snout 3.3 (3.1 to 3.4) in head; eye 3.05 (2.2 to 2.7) in head; interorbital space moderately convex, the bony width 3 (2.9 to 3.55) in head; least depth of caudal peduncle 2 (1.85 to 2.2) in head; longest (fifth or sixth) dorsal spine 1.9 (1.65 to 1.95) in head; first dorsal spine 1.55 (1.45 to 1.55) in second spine; second dorsal spine 1.45 (1.3 to 1.55) in longest dorsal spine; longest (sixth) dorsal ray 1.4 (1 to 1.3) in head; base of soft portion of dorsal fin 2.05 (1.75 to 2) in base of spinous portion of fin; first anal spine longer than first dorsal spine, its length 2.15 (1.85 to 2.05) in second anal spine; second anal spine 1.7 (1.65 to 1.8) in head; longest (seventh) anal soft ray 1.5 (1.3 to 1.5) in head; base of anal fin 1.8 (1.9 to 2) in base of dorsal fin; caudal fin 1.8 (1.35 to 2.15) in standard length; caudal concavity 2.5 (2 to 3.75) in standard length; pectoral fins reaching slightly beyond a vertical at origin of anal fin, the length of longest ray 3.25 (3.05 to 3.45) in standard length; pelvic fins reaching beyond a vertical at anterior part of soft portion of anal fin, their length 2.8 (2.4 to 2.9) in standard length.

Mouth terminal, oblique, small, the maxillary nearly reaching or reaching slightly beyond a vertical at anterior edge of eye; upper jaw with 40 (36 to 50) teeth in outer row, the largest less than twice diameter of nostril; lower jaw with 36 (34 to 48) teeth, the largest about half as long as largest upper tooth; two irregular rows of small teeth medial to outer row at front of upper jaw and one irregular row of small teeth medial to outer row at front of lower jaw; front of lips and unscaled portion of snout

TABLE 4

PROPORTIONAL MEASUREMENTS OF TYPE SPECIMENS OF *Chromis hanui* (IN THOUSANDTHS OF THE STANDARD LENGTH)

ITEM	HOLOTYPE	PARATYPES				
	BPBM 7966	BPBM 7405	BPBM 7931	BPBM 9774	BPBM 6351	BPBM 13764
Standard Length (mm)	60.3	26.9	32.5	45.9	54.8	57.2
Greatest Depth of Body	543	513	538	511	525	542
Greatest Width of Body	201	175	173	196	201	194
Head Length	321	327	329	314	305	310
Snout Length	100	97	98	100	92	93
Diameter of Orbit	108	148	137	119	112	114
Bony Interorbital Width	109	93	92	107	104	106
Length of Upper Jaw	104	109	107	102	97	103
Least Depth of Caudal Peduncle	160	167	166	167	157	159
Length of Caudal Peduncle	141	148	142	142	142	136
Snout to Origin of Dorsal Fin	431	440	432	441	409	400
Snout to Origin of Anal Fin	657	671	657	620	667	675
Snout to Origin of Pelvic Fins	415	391	410	393	390	407
Length of First Dorsal Spine	76	100	92	91	83	78
Length of Second Dorsal Spine	119	156	135	135	128	122
Length of Longest Dorsal Spine	171	200	184	187	181	159
Length of Longest Dorsal Ray	237	242	329	257	233	246
Length of Base of Dorsal Fin	583	556	540	558	575	586
Length of First Anal Spine	91	102	92	96	92	86
Length of Second Anal Spine	196	191	185	185	182	175
Length of Longest Anal Ray	216	245	246	238	217	210
Length of Base of Anal Fin	322	280	308	294	301	308
Length of Caudal Fin	547	675	745	620	457	520
Caudal Concavity	394	372	502	390	265	315
Length of Pectoral Fin	307	325	326	308	317	290
Length of Pelvic Spine	178	189	197	183	168	175
Length of Pelvic Fin	358	422	431	373	358	343

above upper lip with tiny papillae; nostril with a low fleshy rim, more elevated posteriorly; five prominent pores in vicinity of nostril (one ventroposterior within about a nostril's diameter of nostril, the second directly anterior a distance slightly greater than space between nostril and eye, the third directly above, about half distance between anterior pore and nostril, the fourth directly below at edge of preorbital, and the fifth posterior to this, also on rim of preorbital); margin of preopercle slightly irregular with a few weak serrations on upper limb; suborbital depth about one-fourth eye diameter, the lower margin free only anteriorly; opercle with a single flattened obtuse spine which projects only slightly, this and associated opercular membrane nearly covered by posterior opercular scales.

Scales entirely ctenoid; head fully scaled except narrow zone at front of snout and a narrow corridor from eye to upper lip containing nostril and nearest pore (the three pores along edge of snout also in scale-free zone); seven scales across interorbital; suborbital with a single row of scales; four parallel rows of scales below this to lower margin of preopercle; spinous portion of dorsal fin with a basal scaly sheath of 1.5 to 2 scales in width; above this on each interspinous membrane a single row of progressively smaller scales which reach farther out on fin than width of basal sheath (nearly twice width of basal sheath on posterior membrane); soft portion of fin and anal fin scaled about two-thirds distance to margin anteriorly and only about one-fourth distance to margin posteriorly; small scales on caudal fin reach about two-thirds distance to margin (excluding filamentous rays); paired fins scaled only basally; axillary scale of pelvic fins about 0.6 length of pelvic spine.

Tubed part of lateral line ending beneath anterior two rays of soft portion of dorsal fin; three (two to five) pored scales posterior to tubed scales (the last one or two usually in row below tubed scales); a series of 9 (9 or 10) pored scales mid-laterally on caudal peduncle to caudal base (second from front of this series sometimes without a pore); a few scales anterior to mid-lateral pored series may have a median circular depression (on some specimens other scales on caudal peduncle may also have this dimple).

COLOR OF HOLOTYPE: Holotype in life was dark yellowish brown, abruptly white on caudal peduncle two scales posterior to rear base of dorsal and anal fins; snout, lower head, thorax, and lower abdomen with a bluish cast; dorsal and anal fins colored like body basally, becoming dusky to blackish outwardly except posteriorly where abruptly pale in line with white zone of caudal peduncle; caudal fin bluish white; pectoral fins pale with dusky rays and a large black spot at base and in axil; pelvic fins with dark brown membranes and spine, first ray and membranes dark brown, the next three rays yellowish brown, and the last ray light brownish; iris bluish, the inner rim light yellow.

In preservative the color is very similar to that in life; the bluish hues are absent, and the white of the caudal peduncle and posterior median fins is pale yellowish.

Remarks

Chromis hanui is known only from the Hawaiian Islands. Our specimens have been taken in the depth range of 6 to 50 m. We have seen no material from Johnston Island. The specimens in the "black and white" color form discussed by Gosline (1955) in his Johnston Island paper are from Hawaii. His "brown" phase fish from Johnston identified as *C. leucurus* are *agilis*. The *leucurus* from Johnston Island reported by Woods and Schultz in Schultz et al. (1960) is also *agilis*. Nevertheless, it would not be surprising to find *C. hanui* at Johnston, since the island's fauna is principally Hawaiian.

C. hanui ranges into the Leeward Hawaiian Islands; we have specimens from French Frigate Shoals. While observing the species at French Frigate Shoals, the junior author noted several individuals with yellow caudal fins. In view of a number of closely related species of *Chromis* with the same basic color pattern of dark brown body and abruptly pale caudal region, we cannot be certain, however, that those with yellow tails were *hanui*.

C. hanui is perhaps most closely related to *C. margaritifer*, which Fowler (1946) described as a subspecies of *C. dimidiatus* from the Ryukyu Islands. Usually this species has been misidentified as *dimidiatus*, *leucurus*, or *xanthurus*. Since its description, only Fourmanoir (1965) seems to have identified it correctly when he listed a 55-mm specimen from Vietnam (examined by senior author in MNHN).

C. margaritifer is widespread in the central and western Pacific but not Hawaii. It differs from *hanui* in having the demarcation of dark brown and white running vertically from the rear base of the anal fin to slightly in advance of the rear base of the dorsal fin, 12 dorsal soft rays, 11 or 12 anal soft rays, and in being of smaller size.

C. hanui is often seen in aggregations, sometimes mixed with *agilis*. It rarely wanders more than a few feet from protective crevices. It feeds on copepods, fish eggs, malacostracan larvae, and other animals of the zooplankton.

Our largest specimen is the holotype, 60.3 mm in standard length.

Named *hanui* from an ancient Hawaiian name for an unknown member of the damselfish family.

Chromis ovalis

Fig. 8, Tables 1–2

Heliastes ovalis Steindachner, 1900. Denkschriften der mathematisch-naturwissenschaftlichen Klasse der kaiserlichen Akademie der Wissenschaften, Wien, vol. 70, p. 502 (type locality, Honolulu) (year of publication given as 1901 in Dean's *Bibliography of Fishes*).

Chromis velox Jenkins, 1901. Bulletin of the United States Fish Commission for 1899, vol. 19, p. 393, fig. 6 (type locality, Honolulu).

Diagnosis

Dorsal rays XIV,11 to 13 (usually 12); anal rays II,12 or 13 (usually 13); pectoral rays 20

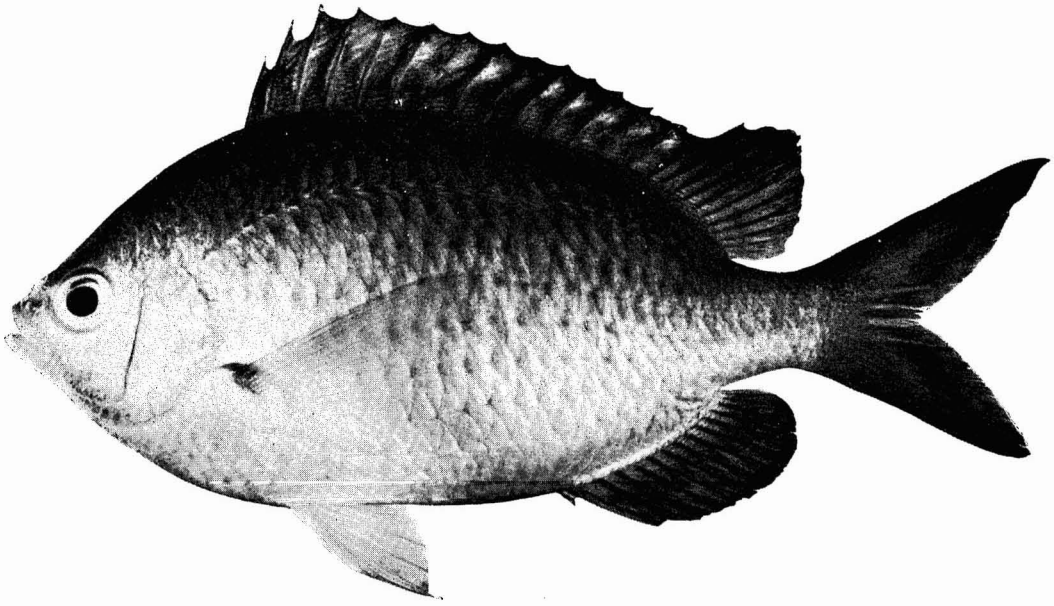

FIG. 8. *Chromis ovalis*, BPBM 10214, 130 mm SL, Oahu, 28 m.

to 22 (usually 21); lateral-line scales with tubes 19 to 21 (modally 20); gill rakers 9 to 11+1+23 to 27; upper jaw with 40 to 52 teeth in outer row and lower jaw with 45 to 56; body moderately elongate, the depth 2 to 2.35 in standard length; head length 3 to 3.5 in standard length; soft portion of dorsal fin 2.5 to 2.8 in spinous portion of fin; pectoral fins just reaching a vertical at origin of anal fin in adults (extending to soft portion of fin on juveniles), their length 3 to 3.2 in standard length; caudal fin deeply forked, the caudal concavity 4.3 to 5.7 in standard length.

COLOR: Adults in life bluish or greenish on back and sides, the edges of scales yellowish brown, shading to silvery gray on lower part of head and body; median fins dusky, the anal darkest, the outer unscaled part of spinous portion of dorsal fin yellowish; paired fins yellowish, the pectorals with a black spot in axil and on upper half of base of fin; lips light orange-yellow.

An 84-mm individual was olive on back, shading to light greenish yellow on sides; unscaled outer part of spinous dorsal fin greenish yellow, the margin blackish, the scaled basal part olive; soft portion of the dorsal fin, anal fin, and caudal fin dark gray; pectorals with pinkish and yellow rays, clear membranes, and a black spot on upper half of base; pelvics salmon pink; lips light salmon.

Juveniles of about half this size are more colorful; underwater photos at Pearl and Hermes Reef kindly supplied by John A. Maciolek of the University of Hawaii show a ground color of blue with the dorsal fin and a band along its base bright yellow; a brilliant iridescent blue or blue-green streak commences on upper part of eye and runs horizontally onto body, fading as it passes posteriorly (streak is much more apparent on upper part of eye and postorbital part of head than on body); the caudal fin varies from whitish to pinkish, a little dusky on edges of lobes; remaining fins pale.

Remarks

The holotype of *Chromis ovalis* is in the Überseemuseums, Bremen. It was illustrated by Wahlert (1955: fig. 2). The holotype of *C. velox* Jenkins (USNM 49684, 118 mm SL) was examined at the United States NationalMuseum.

Whitley (1929) stated that the name *Heliastes ovalis* Steindachner is invalid when *ovalis* enters

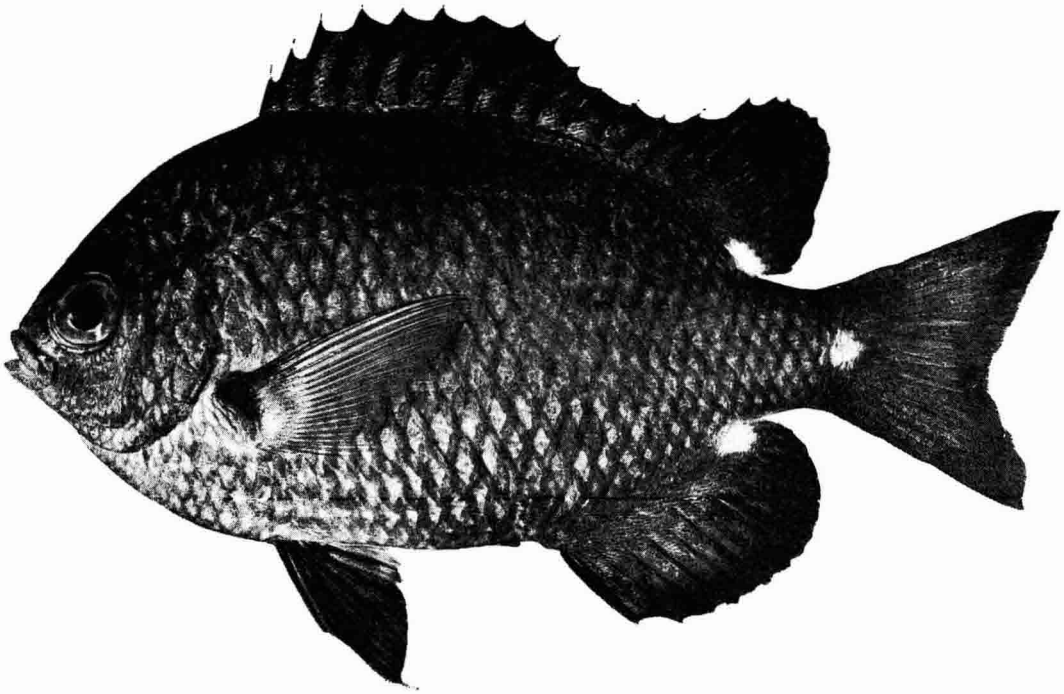

FIG. 9. *Chromis verater*, BPBM 7407, 135 mm SL, Oahu, 28 m.

Chromis because Steindachner (1866) proposed the name *Chromis ovalis* earlier for a cichlid fish. Though aware of this difficulty, Gosline and Brock (1960) employed *ovalis* for the Hawaiian pomacentrid, but they expressed doubt of this usage. The use of *Chromis* as a generic name in the Cichlidae, however, is an error; thus, *ovalis* is available as a name for *Chromis* in the Pomacentridae.

Chromis ovalis is known only from the Hawaiian Islands where it has been taken at depths of 7 to 45 m. The specimen taken at 45 m is a transforming juvenile 17.8 mm SL, 6.6 mm in depth, which was pinkish silver with a yellow band on the back. It was collected by the senior author on 16 June 1973.

Our largest female specimen measures 137 mm SL, and our largest male 148 mm SL. Sexual maturity is attained at a standard length of about 95 mm.

The junior author has determined that the spawning season occurs from February through May. Eggs are transparent, elliptical, average 0.6 mm in length, and are attached by adhesive tendrils at one end to benthic filamentous algae. The spawning behavior is typical of that reported for the family. The male, which may be light silvery gray or show a barred pattern, begins courtship with a "signal jump"; a receptive female responds by moving to the nesting site which has been prepared by the male. Males guard the nest very effectively. The eggs hatch in 72 to 74 hours at 23° to 24° C; the larvae are 2.3 to 2.5 mm long at hatching.

The diet of both juveniles and adults consists mainly of calanoid and cyclopoid copepods, but adults also feed on pelagic tunicates, mysids, euphausids, crustacean larvae, larval polychaetes, siphonophores, and fish eggs.

Chromis verater

Fig. 9, Tables 1–2

Chromis leucurus Gilbert, 1905 (in part). Bulletin of the United States Fish Commission for 1903, vol. 23, pt. 2, p. 620 (off Kauai, Hawaiian Islands).

Chromis verater Jordan & Metz, 1912. Proceedings of the United States National Museum, vol. 42, p. 526, pl. 71, fig. 2 (type locality, Honolulu).

Diagnosis

Dorsal rays XIV,12 to 14 (usually 13); anal rays II,12 to 14 (usually 13); pectoral rays 19 or 20 (usually 20); lateral-line scales with tubes 17 to 19 (usually 18); gill rakers 7 to 9+1+19 to 23; upper jaw with 42 to 52 teeth in outer row and lower jaw with 42 to 58; body moderately deep, the depth 1.8 to 2.05 in standard length; head length 3.3 to 3.5 in standard length; base of soft portion of dorsal fin 2.2 to 2.6 in base of spinous portion of fin; pectoral fins reaching a vertical at origin of anal fin of adults to well into soft portion of fin on juveniles, their length 3.2 to 3.45 in standard length; pelvic fins 2.6 to 3.6 in standard length (relatively longer in juveniles); caudal fin of adults not deeply forked, the caudal concavity 10 to 14 in standard length (juveniles with caudal fin more deeply forked, the smaller individuals with produced rays in lobes, the caudal concavity to 3.5 in standard length); three spiniform procurrent rays on both upper and lower edges at base of caudal fin (other Hawaiian species with two such rays).

COLOR: This species is dark brown to dark gray (appearing almost black underwater) with three white spots about half diameter of eye posteriorly, one at rear base of dorsal fin, one at rear base of anal fin, and the third at midbase of caudal fin (these spots usually fading after death and nearly always absent on preserved specimens); a large black spot at pectoral base and axil, not reaching lower edge of pectoral base; all fin membranes dark brown except pectoral membranes which are clear. Juveniles lighter bodied (light gray in life), the median and pelvic fins dusky to brown.

Remarks

The holotype of *C. verater* (USNM 73912, 137 mm SL) was examined at the United States National Museum.

This species is recorded only from the Hawaiian Islands. The senior author, however, speared an adult in the lagoon of Johnston Island (BPBM 7499, 118 mm SL) which represents the first record from this atoll. The marine fauna of Johnston, though essentially Hawaiian, is somewhat divergent (Gosline 1955; Brock, Jones, and Helfrich 1965). The speared individual was observed feeding among an aggregation of *Hemitaurichthys thompsoni*, a dark brown chaetodontid of similar body shape to *C. verater*.

C. verater is found over a great range in water depth; our specimens have been taken from 6 to 160 meters. It is most commonly seen above areas of hard substratum with good cover, especially vertical discontinuities with ledges and caves. The young are often seen over rubble bottoms at depths generally greater than 30 meters. Brock and Chamberlain (1968) stated that *verater* appears to be the most abundant fish associated with outcrops of reef rock at about 70 meters off the Waianae coast of Oahu.

This damselfish is a large species for the genus. Our largest specimen is a male 152 mm in standard length; our largest female is 150 mm.

The remarks on reproduction and food habits for *ovalis* apply as well for *verater* except that the spawning season occurs from December through June. Males in nuptial coloration become paler on the body, in contrast to the fins which remain dark. The eggs average 0.65 mm in length.

C. verater is related to other relatively large *Chromis* with three spiniform procurrent caudal rays such as *analis* and *pembae*. The latter species was recently collected by the senior author in the Gulf of Aqaba (BPBM 13897, 5:54 to 86 mm SL), thus representing the first record from the Red Sea. Also related to *verater* is an undescribed species from the Marquesas Islands.

Chromis struhsakeri n. sp.

Figs. 10–12; Tables 1, 2, and 5

Holotype

BPBM 10564, 53.2 mm SL, off Haleiwa, Oahu, Hawaiian Islands, 125 to 160 m, bottom believed to be mainly sand, 3.7-m otter trawl, Robert Cordover, 22 October 1970.

Paratypes

USNM 208433, 2:81.8 and 83.6 mm SL, off Molokai, Hawaiian Islands, north of Penguin

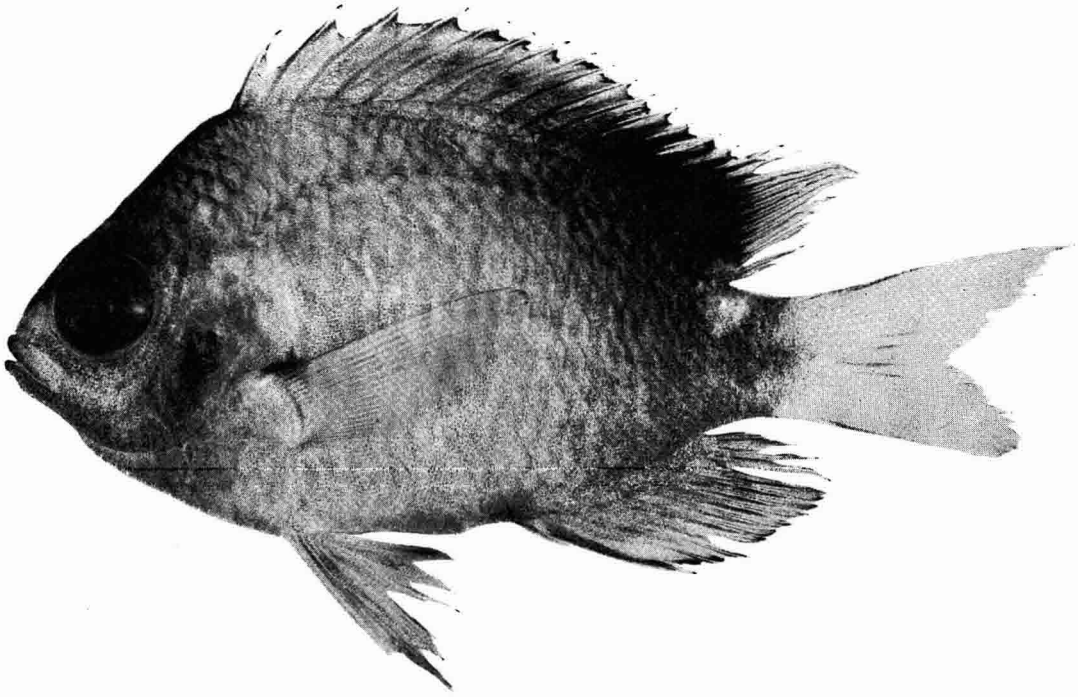

FIG. 10. Holotype of *Chromis struhsakeri*, BPBM 10564, 53.2 mm SL, off Haleiwa, Oahu, 125 to 160 m.

Bank (21°10′ N, 157°24′ W), 183 m, *Townsend Cromwell* Cruise 40, Station 20, 12.5-m shrimp trawl, P. Struhsaker et al., 9 November 1968; BPBM 13819, 69.8 mm SL, off Haleiwa, Oahu, Hawaiian Islands (21°39′ N, 158°7′ W), 100 m, *Townsend Cromwell* Cruise 40, Station 112, 12.5-m shrimp trawl, P. Struhsaker et al., 30 November 1968; BM(NH) 1972.12.5.3, 66.0 mm SL, off north shore of Oahu, Hawaiian Islands (21°39′ N, 158°7′ W), 99 m, *Townsend Cromwell* Cruise 40, Station 113, 12.5-m shrimp trawl, P. Struhsaker et al., 30 November 1968; CAS 15911, 55.0 mm SL, off Haleiwa, Oahu, Hawaiian Islands, 124 to 159 m, 3.7-m otter trawl, Robert Cordover, 22 October 1970; BPBM 13919, 26.5 mm SL, off Molokai, Hawaiian Islands (21°9′ N, 157°28.3′ W), 140 m, *Townsend Cromwell* Cruise 59, Station 16, 12.5-m shrimp trawl, P. Struhsaker et al., 15 June 1972; BPBM 13821, 43.5 mm SL, off north shore of Oahu, Hawaiian Islands (21°41.7′ N, 158°5.7′ W), 119 to 168 m, *Townsend Cromwell* Cruise 61, Station 27, 12.5-m shrimp trawl, P. Struhsaker et al., midnight, 17–18 October 1972.

Description

Dorsal rays XV (all paratypes XIV), 13 (all paratypes 14); anal rays II,13 (one paratype with 14); pectoral rays 19 (19 or 20); branched caudal rays 13; lateral-line scales with tubes 17 (16 to 18); vertical scale rows from upper end of gill opening to caudal base 27 (27 to 28); scales above lateral line to origin of dorsal fin 4; scales below lateral line to origin of anal fin 11; circumpeduncular scales 15; gill rakers 8+1+22 (7 or 8+1+21 to 25); branchiostegal rays six; vertebrae 26 (one specimen).

Body moderately deep, the depth 1.85 (1.8 to 1.9) in standard length, and compressed, the width 2.8 (2.6 to 3.05) in depth; head length 2.95 (2.95 to 3.1) in standard length; snout 3.55 (3.5 to 3.75) in standard length; eye 2.35 (2.15 to 2.7) in head; interorbital space slightly convex, the bony interorbital width 3.6 (3.45 to 4) in head; least depth of caudal peduncle 2.15 (2.1 to 2.15) in head; longest (fourth) dorsal spine 1.3 (1.25 to 1.45) in head; first dorsal spine 1.8 (1.5 to 1.75) in second spine; second

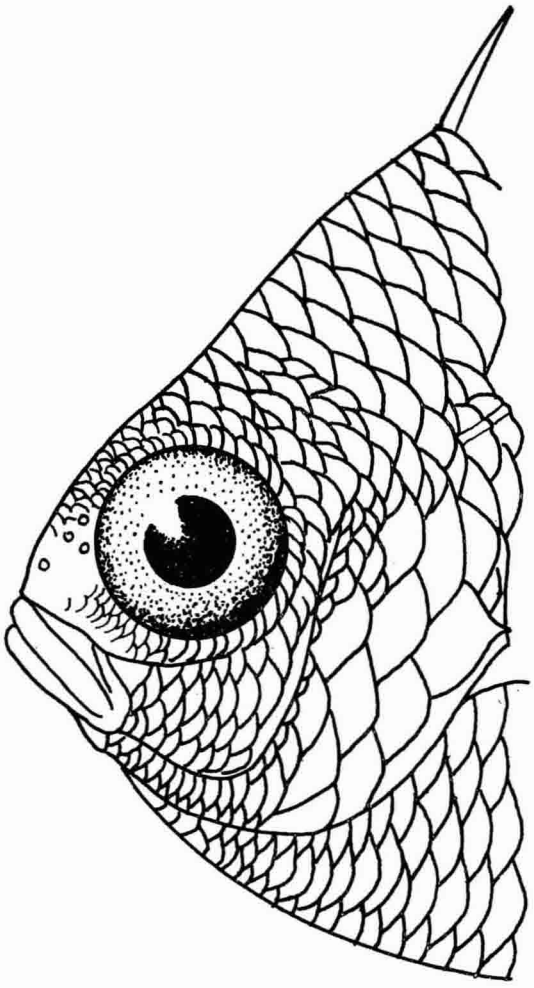

FIG. 11. Head of *Chromis struhsakeri*. Drawing by Susan Monden.

dorsal spine 1.2 (1.15 to 1.2) in longest dorsal spine; longest (fifth or sixth) dorsal ray 1.3 (1.25 to 1.4) in head; base of soft portion of dorsal fin 2.7 (2.3 to 2.6) in base of spinous portion of fin; first anal spine shorter than first dorsal spine, its length 2.6 (2.3 to 2.5) in second anal spine; second anal spine 1.4 (1.3 to 1.5) in head; longest (fifth) anal ray 1.25 (1.15 to 1.3) in head; base of anal fin 2.5 (2.35 to 2.55) in base of dorsal fin; caudal fin 2.35 (2.3 to 2.45) in standard length; caudal concavity 4.8 (4.9 to 5.9) in standard length; pectoral fins reach to or slightly beyond a vertical at anterior soft portion of anal fin, the length of the longest pectoral ray 2.8 (2.65 to 2.95) in standard length; pelvic fins reaching to or beyond a vertical at middle of soft portion of anal fin, the length of the longest pelvic ray 2.3 (2.05 to 2.45) in standard length.

Mouth terminal, oblique, small, the maxillary reaching to or slightly beyond a vertical at anterior edge of eye; upper jaw with 41 (34 to 45) teeth in outer row, the largest only slightly larger than nostril; lower jaw with 44 (34 to 45) teeth, the largest nearly as long as largest upper tooth; two irregular rows of small teeth medial to outer row at front of jaws; no papillae on lips or front of snout; nostril with a very low fleshy rim, slightly higher posteriorly; pores in vicinity of nostril very similar to those described for *C. hanui* and *acares* except for a dorsoposterior pore even closer to nostril than ventroposterior one; margin of preopercle smooth; depth of suborbital about seven in eye diameter, the lower margin free slightly posterior to middle of eye.

Scales entirely ctenoid; head fully scaled except zone at front of snout about one-fifth eye diameter and a contiguous broad corridor running to eye which contains nostril; scales across interorbital smaller anteriorly, seven or eight across narrowest point and 11 slightly anterior to this; suborbital with a single row of scales; four rows of scales below this to lower margin of preopercle, the uppermost and lowermost smaller than the two rows in the middle (Fig. 11); spinous portion of dorsal fin with a basal scaly sheath of one or two scales in width; above this on each interspinous membrane a column of progressively smaller scales which reach approximately halfway to margin of fin; scaly sheath of soft portion of fin not well differentiated from smaller scales above which extend about halfway out on the anterior soft rays but less on the posterior rays; small scales on caudal fin reaching about half distance to posterior margin; paired fins scaled only basally; axillary scale of pelvic fins about half length of pelvic spine.

Tubed part of lateral line ending beneath last dorsal spine; pored scales continue to base of caudal fin or there may be a break of one unpored scale in the oblique portion of scales leading to the horizontal row midlaterally on caudal peduncle (other scales on caudal pedun-

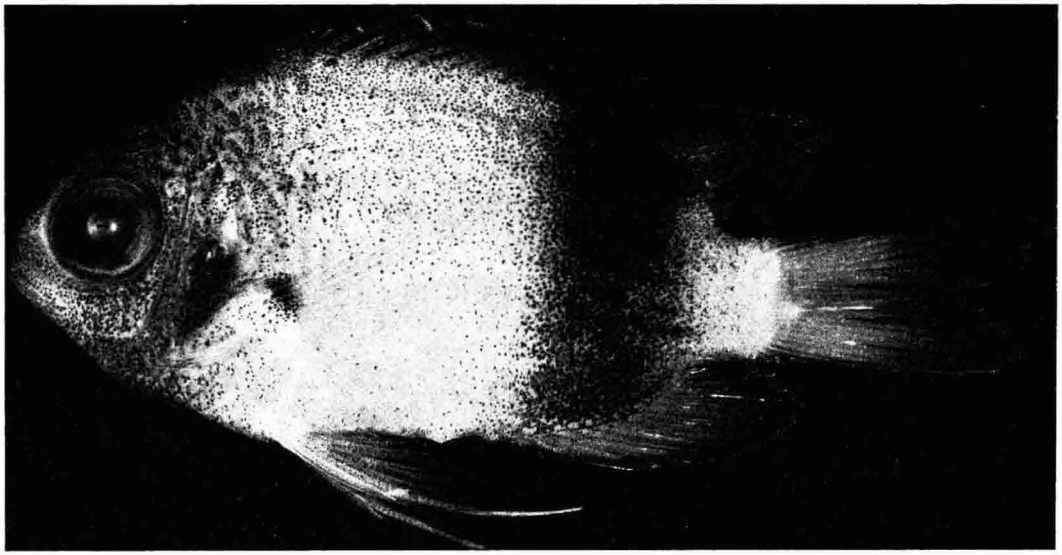

FIG. 12. Paratype of *Chromis struhsakeri*, BPBM 13919, 26.5 mm SL, Molokai, 140 m.

TABLE 5

PROPORTIONAL MEASUREMENTS OF TYPE SPECIMENS OF *Chromis struhsakeri* (IN THOUSANDTHS OF THE STANDARD LENGTH)

	HOLOTYPE	PARATYPES				
ITEM	BPBM 10564	BPBM 13821	CAS 15911	BM(NH) 1972. 12.5.3	BPBM 13819	USNM 208433
Standard Length (mm)	53.2	43.5	55.0	66.0	69.8	83.6
Greatest Depth of Body	544	525	546	545	523	557
Greatest Width of Body	197	200	193	177	176	201
Head Length	337	338	335	335	326	323
Snout Length	95	90	96	91	92	90
Diameter of Orbit	145	156	131	130	120	126
Bony Interorbital Width	93	85	96	84	89	94
Length of Upper Jaw	117	117	115	103	109	104
Least Depth of Caudal Peduncle	157	158	154	156	148	155
Length of Caudal Peduncle	105	110	113	106	107	106
Snout to Origin of Dorsal Fin	411	400	389	386	390	407
Snout to Origin of Anal Fin	692	704	705	703	708	707
Snout to Origin of Pelvic Fins	431	423	443	456	457	430
Length of First Dorsal Spine	120	131	130	109	114	117
Length of Second Dorsal Spine	215	214	197	194	—	196
Length of Longest Dorsal Spine	259	252	237	232	245	233
Length of Longest Dorsal Ray	263	246	244	257	256	255
Length of Base of Dorsal Fin	683	650	646	677	672	692
Length of First Anal Spine	94	97	95	110	109	94
Length of Second Anal Spine	245	233	237	251	251	236
Length of Longest Anal Ray	273	262	273	293	279	256
Length of Base of Anal Fin	275	260	276	271	262	270
Length of Caudal Fin	427	430	–	429	408	–
Caudal Concavity	208	169	–	204	169	–
Length of Pectoral Fin	346	345	339	344	337	375
Length of Pelvic Spine	225	229	221	220	219	227
Length of Pelvic Fin	440	488	446	428	407	424

cle may be pored including two to four on midlateral row anterior to juncture with descending pored scales).

COLOR OF HOLOTYPE: The holotype, preserved in alcohol, is light brown, becoming slightly blackish posterior to an approximate diagonal demarcation between base of 11th dorsal spine and slightly posterior to middle of soft portion of anal fin; within blackish zone a large pale yellowish spot on upper anterior caudal peduncle and rear base of dorsal fin; dorsal and anal fins dusky yellowish, the dorsal blackish above blackish zone posteriorly on body; caudal and paired fins pale, the pectoral with a black spot on slightly more than upper half of axil, which extends a short distance above level of pectoral base. After 1 month in formalin the caudal was yellow and there was some light yellow color on the anal fin.

On larger specimens the blackish posterior region is obscure or absent.

A 26.5-mm juvenile (Fig. 12) after 6 months in formalin with ionol was yellowish white with a broad blackish bar running dorsally from level of base of soft portion of anal fin into basal part of dorsal fin; head dusky; caudal peduncle light yellow; caudal, anal, and soft portion of dorsal fin (except blackish portion) yellow; paired fins pale, the upper half of pectoral axil black; some dark pigment on upper part of outer pectoral base.

Remarks

C. struhsakeri is a deep-dwelling species known thus far only from the Hawaiian Islands; our specimens have been taken in the depth range of 99 to 183 meters.

Named in honor of Paul Struhsaker of the National Marine Fisheries Service who collected most of the specimens during a survey for shrimps in the Hawaiian area and suspected that they represented an undescribed species.

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