Japanese Journal of Ichthyology
Vol. 28, No. 3 1981

魚類学雑誌
28巻3号 1981年

A Review of the Damselfishes of the Genus *Chromis* from Japan and Taiwan, with Description of a New Species

John E. Randall, Hitoshi Ida and Jack T. Moyer

(Received March 12, 1980)

Abstract The pomacentrid fish genus *Chromis* is represented in Japan and Taiwan by the following 20 species: *C. albomaculata* Kamohara, *C. alleni* sp. nov., *C. analis* (Cuvier), *C. atripectoralis* Welander et Schultz (often confused with *C. caerulea*), *C. atripes* Fowler et Bean, *C. caerulea* Cuvier, *C. chrysura* (Bliss) (*C. lepidostethicus* (Fowler), *C. westalli* (Whitley) and *C. isharae* (Schmidt) are junior synonyms), *C. elerae* Fowler et Bean (recorded for the first time from Taiwan; not yet known from Japanese waters); *C. flavomaculata* Kamohara (*C. kennensis* (Whitley) is a junior synonym), *C. fumea* (Tanaka) (described as a *Pomacentrus*, here revealed as a *Chromis*; *C. caudofasciata* Shen et Chen is a junior synonym), *C. lepidolepis* Bleeker, *C. leucura* Gilbert (first record from Japan); *C. margaritifer* Fowler (often misidentified as *C. dimidiata*; *C. bicolor* (Macleay) is a homonym), *C. mirationis* Tanaka (*C. fraenatus* Araga et Yoshino is both a synonym and a homonym), *C. notata* (Temminck et Schlegel) (*C. villadolidi* Jordan et Tanaka and *C. miyakeensis* Moyer et Ida are synonyms), *C. ovatiformis* Fowler, *C. ternatensis* (Bleeker), *C. vanderbilti* (Fowler), *C. weberi* Fowler et Bean (often misidentified as *C. xanthochir*), and *C. xanthura* (Bleeker). *C. alleni* is described from specimens from the Ryukyus, Izu Islands, Taiwan, and Ogasawara Islands. It is dark yellow-brown, abruptly whitish on caudal peduncle and fin, with a large blackish spot at pectoral base. Allied to other small bicolored *Chromis* with produced filamentous caudal lobes, it differs in having modally 13 dorsal soft rays, 17 pectoral rays, and 15 or 16 tubed lateral-line scales.

Aoyagi (1941) reviewed the damselfishes of Japan; he listed ten species of *Chromis*; however, one of them, *C. bitaeniatus* Fowler et Bean, is the young of *Paraglyphidodon nigroris* (Cuvier in Cuvier et Valenciennes) (Allen, 1973).

Kamohara (1960) devoted a paper entirely to the genus *Chromis* in Japan. He recognized 14 species; he named two of these as new, both of which are valid. He also erred in listing *C. bitaeniatus* in the genus.

Jones et al. (1973) reported seven *Chromis* from southern Taiwan. They regarded three of these, *C. atripectoralis* Welander et Schultz (misspelled *atropectoralis*), *C. dimidiata* (Klunzinger) (probably=*C. margaritifer* Fowler), and *C. xanthura* (Bleeker), as new records for Taiwan. Of the remaining four species, one was "*C.*" *bitaeniatus,* and two were listed as *C.* sp. The senior author asked to examine the two unidentified *Chromis* at the Institute of Oceanography of National Taiwan University. He was informed that the specimens are no longer extant.

Randall and Swerdloff (1973) reviewed the eight Hawaiian species of *Chromis,* only two of which are common to Japanese waters.

Allen (1975) included 36 species of *Chromis* from the central and western Pacific in his "Damselfishes of the South Seas", illustrating most with underwater photographs in color. He made some important nomenclatorial changes involving Japanese species.

Emery (1975) showed that the gender of *Chromis* is feminine.

Masuda et al. (1975) figured 12 species of *Chromis* from southern Japan with high quality color photographs and provided brief species accounts. As we indicate below in the discussion of *C. mirationis* Tanaka, *C. fraenatus* Araga et Yoshino in Masuda et al. (1975) is both a junior synonym and secondary homonym.

Shen and Chen (1978) studied the "chromid" fishes of Taiwan; their review included 11 species of *Chromis,* all of which occur also in Japan. They described a new species, *C. caudofasciata,* which we regard as a junior synonym (see discussion below under *C. fumea*).

Recent collections by us have raised the number of species of *Chromis* in Japan and Taiwan to 20.

One of these, *C. alleni,* is described herein as new. Also, our investigations have necessitated the alteration of some specific names of *Chromis* in use by recent authors for Japanese species, among them *C. miyakeenisis* Moyer et Ida (1976) which we now regard as a deep-bodied variant of *C. notata* (Temminck et Schlegel).

Species often confused with other forms from waters around Japan and Taiwan are listed in Table 1.

Materials and methods

The senior author has examined types and other specimens of *Chromis* at the following institutions: Academy of Natural Sciences of Philadelphia (ANSP); Australian Museum, Sydney (AMS); British Museum (Natural History), London [BM(NH)]; California Academy of Sciences, San Francisco (CAS; SU); Field Museum of Natural History, Chicago (FMNH); Museum of Comparative Zoology, Harvard University, Cambridge (MCZ); Muséum National d'Histoire Naturelle, Paris (MNHN); Department of Zoology, National Taiwan University, Taipei (NTUM); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); U.S. National Museum of Natural History, Washington, D.C. (USMN); Western Australian Museum, Perth (WAM); and Zoölogisch Museum, Amsterdam (ZMA).

Our principal study materials are deposited in the Bernice P. Bishop Museum, Honolulu (BPBM); School of Fishery Sciences, Kitasato University, Iwate-ken (FSKU); and Tatsuo Tanaka Memorial Biological Station, Miyakejima (TMBS). We have examined material at the following other Japanese institutions: Department of Biological Sciences, Kochi University, Kochi City (BSKU); Kochi Senior High School, Kochi City (KSHS); Division of Biological Sciences, Ryukyu University, Naha (RUB); Seto Marine Biological Station, Kyoto University, Shirahama (SMBL-F); Marine Science Museum, Tokai University, Shimizu (MSM); Museum of the Tokyo University of Fisheries (MTUF); and Department of Zoology, University Museum, University of Tokyo (ZUMT).

Except for types and *C. leucura* (of which we have only one specimen from the study area available for analysis), we have restricted our materials for counts and measurements to specimens from Japan and Taiwan. We have examined specimens of *Chromis* extralimital to Japan and Taiwan for comparative purposes and have selected some for illustrations when they are representative of the species from our area.

Most of our specimens were collected using screen nets, dip nets, and multiprong spears, but some were taken with rotenone and quinaldine. Most observations and collections were carried out with the aid of SCUBA.

When the last two dorsal or anal fin rays shared the same pterygiophore, they were counted as one ray. Pectoral ray counts include the

Table 1. *Chromis* species often confused

Species	Authority		
	Aoyagi, 1941	Matsubara, 1955	Kamohara, 1960
C. analis (Cuvier)	*C. xanthochir* (Bleeker)	*C. analis* (Cuvier)	*C. analis* (Cuvier) *C. cinerascens* (Cuvier)
C. chrysura (Bliss)	*C. isharae* (Schmidt)	*C. isharae* (Schmidt)	*C. isharae* (Schmidt)
C. flavomaculata Kamohara	*C. notatus* (Temminck et Schlegel)	—	*C. flavomaculata* Kamohara (original)
C. fumea (Tanaka)	*Pomacentrus fumeus* Tanaka	*P. fumeus* Tanaka	—
C. margaritifer Fowler	*C. dimidiatus* (Klunzinger)	*C. dimidiatus* (Klunzinger) *C. d. margaritifera* (Fowler)	*C. dimidiatus* (Klunzinger)
C. mirationis Tanaka	*C. mirationis* Tanaka	*C. mirationis* Tanaka	*C. mirationis* Tanaka
C. notata (Temminck et Schlegel)	—	*C. notatus* (Temminck et Schlegel)	*C. notatus* (Temminck et Schlegel)
C. weberi Fowler et Bean	—	—	*C. xanthochir* (Bleeker)

upper and lower unbranched rays (the upper two and lower two rays of this fin are nearly always unbranched). In enumerating the transverse scale rows (above and below lateral line), the last scale before the origins of the dorsal and anal fins which is often about half the size of the scales of the other rows, was included in the count. Gill rakers were counted on the first gill arch, and all rudiments were included. The upper-limb count is given first; the raker at the angle is contained with the lower-limb count.

Unless otherwise stated, color descriptions are based on live or fresh material.

In the description of the new species, data in parentheses apply to paratypes. The order of presentation of species accounts and that of the listing of species in the tables is alphabetical.

Radiographs were taken for vertebral counts and analysis of other skeletal characters. Caudal vertebrae are defined as those having closed haemal arches; the urostyle is counted as one. More than 200 specimens of pomacentrid fishes were radiographed for this study. Most were species of *Chromis,* but specimens of the following eight other genera were included for comparative purposes: *Amphiprion, Cheiloprion, Chrysiptera, Dascyllus, Paraglyphidodon, Plectroglyphidodon, Pomacentrus,* and *Pristotis.*

Lateral-line systems of the head and the nasal organs were observed under a binocular dissecting microscope using a solution of thianine blue. Drawings were made with the use of a camera lucida.

Sampling sites of the materials used for the present study are shown in the following Table (Table 2).

Length given for specimens are standard length (2).

Chromis

Chromis Cuvier, 1814: 88 (type species, *Sparus chromis* Linnaeus).

Diagnosis. Body elliptical, moderately deep, the depth 1.6 to 3.0 in standard length, and compressed; eye moderately large; snout short; mouth small, the maxilla reaching at most slightly posterior to a vertical at anterior edge of orbit, and oblique; teeth conical, those in outer row at front of jaws somewhat larger than the two or more inner rows; posterior nasal opening present (small and indistinct in some species), in contrast to other genera of the family; margins of opercular bones usually smooth (upper edge of preopercle weakly serrate in a few species), margin of suborbital nearly always smooth when free; head fully scaled except for tip of snout and region around nasal openings; dorsal fin rays XII to XV,10 to 15; anal fin rays II,10 to 14; principal caudal rays 15; procurrent caudal rays 5 or 6, those with 5 having the first 2 spiniform (referred to in text as caudal spinules) and those with 6 with the first 3 spiniform; predorsals 3, the

with other forms from Japan and Taiwan.

Masuda et al., 1975	Allen, 1975	Shen and Chen, 1978	Others
C. xanthochir (Bleeker)	*C. analis* (Cuvier)	*C. analis* (Cuvier)	
C. isharai (Schmidt)	*C. chrysura* (Bliss)	*C. chrysura* (Bliss)	
C. sp.	*C. kennensis* Whitley	*C. flavomaculata* Kamohara	
—	—	*C. caudofasciata* (original)	
C. margaritifer Fowler	*C. margaritifer* Fowler	*C. bicolor* (Macleay)	
	—	—	
	—	*C. notata* (Temminck et Schlegel)	*C. villadolidi* Jordan et Tanaka
C. fraenatus Yoshino et Araga (original)		*C. mirationis* Tanaka	*C. miyakeensis* Moyer et Ida
—			
C. weberi Fowler et Bean	*C. weberi*	*C. weberi* Fowler et Bean	

Table 2. Details of location of sampling site.

Central Japan		
Hayama	35°16.0′N	139°34.4′E
Futo	34°54.2′N	139°08.3′E
Shirahama	33°40.0′N	135°23.0′E
Minabe	33°42′N	135°20′E
Entrance of Osaka Bay		
	34°23′N	135°00′E
Fukura	34°23′N	134°53′E
Shikoku		
Kochi	33°24.3′N	133°30.0′E
Sukumo	32°52.5′N	132°42.0′E
Kashiwajima	32°45′N	132°38.5′E
Okinoshima	32°43′N	132°34′E
Western Japan		
Wakasa Bay	ca. 35°40′N	ca. 135°30′E
Oki	36°07′N	133°00′E
Sea between Tsushima and Fukuoka		
	ca. 34°00′N	ca. 129°20′E
Nagasaki	32°43′N	129°43′E
Kagoshima	31°36′N	130°33′E
Yakushima	30°22′N	130°40′E
Izu Islands		
Miyake-jima	34°05′N	139°10′E
Hachijo-jima	33°02′N	139°57′E
Bonin Islands		
Chichi-jima	27°06′N	142°11′E
Okinawa Islands		
Sesoko-jima	26°38.3′N	127°52′E
Motobu	26°37.6′N	127°53.2′E
Seragaki	26°30.5′N	127°52.4′E
Onna	26°30.0′N	127°50.7′E
Aha	26°42.5′N	128°18.0′E
Nakagusuku Bay	26°15.2′N	127°53.5′E
Yonesu	26°15.0′N	127°51.0′E
China	26°10.8′N	127°49.5′E
Aguni-shima	26°35′N	126°13.8′E
Kerama	26°13′N	127°19′E
Nakanose	24°18′N	125°19′E
Ishigaki	24°20.0′N	124°09.3′E
Kabira	24°27.6′N	124°08.7′E
Kuroshima	24°23.3′N	123°59.3′E
Iriomote	24°23.3′N	123°43.3′E
Taiwan		
Keelung	25°08.8′N	121°45′E
Yeh-liu	25°13′N	121°42′E
Sanshien tai	23°08′N	121°22′E
O-luan-pi	21°50′N	120°52′E
Nanwan	21°53′N	120°43′E
Southern Taiwan		
	ca. 22°30′N	120°30′E

first situated in front of the spine of the atlas, the second between the atlas and the second vertebra, and the third between the second and third vertebrae (the same space also occupied by the first dorsal pterygiophore); second and third dorsal pterygiophores between third and fourth neural spines.

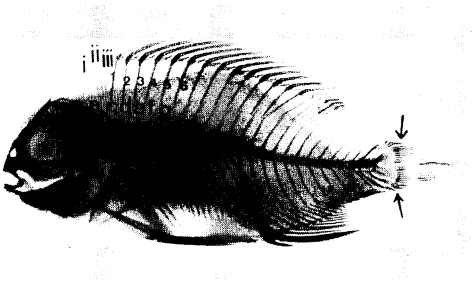

Fig 1. Radiograph of *Chromis mirationis* (ZUMT 24310) showing relative position of three predorsals (Roman numerals) and the following dorsal pterygiophores (in Arabic). Numbers on neural spines show ordinal numbers of vertebrae. Interspaces between neural spines are arranged in alphabetical order. Arrows indicate two spiniform procurrent caudal rays on each edge of caudal base.

Remarks. Arai et al. (1976) regarded *Chromis* as one of the most generalized of the pomacentrid genera from a tabulation of external characters. The presence of conical teeth and of a posterior nostril in *Chromis* adds weight to this hypothesis.

A low number of procurrent caudal rays may also be primitive. As mentioned above, species of *Chromis* have 5 or 6. *Dascyllus* (*aruanus, marginatus,* and *reticulatus*) and the monotypic *Cheiloprion* have 5 procurrent caudal rays. *Pomacentrus* (*nagasakiensis* and *moluccensis*), *Plectroglyphidodon dickii,* and *Paraglyphidodon nigroris* have 6. *Pomacentrus coelestis* and *Chrysiptera* (*cyanea, starcki,* and *glauca*) have 7. *Amphiprion* has 8. *Pristotis* has 9.

With the exception of two aberrant specimens of *Chromis,* all member of nine genera mentioned above had 11+15=25 vertebrae. Also, all had the same supporting elements in the caudal skeleton: 1 parhypural, 5 hypurals, and 3 epurals.

Among the genera of pomacentrids examined, there is some variation in the position of the predorsals and dorsal pterygiophores with respect to the spaces between the neural spines, as shown in Table 3. The arrangement of these bones for *Chromis* and *Dascyllus* is given in the first two columns of the table; this is illustrated in the

Table 3. Position of predorsals (Roman numerals) and dorsal pterygiophores (Arabic numerals) of some selected forms of the family Pomacentridae. For the position of interspaces between neural spines see Fig. 1. Each species group conconsists of the following species. A: all species of *Chromis* and *Dascyllus*, and *Plectroglyphidodon dickii*; B: all species of *Amphiprion*, *Chrysiptera rex* and *C. cyanea*; C: *Paraglyphidodon behni*, *Chrysiptera starcki*, *Amblyglyphidodon leucogaster*, *Cheiloprion labiatus* etc; D: *Pristotis jerdoni*. Note the anterior migration of the predorsals in the groups of the right columns. In the species of the genus *Amphiprion*, *Chrysiptera rex* and *C. cyanea*, the three elements viz. the 3rd predorsal and the 1st and 2nd dorsal pterygiophores are situated between the 2nd and 3rd neural spines. In *Pristotis jerdoni*, the two out of three predorsals have disappeared.

Position	Species group			
	A	B	C	D
a	i	i	i	0
b	ii	ii	ii, iii	i
c	iii, 1	iii, 1, 2	1, 2	1, 2
d	2,3	3	3	3
e	4	4	4	4
f	5	5	5	5
.	.	.	.	.
.	.	.	.	.

diagram of Fig. 1. For the remaining genera there is a trend toward the predorsals and dorsal pterygiophores occupying more anterior interneural spaces. *Pristotis* is unique in having the 3 predorsals reduced to 1.

Key to the Japanese and Taiwanese species of *Chromis*

1a. No auxiliary scales present; upper margin of preopercle smooth (except *C. elerae* and some *C. fumea*); tips of caudal lobes not darker than rest of fin (except *C. flavomaculata* and *C. weberi*) 2

1b. Auxiliary scales present on nape and back (Fig. 2A); upper margin and corner of preopercle serrate; tips of caudal lobes blackish, darker than rest of fin ..... *C. lepidolepis*

2a. Upper and lower caudal spinules (spiniform procurrent caudal rays) 2..... 3

2b. Upper and lower caudal spinules (spiniform procurrent caudal rays) 3.....14

3a. Dorsal spines XII (*C. ovatiformis* sometimes with XIII) 4

3b. Dorsal spines XIII or XIV 10

4a. Body relatively deep, the depth 45 to 60% SL; free margin of suborbital reaching or nearly reaching rear edge of pupil; body without stripes; no prominent black band in lower lobe of caudal 5

4b. Body elongate, the depth 34 to 43% SL; no free margin of suborbital posterior to maxilla; body with blue and yellow stripes in life (stripes persisting in preservative); a prominent black band on lower lobe of caudal fin .....*C. vanderbilti*

5a. Margin of preopercle smooth; dorsal soft rays 12 to 14; third upper and lower principal caudal rays with elongate filamentous branches, the caudal concavity (horizontal distance bdtween tips of shortest and longest caudal rays 29 to 48%, SL; caudal fin distinctly paler than ground color of body 6

5b. Upper margin of preopercle serrate; dorsal soft rays 11; third upper and lower principal caudal rays not free from membranes and not very elongate, the caudal concavity 7 to 14.5% SL; caudal fin nearly as dark as ground color of body....*C. elerae*

6a. Dorsal soft rays 12 or 13; body may or may not be blackish with a pale caudal peduncle and fin, but if so, more than half of caudal peduncle is whitish; a black spot, if present on pectoral base, not preceded by a zone of yellow 7

6b. Dorsal soft rays 14; body blackish, the caudal fin and posterior caudal peduncle (less than half of peduncle abruptly white a black spot covering all of pectoral fin base, preceded by a zone of yellow in life .....*C. leucura*

7a. Pectoral rays 17 or 18; caudal peduncle and fin abruptly paler than rest of body; no blackish spot at rear base of dorsal fin 8

7b. Pectoral rays 16; caudal peduncle and fin not abruptly paler than rest of body, the upper and lower edges of peduncle and

Table 4. Fin-ray counts of species of *Chromis*.

Species	Dorsal spines			Dorsal soft rays							Anal soft rays							Pectoral rays					
	XII	XIII	XIV	9	10	11	12	13	14	15	9	10	11	12	13	14	15	15	16	17	18	19	20
C. albomaculata			15				6	9						4	11						2	13	
C. alleni	21	5					4	22						1	25					24	2		
C. analis		17				2	14	1					6	11							2	13	2
C. atripectoralis	17			1	16						2	15									1	10	6
C. atripes	13						13							13				1	9	3			
C. caerulea	17			1	16							17								3	14		
C. chrysura		10							9	1					10						1	9	
C. elerae	6					6						6								2	4		
C. flavomaculata		21	1			4	16	2				2	20								2	12	8
C. fumea		28	11		1	14	24				2	37									4	31	4
C. lepidolepis	26					1	23	2					25	1						2	23	1	
C. leucura	8								8						1	6	1		7	1			
C. margaritifer	35						32	3					1	34					3	28	4		
C. mirationis			10					7	3				1	8	1							9	1
C. notata miyakeensis	2	18					8	11	1			3	16	1							2	17	1
C. notata notata		63	2				9	55	1			1	64								6	56	3
C. ovatiformis	24	5					3	26						2	26	1			5	23	1		
C. ternatensis	11	1			1	9	2						12							1	10	1	
C. vanderbilti	14				2	11	1					1	12	1					1	12	1		
C. weberi		14				14							14								5	8	1
C. xanthura		17			2	15					2	15									3	13	1

Table 5. Counts of tubed lateral-line scales of species of *Chromis*.

Species	13	14	15	16	17	18	19
C. albomaculata				5	10		
C. alleni			13	12	1		
C. analis				3	6	7	1
C. atripectoralis			9	8			
C. atripes		5	7	1			
C. caerulea			11	6			
C. chrysura					5	3	2
C. elerae			1	4	1		
C. flavomaculata					7	10	5
C. fumea					7	12	16
C. lepidolepis			1	3	17	5	
C. leucura	1	6	1				
C. margaritifer				3	22	10	
C. mirationis				3	6	1	
C. notata miyakeensis				1	14	4	1
C. notata notata				10	35	19	1
C. ovatiformis	4	11	3				
C. ternatensis		1	6	4	1		
C. vanderbilti				7	6	1	
C. weberi					3	10	1
C. xanthura				1	7	7	2

Table 6. Gill-raker counts of species of *Chromis*.

Species	Upper Limb					Lower Limb									
	6	7	8	9	10	16	17	18	19	20	21	22	23	24	25
C. albomaculata	3	10						5	7	1					
C. alleni		14	6	1				2	5	10	3	1			
C. analis	2	9				1	5	2	3						
C. atripectoralis			2	7	3						2	6	4		
C. atripes	1	6	4	1				1	4	3	3	1			
C. caerulea			3	13	1					1	2	4	7	3	
C. chrysura			3	6	1						3	4	3		
C. elerae		2	2	2					1	2	1	2			
C. flavomaculata			6	9	3						3	7	4	2	2
C. fumea	1	12	20	2					7	13	11	2	1	1	
C. lepidolepis			9	14	2					8	11	6			
C. leucura	3	5						2	4	2					
C. margaritifer		9		23	1				9	22	2				
C. mirationis			4	5					1	4	4				
C. notata miyakeensis			3	8	1					4	3	3	2		
C. notata notata			17	42	6					10	21	20	13	1	
C. ovatiformis	2	8	6	1						6	5	5	1		
C. ternatensis		1	6	5							2	3	7		
C. vanderbilti	3	7	4					3	6	5					
C. weberi			6	4					1	2	6	1			
C. xanthura	1	5	11						1	5	7	4			

caudal fin blackish; a blackish spot at rear base of dorsal fin ..... *C. atripes*

8a. Body not very deep, the depth 48 to 53% SL; tubed lateral-line scales 15 to 18; body dark yellowish brown to black; a large black spot covering all of pectoral fin base; no yellow on side of snout 9

8b. Body very deep, the depth 55 to 64% SL;

tubed lateral-line scales 13 to 15 (modally 14); body light grayish brown; a diffuse dark spot at pectoral fin base; side of snout yellow in life ..... *C. ovatiformis*

9a. Tubed lateral-line scales 17 or 18; anal soft rays 11 or 12; dorsal soft rays modally 12; ground color dark bluish gray to black (except for whitish tail region) ..... *C. margaritifer*

9b. Tubed lateral-line scales 15 or 16; anal soft rays 13 or 14; dorsal soft rays modally 13; ground color dark yellowish to orangish brown (except for whitish tail region) ..... *C. alleni,* n. sp.

10a. Eye not very large, 8 to 12.8% SL (2.7 to 3.75 in head); dorsal spines XIII (rarely XIV); posterior nasal opening very small and more or less round; no mid-lateral stripe on head and body 11

10b. Eye large, 13.3 to 14.1% SL (2.1 to 2.55 in head); dorsal spines XIV; posterior nostril a large vertical slit just in front of eye; a mid-lateral yellowish to blackish stripe passing from eye to caudal base and thence into lower lobe of caudal fin.. *C. mirationis*

11a. Dorsal soft rays 10 to 13 (rarely 14); body not very deep, the depth 39 to 55% SL; caudal peduncle and fin not abruptly paler than rest of body; a small pale yellowish to white spot usually visible at rear base of dorsal fin 12

11b. Dorsal soft rays 14 or 15; body very deep, the depth 53.5 to 60% SL; caudal peduncle and fin abruptly whitish (except upper and lower edges of fin which are narrowly blackish), in contrast to dark brown to blackish color of rest of body; no pale spot at rear base of dorsal fin .... *C. chrysura*

12a. Anal soft rays modally 11; a large black spot covering most or all of pectoral fin base; preopercular margin smooth.... 13

12b. Anal soft rays 10 (rarely 9); no black spot at base of pectoral fins (though axil and narrow upper edge of base of fins are black); upper preopercular margin usually serrate ..... *C. fumea*

13a. Dorsal soft rays modally 12; margin of soft portions of dorsal and anal fins rounded (when spread); caudal fin yellowish, the lobe tips blackish ..... *C. flavomaculata*

13b. Dorsal soft rays modally 11; margins of soft portions of dorsal and anal fins angular; caudal fin blackish except posteriorly, the dark pigment concentrated in bands near upper and lower margins.. *C. notata*

14a. Dorsal rays XII or XIII, 9 to 12; anal soft rays 9 to 11; fins and body not entirely dark brown 15

14b. Dorsal rays XIV,12 or 13; anal soft rays 12 or 13; fins and body dark brown, the centers of scales paler than edges..... ..... *C. albomaculata*

15a. Dorsal spines XII 16

15b. Dorsal spines XIII 18

16a. Dorsal and anal soft rays 9 or 10; dorsal and anal fins not scaled (or with only a single row of small scales basally on soft portions); color in life blue-green, without black bands in caudal lobes 17

16b. Dorsal soft rays usually 11 and anal soft rays 11; dorsal and anal fins with scales extending half or more the distance to outer margin; color in life gray with a black band at the upper and lower margin of caudal fin..... *C. ternatensis*

17a. Pectoral rays 17 or 18; axil of pectoral fin pale to slightly dusky..... *C. caerulea*

17b. Pectoral rays 18 to 20 (rarely 18); axil of pectoral fins jet black .... *C. atripectoralis*

18a. Body not very deep, the depth 40 to 53% SL (usually less than 48%); lower-limb gill rakers 19 to 22; body color brownish or olivaceous gray to blackish; a narrow blackish bar just posterior to upper preopercular margin and another on upper posterior margin of opercle 19

18b. Body deep, the depth 49.5 to 58% SL; lower-limb gill rakers 17 to 19; color in life mainly yellow; no dark bars along margins of preopercle and opercle .... *C. analis*

19a. Body blackish, the centers of the scales bluish, the caudal peduncle and fin usually abruptly white (in Taiwan and Ryukyu Is.); longest dorsal soft ray 24.1 to 40.7% SL ..... *C. xanthura*

19b. Body brownish to olivaceous gray, the caudal peduncle not lighter than rest of body, the caudal fin with a broad dark brown to blackish margin on each lobe, the distal tips black; longest dorsal soft ray 18.5 to 23.4% SL ..... *C. weberi*

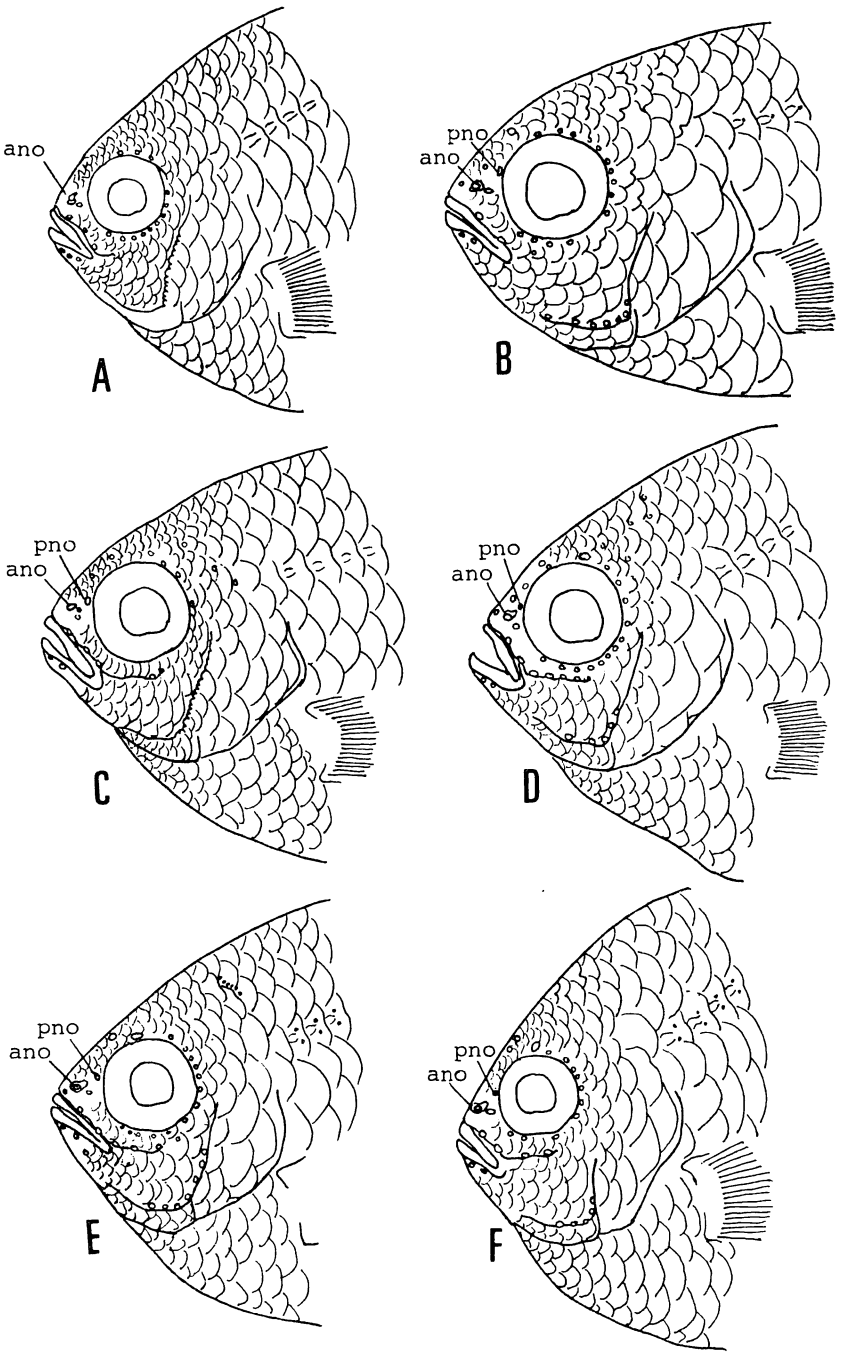

Fig. 2. Head of *Chromis* showing lateralis system of head, margin of suborbital, and state of preopercle margin. ano: anterior nasal opening, cso: crescent opening of supraorbital canal, pno: posterior nasal opening. A: *Chromis lepidolepis*, FSKU 751001, 54.0 mm. B: *C. vanderbilti*, FSKU 741119, 39.3 mm. C: *C. elerae*, BPBM 22608, 52.0 mm. D: *C. leucura*, BPBM 22317 31.0 mm. E: *C. atripes*, FSKU 751001, 39.9 mm. F: *C. ovatiformis*, FSKU 751205, 58.5 mm. Note serrated preopercle and absence of posterior nasal opening in *C. lepidolepis* and absence of free suborbital margin in *C. vanderbilti*. Opening of supraorbital canal just above the eye is oval-shaped and relatively large in *C. leucura*, *C. atripes*, and *C. ovatiformis*.

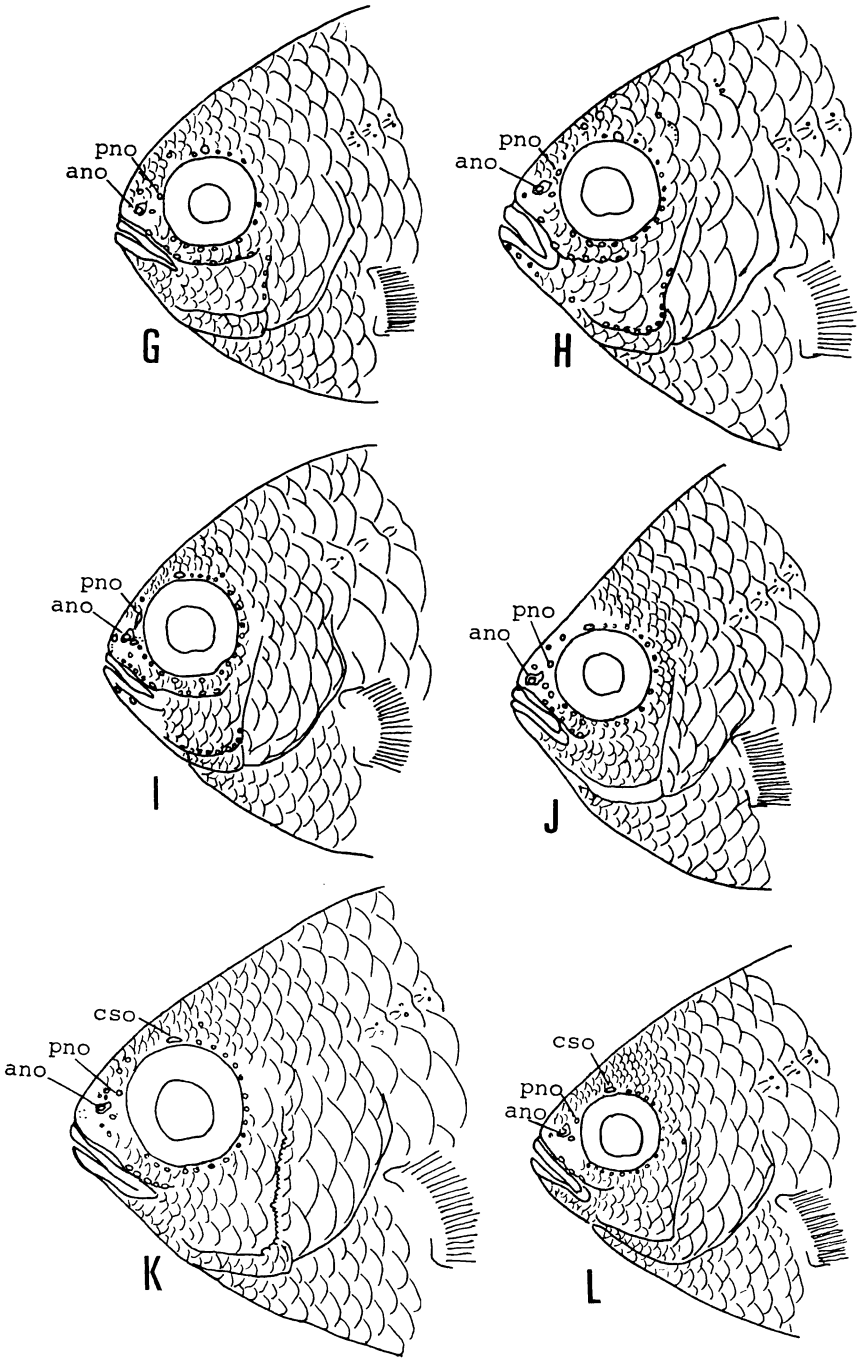

Fig. 2. Continued. G: *C. margaritifer*, FSKU 701003, 40.8 mm. H: *C. alleni*, TMBS 741230, 39.0 mm. I: *C. mirationis*, SMBL 72067, 91.0 mm. J: *C. chrysura*, TMBS 740715, 73.0 mm. K: *C. fumea*, FSKU 760225, 54.2 mm. L: *C. flavomaculata*, TMBS 741119, 70.0 mm. Note extention of free margin of suborbital in the first three species. Posterior nasal opening is a large vertical slit in *C. mirationis*. Posterior margin of preopercle is distinctly serrated in *C. fumea*.

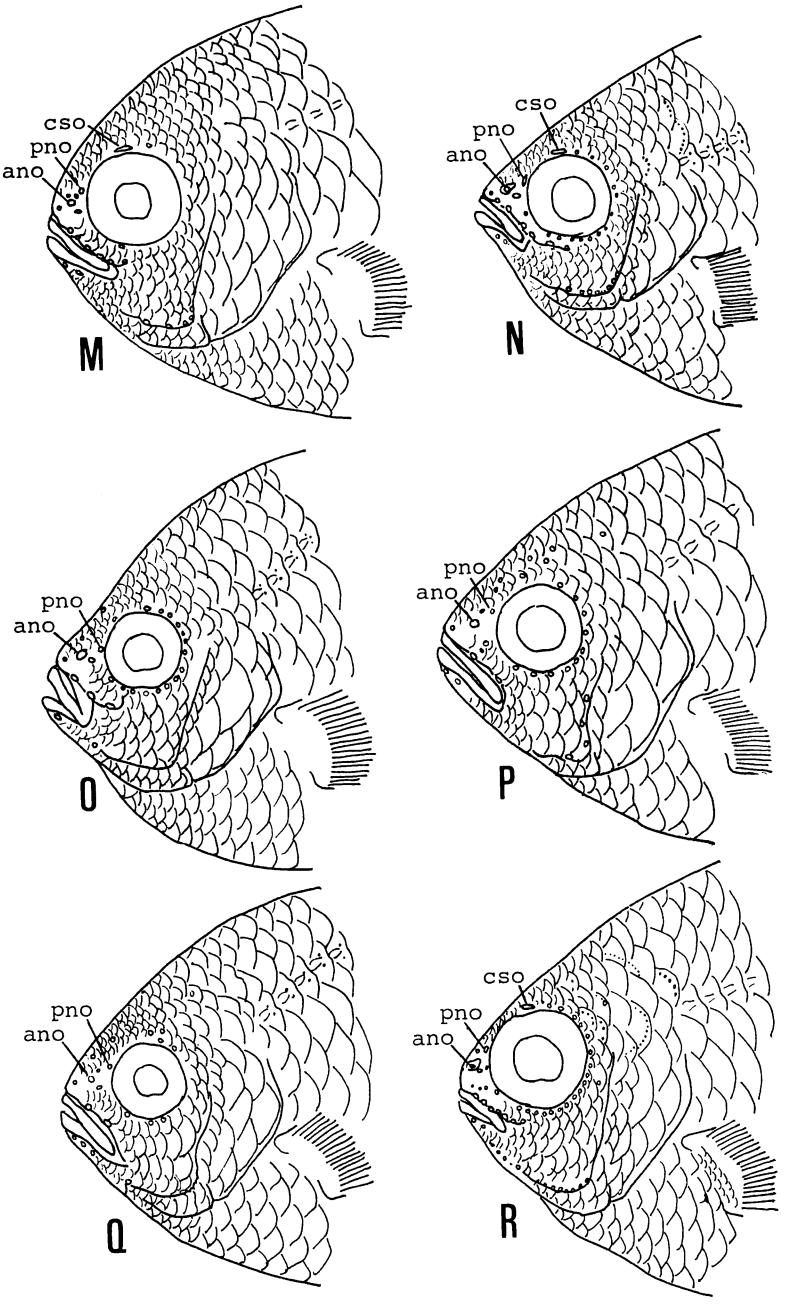

Fig. 2. Continued. M: *C. notata*, FSKU 760623, 100.0 mm. N: *C. albomaculata*, FSKU 750518, 44.0 mm. O: *C. ternatensis*, FSKU 751001, 74.0 mm. P: *C. caerulea*, BPBM 10183, 51.0 mm. Q: *C. atripectoralis*, FSKU 751117, 60.0 mm. R: *C. analis*, FSKU 751013, 79.0 mm. Note absence of enlarged opening of supraorbital canal in *C. ternatensis*, *C. caerulea* and *C. atripectoralis*. Margin of suborbital is not exposed in *C. caerulea* and *C. atripectoralis*.

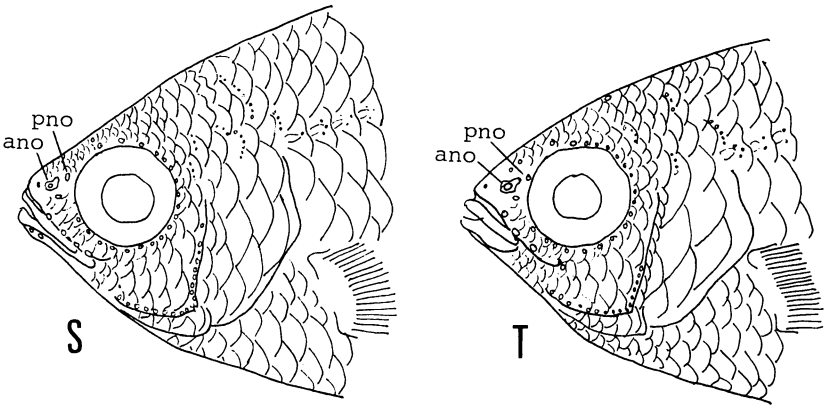

Fig. 2. Continued. S: *C. weberi*, TMBS 741230, 50.3 mm. T: *C. xanthura*, TMBS 741230, 37.2 mm. Note absence of enlarged openings in supraorbital canal in the two species. Free margin of suborbital is shortened in larger individuals in *C. xanthura*.

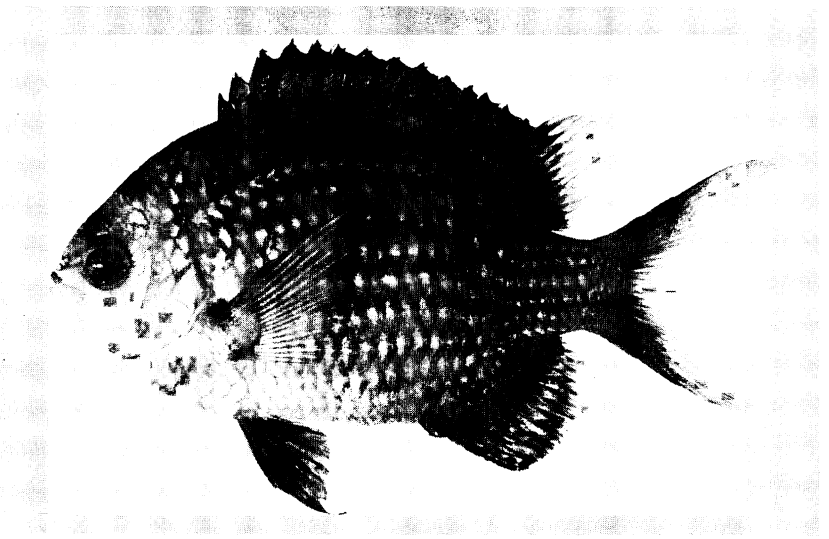

Fig. 3. *Chromis albomaculata*, BPBM 19114, 127 mm SL, Okinawa, Japan.

Meristic data for all the *Chromis* of the present paper are given in Tables 4～6.

Chromis albomaculata Kamohara
(Japanese name: Shiroboshi-suzumedai)
(Figs. 2N, 3)

Chromis albomaculatus Kamohara, 1960: 3, fig. 1 (type locality, Kashiwajima, Kochi-ken, Japan).

Materials. BSKU 7487, 119 mm, holotype; BSKU 8514, 105 mm, paratype, Okinoshima, Kochi-ken; TMBS 740717, 2: 136～138 mm, Miyake-jima, Izu Islands; TMBS 741231-A, 3: 114.4～137.2 mm, Miyake-jima; FSKU 750518, 24.4～42.5 mm, Miyake-jima; BPBM 19014, 5: 94.8～140.4 mm, Miyake-jima; BPBM 19114, 125 mm, Sesoko-jima, Okinawa.

Description. Dorsal rays XIV,12 or 13; anal rays II,12 or 13; pectoral rays 18 or 19 (usually 19); caudal spinules 3/3; tubed lateral-line scales 16 or 17 (usually 17); scales above lateral line 3 or 4 (rarely 3); scales below lateral line 10; gil rakers 6 or 7+18 to 20.

Body deep, 52.5～57.6% SL; head length 29.1～31.1; orbit relatively small, 8.7～9.5 in adults over 100 mm SL and 12.2～12.5 in juveniles of

42.5～44.0 mm SL; interorbital width 11～11.8; snout length 7.3～9.9; least depth of caudal peduncle 15.1～16.8; longest dorsal spine 14.2～17.4; second anal spine moderately long, 19.5～22.7.

Interspinous membranes of dorsal fin slightly incised, the posterior membranes scarcely so; third dorsal soft ray longest; anal soft rays progressively shorter posteriorly; posterior margin of soft dorsal and anal fins rounded; caudal fin forked, the tips of upper and lower lobes extending as filaments only in young; caudal concavity of adults 14.3～20% SL.

Free margin of suborbital extending to below posterior margin of pupil; margin of preopercle smooth. Anterior nasal opening rather large with a membranous rim which is higher posteriorly; posterior nostril near edge of orbit, usually a narrow slit; pores of lateralis system on head small.

Color blackish brown, the centers of the scales paler than edges; some lavender reflections on scales of cheek and thorax; fins blackish brown, the posterior part of the median fins somewhat paler and the pectoral membranes clear; a small black spot on upper pectoral base; axil of pectoral fins dark. The young are uniform mauve, the anterior part of anal and pelvic fins and upper and lower edges of caudal fin bright pink. Underwater photographs showing normal and courtship coloration were published by Moyer (1980).

Distribution and habitat. Because this species occurs in relatively deep water (to at least 40 m) and is comparatively shy, few specimens have been collected. Except for two short behavioral notes by Moyer (1977, 1980) our records here are apparently the first since the description by Kamohara (1960). Also see Shepard and Moyer (1980). The present range is Miyake-jima, Izu Islands, to Okinawa.

The preferred habitat of *C. albomaculata* is along cliffs or among large boulders. It is sometimes solitary but is usually seen in loose aggregations which feed in the water column. The species covers a rather large home range in comparison with other members of the genus. It nests on the sides of large boulders or in crevices that have been cleared of most algae. Although we have observed large aggregations repeatedly in as little as 12 m, we have found nests only from 18 to 30 m.

Chromis alleni, sp. nov.

(New Japanese name: Onaga-suzumedai)
(Fig. 2H; Pl. 1A)

Holotype. BPBM 19092, 57.5 mm, gravid female, Sesoko-jima, Okinawa, Ryukyu Islands, west side, head of dead coral in 15 m, quinaldine, J. E. Randall, 27 May 1975.

Paratypes. TMBS 741230-A, 39 mm, Igaya, Miyake-jima, Izu Is., 12 m, hand net, H. Ida and and J. T. Moyer, 30 Dec. 1974; BPBM 19093, 56.5 mm, same data as holotype but collected by spearing; BPBM 19119, 53 mm, same as preceding except date of collection, 30 May 1975; BPBM 19142, 50.5 mm, same as preceding except depth 14 m, 1 June 1975; TMBS 750700, 33.1 mm, Igaya, Miyake-jima, 21 m, quinaldine, J. T. Moyer, July 1975; TMBS 751001-B, 28.5 mm, Okubo, Miyake-jima, 10 m, quinaldine, J. T. Moyer, 1 Oct. 1975; USNM 220557, 45 mm, Nakagusuku Bay, Okinawa, 30 m, screen net and quinaldine, J. W. Shepard and K. A. Meyer, 21 Feb. 1976; WAM P25516, 5: 46.7～62.2 mm, Sesoko-jima, Okinawa, 15 m, spear, G. R. Allen, 22 March 1976; FSKU 760810, 7: 49.3～62.2 mm, Anijima Strait, Chichi-jima, Bonin (Ogasawara) Is., 3 to 7 m, screen net, H. Ida and J. Kimura, July 1976; NTUM 4927, 2: 52.2～59.1 mm, same data as preceding; BM(NH) 1979. 7. 17.1, 36.2 mm, Sesoko-jima, Okinawa, west side, base of reef front in 11 m, spear, J. E. Randall, 12 Sept. 1977; BPBM 22310, same locality, 15 m, J. E. Randall, T. Yoshino, and M. Yasumoto, 13 Sept. 1977; BPBM 22618, 53.3 mm, Taiwan, south end at Nan Wan, middle of bay east of harbor at Hou-pi-hu, rocky pinnacle in 24 m, spear, J. E. Randall, 20 July 1978.

Diagnosis. Dorsal soft rays usually 13; anal soft rays nearly always 13; pectoral rays usually 17; tubed lateral-line scales 15 to 17 (rarely 17); gill rakers 7 to 9+18 to 22; depth of body 46.5～52.5% SL; orbit diameter about one-third head length; free margin of suborbital extending to or nearly to a vertical at posterior margin of pupil; soft portions of dorsal and anal fins angular and filamentous; distal ends of caudal fin lobes produced as filaments; deep yellow-brown to orange-brown, abruptly whitish on caudal peduncle and fin; a large dark spot at pectoral fin base.

Description. Dorsal rays XII,13 (XII or XIII,

usually XII, 12 or 13, usually 13); anal rays II, 13 (12 or 13, rarely 12); pectoral rays 18 (upper two and lower two unbranched) (17 or 18, usually 17); pelvic rays I,5; principal caudal rays 15 (upper and lower unbranched); upper and lower caudal spinules 2; tubed lateral-line scales 15 (15 to 17); posterior mid-lateral pored scales 9 (8 to 10); longitudinal scale rows 27 (26 or 27); scales above lateral line 3; scales below lateral line 9; circumpeduncular scales 16; gill rakers 7+21 (7 to 9+18 to 22); vertebrae 11+15.

The relative lengths are expressed as % of standard length. Body moderately deep, the depth 52.5 (46.5～51.8) SL, and compressed, the width contained about 2.7 times in depth; head length 32.3 (29.2～35.1); orbit diameter 10.4 (10.6～12.3); snout length 11.3 (7.4～10.9); interorbital width 12.3 (10.4～12.6); least depth of caudal peduncle 16.0 (14.0～16.6); origin of dorsal fin above third lateral-line scale, the predorsal distance 38.6 (36.7～43.8); first dorsal spine contained about 1.5 times in second; second dorsal spine about 1.4 in longest (sixth or seventh) dorsal spine (but fifth to last spines subequal); longest dorsal spine 14.8 (14.1～16.7); interspinous membranes of dorsal fin deeply incised anteriorly, progressively less so posteriorly; fifth and sixth dorsal soft rays the longest, filamentous in adults (31.4 in holotype); origin of anal fin below base of eighth to ninth dorsal spines; first anal spine contained about 1.7 times in second; second anal spine 15.3 (15.1～18.8); seventh anal soft ray usually longest (the sixth and seventh filamentous in adults), 26.0 in holotype (up to 30.0 in paratypes), caudal fin forked, the second and twelfth branched rays filamentous, the caudal concavity 35.0 in holotype (up to 48.6 in paratypes); pectoral fins somewhat pointed, reaching slightly posterior to a vertical at origin of anal fin, their length in holotype 32.2; origin of pelvic fins below lower base of pectoral fins; pelvic fins filamentous, reaching to or beyond base of first anal soft ray, their length in holotype 35.2.

Mouth highly oblique, the lower jaw slightly projecting, the maxilla not reaching or just reaching a vertical at front of orbit; teeth conical, in three to four rows at front of upper jaw and two in lower, narrowing to a single row on sides of jaws; outer row of teeth notably larger than inner rows, 22 (21 to 25) in upper jaw and 20 (18 to 24) in lower.

Free margin of suborbitals extending to or nearly to a vertical at hind margin of pupil; margin of preopercle smooth.

Anterior nostril in front of eye, slightly above a horizontal through center of eye, with a fleshy rim that is higher posteriorly; posterior nostril very small, diagonally upward and posterior to anterior nostril, near edge of orbit. Pores of lateralis system on head moderate in size.

Scales ctenoid; no auxiliary scales; head completely scaled except a narrow zone at front of snout above upper lip and a corridor extending from eye to front of snout which contains anterior nostril. Median and pelvic fins with scales extending more than half distance to margins; pectoral fins with small scales basally; axillary scale of pelvic fin nearly half length of pelvic spine.

Color in preservative brown, the posterior three-fourths of caudal peduncle abruptly whitish, the caudal fin pale (slightly dusky basally and out on lobes); dorsal and anal fins brown, a little darker on soft portions, but abruptly whitish posteriorly, the demarcation curved, coming into alignment ventrally with the demarcation of the caudal peduncle; pale region posteriorly on anal fin about half as broad as that of dorsal fin; pectoral fins clear with dusky rays, a large hemispherical black spot at base with a faint pale margin on curved distal edge; axil of pectoral fins broadly black; pelvic fins with dark brown membranes and pale rays.

In life the ground color is yellow to orange-brown, the caudal peduncle and fin whitish with a faint bluish cast; lips bluish; dorsal and anal fins yellowish brown, basally shading to dark brown except pale bluish white posterior parts; pelvic fins with dark brown membranes and brownish yellow rays.

Distribution and habitat. *C. alleni* is known from the Ryukyu Islands, Miyake-jima in the Izu Group, the Bonin (Ogasawara) Islands and Taiwan. Our specimens have come from the depth range of 11 to 30 m in outer coral reef or rocky areas.

The habitat separation of *Chromis atripes, C. margaritifer,* and *C. ovatiformis* in Japanese waters is discussed below (*C. atripes*). This separation is by no means complete, with some over-